# Development of an artificial neural network for automated age estimation

*Simon Robertson and Alexander Morison*

**Project No. 98/105**

Department of Natural Resources and Environment
State Government Victoria

FISHERIES RESEARCH & DEVELOPMENT CORPORATION

Victoria
The Place To Be

**Fisheries Research and Development Corporation**

# Development of an artificial neural network for automated age estimation

**Simon Robertson and Alexander Morison**

**P.O. Box 114**
**Weeroona Parade**
**Queenscliff**
**Victoria 3223**
**Australia**

**November 2001**



**ISBN 0 7311 5038 4**

# CONTENTS

# NON-TECHNICAL SUMMARY

## 98/105 Development of an artificial neural network for automated age estimation

**PRINCIPAL INVESTIGATOR:** Simon Robertson
**CO-INVESTIGATOR:** Alexander Morison
**ADDRESS:** Marine and Freshwater Resources Institute
P.O. Box 114
Queenscliff, Vic. 3225
Tel: (03) 5258 0111 Fax: (03) 5258 0270
Email: simon.robertson@nre.vic.gov.au

**OBJECTIVES:**

1. Compare the effect of different forms of data input on the performance of neural network models for automatically estimating the age of fish.
2. Compare the effect of different forms of neural network models and their respective performance on the precision of the derived age estimates.
3. Develop a protocol for the application of the neural network models to the process of automated ageing.

**NON TECHNICAL SUMMARY:**

OUTCOMES ACHIEVED

The project has confirmed the results of the pilot study that neural networks are an effective technique for predicting fish age. It has advanced the method by successfully including a greater range of data inputs, by demonstrating the improved effectiveness of alternative network models, and by improving the model training process. A preliminary protocol for the application of neural networks to age estimation for fish has been developed. The optimal combination of network models and data inputs is not readily predictable for a given species, and a full range of options should be evaluated.

Following the success of the FRDC funded project ‘Investigation of the potential for automated ageing using image analysis: a pilot study’ (FRDC 96/136), a second proposal was funded to further examine the potential of using artificial neural networks to automatically estimate the age of fish. This current project aimed to extend the techniques developed in the pilot study, using the available biological information and signal processing algorithms and to apply these techniques to a range of species important to the commercial and recreational fishing sectors. The species chosen for this study were ling, snapper, black bream, school whiting, King George whiting, blue grenadier, pilchards, ocean perch and sand flathead.

Ageing of otolith samples provides integral information for stock assessment. Current techniques require experienced readers to examine the otoliths for age estimation; this is a time consuming and expensive process. The application of neural networks has the potential to increase the number of samples and reduce the cost. Further benefits include the provision of an error estimate for each individual age estimate.

During the project, over 330,000 age estimates from over 37,000 individuals were made and compared among three different neural network models using different model inputs. Types of models tested were the back propagation, multiple hidden layer and probabilistic neural networks. Data inputs to these models (tested on their own and in various combinations) were brightness values along transects within images of each sectioned otolith (signal data), biological data (including fish length), otolith weight, and date of capture.

We used the decision criteria of average percentage error (APE) and regression analysis to measure the performance of neural networks against age estimates made by experienced readers. The study confirmed the results of the pilot study that neural networks were able to accurately predict the age of a fish based on a small number of data inputs. It also showed that data inputs not derived from the otolith image can contribute significantly to the performance of a neural network, and can be sufficient on their own for the accurate estimation of fish age.

Biological data alone or in combination with signal data were more effective in age prediction than signal data alone. Signal data from transects across otolith images were still useful and could be substantially condensed by a discrete fast Fourier transformation prior to input to a neural network. However, segments of otolith images could not be successfully reduced and manipulated for use as data inputs. They may, nevertheless, still prove to be a superior type of data input for neural networks.

Neural networks reproduced age estimates with an APE of less than ten percent and with non-significant regression statistics, for all of the species trialed except for ocean perch. The optimal combination of type of input data and type of neural network was species dependent. Different forms of neural networks and data inputs are likely to be preferred for different species. The back propagation model used in the earlier project was the least effective of the models trialed.

A preliminary protocol for the application of neural networks to age estimation in fish has been developed. The steps identified are necessary but not sufficient for the identification of an effective neural network for other species. The application of the neural network approach to production fish ageing, would provide significant benefits to the quality control aspects of such work.

The models trialed in this study significantly extend the knowledge base of the field of automated ageing and will generate significant interest in this area. However, the application of automated ageing to production ageing laboratories is still yet to be realised. The results obtained from neural networks were not as precise as those obtained by an experienced reader, but these slightly higher error levels may still be acceptable for some quantitative stock assessment or other applications.

KEYWORDS:

Neural networks, automated ageing, probabilistic neural network, multiple layer neural network, back propagation neural network, otoliths, ling (*Genypterus blacodes*), snapper (*Pagrus auratus*), black bream (*Acanthopagrus butcheri*) , school

whiting (*Sillago flindersi*), King George whiting (*Sillaginodes punctata*), blue grenadier *(Macruronus novaezelandiae*), pilchards (*Sardinops neoplichardus*), ocean perch (*Heliocolenus* sp.), sand flathead (*Platycephalus bassensis*).

# List of Figures

# List of Tables

# DRAFT FINAL REPORT

**98/105 Development of an artificial neural network to automatically estimate the age of fish**

## Acknowledgements

We would like to thank the following staff member for their significant input into this project. Corey Green for age estimation of blue grenadier; Kyne Krusic-Golub for age estimates on snapper and ling; Kylie Hall for age estimates of pilchards and registration of samples at the CAF; Julia Curtain for estimates of offshore ocean perch and sample registration. Simon Conron, David McKeown, Pam Olivero, Patrick Coutin supplied samples of King George whiting, snapper and black bream. Mathew Koopman supplied age estimates for samples of sand flathead. David Smith and Leanne Gunthorpe provided useful comments on drafts of this report. Funding for collection of otolith samples has been provided by Fisheries Victoria (King George whiting, black bream, sand flathead, snapper and pilchard), and by the Australian Fisheries Management Authority (school whiting, ocean perch, blue grenadier, and ling).

## Background

Traditional methods of determining the age of fish from otoliths are time-consuming and require experienced technicians. The wider availability of more powerful computers has lead to an increased interest in the use of image analysis software to assist the age estimation process (e.g. Estep *et al.* 1995; Macy 1995; Welleman and Storbeck 1995 and Robertson and Morison 1999). Computers offer potential advantages over using trained technicians in the age estimation process in several ways (Troadec 1991):

- Quantification - computers are superior by effecting the ability to provide accurate counts and measurements.
- Interpretation - in using mathematical models in the reading process.
- Replication - by reducing intra-reader variability.
- Knowledge preservation - in overcoming problems of knowledge transfer between readers.

The FRDC funded a pilot study to investigate the use of image analysis systems for automatically estimating the age of fish using otoliths (Project 96/136, Morison and Robertson, 1997; Robertson and Morison 1999). This pilot project initially applied published methods for automating the age estimation process. Published methods have usually attempt to replicate the way in which humans interpret structures. These methods require the identification of peaks and troughs in light intensity (the annual increments) along a single transect drawn across an image of an otolith (Welleman and Storbeck 1995). Such an approach can be successful, but the pilot study identified a number of inherent weaknesses. It uses only a small part of the information that is available in an image and which is normally used by the experienced reader. A single transect will rarely encapsulate all the relevant information about the otolith. In addition, peaks and troughs are local phenomenon along the transect, and their number (frequency) depends very much on the scale at which they are identified (the bandwidth of the search range). Also, scale may vary along the transect. There is also considerable variation in increment width among individual otoliths. Objective criteria for identification of increments as peaks and troughs along a light intensity profile are therefore difficult to codify as a numerical decision rule.

The second approach used in the pilot study was to employ an artificial neural network (ANN) to address the problem of classifying transects drawn across images of otoliths into their respective age class. The term artificial neural network derives its origin from the analogy of its structure with that of a network of interconnected neurons in an animal's nervous system. Neural networks are startlingly effective at solving problems for which no clear-cut method exists. They are exceptionally robust against noise, and are immune to violations of assumptions that would cripple many traditional analytical methods (Masters 1994). The neural network approach is to use a calibration set of known inputs and outputs to allow the model to train itself to be able to correctly estimate outputs for novel inputs. The neural network iteratively develops its own decision rules which are expressed as complex weighting functions in the connections within the neural network. These decision rules then allow the model to classify or map unknown vectors of input variables to the desired output vector or age class. Some neural networks 'learn' in much the same way that tradition statistical algorithms minimise the error function, and many neural network models are similar or identical to popular statistical techniques, such as generalised linear models, polynomial regression and discriminant function analysis (Sarle 1994). Other neural network models have no precise statistical equivalent. Increased interest in neural networks has led to many commercial software packages becoming available and the incorporation of neural network modules into standard statistical software applications (such as SAS). In fields of aquatic science, such models have been used for processing images to discriminate between two species of phytoplankton (*Ceratium* spp.) (Simpson *et al.* 1992), to count fish (Newbury *et al.* 1995), for the development of American lobster management regimes (Saila 1997), and for predicting the catch of Japanese sardine larvae in Sagami bay (Komatsu *et al.* 1994).

The pilot study employed a back propagation neural network, and as a first stage, used a single transect of raw luminance values with a vector length of 202 pixels as the inputs to the neural network. It was necessary to work with single transect inputs to reduce the complexity of the calculations in the development phase of the neural network. Although each transect represents a cyclical pattern of light and dark areas, from the neural network's perspective the inputs were a single vector of independent data values. Despite the simplicity of the network inputs, the neural network developed was able to successfully classify fish age from transects not in the training set for two of the three species tested. (The successful species were black bream and snapper; the unsuccessful species was blue grenadier. Age predictions for blue grenadier were inaccurate because of the more ambiguous nature of the increments.). One benefit of using a neural network is that each age estimate is accompanied by an error term which indicates the certainty of the resultant estimate. This can allow uncertain estimates to be screened and either discarded or aged using traditional techniques. The error term can also be incorporated directly into assessment models. A more sophisticated form of data input, additional data and different forms of neural networks which more effectively captures the fundamental otolith pattern, were all expected to improve the performance of artificial neural networks.

# Need

"The ageing of fishes, and consequently the determination of their growth and mortality rates, is an integral component of modern fisheries science. It is not an easy task: a wide variety of techniques are employed and continue to be developed, and discrepancies between readers is common." (Paul 1992). It is estimated that approximately 800,000 otoliths are processed annually through the world's production fish ageing laboratories at an annual cost of approximately $CAN 8,000,000 (Campana and Thorrold 2001). The Central Ageing Facility (CAF) in Victoria, Australia currently ages approximately 25,000 samples annually. Current age estimation methods, even when aided by image analysis software still depend on interpretation by an experienced reader. The process of ageing is laborious, time consuming and hence, relatively expensive. For production ageing, where there is an ongoing requirement for a large number of age estimates, there is a substantial training and verification period needed to ensure that the new reader is interpreting otolith structure in a consistent and correct manner.

The development of an automatic ageing regime would have the primary advantage of being a far more objective method than is possible with even the best training, reducing discrepancies both between readers and between organisations. This factor will increase the precision of estimates and therefore provide greater confidence in the age estimates for stock assessment. Benefits associated with the development of this technique would also include a significant reduction in the sample processing time which would increase the number of samples able to be processed in a given period of time and hence reduce the cost.

The development of a semi-automated/automated ageing technique would reduce the cost of production ageing significantly on a national and international level. This fact has been recognised on an international level by the European Fish Ageing Network where one of the five units within the network is focused on the development of such techniques (www.efan.no). The Fisheries Research and Development Corporation (FRDC) recognised the advantages of automating current ageing techniques by funding the pilot study (FRDC 96/136). This study extends the initial investigation into the possibility of automating ageing techniques using neural networks.

# Objectives

- Compare the effect of different forms of data input on the performance of the neural network model for automatically estimating the age of fish.
- Compare the effect of different forms of artificial neural network models and their respective performance on the precision of the derived age estimates.
- Develop a protocol for the application of the artificial neural network models to the process of automated ageing.

# Methods

## Otolith preparation and reading

All the otoliths used in this project had been previously aged using the procedures and protocols developed at the CAF (Morison *et al.* 1998). The procedures used for preparing the samples and estimating the age of fish are summarised below.

Otoliths are sent to the CAF in small batches (usually about 100 samples) depending on species. These are then allocated a unique three digit batch number. Each batch is registered in a Microsoft Access database. One otolith from the pair supplied is weighed to the nearest milligram using an electronic balance coupled to a computer. Weight data from the balance is exported to an ASCII file. These data are matched with the biological data. All biological information associated with samples are entered in Microsoft Excel spreadsheets.

Samples are then embedded in clear polyester casting resin in rows of five otoliths. These are then sectioned at 300 - 500 microns using a modified lapidary saw and mounted on glass slides and cover-slips applied using further polyester casting resin. A total of four sections through each row of otoliths are taken to ensure the primordium of each otolith is included on the slide.

The slides are then examined by an experienced reader to determine the age. This entails placing the slide on the stage of a dissecting microscope, locating the section with the primordium (biological centre), and counting the number of alternating translucent and opaque zones to determine the age. An image of the sectioned otolith is displayed on a computer monitor. A trained technician draws a line on the image from the primordium to the edge of the otolith through a predetermined sector of the otolith section image. The opaque zones are marked with screen markers along the transect. The edge of the otolith is also marked. These data are automatically exported to a Microsoft Excel spreadsheet with species, batch and fish number. The age of the fish is determined by the zone count and a birthday adjustment.

Correct assignment of fish to an age class requires the application of a standard rule for counting zones near the otolith edge (the 'edge interpretation problem' of Francis *et al.* 1992). This is necessary as the zones may form in otoliths within a given year class over a period of several months. Fish aged just before the birthday (generally January 1$^{st}$) that have a zone just formed on the edge have an age estimate of the zone count minus one, whereas a fish aged just after the birthday with a wide margin between the last zone and the edge (ie. the zone hasn't completely formed), the age estimate is the zone count plus one.

These age estimates, biological data and date of capture information were used for training, testing, and evaluation, of the neural networks developed and trialed in this project.

Initially four species were proposed to be trialed. The species list was expanded due to the availability of samples at the CAF. It was also felt that by using a larger variety of species, the most broadly applicable types of data inputs and networks, or that the types of networks that are best suited to particular types of species, may become evident.

The following nine species were used in the project.

- King George whiting (*Sillaginodes punctata*)
- Ling (*Genypterus blacodes*)
- Snapper (*Pagrus auratus*)
- Black bream (*Acanthopagrus butcheri*)
- School whiting (*Sillago flindersi*)
- Blue grenadier *(Macruronus novaezelandiae*)
- Ocean perch (*Heliocolenus* sp.)
- Sand flathead (*Platycephalus bassensis*)
- Pilchard (*Sardinops neopilchardus*)

## Data inputs from otolith images

Images of the otolith sections were saved as an eight bit grey scale tagged image format file. Image nomenclature comprised a nine digit code with the first three digits being the species code, the second three digits the batch code and the last three digits the CAF fish number. The extension identified the file type (eg. *.tif being tagged image format). These images were saved and recorded to CD for further processing.

From each of the images, luminance data were collected from up to five transects for all species (the signal data). The transects were manually drawn from the primordium of the otolith to the edge of the otolith. The transects were drawn on the areas of the otolith which showed a clear alternating patterns of opaque and translucent zones that would be used by an experienced reader when estimating age. The location and number of transects varied among species but were consistent for all individuals within species. Three transects were taken from blue grenadier, five from the remaining species. Typical transect locations for each species are shown in Figure 1. through Figure 8. For each transect, its length was calculated (in number of pixels) from the XY coordinates of the start and finish points.

Square image segments were also saved from samples, for use as inputs to neural network models. The size of the image segments was either 128x128 or 256x256 pixels depending on species. Image segments were drawn with one corner at the primordium and extending out proximally and dorsally (Figure 1). These image segments were saved in bitmap (BMP) format using the same image nomenclature with the *.bmp file extension. A high level of compression is required to reduce such image segments to a small enough dataset to be useful as a neural network input, yet still retain enough useful information on the inherent signal within the section. For example, using only five percent of the original data would still retain 3,276 values from an image segment of 256x256 pixels, and 819 values from an image segment of 128x128 pixels. Several image compression routines were tried to reduce the size of datasets, including two dimensional Fourier transforms and wavelet compression algorithms.

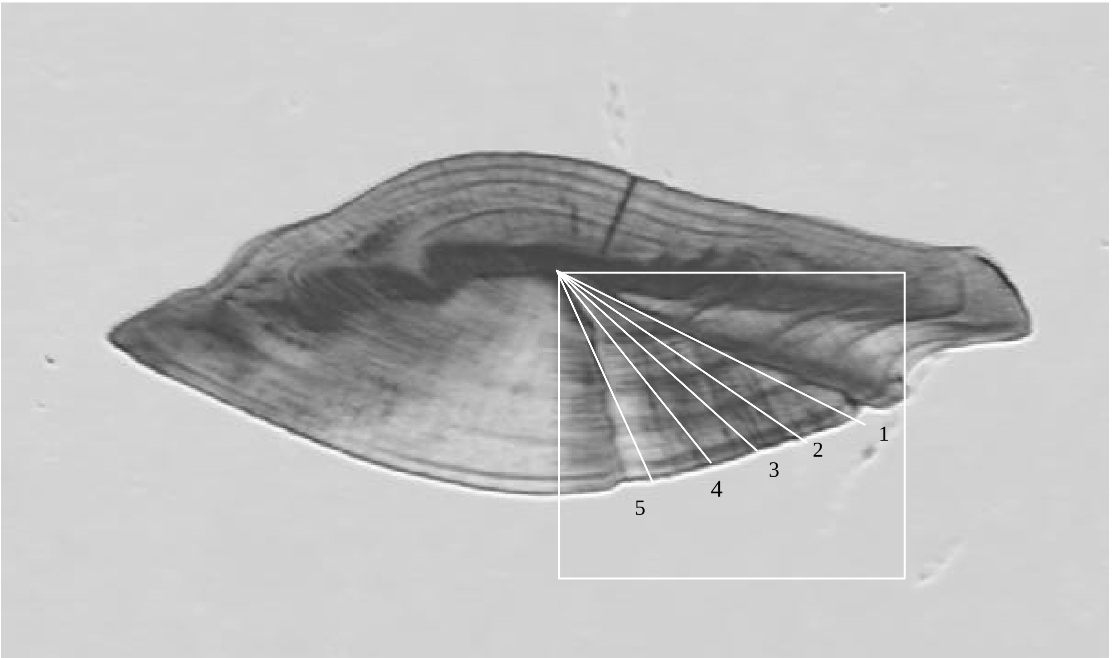


Figure 1. Sectioned King George whiting otolith showing typical locations of transects (1-5).
The square represents the typical position of a 128 x 128 pixel segment.

The transects are through the clearest section of the otolith, being the sulcus. The first transect is closest to the dorsal edge of the otolith. The example is of a 4 year old 41 cm King George whiting sampled from Port Phillip bay on 24/1/99.

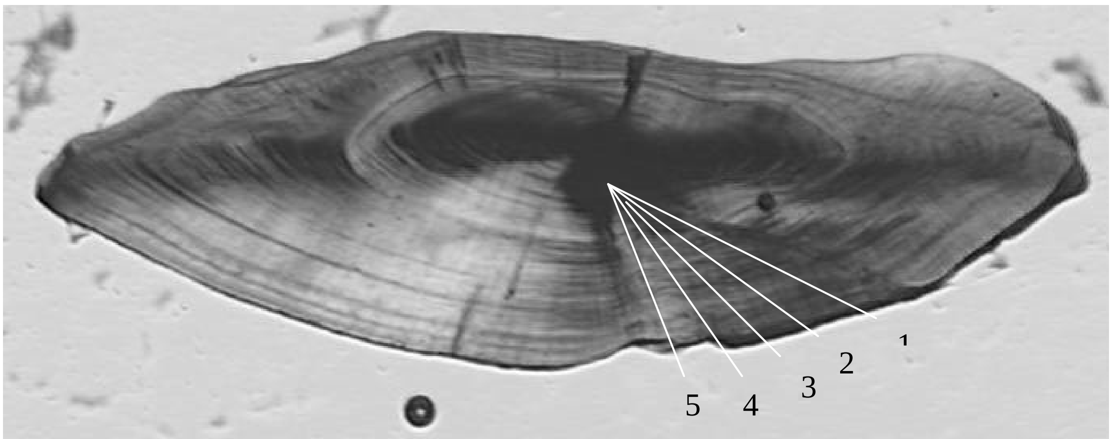


Figure 2 Sectioned school whiting showing typical locations of transects.

The example is of a 3 year old 18 cm school whiting female fish captured from eastern Bass strait on 1/5/1995.

Transects from King George whiting and school whiting were taken in the same region as the otoliths have the same morphology. These two species provide a comparative dataset for related species with similar ages and otolith morphologies.

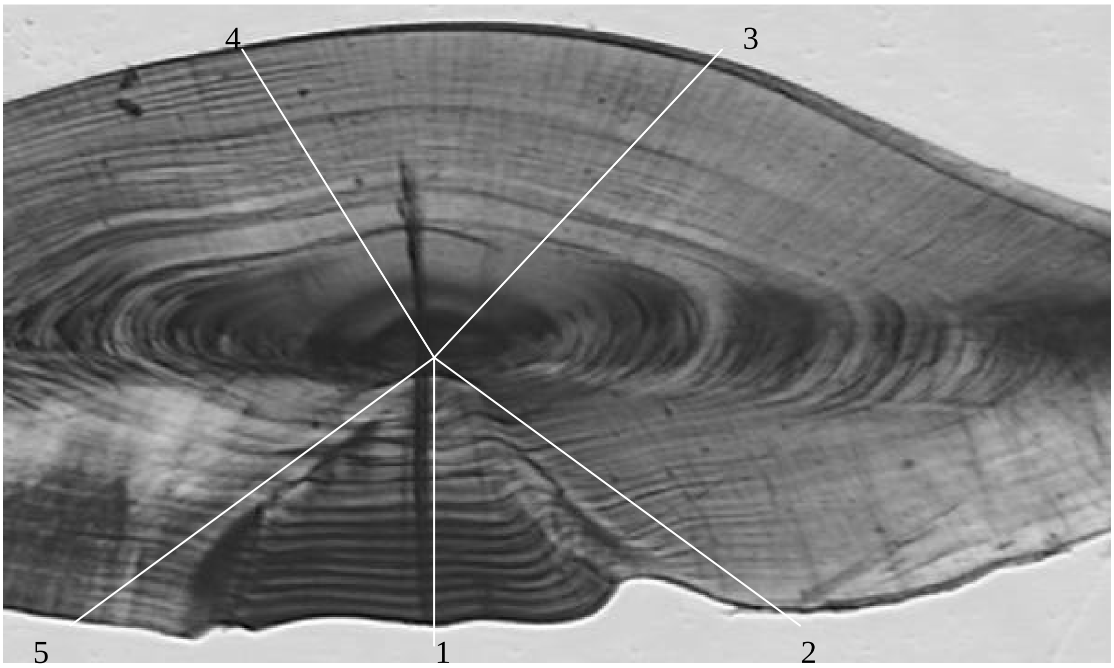


Figure 3. Sectioned ling otolith showing typical locations of transects.

The first transect was taken through the sulcus, subsequent transects were sampled moving counter-clockwise from the sulcus moving through the ventral sector of the otolith. The example is of a 108 cm 12 year old female ling sampled on 25/3/1997.

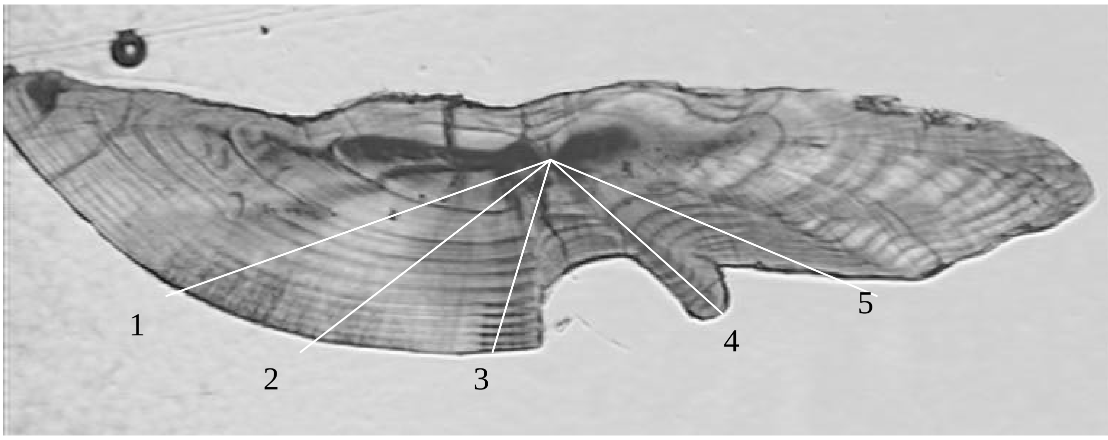


Figure 4. Sectioned snapper otolith showing typical locations of transects.

Transects were sampled from the ventral lobe (1) then successively counter - clockwise around the otolith from the primordium. The example is of a 10 year old, 60 cm snapper sampled on 5/3/97 from Port Phillip Bay.

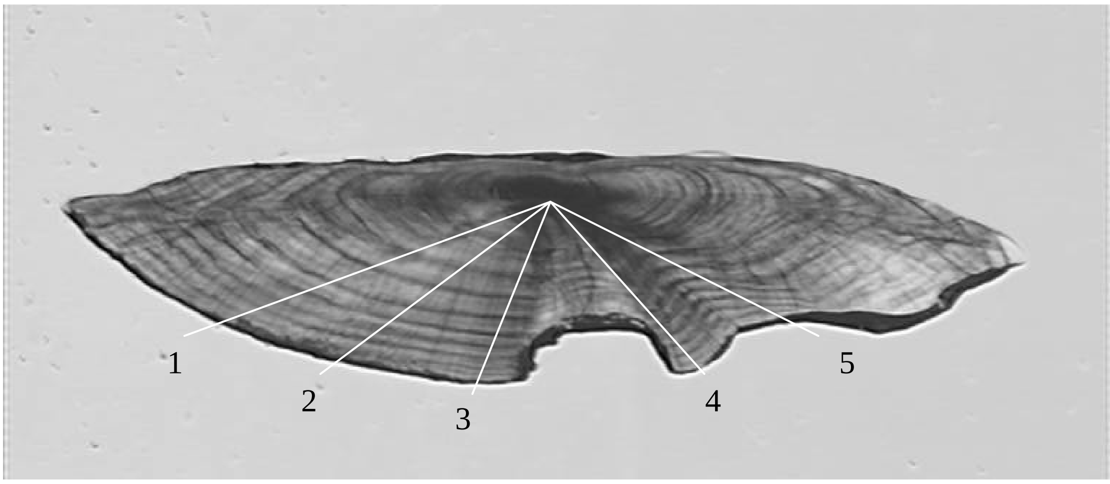


Figure 5. Sectioned black bream otolith showing typical locations of transects.

Transects were sampled using the same locations and sequence as the transects taken from the snapper otolith sections. The example is of a 9 year old 25 cm black bream sampled on 1/4/97 from Sydenham Inlet.

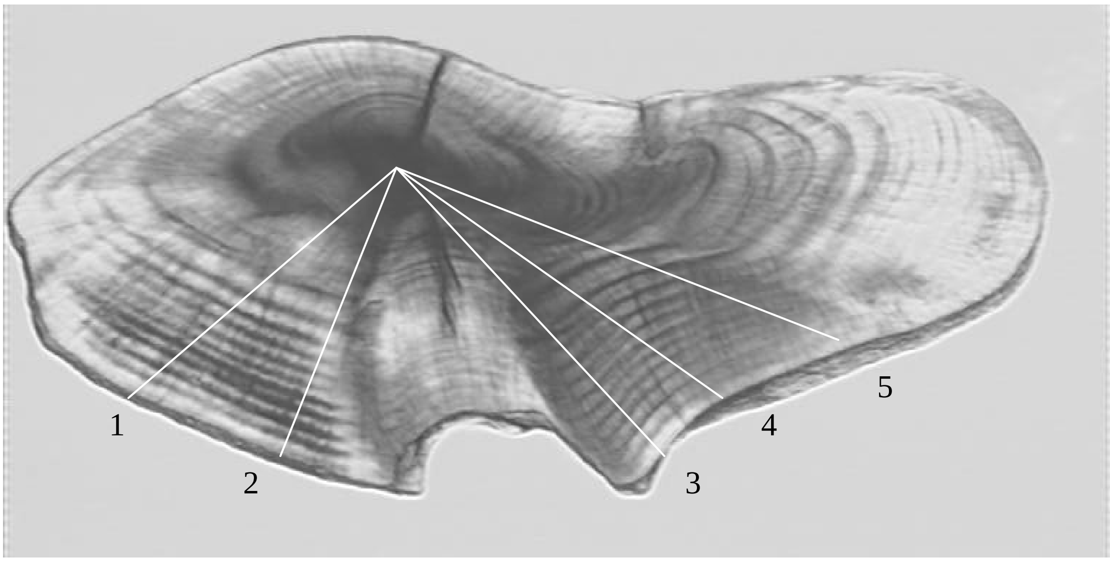


Figure 6. Sectioned sand flathead otolith showing typical location of transects.

Two transects were taken from the ventral lobe of the otolith and three transects were taken from the dorsal lobe of the otolith. The example is of a 12 year old 25 cm sand flathead captured in Port Phillip Bay.

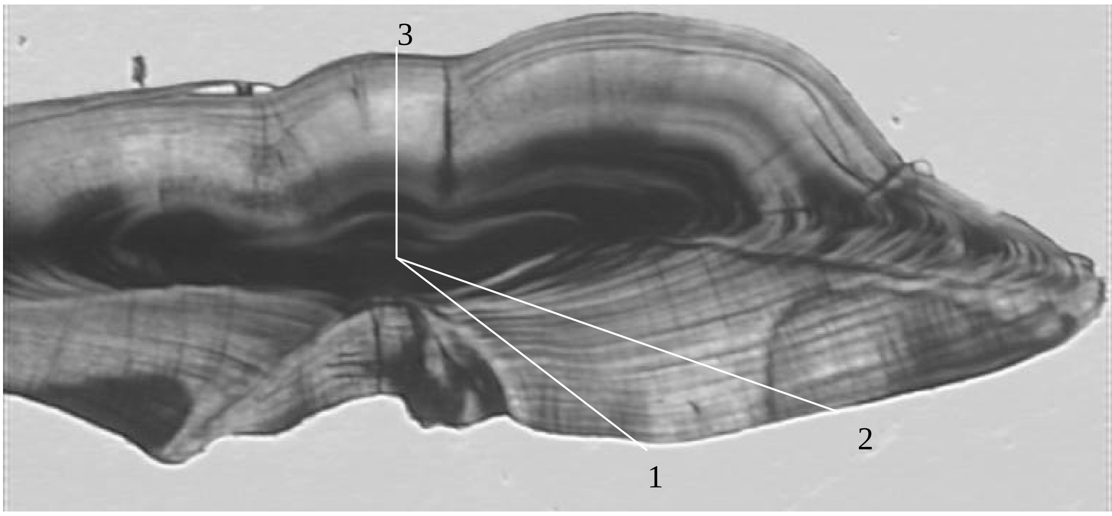


Figure 7. Sectioned blue grenadier otolith showing typical locations of transects.

The first two transects were drawn from the primordia to the edge of the ventral lobe. The third transect was drawn from the primordium to the distal edge of the otolith. The example is of an 8 year old 93 cm female blue grenadier captured on 29/6/98 from the west coast of Tasmania.

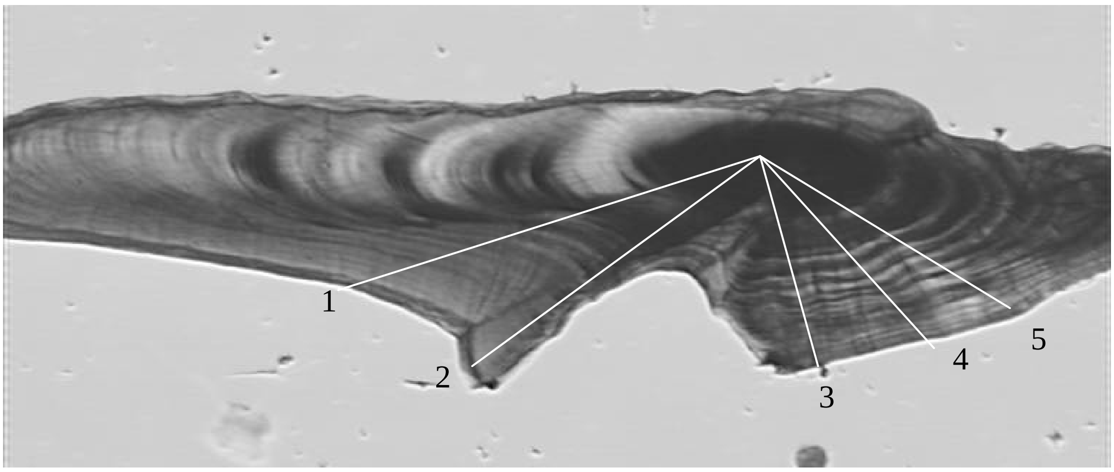


Figure 8. Sectioned ocean perch (offshore form) showing typical locations of transects.

First transect drawn through dorsal lobe. Second transect drawn through dorsal lobe, three transects drawn through ventral lobe. The example is of a 14 year old 33 cm male ocean perch captured on 4/8/99

The number of samples from which transects were taken and the number of transects per section for each species are shown in Table 1.

Table 1. Species used for trialing the artificial neural network models, number of transects per species and total number of transects recorded.

| Species | Number of transects/section | Number of samples | Total number of transects |
|---|---|---|---|
| King George whiting | 5 | 378 | 1,890 |
| School whiting | 5 | 514 | 2,570 |
| Ling | 5 | 2,226 | 11,130 |
| Snapper | 5 | 987 | 4,935 |
| Black bream | 5 | 913 | 4,565 |
| Sand flathead | 5 | 963 | 4,185 |
| Blue grenadier | 3 | 1,531 | 4,593 |
| Ocean perch (offshore) | 5 | 573 | 2,865 |
| Total | | 8,085 | 36,733 |

***Transformations of signal data***

The signal data from transects were collected using programs written in Analytical Language for Images (ALI) in Bioscan™ Optimas®. A discrete Fast Fourier transform (DFT) (Equation 1) was then used to reduce this dataset to a series of complex numbers. As the DFT transform requires that the array length be $2^n$ (either 2, 4, 8, 16, 32, 64, 128 etc…) in length, the original signal data were first mapped to an array of 128 values. The complex numbers from the DFT were written to two Microsoft Excel sheets using Dynamic Data Exchange (DDE), the first sheet contained the real component of the complex number, the second sheet containing the imaginary component of the complex number. The discrete Fourier transform was calculated as

$$H(f) = \sum_{t=0}^{n-1} h(t)\cos(2pft) + i\sum_{t=0}^{n-1} h(t)\sin(2pft)$$

Equation 1. Discrete Fourier transform.

Where $H(f) =$ the Fourier transform

$h(t)$ = step of signal value
$f$ = amplitude of signal value
$t$ = position in data series
$i$ = complex component of transform (Masters, 1993)

Other data written to both sheets included the image name and path, XY coordinates of the start and finish points of each transect, and the non-normalised transect length.

To determine the number of complex numbers needed to represent the pattern of luminance values along the transect, the full array of 128 complex numbers was transformed to return the original luminance profile of the transect using an inverse DFT. This was calculated in Microsoft Excel using Equation 2.

$$h(t) = \frac{1}{n}\sum_{t=0}^{n-1} H(f)\cos(2pft) + i\,\frac{1}{n}\sum_{t=0}^{n-1} H(f)\sin(2pft)$$

Equation 2. Inverse discrete Fourier transform.

The luminance profile was then reconstructed using 20 harmonics and the deviation from the original luminance profile calculated as the absolute pixel deviation. The maximum deviation was 18 pixels with an average deviation of 3 pixels.

Further, recent work has shown that 20 harmonics are sufficient to adequately describe otolith shape (Smith *et al.* in press). Therefore, we used the harmonic (absolute value) of the first 20 complex numbers as the input values for the signal data, as calculated in Microsoft Excel using Equation 3.

$$H_j = \sqrt{a + b_i}$$

Equation 3. Harmonic of complex number.

Where $H_j$ is the $j^{th}$ harmonic and a+b*i* is the complex number

## Other data inputs

In addition to the data from the otolith images, other data used as inputs to neural networks included fish length (cm), fish weight (g), otolith weight (g), sex, area of capture, and date of capture. Sex and area of capture were expressed as categories. Date of capture was expressed as a decimal number representing the proportion of the year from 1 January. This was used to provide an informative input to the neural network for the 'edge interpretation problem' (Francis *et al.* 1992).

## Overview of neural networks

The use of neural networks for fish age estimation is an example of a classification problem. This problem can be expressed as mapping a vector of *n* data inputs to *m* outputs (age classes). The length of the output vector is determined by the number of age classes. An output value of 1 represents a perfect match to the age class corresponding to the position in the vector.

The present study extends the original pilot project (Morison and Robertson 1997) by incorporating additional data inputs in the form of biological data, (otolith weight, fish length and fish sex) combined with information on date of capture. Conceptually, the function of a neural network is shown in Figure 9 and is described in Robertson and Morison (1999). The topology, or structure, of the neural networks is a function of the inputs, outputs and number of samples. The data presented to the neural networks determines the number of inputs. The number of outputs represents the number of age-classes that are present within the sample.

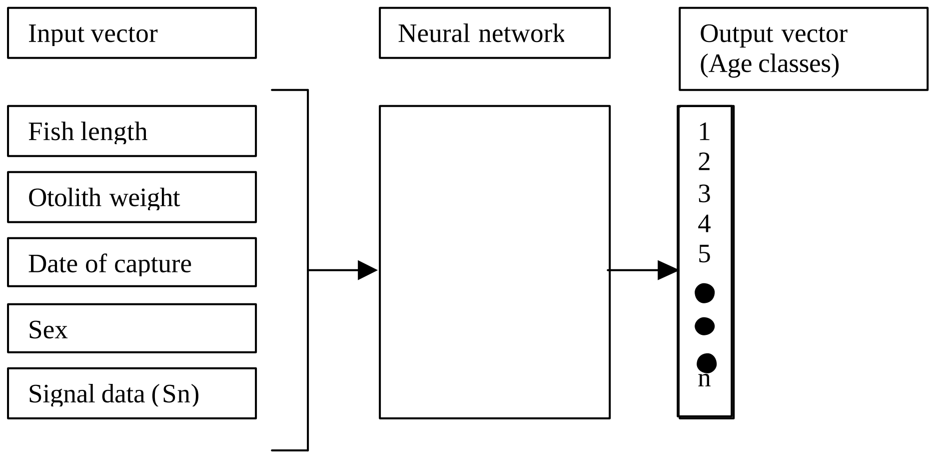


Figure 9. Conceptual overview of a neural network

There are many different neural network models. The 'standard' neural network model is the back propagation neural network. This was the first practical neural network developed and is still the most widely used (Masters 1994). The probabilistic neural network is a Bayes optimal classification model (Masters 1994), and together with the back propagation neural network provide excellent candidates for classification using supervised training (Masters 1994).

Three types of neural networks were trialed for this project. Two of the neural networks trialed are back propagation neural networks, one of which was used in the pilot project (FRDC 96/136, Morison and Robertson 1997). The second back propagation neural network was a variant of the back propagation design where different activation thresholds were used within three groups of neurons. This type of neural network is known as a multiple hidden layer network. The third neural network trialed was a probabilistic neural network. Neural networks were developed using Ward Systems Neuroshell software and Microsoft Visual Basic Version 6. All networks used ‘supervised training’. This refers to the process of fitting a model (training) to a set of data for which the correct classifications are known, and thus determines or ‘supervises’ the modification of the weight matrices to determine the trained model.

***Back Propagation Neural Network.***

The back propagation neural network consists of three layers (or groups) of neurons. These are arranged into an input layer (the input dataset), a hidden layer (incorporating values from intermediate calculations), and an output layer (representing the values predicting age class membership). Each neuron, or processor, is fully inter-connected (exchanges data) with the neurons on the next successive level. These inter-connections take the form of variables (multiplying factors) which collectively form the weight matrices between the input and hidden layers, and the hidden and output layers (Figure10).

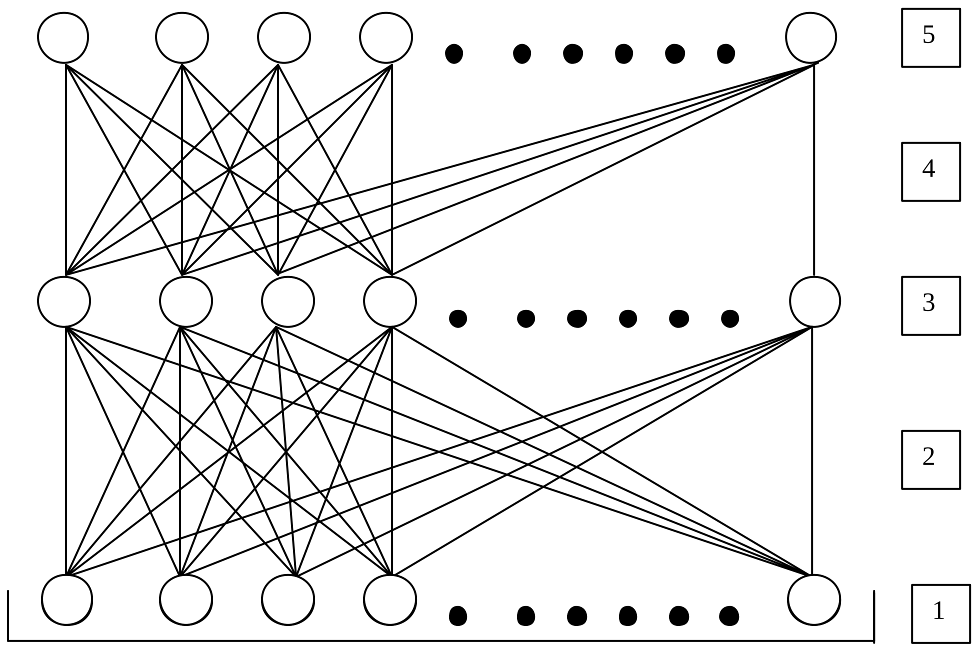


Figure10. Topology of a back propagation neural network.

Where

1. Input layer of neurons (fish length, sex, date of capture, otolith weight and signal information).
2. Weight matrix between the input layer and hidden layer.
3. Hidden layer of neurons.
4. Weight matrix between the hidden and output layer.
5. Output layer of neurons (age classes).

Before the input data were processed by the neural network, their mean, minimum, maximum and standard deviations were calculated. The minimum and maximum range of the input data were used to linearly scale input values between zero and one using Equation 4. The means and standard deviations were used in the thresholding functions.

$$A = rV + (A_{min} - rV_{min}), \textit{where}$$

$$r = \frac{A_{max} - A_{min}}{V_{max} - V_{min}}$$

Equation 4. Input scaling of data.

Where $A$ is the scaled input value at each neuron.

$r$ is the scaling factor.

$V$ is the value being scaled within the range $V_{min}:V_{max}$

$V_{max}$ is the maximum value of the input data at each input variable.

$V_{min}$ is the minimum value of the input data at each input variable.

$A_{max}$ is the maximum value to which the data is being scaled

$A_{min}$ is the minimum value to which the data is being scaled.

The data from all of the neurons in the input layer are summed at each of the hidden neurons, and normalised using the logistic function (Equation 5) to give the output at the hidden layer neuron (Equation 6).

$$f(x) = \frac{1}{1 + ^{-\frac{x_i - \bar{x}}{s}}}$$

Equation 5. Logistic thresholding function.

Where $x_i$ is the ith input value

$\bar{x}$ is the mean of the input values

$s$ is the standard deviation of the input values

$$out = f(hidden) = f\left(\sum_{i=0}^{n-1} x_i w_i + w_n\right)$$

Equation 6. Output value of the hidden neuron of the back propagation neural network.

Where $out$ is the output of the hidden neuron.

$f(hidden)$ is the thresholding function.

$n$ is the number of neurons in the input layer.

$i$ is the i$^{th}$ index

$x_i$ is the i$^{th}$ input value

$w_i$ is the i$^{th}$ weight index, and

$w_n$ is the bias neuron.

The bias neuron is an additional neuron in the input layer, which is fully interconnected to the hidden layer. The bias neuron provides 'linear separability' between patterns being learned by the neural network (Bishop 1995).

The optimal number of hidden neurons is dependent on the type of problem being tackled and the variability in the input data (Masters 1994). In the previous study, the number of hidden neurons was calculated from the integer value of the square root of the number of input neurons multiplied by the number of output neurons. This was changed in this study to account for higher levels of variability by using Equation 7 to determine the number of hidden neurons (Steve Ward, Ward Systems Neuroshell, pers. comm.).

$$Hidden = \frac{1}{2}(In + On) + \sqrt{T_s}$$

Equation 7. Determination of an appropriate number of hidden neurons in the back propagation neural network.

Where $In$ is the number of input neurons,
$On$ is the number of output neurons,
$T_s$ is the number of samples in the training set.

## Multiple Hidden Layer Neural Network

The multiple hidden layer neural network has input, hidden and output layers like the back propagation neural network. However, it has three hidden layers of neurons which each use different thresholding functions. Each is fully interconnected between the input and output neurons, but they do not connect with each other (Figure 11). This approach has been proven effective in enhancing the feature detection ability of the neural network in 'noisy' financial data (Sherald and Ward 1994). The three different thresholding functions used for each of the hidden layers in the neural network were the Gaussian, Gaussian complement and the hyperbolic tangent functions, as described in Equations 8, 9, and 10.

$$f(x) = e^{-x^2}$$

Equation 8. Gaussian thresholding function.

$$f(x) = 1 - e^{-x^2}$$

Equation 9. Gaussian complement thresholding function.

$$f(x) = \frac{e^{x} - e^{-x}}{e^{x} + e^{-x}}$$

Equation 10. Hyperbolic tangent thresholding function.

Where $x = \frac{x_i - \overline{x}}{s}$ for Equations 8, 9 and 10.

The number of neurons in each of the hidden layers is determined by division of Equation 7 by number of hidden layers in the neural network (Equation 11).

$$Hidden = \frac{\frac{1}{2}(In + On) + \sqrt{T_s}}{hl}$$

Equation 11. Determination of the appropriate number of neurons in each group in the multiple hidden layer neural network.

Where $In$ is the number of input neurons,
$On$ is the number of output neurons,
$T_s$ is the number of samples in the training set.
$hl$ is the number of hidden layers

The error term for the network minimisation (training) for a single presentation of a record and for the combined dataset used in the training routines are shown in Equations 12 and Equation 13 respectively.

$$E_p = \frac{1}{n}\sum_{j=0}^{n-1}(t_{pj} - o_{pj})^2$$

Equation 12. Mean square error for a single presentation

Where $p$ is the training pattern

$t_{pj}$ is the target activation for pattern $p$ at neuron $j$

$O_{pj}$ is the observed activation for pattern $p$ at neuron $j$

$n$ is the number of neurons.

$$E = \frac{1}{m}\sum_{p=0}^{m-1} E_p$$

Equation 13. Training error for combined dataset.

Where $m$ is the number of presentations in the training set.

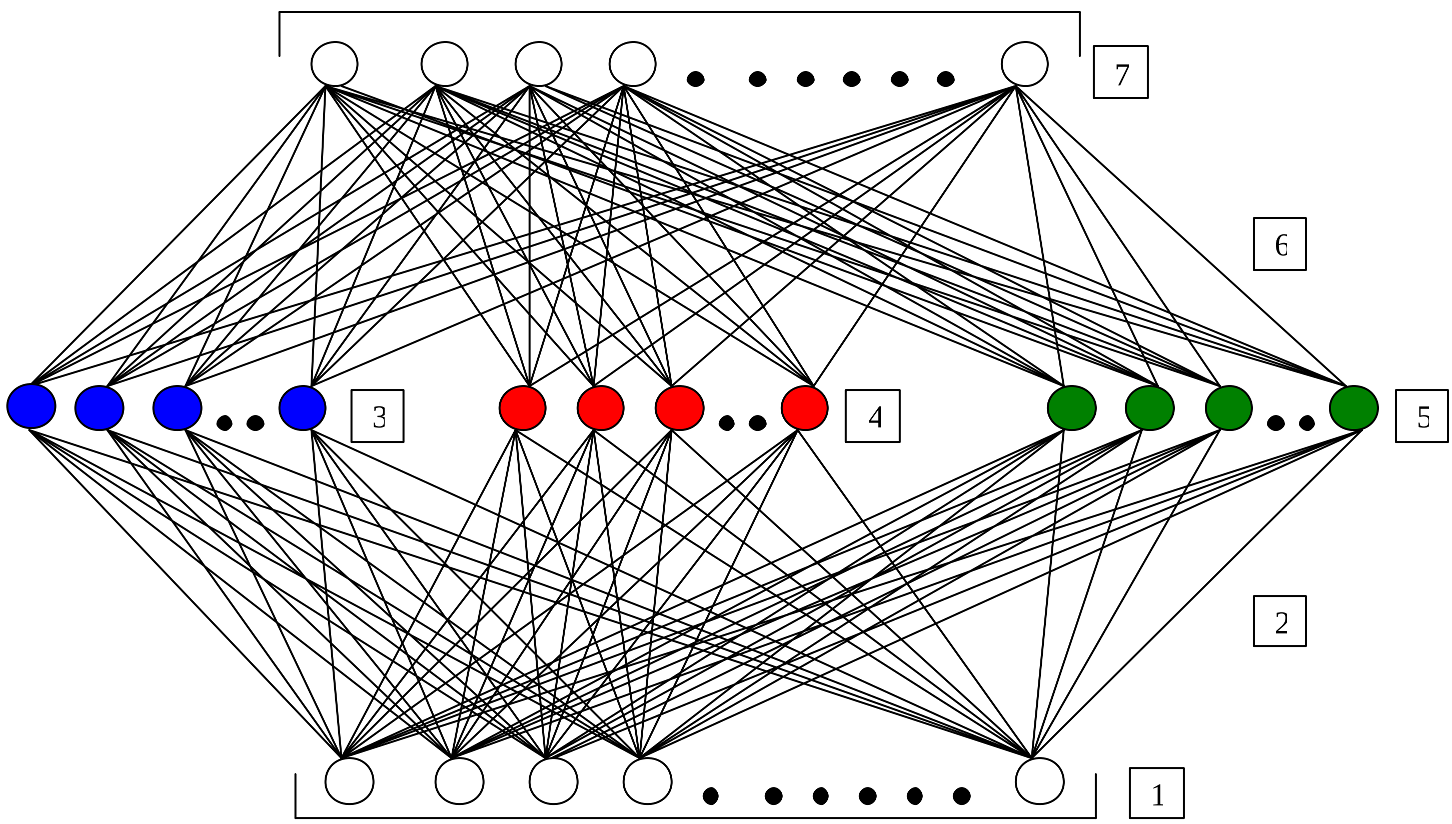


Figure11. Topology of a multiple hidden layer neural network.

Where

1. Input layer of neurons (fish length, sex, date of capture, otolith weight and signal information).
2. Weight matrix connecting the input to the hidden layer, linearly-scaled between minus one and one.
3. Hidden layer first functional group of neurons. All subsequent inputs from the input layer are summed and normalised between zero and one using the Gaussian thresholding function.
4. Hidden layer second functional group of neurons. All subsequent inputs from the input layer are summed and normalised between zero and one using the Gaussian complement thresholding function.
5. Hidden layer third functional group of neurons. All subsequent inputs from the input layer are summed and normalised between zero and one using the hyperbolic tangent thresholding function.
6. Weight matrix between the hidden and output layer, scaled between minus one and one for the hyperbolic tangent function and minus two and two for the Gaussian and Gaussian-complement functions.
7. Output layer of neurons (age classes). All inputs from the hidden layer are summed and normalised between zero and one using the logistic thresholding function.

## Probabilistic neural network

Probabilistic neural networks (PNNs) are intrinsic classification models and are known for their ability to train quickly (Masters 1993). PNNs categorise data into a specified number of output categories which correspond to, in this application, age-classes. The topology of the PNNs resembles the back propagation neural network ie. there are three layers in the networks. The difference lies in the number of neurons in the hidden layer and the function of the hidden layer. There are as many neurons in the hidden layer as there are samples in the pattern dataset. The input layer uses the same linearly-scaled data as the input layer of the back propagation models. The output layer has the same number of neurons as the number of age classes. The probabilistic neural network provides a probability density function of age-membership as an output (ie., all the outputs sum to one) where the most probable age-class is classified by the output neuron with the highest value.

The hidden layer in the PNN uses a 'sphere of influence' weighting function to classify the given inputs to a particular age-class. The width of the 'sphere of influence' is determined by a scaling parameter which varies among age-classes. There is no objective method for determining the size of this scaling parameter (Masters 1994). Neuroshell® software uses a ‘genetic’ algorithm for determining the optimum size of the scaling parameter for each age-class.

Genetic algorithms are iterative parameter selection methods for model fitting. Initially, 100 sets of parameters were randomly selected. This is termed a 'population'. These were tested against the test set and a proportion of the parameter sets which produced the lowest fit (highest network error) were discarded. The remainder were then used to generate a new group of 100 parameter sets based on the result of the previous parameters. This phase is termed a generation. The network performance was again evaluated using the test set, and those parameters providing the best fit were again saved. Network performance was evaluated each time the population of possible parameter set solutions was presented to the test set. Training was stopped when there was no change in the number of incorrect age-class assignments over a period of twenty generations. The proportions of discarded parameter sets at each generation, and the method of encoding the scaling parameters for the genetic algorithm, are propriety of Ward Systems™ Neuroshell ®.

## Training of networks

The data used for the training and testing the efficacy of all the neural network models trialed were randomly divided into the training, test and production data subsets. These datasets contain the biological (length, sex and otolith weight), date of capture (as a year fraction), transect lengths and harmonics from the transects. The combination of these three subsets and the target network outputs is termed the pattern set. The division of the data into the three subsets was made so that the training set contained 60% of the records, while the test and production sets each contained 20% of the records.

The training set is used for minimising or fitting the model to produce the desired output response for a given data input. The test set is used to evaluate when the training has reached an optimal level. The production set provides an estimate on the final performance of the trained model, using a dataset not previously used in the training or test phases. All comparisons of different inputs and network types used the same training, test and production sets.

A summary of the training procedure is listed below:

- The data were standardised between one and zero using the described equations and presented to the input layer of neurons. The standardised values are multiplied by the weight matrix between the input and hidden layer. These values are summed and normalised using the logistic thresholding function. The weight matrices were initially assigned a random value between - 0.3 and 0.3.
- The normalised values in the hidden layer were then multiplied by the weight matrix between the hidden and output layer, and again normalised using the logistic thresholding function. These initial results comprise the feedforward component of the neural network.
- Neural network error was then calculated as the sum of the differences between the observed ages from the age-class array of the training set and predicted age-class in the output array.
- The individual error in each output neuron was used to modify the weight matrix connecting the output layer to the hidden layer using the mean square error between the observed output and the predicted output.
- The error at each of the hidden neurons was used to modify the weight matrix between the hidden and input neurons.

The presentation of all the training samples to the neural network marks the completion of one epoch.

This process of propagating the error back through the model is the source of the name of the back propagation neural networks. Weight matrices are adjusted only in the training phase.

A further refinement of the approach used in the pilot study was the addition of a deterministic method for the cessation of training. In the pilot study, the training was ceased when the neural network error reached a predetermined level of 0.1. This approach, however, does not determine whether the model has achieved a best fit to the data. In the present study the error on the test dataset was used to determine efficacy of model fit.

After each epoch, the data from the test set was presented to the neural network for the feedforward component of the model, and the error determined. The training was continued until no change in the error term was observed in 2000 epochs.

## Data inputs to neural networks

Two groups of datasets were used as inputs to the neural networks. The first group (termed the signal dataset) included the biological data for fish from which signal data had been collected from otolith images. These datasets were trialed as signal data alone, biological data alone and combinations of signal and biological data. Biological data comprised transect length, fish length, otolith weight, sex, and date of capture. These datasets were used for all species except pilchards. Examination of the preliminary results indicated that the models using biological data alone as inputs performed as well as, or better than, those also using signal data. Therefore, a second group of datasets (termed the biological datasets), with much larger sample sizes, were created using fish length, fish weight, otolith weight, sex, date of capture and area of capture. These were created for school whiting, snapper, ling, blue grenadier and pilchards. Area of capture was trialed as an additional input for blue grenadier and pilchards.

The same scaling and activation functions were used for networks with both types of input datasets.

### *Pilot study extension FRDC 96/136*

The pilot study FRDC 96/136 used arrays of pixels 202 elements in length as neural network inputs to the back propagation neural networks. These original datasets for black bream and snapper (the species for which the study was successful) were trialed using the probabilistic neural network model. The inputs to the model were scaled to a vector length of 128 elements and transformed using the DFT. No biological data were included in the comparison between the pilot data and the current study to provide the comparative results on the efficiency of the input reduction using the harmonics of the signal within the transect.

The original training sets for black bream and snapper were used to minimise the model, while the unseen samples were used to test the efficacy of the probabilistic neural networks. This part of the study provided a comparison between the results obtained in the pilot study (FRDC 96/136) and the data reduction techniques developed for the current study (FRDC 98/105).

The same number of outputs (age classes) were used for the comparison between the techniques developed for FRDC 96/136 and probabilistic neural networks.

### *Neural networks using the signal dataset - inputs and structure*

For each species, the signal data (represented as the first 20 harmonics from the DFT) from each transect were presented to the neural networks both with and without the biological data and date of capture information (where available). This produced 10 networks using signal data from the five transects separately, with and without biological data (6 networks for blue grenadier for which only three transects were taken). Three further networks were trialed using; i) the signal data from all the transects, transect lengths, and the biological data; ii) the biological data alone and iii) biological data with all the transect lengths. Across each of the three network types, this involved thirty nine networks for each of the species except blue grenadier where, because only three transects were taken, twenty seven neural networks were trialed. The number of estimates per network type, total number of estimates per species and total number of estimates are summarised in Table 2.

The number of elements in the input and hidden layers for each type of neural networks for the signal datasets are summarised by species and network type in Table 3.

Table 2. Number of neural networks per species, number of age estimates per network type and total number of age estimates.

| Species | Networks | Number of estimates per network type | Total number of estimates |
|---|---|---|---|
| King George whiting | 3 | 4,914 | 14,742 |
| School whiting | 3 | 6,682 | 20,046 |
| Ling | 3 | 28,938 | 86,814 |
| Snapper | 3 | 12,831 | 38,493 |
| Black bream | 3 | 11,869 | 35,607 |
| Sand flathead | 3 | 12,519 | 37,557 |
| Blue grenadier | 3 | 13,779 | 41,337 |
| Ocean Perch | 3 | 7,449 | 22,347 |
| Total | | 98,981 | 296,943 |

Table 3. Number of elements in input and hidden layers for neural network models and input data for each species, for networks using the signal dataset.

Signal = data from otolith image, Bio = biological data and date of capture; TL = transect length.

| Model type | Input data | Number of elements in input and hidden layers | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | King George whiting | School whiting | Ling | Snapper | Black bream | Sand flathead | Blue grenadier | Ocean perch |
| Back propagation | Signal | 21-28 | 21-30 | 21-54 | 21-43 | 21-42 | 21-42 | 21-49 | 21-39 |
| | Signal, Bio | 29-32 | 30-36 | 30-59 | 30-48 | 30-46 | 29-46 | 28-52 | 30-43 |
| | Bio | 3-19 | 4-23 | 4-46 | 4-35 | 4-33 | 3-33 | 4-39 | 4-30 |
| | Bio, TL | 8-21 | 9-21 | 9-48 | 9-37 | 9-36 | 8-36 | 7-42 | 9-33 |
| | All data | 113-28 | 114-78 | 114-101 | 114-90 | 114-88 | 113-88 | 70-73 | 114-85 |
| Multiple hidden layer | Signal | 21-9 | 21-10 | 21-18 | 21-14 | 21-14 | 2115 | 21-16 | 21-13 |
| | Signal, Bio | 29-11 | 30-12 | 30-20 | 30-18 | 30-15 | 29-15 | 28-17 | 30-14 |
| | Bio | 3-6 | 4-8 | 4-15 | 4-12 | 4-11 | 3-11 | 4-13 | 4-10 |
| | Bio, TL | 8-7 | 9-8 | 9-16 | 9-12 | 9-12 | 8-12 | 7-14 | 9-11 |
| | All data | 113-25 | 114-26 | 114-34 | 114-34 | 114-29 | 113-29 | 70-24 | 114-28 |
| Probabilistic | Signal | 21-378 | 21-514 | 21-2,226 | 21-987 | 21-913 | 21-963 | 21-1,531 | 21-573 |
| | Signal, Bio | 29-378 | 30-514 | 30-2,226 | 30-987 | 30-913 | 29-963 | 28-1,531 | 30-573 |
| | Bio | 3-378 | 4-514 | 4-2,226 | 4-987 | 4-913 | 3-963 | 4-1,531 | 4-573 |
| | Bio, TL | 8-378 | 9-514 | 9-2,226 | 9-987 | 9-913 | 8-963 | 7-1,531 | 9-573 |
| | All data | 113-378 | 114-514 | 114-2,226 | 114-987 | 114-913 | 113-963 | 70-1,531 | 114-573 |

### *Neural networks using the biological dataset – inputs and structure*

For ling, blue grenadier, school whiting and snapper, the best performing network using the signal dataset (the probabilistic neural network) was used. For blue grenadier, all areas of capture were initially combined, and two further neural networks were trialed using biological data from the spawning and non-spawning areas. For pilchards, the three network types (back propagation, multiple hidden layer and probabilistic) were trialed on the complete dataset. The best performing network was then trialed separately for each area of capture.

The inputs used in the biological only data models for each species are described below. The network types and structure used for biological/area data as inputs are shown in Table 4. For the biological dataset a total of fourteen models were trialed and 33,691 age estimates were compared.

Table 4. Neural network models trialed using biological, date of capture and area of capture data, for networks using the biological dataset.

| Species | Area | Network Type | No. elements in network layers<br>Input-hidden | No. age classes | N |
|---|---|---|---|---|---|
| Pilchards | All | Back propagation | 6-50 | 6 | 3,456 |
| | All | Multiple layer | 6-17 | 6 | 3,456 |
| | All | PNN | 6-3,456 | 6 | 3,456 |
| | Coffin Bay | Multiple layer | 5-9 | 6 | 511 |
| | Lakes Entrance | Multiple layer | 5-7 | 6 | 390 |
| | Port Phillip Bay | Multiple layer | 5-10 | 6 | 1079 |
| | Pt Lincoln | Multiple layer | 5-9 | 6 | 693 |
| | Queensland | Multiple layer | 5-9 | 6 | 783 |
| School whiting | All | PNN | 4-4,975 | 7 | 4975 |
| Snapper | All | PNN | 4-2,377 | 17 | 2,377 |
| Ling | All | PNN | 4-3,117 | 14 | 3,117 |
| Blue grenadier | All | PNN | 5-4,699 | 21 | 4,699 |
| | Spawning | PNN | 5-1,808 | 21 | 1,808 |
| | Non-spawning | PNN | 5-2,891 | 21 | 2,891 |

*Pilchards*

The available data included length (cm), sex, fish weight (g), date of capture and otolith weight. All pilchard otoliths were weighed to the nearest 0.0001 grams. Further, area of collection was used as a categorical input for the initial trial. Sex classified as one of four categories (male, female, immature or unknown). This gave a total of six inputs to the initial screening neural network models, and five inputs when a separate model was trained for each area of capture.

The age range for pilchards samples was 0–7 years, however, there were only three 7 year old fish. These were combined with 6 year old fish in the one category.

*School whiting*

The biological data available for school whiting included fish length (cm), otolith weight (mg), date of capture and sex. The age range for school whiting samples was from 1–7 years.

*Snapper*

The available biological data for the snapper included fish length (cm), otolith weight (mg) date of capture and sex. The age range for snapper samples was 0–37 years, but fish aged over 14 years were combined in a plus group.

*Ling*

The biological data available for the ling samples were the same as those used for the snapper samples, length (cm), otolith weight (mg), date of capture and sex. The age range was 1–28 years, but fish over thirteen years were combined in a plus group.

*Blue grenadier*

The biological data available for the blue grenadier was length (cm), otolith weight, date of capture, sex and area code. The samples were supplied from four areas, these were eastern Bass Strait, east Tasmania, western Bass Strait and western Tasmania. The age range was 1–21 years.

## Network outputs

The outputs of all the neural network models trialed in this project used a binary vector as the target output for each age class. The position of the single non-zero value in the vector indicated the age relative to lowest age class in the sample (Table 5). The age structure of the samples determines the number of neurons in the output layer of the neural network models.

Table 5. Examples of target output vectors used for a sample with 12 age classes. (*m* is the minimum age class from the sample in the pattern set).

| Age class | Target output vector | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *m* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *m*+1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *m*+2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *m*+3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *m*+4 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *m*+5 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| *m*+6 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *m*+7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *m*+8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *m*+9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *m*+10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *m+11* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

## Age compositions of the signal datasets

For neural network models to operate effectively, the models must be trained using samples that approximate the distribution of the original dataset (Masters 1994). The distributions of the training, test and production sets are shown below (as the unshaded histograms), together with the percentage deviation of the pattern datasets (complete datasets) from each of the subsets (as the shaded histograms).

### *King George Whiting*

King George whiting are a fast growing relatively short lived species. The samples supplied to the CAF and subsequently used in the neural network project range from one year to six years with a modal age of three (Figure 12). The samples of King George whiting were collected from Port Phillip Bay. The age frequency distribution, and deviations from the age frequency distributions of the pattern set for the training, test and production sets are shown in Figure 13, Figure 14 and Figure 15 respectively.

Dates of capture by month and year are shown in Table 6.

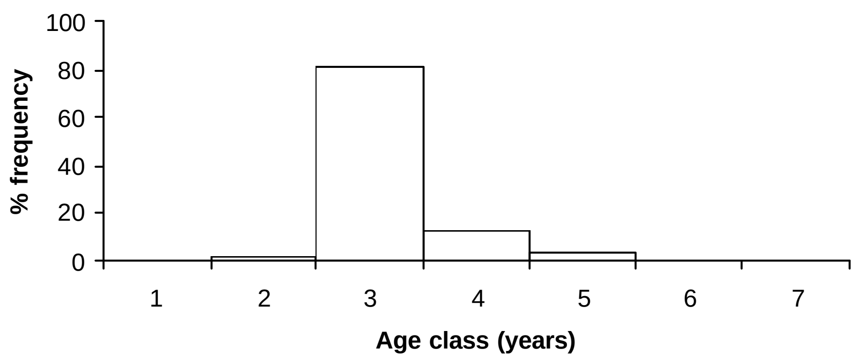


Figure 12. Age frequency distribution of King George whiting samples used for trialing artificial neural networks. N=379

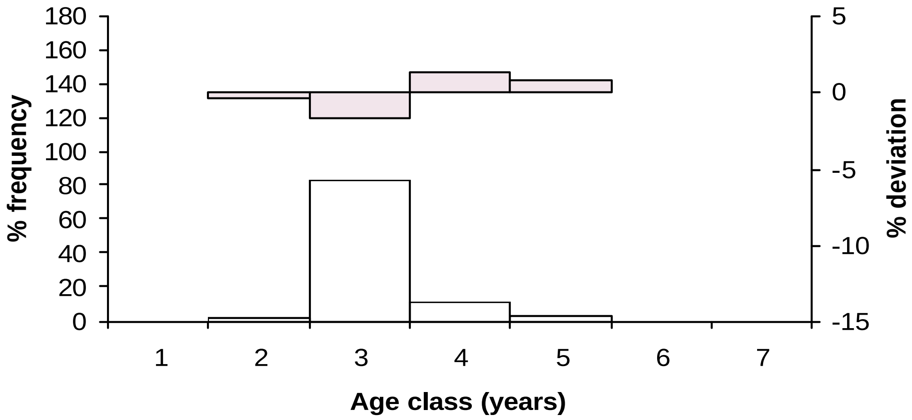


Figure 13. Age distribution of King George whiting training set with percentage deviation of the pattern set. N=228.


Figure 14. Age distribution of King George whiting test set with percentage deviation of the pattern set. N=75.


Figure 15. Age distribution of King George whiting production set with percentage deviation of the pattern set. N=75.

Table 6. Date of capture details for the King George whiting samples used for signal and biological neural network input combinations.

| Year | Month | | | | | | | N |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 6 | 9 | 10 | |
| 1997 | 30 | 26 | | 51 | | | 60 | 167 |
| 1998 | | | 29 | | 50 | 30 | | 109 |
| 1999 | 102 | | | | | | | 102 |
| Total | 132 | 26 | 29 | 51 | 50 | 30 | 60 | 378 |

***School Whiting***

School whiting are a fast growing relatively short lived species from the same family as King George whiting with a similar age frequency distribution. The samples supplied to the CAF and subsequently used in the neural network project range from one year to six years with a modal age of three (Figure 16). The samples of school whiting were collected from the Lakes Entrance commercial Danish seine fishery.

The age frequency and deviations from the age frequency distributions from the pattern set for the training, test and production sets are shown in Figure 17, Figure 18 and Figure 19 respectively.

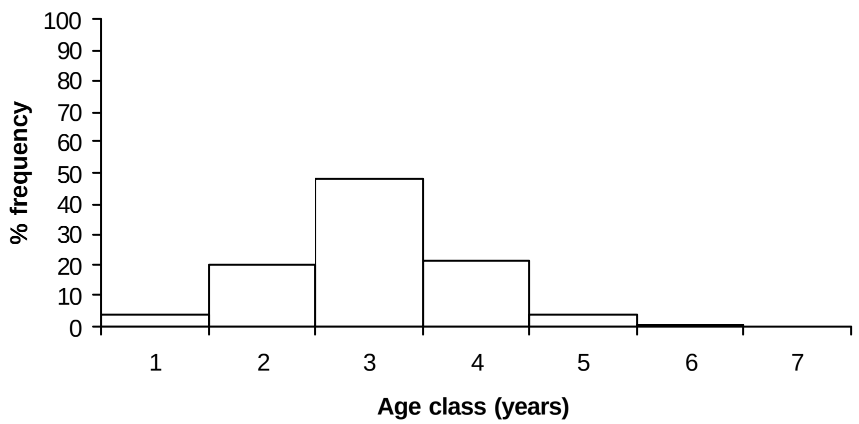


Figure 16. Percentage age frequency distribution of school whiting otoliths used for trialing artificial neural networks.

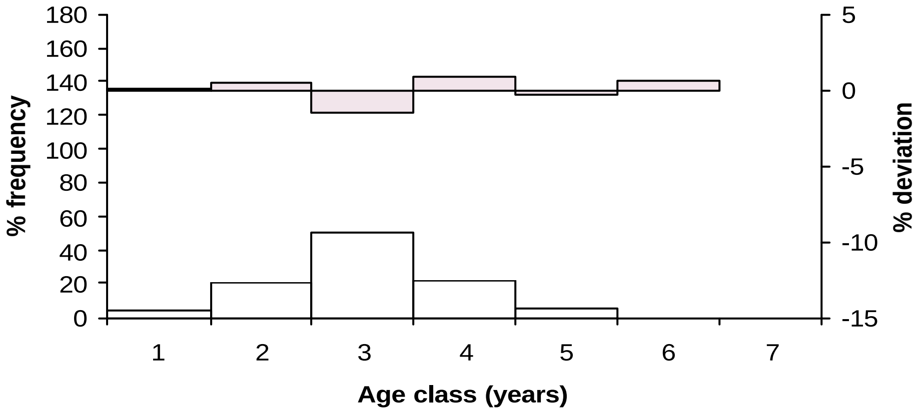


Figure 17. Age distribution of school whiting training set with percentage deviation of the pattern set. N=310.

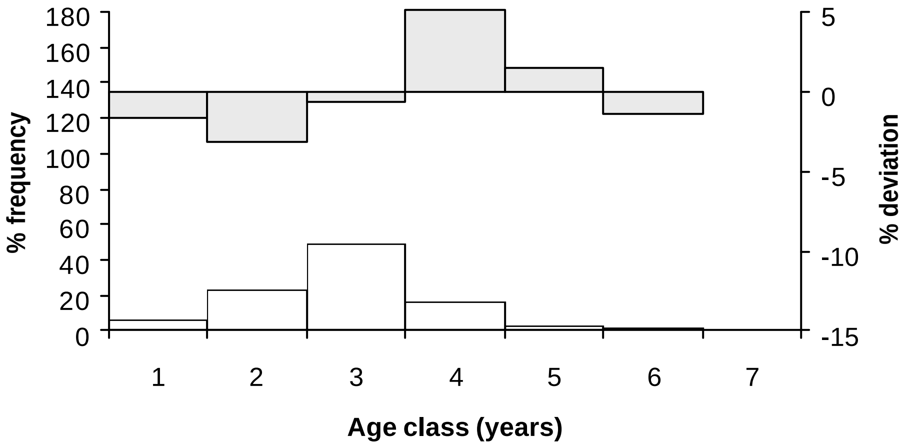


Figure 18. Age distribution of school whiting test set with percentage deviation of the pattern set. N=102.

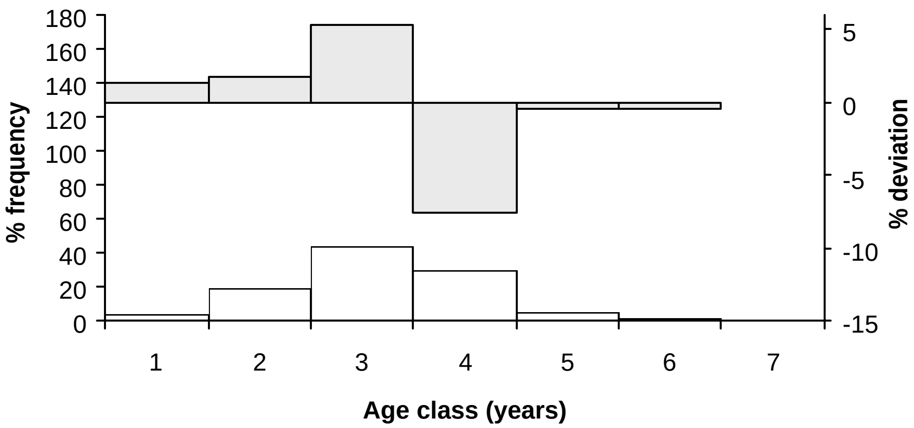


Figure 19. Age distribution of school whiting production set with percentage deviation of the pattern set. N=102

All samples were collected from commercial catches from six batches from February through to November from 1995 to 1997. This provided samples collected evenly over a composite year.

Dates of capture by month and year are shown in Table 7.

Table 7. Date of capture details for the school whiting samples used for signal and biological neural network input combinations.

| Year | Month | | | | | | N |
|---|---|---|---|---|---|---|---|
| | 2 | 4 | 6 | 7 | 9 | 11 | |
| 1995 | | 93 | 97 | | 25 | | 215 |
| 1996 | | | | 98 | | 102 | 200 |
| 1997 | 99 | | | | | | 99 |
| Total | 99 | 93 | 97 | 98 | 25 | 102 | 514 |

### *Ling*

Ling samples used for this project representative of the commercial catch from Eastern and Western Bass Strait from 1994 through to 1997. The maximum age from the samples aged at the CAF was 28 years. The modal age of the samples was three years. These samples comprised the pattern set. The total number of samples in the pattern set was 2,226. The age distribution of the ling pattern set is shown below in Figure 20.


Figure 20. Ling percentage age frequency distribution of the pattern set. N=2,226

There were few ling older than 12 years so all older fish were combined into one 13+ age class. The modified distribution of age classes is shown below in Figure 21. The age frequency and deviations from the age frequency distributions from the pattern set for the training, test and production sets are shown in Figure 22, Figure 23 and Figure 24 respectively.

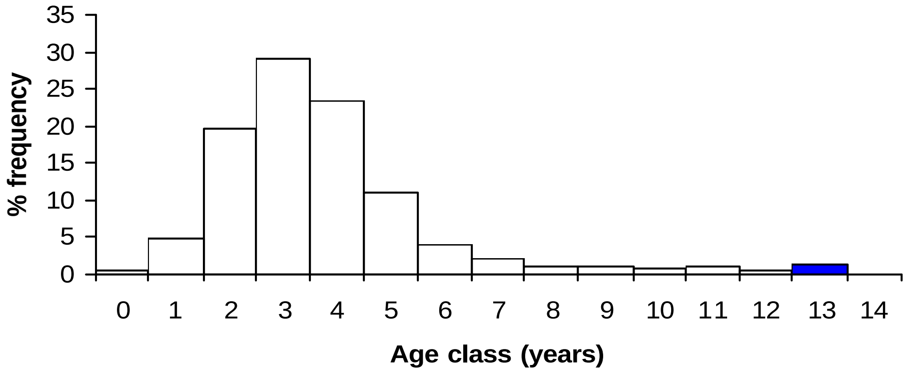


Figure 21. Ling age frequency distribution after age classes were combined.
Solid bar indicates summation of year classes from (and including) 13 to 28. N=2,226

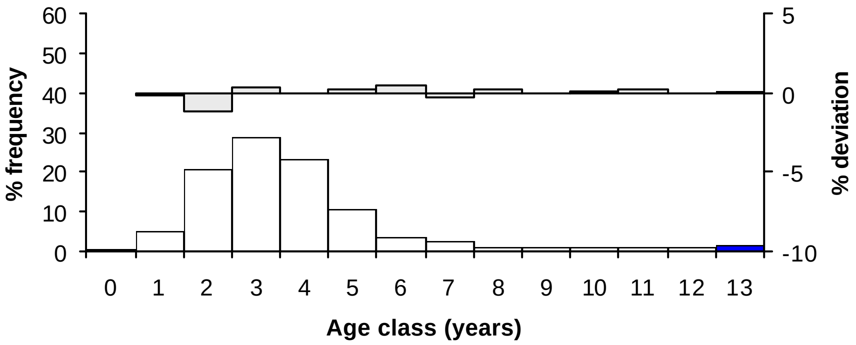


Figure 22. Age distribution of ling training set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 13 to 28. N=1,336

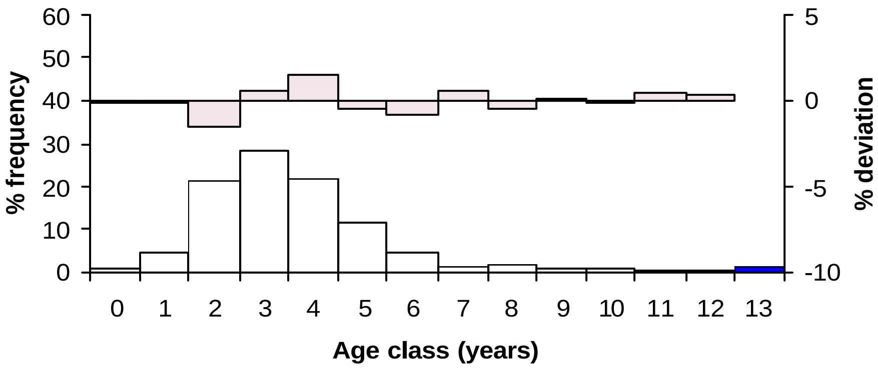


Figure 23. Age distribution of ling test set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 13 to 28. N=445

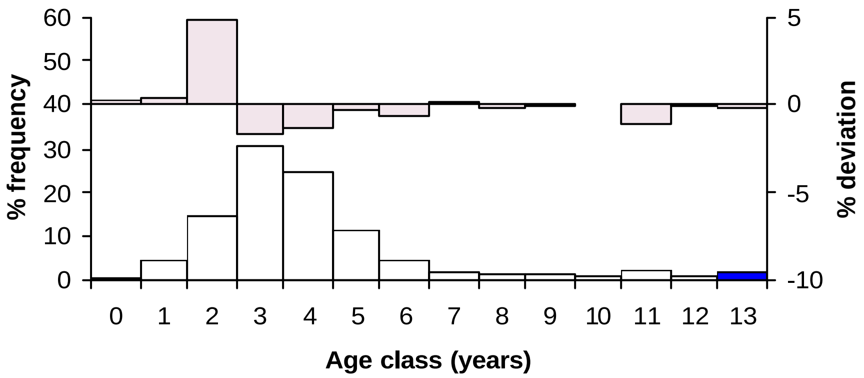


Figure 24. Age distribution of ling production set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 13 to 28. N=445

Samples were collected over a four-year period, numbers by month and year are shown in Table 8.

Table 8. Date of capture details for the ling samples used for signal datasets for neural network input combinations.

| Year | Month | | | | | | | | | | | | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| 1994 | | | | 237 | | | | | | | | | 237 |
| 1995 | | 146 | 49 | 101 | 240 | | | | 100 | 24 | 91 | 52 | 803 |
| 1996 | | 183 | 33 | 65 | 71 | 37 | 132 | 74 | 54 | 51 | 160 | 135 | 995 |
| 1997 | 32 | 50 | 109 | | | | | | | | | | 191 |
| Total | 32 | 379 | 191 | 403 | 311 | 37 | 132 | 74 | 154 | 75 | 251 | 187 | 2226 |

### *Snapper*

A total of 987 samples of sectioned snapper otoliths were used for this project representative of the commercial and recreational catch from Port Phillip Bay and Western Port Bay from 1995 through to 1998. The maximum age from the samples analysed at the CAF was 28 years. The modal age of the samples was three years. These samples comprised the pattern set. The age distribution for the samples used in this project are shown in Figure 20. Age classes zero to fifteen were used as inputs, all subsequent age classes were combined (ie. ages 16-28). The modified age distribution is shown in Figure 25. The age frequency and deviations from the age frequency distributions from the pattern set for the training, test and production sets are shown in Figure 26, Figure 27 and Figure 28 respectively.

Date of capture for the snapper samples used for this project are shown by year and month in Table 9.


Figure 25. Snapper percentage age frequency distribution of the pattern set. N=987.

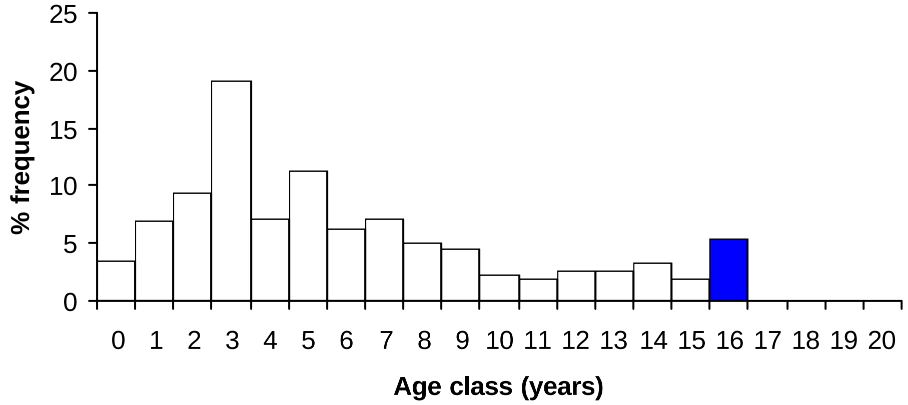


Figure 26. Snapper age frequency distribution after age classes were combined. Solid bar indicates summation of year classes from (and including) 16 to 28. N=987

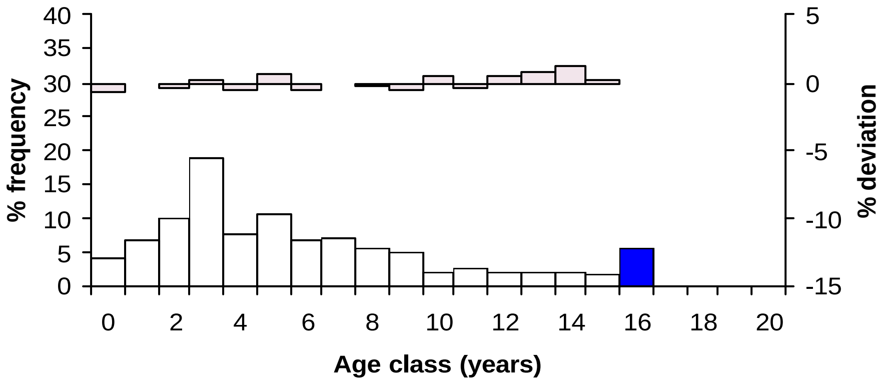


Figure 27. Age distribution of snapper training set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 16 to 28. N=593.

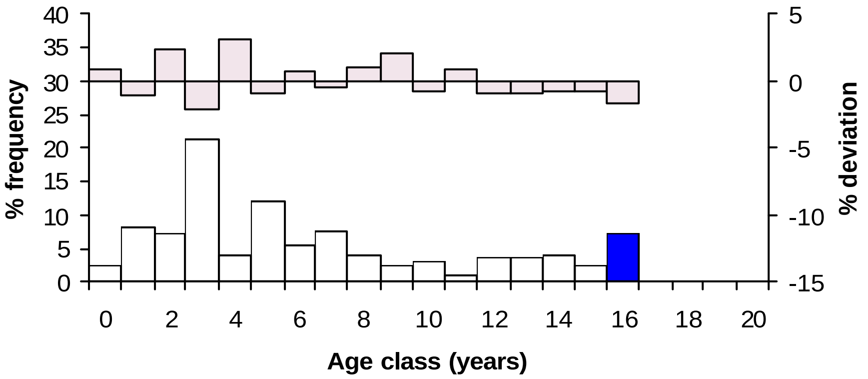


Figure 28. Age distribution of snapper test set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 16 to 28. N=197.

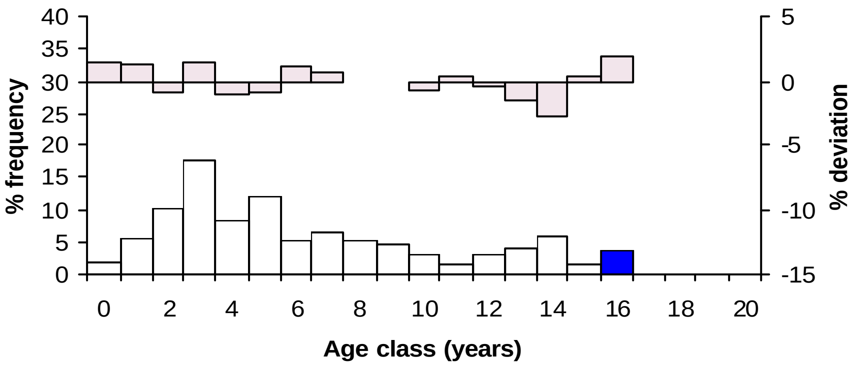


Figure 29. Age distribution of snapper production set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 16 to 28. N=197.

Table 9. Date of capture details for the snapper samples used for signal and biological neural network input combinations.

| Year | Month | | | | | | | | | | N |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 10 | 11 | 12 | |
| 1995 | 17 | 14 | | | | | | 3 | 9 | 12 | 55 |
| 1996 | 71 | | 30 | | | | | 1 | 2 | 24 | 128 |
| 1997 | | 7 | | | 38 | | | 26 | 70 | 1 | 142 |
| 1998 | 13 | 57 | 158 | 84 | 93 | 28 | 22 | 18 | 43 | 146 | 662 |
| Total | 101 | 78 | 188 | 84 | 131 | 28 | 22 | 48 | 124 | 183 | 987 |

***Black bream***

A total of 913 black bream samples were supplied by Bays and Inlets Program at the Marine and Freshwater Resources Institute for this project. Samples were collected from the recreational fishery and from fishery independent samples, from the Gippsland Lakes during the period between 1997 and 1999. Black bream have highly variable recruitment (Morison *et al*. 1998b), and as such, a number of strong year classes are represented in the sample. Within the sample, there were 22 age classes ranging from one year to 37 years, with strong modal ages of three, nine and fifteen years.

Age classes above 15 years were combined, producing 16 age groups. The distribution of original age classes are shown in Figure 30, with the modified age distribution in Figure 31.

The age frequency and deviations from the age frequency distributions from the pattern set for the training, test and production sets are shown in Figure 32, Figure 33 and Figure 34 respectively.

Date of capture for the snapper samples used for this project are shown by year and month in Table 10.

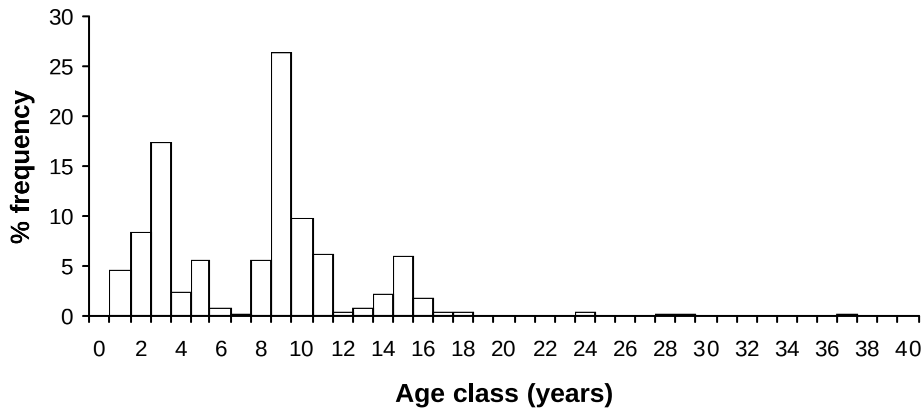


Figure 30. Percentage age frequency distribution of black bream used for the pattern set. N=913

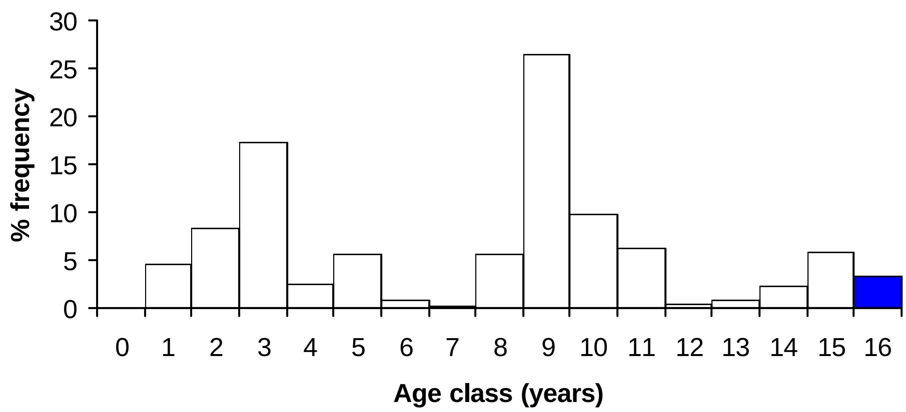


Figure 31. Percentage age frequency distribution of combined age classes used for neural network output.
Solid bar indicates summation of year classes from (and including) 16 to 37. N=913.

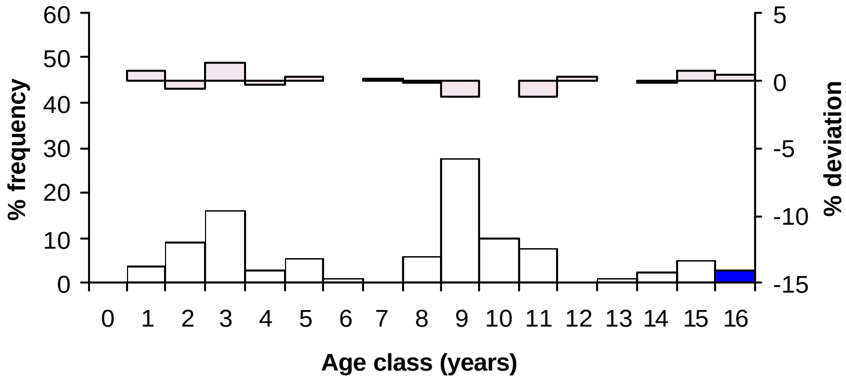


Figure 32. Age distribution of black bream training set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 16 to 37. N=549.

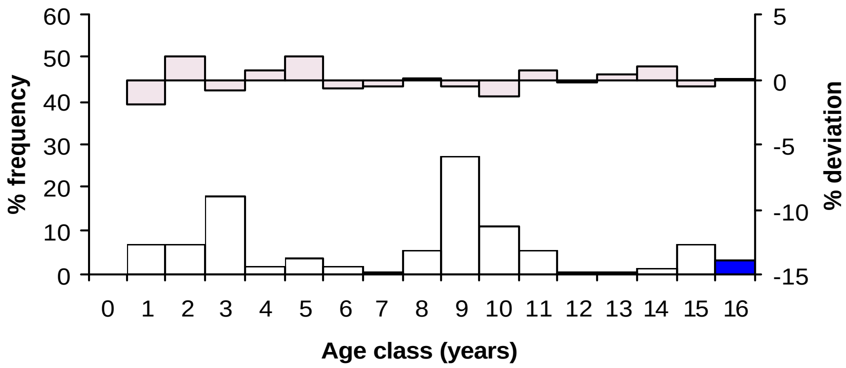


Figure 33. Age distribution of black bream test set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 16 to 37. N=182.

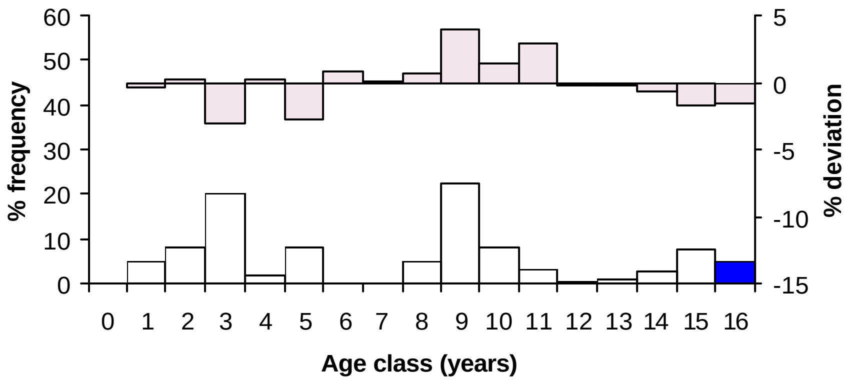


Figure 34. Age distribution of black bream production set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 16 to 37. N=182.

Table 10. Date of capture details for the snapper samples used for signal and biological neural network input combinations.

| Year | Month | | | | | | | | | N |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 8 | 10 | 11 | 12 | |
| 1997 | | 142 | | 95 | | | | | 47 | 284 |
| 1998 | 43 | 276 | 123 | 8 | 1 | 1 | 7 | 30 | 8 | 497 |
| 1999 | 26 | 92 | 14 | | | | | | | 132 |
| Total | 69 | 510 | 137 | 103 | 1 | 1 | 7 | 30 | 55 | 913 |

***Sand flathead***

A total of 963 sand flathead samples were used for training and testing artificial neural networks. Samples were collected from Port Phillip Bay. Strong modal age classes were evident in three, four, six, eight and eleven year cohorts. The minimum age was zero and the maximum age was twenty one, with twenty one cohorts represented in the data.

Age classes above 12 years were combined producing 14 age groups. The distribution of original age classes are shown in Figure 35, with the modified age distribution in Figure 36.

The age frequency and deviations from the age frequency distributions from the pattern set for the training, test and production sets are shown in Figure 37, Figure 38 and Figure 39 respectively.

No date of capture details were available for the sand flathead samples.

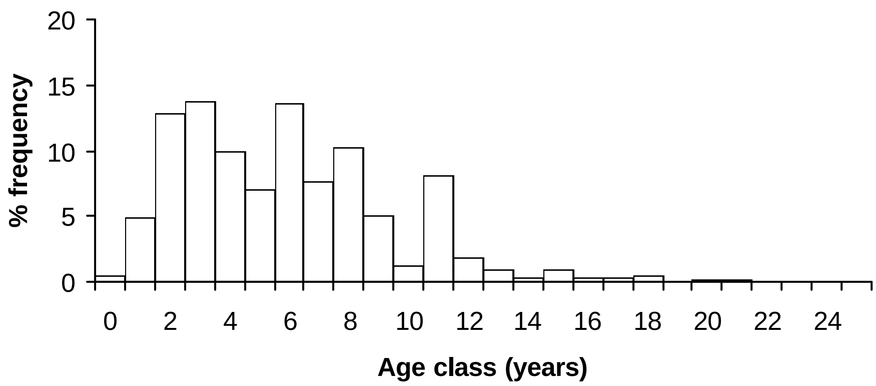


Figure 35. Percentage age frequency distribution of sand flathead used for the pattern set. N=963

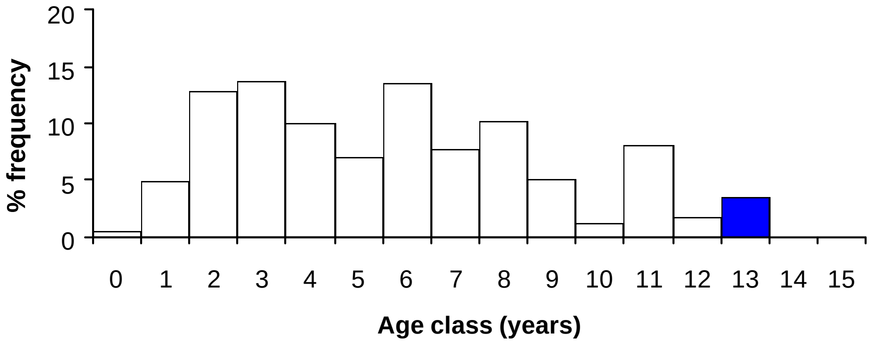


Figure 36. Percentage age frequency distribution of combined age classes used for neural network output.
Solid bar indicates summation of year classes from (and including) 13 to 21. N=963.

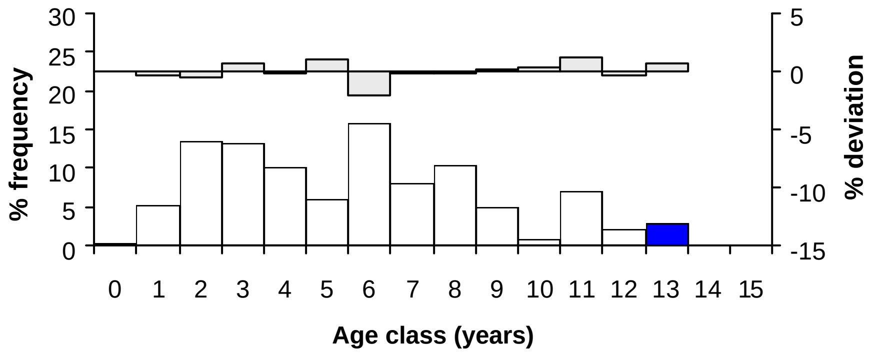


Figure 37. Age distribution of sand flathead training set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 13 to 21. N=579.

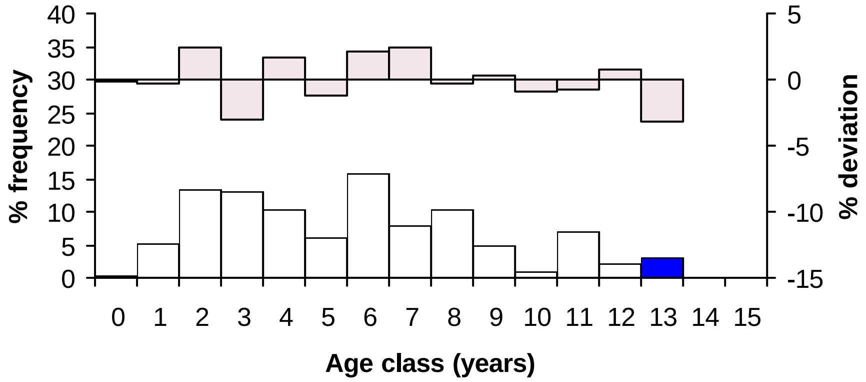


Figure 38. Age distribution of sand flathead test set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 13 to 21. N=192.


Figure 39. Age distribution of sand flathead production set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 13 to 21. N=192.

### *Blue grenadier*

A total of 1,513 blue grenadier samples were selected from the CAF sample collection with dates of capture between April 1998 and August 1999. Twenty three cohorts were shown in the sample. The minimum age of one year and a maximum age of twenty three years. Strong modes in the age distribution were evident at three, four, five and twelve years. Samples were collected from the non-spawning fishery where younger samples are collected and the winter fishery which targets spawning aggregations and is dominated by older age classes.

Age classes above 15 years were combined producing 16 age groups. The distribution of original age classes are shown in Figure 40, with the modified age distribution in Figure 41.

The age frequency and deviations from the age frequency distributions from the pattern set for the training, test and production sets are shown in Figure 42, Figure 43 and Figure 44 respectively.

Date of capture for the blue grenadier samples used for this project are shown by year and month in Table 11.

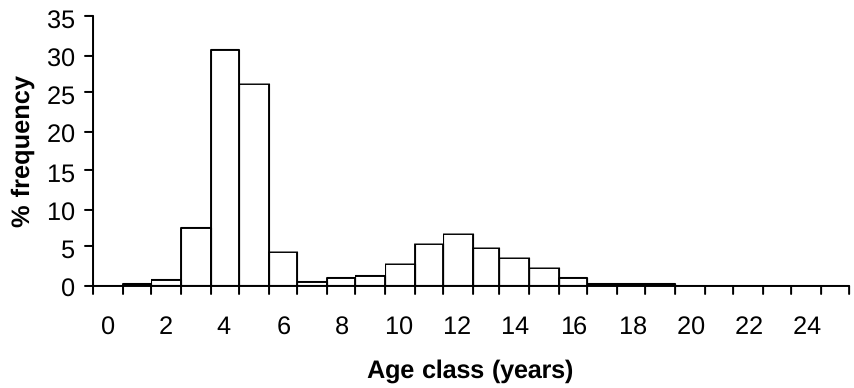


Figure 40. Percentage age frequency distribution of blue grenadier used for the pattern set. N=1531.

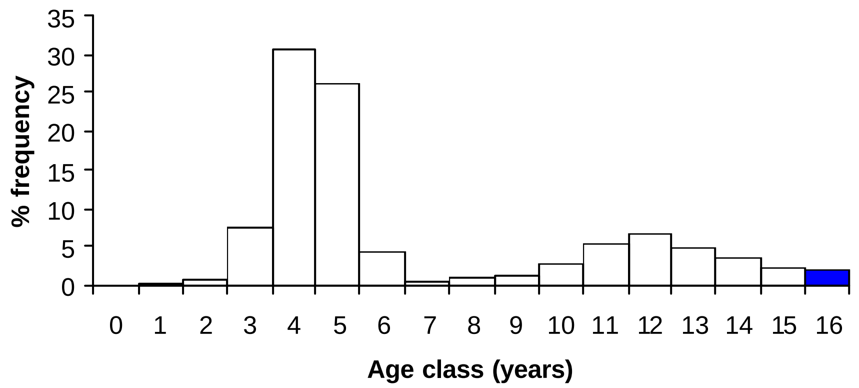


Figure 41. Percentage age frequency distribution of combined age classes used for neural network output.
Solid bar indicates summation of year classes from (and including) 16 to 23. N=1531.

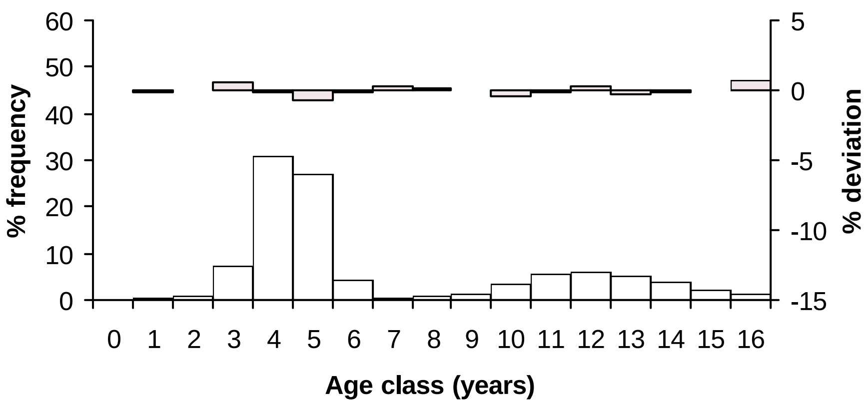


Figure 42. Age distribution of blue grenadier training set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 16 to 23. N=919.

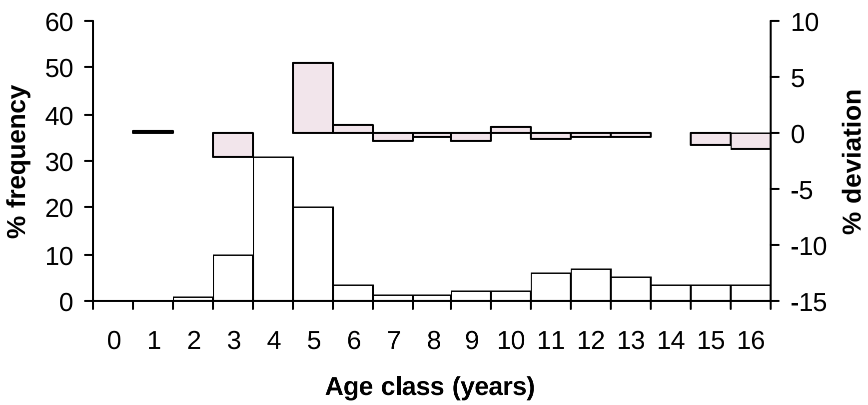


Figure 43. Age distribution of blue grenadier test set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 16 to 23. N=306.

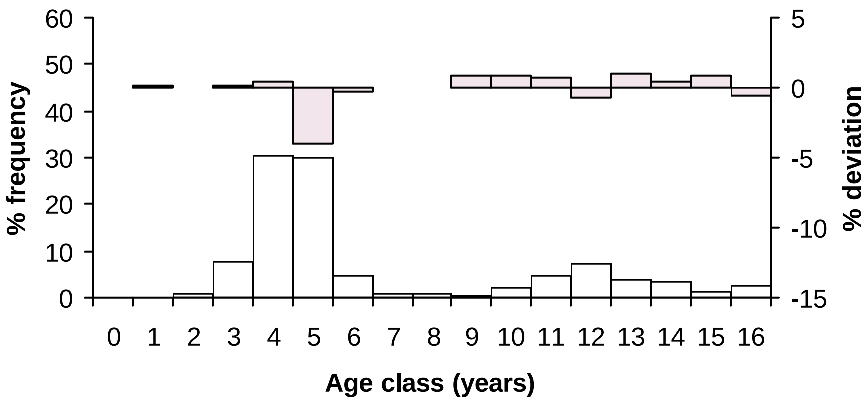


Figure 44. Age distribution of blue grenadier production set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 16 to 23. N=306.

Table 11. Date of capture details for the blue grenadier samples used for signal and biological neural network input combinations.

| Year | Month | | | | | | | | | | | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | |
| 1998 | 119 | 137 | | 124 | 116 | 231 | 117 | | 5 | 10 | 244 | 1103 |
| 1999 | 14 | | 99 | 15 | | | 203 | 97 | | | | 428 |
| Total | 133 | 137 | 99 | 139 | 116 | 231 | 320 | 97 | 5 | 10 | 244 | 1531 |

### *Ocean perch*

A total of 573 ocean perch (offshore form) otolith samples were used to develop neural networks. Samples were supplied from the Integrated Scientific Monitoring Program. The maximum age of the samples examined was 63 years and the minimum age class was three. The modal age distribution was eight and twelve years. The majority of the samples were between three and 21 years.

Age classes above 21 years were combined producing 19 age groups. The original distribution of age classes are shown in Figure 45. The modified age distribution is shown in Figure 46.

The age frequency and deviations from the age frequency distributions from the pattern set for the training, test and production sets are shown in Figure 47, Figure 48 and Figure 49 respectively.

Ocean perch samples were collected between May 1999 and February 2000. The dates of capture by batch are shown in Table 12.

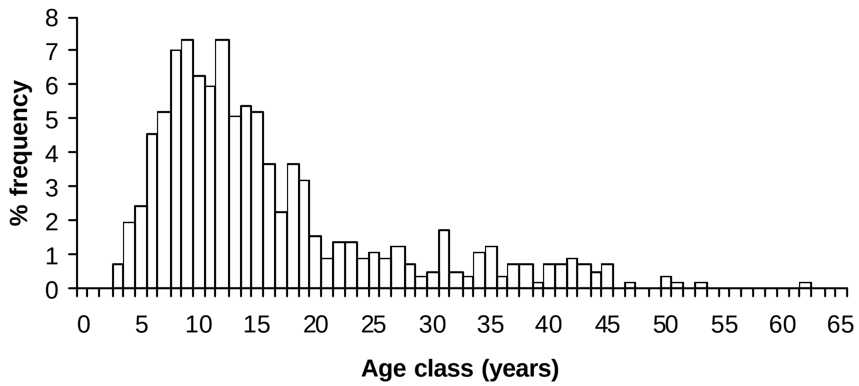


Figure 45. Percentage age frequency distribution of ocean perch (offshore form) used for the pattern set. N=573


Figure 46. Percentage age frequency distribution of combined age classes for ocean perch (offshore form) used for neural network output.
Solid bar indicates summation of year classes from (and including) 21 to 62. N=573

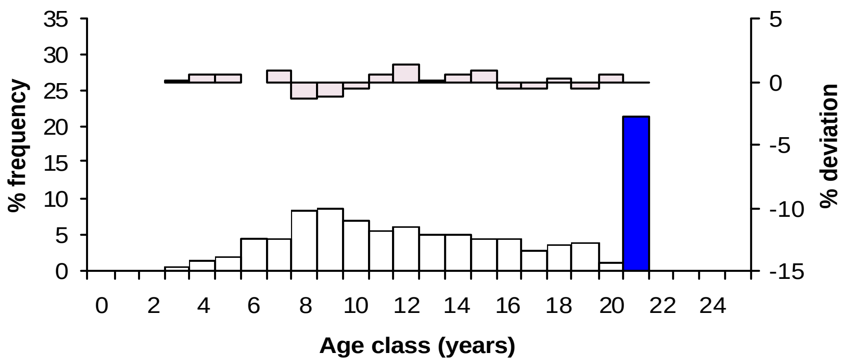


Figure 47. Age distribution of ocean perch (offshore form) training set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 21 to 62. N=345.

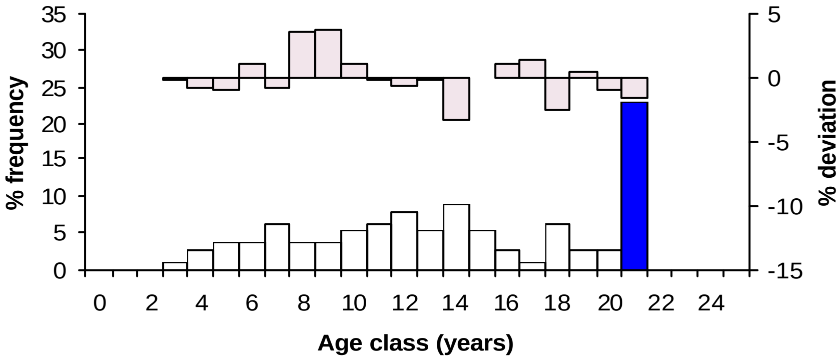


Figure 48. Age distribution of ocean perch (offshore form) test set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 21 to 62. N=114.

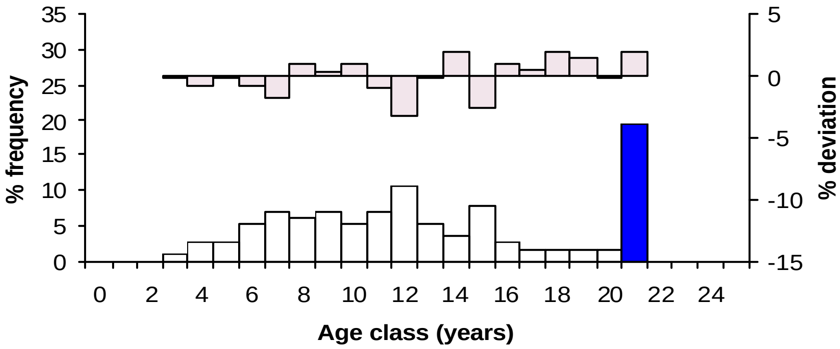


Figure 49. Age distribution of ocean perch (offshore form) production set with percentage deviation of the pattern set.
Solid bar indicates summation of year classes from (and including) 21 to 62. N=114.

Table 12. Date of capture details for the ocean perch (offshore form) samples used for signal and biological neural network input combinations.

| Year | Month | | | | | | | | | N |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 7 | 8 | 9 | 10 | 11 | 12 | |
| 1999 | | | 62 | 79 | 48 | 92 | 90 | 28 | 70 | 469 |
| 2000 | 65 | 39 | | | | | | | | 104 |
| Total | 65 | 39 | 62 | 79 | 48 | 92 | 90 | 28 | 70 | 573 |

## Age composition of the biological dataset

The pattern set for each species were randomly divided into the training, test and production sets for each of the four species trialed with biological, date of capture and area (were applicable) data. The distributions of the training, test and production set are shown below with their percentage deviation of the pattern set (complete dataset).

### *Pilchards*

The CAF has a large collection of pilchard otoliths collected from three states, Victoria, Queensland, and South Australia (Table 13). All pilchards were collected from the same area with each state except for Victoria where samples were collected from Lakes Entrance and Port Phillip Bay. A total of 3,456 samples were selected for this component of the study where complete biological data were available. The samples were collected from 1994 through to 1997.

Table 13. Numbers of pilchards collected by year, state and area.

| Year | Victoria | | South Australia | | Queensland | |
|---|---|---|---|---|---|---|
| | Lake Entrance | Port Phillip Bay | Port Lincoln | Coffin Bay | | |
| | | | | | | N |
| 1994 | | 48 | | | | 48 |
| 1995 | 390 | 373 | 478 | 191 | 105 | 1537 |
| 1996 | | 617 | 174 | 272 | 678 | 1741 |
| 1997 | | 41 | 41 | 48 | | 130 |
| Total | 390 | 1079 | 693 | 511 | 783 | 3456 |

All pilchards were aged at the CAF using techniques described earlier, except otolith samples were examined whole under a dissecting microscope using reflected light with the samples immersed in water against a black background at a magnification of 16x. Pilchards are a short lived species with the maximum recorded age for a pilchard as determined by experienced readers at the CAF at seven years.

The age composition of these samples is predominantly age classes one, two, three and four. The minimum age was zero which accounts for 72 individuals, 2.08% of the sample. The number of age-classes over five years was low, comprising 43 individuals, 1.24% of the combined samples. The age classes for the sample are shown in Figure 50.

The age frequency and deviations from the age frequency distributions from the pattern set for the training, test and production sets are shown in Figure 51, Figure 52 and Figure 53 respectively.

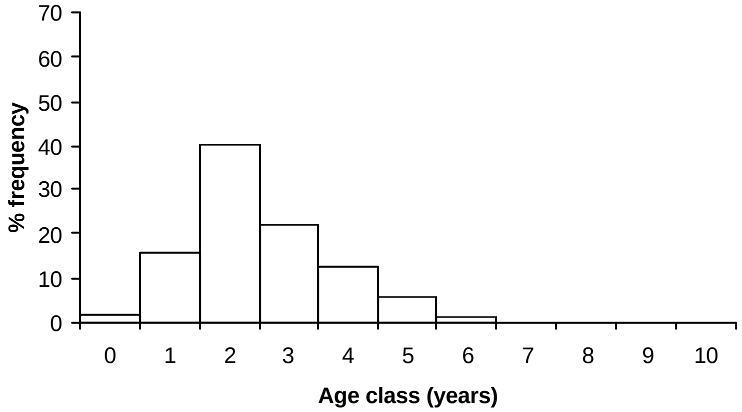


Figure 50. Age frequency composition of the pilchard samples used for trialing the three artificial neural networks, combined areas N=3,456.

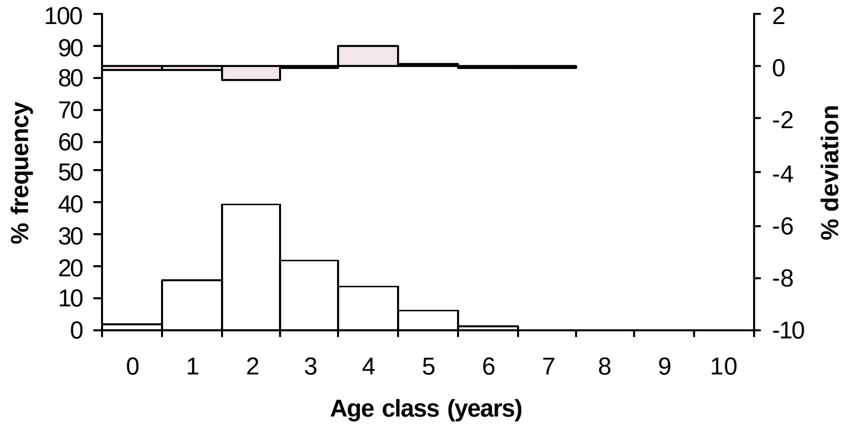


Figure 51. Pilchard training set with percentage deviation of the pattern set, combined areas, n=2,074.

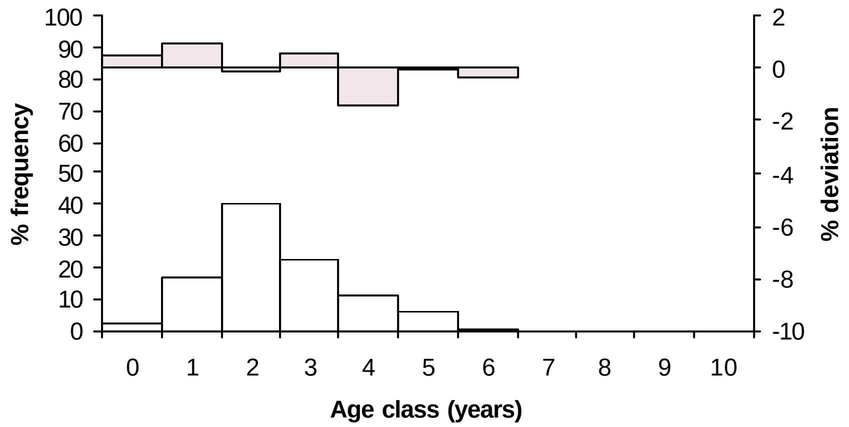


Figure 52. Pilchard test set with percentage deviation of the pattern set, combined areas, n=691.

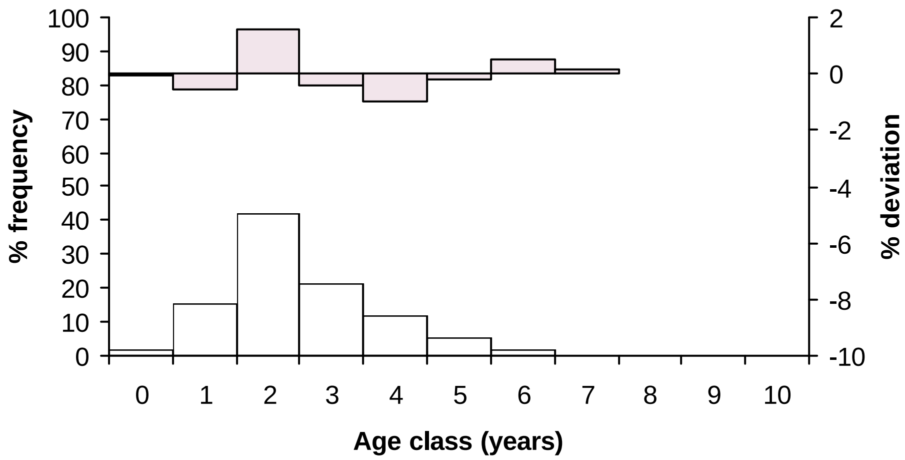


Figure 53. Pilchard production set with percentage deviation of the pattern set, combined areas, n=691.

### *School whiting*

School whiting samples were collected as part of the monitoring of the school whiting fishery in Bass Strait since 1991. These samples were collected mainly in eastern Bass Strait, however, 110 samples were collected in western Bass Strait. The total number of samples in the pattern set was 4,975. The collection dates ranged from 20th October 1991 through to 11$^{th}$ February 1999. The numbers collected by year are summarised in Table 14.

Table 14. Collection details of school whiting used to trial biological inputs for the probabilistic neural network.

| Year | Month | | | | | | | | | | | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 11 | 12 | |
| 1991 | | | | | | | | | 97 | | | 97 |
| 1992 | | | 282 | | | | 295 | 116 | | | | 693 |
| 1993 | | 104 | | | 272 | 387 | 103 | | 98 | 101 | | 1065 |
| 1994 | | 135 | 270 | | | | 147 | | 198 | | | 750 |
| 1995 | 97 | | 194 | | 96 | | | 197 | | 99 | | 683 |
| 1996 | | | | 102 | 101 | 199 | 101 | | | 102 | | 605 |
| 1997 | | 100 | | 100 | 99 | 94 | | | | | | 393 |
| 1998 | | 126 | | 100 | 100 | | | | | | 363 | 689 |
| Total | 97 | 465 | 746 | 302 | 668 | 680 | 646 | 313 | 393 | 302 | 363 | 4975 |

The modal age-class in the combined sample was three years comprising 37.4% of the sample, the next most frequent year-class was four years (27.9%). The youngest samples were one year and the oldest age-class represented was seven years, comprising 1.0% of the sample. These age frequency data from the combined dataset is shown in Figure 54.

The age frequency and deviations from the age frequency distributions from the pattern set for the training, test and production sets are shown in Figure 55, Figure 56 and Figure 57 respectively.

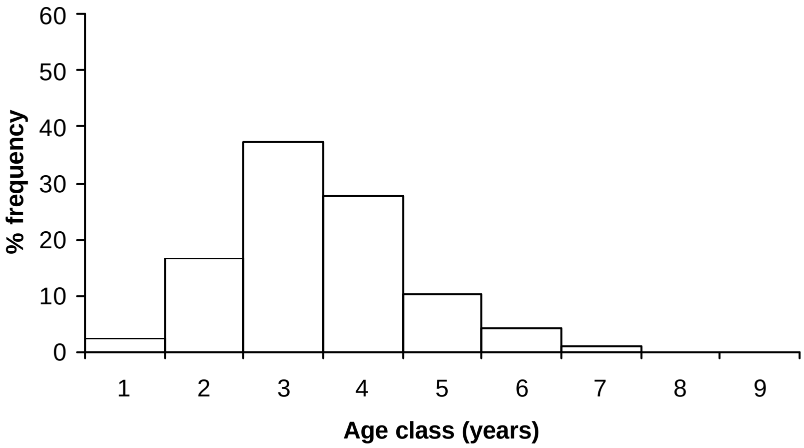


Figure 54. Age frequency composition of the school whiting samples from the combined dataset used for trialing the probabilistic neural network.

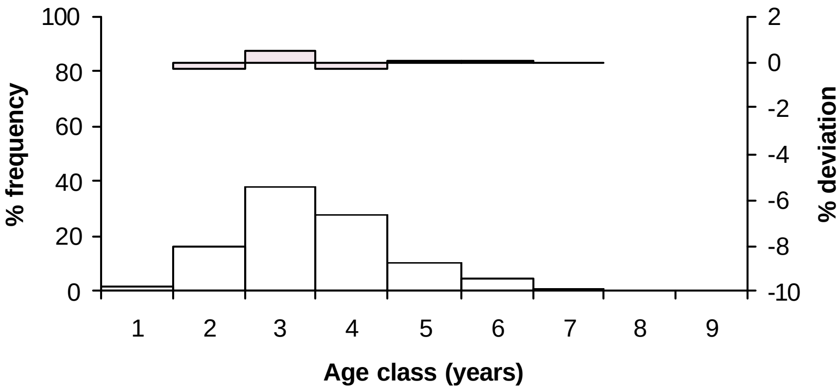


Figure 55. School whiting training set with percentage deviation of the pattern set, n=2,985

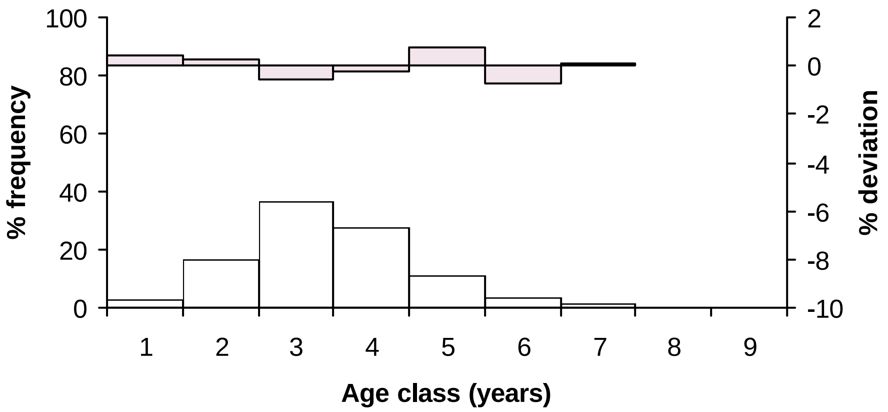


Figure 56. School whiting test set with percentage deviation of the pattern set, n=995.

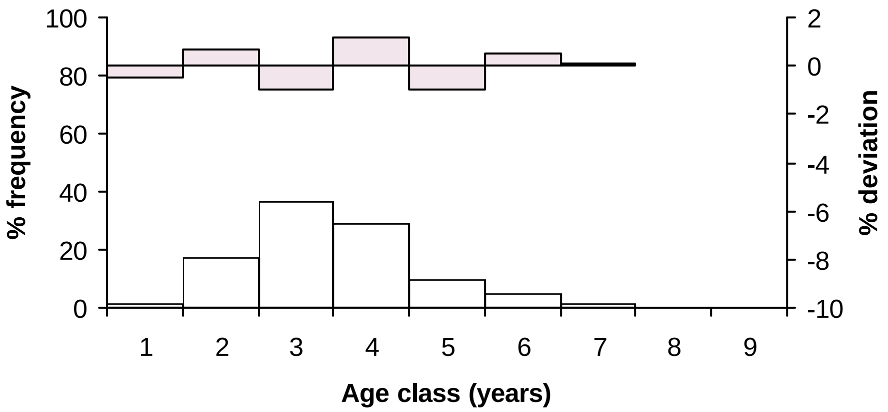


Figure 57. School whiting production set with percentage deviation of the pattern set, n=995.

***Snapper***

The snapper samples used to trial the neural networks were collected from recreational and commercial fishers caught predominantly in Western Port Bay and Port Phillip Bay; both areas are located in Victoria. A total of 2,377 samples were used to trial the probabilistic neural network. These samples were collected from 8$^{th}$ December 1994 through to the 10$^{th}$ August 1999. The sample collection details are shown below by month and year in Table 15.

The age frequency of the samples ranged from zero years through to 38 years. A modal age-class of three comprises 22.13% of the sample. Each age class up to 15 years includes more than two percent of the total sample. Age classes above 15 years (7.6% of the total sample) were combined producing 17 age groups. The age frequency of the combined sample is shown in Figure 58.

Table 15. Collection details of snapper used to trial biological inputs for the probabilistic neural network.

| Year | Month | | | | | | | | | | | | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| 1994 | | | | | | | | | | | | 8 | 8 |
| 1995 | 23 | 18 | 55 | 43 | | | | | | 3 | 20 | 16 | 178 |
| 1996 | 81 | | 31 | 4 | | | | | | 1 | 190 | 25 | 332 |
| 1997 | 1 | 7 | | | 38 | | | | | 28 | 93 | 9 | 176 |
| 1998 | 47 | 57 | 358 | 86 | 95 | 50 | 22 | 180 | 67 | 38 | 188 | 126 | 1314 |
| 1999 | 162 | 20 | 149 | 31 | | | | 7 | | | | | 369 |
| Total | 314 | 102 | 593 | 164 | 133 | 50 | 22 | 187 | 67 | 70 | 491 | 184 | 2377 |

The age frequency and deviations from the age frequency distributions from the pattern set for the training, test and production sets are shown in Figure 59, Figure 60 and Figure 61 respectively.

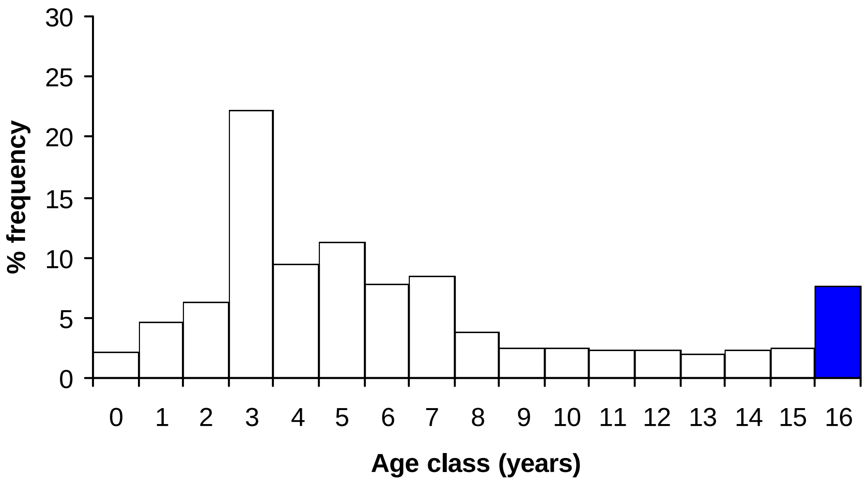


Figure 58. Age frequency composition of the snapper samples from the combined dataset used for trialing the probabilistic neural network.
Age class 16 (solid bar) contains age-classes from (and including) 16 to 37.

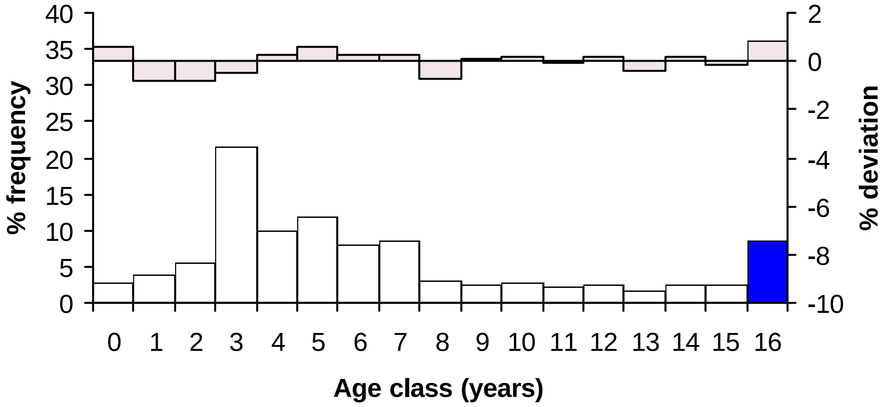


Figure 59. Snapper training set with percentage deviation of the pattern set, n=1,427.
Solid bar indicates combined age classes.

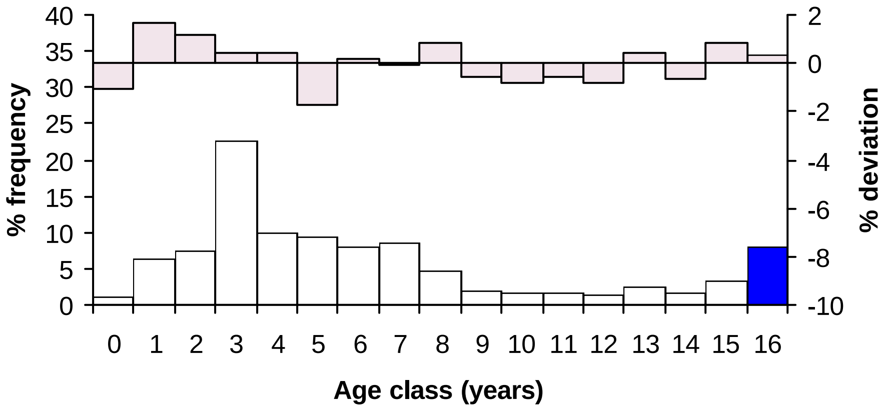


Figure 60. Snapper test set with percentage deviation of the pattern set, n=475.
Solid bar indicates combined age classes.

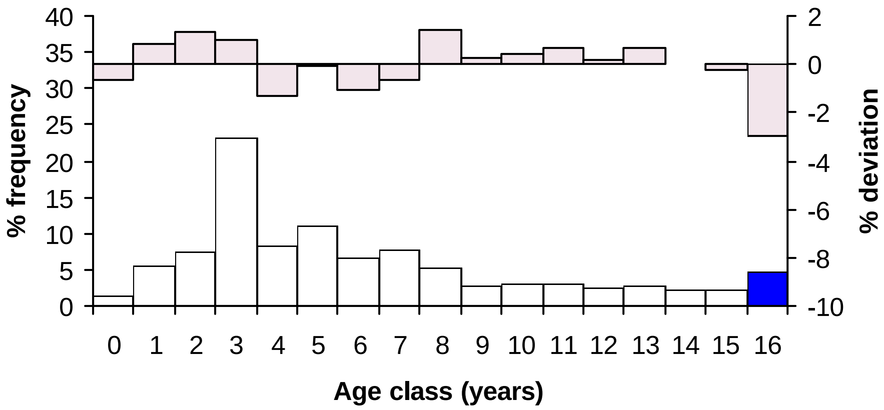


Figure 61. Snapper production set with percentage deviation of the pattern set, n=475.
Solid bar indicates combined age classes.

### *Ling*

The ling samples were collected from eastern and western Bass Strait from 5th April 1994 through to 19th July 1998. A total of 3,117 samples were used to trial the probabilistic artificial neural network. The samples were collected as part of the ongoing monitoring of ling stocks in the South East Fishery. Samples were collected from primarily otter trawling, however, 31 samples were caught by Danish seine. The year and month of sampling the ling samples used for this project are shown in Table 16.

Table 16. Collection details of ling samples used to trial biological inputs for the probabilistic neural network.

| Year | Month | | | | | | | | | | | | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| 1994 | | | | 241 | | | | | | | | | 241 |
| 1995 | | 146 | 50 | | 102 | | | | 101 | 37 | | 89 | 525 |
| 1996 | 53 | 106 | 79 | | 29 | 98 | | 186 | | | 128 | 212 | 891 |
| 1997 | | 159 | 51 | 92 | 297 | | 151 | | 64 | 97 | 196 | 47 | 1154 |
| 1998 | | | | | 227 | 79 | | | | | | | 306 |
| Total | 53 | 411 | 180 | 333 | 655 | 177 | 151 | 186 | 165 | 134 | 324 | 348 | 3117 |

The age frequency composition of the ling samples comprised age classes 1 to 28 years. The modal age class was three years comprising 31.8% of the sample. The next most dominant age classes were 2 and 3 years respectively. These three age classes comprise 77.8% of the combined sample. Age classes above 14 years (1.5% of the sample) class were combined producing 14 age groups. The age composition of the combined sample is shown in Figure 62.

The age frequency and deviations from the age frequency distributions from the pattern set for the training, test and production sets are shown in Figure 63, Figure 64 and Figure 65 respectively.


Figure 62. Age frequency composition of the ling samples from the combined dataset used for trialing the probabilistic neural network.
Age class 14 (solid bar) contains age classes from (and including) 14 to 28.

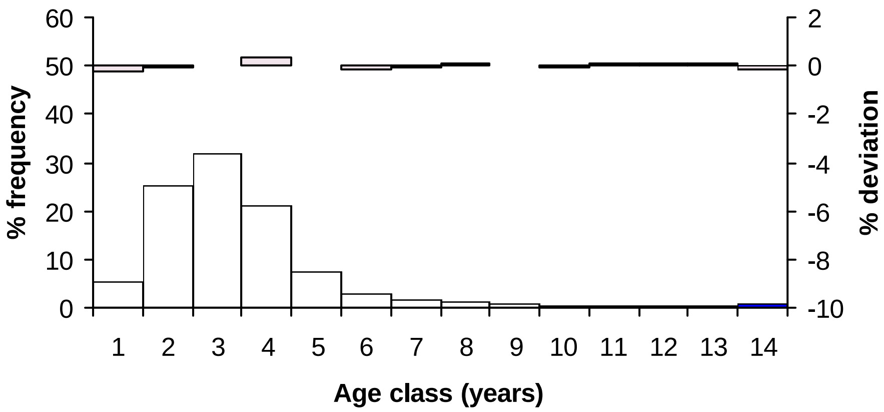


Figure 63. Ling training set with percentage deviation of the pattern set, n=1,871.
Solid bar indicates combined age classes.

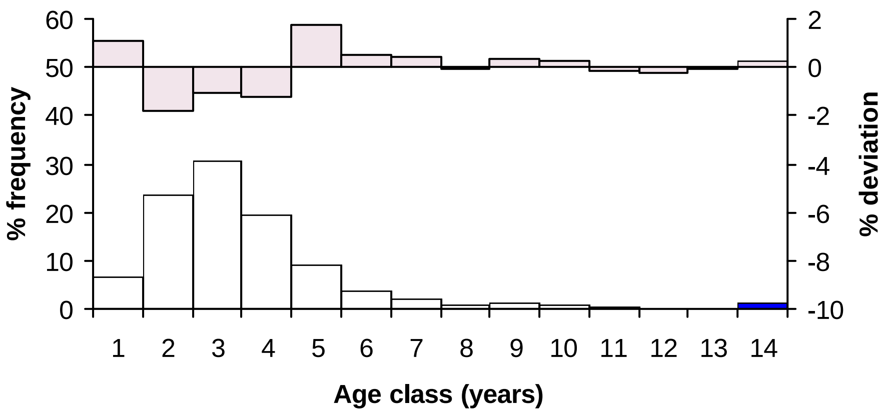


Figure 64. Ling test set with percentage deviation of the pattern set, n=623.
Solid bar indicates combined age classes.

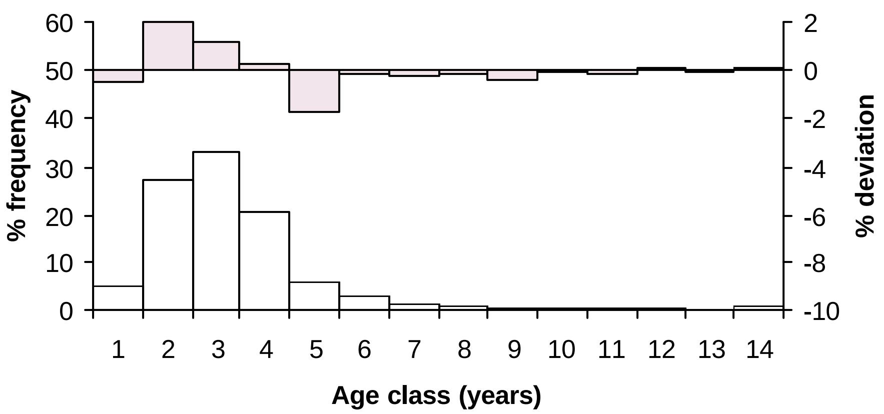


Figure 65. Ling production set with percentage deviation of the pattern set, n=623.
Solid bar indicates combined age classes.

### *Blue grenadier*

Blue grenadier otolith samples were collected from two distinct sub-fisheries of the South East Fishery. These either target the spawning stock in winter off the west coast of Tasmania, which is dominated by older age classes of 10, 11, 12 and 13 years, or they target the non-spawning stock in Bass Strait, which is dominated by fish aged two, three and four years. From the non-spawning fishery 2,891 samples were collected and from the spawning fishery 1,808 samples were collected. This gave a combined sample of 4,699 individual age estimates to trial using the probabilistic neural network model. The samples were collected from February 12th 1997 through to December 1st 1998. The collection details for the combined group are shown by month and year for both the spawning and non-spawning fishery in Table 17.

Table 17. Collection details of blue grenadier samples used to trial biological inputs for the probabilistic neural network, by year, month and fishery.

| Season | Year | Month | | | | | | | | | | | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| Non-spawning | 1997 | 386 | 127 | 153 | | | | | 555 | | 384 | 408 | 2013 |
| | 1998 | | 147 | 125 | 116 | | | | 8 | 248 | | 234 | 878 |
| Sub-total | | 386 | 274 | 278 | 116 | | | | 563 | 248 | 384 | 642 | 2,891 |
| Spawning | 1997 | | | | | | 231 | 437 | | | | | 668 |
| | 1998 | | | | | 443 | 575 | 122 | | | | | 1140 |
| Sub-total | | | | | | 443 | 806 | 559 | | | | | 1,808 |
| Total | | 386 | 274 | 278 | 116 | 443 | 806 | 559 | 563 | 248 | 384 | 642 | 4,699 |

The age distribution of the non-spawning stock showed a modal age class of three representing 38% (1099 estimates) with the age classes four (21%), three (15.2%) and five years (6.1%) being the next most dominant age classes respectively. Age class membership was continuous from one through (and including) age class twenty. The youngest age class represented in the sample was one year while the oldest age class in the sample was twenty years.

The spawning samples have a modal age class of eleven representing 16.4% (297) of the sample, with the next most frequently occurring age classes being twelve (15.1%), ten (13.2%) and thirteen (11.1%) years respectively. The age composition for the non-spawning and spawning blue grenadier samples are shown in Figure 66 and Figure 67 respectively.

The age frequency and deviations from the age frequency distributions of the combined spawning and non-spawning fishery from the pattern set for the training, test and production sets are shown in Figure 68, Figure 69 and Figure 70 respectively.

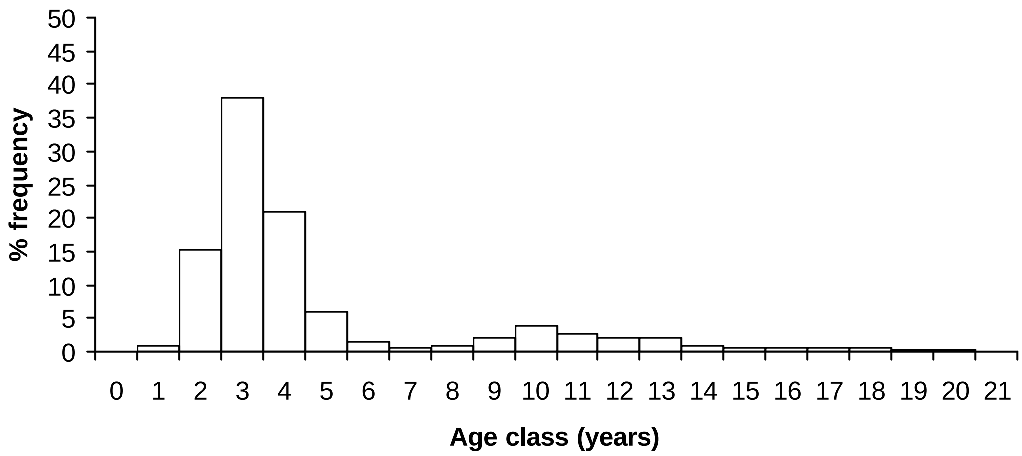


Figure 66. Non-spawning blue grenadier age frequency composition used for trialing the probabilistic arifical neural networks.

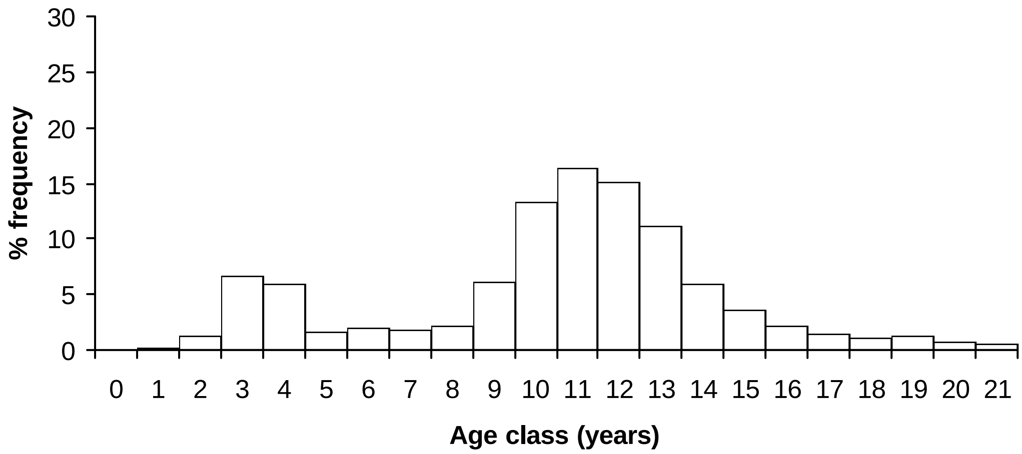


Figure 67. Spawning blue grenadier age frequency composition used for trialing the probabilistic arifical neural networks.

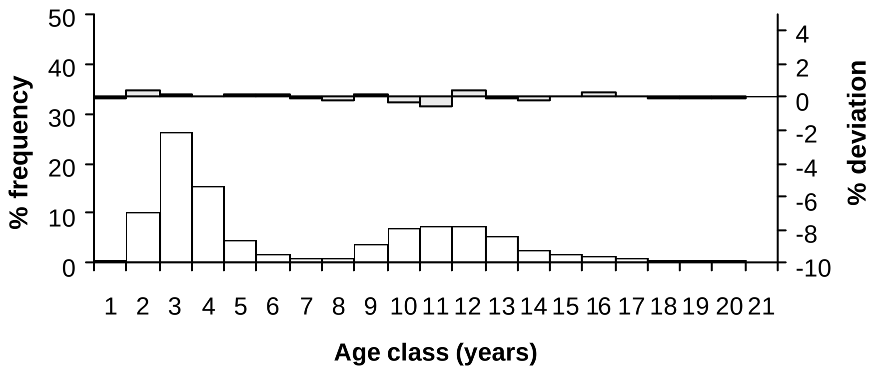


Figure 68. Blue grenadier training set with percentage deviation of the pattern set, n=2,821.

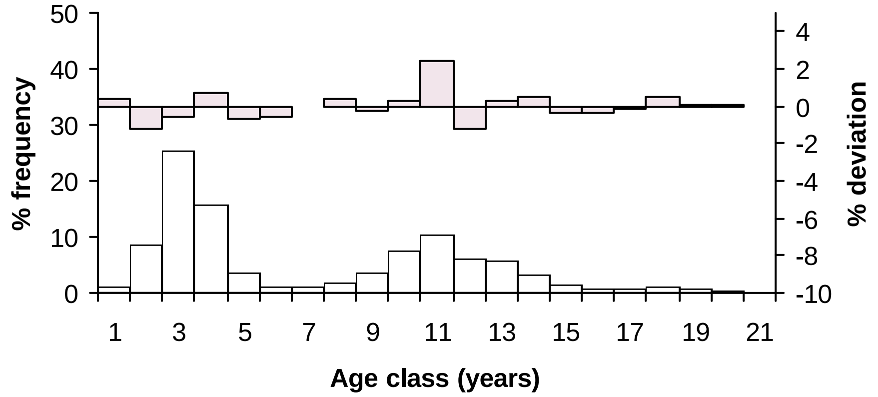


Figure 69. Blue grenadier test set with percentage deviation of the pattern set, n=939.

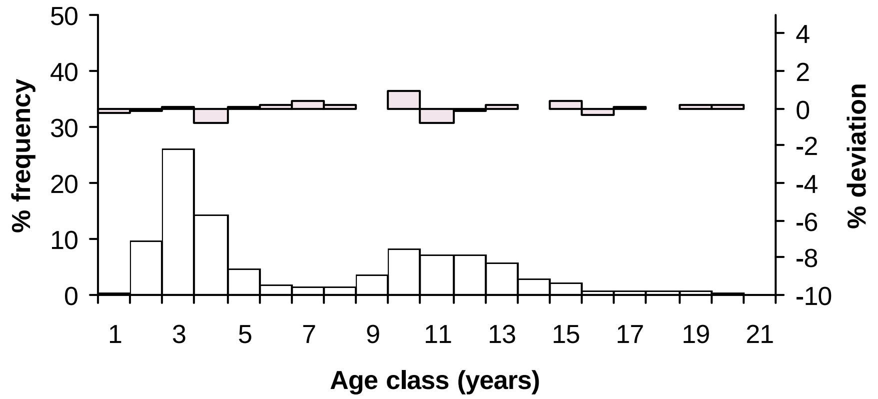


Figure 70. Blue grenadier production set with percentage deviation of the pattern set, n=939.

# Results

The ability of the various neural network models to predict the age of fish from the various data inputs were assessed using the same techniques as those used in the pilot study (Morison and Robertson 1997). These are Beamish and Fournier average percent error (APE), regression analysis and age difference tables. The criteria for assessing whether the networks have successfully estimated ages are listed below:

- A low Beamish and Fournier index of average percentage error (APE). The standard criteria used in the CAF for determining successful age estimation is an APE value of less than five percent (Morison *et al.* 1998). However, APE's are commonly reported in the literature of up to fifteen percent. APE values are presented for the training set, test set and production datasets for each of the species by each neural network model in Appendix 3.

- Regression analysis. Regression analysis is used to determine whether there is a systematic bias in the age estimates. For no systematic biases to be present two criteria must be satisfied. Firstly, the slope of the regression line for the observed age versus the predicted age must be not significantly different from one. Secondly, the intercept of the regression equation must not be significantly different from zero. The regression equations and significance testing for all production datasets for each species by neural network type are presented in Appendix 4.

- Age difference tables. Age difference tables, or their graphical equivalent the age-bias plot (Campana *et al*. 1995), are an important tool routinely used in age estimation studies for examining the distribution of errors by age class. These are presented for all the species and network combinations in Appendix 5.

Results against study Objectives 1 and 2 are reported together for each of the species tested in the following sections. Presented first are the extensions to the pilot study undertaken for snapper and black bream. Second are the results for neural networks using both biological and signal data as inputs. Thirdly, are the results for neural networks that used larger sets of biological data as the sole data inputs. Finally, a draft protocol for the development and application of neural networks (Objective 3) is presented.

## Extension of pilot study (FRDC 96/136)

The results obtained for the datasets from the pilot study, using the probabilistic neural networks and the signal transformation techniques developed for this study, demonstrate similar precision. The APEs were below five percent for snapper and black bream (4.03% and 4.14%, respectively). These approximated the best performing back propagation neural networks from the pilot study (4.15% and 3.38% for snapper and black bream respectively).

The regression analyses comparing observed and predicted ages showed no significant biases for both the snapper and black bream; the slopes and intercepts were not significantly different from one and zero respectively. These results differ from those from the pilot study where significant differences were found for both species in the comparable analyses. The correlation coefficients were also higher for both snapper and black bream (0.88 and 0.89 respectively) using the transformed signal dataset.

The age difference tables for snapper (Table 18) showed maximum differences of -5 and +4 years. This result was more precise than for the pilot study where the maximum difference was +7 years in the best performing network using unscreened data.

Table 18. Age difference table for snapper using the probabilistic neural network and signal transformed data on the unseen samples from pilot study.

| Difference | Observed age | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **2** | **3** | **4** | **5** | **6** | **8** | **9** | **10** | **12** | **All** |
| -5 | | | | 2 | | | | | | 2 |
| -3 | | | | | | | 2 | | | 2 |
| -2 | | | | | | 2 | | 4 | | 6 |
| -1 | 1 | | 4 | 2 | | 5 | 8 | | | 20 |
| **0** | **30** | **24** | **18** | **15** | **13** | **8** | **9** | **7** | **17** | **141** |
| 1 | 4 | 1 | 3 | 6 | 2 | | 1 | | | 17 |
| 2 | | | | | | | | 4 | | 4 |
| 3 | | | | | | | | | 3 | 3 |
| 4 | | | | | | | | 5 | | 5 |
| Total | **35** | **25** | **25** | **25** | **15** | **15** | **20** | **20** | **20** | **200** |

The age difference table for black bream (Table 19) again shows slightly lower precision than the pilot study. The maximum negative difference (-3 years) was observed at age class two and a maximum positive difference (+3 years) for the fifth and ninth age classes. These were similar to the differences obtained for the best network from the pilot study.

For snapper, the percentage agreement using the probabilistic neural network was 71% exact agreement and 89% within one year. This compares 72% exact agreement and 88% within one year for best model in the pilot study. The percentage agreement for black bream observed and predicted age for the probabilistic neural network was 76% exact agreement and 88% within one year. This compares to 75% exact agreement and 86% within one year for the best model in the pilot study.

Table 19. Age difference table for black bream using the probabilistic neural network and signal transformed data on the unseen samples from the pilot study.

| Difference | Observed age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **4** | **5** | **6** | **7** | **8** | **9** | **All** |
| -3 | | 1 | | | | | | | 1 |
| -2 | | 2 | | | 1 | | | | 3 |
| -1 | | | 1 | | 10 | | 6 | | 17 |
| **0** | **25** | **22** | **20** | **18** | **13** | **18** | **20** | **16** | **152** |
| 1 | | | | | | 6 | | 1 | 7 |
| 2 | | | 4 | | | 2 | 4 | | 10 |
| 3 | | | | 7 | | | | 3 | 10 |
| Total | **25** | **25** | **25** | **25** | **24** | **26** | **30** | **20** | **200** |

## Comparison of network types and data types

Neural networks generally demonstrated acceptable accuracy, but a slightly lower level of precision than we would normally consider acceptable.

At least one network type satisfied the regression criteria (demonstrating no significant bias in predicted ages) for all species (Table 20). The regression criteria were met for two species by the back propagation networks, for six species by the multiple hidden layer back propagation network type, and for seven species by the probabilistic network. The network type that produced the lowest APE (best precision) varied among species, but the variation in APEs among species were larger than the variation among network types. The lowest APEs were produced by back propagation neural networks for King George whiting, school whiting and black bream, by multiple hidden layer networks for sand flathead and blue grenadier, and by probabilistic neural networks for ling, snapper and ocean perch. All neural network types met the precision criteria (an APE of less than 5%) for King George whiting and the back propagation network also met it for school whiting. No other species met the precision criteria for any combination of data input and model type.

Using less stringent criteria of an APE below 10% and the same regression criteria, six of the eight species trialed using signal and biological data as inputs could be considered successful (Table 21). The back propagation model was successful only for snapper. The multiple hidden layer neural network was successful for four species (ling, black bream, snapper and blue grenadier) and the probabilistic neural network model was successful for five species (King George whiting, school whiting, black bream, snapper and blue grenadier).

The input data types that produced the lowest APEs included the biological data for all species tested. For four species (school whiting, ling, snapper and ocean perch) the lowest APEs were produced by networks using both biological data and transect length as model inputs. For three species (black bream, sand flathead and blue grenadier) the lowest APEs were produced by networks using both biological data and transect data as model inputs. For the remaining species (King George whiting) three different combinations of input data produced identical APEs, but all included biological data.

Overall the back propagation neural network was the least successful model. It produced similar APEs to the other network types, but was substantially inferior in satisfying the regression criteria. The probabilistic networks satisfied the regression criteria for a greater range of species and data inputs than either of the other network types.

The performance of each neural network type with different data inputs are described below in more detail for each species.

Table 20. Network types for which precision and bias criteria were satisfied for at least one type of input data for each species.
A = precision criterion met (average percent error <5%); R = bias criteria met (slope=1 and intercept=0 for linear regression); B = both precision and bias criteria met; Bio=Biological data; Transect L.=Transect length; T1, T2 etc=Signal data from numbered transect.

| | Network type | | |
|---|---|---|---|
| Species | Back propagation | Multiple layer | Probabilistic |
| King George whiting | A (All Data) | A (T3 with Bio) | B (Bio) |
| school whiting | A (Bio with Transect L.) | | R (Bio) |
| ling | | R (Bio with Transect L.) | |
| Black bream | | R (Bio with Transect L.) | R (All Data) |
| Snapper | R (T5 with Bio) | R (Bio with Transect L.) | R (Bio with Transect L.) |
| sand flathead | | R (T4 with Bio) | R (T4 with Bio) |
| blue grenadier | | R (T3 with Bio) | R (All Data) |
| ocean perch | R (T5 with Bio) | R (T4 with Bio) | |

Table 21. Network types for which precision and bias criteria were satisfied for at least one type of input data for each species.
A = precision criterion met (average percent error <10%); R = bias criteria met (slope =1 and intercept =0 for linear regression); B = both precision and bias criteria met; Bio=Biological data; Transect L.=Transect length; T1, T2 etc=Signal data from numbered transect.

| | Network type | | |
|---|---|---|---|
| Species | Back propagation | Multiple layer | Probabilistic |
| King George whiting | A (All Data) | A (T3 with Bio) | B (Bio) |
| school whiting | A (Bio with Transect L.) | A (Bio) | B (Bio) |
| ling | A (Bio) | B (Bio with Transect L.) | A (Bio with Transect L.) |
| black bream | A (T5 with Bio) | B (Bio with Transect L.) | B (All Data) |
| snapper | B (T5 with Bio) | B (Bio with Transect L.) | B (Bio with Transect L.) |
| sand flathead | A (T3 with Bio) | A (T3 with Bio) | R (T4 with Bio) |
| blue grenadier | A (T3 with Bio) | B (T3 with Bio) | B (All Data) |
| ocean perch | R (T5 with Bio) | R (T4 with Bio) | A (Bio and Transect) |

### *King George whiting*

Low APEs were achieved with each network model, with a variety of data inputs (Table 22). Significant bias was indicated by the regression analyses for each of these network – data input combinations. Results for each neural network and type of data input are presented in more detail below.

The average percentage errors for the back propagation neural networks using all permutations of data inputs were all below five percent for the training, test and production datasets (Appendix 3. Table 1). The addition of the biological data to the signal data reduced the APE's in all cases by approximately one percent for the production set. All back propagation neural networks trialed on King George whiting over-estimated age class one and generally assigned this cohort as two year olds (Appendix 5, Table 1.1.1 through Table 1.1.13.). The addition of all the signal data from the transects to the biological data did not improve network performance. There was close agreement between observed and predicted age with 90.7% of the samples being in agreement, 4% under-estimated and 5.3% over estimated.

Table 22. Data inputs with lowest APEs by model type for King George whiting.
BPN=back propogation neural network; MHN=multiple hidden layer neural network; PNN=probabilistic neural network. Regression = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively (a=0.05).

| Model | Data input | APE | $R^2$ | Regression |
|---|---|---|---|---|
| BPN | All data[1] | 2.06 | 0.76 | * |
| MHN | T3 with bio | 2.10 | 0.64 | * |
| PNN | Bio | 2.5 | 0.65 | * |

[1] Four types of data input also produced equivalent results.

The regression analysis reflects the over-estimation of younger age classes with slopes being significantly less than one and the intercepts being significantly greater than zero (Appendix 4, Table 1.1).

The APEs for the multiple hidden layer neural networks were similar to those for the back propagation neural network with maximum values similar to those from the training set. The addition of the biological data reduced the APE for all networks by approximately one percent with all trials on the signal data. The age difference tables (Appendix 5, Table 1.2.1 through Table 1.2.13) indicate a failure of these models to correctly estimate the age of the youngest fish. The maximum number of correct age class assignment was 92% for the model trialed on Transect one with biological data (98.67% plus or minus one year). The addition of the signal data to the biological data did not significantly increase the accuracy of the network.

The regression analysis, as with the back propagation neural network, reflected the over-estimation of younger age classes with slopes being significantly less than one and the intercepts being significantly greater than zero (Appendix 4, Table 1.2).

The APEs for the probabilistic neural network training and test sets were lower than those for the back propagation neural networks. These ranged from 0.00% to 3.70% for the training sets and 0.00% to 2.90% for the test sets (Appendix 3. Table 1). The addition of the biological data reduced the APE by up to 2.04% (Transect five and transect five with biological data). The production sets produced higher APE's than the back propagation models, with a range from 2.50% for biological data and all signal data from the five transects to 8.84% for the signal data from transect 5 with no biological data. The combination of signal and biological data produced the lowest APE (2.50%) for the probabilistic model (Appendix 3. Table 1). This increased to 2.67 % when the just transect lengths and biological data were used, and to 4.10% when just biological data were used for model inputs.

The regression analysis showed the same bias as the back propagation models (including the multiple hidden layer neural networks) with slopes and intercepts being significantly different from one and zero respectively for all models except the biological data only model. This model correctly classified 85.33% of samples and classified 100% within one year of the observed age (Appendix 4. Table 1.3).

The age difference tables (Appendix 5, Table 1.3.1 through Table 1.3.13) showed the same trend of over-estimating the younger age-classes and under-estimating the older age-classes.

### *School whiting*

Neural network models trialed on school whiting produced higher APEs than those for King George whiting. No models from either the multiple layer or back propagation networks produced unbiased age estimates; the probabilistic neural networks produced four models with no significant bias. The lowest APEs from all models trialed on school whiting were from back propagation networks. Model performance is summarised in Table 23. Results from each network type are presented in detail below.

Table 23. Data inputs with lowest APEs by model type for school whiting.
BPN=back propogation neural network; MHN=multiple hidden layer neural network; PNN=probabilistic neural network. Regression = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively (a=0.05).

| Model | Data input | APE | $R^2$ | Regression |
|---|---|---|---|---|
| BPN | Bio & transect | 4.70 | 0.67 | * |
| MHN | Bio | 5.08 | 0.59 | * |
| PNN | Bio | 5.51 | 0.66 | NS |

The back propagation neural networks produced lower precision than those for King George whiting. The lowest APE for the training set was from the model which used biological data as inputs. The highest APE for the training set was from the model which used signal data from transect two. The addition of the signal data to the biological data approximately doubled the APE (Appendix 3, Table 1). The test set APEs ranged from 3.35% for the biological data only inputs to 11.69% from the models which used the signal data from transect four and signal data from transect five as inputs. The production set APEs were higher than those from the King George whiting models. The lowest APEs were from the models which used biological and transect length data as inputs. This represented a slight improvement over using the biological data alone (Appendix 3, Table 1).

The regression analysis showed that there was bias in the back propagation models for school whiting with all slopes and intercepts being significantly different from one and zero respectively for all models, (Appendix 4, Table 2.1).

The age difference tables (Appendix 5, Table 2.1.1 through Table 2.1.13) show the downward trend associated with over-estimating the age of the younger fish and under-estimating the age of the older fish. In comparison to King George whiting, many of the models correctly assigned the youngest age classes whereas the ages of the older age classes were often under-estimated. The back propagation model with the highest accuracy used the biological and transect length data as inputs with 70.59% of the samples being assigned the correct age class and 99.02 % being within one year of the observed age.

The multiple hidden layer neural networks generally produced higher APEs for the training sets compared to the test sets. The APE's for the training sets were comparable with those for the back propagation models (Appendix 5, Table 1). The minimum APE from the training sets for the multiple hidden layer network was 3.79% from the model which used biological and transect length data as inputs. The highest APE was 9.75% from the model that used the signal data from transect four. The test set APE's ranged from 3.35% from the model which used the biological data as inputs to 12.83% from the model which used the signal data from transect two as inputs. Minimum APE values in the production set were 5.08% from the model which used the biological only data as inputs and the maximum value of 13.11% for the signal data from transect one. The addition of signal data reduced the accuracy of the model compared to using biological data alone as inputs, as was seen in the back propagation models

The regression analysis showed that there was significant bias in the multiple layer networks with all slopes and intercepts being significantly different from one and zero respectively, Appendix 5, Table 2.2.

The probabilistic models training set APE results were 0.00% for all models except those that used biological data with transect length, biological data only, and biological and signal data from transect five, as inputs. The APE results from the test sets ranged from 3.55% (biological and signal data from transect four as inputs) to 12.63% for the model which used signal data from transect one as inputs. APE results from the production set ranged from 5.51% from the model which used the biological data as inputs to 22.64% for the model which used signal data from transect five as inputs. Models where the APEs were low in the training set showed high APEs in the production and test sets; conversely, where APEs were high in the training set they were low in the production set (Appendix 5. Table 1).

The regression analysis indicate that predicted ages from four of the probabilistic models were not significantly biased. These were models which used as inputs either biological data, transect length, and all signal data, or biological data with transect length, or biological data and biological data with signal data from transect five (Appendix 4, Table 2.3.).

Age difference tables for the probabilistic neural network trialed on school whiting (Appendix 5, Table 2.3.1 through Table 2.3.13) generally were more variable than those for the back propagation and multiple hidden layer models. However, models for which the regression analyses showed no significant bias also showed high levels of agreement for all age classes. For the model which used biological data as inputs, 66.7% of the samples were classified correctly with 98.0% being within one year of the observed age (Appendix 5, Table 2.3.3)

### *Ling*

The APEs from the ling data were higher than those of the previous species. The minimum APEs were less than 10%. However, only one model produced an APE less than 10% with regression analyses indicating no significant bias. The best performing models were multiple layer neural networks. The best performing ling neural networks are summarised in Table 24. Results from each network type are presented in detail below.

The back propagation neural networks failed to adequately predict the age of the samples. The APEs for the training set for all networks ranged between 8.43%, for the model which used biological and signal data from transect two as inputs, to

19.26% for the model which used signal data from transect one alone. The addition of the biological data reduced the APE's for all signal/biological model input combinations by approximately 50% (Appendix1, Table 1). The test set APEs were higher than the training set in all cases except for where biological data and transect length were used as inputs. In this case, the APE for the training set was slightly lower. The APEs on the production set were approximately the same as those from the test set.

Table 24. Data inputs with lowest APEs by model type for ling.
BPN=back propogation neural network; MHN=multiple hidden layer neural network; PNN=probabilistic neural network. Regression = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively (a=0.05).

| Model | Data input | APE | $R^2$ | Regression |
|---|---|---|---|---|
| BPN | Bio | 8.25 | 0.75 | * |
| MHN | Bio & transect | 8.30 | 0.84 | NS |
| PNN | Bio & transect | 8.11 | 0.83 | * |

The general failure to predict age class membership using the back propagation neural networks is also shown by the regression analysis. All models showed significant bias, Appendix 4, Table 3.1. Further, the correlation coefficients from the regression analysis were low, ranging between 0.004 for the model which used signal data from transect one as inputs to a maximum of 0.79 for two of the models. The best models used either the biological and signal data from transect one, or the biological and signal data from transect five (Appendix 4, Table 3.1).

The age difference tables show an over-estimation of the younger age classes and an under-estimation of the older age classes for all of the models which used signal data alone as inputs. The differences between observed and predicted age were significantly reduced with the addition of the biological data (Appendix 5, Table 3.1.1 through Table 3.1.13). This reflects the general failure of the back propagation models to determine age class membership.

The multiple hidden layer neural networks generally produced lower APEs and hence, higher correct age class membership than the back propagation neural networks. The range of the APEs from the training set was 7.64% for the model which used biological with signal data as inputs to 17.75% for the model which used signal data from transect two as inputs. The model that used biological data alone produced a relatively low APE of 8.63%. The test set APEs were higher than those from the training sets in all models. The range of APEs were from a minimum 9.06%, for the model which used biological data as inputs, to 20.33% for the model which used signal data from transect three as inputs. The production set APEs ranged from 8.30% for the model which used biological data and transect length as inputs to 20.47% for the model which used signal data from transect three as inputs.

The results from regression analyses for the multiple hidden layer networks were similar to those from back propagation neural networks, in that there were significant bias in the age estimates. All but two models produced regressions in which slopes and intercepts were significantly different from one and zero respectively. The exceptions were from the model which used biological data and transect length as inputs, and the model which used biological and signal data from transect two as inputs, Appendix 4, Table 3.2. Correlation coefficients from the production sets were generally low, ranging from less than 0.0001 for the model which used signal data from transect two as inputs to a maximum of 0.84 for the model which used biological data and transect length as inputs, Appendix 4, Table 3.2.

Age difference tables showed the same pattern of results as the back propagation neural networks where the deviation from the observed age was less where biological data were added to the signal data as network inputs. All of the networks over-estimated the younger age classes and under-estimated the older age classes, producing clear biases in the age difference tables (Appendix 5, Table 3.2.1 through Table 3.2.13).

The probabilistic neural networks showed the highest range in the APEs for the training sets for all of the model types. These values ranged from a minimum value of 0.00% for four of the models (using as inputs either all data, or signal data alone from transect two, or biological and signal data from transect three, or the signal data alone from transect three). The maximum APE value of 12.09% was from the model which used the signal data from transect two combined with the biological data as inputs. The APEs from the test sets were generally higher than those obtained from the training sets. The addition of biological data to the signal data as inputs to the model reduced the APEs. Where low APEs were produced from the training sets, there was also poor age estimation for the production sets. The production set APEs ranged from 8.11% for the model which used biological and transect lengths as inputs to a maximum of 31.54% for the model which used signal data alone from transect one as inputs. APE's were generally higher in the production sets than the test sets (Appendix 3, Table 1).

The regression analysis showed that no bias in the age estimates for two of the models. These were the models that used biological and signal data from transect one as inputs and the model that used biological and signal data from transect four as inputs (Appendix 4, Table 3.3). The APEs for both of these models were above 10%.

The age difference tables showed networks that included biological data as inputs produced less bias than those network models that used signal data alone as inputs. These networks showed less age bias than those from both the back propagation and hidden layer neural networks (Appendix 5, Table 3.3.1 through Table 3.3.13).

***Snapper***

The regression analysis showed that at least one network from each of the three model types produced age estimates that were not significantly biased. The lowest APE for the best performing networks was less than 10% for each model type. The probabilistic neural network produced the lowest APEs with the highest correlation between observed and predicted age. These results are summarised in Table 25. Results from each network type are presented below in detail.

The back propagation neural network produced APEs for the training set as low as 3.91%, for the model which used biological and signal data from transect five as inputs, and up to 22.09% for the model which used signal data from transect one alone. The addition of the biological data as model inputs reduced the APEs compared to the models trialed with signal data alone. The test set APEs were higher in all cases than those obtained from the training set. The APEs from the test sets ranged from 5.69% for the model which used biological data with transect lengths as inputs, up to 26.23% for the model which used signal data from transect one as inputs. The production set APEs were similar to the APE values obtained from the test, with the magnitude of differences between the production and test sets not as great as those between the training and test set (Appendix 5, Table1.).

Table 25. Data inputs with lowest APEs by model type for snapper.
BPN=back propogation neural network; MHN=multiple hidden layer neural network; PNN=probabilistic neural network. Regression = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively (a=0.05).

| Model | Data input | APE | $R^2$ | Regression |
|---|---|---|---|---|
| BPN | T5 with Bio | 6.83 | 0.84 | NS |
| MHN | Bio & transect | 6.80 | 0.88 | NS |
| PNN | Bio & transect | 5.60 | 0.89 | NS |

The regression analyses for the back propagation neural networks showed that age estimates were not significantly biased for six of the thirteen models (Append 4, Table 4.1). This included all of the models that included biological data as inputs. The inputs used were either all biological, transect length and signal; biological data with transect length, or biological data only or biological data with signal data from transect one or biological data with signal data from transect four, or biological data with signal data from transect five. The range of APEs for these models were generally between five and ten percent. Only one model which used biological data as inputs (biological, transect length and all of the signal data as inputs) produced an APE above 10% (13.51%).

The age difference tables show good agreement for the first seven ages for the back propagation models. For higher ages the models tend to under-estimate the age (Appendix 5, Table 4.1.1 through Table 4.1.13.). The range of differences between the observed and the predicted age class were greater in all models that did not contain biological data as inputs.

The multiple hidden layer neural networks generally produced lower APEs for the training sets than did the back propagation neural networks. The APEs for the training sets ranged from 3.49% for the model that used all biological, transect length and signal data as inputs, to 21.44% for the model that used signal data from transect two as the inputs. The APEs for the test sets were comparable to the APEs for the back propagation test sets, ranging from 5.35% for the model which used biological and transect length data as inputs, to 26.74% for the model which used signal data transect two alone as the model inputs. The addition of the biological data improved the precision as shown by the APEs, regressions and age difference tables. The same trend of under-estimating the older age classes were shown by the multiple hidden layer neural networks.

The regression analyses for the multiple hidden layer neural networks showed that the estimated ages were not significantly biased for four of the thirteen models (Appendix 4, Table 4.2). All these included biological data as inputs to the models. Only one of the models produced non-significant results with signal data from a single transect. The data inputs which produced results which were not significantly different from the observed ages were either all biological, transect length and signal data or biological data with transect length or biological data only, or biological data with signal data from transect two. The range of APE's for these models were again generally between five and ten percent. The exception was an APE of 12.23% when biological, transect length and signal data were used as inputs (Appendix 4, Table 4.2.). The model using biological and transect lengths as data inputs had the maximum agreement of 49.75% of the samples being assigned the correct age, and 76.65% being within one year of the observed age class.

The age difference tables for multiple hidden layer neural networks were similar to the back propagation neural networks (Appendix 5, Table 4.2.1 through Table 4.2.13.). The addition of the biological data to the signal data significantly improved the predictive ability of the model. Where biological data or transect length was not included as model inputs, a lack of precision over all age classes was evident. Relatively good agreement between the observed and predicted ages was achieved for the first seven ages, where no large differences were apparent between the observed and predicted ages.

The APEs for the probabilistic neural networks ranged from 0.02% to 24.39% for the models which used biological and signal data from transect two and the signal data from transect two as inputs respectively. Using signal data alone as inputs to the model generally failed to adequately predict age class membership. The APEs for the test sets ranged from 2.54% through to 29.20% for the models which used either biological with signal data from transect three as inputs or signal data from transect three alone. The production set APEs ranged from 5.60% for the model which used biological data with transect lengths as inputs, to 37.21% for the model which used signal data from transect two alone.

The regression analyses for the probabilistic neural networks showed age estimates that were not significantly biased for eight of the thirteen models (Append 2, Table 4.3). These were all models that used biological data as inputs. None were models that used signal data only as inputs. The model producing the highest level of agreement between the observed and the predicted age used biological and transect length data as inputs: 54.82% of the samples were correctly assigned and 80.71% were within one year of the observed age.

The age difference tables demonstrate a similar pattern to those from back propagation family of models where the first seven age classes showed relatively good agreement. The greatest variations between the observed age and the predicted age were from models where biological data were not used as inputs.

### *Black bream*

The lowest APEs were below 10%. The back propagation models did not correctly assign age classes as well as the multiple layer neural networks or the probabilistic neural networks. The regression analyses showed significant bias in the age estimates for all of the back propagation models, for all but one of the multiple layer models, and all but three of the probabilistic neural network models.. The best agreement between the observed and predicted ages was from the multiple layer neural network. These results are summarised in Table 26. The results are presented in detail for each model type below.

Table 26. Data inputs with lowest APEs by model type for black bream.
BPN=back propogation neural network; MHN=multiple hidden layer neural network; PNN=probabilistic neural network. Regression = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively (a=0.05).

| Model | Data input | APE | $R^2$ | Regression |
|---|---|---|---|---|
| BPN | T5 with Bio | 6.23 | 0.92 | * |
| MHN | Bio & transect | 6.81 | 0.90 | NS |
| PNN | Bio & transect | 6.99 | 0.88 | * |

The back propagation neural networks trialed on black bream produced APEs from the training sets ranging between 4.04% for the model which used biological data and the signal data from transect four as inputs, and up to 14.96% for the model which used signal data from transect four. In all cases, the APEs were higher when no biological data were added to the model inputs. The APEs were generally higher than the training sets. The production set APEs were higher than the training set ranging from 6.23% for the model which used biological and signal data from transect five, to 19.21% for the model which used signal data from transect one as inputs (Appendix 5, Table 1).

The regression analyses indicated that the back propagation neural networks produced biased age estimates for all models (Appendix 4, Table 5.1.). The correlation coefficients from the regression analysis ranged from 0.03 for the signal data from transect one model to 0.91 for the model that used biological and signal data from transect two (Appendix 4, Table 5.1.).

The poor ability of the models to predict the ages of black bream is also apparent in the age difference tables. There is a wide range of differences between observed and predicted ages in all age-classes: younger age classes were over-estimated and older age classes were under-estimated (Appendix 5. Table 5.1.1 through 5.1.13.).

The multiple hidden layer neural networks produced APEs for the test sets ranging from 0.65% for the model which used biological, signal and transect length data as inputs, to 13.34% for the model which used signal data from transect four as inputs. The APE's on the test set were higher in most cases than those from the training sets. The addition of the biological data to the signal data as model inputs reduced the APEs in all cases. The APEs for the test ranged from 5.96% for the model which used biological with transect lengths as inputs, through to 17.90% for the model which used signal data from transect one as inputs. The APEs in the production set approximated those from the test set. The addition of transect lengths s a model input increased the precision. Signal data as inputs to the models reduced the precision over biological and transect length (Appendix 3, Table 1).

The regression analyses for the multiple layer neural networks showed unbiased age estimates were produced for only one of the thirteen models (Append 4, Table 5.2.). This model used biological transect length data as inputs. It produced agreement between observed and predicted age for 61.54% of the samples, and 83.52% of the samples were within one year of the observed age.

The age difference tables for the multiple hidden layer neural networks were similar to those from the back propagation neural networks. The networks generally over-estimated the age of the younger age classes and under-estimated the age classes of the older samples (Appendix 5, Table 5.2.1. through Table 5.2.13.).

The probabilistic neural network models were more successful than the back propagation neural network models. The APEs were low for the training sets ranging from 0.00%, for eight of the models; to 6.39% for the model that used biological data as the inputs. The test sets produced higher APEs, ranging from 5.45% for the biological with the signal data from transect five model, to 17.65% for the model which used signal data from transect five as inputs. The production set produced higher APEs in all models. The minimum APE was 6.99% for the model that used biological and transect length data as model inputs. The maximum APE was 22.98% for the signal data from transect three models. The addition of the biological data reduced the APEs in all cases. Models with low APE in the training sets produced higher APEs in the production set than the models with higher APEs in the training sets.

The regression analyses for the probabilistic neural network showed unbiased age estimates for three models. These models used as their input data either biological, transect length and all signal data, or biological with signal data from transect three, or biological with signal data from transect four (Appendix 4, Table 5.3.).

The age difference tables were generally displayed more variability and a lower negative bias between observed and predicted age than the back propagation models. The greatest variability between the observed and predicted age was observed at the ninth observed age class (Appendix 5, Table 5.3.1 through Table 5.3.13.). The differences between observed age and predicted age were much greater without the addition of the biological data.

***Sand flathead***

The back propagation models failed to predict the observed age classes of the sand flathead samples, with the regression analyses indicating significant biases. The lowest APEs from these models were approximately 10%. The multiple layer neural network results were similar to those from the back propagation neural network with respect to precision, however, two of the models produced unbiased age estimates. The APEs from these models were higher than 10%. The probabilistic neural network models produced two models with non-significant regression statistics. The APEs for the probabilistic neural network models were similar to those from the back propagation neural networks and the multiple layer neural networks. The best performing networks are summarised in Table 27. The results from each network type are presented below.

Table 27. Data inputs with lowest APEs by model type for sand flathead.
BPN=back propogation neural network; MHN=multiple hidden layer neural network; PNN=probabilistic neural network. Regression = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively (a=0.05).

| Model | Data input | APE | $R^2$ | Regression |
|---|---|---|---|---|
| BPN | T3 with Bio | 9.45 | 0.77 | * |
| MHN | T3 with Bio | 9.34 | 0.75 | * |
| PNN | T5 with Bio | 11.11 | 0.74 | * |

The APEs for the back propagation neural networks trialed on sand flathead were relatively high for the training sets. These ranged from 6.67% for the model which used biological and signal data from transect four as inputs, up to 20.98% for the model which used biological data as inputs. This contrasts with the results for the other species trialed where biological data models generally had comparatively low APEs. The test set APEs ranged from 9.59% for the model that used biological, transect length and signal data as inputs, up to 20.79% for the model that used signal data from transect five as the inputs. The lowest APE for the production set was 9.45% (Appendix 3, Table 1.). The addition of the biological data as inputs reduced the APEs for the sand flathead back propagation neural networks, however, the relative reduction in precision was not as great as found in other species trialed.

The regression analyses of the back propagation neural networks from the sand flathead samples showed significant bias in the age estimates for all models (Appendix 4, Table 6.1.). The inability of the back propagation neural network to adequately assign age class membership is reflected in the number of correct assignments, ranging from 24.48% (56.25% within one year) for the model which used signal data from transect two as inputs, to a maximum of 44.79% (75.52% within one year) for the model using biological with signal data from transect three.

The age difference tables (Append 5, Table 6.1.3 through Table 6.1.13) reflect the inability of the models to predict age class membership. Differences between observed age and predicted age are as large as minus nine to plus ten years from the observed age (Appendix 5, Table 6.1.7.).

The multiple hidden layer neural networks produced APEs in a similar range to those of the back propagation neural networks. These ranged from 6.31% for the model that used biological and signal data from transect three as inputs, to 15.92% for the model that used signal data from transect five as inputs. The test set APEs were higher in all cases, ranging between 9.32% for the model which used biological and signal data from transect three as inputs, to 19.02% for the signal data from transect three only as model inputs. The production APEs approximated those from the back propagation neural networks and multiple layer neural networks and showed the same trends in the relationships between training, test and production set APEs. The range of APEs from the production set was from 9.34% for the model which used biological and signal data from transect three as inputs, to 18.49% for the signal data from transect three model (Appendix 3, Table 1). The addition of the biological data to the models reduced the APEs, but not to the same extent as other species in the trials.

Two of the multiple hidden layer neural network models produced unbiased age estimates. Both of these models contained signal data as model inputs. These models used as data inputs either the biological and signal data from transect four, or the biological with signal data from transect five (Appendix 4, Table 6.2.). The percentage of correct age class assignment was relatively low for these two models: 40.63% correct (70.83% within one year), for the model using biological with signal data from transect four as inputs, and 36.46% correct (65.63% within one year) for the model which used biological and signal data from transect five as inputs.

The age difference tables were similar to those from the back propagation neural networks where large differences between the observed and predicted age classes were apparent (Appendix 5, Table 6.2.1 through Table 6.2.13). Differences were of the same magnitude as the differences seen in the back propagation neural networks. Interestingly, the addition of the biological data as model inputs did not increase model success, unlike the other species trialed.

The probabilistic network APEs from the training sets ranged from 0.00% for two of the models (these models used signal data from transect three and biological and signal data from transect four as inputs), to 11.31% for the model which used biological, transect length and signal data as inputs. The APEs for the test set ranged from 7.05% for the model which used biological and signal data from transect two as inputs, to 23.76% for the model which used signal data from transect two as inputs. The production dataset APEs were all above ten percent with a minimum value of 11.11% for the model which used biological and signal data from transect five as inputs, and a maximum of 27.42% for the model which used signal data from transect two as inputs (Appendix 3, Table 1.). As with other species, where low APEs were found in the training set, high APEs were produced in the test and production sets.

The regression analyses for the probabilistic neural network showed that two models produced unbiased age estimates. These models used biological, transect length and all signal data and biological with signal data from transect four as inputs (Appendix 4, Table 6.3.). The APEs for these non-significant models were 11.75% and 11.65% respectively. The percentage agreement between the observed age and the predicted age was 41.15% (73.44% within one year) and 34.38% (69.79% within one year) for the two models.

The age difference tables for the sand flathead probabilistic networks reflect the lack of the models' ability to predict the age class membership for the production set. These results were similar to those found for the back propagation neural networks. The range of differences between observed and predicted age classes was not as great in models which included biological data as model inputs, however, the large differences of minus nine and plus ten were can be seen in a number of these age difference tables (Appendix 5, Table 6.2.1 through Table 6.2.13).

### *Blue grenadier*

The lowest APEs for each of the best performing network types were below 10%. The best performing network type for blue grenadier was the multiple hidden layer model using signal data from transect three and biological data as inputs. The regression analysis for this model showed that age esimates were unbiased. Neither the back propagation nor multiple hidden layer neural networks produced unbiased estimates. The best performing networks for this species are shown below in Table 28. The results from each network type are presented in detail below.

Table 28. Data inputs with lowest APEs by model type for blue grenadier.
BPN=back propogation neural network; MHN=multiple hidden layer neural network; PNN=probabilistic neural network. Regression = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively (a=0.05).

| Model | Data input | APE | $R^2$ | Regression |
|---|---|---|---|---|
| BPN | Bio | 5.89 | 0.86 | * |
| MHN | T1 with Bio | 5.77 | 0.90 | * |
| PNN | All data | 7.87 | 0.83 | * |

The back propagation neural networks produced APEs in the training sets ranging from 5.66% for the model which used biological with signal data from transect three as inputs, to a 18.22% for the model which used signal data from transect two as inputs. All APE values from the test set were higher than those from the training set by approximately 2%. The production sets produced APEs ranging from 5.89% for the model which used biological data as the input, to 16.75% for the model which used the signal data from transect two as inputs (Appendix 3, Table 1.). The lowest APEs for the production sets were from models which included biological data as model inputs. The addition of biological inputs improved the APEs by approximately 60%.

The regression analysis of the back propagation networks from the blue grenadier samples showed all models produced biased age estimates (Appendix 4, Table 7.1.). The percentage of correct age class assignments for the models which produced the lowest APEs was under 45. All of the back propagation models which produced APEs in the range of 5-10% included biological data as inputs. The best performing network classified 86.72% of the samples within one year of the observed age class, (this model used biological data only as model inputs).

The age difference tables for the back propagation models showed the over estimation of age for the younger age classes and the under estimation of the older age classes (Appendix 5, Table 7.1.1 though Table 7.1.13.). The same pattern of differences between observed and predicted age class assignments was evident in pilot study for this species.

The multiple hidden layer neural networks produced similar APEs to the back propagation models from the training sets. These ranged from 4.69% for the model that used biological and signal data from transect three as model inputs, to 14.63% for the model that used signal data from transect three. Generally, the distributions of APEs from the multiple hidden layer neural network were similar to those obtained from the back propagation neural network training sets, albeit slightly lower. The test set APEs were higher in all cases than the training set. The APEs from the production set ranged from 5.78% for the model that used biological and signal data as inputs, to 13.87% for the model which used signal data from transect one. The APEs were reduced in all cases where biological data was added to the signal data as model inputs.

The regression analyses on the multiple hidden layer neural network showed one model which produced unbiased age estimates. This was the model which used biological with signal data from transect three as inputs (Appendix 4, Table 7.2.). The percentage assignment of correct age classes was 42.48% with 83.01% being within one year of the observed age.

The age difference tables were similar to the back propagation neural networks where younger ages were over estimated and older age classes were under estimated for all models. The differences of the observed and predicted ages were greatest in models which did not include biological data as model inputs (Appendix 5, Table 7.2.1 through Table 7.2.13.).

The probabilistic neural networks APEs from the training set ranged from 0.00% for three of the models, to 5.19% for the model that used biological data as inputs. The test set APEs ranged from 6.08% for the model which used biological with transect length as model inputs, to 22.29% for the model which used signal data from transect three. The production set APEs were similar to those from the test set, ranging between 7.87% to 25.12% (Appendix 3, Table 1).

The regression analyses showed only one model with unbiased age estimates; this used biological, transect length and all signal data as inputs (Appendix 4, Table 7.3.). The percentage of samples correctly assigned to the observed age class was 35.45%, while 81.27% were classified within one year of the observed age class. The model failed to classify seven of the samples that were presented in the production set.

Age difference tables were less biased for the probabilistic network than the back propagation neural networks (Appendix 5, Table 7.3.1 through 7.3.13.). The addition of the biological data reduced the differences between observed and predicted ages. The range of differences was minus eight to plus six years from the observed age for the non-significant model (Appendix 5, Table 7.3.1.). Large differences between observed and predicted ages were apparent for models that did not include biological data as inputs. These differences were as great as minus thirteen and plus fifteen years (Appendix 4, Table 7.3.6.).

***Ocean perch***

The probabilistic neural networks were the best performing model for the ocean perch production sets. The APE from this model was above 10%. Only one of the multiple layer neural network models produced age estimates that were unbiased. One of the back propagation models also produced results that were not significantly different from the observed age classes. All of the probabilistic neural network models produced estimates that were significantly biased. The best-performing models from each network type are summarised in Table 29. The results from each network type are presented in detail below.

Table 29. Data inputs with lowest APEs by model type for ocean perch.
BPN=back propogation neural network; MHN=multiple hidden layer neural network; PNN=probabilistic neural network. Regression = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively (a=0.05).

| Model | Data input | APE | $R^2$ | Regression |
|---|---|---|---|---|
| BPN | T5 with Bio | 8.41 | 0.73 | * |
| MHN | Bio with TL | 7.84 | 0.78 | * |
| PNN | Bio with TL | 6.40 | 0.82 | * |

For the training set, the back propagation models for ocean perch produced APEs ranging from 6.80% for the model using biological and transect length data as model inputs, to 20.61% for the model which used signal data from transect three. The APEs from the test approximated those seen in the training set for each of the models trialed. The minimum and maximum APE values from the test set were 7.08% for the model which used biological data as model inputs, to 22.40% for the model which used signal data for model inputs. The production set APEs were generally higher than those from the test set, but the same pattern of lower APEs where biological data was included was apparent.

Two of the models from the back propagation neural networks produced age esimates that were not significantly biased. These were the models and their inputs were i) biological, transect length and all signal data and ii) biological and signal data from transect five (Appendix 4, Table 8.1.). All other models produced results which were significantly different from the observed age. The failure to predict age class membership for the non-significant models is shown by the relatively high APEs and the low percentage agreement between observed and predicted ages.

The age difference tables show over estimation of the younger age classes and under estimation of the older age classes (Appendix 5, Table 8.1.1 through 8.1.13). The modal percentage agreement is driven by the combined older age-classes (class twenty-one) where the models adequately predict membership. The range of differences is greatest where biological data is not used as the model inputs, eg. where signal data from transect one was used as model inputs (-18 to 11) compared to the model which used biological data with signal data from transect one as 9 to 7.

The APEs from the multiple hidden layer models for the training set were generally lower than those from the back propagation models. The APEs for models which included biological data were below 10% and greater than 10% for models which used signal data only as inputs. The range of APEs from the training set were 6.79% for the model which used biological, transect length and all signal data as inputs, to 18.89% for the model which used signal data only for transect two (Appendix 5, Table 1). The APEs for the test sets were higher than those obtained in the training sets. The APEs for the production set were generally higher than those obtained for the test set, only two of the APEs were below ten percent, these were the models which biological data (8.68%) and biological with transect length (7.84%) as inputs.

The regression analyses show that only one of the models produced age estimates that were not significantly biased. This model used biological data and signal information form transect four as inputs. The APE for this model was 11.12%. The high APE is a function of the low correct age class assignments, with 28.07% being classified correctly. Less than 47% (46.49%) were classified within one year of the observed age (Appendix 4, Table 8.2).

The age difference tables show over estimation of the younger age classes and under estimation of the older age classes in all models. For the model which produced a non-significant result (biological data and signal information from transect four), the correct age class assignments was driven primarily by the combined age class (21) which accounted for twenty-two of the thirty-one correct assignments (Appendix 5, Table 8.2.11).

The probabilistic neural network produced low APEs in the training set with eight of the thirteen models being 0.00%. The maximum APE value for the training set was 3.79%. The test set APEs were higher than those from the training set, ranging between 4.82% for the model which used transect length and biological data as inputs, to 20.33% for the signal data from transect three model. The APEs for the production set were higher in all cases than those from the test set. The lowest APE from the production set was 6.40% for the model that used biological data and transect length as inputs (Appendix 3, Table1).

The regression analysis showed that predicted ages were biased for all probabilistic network models. Percentage agreement between observed age class and predicted age class was low, with a minimum of 7.27%, and a maximum of 32.46% agreement (Appendix 4, Table 8.3).

The age difference tables show more variability within age classes than the back propagation and multiple hidden layer models. The range of differences between the observed and predicted ages was however, comparable to those seen from the back propagation models (Appendix 5, Table 8.3.1 through Table 8.3.13).

## Age estimation using only biological data

Results from the biological data only models are described by species below. Pilchards were trialed using the three model types. Based on the results from the signal with biological models, subsequent species were trialed using the probabilistic neural network.

### *Pilchards*

The three network models were initially trialed on the combined biological dataset using fish length, fish weight, sex, otolith weight, area of capture and date of capture as inputs. The APEs for the back propagation neural network were all between seven and eight percent for the training, test and production sets. The APEs for the multiple layer neural network were lower than those produced by the back propagation neural network, ranging from 5.74% for the test set to 6.41% for the production set. The probabilistic neural network APEs were between the ranges of those for the back propagation neural network and the multiple layer neural network for the training and test sets, however, the probabilistic neural network produced the highest APE for the production set for all of the networks trialed (7.64%), Appendix 3, Table 2.

The regression analyseis for the three network types indicated significant biases for each. The model which produced the highest percentage of correctly assigned age estimates was the multiple layer neural network (69.32%), while the back propagation and the probabilistic neural networks were lower (66.71% and 67.58%, respectively). The back propagation and multiple layer neural network produced the same number of samples within one year of the observed age (98.99%), while the probabilistic neural network was slightly lower (97.54%), Appendix 4, Table 9.1.

The deviations from the observed age using the multiple layer model were lower than those from the back propagation model. The maximum range of the data was minus two and plus three years (Appendix 5, Table 9.1.2.). The probabilistic neural network age difference table showed the largest range of differences between observed and predicted age class. The range of differences was between minus four and plus three (Appendix 5, Table 9.1.3.).

The age difference tables for the combined area pilchard production set produced relatively high agreements between observed and predicted ages for each of the three network types. The back propagation neural network produced the largest deviations from the observed age. These were most evident at age class two. The range of differences from the back propagation neural network was minus four to plus three years (Appendix 5, Table 9.1.1.). The multiple layer neural network produced the highest agreement between observed and predicted age.

The age difference tables for the multiple layer neural networks for separate areas of capture all show a negative bias between observed and predicted ages. The deviation from the observed age class was greatest in the probabilistic neural network model for combined area of capture dataset with a range of plus three and minus seven. For combined areas, the best model was the multiple layer neural networks which showed the closest agreement between observed and predicted ages. This model was used subsequently on area of capture datasets.

The by-area models for pilchards had lower APEs from the training set than those from combined area model. The test set showed lower APEs than the combined model for all areas of collection except for the Queensland model. Only the Coffin Bay model produced a higher APE than those for the combined area model in the production set. The lowest APE for the combined sample for the production set was from the Lakes Entrance sample. All other production set APEs were between five and six percent (Appendix3, Table 3.).

The regression analysis demonstrated over-estimation of the younger ages and under-estimation of the older ages for the pilchards. Although biases were apparent, the by-area models closely predicted the age of the samples. The minimum number of correctly assigned age classes was 66.02% (Queensland model), the highest correct age class assignment was from the Lakes Entrance model (79.49%). Close agreement within one year of the observed age class was seen in all models. Where areas were combined, agreement within one year of the observed age class ranged between 97.54% (probabilistic neural network), to 97.99% for both the back propagation and multiple layer neural network. Agreement within one year for the separate area models ranged from 97.06% for the Coffin Bay sample to 100.00% for Lakes Entrance, Port Phillip Bay and Port Lincoln (Appendix 4, Table 9.1.). The multiple layer neural networks produced relatively close agreement between observed and predicted age with three of the five models producing estimates within one year of the observed age class for all samples. The maximum range for the multiple layer neural network by-area model was the Queensland sample with a range of plus and minus two (Appendix 5, Table 9.2.5).

### *School whiting*

The probabilistic neural network APEs for the biological data from the school whiting produced APEs for the training, test and production set below 10% (Appendix 3, Table 3.). The regression analysis from the production set show a high correlation between the biological and predicted age, the intercept was not significantly different from zero, however, the slope was significant indicating bias (Appendix 4, Table 9.2.).

Sixty percent of the predicted ages were correctly assigned to the observed age class, and 96.68% were within one year of the observed age class. The age difference table (Appendix 5, Table 9.3.1) for school whiting shows strong modes on the correct age classes for each of the predicted age classes, however, the age difference table shows over-estimation of the younger age classes and under-estimation of the older age classes.

***Snapper***

The results from the snapper probabilistic neural network showed APEs for the training, test and production APEs of 3.28%, 4.44% and 6.01% respectively (Appendix 3, Table 3). The model correctly assigned 54.95% of the samples to the correct age class and 82.11% of the samples within one year (Appendix 4, Table 9.2.). The regression analysis between observed and predicted ages was significant, indicating an over-estimation of the younger age classes and an under-estimation of the older age classes (Appendix 5, Table 9.3.2.). The maximum difference between the observed age and predicted age was seven years.

***Ling***

The ling samples produced APEs below ten percent for the training, test and production sets (9.57%, 8.47% and 9.88% respectively) (Append 1, Table 3). The regression analysis showed significant bias in the age estimates. The percentage of samples assigned the correct age class for ling was 50.56% while 92.13 percent of the sample was within one year of the observed age class, Appendix 4, Table 9.2. The age difference tables (Appendix 5, Table 9.3.3) showed strong modes on the observed age class and a maximum deviation between the observed and predicted age class of minus three and plus three.

***Blue grenadier***

The APEs for the combined sample was between four and six percent for the training, test and production sets. The non-spawning blue grenadier sample APEs were slightly higher than those from the combined sample for the training, test and production sets, these were 6.46%, 7.17% and 7.01% respectively. The spawning sample produced the highest APEs for the blue grenadier, these were, training set (8.95%), test set (9.00%) and production set (10.38%), Appendix 3, Table 3.).

Regression analysis showed significant bias in the age estimates for both the blue grenadier combined sample and the blue grenadier non-spawning sample. Correlation between the observed age class and the predicted age class was high, for the combined and non - spawning sample (0.89). The spawning sample correlation coefficient was lower (0.61). The spawning blue grenadier sample however, produced unbiased age estimates. The percentage correct age class assignment for the three models was 49.20% (combined sample), 57.96% (non-spawning sample) and 20.22% for the spawning sample. The number of samples assigned an age class within one year of the observed age was 80.40% (combined sample), 88.58% (non-spawning sample) and 46.26% for the spawning sample (Appendix 4, Table 9.2.).

The age differences tables for blue grenadier combined sample (Appendix 5, Table 9.3.4.) show close agreement between the observed age class and the predicted age class for the first four age classes. The differences between observed and predicted for these age classes was less than plus or minus two years. The greatest variability was apparent at year class ten and year class thirteen where differences of up to ten years were seen. Between age classes seven and twenty-one, a general downward trend with age is apparent, however, the majority of the differences are less than the observed age. The age difference table for the non-spawning blue grenadier production set (Appendix 5, Table 9.3.5) show similar trends as the age difference table for the combined sample. The agreements between observed and predicted age are generally close for the first four age classes. From age class seven through to twenty differences of up to seven years were present. The maximum difference between observed and predicted age was plus five and minus seven years. The age difference table from the spawning blue grenadier sample (Appendix 5, Table 9.3.6.) was more variable than the combined sample and the non-spawning sample. Again the first four age classes were fairly accurately assigned, while large differences (up to ten years) are evident in the mid age range. The greatest differences were observed at age class ten.

## Age estimation using the image segments

Image segments were saved from samples to be used for inputs to neural network models. However, significant difficulties were encountered in reducing the large amount of data in these image segments to a size that could be used as an input to a neural network, with the computing resources available. Although substantial reductions in the size of the datasets were achieved using the image compression routines, they remained too large for processing by neural networks within a practical time. In addition, the process of linking the different applications needed to select image segments, run the compression routines and output the required datasets also proved too difficult to achieve within the available timeframe. Therefore, in the following results, the only data from otolith images that was used as an input to the networks was the signal data from the transects across the images.

## Development of a protocol for the application of neural networks.

The successful implementation of artificial neural networks for estimating the age of fish will depend on two factors:

- the initial effectiveness of the neural network model, and
- its subsequent ability to accurately estimate ages for newly collected samples.

These factors correspond to two distinct phases in the application of neural networks to 'production' age estimation: network development and network implementation. The pilot project and current project have identified important elements of a protocol for the development of neural networks. The important elements for implementation can also be identified although they are yet to be tested in practice.

The following preliminary protocol describes the important elements of these two phases.

### *Network Development Phase*

1. *Identify a suitable training set of aged material.*
   Samples need to be representative of the age range, sexes, locations, and growth histories of the population.
   Ages should be estimated with a high level of accuracy and precision. Known-age samples would be ideal.
2. *Establish a database including all variables of potential use for the training set.*
   Useful data is likely to include
   data describing features of the whole fish – its length, weight, sex,
   data from the otolith – otolith weight, image, transect data, and

data from the sample - area of collection, date of collection.
Data may be used raw or transformed.

3. *Divide database into subsets of training, testing and production sets.*
   Subsets should be randomly selected but each should be closely representative of the total dataset (the pattern set).

4. *Select a range of neural network models to be tested.*
   At this stage, no type seems to be universally applicable for fish ageing. Trials with a range of types are more likely to produce a successful outcome.

5. *Run trials with various combinations of input data and network models.*
   Some network types may work better with some types of data inputs.
   Within each type of network model there is also a range of options for model structures and activation functions that can be explored.

6. *Select the preferred combinations of data inputs and network types by evaluation of their combined performance against performance criteria.*
   Performance criteria should be established in advance according to the needs of the proposed application of the data.

7. *Train network on full training set.*
   This includes the training, testing and final validation phases of network training as discussed in the methods.

8. *Examine network outputs to identify appropriate screening criteria.*
   The development and application of screening criteria can improve the reliability of the results, but at the expense of a reduction in the number of accepted age estimates. Samples for which estimates were rejected can be aged manually. Screening was not undertaken as part of the current study, although screening was used in the pilot study.

***Network Implementation Phase***

9. *Apply neural network to new samples.*
   The dataset for the new samples must include the same variables as used for the preferred neural network.

10. *Apply selected screening criteria to identify accepted age estimates.*
    Rejected samples may be excluded or aged manually.

11. *Monitor neural network performance*
    A comparison of ages estimated by experienced readers for a sub-sample of fish would be desirable, at least until some confidence is gained in the ongoing performance of neural networks.
    Monitoring the proportion of samples not meeting screening criteria would also provide an indicator of network performance.

12. *Re-train neural network when necessary.*
    If network performance is low, then retraining should be undertaken with an enhanced training set that includes rejected and manually aged samples.

# Discussion

## Objective 1. The performance of neural network models with different forms of data inputs.

The data inputs for the artificial neural network models comprised four main groups: the biological and date of capture data, signal data within the transect as summarised by the DFT, information on the lengths of the transects, and the combinations of these data (eg., biological with signal harmonics, biological with transect length and all available data combined).

Of the data types used, the biological data consistently produced the best predicted ages, regardless of species or network type. The use of data from transects across otolith images alone was consistently less effective than the use of biological data alone, or biological data used in conjunction with transect data. The use of transect data alone did not produce acceptable age estimates for any network type with any species.

This result was unexpected, as we believed that the information most likely to be useful for prediction of the age of an individual was in the otolith image. The pilot study showed that acceptable age estimates could be achieved by the use of the raw transect data alone for two of the three species studied. Possible reasons for relatively lower level of success are considered below.

With the greater sample size used it is likely that the variability in the input data was greater within an age class than among age classes. This would reduce the ability of the model to adequately assign an age class using signal information alone.

Important but subtle cues within the data series may have been lost in the data transformations. However, inspection of transects reconstructed from the transformed data series showed only minor discrepancies from the originals, and hence the Fourier series are believed to have adequately represented the signal within the otolith. Also, more accurate predictions were made for the snapper and black bream samples of the pilot study after the application of the DFT to the original transect data. The DFT is a well accepted transformation and we consider it unlikely to be a significant source of error in the application of the neural network models.

The neural networks chosen for this study may be inferior to other types of network models. The three used in this study included two that were similar to those used in the pilot study with the addition of the probabilistic model, which is a proven classification model (Masters 1993, Masters 1994). However, other neural network models, which were not used in this project, may be more successful in the prediction of fish age.

Alternatively, although it has been considered that ‘any problem which can be solved with traditional modelling or statistical methods can most likely be solved more effectively using neural networks’ (Masters 1993), the problem of estimating the age of fish using the types of data we presented to the networks may be beyond the capabilities of any currently available neural network.

Date of capture was used as one of the data inputs primarily to allow the networks to adjust for variation in the time of increment formation among individuals of the same age class. For example, it would have provided a variable that could have distinguished fish with the same number of increments, but different assigned ages, where these had dates of capture before and after the assigned birthday. This would mainly have been an issue where data from a transect of the otolith was given a high weighting by the network. This type of data input was not used for the most successful network types, and date of capture may not have contributed greatly to the overall performance of many networks. However, it may also have been important in the age estimation of younger individuals using other types of data inputs, for example helping classify together fish that have just moved into an age class with those about to leave it. Such fish are likely to show very different sizes and otolith dimensions, particularly for the younger age classes.

The results of the present study confirm to some extent the findings of Boehlert (1985), that information on the size of fish and of otoliths can be used to predict the age of fish with some degree of accuracy. Direct comparison of the two studies is difficult because of the different analytical methods used, but inspection of the plots of the deviation in predicted from observed mean age-at-length from Boehlert (1985) shows average deviations in excess of 1 year for 68% of ages for *Sebastes diploproa* and 46% of ages for *S. pinniger*. A much larger proportion of individual age estimates would show deviations of at least 1 year. This suggests much poorer level of agreement than obtained with neural networks, where fewer than 30% of individual age estimates would differ by more than one year from observed ages for the best performed networks.

It was planned to condense two-dimensional sections of otolith images to allow larger parts of the images to be used as data inputs for the networks. However, the range of image compression algorithms used failed to reduce the size of the required dataset sufficiently to allow their use. This and other programming difficulties encountered meant that this type of data input could not be tested with the chosen models. The image of an otolith section is the main information used by people in estimating age, and we believe that a compressed form of such images may yet prove to be the most effective type of data input to neural networks. However, the time and computer resources available to the current study proved insufficient for testing this.

## Objective 2. The performance of different artificial neural network models.

There was no network model that consistently produced more precise age estimates than the other types. The best performing network varied among species. This was not unexpected, but there was no obvious pattern that related the success of a network type to the complexity of the otolith increments, maximum age, or other features of a species. Even for species with similar maximum ages and otolith clarity, such as black bream and snapper, the preferred network types were different.

The multi-layer back propagation model produced age estimates that met the criteria for acceptable levels of either precision or bias for all species, but not for both criteria for any species. The probabilistic network was the only one to meet both precision and bias criteria but only for one species (King George whiting).

Initial inspection of the results from the present study suggests comparatively little improvement in the ability of the neural network models to predict ages for two of the three species used in the pilot study. However, the current project used a more rigorous procedure to test model performance than the pilot study. The testing procedure of the pilot study used input data drawn from the same samples as were used in training of networks; the current study used input data from a completely separate set of individuals. Neural networks will only classify correctly if the data used to train them adequately represents the variability in the unknown samples they are required to classify. For the pilot study, this was made more likely by drawing the input data for the testing phase from the same set of individuals used to train the network. For the current study, some level of individual variation among the test set was likely to have been missing from the training set. This approach is a more stringent, but also a more realistic, test of model performance.

## Objective 3. A protocol for the application of the artificial neural networks.

The steps to the application of an neural network that have been identified as the Network Development Phase of the protocol, essentially document the process that was followed during this study, except for the use of screening criteria. A more prescriptive approach is not warranted given the variety of combinations of data inputs and network types that produced the best agreement in age estimates for different species. No combination of these two factors could be predicted to perform acceptably for any untested species. An exploratory approach to this phase is therefore still appropriate, and should incorporate a range of data inputs and model types.

Because of the findings for Objectives 1 and 2, the application of neural networks has not yet proceeded to the application phase. Therefore the steps identified as being required in the Network Implementation Phase of the protocol have yet to be tested and may require additional refinement.

The requirements for adequate quality control for age estimation with neural networks are very different to those described for age estimation by human readers (Morison 1998, Campana 2001). For example, it is desirable to use any known-age material, or material for which there is high confidence, in the training of the neural network. Once this is done, this material cannot provide an ongoing test of the accuracy of the age estimates produced, as might be done for human readers. The ability of neural networks to provide completely repeatable age estimates (absolute precision) avoids many of the potential errors that are associated with age estimation by human readers. However, it also means that measures of precision based on repeated estimates from the same samples cannot be used to measure network performance. Many of the potentially erroneous age estimates can be objectively identified using network outputs. Such samples could possibly also be those that a human reader would find more difficult to interpret, and therefore be among those that would contribute to the lack of absolute precision in repeat readings by humans.

# General discussion

A number of the tested combinations of data input and neural network models provided estimates of age that approached success by the *a priori* criteria – an error level below five percent and with no significant bias. But only one of the nine species trialed produced results that were within these criteria. However, many of the models classified 100% of the samples within one year of the correct age class and with over 85% correct assignment of age class (eg. King George whiting back propagation and multiple layer neural networks). Where biological data were used (for example pilchards), again, high levels of correctly assigned age classes were assigned (up to 100% within one year of the correct age class, and approximately 70% correct).

The observed biases were frequently an over-estimation of the age in the youngest samples and under-estimation of the age in the oldest samples, which produced significant differences between the observed and predicted age classes. A tendency to produce this type of bias may be an inherent weakness in the model structures tested: it was not possible for age estimation errors at the upper and lower limits of the age distributions to be evenly distributed above and below the observed ages. A method of overcoming this bias will need to be developed in the application of neural networks. The impact of these potential biases on specific applications of age composition data also requires evaluation.

As a result of the current study, protocols could not be developed that would reliably lead to an acceptably performing neural network model for the application of production ageing. The steps identified in the model development and model implementation phases, are necessary but not sufficient for such a purpose. However, these results suggest that such networks and protocols may still be developed, although the combination of data inputs and network types tested in this study have produced acceptable age estimates for only one of the nine species tested.

As the form of data inputs has been shown to be more important than network types, further work on this aspect of the problem is likely to be of more use than tests of other types of neural networks. The results from the DFT transformed data as neural network inputs demonstrate the effectiveness of this approach as a mechanism for the reduction of the data inputs to the neural network while still retaining the inherent signal information within the otolith transect. This was shown by the transformation of the signal data for snapper and black bream used in the pilot study, which, after processing using neural models, produced results that were directly comparable with those obtained in the pilot study.

Neural networks are most useful for the estimation of fish age in situations requiring the ongoing processing of samples from the same population, a process described as production fish ageing (Morison *et al.* 1998). This requires neural networks to produce acceptably accurate age estimates even if growth patterns of newly classes differ from those of previously aged material. Any application of neural networks to production ageing will require careful attention to this issue to ensure that their performance does not deteriorate as the fished population changes. For example, changes to the growth rates of the dominant age classes may produce significant differences between samples used to train networks and those in the most recently collected samples. Similarly, changes in the areas fished may also produce samples with different characteristics. How robust neural networks would be to such changes is not known.

The same issue arises with human readers but in a slightly different form. The ability of humans to consistently interpret the same samples may vary over time, and this potential for drift in interpretations needs to be monitored, but experienced staff quickly learn to recognise new growth patterns in samples. In contrast, neural networks will be entirely consistent on samples and their performance will not drift, but may have to be re-trained if there are significant changes to growth patterns of sampled populations.

One of the uncertainties with the age estimation process is the establishment of appropriate standards for production ageing. Such standards may vary depending on the uses to which the data are to be put. Where the age composition data are used in formal stock assessment models, one of the important considerations may be the sensitivity of the models to inaccuracies in the ageing data compared with other data sources. Sensitivity tests would be needed to test whether the error levels identified in the present study would be acceptable in a particular model. An additional factor in such tests would be the ability for a neural network approach to provide age estimates on a greater number of individuals for a given cost. An increased sample size may more than offset any increase in the error level of age estimates from an neural network compared with a human reader.

The provision of an error estimate with each individual age estimate is also a potential additional benefit of an neural network approach. At present, estimates of precision are usually based on repeat readings of subsets of samples. The availability of an error estimates for each neural network-derived age estimate would seem to fit well in the Bayesian frameworks commonly used for current stock assessments.

# Benefits

The benefits of the use of neural networks for estimating the age of fish are yet to be realised but are still likely. The findings of the study support those of the pilot study, in suggesting that neural networks may provide a rapid and relatively cheap way to estimate the age of fish. The development and implementation of this technology, however, will require further work.

The project has confirmed that information such as fish size, otolith weight and date of capture can contribute to the ability of an neural network to estimate fish age. This provides an important pointer to the data requirements and structure for such models.

Improvement in the ability of neural networks to estimate the age of blue grenadier, compared with the results from the pilot study, suggests that the approach can be successful even for a species with a complex otolith structure. Such species are difficult even for trained readers to interpret. Network performance will probably depend more on the choice of appropriate data inputs and model structure, than on the readability of the otolith.

The project has also highlighted the difficulty in reducing images or image segments to a form that is amenable to their use in neural networks. The image reduction algorithms used did not provide a sufficiently small dataset to be incorporated into the neural network models. The study therefore indicates that any future developments should explore alternative forms of image reduction.

The application of neural networks to production fish ageing, will provide a major benefit to the quality control aspects of this work. It will remove the need for constant checks of consistency by readers, and provide complete precision in the assigned ages.

# Conclusions

- Neural networks have again been shown to be able to accurately predict the age of a fish based on a small number of data inputs. However, the results obtained were still not as precise as those obtained by an experienced reader.
- The use of data inputs not derived from the otolith image can contribute significantly to the performance of an neural network, and can be sufficient on their own for the accurate estimation of fish age.
- Data inputs from DFT of data from transects of otolith images are a useful way of reducing this information before its use as an input to a neural network.
- Segments of otolith images could not be successfully reduced and manipulated for use as data inputs, but may still prove to be a superior type of data input for neural networks.
- Different forms on neural networks and data inputs are likely to be preferred for different species.

# Further development

There are several areas in the application of neural networks that require further development. These mainly concern further improvements in the forms of data inputs. Initially it was proposed to use data from segments of otolith images as inputs. The information in these images is that used by human readers for age estimation. If incorporated into neural networks it could be expected to produce more precise age estimates. The main obstacle to the incorporation of this type of information into neural networks is the need for a high degree of data compression. Potentially useful algorithms for data compression have been identified in this study, including two dimensional Fast Fourier and types of wavelet transformations. The successful implementation and testing of these algorithms is likely to lead to improvements in the performance of neural networks. They could not successfully implemented during this project because of technical and time constraints, but there is no obvious reason why they could not be incorporated into models at some future stage.

The acceptability or otherwise of the precision levels obtained with the neural networks (APEs of between five and ten percent) has yet to be assessed. These levels of error, when combined with individual error estimates, may be acceptable for some applications of age composition data. The disadvantages of poorer precision may be offset by the increased sample sizes that the processing of samples with neural networks offer. Further study would need to be undertaken to assess these issues.

# References

Beamish, R., and Fournier, D. A. (1981). A method of comparing the precision of a set of age determinations. *Journal of Fisheries Research Board of Canada* **36**, 1395-400.

Blum, A. (1992). 'Neural networks in C++. An Object-oriented Framework for Building Connectionist Systems' (John Wiley : New York.)

Bishop (1995) 'Neural Networks for Pattern Recognition' Oxford University Press.

Boehlert, G. W. (1985). Using objective criteria and multiple regression models for age determination in fishes. *US National Marine Fisheries Service Fishery Bulletin* **83**, 103-117.

Cailliet, G. M., Botsford, L. W., Brittnacher, J. G., Ford, G., Matsubayashi, M., King, A., Watters, D. L., and Kope, R. G. (1996). Development of a computer-aided age determination system: evaluation based on otoliths of bank rockfish off California. *Transactions of the American Fisheries Society* **125**, 874-888.

Campana, S. E., Annan, M. C., and McMillan, J. I. (1995). Graphical and statistical methods for determining the consistency of age determinations. *Transactions of the American Fisheries Society* **124**, 131-138.

Campana and Thorrold (2001). Otoliths, increments, and elements: keys to a comprehensive understanding of fish populations?. *Canadian Journal of Fish and Aquatic Science*. **58**, 30-38

Estep, K. W., Nedreaas, K. H., and MacIntyre, F. (1995). Computer image enhancement and presentation of otoliths. In 'Recent Developments in Fish Otolith Research'. (Eds. D. H. Secor, J. M. Dean and S. E. Campana.) pp. 303-317 (University of South Carolina Press: Columbia.)

Francis, R. I. C. C., Paul, L. J., and Mulligan, K. P. (1992). Ageing of adult snapper (*Pagrus auratus*) from otolith annual ring counts: validation by tagging and oxytetracycline injection. *Australian Journal of Marine and Freshwater Research* **43**, 1069–89.

Kalish, J. M., Johnston, J. M., Smith, D. C., Morison, A. K., and Robertson, S. G. (1997). Use of the bomb radiocarbon chronometer for age validation of the blue grenadier *Macruronus novaezelandiae*. *Marine Biology* **128**, 557-563.

Komatsu, T., Aoki, I., Mitani, I and Ishij, T. (1994). Prediction of Japanese sardine larvae in Sagami bay using a neural network. *Fisheries Science* **60**, 385-391

Macy, W. K. III (1995). The application of digital image processing to the ageing of long-finned squid, *Loligo pealei*, using the statolith. In 'Recent Developments in Fish Otolith Research'. (Eds. D. H. Secor, J. M. Dean and S. E. Campana.) pp. 283-302 (University of South Carolina Press: Columbia.)

Masters, T. (1993. 'Practical Neural Network Recipes in C++' (Academic press, inc: San Diego CA.)

Masters, T. (1994). 'Signal and Image Processing with Neural Networks' (John Wiley: New York.)

Masters, T. (1995). 'Advanced Algorithms for Neural Networks A C++ Source Book' (John Wiley: New York.)

McGowan, M. F., Prince, E. D., and Lee, D. W. (1987). An inexpensive microcomputer-based system for making rapid and precise counts and measurements of zonations in video displayed skeletal structures of fish. In 'Age and Growth of Fish' (Eds. R. C. Summerfelt and G. E. Hall.) pp. 385-395 (Iowa State University Press: Ames.)

Morison, A. K., Coutin, P. C., and Robertson, S. G. (1998b). Age determination of black bream, *Acanthopagrus butcheri* (Sparidae), from the Gippsland Lakes of south–eastern Australia indicates slow growth and episodic recruitment. *Marine and Freshwater Resources* **49**, 491-8.

Morison, A. K., Robertson, S. G., and Smith, D. C. (1998a). An integrated production fish ageing system: quality assurance and image analysis. *North American Journal of Fisheries Management* **18**, 587-598.

Morison, A. K., and Robertson, S. G.(1997). Automatic ageing of fish from otoliths: a pilot study. Final report to FRDC for Project 96/136. (Marine and Freshwater Resources Institute: Queenscliff, Victoria, Australia)

Newbury, P. F., Culverhouse, P. F., and Pilgrim, D. A. (1995). Automatic fish population counting by artificial neural network. *Aquaculture* **133**, 45-55.

Paul, L. J.(1992). Age and growth studies of New Zealand Fishes, 1921-90: A review and bibliography. In 'Age Determination and Growth in Fish and Other Aquatic Animals'. (Ed. D. C. Smith) *Australian Journal of Marine and Freshwater Research* **43**, 879-911

Robertson, S. G., and Morison, A. K. (1999). A trial of artificial neural networks for automatically estimating the age of fish. *Marine and Freshwater Research* **50**, 73-82.

Saila, S. B. (1996) Guide to some computerized artificial intelligence methods. In 'Computers in Fisheries Research'. (Eds. B. A. Megrey and E. Moksness.) pp. 8-40 (Chapman and Hall : London.)

Saila, S. B. (1997). Fuzzy control theory applied to American lobster management. In 'Developing and Sustaining World Fisheries Resources: The State of Science and Management: 2nd World Fisheries Congress proceedings' (Eds. D. A. Hancock, D. C. Smith, A. Grant, and J. P. Beumer.) pp. 204-209 (CSIRO: Collingwood Australia.)

Sarle, W. S. (1994). Neural networks and statistical models. Proceedings of the Nineteenth Annual SAS Users Group International Conference, April 1994. (SAS Institute: Cary, North Carolina.) http://www.sas.com/rnd/app/stat/papers/neural1.pdf

Sherald and Ward (1994). Predicting the Market: A Better Way to Use Backpropagation Neural Networks. *AI in Finance*

Simpson, R., Williams, R., Ellis, R., and Culverhouse, P. F. (1992). Biological pattern recognition by neural networks. *Marine Ecological Progress Series* **79**, 303-308.

Small, G. J., and Hirschhorn, G. (1987). Computer-assisted age and growth pattern recognition of fish scales using a digitizing tablet. In 'Age and Growth of Fish' (Eds. R. C. Summerfelt and G. E. Hall.) pp. 397-410 (Iowa State University Press: Ames.)

Troadec, H. (1991). Frequency demodulation on otolith numerical images for the automation of fish age estimation. *Aquatic Living Resources* **4**, 207-219.

Welleman, H. C., and Storbeck, F. (1995). Automatic ageing of plaice (*Pleuronectes platessa* L.) otoliths by means of image analysis. In 'Recent Developments in Fish Otolith Research'. (Eds. D. H. Secor, J. M. Dean and S. E. Campana.) pp. 271-282 (University of South Carolina Press: Columbia.)

Williams, T., and Bedford, B. C. (1974). The use of otoliths for age determination. In 'The Ageing of Fish'. (Ed. T. B. Bagenal.) pp. 114-23 (Unwin Brothers: Old Woking.)

# Appendix 1: Intellectual property

No Intellectual Property of commercial importance has been developed from this project. However, the approach of using a neural networks for the problem of objectively ageing fish significantly increased through the FRDC 98/105 project. This study will continue to generate considerable interest in the fisheries science community. A manuscript will be developed from these studies and published in a peer reviewed journal, further, findings from this study will be presented at the next World Otolith Symposium, increasing exposure of this novel technique to the world otolith community and FRDC.

# Appendix 2: Staff

Simon Robertson : Principle investigator
Alexander Morison : Co-Investigator

## APPENDIX 3. Indices of average percentage error

Table 1. Beamish and Fournier index of average percent error from back propagation, multiple layer and probabilistic neural networks for training, test and production sets.

| | | ***Network Type*** | | | Multiple layer | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Back propagation | | | Back propagation | | | Probabilistic | | |
| ***Species*** | **Network Inputs** | Training | Test | Production | Training | Test | Productio n | Trainin g | Test | Production |
| King George Whiting | All Data | 0.29 | 1.28 | 2.51 | 0.29 | 1.47 | 2.70 | 0.00 | 0.00 | 2.50 |
| | All Bio & TL | 0.74 | 0.64 | 2.06 | 0.48 | 0.63 | 2.25 | 0.15 | 0.44 | 2.67 |
| | All Bio | 0.86 | 0.90 | 2.32 | 0.98 | 0.91 | 2.32 | 3.70 | 1.54 | 4.10 |
| | T1 | 0.88 | 1.50 | 3.67 | 0.82 | 1.82 | 3.12 | 0.00 | 1.09 | 3.89 |
| | Bio & T1 | 0.38 | 0.82 | 2.06 | 0.38 | 0.83 | 2.28 | 0.15 | 0.00 | 2.62 |
| | T2 | 1.49 | 2.00 | 3.43 | 1.25 | 2.01 | 3.16 | 0.15 | 1.17 | 4.48 |
| | Bio & T2 | 0.29 | 0.63 | 3.47 | 0.44 | 0.83 | 2.55 | 2.90 | 0.00 | 3.14 |
| | T3 | 1.41 | 2.41 | 3.09 | 1.25 | 2.01 | 3.16 | 0.29 | 0.27 | 5.11 |
| | Bio & T3 | 0.29 | 1.28 | 2.20 | 0.15 | 1.02 | 2.10 | 0.15 | 0.00 | 3.63 |
| | T4 | 1.66 | 1.99 | 3.95 | 1.22 | 1.74 | 3.68 | 1.02 | 0.71 | 6.44 |
| | Bio & T4 | 0.62 | 1.02 | 2.25 | 0.62 | 1.02 | 2.47 | 0.00 | 0.44 | 2.69 |
| | T5 | 1.55 | 2.26 | 3.57 | 1.70 | 2.20 | 3.70 | 0.73 | 2.04 | 8.84 |
| | Bio & T5 | 0.47 | 0.90 | 2.06 | 0.62 | 1.02 | 2.47 | 1.26 | 0.00 | 3.61 |
| School whiting | All Data | 5.69 | 9.63 | 9.14 | 4.32 | 8.48 | 11.47 | 0.00 | 5.67 | 14.50 |
| | All Bio & TL | 4.27 | 5.21 | 4.70 | 3.79 | 4.22 | 5.55 | 2.34 | 4.19 | 5.74 |
| | All Bio | 3.46 | 3.35 | 4.95 | 3.96 | 3.35 | 5.08 | 4.49 | 4.21 | 5.51 |
| | T1 | 8.47 | 10.06 | 12.09 | 8.02 | 10.55 | 13.11 | 0.00 | 12.63 | 16.52 |
| | Bio & T1 | 4.97 | 7.77 | 7.63 | 5.63 | 7.14 | 8.19 | 0.17 | 2.92 | 7.99 |
| | T2 | 10.08 | 11.22 | 12.10 | 7.38 | 12.83 | 11.94 | 0.00 | 11.95 | 16.09 |
| | Bio & T2 | 4.19 | 6.92 | 7.34 | 2.04 | 7.24 | 7.38 | 0.00 | 3.26 | 8.76 |
| | T3 | 10.03 | 10.92 | 11.90 | 8.78 | 11.23 | 12.05 | 0.00 | 9.42 | 19.17 |
| | Bio & T3 | 4.84 | 6.75 | 6.34 | 5.63 | 6.28 | 7.88 | 0.00 | 4.00 | 7.85 |
| | T4 | 9.88 | 11.69 | 12.71 | 9.75 | 11.86 | 11.75 | 0.00 | 9.73 | 16.54 |
| | Bio & T4 | 7.22 | 8.54 | 8.12 | 4.81 | 7.74 | 8.43 | 0.00 | 3.55 | 9.04 |
| | T5 | 9.88 | 11.69 | 12.71 | 7.74 | 11.12 | 12.46 | 0.00 | 8.97 | 22.66 |
| | Bio & T5 | 3.68 | 6.13 | 8.07 | 4.23 | 7.01 | 7.83 | 0.25 | 3.70 | 8.10 |
| Ling | All Data | 13.67 | 15.06 | 14.30 | 11.35 | 13.00 | 12.10 | 0.00 | 14.85 | 17.23 |
| | All Bio & TL | 10.07 | 9.96 | 10.41 | 8.63 | 9.15 | 8.30 | 6.05 | 7.79 | 8.11 |
| | All Bio | 9.07 | 9.87 | 8.25 | 8.43 | 9.06 | 8.40 | 6.88 | 8.02 | 9.20 |
| | T1 | 17.54 | 18.31 | 17.90 | 16.91 | 17.90 | 16.74 | 1.60 | 26.51 | 31.54 |
| | Bio & T1 | 8.43 | 9.72 | 9.50 | 8.15 | 10.47 | 10.98 | 9.79 | 11.14 | 14.41 |
| | T2 | 18.20 | 18.65 | 17.77 | 17.75 | 18.62 | 18.23 | 0.00 | 24.56 | 30.84 |
| | Bio & T2 | 9.02 | 10.52 | 9.61 | 9.06 | 10.86 | 10.29 | 12.09 | 11.47 | 12.13 |
| | T3 | 19.26 | 20.33 | 20.47 | 19.26 | 20.33 | 20.47 | 0.00 | 28.92 | 27.85 |
| | Bio & T3 | 9.07 | 10.53 | 10.43 | 8.81 | 10.75 | 10.76 | 0.00 | 10.32 | 11.77 |
| | T4 | 17.35 | 17.80 | 16.95 | 17.27 | 17.34 | 17.86 | 0.30 | 27.18 | 29.13 |
| | Bio & T4 | 8.87 | 11.73 | 9.59 | 7.64 | 10.35 | 9.86 | 10.11 | 10.50 | 10.69 |
| | T5 | 17.35 | 17.98 | 16.87 | 17.46 | 18.49 | 16.88 | 0.07 | 25.78 | 29.92 |
| | Bio & T5 | 9.51 | 10.44 | 9.03 | 7.70 | 9.75 | 10.03 | 5.75 | 11.35 | 12.24 |
| Black bream | All Data | 5.01 | 9.69 | 8.77 | 0.65 | 7.71 | 8.24 | 0.00 | 5.59 | 8.68 |
| | All Bio & TL | 6.78 | 6.61 | 7.55 | 4.53 | 5.96 | 6.81 | 4.35 | 6.59 | 6.99 |
| | All Bio | 8.33 | 8.88 | 9.60 | 8.31 | 8.26 | 9.22 | 6.39 | 8.52 | 8.61 |
| | T1 | 14.84 | 16.93 | 19.21 | 13.17 | 17.90 | 18.64 | 0.00 | 16.54 | 22.85 |
| | Bio & T1 | 4.59 | 7.77 | 9.08 | 4.73 | 8.99 | 8.32 | 0.11 | 6.40 | 9.82 |
| | T2 | 10.50 | 12.68 | 13.24 | 10.23 | 12.55 | 12.46 | 0.00 | 12.77 | 16.01 |
| | Bio & T2 | 4.31 | 6.47 | 6.27 | 5.87 | 7.55 | 7.44 | 0.00 | 6.30 | 9.37 |
| | T3 | 14.03 | 16.35 | 17.83 | 12.58 | 17.05 | 17.53 | 0.00 | 16.48 | 22.98 |
| | Bio & T3 | 5.12 | 7.19 | 7.26 | 5.30 | 7.00 | 8.49 | 0.00 | 7.38 | 9.35 |
| | T4 | 14.96 | 15.81 | 18.30 | 13.34 | 16.10 | 16.94 | 0.09 | 15.65 | 22.77 |
| | Bio & T4 | 4.04 | 6.90 | 7.43 | 5.95 | 8.42 | 9.12 | 0.00 | 5.78 | 9.01 |
| | T5 | 14.31 | 18.98 | 17.39 | 12.16 | 14.07 | 15.24 | 0.00 | 17.65 | 22.35 |
| | Bio & T5 | 4.85 | 6.66 | 6.23 | 5.67 | 8.09 | 7.13 | 0.04 | 5.45 | 8.47 |

Table 1. Beamish and Fournier index of average percent error from back propagation, multiple layer and probabilistic neural networks for training, test and production sets (continued).

| | ***Network Type*** | | | Multiple layer | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Back propagation | | | Back propagation | | | Probabilistic | |
| ***Species*** | **Network Inputs** | Training | Test | Production | Training | Test | Production | Training | Test | Production |
| Snapper | All Data | 10.45 | 15.55 | 13.51 | 3.49 | 12.34 | 12.23 | 0.17 | 6.91 | 9.18 |
| | All Bio & TL | 5.16 | 5.96 | 7.37 | 4.91 | 5.35 | 6.80 | 3.88 | 4.36 | 5.60 |
| | All Bio | 8.45 | 11.27 | 9.45 | 5.52 | 6.88 | 7.92 | 6.54 | 5.62 | 8.11 |
| | T1 | 22.09 | 24.93 | 23.84 | 19.74 | 24.47 | 23.08 | 16.87 | 24.08 | 32.15 |
| | Bio & T1 | 5.42 | 8.50 | 9.11 | 5.49 | 10.14 | 9.64 | 5.50 | 4.99 | 7.20 |
| | T2 | 20.67 | 26.23 | 23.89 | 21.44 | 26.74 | 24.80 | 24.39 | 29.20 | 37.21 |
| | Bio & T2 | 4.09 | 7.78 | 7.85 | 7.36 | 12.42 | 10.43 | 0.02 | 6.70 | 8.06 |
| | T3 | 16.54 | 21.10 | 20.42 | 16.17 | 22.02 | 21.26 | 19.03 | 22.17 | 25.61 |
| | Bio & T3 | 3.84 | 6.73 | 7.97 | 6.50 | 8.09 | 7.84 | 0.08 | 2.54 | 8.41 |
| | T4 | 22.98 | 25.52 | 23.58 | 19.05 | 23.22 | 21.54 | 1.55 | 25.05 | 30.60 |
| | Bio & T4 | 5.26 | 7.59 | 8.79 | 6.35 | 10.30 | 9.85 | 1.65 | 5.50 | 7.16 |
| | T5 | 17.87 | 20.80 | 19.20 | 16.16 | 15.96 | 17.19 | 15.21 | 17.98 | 17.45 |
| | Bio & T5 | 3.91 | 8.94 | 6.83 | 3.53 | 10.64 | 8.99 | 0.27 | 4.59 | 7.64 |
| Sand flathead | All Data | 8.77 | 9.59 | 11.99 | 4.39 | 9.78 | 12.02 | 0.00 | 7.33 | 11.76 |
| | All Bio & TL | 9.68 | 9.79 | 11.31 | 9.68 | 9.79 | 11.31 | 11.34 | 9.67 | 12.50 |
| | All Bio | 20.98 | 18.56 | 20.10 | 11.45 | 11.93 | 13.62 | 10.32 | 10.43 | 12.91 |
| | T1 | 16.32 | 17.15 | 17.08 | 15.64 | 16.65 | 15.88 | 0.17 | 21.46 | 27.42 |
| | Bio & T1 | 9.48 | 10.17 | 11.58 | 8.33 | 10.39 | 11.93 | 11.09 | 8.81 | 13.71 |
| | T2 | 15.34 | 16.01 | 19.09 | 14.83 | 15.91 | 16.75 | 0.35 | 23.76 | 27.08 |
| | Bio & T2 | 8.26 | 9.67 | 11.90 | 7.06 | 10.31 | 10.77 | 3.62 | 7.05 | 12.92 |
| | T3 | 19.54 | 19.35 | 21.89 | 14.98 | 19.02 | 18.49 | 0.00 | 19.25 | 27.19 |
| | Bio & T3 | 6.72 | 9.65 | 9.45 | 6.31 | 9.23 | 9.34 | 1.04 | 7.70 | 12.01 |
| | T4 | 15.54 | 18.35 | 16.41 | 12.88 | 16.82 | 14.30 | 0.52 | 18.68 | 20.86 |
| | Bio & T4 | 6.67 | 9.34 | 10.68 | 8.00 | 10.26 | 10.96 | 0.00 | 7.31 | 11.65 |
| | T5 | 17.47 | 20.79 | 18.26 | 15.92 | 18.29 | 17.98 | 0.52 | 16.41 | 21.51 |
| | Bio & T5 | 10.63 | 11.41 | 12.42 | 9.99 | 12.91 | 13.59 | 0.16 | 7.34 | 11.11 |
| Blue grenadier | All Data | 5.78 | 6.86 | 6.55 | 5.52 | 7.05 | 6.65 | 0.00 | 6.84 | 8.31 |
| | All Bio & TL | 6.60 | 7.53 | 6.79 | 5.39 | 5.87 | 5.78 | 1.49 | 6.08 | 7.87 |
| | All Bio | 5.79 | 6.63 | 5.89 | 5.58 | 5.85 | 6.00 | 5.19 | 7.82 | 9.12 |
| | T1 | 15.49 | 17.43 | 15.33 | 12.46 | 14.87 | 13.76 | 0.00 | 13.88 | 14.50 |
| | Bio & T1 | 5.85 | 6.76 | 6.35 | 5.89 | 6.20 | 5.77 | 0.00 | 6.50 | 8.73 |
| | T2 | 18.22 | 20.08 | 16.75 | 14.37 | 17.75 | 13.87 | 0.11 | 22.19 | 25.12 |
| | Bio & T2 | 6.04 | 6.66 | 6.33 | 5.69 | 6.22 | 5.79 | 0.02 | 6.95 | 8.30 |
| | T3 | 16.24 | 18.84 | 14.73 | 14.63 | 16.16 | 13.27 | 0.00 | 22.29 | 23.24 |
| | Bio & T3 | 5.66 | 6.57 | 6.14 | 4.69 | 6.74 | 6.80 | 0.02 | 7.23 | 9.75 |
| Ocean perch | All Data | 12.44 | 14.85 | 15.09 | 6.79 | 12.60 | 17.25 | 0.00 | 8.70 | 11.91 |
| | All Bio & TL | 6.80 | 7.64 | 8.41 | 6.98 | 7.23 | 7.84 | 3.79 | 4.82 | 6.40 |
| | All Bio | 8.00 | 7.08 | 9.10 | 7.08 | 6.90 | 8.68 | 0.74 | 5.19 | 8.05 |
| | T1 | 20.35 | 18.71 | 22.64 | 16.00 | 18.37 | 21.46 | 0.00 | 16.82 | 19.19 |
| | Bio & T1 | 8.27 | 9.43 | 11.67 | 5.50 | 8.27 | 10.79 | 0.00 | 5.65 | 9.77 |
| | T2 | 19.12 | 20.94 | 20.90 | 18.89 | 22.30 | 22.99 | 0.00 | 19.99 | 22.51 |
| | Bio & T2 | 8.32 | 9.91 | 11.90 | 6.93 | 9.35 | 11.03 | 0.76 | 6.07 | 9.75 |
| | T3 | 20.61 | 22.40 | 22.67 | 17.71 | 18.48 | 22.06 | 0.00 | 20.33 | 23.44 |
| | Bio & T3 | 8.29 | 10.27 | 12.55 | 7.36 | 8.91 | 10.12 | 0.72 | 5.84 | 11.27 |
| | T4 | 19.04 | 17.74 | 20.97 | 17.55 | 17.00 | 19.43 | 0.00 | 20.07 | 24.05 |
| | Bio & T4 | 10.52 | 11.73 | 9.11 | 6.40 | 9.55 | 11.12 | 1.51 | 5.39 | 9.11 |
| | T5 | 20.23 | 19.24 | 21.80 | 18.41 | 18.81 | 19.27 | 0.00 | 20.05 | 25.46 |
| | Bio & T5 | 10.52 | 11.73 | 13.30 | 7.18 | 10.51 | 17.24 | 0.00 | 5.83 | 11.35 |

Table 2. Beamish and Fournier index of average percent error from back propagation, multiple layer and probabilistic neural networks for training, test and production sets for biological inputs only.

| | | *Network Type* | | | Multiple layer | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Back propagation | | | Back propagation | | | Probabilistic | | |
| ***Species*** | **Network Inputs** | Training | Test | Production | Training | Test | Production | Training | Test | Production |
| Pilchards | Bio with area | 7.23 | 7.09 | 7.16 | 6.24 | 5.74 | 6.41 | 6.48 | 6.43 | 7.64 |

Table 3. Beamish and Fournier index of average percent error from multiple layer and probabilistic neural networks for training, test and production sets for biological inputs only.

| | | *Network Type* | | | | | |
|---|---|---|---|---|---|---|---|
| | | Multiple layer | | | Probabilistic | | |
| ***Species*** | **Area** | Training | Test | Production | Training | Test | Production |
| Pilchards | Coffin bay | 4.34 | 4.67 | 6.71 | | | |
| | Lakes Entrance | 4.48 | 2.83 | 4.37 | | | |
| | Port Phillip Bay | 4.05 | 3.87 | 5.65 | | | |
| | Port Lincoln | 3.74 | 3.24 | 5.04 | | | |
| | Queensland | 5.91 | 5.80 | 5.26 | | | |
| School whiting | | | | | 5.40 | 6.45 | 7.18 |
| Snapper | | | | | 3.28 | 4.44 | 6.01 |
| Ling | | | | | 9.57 | 8.47 | 9.88 |
| Blue grenadier | Combined | | | | 4.76 | 5.05 | 5.73 |
| | Non-winter | | | | 6.46 | 7.17 | 7.01 |
| | Winter | | | | 8.95 | 9.00 | 10.38 |

## APPENDIX 4. Regression analysis tables

Table 1.1. Comparison of observed and predicted ages for back propagation neural networks on samples of King George whiting for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| KGWAllData | 2.06 | 0.76 | 0.72 | 0.62 | 0.81 | 0.61 | 0.40 | 0.83 | * | 75 | 100.00 | 92.00 | 100.00 |
| KGWBio & transect | 2.06 | 0.76 | 0.72 | 0.62 | 0.81 | 0.61 | 0.40 | 0.83 | * | 75 | 100.00 | 92.00 | 100.00 |
| KGWBio | 2.32 | 0.72 | 0.68 | 0.58 | 0.78 | 0.67 | 0.45 | 0.89 | * | 75 | 100.00 | 90.67 | 100.00 |
| KGW T1 | 3.67 | 0.35 | 0.46 | 0.32 | 0.62 | 1.17 | 0.84 | 1.50 | * | 75 | 100.00 | 85.33 | 97.30 |
| KGW T1 with Bio | 2.06 | 0.76 | 0.72 | 0.62 | 0.81 | 0.61 | 0.40 | 0.83 | * | 75 | 100.00 | 92.00 | 100.00 |
| KGW T2 | 3.43 | 0.51 | 0.47 | 0.37 | 0.58 | 1.14 | 0.90 | 1.38 | * | 75 | 100.00 | 84.00 | 100.00 |
| KGW T2 with Bio | 2.47 | 0.61 | 0.70 | 0.57 | 0.83 | 0.67 | 0.38 | 0.97 | * | 75 | 100.00 | 90.67 | 98.67 |
| KGW T3 | 3.09 | 0.32 | 0.33 | 0.22 | 0.45 | 1.41 | 1.15 | 1.66 | * | 75 | 100.00 | 89.33 | 98.67 |
| KGW T3 with Bio | 2.20 | 0.64 | 0.63 | 0.52 | 0.74 | 0.82 | 0.57 | 1.07 | * | 75 | 100.00 | 92.00 | 98.67 |
| KGW T4 | 3.95 | 0.44 | 0.29 | 0.21 | 0.36 | 1.44 | 1.27 | 1.61 | * | 75 | 100.00 | 82.67 | 98.67 |
| KGW T4 with Bio | 2.25 | 0.73 | 0.64 | 0.56 | 0.97 | 0.76 | 0.56 | 0.97 | * | 75 | 100.00 | 90.67 | 100.00 |
| KGW T5 | 3.57 | 0.44 | 0.49 | 0.36 | 0.62 | 1.08 | 0.80 | 1.37 | * | 75 | 100.00 | 85.33 | 98.67 |
| KGW T5 with Bio | 2.06 | 0.76 | 0.72 | 0.62 | 0.81 | 0.61 | 0.40 | 0.83 | * | 75 | 100.00 | 92.00 | 100.00 |

Table 1.2. Comparison of observed and predicted ages for multiple hidden layer neural networks on samples of King George whiting for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| KGWAllData | 2.70 | 0.67 | 0.54 | 0.45 | 0.62 | 0.97 | 0.77 | 1.17 | * | 75 | 100.00 | 88.00 | 100.00 |
| KGWBio & transect | 2.25 | 0.73 | 0.70 | 0.60 | 0.80 | 0.62 | 0.39 | 0.84 | * | 75 | 100.00 | 90.67 | 100.00 |
| KGWBio | 2.32 | 0.72 | 0.68 | 0.58 | 0.78 | 0.67 | 0.45 | 0.89 | * | 75 | 100.00 | 90.67 | 100.00 |
| KGW T1 | 3.12 | 0.61 | 0.69 | 0.56 | 0.82 | 0.73 | 0.44 | 1.02 | * | 75 | 100.00 | 86.67 | 100.00 |
| KGW T1 with Bio | 2.28 | 0.64 | 0.67 | 0.55 | 0.79 | 0.73 | 0.47 | 1.00 | * | 75 | 100.00 | 92.00 | 98.67 |
| KGW T2 | 3.16 | 0.59 | 0.46 | 0.37 | 0.54 | 1.14 | 0.95 | 1.34 | * | 75 | 100.00 | 85.33 | 100.00 |
| KGW T2 with Bio | 2.55 | 0.60 | 0.64 | 0.51 | 0.76 | 0.79 | 0.52 | 1.06 | * | 75 | 100.00 | 90.67 | 98.67 |
| KGW T3 | 3.16 | 0.59 | 0.46 | 0.37 | 0.54 | 1.14 | 0.95 | 1.34 | * | 75 | 100.00 | 85.33 | 100.00 |
| KGW T3 with Bio | 2.10 | 0.64 | 0.68 | 0.56 | 0.80 | 0.67 | 0.41 | 0.94 | * | 75 | 100.00 | 92.00 | 98.67 |
| KGW T4 | 3.68 | 0.42 | 0.35 | 0.25 | 0.44 | 1.35 | 1.14 | 1.56 | * | 75 | 100.00 | 84.00 | 98.67 |
| KGW T4 with Bio | 2.47 | 0.60 | 0.60 | 0.48 | 0.71 | 0.88 | 0.62 | 1.14 | * | 75 | 100.00 | 90.67 | 98.67 |
| KGW T5 | 3.70 | 0.47 | 0.44 | 0.33 | 0.55 | 1.20 | 0.96 | 1.44 | * | 75 | 100.00 | 82.67 | 100.00 |
| KGW T5 with Bio | 2.50 | 0.59 | 0.60 | 0.48 | 0.71 | 0.88 | 0.62 | 1.14 | * | 75 | 100.00 | 90.67 | 98.67 |

Table 1.3. Comparison of observed and predicted ages for probabilistic neural networks on samples of King George whiting for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| KGWAllData | 2.50 | 0.72 | 0.78 | 0.67 | 0.89 | 0.44 | 0.19 | 0.69 | * | 75 | 100.00 | 90.67 | 100.00 |
| KGWBio & transect | 2.67 | 0.64 | 0.81 | 0.66 | 0.95 | 0.45 | 0.11 | 0.77 | * | 73 | 97.33 | 87.67 | 100.00 |
| KGWBio | 4.10 | 0.65 | 0.87 | 0.72 | 1.02 | 0.20 | -0.13 | 0.54 | NS | 75 | 100.00 | 85.33 | 100.00 |
| KGW T1 | 3.88 | 0.42 | 0.55 | 0.40 | 0.70 | 0.96 | 0.62 | 1.30 | * | 74 | 98.67 | 83.78 | 98.65 |
| KGW T1 with Bio | 2.62 | 0.63 | 0.78 | 0.64 | 0.92 | 0.50 | 0.18 | 0.81 | * | 75 | 100.00 | 90.67 | 98.67 |
| KGW T2 | 4.48 | 0.43 | 0.57 | 0.42 | 0.72 | 0.83 | 0.48 | 1.17 | * | 75 | 100.00 | 82.67 | 98.67 |
| KGW T2 with Bio | 3.14 | 0.65 | 0.74 | 0.61 | 0.86 | 0.53 | 0.25 | 0.81 | * | 75 | 100.00 | 88.00 | 100.00 |
| KGW T3 | 5.11 | 0.36 | 0.68 | 0.47 | 0.89 | 0.76 | 0.28 | 1.23 | * | 75 | 100.00 | 77.33 | 97.33 |
| KGW T3 with Bio | 3.63 | 0.62 | 0.79 | 0.64 | 0.95 | 0.39 | 0.05 | 0.74 | * | 75 | 100.00 | 86.49 | 100.00 |
| KGW T4 | 6.44 | 0.17 | 0.47 | 0.23 | 0.71 | 1.08 | 0.55 | 1.62 | * | 75 | 100.00 | 77.33 | 84.00 |
| KGW T4 with Bio | 2.69 | 0.69 | 0.70 | 0.59 | 0.82 | 0.59 | 0.34 | 0.84 | * | 75 | 100.00 | 89.33 | 100.00 |
| KGW T5 | 8.84 | 0.17 | 0.47 | 0.23 | 0.72 | 1.14 | 0.59 | 1.70 | * | 74 | 100.00 | 66.22 | 95.95 |
| KGW T5 with Bio | 3.61 | 0.57 | 0.75 | 0.60 | 0.89 | 0.50 | 0.16 | 0.83 | * | 75 | 100.00 | 88.00 | 98.67 |

Table 2.1. Comparison of observed and predicted ages for back propagation neural networks on samples of school whiting for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| SWAllData | 9.14 | 0.19 | 0.27 | 0.16 | 0.38 | 2.25 | 1.88 | 2.61 | * | 102 | 100.00 | 50.00 | 94.12 |
| SWBio & transect | 4.70 | 0.67 | 0.60 | 0.52 | 0.69 | 1.08 | 0.80 | 1.36 | * | 102 | 100.00 | 70.59 | 99.02 |
| SWBio | 4.95 | 0.63 | 0.63 | 0.54 | 0.73 | 1.00 | 0.69 | 1.32 | * | 102 | 100.00 | 68.63 | 99.02 |
| SW T1 | 12.09 | 0.04 | 0.13 | 0.002 | 0.26 | 2.57 | 2.14 | 2.99 | * | 102 | 100.00 | 42.16 | 86.27 |
| SW T1 with Bio | 7.63 | 0.42 | 0.52 | 0.40 | 0.64 | 1.30 | 0.91 | 1.70 | * | 102 | 100.00 | 58.82 | 95.10 |
| SW T2 | 12.10 | 0.002 | -0.02 | -0.107 | 0.07 | 2.99 | 2.70 | 3.28 | * | 102 | 100.00 | 42.16 | 87.25 |
| SW T2 with Bio | 7.33 | 0.42 | 0.54 | 0.42 | 0.67 | 1.28 | 0.87 | 1.69 | * | 102 | 100.00 | 56.86 | 96.08 |
| SW T3 | 11.90 | 0.02 | 0.06 | -0.02 | 0.15 | 2.59 | 2.30 | 2.87 | * | 102 | 100.00 | 43.14 | 87.25 |
| SW T3 with Bio | 6.34 | 0.54 | 0.56 | 0.46 | 0.66 | 1.15 | 0.82 | 1.48 | * | 102 | 100.00 | 63.73 | 97.06 |
| SW T4 | 12.71 | 0.003 | -0.03 | -0.12 | 0.07 | 2.92 | 2.60 | 3.25 | * | 102 | 100.00 | 43.14 | 83.00 |
| SW T4 with Bio | 8.12 | 0.33 | 0.35 | 0.25 | 0.45 | 1.78 | 1.45 | 2.11 | * | 102 | 100.00 | 57.84 | 94.12 |
| SW T5 | 12.71 | 0.003 | -0.03 | -0.12 | 0.07 | 2.95 | 2.60 | 3.25 | * | 102 | 100.00 | 43.14 | 83.33 |
| SW T5 with Bio | 8.07 | 0.36 | 0.47 | 0.35 | 0.60 | 1.48 | 1.06 | 1.90 | * | 102 | 100.00 | 55.88 | 94.12 |

Table 2.2. Comparison of observed and predicted ages for multiple hidden layer neural networks on samples of school whiting for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| SWAllData | 11.47 | 0.27 | 0.50 | 0.34 | 0.67 | 1.16 | 0.62 | 1.71 | * | 102 | 100.00 | 45.09 | 88.24 |
| SWBio & transect | 5.55 | 0.60 | 0.54 | 0.45 | 0.63 | 1.26 | 0.97 | 1.56 | * | 102 | 100.00 | 67.65 | 98.04 |
| SWBio | 5.08 | 0.59 | 0.61 | 0.51 | 0.71 | 1.03 | 0.70 | 1.36 | * | 102 | 100.00 | 68.63 | 99.02 |
| SW T1 | 13.11 | 0.0006 | 0.013 | -0.09 | 0.12 | 2.78 | 2.44 | 3.12 | * | 102 | 100.00 | 40.20 | 82.35 |
| SW T1 with Bio | 8.19 | 0.34 | 0.41 | 0.29 | 0.52 | 1.75 | 1.38 | 2.12 | * | 102 | 100.00 | 55.88 | 95.10 |
| SW T2 | 11.94 | 0.03 | 0.12 | -0.006 | 0.25 | 2.40 | 1.97 | 2.83 | * | 102 | 100.00 | 47.06 | 85.29 |
| SW T2 with Bio | 7.38 | 0.45 | 0.59 | 0.46 | 0.72 | 1.12 | 0.69 | 1.55 | * | 102 | 100.00 | 57.84 | 96.08 |
| SW T3 | 12.05 | 0.02 | 0.07 | -0.03 | 0.18 | 2.69 | 2.34 | 3.04 | * | 102 | 100.00 | 42.16 | 86.27 |
| SW T3 with Bio | 7.88 | 0.52 | 0.60 | 0.49 | 0.72 | 0.85 | 0.47 | 1.23 | * | 102 | 100.00 | 58.82 | 94.12 |
| SW T4 | 11.75 | 0.02 | -0.05 | -0.12 | 0.02 | 3.16 | 2.93 | 3.39 | * | 102 | 100.00 | 44.12 | 86.27 |
| SW T4 with Bio | 8.53 | 0.38 | 0.50 | 0.37 | 0.62 | 1.37 | 0.95 | 1.78 | * | 102 | 100.00 | 56.86 | 94.12 |
| SW T5 | 12.46 | 0.0006 | -0.01 | -0.11 | 0.09 | 2.99 | 2.66 | 3.33 | * | 102 | 100.00 | 41.18 | 86.27 |
| SW T5 with Bio | 7.83 | 0.50 | 0.62 | 0.50 | 0.74 | 0.86 | 0.46 | 1.26 | * | 102 | 100.00 | 58.82 | 95.10 |

Table 2.3. Comparison of observed and predicted ages for probabilistic neural networks on samples of school whiting for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| SWAllData | 14.50 | 0.25 | 0.80 | 0.53 | 1.07 | 0.78 | -0.12 | 1.67 | NS | 102.00 | 100.00 | 33.33 | 79.41 |
| SWBio & transect | 5.74 | 0.57 | 0.90 | 0.75 | 1.06 | 0.49 | -0.02 | 1.002 | NS | 102.00 | 100.00 | 64.71 | 93.14 |
| SWBio | 5.51 | 0.66 | 0.93 | 0.79 | 1.06 | 0.31 | -0.13 | 0.75 | NS | 102.00 | 100.00 | 66.67 | 98.04 |
| SW T1 | 16.52 | 0.0006 | 0.03 | -0.18 | 0.25 | 2.94 | 2.19 | 3.69 | * | 101.00 | 99.01 | 34.65 | 79.21 |
| SW T1 with Bio | 7.99 | 0.47 | 0.83 | 0.65 | 1.00 | 0.65 | 0.08 | 1.21 | * | 102.00 | 100.00 | 53.92 | 92.16 |
| SW T2 | 16.09 | 0.02 | 0.20 | -0.03 | 0.43 | 2.36 | 1.60 | 3.12 | * | 102.00 | 100.00 | 38.24 | 75.49 |
| SW T2 with Bio | 8.76 | 0.44 | 0.83 | 0.64 | 1.01 | 0.70 | 0.09 | 1.30 | * | 102.00 | 100.00 | 50.00 | 92.16 |
| SW T3 | 19.17 | <0.0001 | -0.003 | -0.24 | 0.24 | 3.07 | 2.28 | 3.88 | * | 102.00 | 100.00 | 28.43 | 71.57 |
| SW T3 with Bio | 7.85 | 0.47 | 0.72 | 0.57 | 0.87 | 0.85 | 0.35 | 1.35 | * | 102.00 | 100.00 | 51.96 | 97.06 |
| SW T4 | 16.54 | 0.02 | 0.20 | -0.05 | 0.44 | 2.54 | 1.73 | 3.36 | * | 102.00 | 100.00 | 34.31 | 71.57 |
| SW T4 with Bio | 9.40 | 0.41 | 0.82 | 0.63 | 1.01 | 0.66 | 0.02 | 1.30 | * | 102.00 | 100.00 | 48.04 | 92.17 |
| SW T5 | 22.66 | 0.01 | 0.16 | -0.10 | 0.42 | 2.32 | 1.45 | 3.18 | * | 98.00 | 96.08 | 20.41 | 67.35 |
| SW T5 with Bio | 8.10 | 0.44 | 0.89 | 0.69 | 1.09 | 0.54 | -0.11 | 1.20 | NS | 102.00 | 100.00 | 54.90 | 88.24 |

Table 3.1. Comparison of observed and predicted ages for back propagation neural networks on samples of ling for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| LGAllData | 14.30 | 0.30 | 0.31 | 0.26 | 0.35 | 2.16 | 1.96 | 2.37 | * | 445 | 100.00 | 36.18 | 76.63 |
| LGBio & transect | 10.41 | 0.62 | 0.79 | 0.73 | 0.85 | 0.48 | 0.21 | 0.74 | * | 445 | 100.00 | 48.09 | 87.64 |
| LGBio | 8.25 | 0.75 | 0.85 | 0.81 | 0.90 | 0.43 | 0.22 | 0.64 | * | 445 | 100.00 | 52.13 | 89.89 |
| LG T1 | 17.90 | 0.09 | 0.10 | 0.07 | 0.136 | 2.75 | 2.60 | 2.89 | * | 445 | 100.00 | 29.66 | 70.11 |
| LG T1 with Bio | 9.50 | 0.79 | 0.84 | 0.80 | 0.88 | 0.32 | 0.14 | 0.51 | * | 445 | 100.00 | 46.52 | 87.64 |
| LG T2 | 17.77 | 0.004 | 0.01 | -0.006 | 0.03 | 3.24 | 3.15 | 3.33 | * | 445 | 100.00 | 29.44 | 69.66 |
| LG T2 with Bio | 9.61 | 0.78 | 0.91 | 0.86 | 0.95 | 0.10 | -0.11 | 0.31 | * | 445 | 100.00 | 46.29 | 88.31 |
| LG T3 | 20.47 | 0.10 | 0.15 | 0.11 | 0.19 | 2.35 | 2.16 | 2.54 | * | 445 | 100.00 | 25.39 | 66.29 |
| LG T3 with Bio | 10.43 | 0.75 | 0.79 | 0.74 | 0.83 | 0.41 | 0.21 | 0.61 | * | 445 | 100.00 | 44.49 | 85.84 |
| LG T4 | 16.95 | 0.06 | 0.06 | 0.04 | 0.08 | 3.13 | 3.03 | 3.23 | * | 445 | 100.00 | 32.13 | 70.11 |
| LG T4 with Bio | 9.59 | 0.75 | 0.85 | 0.80 | 0.89 | 0.33 | 0.12 | 0.54 | * | 445 | 100.00 | 47.19 | 86.29 |
| LG T5 | 16.87 | 0.07 | 0.05 | 0.04 | 0.07 | 3.08 | 3.00 | 3.16 | * | 445 | 100.00 | 32.13 | 71.69 |
| LG T5 with Bio | 9.03 | 0.79 | 0.94 | 0.89 | 0.98 | 0.03 | -0.17 | 0.24 | * | 445 | 100.00 | 49.21 | 88.54 |

Table 3.2. Comparison of observed and predicted ages for multiple hidden layer neural networks on samples of ling for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| LGAllData | 12.10 | 0.52 | 0.58 | 0.53 | 0.63 | 1.31 | 1.08 | 1.55 | * | 445 | 100.00 | 41.80 | 81.80 |
| LGBio & transect | 8.30 | 0.84 | 0.998 | 0.96 | 1.03 | -0.17 | -0.36 | 0.01 | NS | 445 | 100.00 | 51.69 | 90.34 |
| LGBio | 8.40 | 0.79 | 0.85 | 0.81 | 0.89 | 0.47 | 0.28 | 0.66 | * | 445 | 100.00 | 51.24 | 92.13 |
| LG T1 | 16.74 | 0.06 | 0.06 | 0.04 | 0.09 | 3.12 | 3.01 | 3.23 | * | 445 | 100.00 | 30.79 | 73.03 |
| LG T1 with Bio | 10.98 | 0.73 | 0.78 | 0.73 | 0.82 | 0.47 | 0.27 | 0.67 | * | 445 | 100.00 | 42.02 | 84.04 |
| LG T2 | 18.23 | <0.0001 | 0.005 | -0.009 | 0.01 | 3.02 | 2.98 | 3.07 | * | 445 | 100.00 | 30.79 | 69.21 |
| LG T2 with Bio | 10.29 | 0.74 | 0.97 | 0.92 | 1.02 | -0.04 | -0.29 | 0.21 | NS | 445 | 100.00 | 44.72 | 86.52 |
| LG T3 | 20.47 | 0.11 | 0.15 | 0.11 | 0.19 | 2.35 | 2.16 | 2.54 | * | 445 | 100.00 | 25.39 | 66.29 |
| LG T3 with Bio | 10.76 | 0.72 | 0.72 | 0.68 | 0.77 | 0.59 | 0.40 | 0.78 | * | 445 | 100.00 | 30.79 | 81.80 |
| LG T4 | 17.86 | 0.04 | 0.10 | 0.05 | 0.14 | 2.89 | 2.68 | 3.11 | * | 445 | 100.00 | 28.99 | 69.44 |
| LG T4 with Bio | 9.86 | 0.73 | 0.81 | 0.77 | 0.86 | 0.53 | 0.31 | 0.74 | * | 445 | 100.00 | 45.62 | 88.54 |
| LG T5 | 16.88 | 0.05 | 0.07 | 0.04 | 0.10 | 3.32 | 3.19 | 3.45 | * | 445 | 100.00 | 32.58 | 68.76 |
| LG T5 with Bio | 10.03 | 0.73 | 0.77 | 0.73 | 0.82 | 0.77 | 0.57 | 0.98 | * | 445 | 100.00 | 44.94 | 87.42 |

Table 3.3. Comparison of observed and predicted ages for probabilistic neural networks on samples of ling for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| LGAllData | 17.23 | 0.53 | 0.77 | 0.70 | 0.83 | 0.68 | 0.38 | 0.98 | * | 431 | 96.85 | 27.84 | 71.93 |
| LGBio & transect | 8.11 | 0.83 | 0.95 | 0.91 | 0.99 | 0.32 | 0.14 | 0.51 | * | 445 | 100.00 | 51.91 | 88.54 |
| LGBio | 9.20 | 0.82 | 0.95 | 0.91 | 0.99 | 0.34 | 0.15 | 0.53 | * | 444 | 99.77 | 47.75 | 87.61 |
| LG T1 | 31.45 | 0.07 | 0.38 | 0.25 | 0.51 | 2.58 | 1.98 | 3.17 | * | 420 | 94.38 | 15.48 | 46.67 |
| LG T1 with Bio | 14.41 | 0.75 | 1.02 | 0.96 | 1.07 | -0.06 | -0.31 | 0.19 | NS | 445 | 100.00 | 34.61 | 79.10 |
| LG T2 | 30.84 | 0.05 | 0.29 | 0.17 | 0.42 | 2.58 | 2.02 | 3.14 | * | 422 | 94.83 | 16.11 | 46.21 |
| LG T2 with Bio | 12.13 | 0.80 | 1.03 | 0.98 | 1.08 | -0.23 | -0.45 | -0.002 | * | 445 | 100.00 | 42.92 | 83.60 |
| LG T3 | 27.85 | 0.03 | 0.19 | 0.08 | 0.30 | 3.00 | 2.52 | 3.47 | * | 407 | 91.46 | 16.22 | 50.61 |
| LG T3 with Bio | 11.77 | 0.67 | 0.82 | 0.76 | 0.87 | 0.69 | 0.45 | 0.93 | * | 439 | 98.65 | 36.90 | 81.09 |
| LG T4 | 29.13 | 0.05 | 0.27 | 0.15 | 0.38 | 3.09 | 2.57 | 3.61 | * | 420 | 94.38 | 17.14 | 47.38 |
| LG T4 with Bio | 10.69 | 0.81 | 0.996 | 0.95 | 1.04 | -0.13 | -0.34 | 0.076 | NS | 445 | 100.00 | 44.04 | 83.60 |
| LG T5 | 29.92 | 0.006 | 0.09 | -0.03 | 0.21 | 3.09 | 2.58 | 3.60 | * | 399 | 89.66 | 19.05 | 44.11 |
| LG T5 with Bio | 12.24 | 0.76 | 0.95 | 0.90 | 0.996 | 0.07 | -0.16 | 0.30 | * | 445 | 100.00 | 40.67 | 81.35 |

Table 4.1. Comparison of observed and predicted ages for back propagation neural networks on samples of snapper for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| SNAllData | 13.51 | 0.76 | 1.04 | 0.95 | 1.12 | -0.40 | -1.02 | 0.22 | NS | 197 | 100.00 | 42.64 | 62.94 |
| SNBio & transect | 7.37 | 0.83 | 0.94 | 0.88 | 1.004 | 0.16 | -0.31 | 0.63 | NS | 197 | 100.00 | 51.27 | 78.68 |
| SNBio | 9.45 | 0.85 | 1.04 | 0.98 | 1.10 | -0.28 | -0.76 | 0.20 | NS | 197 | 100.00 | 44.16 | 70.56 |
| SN T1 | 23.83 | 0.25 | 0.50 | 0.38 | 0.62 | 1.66 | 0.72 | 2.60 | * | 197 | 100.00 | 31.47 | 48.73 |
| SN T1 with Bio | 9.11 | 0.81 | 1.01 | 0.94 | 1.08 | -0.09 | -0.62 | 0.45 | NS | 197 | 100.00 | 45.18 | 71.07 |
| SN T2 | 23.88 | 0.23 | 0.36 | 0.27 | 0.45 | 2.20 | 1.49 | 2.91 | * | 197 | 100.00 | 26.90 | 46.19 |
| SN T2 with Bio | 7.85 | 0.83 | 0.94 | 0.88 | 0.998 | 0.14 | -0.32 | 0.60 | * | 197 | 100.00 | 47.72 | 73.10 |
| SN T3 | 20.42 | 0.29 | 0.52 | 0.40 | 0.63 | 1.93 | 1.04 | 2.81 | * | 197 | 100.00 | 31.47 | 53.30 |
| SN T3 with Bio | 7.97 | 0.79 | 0.93 | 0.86 | 0.995 | 0.23 | -0.28 | 0.74 | * | 197 | 100.00 | 49.24 | 74.11 |
| SN T4 | 23.58 | 0.20 | 0.23 | 0.16 | 0.29 | 2.75 | 2.26 | 3.25 | * | 197 | 100.00 | 22.84 | 47.21 |
| SN T4 with Bio | 8.79 | 0.83 | 0.94 | 0.88 | 1.003 | 0.10 | -0.36 | 0.57 | NS | 197 | 100.00 | 43.15 | 71.57 |
| SN T5 | 19.20 | 0.32 | 0.43 | 0.34 | 0.52 | 2.10 | 1.41 | 2.79 | * | 197 | 100.00 | 28.43 | 48.73 |
| SN T5 with Bio | 6.83 | 0.84 | 1.01 | 0.95 | 1.07 | -0.01 | -0.49 | 0.46 | NS | 197 | 100.00 | 50.76 | 74.62 |

Table 4.2. Comparison of observed and predicted ages for multiple hidden layer neural networks on samples of snapper for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| SNAllData | 12.23 | 0.71 | 1.003 | 0.91 | 1.09 | 0.08 | -0.61 | 0.77 | NS | 197 | 100.00 | 42.64 | 63.96 |
| SNBio & transect | 6.80 | 0.88 | 1.02 | 0.97 | 1.07 | -0.06 | -0.47 | 0.34 | NS | 197 | 100.00 | 49.75 | 76.65 |
| SNBio | 7.92 | 0.84 | 1.005 | 0.94 | 1.07 | -0.10 | -0.58 | 0.37 | NS | 197 | 100.00 | 47.21 | 72.08 |
| SN T1 | 23.08 | 0.25 | 0.52 | 0.39 | 0.64 | 1.77 | 0.80 | 2.74 | * | 197 | 100.00 | 33.50 | 48.22 |
| SN T1 with Bio | 9.64 | 0.76 | 0.92 | 0.85 | 0.99 | 0.27 | -0.29 | 0.83 | * | 197 | 100.00 | 44.67 | 68.53 |
| SN T2 | 24.80 | 0.28 | 0.42 | 0.32 | 0.51 | 1.92 | 1.19 | 2.66 | * | 197 | 100.00 | 27.92 | 45.69 |
| SN T2 with Bio | 10.43 | 0.84 | 1.04 | 0.98 | 1.07 | -0.30 | -0.79 | 0.19 | NS | 197 | 100.00 | 42.13 | 66.50 |
| SN T3 | 21.26 | 0.35 | 0.59 | 0.47 | 0.70 | 1.70 | 0.83 | 2.66 | * | 197 | 100.00 | 33.50 | 53.81 |
| SN T3 with Bio | 7.84 | 0.84 | 1.09 | 1.02 | 1.15 | -0.33 | -0.83 | 0.16 | * | 197 | 100.00 | 51.27 | 73.60 |
| SN T4 | 21.54 | 0.27 | 0.41 | 0.31 | 0.50 | 2.56 | 1.83 | 3.29 | * | 197 | 100.00 | 25.38 | 43.65 |
| SN T4 with Bio | 9.85 | 0.73 | 0.89 | 0.81 | 0.96 | 0.35 | -0.32 | 0.92 | * | 197 | 100.00 | 47.21 | 69.54 |
| SN T5 | 17.19 | 0.51 | 0.80 | 0.69 | 0.91 | 0.96 | 0.11 | 1.82 | * | 197 | 100.00 | 28.93 | 51.78 |
| SN T5 with Bio | 8.99 | 0.81 | 0.94 | 0.87 | 1.004 | 0.24 | -0.26 | 0.74 | * | 197 | 100.00 | 47.21 | 72.59 |

Table 4.3. Comparison of observed and predicted ages for probabilistic neural networks on samples of snapper for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| SNAllData | 9.18 | 0.81 | 1.009 | 0.94 | 1.08 | 0.29 | -0.23 | 0.82 | NS | 197 | 100.00 | 47.21 | 59.40 |
| SNBio & transect | 5.60 | 0.89 | 1.02 | 0.97 | 1.07 | 0.13 | -0.25 | 0.52 | NS | 197 | 100.00 | 54.82 | 80.71 |
| SNBio | 8.11 | 0.87 | 1.05 | 0.99 | 1.11 | -0.06 | -0.50 | 0.37 | NS | 197 | 100.00 | 48.73 | 79.70 |
| SN T1 | 32.15 | 0.13 | 0.44 | 0.28 | 0.61 | 3.95 | 2.68 | 5.21 | * | 197 | 100.00 | 18.71 | 41.12 |
| SN T1 with Bio | 7.20 | 0.89 | 1.007 | 0.96 | 1.06 | 0.08 | -0.31 | 0.47 | NS | 197 | 100.00 | 49.24 | 79.19 |
| SN T2 | 37.21 | 0.25 | 0.63 | 0.47 | 0.78 | 1.99 | 0.81 | 3.18 | * | 197 | 100.00 | 14.72 | 37.06 |
| SN T2 with Bio | 8.06 | 0.82 | 0.96 | 0.89 | 1.02 | 0.35 | -0.14 | 0.83 | NS | 197 | 100.00 | 43.65 | 70.56 |
| SN T3 | 25.61 | 0.48 | 0.83 | 0.70 | 0.95 | 0.84 | -0.09 | 1.78 | * | 197 | 100.00 | 31.98 | 55.33 |
| SN T3 with Bio | 8.41 | 0.82 | 0.97 | 0.91 | 1.03 | 0.37 | -0.12 | 0.87 | NS | 196 | 99.49 | 46.94 | 72.45 |
| SN T4 | 30.60 | 0.25 | 0.54 | 0.41 | 0.67 | 2.36 | 1.34 | 3.39 | * | 194 | 98.48 | 20.62 | 43.30 |
| SN T4 with Bio | 7.16 | 0.85 | 0.98 | 0.92 | 1.04 | 0.30 | -0.15 | 0.74 | NS | 197 | 100.00 | 49.75 | 76.65 |
| SN T5 | 17.45 | 0.55 | 0.86 | 0.75 | 0.97 | 1.50 | 0.66 | 2.34 | * | 197 | 100.00 | 30.96 | 53.81 |
| SN T5 with Bio | 7.64 | 0.88 | 0.99 | 0.94 | 1.04 | 0.19 | -0.21 | 0.59 | NS | 197 | 100.00 | 43.64 | 74.11 |

Table 5.1. Comparison of observed and predicted ages for back propagation neural networks on samples of black bream for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| BBAllData | 8.77 | 0.82 | 0.90 | 0.84 | 0.96 | 0.74 | 0.21 | 1.28 | * | 182 | 100.00 | 54.40 | 77.47 |
| BBBio & transect | 7.55 | 0.87 | 0.92 | 0.87 | 0.98 | 0.80 | 0.34 | 1.26 | * | 182 | 100.00 | 59.34 | 80.77 |
| BBBio | 9.60 | 0.80 | 0.88 | 0.81 | 0.94 | 1.20 | 0.63 | 1.77 | * | 182 | 100.00 | 53.85 | 77.47 |
| BB T1 | 19.21 | 0.30 | 0.37 | 0.29 | 0.46 | 3.91 | 3.17 | 4.65 | * | 182 | 100.00 | 34.07 | 55.49 |
| BB T1 with Bio | 9.08 | 0.83 | 0.93 | 0.87 | 0.996 | 0.75 | 0.21 | 1.29 | * | 182 | 100.00 | 54.95 | 78.02 |
| BB T2 | 13.24 | 0.60 | 0.63 | 0.55 | 0.70 | 2.22 | 1.57 | 2.87 | * | 182 | 100.00 | 42.86 | 68.13 |
| BB T2 with Bio | 6.27 | 0.91 | 0.94 | 0.90 | 0.99 | 0.45 | 0.07 | 0.84 | * | 182 | 100.00 | 62.64 | 84.07 |
| BB T3 | 17.83 | 0.39 | 0.45 | 0.37 | 0.54 | 3.27 | 2.55 | 4.00 | * | 182 | 100.00 | 34.62 | 55.49 |
| BB T3 with Bio | 7.26 | 0.88 | 0.92 | 0.87 | 0.97 | 0.73 | 0.29 | 1.17 | * | 182 | 100.00 | 57.69 | 82.42 |
| BB T4 | 18.30 | 0.27 | 0.35 | 0.26 | 0.43 | 3.89 | 3.16 | 4.62 | * | 182 | 100.00 | 37.91 | 56.04 |
| BB T4 with Bio | 7.43 | 0.86 | 0.93 | 0.88 | 0.99 | 0.62 | 0.14 | 1.10 | * | 182 | 100.00 | 60.44 | 80.22 |
| BB T5 | 17.39 | 0.40 | 0.42 | 0.34 | 0.49 | 4.14 | 3.49 | 4.79 | * | 182 | 100.00 | 31.32 | 57.69 |
| BB T5 with Bio | 6.23 | 0.92 | 0.96 | 0.91 | 0.997 | 0.41 | 0.04 | 0.77 | * | 182 | 100.00 | 60.99 | 85.16 |

Table 5.2. Comparison of observed and predicted ages for multiple layer neural networks on samples of black bream for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| BBAllData | 8.23 | 0.77 | 0.83 | 0.76 | 0.9 | 1.09 | 0.50 | 1.67 | * | 182 | 100.00 | 54.95 | 74.73 |
| BBBio & transect | 6.81 | 0.90 | 0.95 | 0.91 | 1.0002 | 0.38 | -0.02 | 0.78 | NS | 182 | 100.00 | 61.54 | 83.52 |
| BBBio | 9.22 | 0.77 | 0.81 | 0.75 | 0.89 | 1.79 | 1.23 | 2.36 | * | 182 | 100.00 | 58.24 | 76.37 |
| BB T1 | 18.64 | 0.29 | 0.43 | 0.33 | 0.53 | 3.99 | 3.13 | 4.84 | * | 182 | 100.00 | 36.26 | 57.69 |
| BB T1 with Bio | 8.32 | 0.86 | 0.91 | 0.85 | 0.96 | 0.63 | 0.16 | 1.10 | * | 182 | 100.00 | 56.59 | 80.22 |
| BB T2 | 12.46 | 0.66 | 0.68 | 0.61 | 0.75 | 1.70 | 1.07 | 2.33 | * | 182 | 100.00 | 45.60 | 69.78 |
| BB T2 with Bio | 7.44 | 0.89 | 0.95 | 0.90 | 0.998 | 0.46 | 0.03 | 0.89 | * | 182 | 100.00 | 61.54 | 84.62 |
| BB T3 | 17.53 | 0.36 | 0.52 | 0.41 | 0.62 | 3.00 | 2.08 | 3.85 | * | 182 | 100.00 | 35.16 | 58.24 |
| BB T3 with Bio | 8.49 | 0.83 | 0.89 | 0.83 | 0.95 | 0.69 | 0.17 | 1.20 | * | 182 | 100.00 | 54.95 | 79.12 |
| BB T4 | 16.94 | 0.32 | 0.39 | 0.31 | 0.48 | 3.70 | 2.97 | 4.44 | * | 182 | 100.00 | 40.11 | 58.79 |
| BB T4 with Bio | 9.12 | 0.80 | 0.88 | 0.81 | 0.94 | 1.07 | 0.52 | 1.63 | * | 182 | 100.00 | 56.04 | 76.92 |
| BB T5 | 15.24 | 0.48 | 0.59 | 0.50 | 0.68 | 3.08 | 2.29 | 3.86 | * | 182 | 100.00 | 40.66 | 61.54 |
| BB T5 with Bio | 7.13 | 0.90 | 0.94 | 0.90 | 0.99 | 0.52 | 0.12 | 0.91 | * | 182 | 100.00 | 57.14 | 84.07 |

Table 5.3. Comparison of observed and predicted ages for probabilistic neural networks on samples of black bream for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| BBAllData | 8.68 | 0.88 | 0.97 | 0.92 | 1.02 | 0.20 | -0.26 | 0.67 | NS | 182 | 100.00 | 49.45 | 78.02 |
| BBBio & transect | 6.99 | 0.88 | 0.90 | 0.86 | 0.95 | 0.61 | 0.18 | 1.03 | * | 182 | 100.00 | 62.64 | 80.22 |
| BBBio | 8.61 | 0.82 | 0.90 | 0.84 | 0.96 | 0.64 | 0.10 | 1.18 | * | 182 | 100.00 | 57.14 | 75.27 |
| BB T1 | 22.84 | 0.29 | 0.52 | 0.39 | 0.65 | 3.63 | 2.58 | 4.68 | * | 167 | 91.76 | 19.05 | 41.67 |
| BB T1 with Bio | 9.82 | 0.84 | 0.92 | 0.87 | 0.98 | 0.36 | -0.15 | 0.87 | * | 182 | 100.00 | 47.25 | 74.73 |
| BB T2 | 16.01 | 0.58 | 0.74 | 0.65 | 0.84 | 1.12 | 0.30 | 1.95 | * | 182 | 100.00 | 28.74 | 61.49 |
| BB T2 with Bio | 9.37 | 0.87 | 0.94 | 0.89 | 0.99 | 0.25 | -0.21 | 0.71 | * | 182 | 100.00 | 49.45 | 76.37 |
| BB T3 | 22.98 | 0.25 | 0.55 | 0.41 | 0.69 | 3.30 | 2.08 | 4.53 | * | 179 | 98.35 | 21.79 | 46.37 |
| BB T3 with Bio | 9.35 | 0.85 | 0.95 | 0.89 | 1.01 | 0.17 | -0.35 | 0.68 | NS | 182 | 100.00 | 50.55 | 77.47 |
| BB T4 | 22.77 | 0.22 | 0.47 | 0.34 | 0.60 | 2.97 | 1.84 | 4.10 | * | 180 | 98.90 | 27.22 | 49.44 |
| BB T4 with Bio | 9.01 | 0.85 | 0.95 | 0.89 | 1.01 | 0.25 | -0.27 | 0.78 | NS | 182 | 100.00 | 48.90 | 76.37 |
| BB T5 | 22.34 | 0.33 | 0.59 | 0.47 | 0.72 | 2.57 | 1.49 | 3.65 | * | 181 | 99.45 | 23.20 | 44.20 |
| BB T5 with Bio | 8.47 | 0.87 | 0.94 | 0.88 | 0.98 | 0.30 | -0.16 | 0.75 | * | 182 | 100.00 | 46.15 | 80.22 |

Table 6.1. Comparison of observed and predicted ages for back propagation neural networks on samples of sand flathead for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| SFAllData | 11.99 | 0.63 | 0.73 | 0.66 | 0.81 | 1.24 | 0.72 | 1.76 | * | 192 | 100.00 | 40.10 | 67.71 |
| SFBio & transect | 11.31 | 0.73 | 0.89 | 0.81 | 0.97 | 0.68 | 0.15 | 1.20 | * | 192 | 100.00 | 37.50 | 71.88 |
| SFBio | 20.10 | 0.49 | 0.68 | 0.58 | 0.78 | 0.81 | 0.15 | 1.46 | * | 192 | 100.00 | 21.88 | 51.04 |
| SF T1 | 17.08 | 0.52 | 0.68 | 0.59 | 0.77 | 1.23 | 0.60 | 1.86 | * | 192 | 100.00 | 30.73 | 53.13 |
| SF T1 with Bio | 11.58 | 0.71 | 0.81 | 0.73 | 0.88 | 0.87 | 0.37 | 1.37 | * | 192 | 100.00 | 39.06 | 70.83 |
| SF T2 | 19.09 | 0.31 | 0.47 | 0.37 | 0.57 | 2.40 | 1.73 | 3.06 | * | 192 | 100.00 | 24.48 | 56.25 |
| SF T2 with Bio | 11.09 | 0.69 | 0.84 | 0.76 | 0.93 | 0.82 | 0.28 | 1.37 | * | 192 | 100.00 | 35.42 | 69.79 |
| SF T3 | 21.29 | 0.34 | 0.59 | 0.48 | 0.71 | 1.41 | 0.62 | 2.19 | * | 192 | 100.00 | 28.65 | 51.56 |
| SF T3 with Bio | 9.45 | 0.77 | 0.90 | 0.84 | 0.98 | 0.65 | 0.18 | 1.12 | * | 192 | 100.00 | 44.79 | 75.52 |
| SF T4 | 16.41 | 0.47 | 0.69 | 0.59 | 0.80 | 0.998 | 0.29 | 1.71 | * | 192 | 100.00 | 35.94 | 59.38 |
| SF T4 with Bio | 10.68 | 0.76 | 0.87 | 0.80 | 0.94 | 0.68 | 0.21 | 1.15 | * | 192 | 100.00 | 37.50 | 72.92 |
| SF T5 | 16.41 | 0.47 | 0.69 | 0.29 | 0.80 | 0.998 | 0.29 | 1.71 | * | 192 | 100.00 | 35.94 | 59.38 |
| SF T5 with Bio | 12.42 | 0.71 | 0.83 | 0.75 | 0.90 | 0.75 | 0.25 | 1.26 | * | 192 | 100.00 | 35.42 | 65.63 |

Table 6.2. Comparison of observed and predicted ages for multiple hidden layer neural networks on samples of sand flathead for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| SFAllData | 12.01 | 0.64 | 0.84 | 0.75 | 0.93 | 0.79 | 0.18 | 1.39 | * | 192 | 100.00 | 43.75 | 64.58 |
| SFBio & transect | 11.31 | 0.73 | 0.89 | 0.81 | 0.97 | 0.68 | 0.15 | 1.20 | * | 192 | 100.00 | 37.50 | 71.88 |
| SFBio | 13.62 | 0.67 | 0.90 | 0.81 | 0.99 | 0.71 | 0.10 | 1.31 | * | 192 | 100.00 | 33.33 | 64.58 |
| SF T1 | 15.88 | 0.51 | 0.63 | 0.55 | 0.72 | 1.82 | 1.23 | 2.41 | * | 192 | 100.00 | 30.73 | 56.77 |
| SF T1 with Bio | 11.93 | 0.72 | 0.86 | 0.78 | 0.93 | 0.63 | 0.12 | 1.48 | * | 192 | 100.00 | 38.54 | 69.79 |
| SF T2 | 16.75 | 0.51 | 0.71 | 0.61 | 0.80 | 1.37 | 0.70 | 2.03 | * | 192 | 100.00 | 25.52 | 61.98 |
| SF T2 with Bio | 10.77 | 0.73 | 0.86 | 0.79 | 0.94 | 0.84 | 0.33 | 1.34 | * | 192 | 100.00 | 40.10 | 73.96 |
| SF T3 | 18.49 | 0.31 | 0.49 | 0.38 | 0.59 | 2.09 | 1.39 | 2.78 | * | 192 | 100.00 | 32.81 | 60.42 |
| SF T3 with Bio | 9.34 | 0.75 | 0.86 | 0.79 | 0.93 | 1.03 | 0.55 | 1.51 | * | 192 | 100.00 | 46.88 | 79.17 |
| SF T4 | 14.30 | 0.52 | 0.71 | 0.61 | 0.80 | 1.27 | 0.61 | 1.93 | * | 192 | 100.00 | 39.06 | 63.02 |
| SF T4 with Bio | 10.96 | 0.76 | 0.95 | 0.87 | 1.03 | 0.38 | -0.13 | 0.89 | NS | 192 | 100.00 | 40.63 | 70.83 |
| SF T5 | 17.98 | 0.41 | 0.72 | 0.60 | 0.84 | 1.30 | 0.48 | 2.12 | * | 192 | 100.00 | 30.73 | 56.25 |
| SF T5 with Bio | 13.59 | 0.70 | 0.93 | 0.84 | 1.02 | 0.24 | -0.35 | 0.83 | NS | 192 | 100.00 | 36.46 | 65.63 |

Table 6.3. Comparison of observed and predicted ages for probabilistic neural networks on samples of sand flathead for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| SFAllData | 11.75 | 0.74 | 0.97 | 0.89 | 1.05 | 0.06 | -0.49 | 0.62 | NS | 192 | 100.00 | 41.15 | 73.44 |
| SFBio & transect | 12.50 | 0.73 | 0.90 | 0.82 | 0.97 | 0.67 | 0.15 | 1.20 | * | 192 | 100.00 | 29.17 | 72.92 |
| SFBio | 12.91 | 0.66 | 0.90 | 0.80 | 0.99 | 0.92 | 0.30 | 1.54 | * | 192 | 100.00 | 31.25 | 66.67 |
| SF T1 | 27.08 | 0.30 | 0.59 | 0.46 | 0.73 | 1.61 | 0.75 | 2.47 | * | 188 | 97.92 | 19.68 | 46.81 |
| SF T1 with Bio | 13.71 | 0.74 | 0.91 | 0.83 | 0.99 | 0.22 | -0.30 | 0.74 | * | 192 | 100.00 | 35.94 | 68.75 |
| SF T2 | 27.42 | 0.29 | 0.54 | 0.41 | 0.66 | 1.27 | 0.46 | 2.07 | * | 180 | 93.75 | 23.89 | 51.11 |
| SF T2 with Bio | 12.92 | 0.71 | 0.89 | 0.81 | 0.97 | 0.55 | 0.009 | 1.09 | * | 192 | 100.00 | 34.38 | 70.83 |
| SF T3 | 27.19 | 0.14 | 0.44 | 0.28 | 0.59 | 2.86 | 1.84 | 3.89 | * | 188 | 97.92 | 23.40 | 48.40 |
| SF T3 with Bio | 12.01 | 0.70 | 0.93 | 0.84 | 1.01 | 0.77 | 0.19 | 1.36 | * | 192 | 100.00 | 39.06 | 69.27 |
| SF T4 | 20.86 | 0.33 | 0.61 | 0.49 | 0.73 | 1.53 | 0.70 | 2.36 | * | 191 | 99.48 | 27.75 | 56.02 |
| SF T4 with Bio | 11.65 | 0.75 | 0.93 | 0.86 | 1.01 | 0.42 | -0.09 | 0.94 | NS | 192 | 100.00 | 34.38 | 69.79 |
| SF T5 | 21.51 | 0.33 | 0.62 | 0.49 | 0.75 | 1.84 | 0.995 | 2.69 | * | 189 | 98.44 | 22.75 | 52.38 |
| SF T5 with Bio | 11.11 | 0.74 | 0.94 | 0.86 | 1.02 | 0.65 | 0.12 | 1.19 | * | 192 | 100.00 | 38.02 | 71.35 |

Table 7.1. Comparison of observed and predicted ages for back propagation neural networks on samples of blue grenadier for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| BGAllData | 6.55 | 0.82 | 0.82 | 0.78 | 0.86 | 0.90 | 0.58 | 1.22 | * | 306 | 100.00 | 45.75 | 85.62 |
| BGBio & transect | 6.79 | 0.82 | 0.81 | 0.77 | 0.85 | 1.04 | 0.73 | 1.37 | * | 306 | 100.00 | 45.75 | 84.31 |
| BGBio | 5.89 | 0.86 | 0.84 | 0.80 | 0.88 | 1.06 | 0.77 | 1.35 | * | 306 | 100.00 | 49.35 | 86.27 |
| BG T1 | 15.33 | 0.09 | 0.18 | 0.12 | 0.25 | 3.75 | 3.25 | 4.24 | * | 306 | 100.00 | 41.50 | 71.90 |
| BG T1 with Bio | 6.35 | 0.85 | 0.84 | 0.80 | 0.88 | 0.84 | 0.55 | 1.14 | * | 306 | 100.00 | 47.71 | 85.29 |
| BG T2 | 16.75 | 0.06 | 0.10 | 0.05 | 0.14 | 3.81 | 3.47 | 4.15 | * | 306 | 100.00 | 36.93 | 70.26 |
| BG T2 with Bio | 6.33 | 0.85 | 0.90 | 0.85 | 0.94 | 0.60 | 0.29 | 0.92 | * | 306 | 100.00 | 46.73 | 84.31 |
| BG T3 | 14.73 | 0.19 | 0.28 | 0.22 | 0.35 | 3.14 | 2.63 | 3.64 | * | 306 | 100.00 | 36.60 | 72.55 |
| BG T3 with Bio | 6.14 | 0.86 | 0.87 | 0.83 | 0.91 | 0.75 | 0.46 | 1.05 | * | 306 | 100.00 | 47.06 | 83.66 |

Table 7.2. Comparison of observed and predicted ages for multiple hidden layer neural networks on samples of blue grenadier for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| BGAllData | 6.65 | 0.80 | 0.79 | 0.75 | 0.84 | 1.08 | 0.74 | 1.41 | * | 306 | 100.00 | 46.08 | 83.66 |
| BGBio & transect | 5.78 | 0.89 | 0.86 | 0.93 | 0.92 | 0.69 | 0.43 | 0.95 | * | 306 | 100.00 | 48.69 | 85.62 |
| BGBio | 6.00 | 0.88 | 0.90 | 0.86 | 0.93 | 0.71 | 0.42 | 0.99 | * | 306 | 100.00 | 48.04 | 84.13 |
| BG T1 | 13.76 | 0.19 | 0.29 | 0.22 | 0.36 | 3.36 | 2.84 | 3.87 | * | 306 | 100.00 | 40.20 | 74.51 |
| BG T1 with Bio | 5.77 | 0.90 | 0.91 | 0.87 | 0.94 | 0.52 | 0.26 | 0.78 | * | 306 | 100.00 | 49.02 | 84.31 |
| BG T2 | 13.87 | 0.17 | 0.26 | 0.20 | 0.33 | 3.62 | 3.13 | 4.11 | * | 306 | 100.00 | 40.20 | 72.22 |
| BG T2 with Bio | 5.79 | 0.88 | 0.87 | 0.83 | 0.90 | 0.79 | 0.52 | 1.06 | * | 306 | 100.00 | 49.02 | 86.93 |
| BG T3 | 13.27 | 0.25 | 0.38 | 0.30 | 0.46 | 3.20 | 2.64 | 3.77 | * | 306 | 100.00 | 35.62 | 74.18 |
| BG T3 with Bio | 6.80 | 0.87 | 0.96 | 0.92 | 1.003 | 0.26 | -0.06 | 0.57 | NS | 306 | 100.00 | 42.48 | 83.01 |

Table 7.3. Comparison of observed and predicted ages for probabilistic neural networks on samples of blue grenadier for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| BGAllData | 8.27 | 0.82 | 0.95 | 0.90 | 1.66 | 0.34 | -0.03 | 0.71 | NS | 299 | 97.71 | 35.45 | 81.27 |
| BGBio & transect | 7.87 | 0.83 | 0.89 | 0.84 | 0.94 | 0.49 | 0.15 | 0.82 | * | 287 | 93.79 | 37.63 | 79.09 |
| BGBio | 9.12 | 0.77 | 0.87 | 0.82 | 0.93 | 0.65 | 0.25 | 1.04 | * | 301 | 98.37 | 31.56 | 77.08 |
| BG T1 | 14.50 | 0.32 | 0.56 | 0.47 | 0.66 | 2.70 | 2.02 | 3.38 | * | 301 | 98.37 | 28.57 | 66.11 |
| BG T1 with Bio | 8.73 | 0.81 | 0.92 | 0.87 | 0.97 | 0.47 | 0.10 | 0.84 | * | 300 | 98.04 | 34.33 | 76.67 |
| BG T2 | 25.12 | 0.02 | 0.16 | 0.03 | 0.29 | 6.36 | 5.36 | 7.36 | * | 303 | 99.02 | 16.17 | 45.21 |
| BG T2 with Bio | 8.30 | 0.83 | 0.88 | 0.84 | 0.93 | 0.63 | 0.29 | 0.97 | * | 305 | 99.67 | 36.07 | 76.07 |
| BG T3 | 23.24 | 0.03 | 0.19 | 0.06 | 0.32 | 5.05 | 4.87 | 6.83 | * | 286 | 93.46 | 20.98 | 50.00 |
| BG T3 with Bio | 9.75 | 0.77 | 0.83 | 0.78 | 0.88 | 0.76 | 0.38 | 1.14 | * | 301 | 98.37 | 30.90 | 75.08 |

Table 8.1. Comparison of observed and predicted ages for back propagation neural networks on samples of ocean perch for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| OPAllData | 15.09 | 0.58 | 0.98 | 0.82 | 1.14 | -0.23 | -2.41 | 1.94 | NS | 114 | 100.00 | 25.44 | 39.47 |
| OPBio & transect | 8.41 | 0.73 | 0.82 | 0.74 | 0.93 | 2.58 | 1.26 | 3.91 | * | 114 | 100.00 | 29.82 | 52.63 |
| OPBio | 9.10 | 0.72 | 0.89 | 0.79 | 0.997 | 1.60 | 0.14 | 3.07 | * | 114 | 100.00 | 29.82 | 50.88 |
| OP T1 | 22.64 | 0.04 | 0.18 | 0.007 | 0.35 | 15.71 | 13.29 | 18.13 | * | 114 | 100.00 | 21.05 | 26.34 |
| OP T1 with Bio | 11.67 | 0.52 | 0.74 | 0.61 | 0.88 | 5.14 | 3.29 | 6.99 | * | 114 | 100.00 | 31.58 | 46.49 |
| OP T2 | 20.90 | 0.08 | 0.29 | 0.11 | 0.47 | 13.28 | 10.74 | 15.83 | * | 114 | 100.00 | 19.30 | 26.32 |
| OP T2 with Bio | 11.90 | 0.58 | 0.84 | 0.70 | 0.97 | 3.77 | 1.92 | 5.62 | * | 114 | 100.00 | 24.56 | 40.35 |
| OP T3 | 22.67 | 0.06 | 0.29 | 0.07 | 0.43 | 14.35 | 11.81 | 16.89 | * | 114 | 100.00 | 19.30 | 25.44 |
| OP T3 with Bio | 12.55 | 0.53 | 0.79 | 0.65 | 0.93 | 4.73 | 2.80 | 6.66 | * | 114 | 100.00 | 28.95 | 37.72 |
| OP T4 | 20.79 | 0.13 | 0.40 | 0.20 | 0.61 | 11.27 | 8.47 | 14.07 | * | 114 | 100.00 | 20.18 | 29.82 |
| OP T4 with Bio | 9.11 | 0.71 | 0.85 | 0.75 | 0.95 | 1.59 | 0.18 | 3.01 | * | 114 | 100.00 | 23.68 | 52.63 |
| OP T5 | 21.80 | 0.08 | 0.29 | 0.11 | 0.47 | 13.92 | 11.39 | 16.45 | * | 114 | 100.00 | 20.18 | 28.07 |
| OP T5 with Bio | 13.30 | 0.56 | 0.94 | 0.78 | 1.10 | 1.83 | -0.36 | 4.03 | NS | 114 | 100.00 | 29.82 | 41.23 |

Table 8.2. Comparison of observed and predicted ages for multiple hidden layer neural networks on samples of ocean perch for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| OPAllData | 17.25 | 0.40 | 0.75 | 0.57 | 0.92 | 2.74 | 0.36 | 5.13 | * | 114 | 100.00 | 27.19 | 40.35 |
| OPBio & transect | 7.84 | 0.78 | 0.84 | 0.75 | 0.92 | 2.45 | 1.28 | 3.62 | * | 114 | 100.00 | 29.82 | 55.26 |
| OPBio | 8.68 | 0.72 | 0.87 | 0.76 | 0.97 | 1.82 | 0.40 | 3.23 | * | 114 | 100.00 | 31.58 | 54.39 |
| OP T1 | 21.46 | 0.04 | 0.22 | 0.02 | 0.41 | 13.53 | 10.86 | 16.20 | * | 114 | 100.00 | 20.18 | 28.07 |
| OP T1 with Bio | 10.79 | 0.62 | 0.86 | 0.73 | 0.98 | 2.09 | 0.35 | 3.83 | * | 114 | 100.00 | 28.95 | 49.12 |
| OP T2 | 22.99 | 0.04 | 0.19 | 0.004 | 0.39 | 14.65 | 11.98 | 17.31 | * | 114 | 100.00 | 19.30 | 25.44 |
| OP T2 with Bio | 11.03 | 0.63 | 0.86 | 0.74 | 0.99 | 2.17 | 0.44 | 3.91 | * | 114 | 100.00 | 28.95 | 42.98 |
| OP T3 | 22.06 | 0.11 | 0.26 | 0.12 | 0.40 | 13.93 | 12.00 | 15.86 | * | 114 | 100.00 | 16.67 | 23.68 |
| OP T3 with Bio | 10.12 | 0.63 | 0.85 | 0.73 | 0.97 | 2.16 | 0.48 | 3.83 | * | 114 | 100.00 | 31.58 | 49.12 |
| OP T4 | 19.43 | 0.16 | 0.34 | 0.19 | 0.48 | 12.98 | 10.96 | 14.99 | * | 114 | 100.00 | 20.18 | 28.95 |
| OP T4 with Bio | 11.12 | 0.63 | 0.93 | 0.80 | 1.07 | 0.74 | -1.13 | 2.62 | NS | 114 | 100.00 | 28.07 | 46.49 |
| OP T5 | 19.27 | 0.13 | 0.39 | 0.20 | 0.58 | 10.65 | 8.02 | 13.28 | * | 114 | 100.00 | 21.05 | 28.95 |
| OP T5 with Bio | 17.24 | 0.61 | 0.81 | 0.69 | 0.93 | 2.42 | 0.73 | 4.12 | * | 114 | 100.00 | 27.19 | 45.61 |

Table 8.3. Comparison of observed and predicted ages for probabilistic neural networks on samples of ocean perch for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| OPAllData | 11.91 | 0.61 | 0.73 | 0.63 | 0.84 | 3.52 | 1.98 | 5.05 | * | 114 | 100.00 | 20.18 | 39.47 |
| OPBio & transect | 6.40 | 0.82 | 0.88 | 0.81 | 0.96 | 1.24 | 0.17 | 2.31 | * | 114 | 100.00 | 32.46 | 63.16 |
| OPBio | 8.05 | 0.75 | 0.88 | 0.78 | 0.97 | 1.63 | 0.31 | 2.94 | * | 114 | 100.00 | 27.19 | 52.63 |
| OP T1 | 19.19 | 0.18 | 0.23 | 0.23 | 0.58 | 7.69 | 5.25 | 10.13 | * | 103 | 90.35 | 15.53 | 25.24 |
| OP T1 with Bio | 9.77 | 0.68 | 0.82 | 0.72 | 0.93 | 2.32 | 0.86 | 3.78 | * | 113 | 99.12 | 25.44 | 47.37 |
| OP T2 | 22.51 | 0.03 | 0.17 | -0.007 | 0.35 | 11.15 | 8.67 | 13.63 | * | 112 | 98.25 | 11.50 | 15.93 |
| OP T2 with Bio | 9.75 | 0.69 | 0.80 | 0.67 | 0.90 | 2.67 | 1.26 | 4.08 | * | 113 | 99.12 | 23.68 | 42.98 |
| OP T3 | 23.44 | 0.05 | 0.23 | 0.04 | 0.43 | 9.31 | 6.60 | 12.02 | * | 110 | 96.49 | 7.27 | 16.36 |
| OP T3 with Bio | 11.27 | 0.58 | 0.71 | 0.60 | 0.83 | 4.47 | 2.90 | 6.04 | * | 114 | 100.00 | 21.93 | 35.96 |
| OP T4 | 24.05 | 0.07 | 0.25 | 0.07 | 0.42 | 8.31 | 5.87 | 10.74 | * | 110 | 96.49 | 9.09 | 17.27 |
| OP T4 with Bio | 9.11 | 0.71 | 0.85 | 0.75 | 0.95 | 1.59 | 0.18 | 3.01 | * | 114 | 100.00 | 23.68 | 52.63 |
| OP T5 | 25.46 | 0.002 | 0.05 | -0.16 | 0.25 | 11.27 | 8.50 | 14.04 | * | 109 | 95.61 | 10.09 | 22.94 |
| OP T5 with Bio | 11.35 | 0.58 | 0.75 | 0.63 | 0.86 | 3.06 | 1.14 | 4.70 | * | 114 | 100.00 | 19.30 | 41.23 |

Table 9.1. Comparison of observed and predicted ages for neural network models trialed on samples of pilchards for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Data Input (Model type) | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| Pilchards (combined areas) : Back propagation | 7.16 | 0.73 | 0.78 | 0.74 | 0.81 | 0.52 | 0.42 | 0.61 | * | 691 | 100.00 | 66.71 | 98.99 |
| Pilchards (combined areas) : Multiple layer | 6.41 | 0.74 | 0.80 | 0.77 | 0.84 | 0.45 | 0.35 | 0.54 | * | 691 | 100.00 | 69.32 | 98.99 |
| Pilchards (combined areas) : Probabilistic | 7.64 | 0.72 | 0.90 | 0.85 | 0.94 | 0.31 | 0.19 | 0.42 | * | 691 | 100.00 | 67.58 | 97.54 |
| Pilchards (Coffin Bay) : Multiple layer | 6.71 | 0.53 | 0.71 | 0.58 | 0.84 | 0.82 | 0.38 | 1.26 | * | 102 | 100.00 | 61.76 | 97.06 |
| Pilchards (Lakes Entrance) : Multiple layer | 4.37 | 0.38 | 0.36 | 0.25 | 0.47 | 1.26 | 1.02 | 1.50 | * | 78 | 100.00 | 79.49 | 100.00 |
| Pilchards (Port Phillip Bay) : Multiple layer | 5.65 | 0.77 | 0.75 | 0.70 | 0.81 | 0.37 | 0.26 | 0.47 | * | 215 | 100.00 | 77.21 | 100.00 |
| Pilchards (Port Lincoln) : Multiple layer | 5.03 | 0.65 | 0.69 | 0.61 | 0.78 | 0.72 | 0.47 | 0.97 | * | 138 | 100.00 | 70.29 | 100.00 |
| Pilchards (Queensland) : Multiple layer | 5.26 | 0.67 | 0.77 | 0.69 | 0.86 | 0.74 | 0.44 | 1.04 | * | 156 | 100.00 | 66.02 | 98.08 |

Table 9.2. Comparison of observed and predicted ages for probabilistic neural network models trialed on samples of school whiting, snapper, ling, combined blue grenadier, winter and non-winter blue grenadie r for unscreened output data, including average percent error (APE), regression coefficients and 95% confidence limits. P = */NS if either slope or intercept are/not significantly different from 1 or 0 respectively.

| Species (Wint. Non-wint) | APE | $R^2$ | Regression Statistics | | | | | | P | N | % Classified | % Correct | % Within One Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slope | L 95% | U 95% | Intercept | L 95% | U 95% | | | | | |
| School whiting | 7.18 | 0.69 | 0.95 | 0.91 | 0.99 | 0.12 | -0.02 | 0.27 | * | 995 | 100.00 | 60 | 96.68 |
| Snapper | 6.01 | 0.88 | 0.93 | 0.90 | 0.96 | 0.46 | 0.23 | 0.69 | * | 475 | 100.00 | 54.95 | 82.11 |
| Ling | 9.88 | 0.84 | 1.01 | 0.97 | 1.04 | -0.21 | -0.34 | -0.07 | * | 623 | 100.00 | 50.56 | 92.13 |
| Blue grenadier (Wint. / non wint. Combined) | 5.73 | 0.89 | 0.94 | 0.92 | 0.96 | 0.51 | 0.34 | 0.69 | * | 939 | 100.00 | 49.20 | 80.40 |
| Blue grenadier (Non-winter) | 7.01 | 0.89 | 1.04 | 1.01 | 1.06 | -0.04 | -0.21 | 0.13 | * | 578 | 100.00 | 57.96 | 88.58 |
| Blue grenadier (Winter) | 10.38 | 0.61 | 1.01 | 0.92 | 1.01 | 0.69 | -0.25 | 1.63 | ns | 361 | 100.00 | 20.22 | 46.26 |

# APPENDIX 5. Age difference tables

### *King George Whiting*

Table 1.1.1. Age difference table for King George whiting from, network type: back propagation: data inputs: All biological, all transect data and all transect length. APE=2.06. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | | | | 3 |
| **0** | | **60** | **6** | **3** | **69** |
| 1 | | | 2 | 1 | 3 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.1.2. Age difference table for King George whiting from, network type: back propagation: data inputs: All biological and all transect lengths. APE= 2.06. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | | | | 3 |
| **0** | | **60** | **6** | **3** | **69** |
| 1 | | | 2 | 1 | 3 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.1.3. Age difference table for King George whiting from, network type: back propagation: data inputs: All biological data. APE= 2.32. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | | | | 3 |
| **0** | | **60** | **5** | **3** | **68** |
| 1 | | | 3 | 1 | 4 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.1.4. Age difference table for King George whiting from, network type: back propagation: data inputs: Harmonics from transect 1. APE= 3.67. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | 1 | | | 1 |
| -1 | 3 | 2 | | | 5 |
| **0** | | **57** | **6** | **1** | **64** |
| 1 | | | 2 | 2 | 4 |
| 2 | | | | 1 | 1 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.1.5. Age difference table for King George whiting from, network type: back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE= 2.06. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | | | | 3 |
| **0** | | **60** | **6** | **3** | **69** |
| 1 | | | 2 | 1 | 3 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.1.6. Age difference table for King George whiting from, network type: back propagation: data inputs: Harmonics from 2. APE= 3.43. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | 3 | | | 6 |
| **0** | | **57** | **6** | | **63** |
| 1 | | | 2 | 4 | 6 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.1.7. Age difference table for King George whiting from, network type: back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE= 2.47. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | 1 | | | | 1 |
| -1 | 2 | | 1 | | 3 |
| **0** | | **60** | **5** | **3** | **68** |
| 1 | | | 2 | 1 | 3 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.1.8. Age difference table for King George whiting from, network type: back propagation: data inputs: Harmonics from transect 3. APE= 3.09. Data from production set

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | 1 | | | | 1 |
| -1 | 2 | | | | 2 |
| **0** | | **60** | **7** | | **67** |
| 1 | | | 1 | 2 | 3 |
| 2 | | | | 2 | 2 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.1.9. Age difference table for King George whiting from, network type: back propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE= 2.20. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | 1 | | | | 1 |
| -1 | 2 | | | | 2 |
| **0** | | **60** | **7** | **2** | **69** |
| 1 | | | 1 | 2 | 3 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.1.10. Age difference table for King George whiting from, network type: back propagation: data inputs: Harmonics from transect 4. APE= 3.95. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | | | | 3 |
| **0** | | **60** | **2** | | **62** |
| 1 | | | 6 | 3 | 9 |
| 2 | | | | 1 | 1 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.1.11. Age difference table for King George whiting from, network type: back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE= 2.25. Data from production set

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | | | | 3 |
| **0** | | **60** | **6** | **2** | **68** |
| 1 | | | 2 | 2 | 4 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.1.12. Age difference table for King George whiting from, network type: back propagation: data inputs: Harmonics from transect 5. APE= 3.57. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | 2 | | | 5 |
| **0** | | **58** | **4** | **2** | **64** |
| 1 | | | 4 | 1 | 5 |
| 2 | | | | 1 | 1 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.1.13. Age difference table for King George whiting from, network type: back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE= 2.06. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | | | | 3 |
| **0** | | **60** | **6** | **3** | **69** |
| 1 | | | 2 | 1 | 3 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.1. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: All biological, all transect data and all transect length. APE= 2.70. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | | | | 3 |
| **0** | | **60** | **5** | **1** | **66** |
| 1 | | | 3 | 3 | 6 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.2. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: All biological and all transect lengths. APE= 2.25. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 2 | | | | 2 |
| **0** | **1** | **59** | **6** | **2** | **68** |
| 1 | | 1 | 2 | 2 | 5 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.3. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: All biological data. APE= 2.32. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | | | | 3 |
| **0** | | **60** | **5** | **3** | **68** |
| 1 | | | 3 | 1 | 4 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.4. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1. APE=3.12. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | 4 | | | 7 |
| **0** | | **56** | **6** | **3** | **65** |
| 1 | | | 2 | 1 | 3 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.5. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=2.28. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | 1 | | | | 1 |
| -1 | 2 | | | | 2 |
| **0** | | **60** | **6** | **3** | **69** |
| 1 | | | 2 | 1 | 3 |
| 2 | | | | | |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.6. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from 2. APE=3.16. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | 1 | | | 4 |
| **0** | | **59** | **5** | | **64** |
| 1 | | | 3 | 4 | 7 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.7. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=2.55. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | 1 | | | | 1 |
| -1 | 2 | | | | 2 |
| **0** | | **60** | **5** | **3** | **68** |
| 1 | | | 3 | 1 | 4 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.8. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3. APE=3.16. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | 1 | | | 4 |
| **0** | | **59** | **5** | | **64** |
| 1 | | | 3 | 4 | 7 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.9. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=2.10. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | 1 | | | | 1 |
| -1 | 1 | | | | 1 |
| **0** | **1** | **60** | **5** | **3** | **69** |
| 1 | | | 3 | 1 | 4 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.10. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4. APE=3.68. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | 1 | | | 4 |
| **0** | | **59** | **4** | | **63** |
| 1 | | | 4 | 3 | 7 |
| 2 | | | | 1 | 1 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.11. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=2.47. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | 1 | | | | 1 |
| -1 | 2 | | | | 2 |
| **0** | | **60** | **6** | **2** | **68** |
| 1 | | | 2 | 2 | 4 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.12. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5. APE=3.70. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 3 | 3 | | | 6 |
| **0** | | **57** | **5** | | **62** |
| 1 | | | 3 | 4 | 7 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.2.13. Age difference table for King George whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=2.47. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | 1 | | | | 1 |
| -1 | 2 | | | | 2 |
| **0** | | **60** | **6** | **2** | **68** |
| 1 | | | 2 | 2 | 4 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.3.1. Age difference table for King George whiting from, network type: probabilistic: data inputs: All biological, all transect data and all transect length. APE=2.50. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 2 | | | | 2 |
| **0** | **1** | **58** | **6** | **3** | **68** |
| 1 | | 2 | 2 | 1 | 5 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.3.2. Age difference table for King George whiting from, network type: probabilistic: data inputs: All biological and all transect lengths. APE=2.67. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 1 | 3 | 1 | | 5 |
| **0** | | **56** | **5** | **3** | **64** |
| 1 | | 1 | 2 | 1 | 4 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **1** | **60** | **8** | **4** | **73** |

Table 1.3.3. Age difference table for King George whiting from, network type: probabilistic: data inputs: All biological data. APE=4.10. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 1 | 2 | | | 3 |
| **0** | **2** | **52** | **7** | **3** | **64** |
| 1 | | 6 | 1 | 1 | 8 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.3.4. Age difference table for King George whiting from, network type: probabilistic: data inputs: Harmonics from transect 1. APE=3.89. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 2 | 4 | | | 6 |
| **0** | **1** | **55** | **4** | **2** | **62** |
| 1 | | 1 | 3 | 1 | 5 |
| 2 | | | | 1 | 1 |
| 3 | | | | | 0 |
| N | **3** | **60** | **7** | **4** | **74** |

Table 1.3.5. Age difference table for King George whiting from, network type: probabilistic: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=2.62. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | 1 | | | | 1 |
| -1 | 1 | 2 | | | 3 |
| **0** | **1** | **57** | **6** | **4** | **68** |
| 1 | | 1 | 2 | | 3 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.3.6. Age difference table for King George whiting from, network type: probabilistic: data inputs : Harmonics from 2. APE=4.48. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 2 | | 1 | | 3 |
| **0** | **1** | **56** | **4** | **1** | **62** |
| 1 | | 4 | 3 | 2 | 9 |
| 2 | | | | 1 | 1 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.3.7. Age difference table for King George whiting from, network type: probabilistic: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=3.14. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 2 | 1 | | | 3 |
| **0** | **1** | **56** | **7** | **2** | **66** |
| 1 | | 3 | 1 | 2 | 6 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.3.8. Age difference table for King George whiting from, network type: probabilistic: data inputs: Harmonics from transect 3. APE=5.11. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | 1 | | | | 1 |
| -1 | 1 | 4 | 5 | | 10 |
| **0** | **1** | **54** | **2** | **1** | **58** |
| 1 | | 2 | 1 | 2 | 5 |
| 2 | | | | 1 | 1 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.3.9. Age difference table for King George whiting from, network type: probabilistic: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=3.63. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 2 | | 1 | | 3 |
| **0** | **1** | **56** | **5** | **2** | **64** |
| 1 | | 4 | 2 | 1 | 7 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **3** | **74** |

Table 1.3.10. Age difference table for King George whiting from, network type: probabilistic: data inputs: Harmonics from transect 4. APE=6.44. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | 1 | | | | 1 |
| -2 | | | | | 0 |
| -1 | 1 | 2 | 2 | | 5 |
| **0** | **1** | **53** | **2** | **2** | **58** |
| 1 | | | | | 0 |
| 2 | | 5 | 4 | 1 | 10 |
| 3 | | | | 1 | 1 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.3.11. Age difference table for King George whiting from, network type: probabilistic: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=2.69. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | | | | | 0 |
| -1 | 2 | | | | 2 |
| **0** | **1** | **58** | **6** | **2** | **67** |
| 1 | | 2 | 2 | 2 | 6 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

Table 1.3.12. Age difference table for King George whiting from, network type: probabilistic: data inputs: Harmonics from transect 5. APE=8.84. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| Age class | | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | 1 | 2 | | | 3 |
| -1 | 2 | 5 | 1 | | 8 |
| **0** | | **45** | **3** | **1** | **49** |
| 1 | | 7 | 4 | 3 | 14 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **59** | **8** | **4** | **74** |

Table 1.3.13. Age difference table for King George whiting from, network type: probabilistic: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=3.61. Data from production set.

| | Observed age | | | | |
|---|---|---|---|---|---|
| | Age class | | | | |
| Difference | **1** | **2** | **3** | **4** | **All** |
| -3 | | | | | 0 |
| -2 | 1 | | | | 1 |
| -1 | 1 | | | | 1 |
| **0** | **1** | **56** | **6** | **3** | **66** |
| 1 | | 4 | 2 | 1 | 7 |
| 2 | | | | | 0 |
| 3 | | | | | 0 |
| N | **3** | **60** | **8** | **4** | **75** |

### *School whiting*

Table 2.1.1. Age difference table for school whiting from, network type: back propagation: data inputs: All biological, all transect data and all transect length. APE=9.14. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | 2 | 1 | | | | | 3 |
| -1 | 1 | 9 | 9 | | | | 19 |
| **0** | | **9** | **33** | **9** | | | **51** |
| 1 | | | 2 | 21 | 3 | | 26 |
| 2 | | | | | 2 | | 2 |
| 3 | | | | | | 1 | 1 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.1.2. Age difference table for school whiting from, network type: back propagation : data inputs : All biological and all transect lengths. APE=4.70. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | | | | | | 0 |
| -1 | 1 | 4 | 1 | | | | 6 |
| **0** | **2** | **14** | **43** | **13** | | | **72** |
| 1 | | 1 | | 17 | 5 | | 23 |
| 2 | | | | | | 1 | 1 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.1.3. Age difference table for school whiting from, network type: back propagation: data inputs: All biological data.. APE=4.95. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | | | | | | 0 |
| -1 | 1 | 3 | 3 | 1 | | | 8 |
| **0** | **2** | **15** | **40** | **13** | | | **70** |
| 1 | | 1 | 1 | 16 | 5 | | 23 |
| 2 | | | | | | 1 | 1 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.1.4. Age difference table for school whiting from, network type: back propagation: data inputs: Harmonics from transect 1. APE=12.09. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| Age class | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | 2 | 3 | | | | | 5 |
| -1 | 1 | 10 | 6 | | | | 17 |
| **0** | | **6** | **31** | **6** | | | **43** |
| 1 | | | 7 | 18 | 3 | | 28 |
| 2 | | | | 6 | 2 | | 8 |
| 3 | | | | | | 1 | 1 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.1.5. Age difference table for school whiting from, network type: back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=7.63. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| Age class | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | | 1 | | | | 1 |
| -1 | 2 | 5 | 3 | | | | 10 |
| **0** | **1** | **13** | **34** | **12** | | | **60** |
| 1 | | 1 | 5 | 18 | 3 | | 27 |
| 2 | | | 1 | | 2 | 1 | 4 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.1.6. Age difference table for school whiting from, network type: back propagation: data inputs: Harmonics from 2. APE=12.10. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| Age class | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | 2 | 2 | | | | | 4 |
| -1 | 1 | 14 | 2 | | | | 17 |
| **0** | | **3** | **39** | **1** | | | **43** |
| 1 | | | 3 | 26 | | | 29 |
| 2 | | | | 3 | 3 | | 6 |
| 3 | | | | | 2 | 1 | 3 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.1.7. Age difference table for school whiting from, network type: back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=7.34. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | | | | | | 0 |
| -1 | 2 | 3 | 8 | 2 | | | 15 |
| **0** | **1** | **16** | **30** | **11** | | | **58** |
| 1 | | | 6 | 16 | 3 | | 25 |
| 2 | | | | 1 | 2 | 1 | 4 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.1.8. Age difference table for school whiting from, network type: back propagation: data inputs: Harmonics from transect 3. APE=11.90. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | 2 | | | | | | 2 |
| -1 | 1 | 12 | | | | | 13 |
| **0** | | **7** | **37** | | | | **44** |
| 1 | | | 7 | 25 | | | 32 |
| 2 | | | | 5 | 4 | | 9 |
| 3 | | | | | 1 | 1 | 2 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.1.9. Age difference table for school whiting from, network type: back propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE= 6.34. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | | | | | | 0 |
| -1 | 1 | 5 | 1 | | | | 7 |
| **0** | **2** | **13** | **38** | **12** | | | **65** |
| 1 | | 1 | 5 | 17 | 4 | | 27 |
| 2 | | | | 1 | 1 | 1 | 3 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.1.10. Age difference table for school whiting from, network type: back propagation: data inputs: Harmonics from transect 4. APE= 12.71. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| Age class | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | 2 | 2 | | | | | 4 |
| -1 | 1 | 12 | 1 | | | | 14 |
| **0** | | **5** | **38** | **1** | | | **44** |
| 1 | | | 5 | 22 | | | 27 |
| 2 | | | | 7 | 3 | | 10 |
| 3 | | | | | 2 | 1 | 3 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.1.11. Age difference table for school whiting from, network type: back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=8.12. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| Age class | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | 2 | | | | | | 2 |
| -1 | 1 | 6 | | | | | 7 |
| **0** | | **13** | **38** | **8** | | | **59** |
| 1 | | | 6 | 21 | 3 | | 30 |
| 2 | | | | 1 | 1 | 1 | 3 |
| 3 | | | | | 1 | | 1 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.1.12. Age difference table for school whiting from, network type: back propagation: data inputs: Harmonics from transect 5. APE=12.71. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| Age class | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | 2 | 2 | | | | | 4 |
| -1 | 1 | 12 | 1 | | | | 14 |
| **0** | | **5** | **38** | **1** | | | **44** |
| 1 | | | 5 | 22 | | | 27 |
| 2 | | | | 7 | 3 | | 10 |
| 3 | | | | | 2 | 1 | 3 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.1.13. Age difference table for school whiting from, network type: back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE= 8.07. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | 1 | 1 | | | | 2 |
| -1 | 2 | 6 | 2 | 2 | | | 12 |
| **0** | **1** | **11** | **36** | **9** | | | **57** |
| 1 | | 1 | 5 | 18 | 3 | | 27 |
| 2 | | | | 1 | 2 | 1 | 4 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.1. Age difference table for school whiting from, network type: multiple hidden layer back propagation: data inputs: All biological, all transect data and all transect length. APE= 11.47. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | 2 | | | | | 2 |
| -1 | 1 | 1 | 6 | 2 | | | 10 |
| **0** | **2** | **15** | **20** | **9** | | | **46** |
| 1 | | 1 | 16 | 13 | 4 | | 34 |
| 2 | | | 2 | 6 | 1 | | 9 |
| 3 | | | | | | 1 | 1 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.2. Age difference table for school whiting from, network type: multiple hidden layer back propagation: data inputs: All biological and all transect lengths. APE=5.55. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | | | | | | 0 |
| -1 | 2 | 5 | 1 | | | | 8 |
| **0** | **1** | **13** | **42** | **13** | | | **69** |
| 1 | | 1 | 1 | 17 | 4 | | 23 |
| 2 | | | | | 1 | 1 | 2 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.3. Age difference table for school whiting from, network type: multiple hidden layer back propagation: data inputs: All biological data. APE= 5.08. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | | | | | | 0 |
| -1 | 1 | 2 | 2 | 1 | | | 6 |
| **0** | **2** | **16** | **40** | **12** | | | **70** |
| 1 | | 1 | 2 | 17 | 5 | | 25 |
| 2 | | | | | | | 0 |
| 3 | | | | | | 1 | 1 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.4. Age difference table for school whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1. APE=13.11. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | 3 | 1 | | | | | 4 |
| -1 | | 12 | 2 | | | | 14 |
| **0** | | **6** | **34** | **1** | | | **41** |
| 1 | | | 8 | 21 | | | 29 |
| 2 | | | | 8 | 5 | | 13 |
| 3 | | | | | | 1 | 1 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.5. Age difference table for school whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=8.19. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | 3 | | 1 | | | | 4 |
| -1 | | 8 | 1 | 1 | | | 10 |
| **0** | | **10** | **38** | **9** | | | **57** |
| 1 | | 1 | 4 | 20 | 5 | | 30 |
| 2 | | | | | | 1 | 1 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.6. Age difference table for school whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from 2. APE=11.94. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | 2 | | | | | 2 |
| -1 | 3 | 7 | 3 | | | | 13 |
| **0** | | **10** | **32** | **6** | | | **48** |
| 1 | | | 9 | 17 | | | 26 |
| 2 | | | | 7 | 2 | | 9 |
| 3 | | | | | 3 | 1 | 4 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.7. Age difference table for school whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=7.38. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | 1 | | | | | 1 |
| -1 | 1 | 3 | 6 | 2 | | | 12 |
| **0** | **2** | **13** | **33** | **11** | | | **59** |
| 1 | | 2 | 5 | 16 | 4 | | 27 |
| 2 | | | | 1 | 1 | 1 | 3 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.8. Age difference table for school whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3. APE=12.05. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | 2 | 4 | | | | | 6 |
| -1 | 1 | 10 | 1 | | | | 12 |
| **0** | | **5** | **34** | **4** | | | **43** |
| 1 | | | 9 | 24 | | | 33 |
| 2 | | | | 2 | 5 | | 7 |
| 3 | | | | | | 1 | 1 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.9. Age difference table for school whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=7.88. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | | | | | | 0 |
| -1 | 1 | 1 | 1 | | | | 3 |
| **0** | **2** | **17** | **29** | **12** | | | **60** |
| 1 | | 1 | 14 | 14 | 4 | | 33 |
| 2 | | | | 4 | 1 | 1 | 6 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.10. Age difference table for school whiting from, network type: multiple hidden layer back propagation : data inputs : Harmonics from transect 4. APE=11.75. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| Age class | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | 3 | 3 | | | | | 6 |
| -1 | | 15 | 1 | | | | 16 |
| **0** | | **1** | **42** | **2** | | | **45** |
| 1 | | | 1 | 26 | | | 27 |
| 2 | | | | 2 | 4 | | 6 |
| 3 | | | | | 1 | 1 | 2 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.11. Age difference table for school whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=8.53. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| Age class | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | 2 | | | | | | 2 |
| -1 | 1 | 4 | 4 | | | | 9 |
| **0** | | **14** | **31** | **13** | | | **58** |
| 1 | | 1 | 8 | 15 | 5 | | 29 |
| 2 | | | 1 | 2 | | 1 | 4 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.12. Age difference table for school whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5. APE=12.46. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| Age class | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | |
| -2 | 3 | | | | | | 3 |
| -1 | | 15 | 6 | | | | 21 |
| **0** | | **4** | **35** | **3** | | | **42** |
| 1 | | | 3 | 22 | | | 25 |
| 2 | | | | 5 | 3 | | 8 |
| 3 | | | | | 2 | 1 | 3 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.2.13. Age difference table for school whiting from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=7.83. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -3 | | | | | | | 0 |
| -2 | | | | | | | 0 |
| -1 | 1 | 2 | 3 | | | | 6 |
| **0** | **2** | **15** | **28** | **15** | | | **60** |
| 1 | | 2 | 13 | 13 | 3 | | 31 |
| 2 | | | | 2 | 2 | 1 | 5 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.3.1. Age difference table for school whiting from, network type: probabilistic: data inputs: All biological, all transect data and all transect length. APE=14.50. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | | 1 | | | | | 1 |
| -3 | | | 4 | | | | 4 |
| -2 | | 2 | 4 | 5 | | | 11 |
| -1 | 1 | 1 | 6 | 9 | | | 17 |
| **0** | **2** | **9** | **19** | **2** | **2** | | **34** |
| 1 | | 6 | 10 | 11 | 2 | 1 | 30 |
| 2 | | | 1 | 2 | 1 | | 4 |
| 3 | | | | 1 | | | 1 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.3.2. Age difference table for school whiting from, network type: probabilistic: data inputs: All biological and all transect lengths. APE=5.74. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | | | | | | | 0 |
| -3 | | | | | | | 0 |
| -2 | | 1 | 1 | 4 | | | 6 |
| -1 | 1 | 2 | 8 | 8 | | | 19 |
| **0** | **2** | **16** | **33** | **11** | **4** | | **66** |
| 1 | | | 2 | 7 | 1 | | 10 |
| 2 | | | | | | 1 | 1 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.3.3. Age difference table for school whiting from, network type: probabilistic: data inputs: All biological data. APE=5.51. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | | | | | | | 0 |
| -3 | | | | | | | 0 |
| -2 | | | 1 | 1 | | | 2 |
| -1 | 1 | 3 | 6 | 8 | | | 18 |
| **0** | **2** | **14** | **33** | **16** | **3** | | **68** |
| 1 | | 2 | 4 | 5 | 2 | 1 | 14 |
| 2 | | | | | | | 0 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.3.4. Age difference table for school whiting from, network type: probabilistic: data inputs: Harmonics from transect 1. APE=16.69. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| Age class | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | 1 | | | | | | 1 |
| -3 | 1 | 1 | | | | | 2 |
| -2 | 1 | 2 | 4 | | | | 7 |
| -1 | | 8 | 5 | 3 | | | 16 |
| **0** | | **4** | **25** | **5** | **1** | | **35** |
| 1 | | 4 | 9 | 14 | 2 | | 29 |
| 2 | | | | 5 | | | 5 |
| 3 | | | | 3 | 2 | | 5 |
| 4 | | | | | | 1 | 1 |
| N | **3** | **19** | **43** | **30** | **5** | **1** | **101** |

Table 2.3.5. Age difference table for school whiting from, network type: probabilistic: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=7.99. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| Age class | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | | | | | | | |
| -3 | | | | | | | |
| -2 | | 1 | 2 | 3 | | | 6 |
| -1 | 1 | 3 | 10 | 7 | | | 21 |
| **0** | **2** | **14** | **27** | **7** | **5** | | **55** |
| 1 | | 1 | 5 | 12 | | | 18 |
| 2 | | | | 1 | | 1 | 2 |
| 3 | | | | | | | |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.3.6. Age difference table for school whiting from, network type: probabilistic: data inputs: Harmonics from transect 2. APE=16.09. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| Age class | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | 1 | | | | | | 1 |
| -3 | | 1 | 2 | | | | 3 |
| -2 | 1 | 3 | 2 | | | | 6 |
| -1 | 1 | 4 | 7 | 1 | | | 13 |
| **0** | | **7** | **21** | **11** | | | **39** |
| 1 | | 4 | 8 | 11 | 2 | | 25 |
| 2 | | | 4 | 6 | 3 | | 13 |
| 3 | | | | 1 | | 1 | 2 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.3.7. Age difference table for school whiting from, network type: probabilistic: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=8.76. Data from production set.

| | | | Observed age | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | | | | | | | |
| -3 | | | 1 | | | | 1 |
| -2 | | 1 | | 4 | | | 5 |
| -1 | 1 | 2 | 16 | 6 | | | 25 |
| **0** | **2** | **13** | **22** | **13** | **1** | | **51** |
| 1 | | 3 | 5 | 7 | 3 | | 18 |
| 2 | | | | | 1 | 1 | 2 |
| 3 | | | | | | | |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.3.8. Age difference table for school whiting from, network type: probabilistic: data inputs: Harmonics from transect 3. APE=19.17. Data from production set.

| | | | Observed age | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | 2 | 3 | | | | | 5 |
| -3 | | 6 | 2 | | | | 8 |
| -2 | 1 | 4 | 12 | 3 | | | 20 |
| -1 | | 4 | 19 | 4 | 2 | | 29 |
| **0** | | **2** | **7** | **14** | | **1** | **24** |
| 1 | | | 4 | 5 | 2 | | 11 |
| 2 | | | | 4 | | | 4 |
| 3 | | | | | 1 | | 1 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.3.9. Age difference table for school whiting from, network type: probabilistic: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=7.85. Data from production set.

| | | | Observed age | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | | | | | | | 0 |
| -3 | | | | | | | 0 |
| -2 | | | | 2 | | | 2 |
| -1 | | 7 | 9 | 4 | | | 20 |
| **0** | **3** | **10** | **31** | **8** | **1** | | **53** |
| 1 | | 2 | 4 | 15 | 4 | 1 | 26 |
| 2 | | | | 1 | | | 1 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.3.10. Age difference table for school whiting from, network type: probabilistic: data inputs: Harmonics from transect 4. APE=16.54. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | | | | | | | 0 |
| -3 | | 2 | 3 | | | | 5 |
| -2 | 2 | 4 | 3 | 2 | | | 11 |
| -1 | 1 | 4 | 8 | 1 | | | 14 |
| **0** | | **6** | **22** | **7** | | | **35** |
| 1 | | 3 | 6 | 12 | 3 | | 24 |
| 2 | | | 2 | 6 | 2 | 1 | 11 |
| 3 | | | | 2 | | | 2 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.3.11. Age difference table for school whiting from, network type: probabilistic: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=9.40. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | | | | | | | 0 |
| -3 | | | 2 | | | | 2 |
| -2 | | 1 | 1 | 3 | | | 5 |
| -1 | 1 | 3 | 10 | 6 | | | 20 |
| **0** | **2** | **12** | **24** | **7** | **4** | | **49** |
| 1 | | 3 | 7 | 14 | 1 | | 25 |
| 2 | | | | | | 1 | 1 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

Table 2.3.12. Age difference table for school whiting from, network type: probabilistic: data inputs: Harmonics from transect 5. APE=22.66. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | | | | | | | 0 |
| -3 | 1 | 1 | | | | | 2 |
| -2 | 1 | 5 | 2 | 1 | | | 9 |
| -1 | 1 | 8 | 8 | 1 | | | 18 |
| **0** | | | **15** | **5** | | | **20** |
| 1 | | 5 | 9 | 9 | 4 | 1 | 28 |
| 2 | | | 9 | 7 | | | 16 |
| 3 | | | | 5 | | | 5 |
| N | **3** | **19** | **43** | **28** | **4** | **1** | **98** |

Table 2.3.13. Age difference table for school whiting from, network type: probabilistic: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=8.10. Data from production set.

| | Observed age | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age class | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -4 | | | | | | | 0 |
| -3 | | | 2 | | | | 2 |
| -2 | | 1 | | 6 | | | 7 |
| -1 | | 3 | 11 | 6 | | | 20 |
| **0** | **3** | **14** | **26** | **10** | **2** | **1** | **56** |
| 1 | | 1 | 5 | 8 | | | 14 |
| 2 | | | | | 3 | | 3 |
| 3 | | | | | | | 0 |
| N | **3** | **19** | **44** | **30** | **5** | **1** | **102** |

### *Ling*

Table 3.1.1. Age difference table for ling from, network type: back propagation: data inputs: All biological, all transect data and all transect length. APE=14.30. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | | | 1 | | | | | | | | | | 1 |
| -8 | | | | | | 1 | | | | | | | | | 1 |
| -7 | | | | | | | 1 | | | | | | | | 1 |
| -2 | 1 | 10 | | 6 | | | | | | | | | | | 17 |
| -1 | | 10 | 49 | | 12 | | | | | | | | | | 71 |
| **0** | | | **17** | **122** | **4** | **17** | | | | | | | | **1** | **161** |
| 1 | | | | 9 | 85 | 3 | 12 | | | | | | | | 109 |
| 2 | | | | | 8 | 29 | 1 | 8 | | | | | | | 46 |
| 3 | | | | | | | 6 | | 6 | | | | | | 12 |
| 4 | | | | | | | | | | 4 | | | | | 4 |
| 5 | | | | | | | | | | | 3 | | | | 3 |
| 6 | | | | | | | | | | 1 | | 8 | | | 9 |
| 7 | | | | | | | | | | | | | 3 | | 3 |
| 8 | | | | | | | | | | | | 1 | | 6 | 7 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.1.2. Age difference table for ling from, network type: back propagation: data inputs: All biological and all transect lengths. APE=10.41. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -4 | | | | | | | | 1 | | 2 | | | | | 3 |
| -3 | | | | | | | | | 1 | | 2 | | | | 3 |
| -2 | | | 1 | 1 | | | | | | | | 5 | | | 7 |
| -1 | 1 | 4 | 11 | 33 | 7 | | 1 | | 1 | | 1 | | 1 | | 60 |
| **0** | | **16** | **41** | **63** | **68** | **18** | | **2** | | | | | | **6** | **214** |
| 1 | | | 13 | 37 | 30 | 23 | 12 | | 1 | | | | | | 116 |
| 2 | | | | 3 | 5 | 8 | 7 | 3 | | | | | | | 26 |
| 3 | | | | | | 1 | | 1 | 3 | | | | | | 5 |
| 4 | | | | | | | | | | 3 | | | | 1 | 4 |
| 6 | | | | | | | | 1 | | | | 2 | | | 3 |
| 10 | | | | | | | | | | | | 2 | | | 2 |
| 11 | | | | | | | | | | | | | 2 | | 2 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.1.3. Age difference table for ling from, network type: back propagation: data inputs: All biological data. APE=8.25. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -5 | | | | | | | | | 2 | | | | | | 2 |
| -4 | | | | | | | | | | 2 | | | | | 2 |
| -3 | | | | | | | | | | | 2 | | | | 2 |
| -2 | | 2 | | | | | | 2 | | | | 5 | | | 9 |
| -1 | 1 | 5 | 34 | 27 | 5 | | | | | | | | 2 | | 74 |
| **0** | | **13** | **29** | **102** | **66** | **14** | | **1** | | | | | | **7** | **232** |
| 1 | | | 3 | 8 | 39 | 31 | 12 | | | | 1 | | | | 94 |
| 2 | | | | | | 5 | 8 | 4 | | | | 1 | | | 18 |
| 3 | | | | | | | | 1 | 4 | | | | | | 5 |
| 4 | | | | | | | | | | 3 | | | | | 3 |
| 6 | | | | | | | | | | | | 3 | | | 3 |
| 7 | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.1.4. Age difference table for ling from, network type: back propagation: data inputs: Harmonics from transect 1. APE=17.90. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -3 | 1 | 2 | 1 | | | | | | | | | | | | 4 |
| -2 | | 10 | 14 | | | | | | | | | | | | 24 |
| -1 | | 8 | 25 | 40 | 2 | | | | | | | | | | 75 |
| **0** | | | **26** | **63** | **42** | **1** | | | | | | | | | **132** |
| 1 | | | | 34 | 45 | 24 | 2 | | | | | | | | 105 |
| 2 | | | | | 21 | 16 | 10 | | | | | | | | 47 |
| 3 | | | | | | 9 | 8 | 7 | | | | | | | 24 |
| 4 | | | | | | | | 1 | 2 | 1 | | | | | 4 |
| 5 | | | | | | | | | 4 | 2 | | | | | 6 |
| 6 | | | | | | | | | | 2 | 2 | | | | 4 |
| 7 | | | | | | | | | | | | 9 | | | 9 |
| 8 | | | | | | | | | | | 1 | | 3 | | 4 |
| 9 | | | | | | | | | | | | | | 4 | 4 |
| 10 | | | | | | | | | | | | | | 2 | 2 |
| 11 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.1.5. Age difference table for ling from, network type: back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=9.50. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | | | | | | 1 | | | | | | | 1 |
| -4 | | | | | | | | | | 2 | | | | | 2 |
| -3 | | | | | | | 1 | | | | 1 | | | | 2 |
| -2 | | 1 | | 1 | | | | | | | | 1 | | | 3 |
| -1 | 1 | 6 | 31 | 14 | 5 | | 1 | | 2 | | | | 2 | | 62 |
| **0** | | **13** | **30** | **96** | **51** | **9** | | **2** | | | | | | **6** | **207** |
| 1 | | | 5 | 26 | 51 | 25 | 12 | | | | 2 | | | | 121 |
| 2 | | | | | 3 | 15 | 5 | 3 | | 1 | | 8 | | | 35 |
| 3 | | | | | | 1 | 1 | 2 | 4 | | | | 1 | | 9 |
| 4 | | | | | | | | | | 2 | | | | 1 | 3 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.1.6. Age difference table for ling from, network type: back propagation: data inputs: Harmonics from 2. APE=17.77. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -4 | 1 | | | | | | | | | | | | | | 1 |
| -3 | | 3 | 1 | | | | | | | | | | | | 4 |
| -2 | | 17 | 16 | | | | | | | | | | | | 33 |
| -1 | | | 49 | 36 | 1 | | | | | | | | | | 86 |
| **0** | | | | **101** | **30** | | | | | | | | | | **131** |
| 1 | | | | | 79 | 14 | | | | | | | | | 93 |
| 2 | | | | | | 36 | 7 | | | | | | | | 43 |
| 3 | | | | | | | 13 | 5 | | | | | | | 18 |
| 4 | | | | | | | | 3 | 2 | | | | | | 5 |
| 5 | | | | | | | | | 4 | 4 | | | | | 8 |
| 6 | | | | | | | | | | 1 | | | | | 1 |
| 7 | | | | | | | | | | | 3 | 6 | | | 9 |
| 8 | | | | | | | | | | | | 3 | | | 3 |
| 9 | | | | | | | | | | | | | 3 | | 3 |
| 10 | | | | | | | | | | | | | | 7 | 7 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.1.7. Age difference table for ling from, network type: back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=9.61. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | | | 2 | | | | | 2 |
| -3 | | | | | | | | | | | 3 | | | | 3 |
| -2 | | | | 1 | | | | 1 | | | | 3 | | | 5 |
| -1 | 1 | 14 | 18 | 14 | 11 | | 2 | | | | | | 3 | | 63 |
| **0** | | **6** | **47** | **88** | **39** | **17** | | **2** | | | | | | **7** | **206** |
| 1 | | | 1 | 34 | 56 | 17 | 13 | | 3 | | | | | | 124 |
| 2 | | | | | 4 | 15 | 5 | 3 | | 1 | | 2 | | | 30 |
| 3 | | | | | | 1 | | 1 | 2 | | | | | | 4 |
| 4 | | | | | | | | | | 2 | | 3 | | | 5 |
| 6 | | | | | | | | | | | | 1 | | | 1 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.1.8. Age difference table for ling from, network type: back propagation: data inputs: Harmonics from transect 3. APE=20.47. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -3 | | 4 | | | | | | | | | | | | | 4 |
| -2 | 1 | 1 | 20 | | | | | | | | | | | | 22 |
| -1 | | 15 | 3 | 41 | | | | | | | | | | | 59 |
| **0** | | | **43** | **13** | **56** | | | | | | | | | **1** | **113** |
| 1 | | | | 83 | 12 | 28 | | | | | | | | | 123 |
| 2 | | | | | 42 | 3 | 14 | | | | | | | | 59 |
| 3 | | | | | | 19 | 1 | 5 | | | | | | | 25 |
| 4 | | | | | | | 5 | 1 | 4 | | | | | | 10 |
| 5 | | | | | | | | 2 | 1 | 2 | | | | | 5 |
| 6 | | | | | | | | | 1 | | 2 | | | | 3 |
| 7 | | | | | | | | | | 3 | | 5 | | | 8 |
| 8 | | | | | | | | | | | 1 | 1 | 3 | | 5 |
| 9 | | | | | | | | | | | | 3 | | 6 | 9 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.1.9. Age difference table for ling from, network type: propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=10.43. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -5 | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | | | 1 | | | | | 1 |
| -2 | | | 1 | 1 | | 1 | | 1 | | | | 2 | | | 6 |
| -1 | 1 | 7 | 16 | 8 | 16 | | 4 | | 1 | | | | 1 | | 54 |
| **0** | | **13** | **42** | **86** | **28** | **21** | | **2** | | **1** | | | | **5** | **198** |
| 1 | | | 7 | 42 | 53 | 13 | 11 | | 2 | | 2 | | | | 130 |
| 2 | | | | | 13 | 14 | 4 | 3 | | 2 | | 2 | | | 38 |
| 3 | | | | | | 1 | 1 | 2 | 2 | | 1 | | | | 7 |
| 4 | | | | | | | | | | 1 | | 4 | | 1 | 6 |
| 5 | | | | | | | | | | | | | 2 | | 2 |
| 6 | | | | | | | | | | | | 1 | | 1 | 2 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.1.10. Age difference table for ling from, network type: back propagation: data inputs: Harmonics from transect 4. APE=16.95. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -4 | 1 | | | | | | | | | | | | | | 1 |
| -3 | | 5 | | | | | | | | | | | | | 5 |
| -2 | | 14 | 20 | 1 | | | | | | | | | | | 35 |
| -1 | | 1 | 44 | 37 | | | | | | | | | | | 82 |
| **0** | | | **2** | **98** | **43** | | | | | | | | | | **143** |
| 1 | | | | 1 | 64 | 21 | 1 | | | | | | | | 87 |
| 2 | | | | | 3 | 29 | 10 | 3 | | | | | | | 45 |
| 3 | | | | | | | 8 | 4 | | | | | | | 12 |
| 4 | | | | | | | 1 | | 2 | | | | | | 3 |
| 5 | | | | | | | | 1 | 4 | 4 | | | | | 9 |
| 6 | | | | | | | | | | 1 | 1 | | | | 2 |
| 7 | | | | | | | | | | | 2 | 8 | | | 10 |
| 8 | | | | | | | | | | | | 1 | 2 | 2 | 5 |
| 9 | | | | | | | | | | | | | 1 | 2 | 3 |
| 10 | | | | | | | | | | | | | | 3 | 3 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.1.11. Age difference table for ling from, network type: back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=9.59. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | | | | | 2 | | | | | | 2 |
| -4 | | | | | | | | | | 1 | | | | | 1 |
| -2 | | 1 | 3 | 1 | | | | 2 | | | | 3 | | | 10 |
| -1 | 1 | 6 | 18 | 27 | 6 | | 1 | | 1 | | | | 1 | | 61 |
| **0** | | **13** | **42** | **78** | **62** | **6** | | | | **2** | | | | **7** | **210** |
| 1 | | | 3 | 31 | 35 | 30 | 10 | | 1 | | 3 | | | | 113 |
| 2 | | | | | 7 | 14 | 7 | 4 | | | | 4 | | | 36 |
| 3 | | | | | | | 2 | 1 | 2 | | | | 1 | | 6 |
| 4 | | | | | | | | | | 1 | | 1 | | | 2 |
| 5 | | | | | | | | | | | | | 1 | | 1 |
| 6 | | | | | | | | | | 1 | | 1 | | | 2 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.1.12. Age difference table for ling from, network type: back propagation: data inputs: Harmonics from transect 5. APE=16.87. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -3 | 1 | 1 | | | | | | | | | | | | | 2 |
| -2 | | 19 | 14 | | | | | | | | | | | | 33 |
| -1 | | | 52 | 29 | | | | | | | | | | | 81 |
| **0** | | | | **108** | **35** | | | | | | | | | | **143** |
| 1 | | | | | 75 | 20 | | | | | | | | | 95 |
| 2 | | | | | | 30 | 9 | | | | | | | | 39 |
| 3 | | | | | | | 11 | 3 | | | | | | | 14 |
| 4 | | | | | | | | 5 | 2 | | | | | | 7 |
| 5 | | | | | | | | | 4 | 3 | | | | | 7 |
| 6 | | | | | | | | | | 2 | 2 | | | | 4 |
| 7 | | | | | | | | | | | 1 | 6 | | | 7 |
| 8 | | | | | | | | | | | | 3 | 2 | | 5 |
| 9 | | | | | | | | | | | | | 1 | 5 | 6 |
| 10 | | | | | | | | | | | | | | 2 | 2 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.1.13. Age difference table for ling from, network type: layer back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=9.03. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | 1 | | 3 | | | | | 4 |
| -3 | | | | | | | | | | | 1 | | | | 1 |
| -2 | | | | | | | | | | | | 5 | | | 5 |
| -1 | 1 | 12 | 29 | 15 | | 1 | 2 | | | | 2 | | 1 | | 63 |
| **0** | | **8** | **37** | **106** | **50** | **3** | **4** | **1** | | | | **3** | | **7** | **219** |
| 1 | | | | 15 | 59 | 28 | 4 | 1 | 3 | | | | 2 | | 112 |
| 2 | | | | 1 | 1 | 18 | 8 | 2 | 1 | | | | | | 31 |
| 3 | | | | | | | 2 | 2 | 1 | 2 | | | | | 7 |
| 7 | | | | | | | | | | | | 1 | | | 1 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.1. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: All biological, all transect data and all transect length. APE=12.10. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -5 | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | | | 3 | | | | | 3 |
| -2 | 1 | 6 | | 6 | | | | | | | | 3 | | | 16 |
| -1 | | 12 | 46 | 2 | 24 | | | | | | | | 1 | | 85 |
| **0** | | **2** | **18** | **122** | **14** | **26** | | | | | | | | **4** | **186** |
| 1 | | | 2 | 6 | 65 | 3 | 17 | | | | | | | | 93 |
| 2 | | | | 1 | 7 | 19 | 1 | 7 | | | | | | | 35 |
| 3 | | | | | | 2 | 2 | 1 | 5 | | | | | | 10 |
| 4 | | | | | | | | | | 1 | | | | | 1 |
| 5 | | | | | | | | | | | 3 | | | | 3 |
| 6 | | | | | | | | | | 1 | | 6 | | | 7 |
| 7 | | | | | | | | | | | | | 2 | | 2 |
| 8 | | | | | | | | | | | | | | 3 | 3 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.2. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: All biological and all transect lengths. APE=8.30. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -5 | | | | | | | | 2 | | | | | | | 2 |
| -4 | | | | | | | | | 3 | | | | | | 3 |
| -3 | | | | | | | | | | 2 | | | | | 2 |
| -2 | | | 1 | | | 1 | 2 | | | | 3 | 1 | | | 8 |
| -1 | 1 | 6 | 4 | 28 | 5 | 1 | 2 | 1 | | | | 5 | 1 | | 54 |
| **0** | | **14** | **58** | **56** | **71** | **19** | **5** | **1** | **1** | | | | **2** | **3** | **230** |
| 1 | | | 3 | 53 | 28 | 21 | 5 | 2 | 1 | 1 | | | | 4 | 118 |
| 2 | | | | | 6 | 7 | 6 | 1 | 1 | 1 | | 2 | | | 24 |
| 3 | | | | | | 1 | | 1 | | 1 | | 1 | | | 4 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.3. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: All biological data. APE=8.40. Data from production set.

| | | | | | | | | Observed Age | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -4 | | | | | | | | 2 | | 1 | | | | | 3 |
| -3 | | | | | | | | | 2 | | | | | | 2 |
| -2 | | | 2 | 1 | | | | | | | | 1 | | | 4 |
| -1 | 1 | 9 | 22 | 32 | 16 | | | | | | 3 | | 1 | | 84 |
| **0** | | **11** | **39** | **77** | **67** | **21** | | **1** | | **1** | | **5** | | **6** | **228** |
| 1 | | | 3 | 27 | 25 | 25 | 16 | | 1 | | | | 1 | | 98 |
| 2 | | | | | 2 | 4 | 3 | 5 | | | | 1 | | 1 | 16 |
| 3 | | | | | | | 1 | | 3 | | | | | | 4 |
| 4 | | | | | | | | | | 3 | | | | | 3 |
| 5 | | | | | | | | | | | | | 1 | | 1 |
| 6 | | | | | | | | | | | | 2 | | | 2 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.4. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1. APE=16.74. Data from production set.

| | | | | | | | | Observed Age | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -3 | | 2 | 1 | | | | | | | | | | | | 3 |
| -2 | 1 | 15 | 15 | 3 | | | | | | | | | | | 34 |
| -1 | | 3 | 45 | 41 | 2 | | | | | | | | | | 91 |
| **0** | | | **5** | **91** | **36** | **5** | | | | | | | | | **137** |
| 1 | | | | 2 | 72 | 21 | 2 | | | | | | | | 97 |
| 2 | | | | | | 24 | 7 | 1 | | | | | | | 32 |
| 3 | | | | | | | 11 | 5 | | | | | | | 16 |
| 4 | | | | | | | | 2 | 3 | 2 | | | | | 7 |
| 5 | | | | | | | | | 3 | 1 | | | | | 4 |
| 6 | | | | | | | | | | 2 | 2 | | | | 4 |
| 7 | | | | | | | | | | | 1 | 7 | | | 8 |
| 8 | | | | | | | | | | | | 2 | | | 2 |
| 9 | | | | | | | | | | | | | 3 | 4 | 7 |
| 10 | | | | | | | | | | | | | | 3 | 3 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.5. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=10.98. Data from production set.

| | | | | | | | Observed Age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | | | | | | 1 | | | | | | | 1 |
| -3 | | | | | | | 2 | | | | | | | | 2 |
| -2 | | | | 4 | | | | 2 | | | | 1 | | | 7 |
| -1 | 1 | 10 | 9 | 14 | 27 | | | | 2 | | | | 1 | | 64 |
| **0** | | **10** | **55** | **64** | **27** | **27** | | | | | | | | **4** | **187** |
| 1 | | | 2 | 55 | 39 | 10 | 13 | | | | 3 | | 1 | | 123 |
| 2 | | | | | 17 | 10 | 4 | 4 | | | | 5 | | 1 | 41 |
| 3 | | | | | | 3 | 1 | 1 | 4 | | | | 1 | | 10 |
| 4 | | | | | | | | | | 5 | | 2 | | 2 | 9 |
| 6 | | | | | | | | | | | | 1 | | | 1 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.6. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: Harmonics from 2. APE=18.23. Data from production set.

| | | | | | | | Observed Age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -3 | 1 | | 2 | | | | | | | | | | | | 3 |
| -2 | | 20 | | 2 | | | | | | | | | | | 22 |
| -1 | | | 63 | 1 | | | | | | | | | | | 64 |
| **0** | | | **1** | **134** | **1** | **1** | | | | | | | | | **137** |
| 1 | | | | | 107 | | | | | | | | | | 107 |
| 2 | | | | | 2 | 49 | | | | | | | | | 51 |
| 3 | | | | | | | 20 | | | | | | | | 20 |
| 4 | | | | | | | | 8 | | 1 | | | | | 9 |
| 5 | | | | | | | | | 6 | | | | | | 6 |
| 6 | | | | | | | | | | 4 | | | | | 4 |
| 7 | | | | | | | | | | | 3 | | | | 3 |
| 8 | | | | | | | | | | | | 9 | | | 9 |
| 9 | | | | | | | | | | | | | 3 | | 3 |
| 10 | | | | | | | | | | | | | | 7 | 7 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.7. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=10.29. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -7 | | | | | | 1 | | | | | | | | | 1 |
| -6 | | | | | | | 2 | | | | | | | | 2 |
| -5 | | | | | | | | 3 | | | | | | | 3 |
| -4 | | | | | | | | | 3 | 1 | | | | | 4 |
| -3 | | | | | | | | | 1 | 2 | 2 | | | | 5 |
| -2 | | | 1 | | | | | | | | 1 | 2 | | | 4 |
| -1 | 1 | 5 | 10 | 44 | 5 | | 2 | | | | | 4 | 1 | | 72 |
| **0** | | **15** | **51** | **39** | **76** | **11** | | **1** | | | | | **1** | **5** | **199** |
| 1 | | | 4 | 53 | 17 | 31 | 8 | | | | | | | 1 | 114 |
| 2 | | | | 1 | 12 | 4 | 8 | 2 | | | | | | | 27 |
| 3 | | | | | | 3 | | 2 | 1 | | | | 1 | | 7 |
| 4 | | | | | | | | | 1 | 2 | | 3 | | 1 | 7 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.8. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3. APE=20.47. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -3 | | 4 | | | | | | | | | | | | | 4 |
| -2 | 1 | 1 | 20 | | | | | | | | | | | | 22 |
| -1 | | 15 | 3 | 41 | | | | | | | | | | | 59 |
| **0** | | | **43** | **13** | **56** | | | | | | | | | **1** | **113** |
| 1 | | | | 83 | 12 | 28 | | | | | | | | | 123 |
| 2 | | | | | 42 | 3 | 14 | | | | | | | | 59 |
| 3 | | | | | | 19 | 1 | 5 | | | | | | | 25 |
| 4 | | | | | | | 5 | 1 | 4 | | | | | | 10 |
| 5 | | | | | | | | 2 | 1 | 2 | | | | | 5 |
| 6 | | | | | | | | | 1 | | 2 | | | | 3 |
| 7 | | | | | | | | | | 3 | | 5 | | | 8 |
| 8 | | | | | | | | | | | 1 | 1 | 3 | | 5 |
| 9 | | | | | | | | | | | | 3 | | 6 | 9 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.9. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=10.76. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -2 | | | 2 | 1 | | 1 | | 1 | | | 2 | | | | 7 |
| -1 | 1 | 5 | 10 | 15 | 14 | 1 | 2 | | 1 | | | 2 | 1 | | 52 |
| **0** | | **15** | **44** | **66** | **44** | **18** | **3** | **1** | | **1** | | | | **3** | **195** |
| 1 | | | 10 | 55 | 39 | 19 | 11 | 1 | 1 | | 1 | | | | 137 |
| 2 | | | | | 13 | 9 | 4 | 3 | | 1 | | 2 | | | 32 |
| 3 | | | | | | 2 | | 2 | 4 | | | | | | 8 |
| 4 | | | | | | | | | | 3 | | 1 | | 4 | 8 |
| 5 | | | | | | | | | | | | 2 | | | 2 |
| 6 | | | | | | | | | | | | 2 | | | 2 |
| 7 | | | | | | | | | | | | | 2 | | 2 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.10. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4. APE=17.86. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -8 | | | | | | 3 | | | | | | | | | 3 |
| -6 | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | | | | | 1 | | | | | | 1 |
| -3 | 1 | | 2 | | | | | | | | | | | | 3 |
| -2 | | 20 | | 9 | | | | | | | | | | | 29 |
| -1 | | | 64 | 2 | 8 | | | | | | | | | | 74 |
| **0** | | | | **126** | **3** | | | | | | | | | | **129** |
| 1 | | | | | 99 | 2 | 5 | | | | | | | | 106 |
| 2 | | | | | | 45 | | 2 | | | | | | | 47 |
| 3 | | | | | | | 15 | 1 | | | | | | | 16 |
| 4 | | | | | | | | 4 | 1 | | | | | | 5 |
| 5 | | | | | | | | | 4 | 2 | 1 | | | | 7 |
| 6 | | | | | | | | | | 2 | | | | | 2 |
| 7 | | | | | | | | | | 1 | 2 | 2 | | | 5 |
| 8 | | | | | | | | | | | | 7 | | 4 | 11 |
| 9 | | | | | | | | | | | | | 3 | 1 | 4 |
| 10 | | | | | | | | | | | | | | 2 | 2 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.11. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=9.86. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | 1 | | 1 | | | | | 2 |
| -3 | | | | | | | | | 1 | | | | | | 1 |
| -2 | | | 1 | 7 | 1 | | | | | | | 1 | | | 10 |
| -1 | 1 | 10 | 19 | 21 | 16 | 4 | 1 | 1 | | | 1 | 2 | 1 | | 77 |
| **0** | | **10** | **41** | **76** | **47** | **16** | **6** | | **1** | | | | | **6** | **203** |
| 1 | | | 5 | 33 | 38 | 21 | 11 | 4 | | 2 | | | | | 114 |
| 2 | | | | | 8 | 7 | 2 | 1 | 1 | | 2 | | | | 21 |
| 3 | | | | | | 2 | | | 2 | 2 | | 4 | | | 10 |
| 4 | | | | | | | | | | | | | 1 | | 1 |
| 5 | | | | | | | | | | | | 1 | | | 1 |
| 6 | | | | | | | | | | | | 1 | 1 | | 2 |
| 8 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.12. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5. APE=16.88. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -4 | | 2 | | | | | | | | | | | | | 2 |
| -3 | | 5 | 6 | | | | | | | | | | | | 11 |
| -2 | 1 | 12 | 22 | 11 | | | | | | | | | | | 46 |
| -1 | | 1 | 36 | 44 | 10 | | | | | | | | | | 91 |
| **0** | | | **2** | **81** | **52** | **10** | | | | | | | | | **145** |
| 1 | | | | 1 | 48 | 17 | 4 | | | | | | | | 70 |
| 2 | | | | | | 23 | 10 | 1 | | | | | | | 34 |
| 3 | | | | | | | 6 | 5 | 2 | | | | | | 13 |
| 4 | | | | | | | | 2 | | 3 | | | | | 5 |
| 5 | | | | | | | | | 4 | 1 | 1 | | | | 6 |
| 6 | | | | | | | | | | 1 | 2 | 2 | | | 5 |
| 7 | | | | | | | | | | | | 3 | 1 | | 4 |
| 8 | | | | | | | | | | | | 4 | 1 | 2 | 7 |
| 9 | | | | | | | | | | | | | 1 | 4 | 5 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.2.13. Age difference table for ling from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=10.03. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -3 | | | | | | | | | | 1 | | | | | 1 |
| -2 | | | 6 | 2 | 2 | | 3 | 1 | | | | 2 | | | 16 |
| -1 | 1 | 12 | 21 | 44 | 16 | 2 | | | 1 | | 2 | 2 | 1 | | 102 |
| **0** | | **8** | **37** | **60** | **69** | **16** | **1** | **1** | **1** | **1** | | **2** | | **4** | **200** |
| 1 | | | 2 | 31 | 17 | 21 | 12 | 2 | 1 | | 1 | | | | 87 |
| 2 | | | | | 6 | 8 | 4 | 3 | | 1 | | | | 1 | 23 |
| 3 | | | | | | 3 | | 1 | 3 | 2 | | 1 | | | 10 |
| 4 | | | | | | | | | | | | 1 | 1 | 1 | 3 |
| 6 | | | | | | | | | | | | 1 | | | 1 |
| 7 | | | | | | | | | | | | | 1 | | 1 |
| 8 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.3.1. Age difference table for ling from, network type: probabilistic: data inputs: All biological, all transect data and all transect length. APE=17.23. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | | 1 | 1 | | 1 | | | | | | | | 3 |
| -5 | | | | | | 1 | | | | | | | | | 1 |
| -4 | | | | | 3 | 2 | | | | | | | | | 5 |
| -3 | | | | 4 | | 1 | | | | | | | | | 5 |
| -2 | | 1 | 5 | 11 | 13 | 1 | 1 | 2 | | | 1 | 1 | | | 36 |
| -1 | | 3 | 15 | 30 | 18 | 3 | | | | | | 2 | 1 | | 72 |
| **0** | **1** | **12** | **30** | **30** | **28** | **13** | **4** | **1** | | | | | | **1** | **120** |
| 1 | | 4 | 11 | 54 | 23 | 18 | 3 | | 2 | 1 | 1 | 1 | | | 118 |
| 2 | | | 4 | 6 | 18 | 6 | 8 | 1 | | 1 | 1 | 3 | | 1 | 49 |
| 3 | | | | 1 | 5 | 3 | 2 | 1 | 1 | | | | 1 | | 14 |
| 4 | | | | | | | | 1 | 1 | | | | | 1 | 3 |
| 5 | | | | | | | | | | 1 | | | | 1 | 2 |
| 6 | | | | | | | | | | | | 1 | | | 1 |
| 7 | | | | | | | | | | | | 1 | 1 | | 2 |
| N | **1** | **20** | **65** | **137** | **109** | **48** | **19** | **6** | **4** | **3** | **3** | **9** | **3** | **4** | **431** |

Table 3.3.2. Age difference table for ling from, network type: probabilistic: data inputs: All biological and all transect lengths. APE=8.11. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -3 | | | | 1 | | 2 | 1 | 2 | | | | | | | 6 |
| -2 | | | 2 | 8 | 10 | 3 | | 1 | 2 | | 1 | 1 | | | 28 |
| -1 | | 5 | 12 | 23 | 24 | 10 | 7 | 3 | 1 | 2 | 1 | 1 | 1 | | 90 |
| **0** | **1** | **14** | **41** | **85** | **49** | **25** | **7** | | **1** | **2** | | | | **6** | **231** |
| 1 | | 1 | 11 | 20 | 24 | 7 | 4 | 1 | | 1 | 1 | 1 | 1 | 1 | 73 |
| 2 | | | | | 3 | 3 | 1 | 1 | 1 | | | 2 | | | 11 |
| 3 | | | | | | | | | 1 | | | 3 | 1 | | 5 |
| 4 | | | | | | | | | | | | 1 | | | 1 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.3.3. Age difference table for ling from, network type: probabilistic: data inputs: All biological data. APE=9.20. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -4 | | | | | | 1 | 1 | | | | | | | | 2 |
| -3 | | | | 2 | | | 2 | 1 | | | | | | | 5 |
| -2 | | | 2 | 9 | 13 | | 3 | 3 | | 1 | | 1 | | | 32 |
| -1 | | 4 | 15 | 26 | 22 | 16 | 2 | 2 | 1 | 3 | | | 1 | | 92 |
| **0** | **1** | **13** | **38** | **75** | **52** | **19** | **6** | | **1** | | **1** | **1** | | **5** | **212** |
| 1 | | 3 | 11 | 25 | 20 | 11 | 4 | 2 | 2 | | 2 | 5 | | | 85 |
| 2 | | | | | 3 | 2 | 2 | | 2 | 1 | | 2 | 1 | 1 | 14 |
| 3 | | | | | | 1 | | | | | | | | | 1 |
| 4 | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **6** | **444** |

Table 3.3.4. Age difference table for ling from, network type: probabilistic: data inputs: Harmonics from transect 1. APE=31.54. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -11 | | | 4 | | | | | | | | | | | | 4 |
| -9 | | | | 3 | 3 | | | | | | | | | | 6 |
| -8 | | | 2 | | 4 | 1 | | | | | | | | | 7 |
| -7 | | | 2 | 2 | 1 | 2 | | | | | | | | | 7 |
| -6 | | | 1 | 2 | 2 | 2 | | 1 | | | | | | | 8 |
| -5 | | 1 | | 3 | 9 | 3 | | 2 | | | | | | | 18 |
| -4 | | | 1 | 6 | 2 | | | | | | | | | | 9 |
| -3 | | 4 | 4 | 6 | 2 | | | | | 1 | 1 | | | | 18 |
| -2 | 1 | 2 | 8 | 9 | 5 | 1 | | 1 | | | | 1 | | | 28 |
| -1 | | 5 | 9 | 20 | 11 | 2 | 1 | | | | | | | | 48 |
| **0** | | **5** | **11** | **26** | **18** | **3** | | | | **1** | **1** | | | | **65** |
| 1 | | 2 | 15 | 33 | 16 | 14 | 1 | | 1 | | | 1 | | | 83 |
| 2 | | | 6 | 9 | 17 | 5 | 6 | | | 1 | | | 2 | | 46 |
| 3 | | | | 14 | 11 | 9 | 5 | | 1 | | | 2 | | | 42 |
| 4 | | | | | 3 | 3 | 1 | 1 | 2 | | | | | | 10 |
| 5 | | | | | | 1 | 2 | 2 | | 1 | | 1 | | 1 | 8 |
| 6 | | | | | | | 1 | | 1 | 1 | 1 | | | 1 | 5 |
| 7 | | | | | | | | | | | | 3 | | 1 | 4 |
| 8 | | | | | | | | | | | | 1 | | | 1 |
| 9 | | | | | | | | | | | | | | 1 | 1 |
| 11 | | | | | | | | | | | | | | 1 | 1 |
| 12 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **19** | **63** | **133** | **104** | **46** | **17** | **7** | **5** | **5** | **3** | **9** | **2** | **6** | **420** |

Table 3.3.5. Age difference table for ling from, network type: probabilistic: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=14.41. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | | | | 1 | | | | | | | | | 1 |
| -4 | | | | 1 | | | 1 | 1 | 2 | | | | | | 5 |
| -3 | | | | | 3 | 6 | 1 | 1 | 1 | 3 | | | | | 15 |
| -2 | | | 3 | 3 | 8 | 4 | 8 | | 1 | | 3 | | | | 30 |
| -1 | | 4 | 6 | 48 | 7 | 7 | 2 | 4 | 1 | | | 4 | 1 | | 84 |
| **0** | **1** | **11** | **44** | **26** | **59** | **8** | **2** | | | | | | | **3** | **154** |
| 1 | | 5 | 6 | 54 | 19 | 21 | 2 | 1 | 1 | 1 | | | 1 | 3 | 114 |
| 2 | | | 7 | 2 | 14 | 2 | 4 | 1 | | | | 2 | | | 32 |
| 3 | | | | 3 | | 1 | | | | 1 | | 2 | | | 7 |
| 4 | | | | | | | | | | | | 1 | 1 | 1 | 3 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.3.6. Age difference table for ling from, network type: probabilistic: data inputs: Harmonics from transect 2. APE=30.84. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -12 | | 1 | | | | | | | | | | | | | 1 |
| -10 | | | | 3 | | | | | | | | | | | 3 |
| -9 | | | 2 | 2 | 3 | | | | | | | | | | 7 |
| -8 | | | | | 3 | 3 | | | | | | | | | 6 |
| -7 | | | 1 | 2 | 1 | 1 | 1 | | | | | | | | 6 |
| -6 | | 1 | 2 | | 1 | 1 | | | | | | | | | 5 |
| -5 | | 1 | 1 | 2 | | | | | | | | | | | 4 |
| -4 | 1 | 1 | 1 | 1 | 1 | | | | 1 | | | | | | 6 |
| -3 | | 1 | 8 | 5 | 4 | | 1 | 1 | | 1 | | | | | 21 |
| -2 | | 1 | 10 | 18 | 1 | 1 | | 1 | | 1 | | | | | 33 |
| -1 | | 11 | 14 | 14 | 10 | 1 | | | | | | 1 | | | 51 |
| **0** | | **2** | **11** | **34** | **14** | **4** | **1** | | | | | | | **2** | **68** |
| 1 | | 1 | 10 | 27 | 27 | 9 | 1 | | 1 | | | | | | 76 |
| 2 | | | 5 | 20 | 24 | 9 | 2 | 1 | | | | 1 | | 1 | 63 |
| 3 | | | | 3 | 8 | 12 | 3 | 1 | | 1 | | | | | 28 |
| 4 | | | | | 6 | 5 | 5 | 2 | 1 | | | | | | 19 |
| 5 | | | | | | 2 | 4 | | 1 | 2 | | | | | 9 |
| 6 | | | | | | | | 1 | 1 | | | 1 | | | 3 |
| 7 | | | | | | | | 1 | 1 | | 1 | 3 | 1 | | 7 |
| 8 | | | | | | | | | | | | 1 | 1 | 2 | 4 |
| 10 | | | | | | | | | | | | 1 | | 1 | 2 |
| N | **1** | **20** | **65** | **131** | **103** | **48** | **18** | **8** | **6** | **5** | **1** | **8** | **2** | **6** | **422** |

Table 3.3.7. Age difference table for ling from, network type: probabilistic: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=12.13. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -5 | | | | | | | | 2 | | | | | | | 2 |
| -4 | | | | | 1 | | 1 | | 2 | | | | | | 4 |
| -3 | | | | | | 1 | | 1 | 1 | 2 | | | | | 5 |
| -2 | | | 1 | 1 | 7 | 1 | 1 | | 1 | 1 | 2 | | | | 15 |
| -1 | | 2 | 13 | 33 | 11 | 11 | 5 | | | 1 | | 6 | 1 | | 83 |
| **0** | **1** | **14** | **39** | **58** | **53** | **11** | **6** | **3** | | | **1** | | **2** | **3** | **191** |
| 1 | | 4 | 10 | 36 | 25 | 15 | 2 | | 2 | 1 | | 1 | | 2 | 98 |
| 2 | | | 3 | 9 | 12 | 6 | 5 | 1 | | | | 1 | | 1 | 38 |
| 3 | | | | | 1 | 5 | | 1 | | | | | | 1 | 8 |
| 4 | | | | | | | | | | | | 1 | | | 1 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.3.8. Age difference table for ling from, network type: probabilistic: data inputs: Harmonics from transect 3. APE=27.85. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -12 | | 1 | | | | | | | | | | | | | 1 |
| -10 | | | 1 | 1 | | | | | | | | | | | 2 |
| -9 | | | | 1 | 1 | | | | | | | | | | 2 |
| -8 | | | | | 2 | 1 | | | | | | | | | 3 |
| -7 | 1 | | | | | | 1 | | | | | | | | 2 |
| -6 | | 1 | 1 | 2 | | | | | | | | | | | 4 |
| -5 | | 1 | 3 | 2 | 1 | | | | 1 | | | | | | 8 |
| -4 | | 1 | 2 | 5 | 4 | 2 | | | | | | | | | 14 |
| -3 | | 2 | 7 | 4 | 8 | 2 | | 1 | | | | | | | 24 |
| -2 | | 6 | 11 | 11 | 1 | 1 | 1 | 1 | | | | | | | 32 |
| -1 | | 2 | 18 | 19 | 14 | 1 | | | 1 | | | | | | 55 |
| **0** | | **1** | **11** | **30** | **19** | **5** | | | | | | | | | **66** |
| 1 | | 4 | 8 | 30 | 30 | 10 | 3 | | | | | | | | 85 |
| 2 | | | 2 | 19 | 14 | 10 | | 1 | | | | | | | 46 |
| 3 | | | | 4 | 7 | 11 | 8 | 2 | 1 | | | 1 | | 1 | 35 |
| 4 | | | | | | 2 | 2 | 1 | | 1 | | | | | 6 |
| 5 | | | | | | | 1 | 2 | 1 | 1 | | 2 | | | 7 |
| 6 | | | | | | | | | | | 1 | 1 | | | 2 |
| 7 | | | | | | | | | | 1 | | | 1 | 3 | 5 |
| 8 | | | | | | | | | | 1 | 2 | 2 | | | 5 |
| 9 | | | | | | | | | | | | 2 | 1 | | 3 |
| N | **1** | **19** | **64** | **128** | **101** | **45** | **16** | **8** | **4** | **4** | **3** | **8** | **2** | **4** | **407** |

Table 3.3.9. Age difference table for ling from, network type: probabilistic: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=11.77. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -4 | | | | 1 | 1 | | | | | 1 | | | | | 3 |
| -3 | | | | 3 | 2 | 1 | 1 | 1 | 1 | | | | | | 9 |
| -2 | | | 4 | 11 | 11 | 2 | 2 | 1 | 2 | | | 1 | | | 34 |
| -1 | | 6 | 19 | 29 | 17 | 3 | 5 | 1 | 1 | | 2 | 1 | | | 84 |
| **0** | | **14** | **29** | **57** | **42** | **14** | **4** | **1** | **1** | | | | | | **162** |
| 1 | | | 14 | 35 | 26 | 22 | 4 | 3 | 1 | 3 | | 1 | | 1 | 110 |
| 2 | | | | 1 | 11 | 6 | 4 | 1 | | | | 2 | | | 25 |
| 3 | | | | | | 2 | | | | 1 | | 1 | 2 | 1 | 7 |
| 4 | | | | | | | | | | | | 1 | | 2 | 3 |
| 5 | | | | | | | | | | | | 1 | 1 | | 2 |
| N | | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **2** | **8** | **3** | **4** | **439** |

Table 3.3.10. Age difference table for ling from, network type: probabilistic: data inputs: Harmonics from transect 4. APE=29.13. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -11 | | 1 | 1 | | | | | | | | | | | | 2 |
| -10 | | | 2 | | | | | | | | | | | | 2 |
| -9 | | | | 3 | 2 | | | | | | | | | | 5 |
| -8 | | 1 | | 1 | | | | | | | | | | | 2 |
| -7 | | | 5 | 1 | 1 | 1 | | | | | | | | | 8 |
| -6 | | | 2 | 4 | | 2 | 1 | | | | | | | | 9 |
| -5 | | | 1 | 1 | 6 | | | | | | | | | | 8 |
| -4 | | 1 | 2 | 3 | 2 | 2 | | | | | | | | | 10 |
| -3 | 1 | 4 | 9 | 8 | 4 | | | | | | | | | | 26 |
| -2 | | 3 | 13 | 15 | 8 | 2 | | 2 | | | | 1 | | | 44 |
| -1 | | 4 | 10 | 20 | 16 | 2 | 3 | | 1 | | | | | | 56 |
| **0** | | **2** | **8** | **29** | **25** | **5** | **1** | **1** | | | | | | **1** | **72** |
| 1 | | 4 | 6 | 27 | 19 | 9 | 4 | 1 | | | 1 | | | | 71 |
| 2 | | | 6 | 14 | 14 | 10 | 3 | | | | | | | 1 | 48 |
| 3 | | | | 6 | 7 | 9 | 4 | 2 | | | | 1 | | | 29 |
| 4 | | | | | 3 | 3 | | | 2 | 1 | | 1 | | | 10 |
| 5 | | | | | | | | | 1 | 2 | | 2 | | | 5 |
| 6 | | | | | | | 1 | | 1 | | 1 | 2 | 1 | | 6 |
| 7 | | | | | | | | | | | 1 | | 1 | | 2 |
| 8 | | | | | | | | | | | | 1 | | 1 | 2 |
| 9 | | | | | | | | | | | | | | 2 | 2 |
| 10 | | | | | | | | | | | | 1 | | | 1 |
| N | **1** | **20** | **65** | **132** | **107** | **45** | **17** | **6** | **5** | **3** | **3** | **9** | **2** | **5** | **420** |

Table 3.3.11. Age difference table for ling from, network type: probabilistic: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=10.69. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -4 | | | | | | | | 1 | | | | | | | 1 |
| -3 | | | 1 | | | 3 | | 1 | 1 | 1 | | | | | 7 |
| -2 | | | | 7 | 3 | 1 | 8 | | 3 | 1 | 1 | | | | 24 |
| -1 | | 1 | 1 | 20 | 26 | 5 | 2 | 4 | | | 1 | 3 | 1 | | 64 |
| **0** | **1** | **18** | **51** | **48** | **43** | **23** | **4** | | **2** | **1** | **1** | **1** | | **3** | **196** |
| 1 | | 1 | 13 | 56 | 22 | 8 | 5 | 1 | | 2 | | 2 | | 2 | 112 |
| 2 | | | | 6 | 15 | 8 | 1 | 1 | | | | 1 | 1 | 1 | 34 |
| 3 | | | | | 1 | 2 | | | | | | 2 | | | 5 |
| 4 | | | | | | | | | | | | | 1 | 1 | 2 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

Table 3.3.12. Age difference table for ling from, network type: probabilistic: data inputs: Harmonics from transect 5. APE=29.92. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -10 | | | 1 | 1 | | | | | | | | | | | 2 |
| -9 | | | 1 | 2 | 1 | | | | | | | | | | 4 |
| -8 | | | | | | 2 | | | | | | | | | 2 |
| -7 | | | | 2 | | | 1 | | | | | | | | 3 |
| -6 | | | 2 | 1 | 1 | | | | | | | | | | 4 |
| -5 | | 1 | 1 | 2 | 3 | | | | | | | | | | 7 |
| -4 | | 3 | 1 | 5 | | 1 | | | | | | | | | 10 |
| -3 | | 1 | 7 | 8 | 6 | | 1 | | | | | | | | 23 |
| -2 | 1 | 4 | 10 | 11 | 6 | 4 | | | | | | | | | 36 |
| -1 | | 4 | 13 | 12 | 4 | 3 | | | | | | | | | 36 |
| **0** | | **6** | **18** | **33** | **18** | **1** | | | | | | | | | **76** |
| 1 | | 1 | 8 | 26 | 18 | 8 | 2 | 1 | | | | | | | 64 |
| 2 | | | 3 | 19 | 27 | 8 | 2 | | | | | | | | 59 |
| 3 | | | | 5 | 9 | 10 | 2 | 2 | 2 | | | | | | 30 |
| 4 | | | | | 3 | 7 | 9 | 1 | 1 | 1 | | 1 | | | 23 |
| 5 | | | | | | | 2 | 2 | 1 | | 1 | | | | 6 |
| 6 | | | | | | | | 1 | 1 | 2 | | 1 | | 1 | 6 |
| 7 | | | | | | | | | | | | 1 | | | 1 |
| 8 | | | | | | | | | | | 1 | 2 | 1 | | 4 |
| 9 | | | | | | | | | | | | 2 | | | 2 |
| 11 | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **20** | **65** | **127** | **96** | **44** | **19** | **7** | **5** | **3** | **2** | **7** | **2** | **1** | **399** |

Table 3.3.13. Age difference table for ling from, network type: probabilistic: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=12.24. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -4 | | | | | | 1 | 3 | | 2 | | | | | | 6 |
| -3 | | | | 3 | | 2 | | | | | | | | | 5 |
| -2 | | | 1 | 1 | 10 | 2 | 5 | 1 | | 1 | 1 | 1 | | | 23 |
| -1 | | 3 | 9 | 23 | 17 | 14 | 1 | 1 | 1 | | | 1 | 1 | | 71 |
| **0** | **1** | **14** | **40** | **61** | **38** | **11** | **4** | **3** | | **2** | **2** | **2** | | **3** | **181** |
| 1 | | 3 | 13 | 45 | 32 | 8 | 4 | 1 | 2 | 1 | | | | 1 | 110 |
| 2 | | | 3 | 4 | 13 | 10 | 2 | 1 | | 1 | | 3 | | 2 | 39 |
| 3 | | | | | | 2 | 1 | 1 | 1 | | | 1 | 2 | | 8 |
| 4 | | | | | | | | | | | | 1 | | 1 | 2 |
| N | **1** | **20** | **66** | **137** | **110** | **50** | **20** | **8** | **6** | **5** | **3** | **9** | **3** | **7** | **445** |

***Snapper***

Table 4.1.1. Age difference table for snapper from, network type: back propagation: data inputs: All biological, all transect data and all transect length. APE=13.51. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | | | | | | 1 | | | | | | | | | | 1 |
| -8 | | | | | | | | | 1 | | | | | | | | | 1 |
| -7 | | | | | | | | | | 1 | | | | | | | | 1 |
| -6 | | | | | | | | | | | 4 | | | | | | | 4 |
| -5 | | | | | | | | | | 1 | | 1 | | | | | | 2 |
| -4 | | | | | | | | | | | 1 | | 5 | | | | | 6 |
| -3 | | | | | | | | | | | | | | 5 | | | | 5 |
| -2 | | 1 | | | | 2 | | | | | | | | | 7 | | | 10 |
| -1 | | 4 | 2 | | 6 | 2 | 4 | | | | | | | | | 3 | | 21 |
| **0** | **4** | **5** | **16** | **32** | | **12** | | **5** | | | | | | | **3** | | **7** | **84** |
| 1 | | 1 | | 3 | 8 | | 3 | | 4 | | | | | | | | | 19 |
| 2 | | | 2 | | 1 | 4 | | 4 | | 2 | | | | | | | | 13 |
| 3 | | | | | | 3 | 3 | 1 | 3 | | 1 | | | | | | | 11 |
| 4 | | | | | 1 | | | 2 | | 4 | | 2 | | | | | | 9 |
| 5 | | | | | | 1 | | | 2 | | | | 1 | 1 | | | | 5 |
| 6 | | | | | | | | | | 1 | | | | 1 | | | | 2 |
| 7 | | | | | | | | | | | | | | 1 | 2 | | | 3 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.1.2. Age difference table for snapper from, network type: back propagation: data inputs: All biological and all transect lengths. APE=7.37. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -7 | | | | | | | 1 | | | | | | | | | | | 1 |
| -6 | | | | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | | | | | 2 | | | | | | | | | 2 |
| -4 | | | | | | | | | | 1 | | 1 | 1 | | | | | 3 |
| -3 | | | | | | | | | | | | | | 4 | | | | 4 |
| -2 | | | | | | 2 | | 1 | | | | | | | 3 | | | 6 |
| -1 | | | 2 | | 7 | 1 | 6 | 1 | 1 | | | | 3 | | | 2 | | 23 |
| **0** | **4** | **11** | **13** | **31** | **2** | **19** | **1** | **4** | | **4** | | | | **3** | **2** | **1** | **6** | **101** |
| 1 | | | 5 | 4 | 7 | | 2 | 3 | 3 | | 3 | | | | 4 | | | 31 |
| 2 | | | | | | 2 | | 4 | 1 | 4 | | | | | | | | 11 |
| 3 | | | | | | | | | 3 | | 2 | | | | | | | 5 |
| 4 | | | | | | | | | | | | 2 | | | | | | 2 |
| 5 | | | | | | | | | | | | | 1 | | 1 | | | 2 |
| 6 | | | | | | | | | | | | | 1 | 1 | | | | 2 |
| 7 | | | | | | | | | | | | | | | 2 | | | 2 |
| 8 | | | | | | | | | | | | | | | | | | 0 |
| 9 | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.1.3. Age difference table for snapper from, network type: back propagation: data inputs: All biological data. APE=9.45. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | | | | | | 1 | | | | | | | | | | 1 |
| -8 | | | | | | | | | | | | | | | | | | 0 |
| -7 | | | | | | | | | | | | | | | | | | 0 |
| -6 | | | | | | | 1 | | | | 2 | | | | | | | 3 |
| -5 | | | | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | | 1 | | | | 3 | | | | | 4 |
| -3 | | | | | | | 1 | | | | | | | 7 | | | | 8 |
| -2 | | | | | | | 1 | 3 | | | | | | | 7 | | | 11 |
| -1 | | | 1 | 1 | 6 | 2 | 3 | 2 | 2 | | | | | | | 3 | | 20 |
| **0** | **4** | **9** | **13** | **29** | | **16** | **2** | **1** | **1** | **4** | | | **1** | | | | **7** | **87** |
| 1 | | 2 | 6 | 5 | 10 | | 2 | 2 | | 1 | 3 | | | 1 | | | | 32 |
| 2 | | | | | | 6 | | 4 | 1 | 4 | | | | | 2 | | | 17 |
| 3 | | | | | | | | | 5 | | 1 | | 2 | | | | | 8 |
| 4 | | | | | | | | | | | | 2 | | | | | | 2 |
| 5 | | | | | | | | | | | | | | | 1 | | | 1 |
| 6 | | | | | | | | | | | | | | | | | | 0 |
| 7 | | | | | | | | | | | | | | | 2 | | | 2 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.1.4. Age difference table for snapper from, network type: back propagation: data inputs: Harmonics from transect 1. APE=23.84. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -13 | | | | 1 | | | | | | | | | | | | | | 1 |
| -12 | | | 1 | | | | | | | | | | | | | | | 1 |
| -11 | | | | | | 2 | | | | | | | | | | | | 2 |
| -10 | | | | | | | 1 | | | | | | | | | | | 1 |
| -9 | | | | | | | | 1 | | | | | | | | | | 1 |
| -6 | | | | | | | | | 1 | | 1 | | | | | | | 2 |
| -5 | | | | | | | | | | | | 1 | | | | | | 1 |
| -4 | | 1 | | | | | | | | | 1 | | 1 | | | | | 3 |
| -3 | 1 | | | | | 1 | | | | | | | | 3 | | | | 5 |
| -2 | | 2 | | 1 | | | 1 | 1 | | | | | 1 | | 2 | | | 8 |
| -1 | 2 | | 8 | | 1 | | | | 1 | | | | | | | 1 | | 13 |
| **0** | **1** | **7** | **7** | **32** | | **7** | | **1** | **1** | **1** | | | | | **4** | | **1** | **62** |
| 1 | | 1 | 4 | | 15 | | | | | 1 | | | | | | | | 21 |
| 2 | | | | 1 | | 11 | | 4 | | | | | | | | | 3 | 19 |
| 3 | | | | | | 1 | 6 | 1 | 3 | | | | | | | | | 11 |
| 4 | | | | | | | | 3 | 1 | 5 | 1 | | | | | | | 10 |
| 5 | | | | | | 2 | 2 | | 3 | | | | | | | | | 7 |
| 6 | | | | | | | | 2 | | 2 | | 1 | | | | | | 5 |
| 7 | | | | | | | | | | | 3 | | 1 | 1 | | | 1 | 6 |
| 8 | | | | | | | | | | | | 1 | | 1 | | | | 2 |
| 9 | | | | | | | | | | | | | 1 | | 2 | | | 3 |
| 10 | | | | | | | | | | | | | | 2 | | | | 2 |
| 11 | | | | | | | | | | | | | 2 | | 3 | | | 5 |
| 12 | | | | | | | | | | | | | | 1 | 1 | | | 2 |
| 13 | | | | | | | | | | | | | | | | | 2 | 2 |
| 14 | | | | | | | | | | | | | | | | 1 | | 1 |
| 15 | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.1.5. Age difference table for snapper from, network type: back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=9.11. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | | | | | | 2 | | | | | | | | | | 2 |
| -6 | | | | | | | | | 1 | | 1 | | | | | | | 2 |
| -5 | | | | | | | | | | 1 | | 1 | | | | | | 2 |
| -4 | | | | | | | | | | | | | 2 | | | | | 2 |
| -3 | | | | | | | 2 | | | | | | | 7 | | | | 9 |
| -2 | | | | | | 2 | | 1 | | | | | 1 | | 7 | | | 11 |
| -1 | 1 | | 3 | | 6 | 1 | 6 | 1 | 3 | | | | | | 1 | 3 | | 25 |
| **0** | **3** | **10** | **14** | **32** | | **17** | | **3** | **2** | **1** | | | | | **1** | | **6** | **89** |
| 1 | | 1 | 3 | 3 | 10 | | 2 | 2 | 1 | 2 | 2 | | | | | | | 26 |
| 2 | | | | | | 4 | | 3 | | 3 | | | | | | | 1 | 11 |
| 3 | | | | | | | | | 3 | | 3 | 1 | 1 | | | | | 8 |
| 4 | | | | | | | | | | 1 | | 1 | | 1 | | | | 3 |
| 5 | | | | | | | | | | | | | 2 | | 2 | | | 4 |
| 6 | | | | | | | | 1 | | | | | | | | | | 1 |
| 7 | | | | | | | | | | | | | | | 1 | | | 1 |
| 8 | | | | | | | | | | 1 | | | | | | | | 1 |
| 7 | | | | | | | | | | | | | | | | | | |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.1.6. Age difference table for snapper from, network type: back propagation: data inputs: Harmonics from 2. APE=23.89. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -8 | | | | | | | | | 2 | | | | | | | | | 2 |
| -7 | | | | | | | | | | | | | | | | | | 0 |
| -6 | | 1 | | | | | | | | | | | | | | | | 1 |
| -5 | | | 1 | | | | | | 1 | | 1 | 1 | | | | | | 4 |
| -4 | | | | 1 | 1 | | | | 1 | | | | 2 | | | | | 5 |
| -3 | | | | 2 | | 2 | | | | | | | | 1 | | | | 5 |
| -2 | 2 | 2 | | | 1 | 5 | | | | | 1 | | | | | | | 11 |
| -1 | 1 | 3 | 4 | | 1 | 2 | 3 | | | | | | | | | | | 14 |
| **0** | **1** | **5** | **10** | **28** | **1** | **5** | **1** | **2** | | | | | | | | | | **53** |
| 1 | | | 5 | 3 | 12 | 1 | | 1 | | | 1 | | | | 1 | | | 24 |
| 2 | | | | | | 6 | | 1 | | 3 | 1 | | | | | | | 11 |
| 3 | | | | 1 | | 2 | 4 | | | 1 | | | | | | | | 8 |
| 4 | | | | | | 1 | | 7 | 1 | 1 | | 1 | | 1 | 1 | | | 13 |
| 5 | | | | | | | 1 | | 5 | 1 | | | | 2 | | | | 9 |
| 6 | | | | | | | 1 | 2 | | 3 | 1 | | | 2 | 1 | | | 10 |
| 7 | | | | | | | | | | | 1 | 1 | | 1 | 1 | 1 | | 5 |
| 8 | | | | | | | | | | | | | | | 3 | 1 | 2 | 6 |
| 9 | | | | | | | | | | | | | 3 | | | | 2 | 5 |
| 10 | | | | | | | | | | | | | 1 | 1 | 1 | 1 | | 4 |
| 11 | | | | | | | | | | | | | | | 4 | | | 4 |
| 12 | | | | | | | | | | | | | | | | | | 0 |
| 13 | | | | | | | | | | | | | | | | | 2 | 2 |
| 14 | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.1.7. Age difference table for snapper from, network type: back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=7.85. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | | | | | | 1 | | | | | | | | | | 1 |
| -6 | | | | | | | | | | | 1 | | | | | | | 1 |
| -4 | | | | | | | | | | | | | 1 | | | | | 1 |
| -3 | | | | | | 3 | | | | 1 | | | | 5 | | | | 9 |
| -2 | | | | | | | 1 | | | | | | | | 6 | | | 7 |
| -1 | 1 | | 4 | | 6 | 2 | 4 | 1 | 2 | | | | | | 1 | 3 | | 24 |
| **0** | **3** | **11** | **13** | **31** | **1** | **17** | **2** | **6** | **1** | **2** | **1** | | | | **1** | | **5** | **94** |
| 1 | | | 3 | 4 | 7 | | 3 | 1 | 2 | 1 | 3 | | | 1 | 1 | | | 26 |
| 2 | | | | | 1 | 2 | | 4 | 1 | 4 | 1 | | | | | | 1 | 14 |
| 3 | | | | | 1 | | | | 4 | 1 | | 1 | 3 | | 1 | | | 11 |
| 4 | | | | | | | | | | | | 2 | 1 | 2 | | | | 5 |
| 5 | | | | | | | | | | | | | 1 | | 1 | | | 2 |
| 7 | | | | | | | | | | | | | | | 1 | | | 1 |
| 9 | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.1.8. Age difference table for snapper from, network type: back propagation: data inputs: Harmonics from transect 3. APE=20.42. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -11 | | | | | | 1 | | | | | | | | | | | | 1 |
| -10 | | | 1 | | | | 3 | | | | | | | | | | | 4 |
| -9 | | | | | | | | 3 | | | | | | | | | | 3 |
| -7 | | | | | | | | | | 1 | | | | | | | | 1 |
| -6 | | | | | | | | | | | | | | | | | | 0 |
| -5 | | | | | | | | | | | | 1 | | | | | | 1 |
| -3 | | | 1 | | | | | | | | | | | 5 | | | | 6 |
| -2 | | 2 | | 3 | | | | | | | | | | | 4 | | | 9 |
| -1 | 4 | 6 | 5 | | 12 | | 1 | | | | | | | | | 2 | | 30 |
| 0 | | **3** | **13** | **27** | | **14** | | | **4** | | | | | | | | **1** | **62** |
| 1 | | | | 3 | 4 | | 4 | | | 2 | | | | | | | | 13 |
| 2 | | | | 2 | | 4 | | 7 | | | 1 | | | | 1 | | 1 | 16 |
| 3 | | | | | | 1 | 2 | | 4 | | | 1 | | | | | | 8 |
| 4 | | | | | | 4 | | 3 | | 3 | | | | | | | | 10 |
| 5 | | | | | | | | | 2 | | 2 | | 1 | 1 | | | | 6 |
| 6 | | | | | | | | | | 3 | | 1 | | | | | | 4 |
| 7 | | | | | | | | | | | 1 | | 2 | | | | | 3 |
| 8 | | | | | | | | | | | | | | 1 | | | 1 | 2 |
| 9 | | | | | | | | | | | 2 | | 3 | | 5 | | | 10 |
| 10 | | | | | | | | | | | | | | 1 | | 1 | | 2 |
| 11 | | | | | | | | | | | | | | | 2 | | 3 | 5 |
| 12 | | | | | | | | | | | | | | | | | | 0 |
| 13 | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.1.9. Age difference table for snapper from, network type: propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=7.97. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -10 | | | 1 | | | | | | | | | | | | | | | 1 |
| -9 | | | | | | | | 1 | | | | | | | | | | 1 |
| -6 | | | | | | | | | | | 2 | | | | | | | 2 |
| -4 | | | | | | | | | | | | | 2 | | | | | 2 |
| -3 | | | | | | | | | | | | | | 5 | | | | 5 |
| -2 | | | | | | 2 | | | | | | | | | 6 | | | 8 |
| -1 | 1 | | 1 | | 5 | 3 | 6 | | 2 | | | | | | | 3 | | 21 |
| **0** | **3** | **11** | **15** | **30** | **2** | **16** | **2** | **9** | **1** | **1** | | | | **2** | **1** | | **4** | **97** |
| 1 | | | 2 | 5 | 9 | | 2 | 1 | 3 | 3 | | 1 | | | 2 | | | 28 |
| 2 | | | 1 | | | 3 | | 2 | 1 | 5 | | | | | 1 | | 1 | 14 |
| 3 | | | | | | | | | 3 | | 4 | | | 1 | | | | 8 |
| 4 | | | | | | | | | | | | 2 | 1 | | | | | 3 |
| 5 | | | | | | | | | | | | | 3 | | 1 | | | 4 |
| 7 | | | | | | | | | | | | | | | 1 | | 1 | 2 |
| 9 | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.1.10. Age difference table for snapper from, network type: back propagation: data inputs: Harmonics from transect 4. APE=23.58. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | | | | | | 1 | | | | | | | | | | 1 |
| -7 | 1 | | | | | | | | | | | | | | | | | 1 |
| -6 | | 2 | | | | | | | | | | | | | | | | 2 |
| -5 | | | 1 | | | | | | | | | | | | | | | 1 |
| -4 | | | | 1 | | | | | | | | | | | | | | 1 |
| -3 | 2 | | | | | | | | | | | | | | | | | 2 |
| -2 | | 5 | | | | 2 | | 1 | | | | | | | | | | 8 |
| -1 | 1 | | 17 | | 1 | | 5 | | 1 | | | | | | | | | 25 |
| **0** | | **4** | **1** | **33** | | **2** | | **3** | | **2** | | | | | | | | **45** |
| 1 | | | 1 | | 15 | | 1 | | 6 | | | | | | | | | 23 |
| 2 | | | | 1 | | 18 | | 1 | | 3 | | | | | | | | 23 |
| 3 | | | | | | | 4 | | | | 3 | | | | | | | 7 |
| 4 | | | | | | 2 | | 7 | | 1 | | 1 | | | | | | 11 |
| 5 | | | | | | | | | 3 | | | | 3 | | 2 | | | 8 |
| 6 | | | | | | | | | | 3 | | | | 4 | | | | 7 |
| 7 | | | | | | | | | | | 3 | | 1 | | 7 | | 1 | 12 |
| 8 | | | | | | | | | | | | 2 | | | | 3 | | 5 |
| 9 | | | | | | | | | | | | | 2 | | 1 | | 1 | 4 |
| 10 | | | | | | | | | | | | | | 4 | | | | 4 |
| 11 | | | | | | | | | | | | | | | 2 | | 1 | 3 |
| 13 | | | | | | | | | | | | | | | | | 2 | 2 |
| 15 | | | | | | | | | | | | | | | | | 2 | 2 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.1.11. Age difference table for snapper from, network type: back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=8.79. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age class | | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | | | | | | | | | | | | | | 0 |
| -4 | | | | | 1 | | | 1 | | | | | 3 | | | | | 5 |
| -3 | | | | | | | | | | | | | | 6 | | | | 6 |
| -2 | | 1 | | | | 2 | | | | | | | | | 6 | | | 9 |
| -1 | 1 | | 4 | | 8 | 1 | 6 | 4 | 1 | 1 | | | | | | 3 | | 29 |
| **0** | **3** | **10** | **11** | **33** | | **15** | | **3** | **1** | **3** | | | | | **1** | | **5** | **85** |
| 1 | | | 5 | 1 | 7 | | 3 | 2 | 4 | 3 | 1 | | | 1 | | | | 27 |
| 2 | | | | 1 | | 6 | | 3 | | 2 | 1 | | | | 2 | | | 15 |
| 3 | | | | | | | 1 | | 4 | | 3 | | | | 1 | | | 9 |
| 4 | | | | | | | | | | | | 3 | | 1 | | | | 4 |
| 5 | | | | | | | | | | | | | 2 | | | | 1 | 3 |
| 6 | | | | | | | | | | | | | 1 | | 1 | | | 2 |
| 7 | | | | | | | | | | | | | | | 1 | | 1 | 2 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.1.12. Age difference table for snapper from, network type: back propagation: data inputs: Harmonics from transect 5. APE=19.20. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age class | | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -15 | | 1 | | | | | | | | | | | | | | | | 1 |
| -9 | | | | | | | | 2 | | | | | | | | | | 2 |
| -7 | 1 | | 1 | | | | | | | 1 | | | | | | | | 3 |
| -4 | | | | | | | | | | | | | 1 | | | | | 1 |
| -3 | | | | | | | | | | | | | | 2 | | | | 2 |
| -2 | 2 | 1 | | 6 | | 1 | | 1 | | | | | | | 1 | | | 12 |
| -1 | 1 | 4 | 6 | | 8 | | 1 | | | | | | | | | 3 | | 23 |
| **0** | | **5** | **13** | **22** | | **13** | | **2** | | | | | | | | | **1** | **56** |
| 1 | | | | 5 | 5 | | 6 | | 1 | | | | | | | | | 17 |
| 2 | | | | 2 | 2 | 7 | | 6 | | | | | | | | | | 17 |
| 3 | | | | | 1 | 3 | 3 | | 8 | | 5 | | | | | | | 20 |
| 4 | | | | | | | | 2 | | 8 | | 1 | | | | | | 11 |
| 5 | | | | | | | | | 1 | | 1 | | 1 | | 1 | | | 4 |
| 6 | | | | | | | | | | | | 2 | | 4 | | | | 6 |
| 7 | | | | | | | | | | | | | 3 | | 5 | | | 8 |
| 8 | | | | | | | | | | | | | | 2 | | | | 2 |
| 9 | | | | | | | | | | | | | | | 4 | | 3 | 7 |
| 10 | | | | | | | | | | | | | 1 | | | | | 1 |
| 11 | | | | | | | | | | | | | | | 1 | | 2 | 3 |
| 14 | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.1.13. Age difference table for snapper from, network type: layer back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=6.83. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -10 | | | | | | | 1 | | | | | | | | | | | 1 |
| -9 | | | | | | | | 1 | | | | | | | | | | 1 |
| -6 | | | | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | | | | 1 | | 2 | | | | | 3 |
| -3 | | | | | | | 1 | 1 | | | | | | 7 | | | | 9 |
| -2 | | | | | | 2 | | 1 | | | | | | | 6 | | | 9 |
| -1 | 1 | 1 | 1 | | 7 | 2 | 4 | 1 | 2 | 1 | | 1 | | | | 3 | | 24 |
| **0** | **3** | **10** | **19** | **30** | | **18** | **2** | **4** | | **4** | **1** | | **1** | | **2** | | **6** | **100** |
| 1 | | | | 5 | 9 | | 2 | 2 | 3 | 1 | 1 | | | | | | | 23 |
| 2 | | | | | | 2 | | 3 | 1 | 2 | | | | | 1 | | 1 | 10 |
| 3 | | | | | | | | | 4 | | 2 | | 2 | 1 | 1 | | | 10 |
| 4 | | | | | | | | | | 1 | | 1 | | | | | | 2 |
| 5 | | | | | | | | | | | | | 1 | | 1 | | | 2 |
| 7 | | | | | | | | | | | | | | | 1 | | | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.1. Age difference table for snapper from, network type: multiple hidden layer back propagation: data inputs: All biological, all transect data and all transect length. APE=12.23. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -11 | | | | | | 1 | | | | | | | | | | | | 1 |
| -9 | | | | | 1 | | | 3 | | | | | | | | | | 4 |
| -8 | | | | | | | | | 2 | | | | | | | | | 2 |
| -6 | | | | | | | | | | | 4 | | | | | | | 4 |
| -5 | | | | | | | | | | | 1 | 1 | | | | | | 2 |
| -4 | | | | | | | | | | 1 | | | 2 | | | | | 3 |
| -3 | | | | | | 1 | | | | | | | | 4 | | | | 5 |
| -2 | | | | | | 2 | 2 | | | | | | | | 8 | | | 12 |
| -1 | 3 | | | 2 | 6 | 1 | 3 | 1 | 1 | | | 1 | 1 | | | 3 | | 22 |
| **0** | **1** | **10** | **15** | **29** | **1** | **10** | **3** | **1** | **3** | **3** | | | **1** | **1** | **1** | | **5** | **84** |
| 1 | | 1 | 5 | | 7 | 1 | 1 | 2 | 1 | 2 | | | | | | | | 20 |
| 2 | | | | 4 | | 7 | | 4 | 1 | 1 | | | | | 1 | | | 18 |
| 3 | | | | | 1 | | | | 2 | | 1 | | | | | | 1 | 5 |
| 4 | | | | | | 1 | | 1 | | 2 | | 1 | | 1 | | | | 6 |
| 5 | | | | | | | 1 | | | | | | 1 | 1 | 1 | | | 4 |
| 6 | | | | | | | | 1 | | | | | | 1 | | | | 2 |
| 7 | | | | | | | | | | | | | | | 1 | | 1 | 2 |
| 9 | | | | | | | | | | | | | 1 | | | | | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.2. Age difference table for snapper from, network type: multiple hidden layer back propagation: data inputs: All biological and all transect lengths. APE=6.80. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | | | 1 | | | | 1 | | | | | | | 2 |
| -5 | | | | | | | | 1 | | | | 1 | | | | | | 2 |
| -4 | | | | | | | | | 2 | | 1 | | 2 | | | | | 5 |
| -3 | | | | | | | | 1 | | 1 | | | | 5 | | | | 7 |
| -2 | | | | | | | 1 | 2 | | | | | | | 5 | | | 8 |
| -1 | | | 2 | 1 | 4 | 3 | 4 | 4 | 1 | 1 | | | | | 1 | 2 | | 23 |
| **0** | **4** | **11** | **13** | **32** | **4** | **16** | **2** | | **1** | **3** | **2** | | **3** | | | **1** | **6** | **98** |
| 1 | | | 5 | 2 | 8 | 2 | 2 | 1 | 3 | 1 | 2 | 1 | | 3 | | | | 30 |
| 2 | | | | | | 3 | | 4 | | 3 | | | | | 2 | | | 12 |
| 3 | | | | | | | | | 3 | | | 1 | 1 | | 2 | | | 7 |
| 4 | | | | | | | | | | | | | | | 1 | | 1 | 2 |
| 5 | | | | | | | | | | | | | | | 1 | | | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.3. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: All biological data. APE=7.92. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | | | | | | 1 | 2 | | | | | | | 3 |
| -5 | | | | | | | | 1 | | | | 1 | | | | | | 2 |
| -4 | | | | | | | | | 1 | | 1 | | 2 | | | | | 4 |
| -3 | | | | | | | | | | | | | | 6 | | | | 6 |
| -2 | | | | | | | 4 | | | | | | | | 5 | | | 9 |
| -1 | | | 1 | 1 | 7 | 4 | 4 | 4 | | | | | | | 2 | 2 | | 25 |
| **0** | **4** | **11** | **15** | **31** | | **17** | | **2** | **1** | **1** | | | **2** | | **1** | **1** | **7** | **93** |
| 1 | | | 4 | 3 | 9 | | 1 | 2 | 2 | 1 | 1 | | | | 1 | | | 24 |
| 2 | | | | | | 3 | | 4 | 1 | 6 | | | | | | | | 14 |
| 3 | | | | | | | 1 | | 5 | | 2 | | | | 1 | | | 9 |
| 4 | | | | | | | | | | | | 2 | 2 | | | | | 4 |
| 5 | | | | | | | | | | | | | | 1 | | | | 1 |
| 6 | | | | | | | | | | | | | | 1 | | | | 1 |
| 7 | | | | | | | | | | | | | | | 2 | | | 2 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.4. Age difference table for snapper from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1. APE=23.08. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -13 | | | | 1 | | | | | | | | | | | | | | 1 |
| -12 | | | 1 | | | | | | | | | | | | | | | 1 |
| -11 | | | | | | 1 | | | | | | | | | | | | 1 |
| -9 | | | | | | 2 | | | | | | | | | | | | 2 |
| -8 | | | | | | | 1 | | 2 | | | | | | | | | 3 |
| -7 | | | | | | | | | | 1 | | | | | | | | 1 |
| -6 | | | | | | | | | 1 | | 1 | | | | | | | 2 |
| -5 | | | | | | | | | | 1 | | 1 | | | | | | 2 |
| -4 | | 1 | | | | | | | | | 1 | | 1 | | | | | 3 |
| -3 | 1 | | | | | 1 | | | | | | 1 | | 2 | | | | 5 |
| -2 | | 3 | | 1 | | 1 | 1 | | | | | | 2 | | 1 | | | 9 |
| -1 | 2 | | 4 | | | | | | | | | | | | | 1 | | 7 |
| **0** | **1** | **6** | **11** | **32** | | **7** | | **4** | | | | | | | **4** | | **1** | **66** |
| 1 | | 1 | 4 | | 15 | | 2 | | | | | | | | | | | 22 |
| 2 | | | | 1 | | 9 | | 3 | | 2 | | | | | | | 3 | 18 |
| 3 | | | | | | 2 | 4 | 1 | 4 | | | | | | | | | 11 |
| 4 | | | | | 1 | | 1 | 5 | | 4 | 1 | 1 | | | | | 1 | 14 |
| 5 | | | | | | 1 | | | 2 | | | | 1 | | | | | 4 |
| 6 | | | | | | | 1 | | 1 | 1 | | | | | | | | 3 |
| 7 | | | | | | | | | | | 2 | | 1 | | 1 | | | 4 |
| 8 | | | | | | | | | | | 1 | | | 1 | 1 | | | 3 |
| 9 | | | | | | | | | | | | | | | 2 | | | 2 |
| 10 | | | | | | | | | | | | | | 2 | | | | 2 |
| 11 | | | | | | | | | | | | | 1 | 1 | 2 | | | 4 |
| 12 | | | | | | | | | | | | | | | 1 | | | 1 |
| 13 | | | | | | | | | | | | | | 2 | | | 2 | 4 |
| 14 | | | | | | | | | | | | | | | | 1 | | 1 |
| 15 | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.5. Age difference table for snapper from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=9.64. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -8 | | | | | | | 1 | | | | | | | | | | | 1 |
| -6 | | | | | | | | | 2 | | | | | | | | | 2 |
| -5 | | | | | | | | | | 1 | | 1 | | | | | | 2 |
| -4 | | | | | | | | | | | 1 | | 2 | | | | | 3 |
| -3 | | | | | | | | | | | | | | 4 | | | | 4 |
| -2 | | | | 1 | | 3 | 1 | 2 | | | | | 1 | | 7 | | | 15 |
| -1 | 1 | 1 | 3 | | 6 | 3 | 7 | | 1 | | | | | | | 2 | | 24 |
| **0** | **3** | **9** | **15** | **33** | | **13** | | **5** | | **2** | | | | | **3** | | **5** | **88** |
| 1 | | 1 | 2 | 1 | 10 | | 1 | 3 | 3 | | 1 | | | | | 1 | | 23 |
| 2 | | | | | | 5 | | 2 | | 5 | | | | | | | 1 | 13 |
| 3 | | | | | | | | 1 | 4 | | 2 | | 1 | | | | | 8 |
| 4 | | | | | | | | | | 1 | 1 | 2 | | 2 | | | | 6 |
| 5 | | | | | | | | | | | | | 1 | | 1 | | | 2 |
| 6 | | | | | | | | | | | | | | 2 | | | | 2 |
| 7 | | | | | | | | | | | 1 | | | | 1 | | | 2 |
| 9 | | | | | | | | | | | | | | | | | 1 | 1 |
| 12 | | | | | | | | | | | | | 1 | | | | | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.6. Age difference table for snapper from, network type: multiple hidden layer back propagation: data inputs: Harmonics from 2. APE=24.80. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -10 | | | | | 1 | | | | | | | | | | | | | 1 |
| -9 | | | | | | 1 | | | | | | | | | | | | 1 |
| -8 | | | | | | | | | 2 | | | | | | | | | 2 |
| -5 | 1 | | | | | | | | | | | 1 | | | | | | 2 |
| -4 | | 2 | | | | | | | | | 1 | | 2 | | | | | 5 |
| -3 | | | 1 | | | | | | | | | | | 3 | | | | 4 |
| -2 | 2 | 3 | | 4 | | | | | | | | | | | 1 | | | 10 |
| -1 | | 3 | 7 | | 5 | 1 | | | | | | | | | | | | 16 |
| 0 | 1 | 2 | 7 | 27 | | 14 | | 1 | | | | | | | 1 | | 2 | 55 |
| 1 | | 1 | 3 | | 10 | | 5 | | | | | | | | | | | 19 |
| 2 | | | 2 | | | 7 | | 6 | | | | | | | | | | 15 |
| 3 | | | | 4 | | 1 | 4 | | 4 | | | | | | | | | 13 |
| 4 | | | | | | | | 6 | | 6 | | | | | | | | 12 |
| 5 | | | | | | | 1 | | 4 | | 5 | | | 1 | | | | 11 |
| 6 | | | | | | | | | | 3 | | 1 | | | | | | 4 |
| 7 | | | | | | | | | | | | | 2 | | | | | 2 |
| 8 | | | | | | | | | | | | 1 | | 4 | 1 | 2 | | 8 |
| 9 | | | | | | | | | | | | | 2 | | 7 | | 1 | 10 |
| 10 | | | | | | | | | | | | | | | | 1 | | 1 |
| 11 | | | | | | | | | | | | | | | 2 | | 4 | 6 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.7. Age difference table for snapper from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=10.43. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | | | | | 1 | | 2 | | | | | | | 3 |
| -5 | | | | | | | | | | 1 | | 2 | | | | | | 3 |
| -4 | | | | | | | | | | | 1 | | 2 | | | | | 3 |
| -3 | | | | | | 1 | | | | | | | | 7 | | | | 8 |
| -2 | | | | 1 | | 4 | | | | | | | 1 | | 10 | | | 16 |
| -1 | | | 5 | | 4 | 1 | 6 | 1 | | | | | | | | 2 | | 19 |
| **0** | **4** | **9** | **11** | **31** | | **13** | | **7** | **1** | | | | | | **1** | | **6** | **83** |
| 1 | | 2 | 2 | 3 | 12 | | 3 | | 4 | | 2 | | | | | 1 | | 29 |
| 2 | | | 2 | | | 5 | | 5 | | 8 | | | | | | | | 20 |
| 3 | | | | | | | 1 | | 4 | | 1 | | | | | | | 6 |
| 4 | | | | | | | | | | | | 1 | 1 | 1 | | | | 3 |
| 5 | | | | | | | | | | | | | 2 | | | | | 2 |
| 7 | | | | | | | | | | | | | | | 1 | | | 1 |
| 9 | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.8. Age difference table for snapper from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3. APE=21.26. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -10 | | | 1 | | | | 1 | | | | | | | | | | | 2 |
| -9 | | | | | | 1 | | 3 | | | | | | | | | | 4 |
| -8 | | | | | | | | | 2 | | | | | | | | | 2 |
| -7 | | | | | | | | | | 2 | | | | | | | | 2 |
| -6 | | | | | | | | | | | 2 | | | | | | | 2 |
| -5 | | | | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | | | | | | 1 | | | | | 1 |
| -3 | | | 1 | | | | | | | | | | | 2 | | | | 3 |
| -2 | | 1 | | 4 | | 3 | | | | | 1 | | | | 3 | | | 12 |
| -1 | 2 | 6 | 4 | | 11 | | 2 | | | | | | | | | 1 | | 26 |
| **0** | **2** | **2** | **14** | **26** | | **14** | **2** | **3** | | | | | | | | | **3** | **66** |
| 1 | | 2 | | 2 | 5 | | 2 | 1 | 2 | | | | | | | | | 14 |
| 2 | | | | | | 2 | | 3 | 1 | 2 | | | | | 1 | | 1 | 10 |
| 3 | | | | 3 | | 1 | 2 | | 3 | | 1 | | | | | | | 10 |
| 4 | | | | | | | | 2 | | 2 | | 2 | | | | | | 6 |
| 5 | | | | | | 3 | | 1 | 2 | | 2 | | 1 | 1 | | | | 10 |
| 6 | | | | | | | 1 | | | 3 | | | | 3 | | | | 7 |
| 7 | | | | | | | | | | | | | 1 | | 3 | | | 4 |
| 8 | | | | | | | | | | | | | | 1 | 1 | | | 2 |
| 9 | | | | | | | | | | | | | 3 | | 3 | | 2 | 8 |
| 10 | | | | | | | | | | | | | | 1 | | 2 | | 3 |
| 11 | | | | | | | | | | | | | | | 1 | | 1 | 2 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.9. Age difference table for snapper from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=7.84. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age class | | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | | | | | | 2 | | | | | | | | | | 2 |
| -8 | | | | | | | | | 1 | | | | | | | | | 1 |
| -6 | | | | | | | | | | | 3 | | | | | | | 3 |
| -5 | | | | | | | | | | 1 | | 2 | | | | | | 3 |
| -4 | | | | | | | | | | | | | 4 | | | | | 4 |
| -3 | | | | | | | | | | | | | | 7 | | | | 7 |
| -2 | | | | | | 1 | | | | | 1 | | | | 8 | | | 10 |
| -1 | | | 2 | | 7 | 1 | 5 | | | | | | | | | 3 | | 18 |
| **0** | **4** | **10** | **16** | **32** | | **18** | **1** | **9** | **1** | **1** | | | | | **2** | | **7** | **101** |
| 1 | | 1 | 1 | 3 | 9 | | 4 | 1 | 5 | 1 | | | | 1 | | | | 26 |
| 2 | | | 1 | | | 4 | | 1 | | 6 | | | | | 1 | | | 13 |
| 3 | | | | | | | | | 3 | | 2 | | | | | | | 5 |
| 4 | | | | | | | | | | | | 1 | | | | | | 1 |
| 5 | | | | | | | | | | | | | 2 | | | | | 2 |
| 7 | | | | | | | | | | | | | | | 1 | | | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.10. Age difference table for snapper from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4. APE=21.54. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age class | | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | | | | | | 1 | | | | | | | | | | 1 |
| -8 | | | | | | | | | 1 | | | | | | | | | 1 |
| -7 | | | 1 | | | | | | | 1 | | | | | | | | 2 |
| -6 | | | | | | | | | 2 | | 1 | | | | | | | 3 |
| -5 | 2 | | | | | | | | | | | 1 | | | | | | 3 |
| -4 | | 6 | | 1 | | 1 | | | | | 1 | | | | | | | 9 |
| -3 | 1 | | 2 | | 1 | | | | | | | | | | | | | 4 |
| -2 | 1 | 3 | | 6 | | | | 3 | | | | | | 1 | 2 | | | 16 |
| -1 | | 1 | 6 | | 4 | 2 | 2 | | | | | | | | 1 | 2 | | 18 |
| **0** | | **1** | **11** | **26** | | **10** | | **1** | | **1** | | | | | | | | **50** |
| 1 | | | | 1 | 11 | | 5 | | | | | | | | | | 1 | 18 |
| 2 | | | | | | 11 | | 6 | | | | | | | 1 | | | 18 |
| 3 | | | | 1 | | | 3 | | 5 | | | | | | 1 | | | 10 |
| 4 | | | | | | | | 2 | | 3 | | 1 | | | | | | 6 |
| 5 | | | | | | | | | 2 | | 4 | | 1 | | 1 | | | 8 |
| 6 | | | | | | | | | | 3 | | 1 | | 2 | | | | 6 |
| 7 | | | | | | | | | | | | | 5 | | 1 | | | 6 |
| 8 | | | | | | | | | | 1 | | | | 5 | | | | 6 |
| 9 | | | | | | | | | | | | | | | 5 | | | 5 |
| 10 | | | | | | | | | | | | | | | | 1 | | 1 |
| 11 | | | | | | | | | | | | | | | | | 6 | 6 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.11. Age difference table for snapper from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=9.85. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -7 | | | | | | | | 1 | | | | | | | | | | 1 |
| -6 | | | | | | | | | 1 | | 2 | | | | | | | 3 |
| -5 | | | | | | | | | | 1 | | | | | | | | 1 |
| -4 | | | | | | | | | | | | | 4 | | | | | 4 |
| -3 | | | | | | | | | | | | | | 5 | | | | 5 |
| -2 | | | | | | 1 | | | | | | | | | 6 | | | 7 |
| -1 | | | 3 | | 9 | 1 | 7 | 1 | | | | | | | | 3 | | 24 |
| **0** | **4** | **9** | **14** | **33** | | **19** | | **8** | | **1** | | | | | | | **5** | **93** |
| 1 | | 2 | 3 | 1 | 7 | | 2 | | 5 | | | | | | | | | 20 |
| 2 | | | | 1 | | 3 | | 3 | | 7 | | | | | | | | 14 |
| 3 | | | | | | | 1 | | 4 | | 4 | | | | | | | 9 |
| 4 | | | | | | | | | | | | 3 | | | | | | 3 |
| 5 | | | | | | | | | | | | | 2 | | 1 | | | 3 |
| 6 | | | | | | | | | | | | | | 3 | | | | 3 |
| 7 | | | | | | | | | | | | | | | 5 | | | 5 |
| 9 | | | | | | | | | | | | | | | | | 2 | 2 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.12. Age difference table for snapper from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5. APE=17.19. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -15 | | 1 | | | | | | | | | | | | | | | | 1 |
| -14 | | | 1 | | | | | | | | | | | | | | | 1 |
| -9 | | | | | | | | 1 | | | | | | | | | | 1 |
| -8 | | | | | | | 1 | | 1 | | | | | | | | | 2 |
| -7 | | | | | | | | | | 1 | | | | | | | | 1 |
| -6 | | | | | | | | | 3 | | 3 | | | | | | | 6 |
| -5 | | | | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | 1 | | | | | | | 3 | | | | | 4 |
| -3 | | | | | | | 1 | | | | | | | 4 | | | | 5 |
| -2 | | 1 | | 6 | 2 | | | 1 | | | | | | | 7 | | | 17 |
| -1 | 4 | 4 | 4 | | 7 | 1 | 2 | | | | | | | 1 | | 3 | | 26 |
| **0** | | **5** | **14** | **20** | | **12** | | **2** | | | | | | | | | **4** | **57** |
| 1 | | | 1 | 6 | 5 | | 3 | 1 | 2 | | 1 | | | | | | | 19 |
| 2 | | | | 3 | 1 | 5 | | 6 | | | | | | | | | 1 | 16 |
| 3 | | | | | 1 | 5 | 3 | | 3 | | 2 | | | | | | | 14 |
| 4 | | | | | | | | 1 | | 8 | | 2 | | | | | | 11 |
| 5 | | | | | | | | 1 | 1 | | | | 2 | | | | | 4 |
| 7 | | | | | | | | | | | | | 1 | 1 | 2 | | | 4 |
| 8 | | | | | | | | | | | | | | 2 | | | | 2 |
| 9 | | | | | | | | | | | | | | | 2 | | 1 | 3 |
| 11 | | | | | | | | | | | | | | | 1 | | | 1 |
| 14 | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.2.13. Age difference table for snapper from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=8.99. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | | | | | | 1 | | | | | | | | | | 1 |
| -6 | | | | | | | | | | | 2 | | | | | | | 2 |
| -4 | | | | | | | 1 | | 2 | | | | 2 | | | | | 5 |
| -3 | | | | | | 1 | | | | | | | | 2 | | | | 3 |
| -2 | | | | | 3 | 1 | 1 | 1 | | | | | 1 | | 4 | | | 11 |
| -1 | 1 | | 2 | 1 | 4 | 4 | 2 | 4 | | 2 | | | | 4 | | 3 | | 27 |
| **0** | **3** | **9** | **16** | **32** | **1** | **12** | **5** | **2** | **1** | **4** | | **1** | **1** | **1** | **3** | | **2** | **93** |
| 1 | | 2 | 2 | 2 | 8 | 1 | 1 | 1 | 2 | 1 | 1 | | | 1 | 1 | | | 23 |
| 2 | | | | | | 5 | | 3 | 2 | 1 | 2 | | | | 1 | | 3 | 17 |
| 3 | | | | | | | | | 2 | 1 | 1 | | | | 1 | | | 5 |
| 4 | | | | | | | | | | | | 2 | 1 | | 1 | | | 4 |
| 5 | | | | | | | | | | | | | 1 | | | | | 1 |
| 6 | | | | | | | | 1 | | | | | | | | | 1 | 2 |
| 7 | | | | | | | | | 1 | | | | | | 1 | | | 2 |
| 9 | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.3.1. Age difference table for snapper from, network type: probabilistic: data inputs: All biological, all transect data and all transect length. APE=9.81. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age class | | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -10 | | | 1 | | | | | | | | | | | | | | | 1 |
| -8 | | | | | | | 1 | 1 | | | | | | | | | | 2 |
| -6 | | | | | | | | 1 | | 1 | 1 | | | | | | | 3 |
| -5 | | | | | | | | 1 | 1 | | 1 | | | | | | | 3 |
| -4 | | | | | | | 1 | 1 | | 4 | 1 | | 1 | | | | | 8 |
| -3 | | | | | | 1 | | 1 | 3 | | 2 | | 1 | 2 | | | | 10 |
| -2 | | | | | | 1 | | | | | | | | 3 | 3 | | | 7 |
| -1 | | | 1 | 5 | 3 | 5 | 2 | 2 | | | 1 | | 1 | 1 | 2 | 1 | | 24 |
| **0** | **4** | **9** | **17** | **26** | **6** | **9** | **4** | **3** | **3** | **2** | | **1** | | **2** | **2** | **1** | **4** | **93** |
| 1 | | 2 | 1 | 3 | 7 | 4 | | | | 2 | | | 1 | | 2 | 1 | | 23 |
| 2 | | | | 1 | | 4 | 2 | 3 | | | | | | | 1 | | | 11 |
| 3 | | | | | | | | | 3 | | | | 1 | | | | 1 | 5 |
| 4 | | | | | | | | | | | | 2 | 1 | | 2 | | 1 | 6 |
| 5 | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.3.2. Age difference table for snapper from, network type: probabilistic: data inputs: All biological and all transect lengths. APE=5.6. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age class | | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -8 | | | | | | | | 1 | | | | | | | | | | 1 |
| -7 | | | | | | | 1 | | | | | | | | | | | 1 |
| -5 | | | | | | | | 2 | 1 | | 1 | | | | | | | 4 |
| -4 | | | | | | | | | 1 | 2 | | 1 | | | | | | 4 |
| -3 | | | | | | | | | | | 3 | | | 1 | | | | 4 |
| -2 | | | | | | | 1 | 2 | | | | 1 | | 3 | 2 | | | 9 |
| -1 | | | 1 | 1 | 7 | 5 | 5 | | 1 | | 1 | | | 2 | 3 | | | 26 |
| **0** | **4** | **11** | **17** | **33** | **1** | **17** | **2** | **2** | **2** | **5** | | **1** | **4** | **1** | **3** | **1** | **4** | **108** |
| 1 | | | 2 | 1 | 8 | 1 | 1 | 4 | 1 | 1 | 1 | | 1 | | 2 | | 2 | 25 |
| 2 | | | | | | 1 | | 2 | 1 | 1 | | | | 1 | 2 | 1 | 1 | 10 |
| 3 | | | | | | | | | 3 | | | | 1 | | | 1 | | 5 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.3.3. Age difference table for snapper from, network type: probabilistic: data inputs: All biological data. APE=8.11. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -8 | | | | | | | | 1 | | | | | | | | | | 1 |
| -7 | | | | | | | 1 | 1 | | | | | | | | | | 2 |
| -6 | | | | | | | | 1 | 1 | | 2 | | | | | | | 4 |
| -5 | | | | | | | | | 1 | | | | | | | | | 1 |
| -4 | | | | | | | | | | 1 | | 1 | 2 | | | | | 4 |
| -3 | | | | | | | | | | | 2 | | | 1 | | | | 3 |
| -2 | | | | | | | | | | | | | 1 | 5 | 2 | | | 8 |
| -1 | | | 1 | 1 | 7 | 7 | 5 | 1 | | 1 | | | 2 | | 2 | 3 | | 30 |
| **0** | **4** | **7** | **18** | **33** | | **14** | **3** | **4** | | **1** | **1** | | **1** | **1** | **6** | | **3** | **96** |
| 1 | | 4 | 1 | 1 | 9 | 2 | 1 | 4 | 2 | | | 2 | | 1 | 1 | | 3 | 31 |
| 2 | | | | | | 1 | | 1 | 3 | 6 | | | | | | | | 11 |
| 3 | | | | | | | | | 3 | | 1 | | | | | | 1 | 5 |
| 4 | | | | | | | | | | | | | | | 1 | | | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.3.4. Age difference table for snapper from, network type: probabilistic: data inputs: Harmonics from transect 1. APE=32.15. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -16 | 1 | | | | | | | | | | | | | | | | | 1 |
| -13 | 1 | | | 1 | | | | | | | | | | | | | | 2 |
| -12 | | 1 | | | 1 | | | | | | | | | | | | | 2 |
| -11 | | | 2 | | | | | | | | | | | | | | | 2 |
| -10 | | | 2 | 5 | | 2 | | | | | | | | | | | | 9 |
| -9 | | | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | 5 |
| -8 | | | | 1 | | 6 | | | 2 | | | | | | | | | 9 |
| -7 | | | | 1 | | | 1 | | | | | | | | | | | 2 |
| -6 | | | | | | | | 1 | 2 | | 1 | | | | | | | 4 |
| -5 | | | | | | 2 | | | 2 | | 1 | | | | | | | 5 |
| -4 | | | | | | | | | 1 | 4 | 2 | 1 | | | | | | 8 |
| -3 | | | | 2 | | | | 1 | | | 1 | 1 | | 1 | | | | 6 |
| -2 | 1 | | 1 | | | | 1 | | | | | 1 | | | | | | 4 |
| -1 | | 3 | | 8 | | 2 | 1 | 1 | | | | | 1 | | 1 | 1 | | 18 |
| **0** | **1** | **6** | **11** | **10** | **2** | **1** | | | **1** | | | | **1** | **2** | **2** | | | **37** |
| 1 | | 1 | 3 | 3 | 9 | 3 | 1 | 1 | | 1 | | | | 1 | 3 | | | 26 |
| 2 | | | 1 | 2 | 1 | 1 | 1 | | | 1 | | | | | 1 | | 2 | 10 |
| 3 | | | | 1 | 1 | 4 | | 2 | | 1 | | | | | 1 | | 3 | 13 |
| 4 | | | | | 1 | 1 | 3 | 1 | | 2 | | | | | | | 1 | 9 |
| 5 | | | | | | 1 | | 1 | | | | | | 1 | | | | 3 |
| 6 | | | | | | | 1 | 2 | 2 | | | | 1 | | | | | 6 |
| 7 | | | | | | | | 2 | | | | | | | | | | 2 |
| 8 | | | | | | | | | | | | | | | 1 | | | 1 |
| 9 | | | | | | | | | | | 1 | | | | 1 | | | 2 |
| 10 | | | | | | | | | | | | | | | 1 | | 1 | 2 |
| 12 | | | | | | | | | | | | | 3 | | 1 | | | 4 |
| 13 | | | | | | | | | | | | | | 3 | | | | 3 |
| 15 | | | | | | | | | | | | | | | | 2 | | 2 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.3.5. Age difference table for snapper from, network type: probabilistic: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=7.20. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -7 | | | | | | | 1 | | | | | | | | | | | 1 |
| -5 | | | | | | | | | 1 | 1 | | | | | | | | 2 |
| -4 | | | | | | | | 3 | 1 | 1 | 4 | | | | | | | 9 |
| -3 | | | | | | | | | | | 1 | 2 | | 1 | | | | 4 |
| -2 | | | | | | 2 | | | | 2 | | 1 | 1 | | 2 | | | 8 |
| -1 | | | 1 | | 4 | 3 | 4 | 3 | 1 | | | | 2 | 4 | | 1 | | 23 |
| **0** | **4** | **9** | **18** | **29** | **5** | **13** | **4** | **1** | | **2** | **1** | | **2** | **1** | **6** | | **2** | **97** |
| 1 | | 2 | 1 | 6 | 7 | 4 | 1 | 4 | 3 | 3 | | | | 2 | 2 | 1 | | 36 |
| 2 | | | | | | 2 | | 2 | 1 | | | | 1 | | 1 | | 2 | 9 |
| 3 | | | | | | | | | 2 | | | | | | 1 | 1 | 2 | 6 |
| 4 | | | | | | | | | 1 | | | | | | | | 1 | 2 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.3.6. Age difference table for snapper from, network type: probabilistic: data inputs: Harmonics from transect 2. APE=37.21. Data from production set

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -14 | 1 | | 1 | | | | | | | | | | | | | | | 2 |
| -11 | | | | 1 | | | | | | | | | | | | | | 1 |
| -10 | | | 1 | | 1 | 1 | 1 | | | | | | | | | | | 4 |
| -9 | | | | | | 4 | 2 | 1 | | | | | | | | | | 7 |
| -8 | | | | | 1 | | 1 | | | | | | | | | | | 2 |
| -7 | | | | | | | | 1 | 2 | | | | | | | | | 3 |
| -6 | | | | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | | | | | | 2 | 1 | | | | | | | 3 |
| -4 | | 2 | | | | | | | | 1 | 2 | 1 | 1 | | | | | 7 |
| -3 | 1 | 1 | 1 | 1 | | | | 2 | 1 | | 1 | 1 | | | | | | 9 |
| -2 | | 1 | 1 | 4 | | 1 | 1 | | 2 | | | | 2 | 4 | | | | 16 |
| -1 | 1 | | 1 | 5 | 5 | 1 | | 2 | | 1 | | | | 1 | 4 | 1 | | 22 |
| **0** | **1** | **2** | **7** | **7** | **2** | **5** | | | | | | | | | **3** | | **2** | **29** |
| 1 | | 5 | 4 | 5 | 2 | 4 | | | | 1 | | | | | | | 1 | 22 |
| 2 | | | 4 | 5 | 1 | 2 | 1 | 3 | | | | | | | 1 | | 1 | 18 |
| 3 | | | | 7 | 2 | 1 | 2 | | 3 | | | | | 1 | | | | 16 |
| 4 | | | | | 2 | 2 | | | | 3 | | | | | | | | 7 |
| 5 | | | | | | 3 | 1 | 1 | | 1 | | | | | | | | 6 |
| 6 | | | | | | | 1 | 3 | | | | | | | | | | 4 |
| 7 | | | | | | | | | 2 | | | 1 | | | | | | 3 |
| 8 | | | | | | | | | | | | | 1 | 1 | 1 | | | 3 |
| 9 | | | | | | | | | | | 1 | | | | | | | 1 |
| 11 | | | | | | | | | | | | | 1 | | | 1 | 1 | 3 |
| 12 | | | | | | | | | | | | | 1 | 1 | | | 1 | 3 |
| 13 | | | | | | | | | | | | | | | 1 | | | 1 |
| 14 | | | | | | | | | | | | | | | 2 | | 1 | 3 |
| 15 | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.3.7. Age difference table for snapper from, network type: probabilistic: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=8.06. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | | | | | | 1 | | | | | | | | | | 1 |
| -7 | | | | | | | | 1 | | | | | | | | | | 1 |
| -6 | | | | | | | 1 | | | | 1 | | | | | | | 2 |
| -5 | | | | | | | | | | 1 | | | | | | | | 1 |
| -4 | | | | | | 1 | | | 1 | | 1 | | 1 | | | | | 4 |
| -3 | | | | | | | 1 | | 1 | | 2 | | | 2 | | | | 6 |
| -2 | | | | 1 | 4 | 1 | | 1 | | 1 | | 1 | 1 | 2 | 2 | | | 14 |
| -1 | | | 1 | 8 | | 3 | 3 | 3 | 2 | 2 | | | | 2 | 4 | 1 | | 29 |
| **0** | **4** | **11** | **18** | **21** | **6** | **11** | **3** | **2** | **1** | **3** | **1** | | | | **1** | | **4** | **86** |
| 1 | | | 1 | 5 | 6 | 3 | 1 | 3 | 1 | | 1 | | | 1 | 1 | 1 | | 24 |
| 2 | | | | | | 5 | 1 | 2 | 2 | 1 | | 1 | | | 1 | 1 | 2 | 16 |
| 3 | | | | | | | | | 2 | 1 | | | 2 | 1 | | | | 6 |
| 4 | | | | | | | | | | | | 1 | 1 | | | | | 2 |
| 5 | | | | | | | | | | | | | 1 | | 1 | | 1 | 3 |
| 6 | | | | | | | | | | | | | | | 2 | | | 2 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.3.8. Age difference table for black bream from, network type: probabilistic: data inputs: Harmonics from transect 3. APE=25.61. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -10 | | | 1 | | | | | | | | | | | | | | | 1 |
| -9 | | | | | | 1 | 2 | 1 | | | | | | | | | | 4 |
| -8 | | | | | | 3 | 1 | 1 | | | | | | | | | | 5 |
| -7 | | | | | | | 2 | | | 3 | | | | | | | | 5 |
| -6 | | | | | | 1 | | 4 | | | | | | | | | | 5 |
| -5 | | | | | | 2 | | | 2 | | | | | | | | | 4 |
| -4 | | | | | | | | 1 | | 1 | | 1 | | | | | | 3 |
| -3 | | | 1 | | | | | | 1 | | 2 | | | | | | | 4 |
| -2 | | | | | | | | | 2 | 1 | | 1 | | | | | | 4 |
| -1 | 2 | 1 | 1 | 1 | 4 | 1 | | | | 2 | 1 | | 1 | 1 | 1 | 1 | | 17 |
| 0 | 2 | 7 | 12 | 24 | 2 | 5 | 2 | | | | | 1 | | 5 | 2 | 1 | | 63 |
| 1 | | 3 | 4 | 2 | 4 | 3 | 1 | 3 | | | | | 2 | 1 | 4 | 1 | 1 | 29 |
| 2 | | | 1 | 6 | | 1 | | 1 | 1 | | | | | | 1 | | 2 | 13 |
| 3 | | | | 2 | 1 | 1 | 2 | | 2 | | | | | | 1 | | 2 | 11 |
| 4 | | | | | 5 | | | 1 | 1 | 1 | | | | | | | | 8 |
| 5 | | | | | | 6 | | 1 | | | 1 | | | | | | 2 | 10 |
| 7 | | | | | | | | | 1 | 1 | 1 | | 1 | | | | | 4 |
| 8 | | | | | | | | | | | | | | | 1 | | | 1 |
| 9 | | | | | | | | | | | | | 2 | | | | | 2 |
| 10 | | | | | | | | | | | 1 | | | | | | | 1 |
| 11 | | | | | | | | | | | | | | | 1 | | | 1 |
| 12 | | | | | | | | | | | | | | 1 | | | | 1 |
| 14 | | | | | | | | | | | | | | | 1 | | | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.3.9. Age difference table for snapper from, network type: probabilistic: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=9.49. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age class | | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -7 | | | | | | | 1 | | | | | | | | | | | 1 |
| -6 | | | | | | | | 2 | | 1 | | | | | | | | 3 |
| -5 | | | | | | | | | | | 1 | | | | | | | 1 |
| -4 | | | | | | | | | | 1 | 2 | | 1 | | | | | 4 |
| -3 | | | 1 | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | | 7 |
| -2 | | | | | | 2 | 1 | 1 | 1 | 3 | | 1 | | | 1 | | | 10 |
| -1 | 1 | | 1 | | 5 | 9 | 2 | 1 | 2 | | | | | 2 | | | | 23 |
| **0** | **3** | **7** | **16** | **29** | **5** | **11** | **4** | **4** | **3** | | | **1** | | **3** | **4** | **2** | **1** | **93** |
| 1 | | 4 | 2 | 5 | 5 | 1 | 1 | 4 | 1 | 2 | 1 | | 1 | 1 | | | | 28 |
| 2 | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | | 4 | 1 | 3 | 17 |
| 3 | | | | | | | | | 1 | | | | 1 | | 3 | | 1 | 6 |
| 4 | | | | | | | | | | | | | 1 | | | | 2 | 3 |
| 5 | | | | | | | | | | | | | | 1 | | | | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.3.10. Age difference table for snapper from, network type: probabilistic: data inputs: Harmonics from transect 4. APE=30.60. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age class | | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -15 | | 2 | | | | | | | | | | | | | | | | 2 |
| -10 | | | 1 | 1 | 1 | | 1 | | | | | | | | | | | 4 |
| -8 | | 1 | | 1 | | 1 | 1 | | | | | | | | | | | 4 |
| -7 | | | | 1 | | | | | | 1 | | | | | | | | 2 |
| -6 | | | | | 1 | | | 2 | 1 | | | | | | | | | 4 |
| -5 | | | | | | 1 | | 1 | 1 | 1 | 1 | 1 | | | | | | 6 |
| -4 | | | | 3 | | 1 | | | 1 | 1 | | | 1 | | | | | 7 |
| -3 | | | | | | 2 | | 1 | 1 | 1 | | | | 1 | | | | 6 |
| -2 | 2 | | 1 | 1 | | 1 | | | | | | | 1 | | 1 | | | 7 |
| -1 | 1 | 2 | 1 | 5 | 4 | 2 | 1 | 1 | 1 | 1 | | | | | | | | 19 |
| **0** | **1** | **2** | **12** | **11** | **3** | **1** | **1** | **4** | | **1** | | | **1** | **1** | | **2** | | **40** |
| 1 | | 4 | 4 | 1 | 2 | 6 | 1 | | | 2 | 2 | 1 | | 1 | | 1 | | 25 |
| 2 | | | 1 | 7 | 2 | 3 | | 1 | 2 | 1 | 1 | | 1 | | 3 | | 2 | 24 |
| 3 | | | | 3 | 2 | 5 | 2 | 1 | | | | | | | | | | 13 |
| 4 | | | | | 1 | | 1 | | | | | 1 | | | | | 1 | 4 |
| 5 | | | | | | 1 | | 1 | | | | | | | 2 | | | 4 |
| 6 | | | | | | | 1 | | | | 1 | | 1 | | 1 | | | 4 |
| 7 | | | | | | | | 1 | 2 | | | | | 2 | 1 | | 1 | 7 |
| 8 | | | | | | | | | 1 | | | | | | 2 | | | 3 |
| 9 | | | | | | | | | | | 1 | | | 1 | | | | 2 |
| 11 | | | | | | | | | | | | | | | | | 1 | 1 |
| 12 | | | | | | | | | | | | | 1 | | | | | 1 |
| 13 | | | | | | | | | | | | | | 2 | 1 | | 1 | 4 |
| 14 | | | | | | | | | | | | | | | | | 1 | 1 |
| N | 4 | 11 | 20 | 34 | 16 | 24 | 9 | 13 | 10 | 9 | 6 | 3 | 6 | 8 | 11 | 3 | 7 | **194** |

Table 4.3.11. Age difference table for snapper from, network type: probabilistic: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=7.16. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | | | | | | 1 | | | | | | | | | | 1 |
| -6 | | | | | | | 1 | | | 1 | 1 | | | | | | | 3 |
| -5 | | | | | | | | | 1 | | 1 | | | | | | | 2 |
| -4 | | | | | | | | | 1 | | 1 | 3 | | | | | | 5 |
| -3 | | | | | | 3 | | 1 | 1 | 2 | 2 | | | | | | | 9 |
| -2 | | | | | | | 1 | 1 | | | | | | 2 | 1 | | | 5 |
| -1 | | | 1 | 4 | 2 | 3 | 4 | 3 | 1 | | 1 | | 1 | | 3 | 1 | | 24 |
| **0** | **4** | **10** | **19** | **23** | **8** | **13** | **3** | **3** | | **4** | | | **5** | **3** | **1** | **1** | **1** | **98** |
| 1 | | 1 | | 8 | 6 | 4 | | 1 | 2 | 1 | | | | 1 | 3 | | 2 | 29 |
| 2 | | | | | | 1 | 1 | 3 | 2 | 1 | | | | 1 | 2 | 1 | 1 | 13 |
| 3 | | | | | | | | | 2 | | | | | 1 | 1 | | | 4 |
| 4 | | | | | | | | | | | | | | | | | 2 | 2 |
| 5 | | | | | | | | | | | | | | | 1 | | 1 | 2 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

Table 4.3.12. Age difference table for snapper from, network type: probabilistic: data inputs: Harmonics from transect 5. APE=17.45. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -15 | | 1 | | | | | | | | | | | | | | | | 1 |
| -11 | | | | | | 1 | | | | | | | | | | | | 1 |
| -10 | | | 1 | | | | | | | | | | | | | | | 1 |
| -9 | | | | | | 2 | | 1 | | | | | | | | | | 3 |
| -8 | | | | | | | 2 | | 1 | | | | | | | | | 3 |
| -7 | 1 | | | | | | | 1 | | | | | | | | | | 2 |
| -6 | | | | | 2 | | | | 2 | | 2 | | | | | | | 6 |
| -5 | | | | | | 1 | | 1 | | 2 | | 1 | | | | | | 5 |
| -4 | | | | | | | 1 | | | 1 | 3 | | 2 | | | | | 7 |
| -3 | | | | | | 1 | 1 | 4 | | | | 1 | | 4 | | | | 11 |
| -2 | | 1 | | 2 | 2 | | | 2 | 2 | | | 1 | 1 | 1 | 2 | | | 14 |
| -1 | 2 | 3 | 2 | 3 | 5 | 1 | 3 | | | 2 | | | 1 | 1 | | 2 | | 25 |
| **0** | **1** | **6** | **14** | **20** | **1** | **8** | **2** | **2** | | **3** | **1** | | | **1** | **1** | | **1** | **61** |
| 1 | | | 2 | 7 | 5 | | | | 3 | | | | | | 3 | | | 20 |
| 2 | | | 1 | 2 | 1 | 5 | | 2 | | 1 | | | | | 1 | | 2 | 15 |
| 3 | | | | 1 | | 5 | 1 | | 2 | | | | | | 1 | 1 | 2 | 13 |
| 5 | | | | | | | | | | | | | | 1 | | | | 1 |
| 6 | | | | | | | | | | | | | 1 | | 1 | | | 2 |
| 7 | | | | | | | | | | | | | 1 | | 1 | | | 2 |
| 8 | | | | | | | | | | | | | | | 1 | | 1 | 2 |
| 9 | | | | | | | | | | | | | | | 1 | | | 1 |
| 14 | | | | | | | | | | | | | | | | | 1 | 1 |
| N | 4 | 11 | 20 | 35 | 16 | 24 | 10 | 13 | 10 | 9 | 6 | 3 | 6 | 8 | 12 | 3 | 7 | **197** |

Table 4.3.13. Age difference table for snapper from, network type: probabilistic: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=7.64. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | | | | | | 1 | | | | | | | | 1 |
| -5 | | | | | | 2 | | | | 1 | | | | | | | | 3 |
| -4 | | | | | | | | | 1 | 1 | 1 | | | | | | | 3 |
| -3 | | | | | | 1 | | 1 | 1 | | | | 2 | 1 | | | | 6 |
| -2 | | | | 1 | 2 | | | 1 | 2 | 1 | 1 | 1 | 1 | 3 | 3 | | | 16 |
| -1 | | 1 | 2 | 4 | 4 | 6 | 3 | 4 | 1 | | 1 | | | 2 | 1 | 2 | | 31 |
| **0** | **4** | **10** | **18** | **22** | **4** | **6** | **5** | **4** | | **2** | **1** | **1** | | **2** | **4** | | **3** | **86** |
| 1 | | | | 7 | 6 | 4 | 2 | 2 | 2 | 3 | 1 | 1 | | | | | 1 | 29 |
| 2 | | | | 1 | | 5 | | 1 | 1 | | 1 | | 1 | | 1 | 1 | 1 | 13 |
| 3 | | | | | | | | | 1 | | | | 1 | | 3 | | | 5 |
| 4 | | | | | | | | | 1 | | | | | | | | 2 | 3 |
| 6 | | | | | | | | | | | | | 1 | | | | | 1 |
| N | **4** | **11** | **20** | **35** | **16** | **24** | **10** | **13** | **10** | **9** | **6** | **3** | **6** | **8** | **12** | **3** | **7** | **197** |

### *Black bream*

Table 5.1.1. Age difference table for black bream from, network type: back propagation: data inputs: All biological, all transect data and all transect length. APE=8.77. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | 2 | | | | | | | | | | 2 |
| -5 | | | | | 1 | | | 3 | | | | | | | 4 |
| -4 | | | | 1 | 3 | | | | | | | | | | 4 |
| -3 | | | | | 2 | | | | | | 1 | | | | 3 |
| -2 | 2 | | | | | 2 | 2 | | | | | | | | 6 |
| -1 | 4 | 5 | | | | 6 | 7 | | | | | 4 | | | 26 |
| **0** | **3** | **10** | **31** | | | **1** | **29** | **9** | **2** | | | | **11** | **3** | **99** |
| 1 | | | 5 | 2 | | | | 3 | 3 | | | | | 3 | 16 |
| 2 | | | 1 | | 6 | | | | 1 | 1 | | | | | 9 |
| 3 | | | | 1 | 1 | | | | | | 1 | | | | 3 |
| 4 | | | | | | | | | | | | 1 | 2 | | 3 |
| 5 | | | | | | | | | | | | | 1 | | 1 |
| 6 | | | | | | | 3 | | | | | | | 3 | 6 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.1.2. Age difference table for black bream from, network type: back propagation: data inputs: All biological and all transect lengths. APE=7.55. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -7 | | 1 | | | | | | | | | | | | | 1 |
| -6 | | | 2 | | | | | | | | | | | | 2 |
| -5 | | | | 1 | | | | | | | | | | | 1 |
| -4 | | | | | 10 | | | | | | | | | | 10 |
| -3 | | 1 | | | | | | | | | | | | | 1 |
| -2 | 1 | | | | | 2 | 1 | | | | | 1 | | | 5 |
| -1 | | 4 | | 1 | | 7 | 2 | 2 | | | | 3 | 4 | | 23 |
| **0** | **8** | **5** | **32** | | **1** | | **37** | **5** | **2** | | | | **10** | **8** | **108** |
| 1 | | 4 | 1 | 2 | | | | 8 | 1 | | | | | | 16 |
| 2 | | | 2 | | 4 | | | | 3 | 1 | 1 | | | | 11 |
| 3 | | | | | | | | | | | 1 | | | | 1 |
| 4 | | | | | | | | | | | | 1 | | | 1 |
| 5 | | | | | | | | | | | | | | | |
| 6 | | | | | | | 1 | | | | | | | 1 | 2 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.1.3. Age difference table for black bream from, network type: back propagation: data inputs: All biological data. APE=9.60. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -7 | | 4 | | | | | | | | | | | | | 4 |
| -6 | | | 3 | 1 | | | | | | | | | | | 4 |
| -5 | | | | 1 | 1 | | | 1 | | | | | | | 3 |
| -4 | | | | | 8 | | | | | | | | | | 8 |
| -3 | | | | | | | | | | | | | | | 0 |
| -2 | 1 | | | | | 3 | | | | | | | | | 4 |
| -1 | | 4 | | | | 5 | 5 | | | | | 4 | 3 | | 21 |
| **0** | **8** | **4** | **30** | | | **1** | **34** | **5** | | | | | **11** | **5** | **98** |
| 1 | | 3 | 2 | 2 | | | | 9 | 3 | | | | | 3 | 22 |
| 2 | | | 2 | | 5 | | | | 3 | 1 | | | | | 11 |
| 3 | | | | | | | | | | | 2 | | | | 2 |
| 4 | | | | | 1 | | | | | | | 1 | | | 2 |
| 5 | | | | | | | | | | | | | | | 0 |
| 6 | | | | | | | 2 | | | | | | | 1 | 3 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.1.4. Age difference table for black bream from, network type: back propagation: data inputs: Harmonics from transect 1. APE=19.21. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -8 | 1 | | | | | | | | | | | | | | 1 |
| -7 | | 4 | 2 | | | | | | | | | | | | 6 |
| -6 | | | 6 | | | | | | | | | | | | 6 |
| -5 | | | | 1 | 2 | | | | | | | | | | 3 |
| -4 | | | | | 8 | | | | | | | | | | 8 |
| -2 | 7 | | | | | | | | | | | | | | 7 |
| -1 | 1 | 6 | | | | 9 | 3 | | | | | | | | 19 |
| **0** | | **5** | **25** | | | | **32** | | | | | | | | **62** |
| 1 | | | 4 | 1 | | | | 13 | 2 | | | | | | 20 |
| 2 | | | | 2 | 2 | | | | 4 | | | | | | 8 |
| 3 | | | | | 3 | | | | | 1 | | | | | 4 |
| 4 | | | | | | | | | | | 2 | | | | 2 |
| 5 | | | | | | | | | | | | 3 | 1 | | 4 |
| 6 | | | | | | | 3 | | | | | | 12 | 1 | 16 |
| 7 | | | | | | | 3 | 1 | | | | | | 7 | 11 |
| 8 | | | | | | | | 1 | | | | | | | 1 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | | 0 |
| 11 | | | | | | | | | | | | 1 | | | 1 |
| 12 | | | | | | | | | | | | 1 | 1 | | 2 |
| 13 | | | | | | | | | | | | | | 1 | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.1.5. Age difference table for black bream from, network type: back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=9.08. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -8 | 1 | | | | | | | | | | | | | | 1 |
| -7 | | | | | | | | | | | | | | | 0 |
| -6 | | | 2 | | 3 | | | 1 | | | | | | | 6 |
| -5 | | | | 1 | | | | | 1 | | | | | | 2 |
| -4 | | | | 1 | 5 | | | | | | | | | | 6 |
| -3 | | | | | | 1 | | | | | 1 | | | | 2 |
| -2 | 1 | | 1 | | | 1 | 1 | | | | | 1 | | | 5 |
| -1 | 1 | 5 | | 1 | | 5 | 3 | 4 | | | | 3 | 2 | | 24 |
| **0** | **6** | **7** | **27** | | | **2** | **33** | **4** | **2** | | | | **11** | **8** | **100** |
| 1 | | 3 | 6 | 1 | | | 1 | 6 | 1 | | | | | | 18 |
| 2 | | | 1 | | 4 | | | | 2 | 1 | 1 | | | | 9 |
| 3 | | | | | 3 | | | | | | | | | | 3 |
| 4 | | | | | | | 2 | | | | | 1 | 1 | | 4 |
| 5 | | | | | | | | | | | | | | 1 | 1 |
| 6 | | | | | | | 1 | | | | | | | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.1.6. Age difference table for black bream from, network type: back propagation: data inputs: Harmonics from 2. APE=13.24. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | 3 | | | | | | | | | | | | 3 |
| -5 | | | | | | | | | | | | | | | 0 |
| -4 | | | | | 9 | | | | 1 | | | | | | 10 |
| -2 | 8 | | | | | 1 | | | | | | | | | 9 |
| -1 | 1 | 11 | | | | 7 | 5 | | | | | 1 | | | 25 |
| **0** | | **4** | **31** | | | | **32** | **2** | **2** | | | | **7** | | **78** |
| 1 | | | 3 | 3 | | | | 13 | 2 | | | | | | 21 |
| 2 | | | | 1 | 5 | | | | 1 | | | | | | 7 |
| 3 | | | | | 1 | | | | | 1 | 2 | | | | 4 |
| 4 | | | | | | | | | | | | 1 | 1 | | 2 |
| 5 | | | | | | | | | | | | 3 | 4 | | 7 |
| 6 | | | | | | 1 | 3 | | | | | | 2 | 3 | 9 |
| 7 | | | | | | | 1 | | | | | | | 4 | 5 |
| 8 | | | | | | | | | | | | | | | 0 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | | 0 |
| 11 | | | | | | | | | | | | | | | 0 |
| 12 | | | | | | | | | | | | | | | 0 |
| 13 | | | | | | | | | | | | | | 2 | 2 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.1.7. Age difference table for black bream from, network type: back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=6.27. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -4 | | | | | 8 | | | | | | | | | | 8 |
| -3 | | 1 | | | | | | | | | | | | | 1 |
| -2 | | | 1 | | | 1 | 1 | | | | | 1 | | | 4 |
| -1 | 2 | 7 | | | | 7 | 3 | 1 | | | | 3 | 1 | | 24 |
| **0** | **7** | **7** | **32** | **1** | **1** | **1** | **35** | **8** | **2** | | | | **12** | **8** | **114** |
| 1 | | | 3 | 2 | | | | 6 | 3 | | | | 1 | | 15 |
| 2 | | | 1 | 1 | 6 | | | | 1 | 1 | | | | | 10 |
| 3 | | | | | | | | | | | 2 | | | | 2 |
| 4 | | | | | | | 1 | | | | | 1 | | | 2 |
| 5 | | | | | | | | | | | | | | | 0 |
| 6 | | | | | | | 1 | | | | | | | 1 | 2 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.1.8. Age difference table for black bream from, network type: back propagation: data inputs: Harmonics from transect 3. APE=17.83. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -8 | 1 | | | | | | | | | | | | | | 1 |
| -7 | | 1 | | | | | | | | | | | | | 1 |
| -6 | | | 6 | 1 | | | | | | | | | | | 7 |
| -5 | | | | 2 | | | | | | | | | | | 2 |
| -4 | | | | | 8 | | | | | | | | | | 8 |
| -3 | | | | | | | | | | | | | | | 0 |
| -2 | 6 | | | | | 1 | 3 | | | | | | | | 10 |
| -1 | | 14 | | | | 6 | 1 | | | | | 1 | | | 22 |
| **0** | **2** | | **29** | | | | **30** | | **1** | | | | **1** | | **63** |
| 1 | | | | 1 | | | | 15 | | | | | | | 16 |
| 2 | | | 2 | | 7 | | | | 5 | | | | | | 14 |
| 3 | | | | | | | | | | 1 | 1 | | | | 2 |
| 4 | | | | | | | | | | | 1 | | | | 1 |
| 5 | | | | | | 1 | | | | | | 3 | | | 4 |
| 6 | | | | | | | 5 | | | | | | 12 | | 17 |
| 7 | | | | | | 1 | | | | | | | | 9 | 10 |
| 8 | | | | | | | 2 | | | | | | | | 2 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | | 0 |
| 11 | | | | | | | | | | | | | | | 0 |
| 12 | | | | | | | | | | | | | | | 0 |
| 13 | | | | | | | | | | | | 1 | | | 1 |
| 14 | | | | | | | | | | | | | 1 | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.1.9. Age difference table for black bream from, network type: propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=7.26. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | 2 | | | | | | | | | | | | 2 |
| -5 | | | | 1 | 1 | | | | | | | | | | 2 |
| -4 | | | | | 8 | | | | | | | | | | 8 |
| -2 | 1 | | | | | 1 | 2 | | | | | 1 | | | 5 |
| -1 | 2 | 7 | | | | 8 | 3 | | | | | 3 | 2 | | 25 |
| **0** | **6** | **5** | **33** | | **1** | | **35** | **5** | **1** | | | | **11** | **8** | **105** |
| 1 | | 3 | 2 | 2 | | | | 10 | 2 | | | | 1 | | 20 |
| 2 | | | | 1 | 5 | | | | 3 | 1 | | | | | 10 |
| 3 | | | | | | | | | | | 2 | | | | 2 |
| 4 | | | | | | | | | | | | 1 | | | 1 |
| 5 | | | | | | | | | | | | | | | 0 |
| 6 | | | | | | | 1 | | | | | | | 1 | 2 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.1.10. Age difference table for black bream from, network type: back propagation: data inputs: Harmonics from transect 4. APE= 18.30. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -7 | | 3 | | | | | | | | | | | | | 3 |
| -6 | | | 7 | | | | | | | | | | | | 7 |
| -5 | | | | 3 | | | | | | | | | | | 3 |
| -4 | | | | | 7 | | | | | | | | | | 7 |
| -3 | | | | | | | | | | | | | | | 0 |
| -2 | 7 | | | | | | | | | | | | | | 7 |
| -1 | 2 | 9 | | | | 7 | | | | | | | | | 18 |
| **0** | | **3** | **30** | | | | **36** | | | | | | | | **69** |
| 1 | | | | 1 | | | | 14 | | | | | | | 15 |
| 2 | | | | | 8 | | | | 6 | | | | | | 14 |
| 3 | | | | | | | | | | 1 | | | | | 1 |
| 4 | | | | | | | | | | | 2 | | | | 2 |
| 5 | | | | | | 2 | | | | | | 4 | | | 6 |
| 6 | | | | | | | 5 | | | | | | 9 | | 14 |
| 7 | | | | | | | | 1 | | | | | | 7 | 8 |
| 8 | | | | | | | | | | | | | | | 0 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | | 0 |
| 11 | | | | | | | | | | | | 1 | | | 1 |
| 12 | | | | | | | | | | | | | 5 | | 5 |
| 13 | | | | | | | | | | | | | | 2 | 2 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.1.11. Age difference table for black bream from, network type: back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=7.43. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | 1 | | | | 2 | | | | | | | 3 |
| -4 | | | | | 7 | | | | | | | | | | 7 |
| -3 | | 2 | | | | | | | | | | | | | 2 |
| -2 | | | 1 | | | | 1 | | | | | 1 | | | 3 |
| -1 | 2 | 3 | | 1 | | 7 | 2 | 1 | | | | 3 | 3 | | 22 |
| **0** | **7** | **7** | **32** | | **1** | **1** | **36** | **6** | **2** | | | | **11** | **7** | **110** |
| 1 | | 2 | 3 | 1 | | | | 5 | 2 | | | | | 1 | 14 |
| 2 | | | | 1 | 6 | | | 1 | 2 | 1 | | | | | 11 |
| 3 | | | | | 1 | 1 | | | | | 1 | | | | 3 |
| 4 | | | | | | | 1 | | | | 1 | 1 | | | 3 |
| 5 | | | | | | | | | | | | | | | 0 |
| 6 | | | | | | | 1 | | | | | | | 1 | 2 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.1.12. Age difference table for black bream from, network type: back propagation: data inputs: Harmonics from transect 5. APE=17.39. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -8 | 1 | | | | | | | | | | | | | | 1 |
| -7 | | 2 | | | | | | | | | | | | | 2 |
| -6 | | | 13 | | | | | | | | | | | | 13 |
| -5 | | | | 1 | 3 | | | | | | | | | | 4 |
| -4 | | | | | 7 | | | | | | | | | | 7 |
| -3 | | | | | | | | | | | | | | | 0 |
| -2 | 8 | | | | | | | | | | | | | | 8 |
| -1 | | 13 | | | | 8 | 9 | | | | | | | | 30 |
| **0** | | | **23** | | | | **30** | **3** | | | | | **1** | | **57** |
| 1 | | | 1 | 3 | | | | 12 | 2 | | | | | | 18 |
| 2 | | | | | 5 | | | | 4 | | | | | | 9 |
| 3 | | | | | | | | | | 1 | | | | | 1 |
| 4 | | | | | | | | | | | 2 | 2 | | | 4 |
| 5 | | | | | | 1 | | | | | | 3 | 2 | | 6 |
| 6 | | | | | | | 2 | | | | | | 10 | 2 | 14 |
| 7 | | | | | | | | | | | | | | 7 | 7 |
| 8 | | | | | | | | | | | | | | | 0 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | | 0 |
| 11 | | | | | | | | | | | | | | | 0 |
| 12 | | | | | | | | | | | | | | | 0 |
| 13 | | | | | | | | | | | | | | | 0 |
| 14 | | | | | | | | | | | | | 1 | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.1.13. Age difference table for black bream from, network type: layer back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE= 6.23. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -4 | | | | | 7 | | | | | | | | | | 7 |
| -3 | | 1 | | | | | | | | | | | | | 1 |
| -2 | | | 2 | | | | 1 | | | | | 1 | | | 4 |
| -1 | 4 | 5 | | | | 9 | 3 | 1 | | | | 3 | 4 | | 29 |
| 0 | 5 | 7 | 34 | 1 | 3 | | 35 | 8 | 1 | | | | 9 | 8 | 111 |
| 1 | | 2 | 1 | 1 | | | 1 | 6 | 3 | | | | 1 | | 15 |
| 2 | | | | 2 | 4 | | | | 2 | 1 | 1 | | | 1 | 11 |
| 3 | | | | | 1 | | | | | | 1 | | | | 2 |
| 4 | | | | | | | | | | | | | | | 0 |
| 5 | | | | | | | | | | | | 1 | | | 1 |
| 6 | | | | | | | 1 | | | | | | | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.1. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: All biological, all transect data and all transect length. APE=8.24. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | 1 | | | | | | | | | | | | | 1 |
| -8 | | | | | | | | | | | | | | | 0 |
| -7 | | | | | | | | | | | | | | | 0 |
| -6 | | | 2 | | | | | | | | | | | | 2 |
| -5 | | | | 1 | | | | 1 | | | | | | | 2 |
| -4 | | | | | 3 | | | | | | | | | | 3 |
| -3 | | 1 | | | 1 | | | | | | | | | | 2 |
| -2 | | | 2 | | | | 6 | | | | | 1 | | | 9 |
| -1 | 1 | 3 | | 1 | | 6 | 2 | 3 | | | | 3 | 1 | | 20 |
| **0** | **8** | **9** | **31** | | **3** | **3** | **25** | **6** | **4** | | | | **6** | **5** | **100** |
| 1 | | 1 | 2 | 2 | | | 6 | 3 | 1 | | | | 1 | | 16 |
| 2 | | | | | 7 | | | 1 | 1 | | 1 | | | 1 | 11 |
| 3 | | | | | 1 | | | | | | 1 | | | | 2 |
| 4 | | | | | | | | | | 1 | | 1 | 4 | | 6 |
| 5 | | | | | | | | | | | | | 1 | 1 | 2 |
| 6 | | | | | | | 2 | | | | | | | 1 | 3 |
| 7 | | | | | | | | 1 | | | | | 1 | | 2 |
| 8 | | | | | | | | | | | | | | | 0 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | | 0 |
| 11 | | | | | | | | | | | | | | 1 | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.2. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: All biological and all transect lengths. APE=4.70. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | 2 | | | | | | | | | | | 2 |
| -4 | | | | | 5 | | | | | | | | | | 5 |
| -3 | | 3 | | | | | | | | | | | | | 3 |
| -2 | 1 | | 2 | | | | 1 | | | | | 1 | | | 5 |
| -1 | | 3 | | 1 | | 9 | 1 | 1 | | | | 3 | 3 | | 21 |
| **0** | **8** | **6** | **30** | | **3** | | **36** | **9** | **1** | | **2** | | **10** | **7** | **112** |
| 1 | | 3 | 5 | 1 | | | | 4 | 3 | | | | 1 | 2 | 19 |
| 2 | | | | | 7 | | | | 2 | 1 | | | | | 10 |
| 3 | | | | | | | | | | | | | | | 0 |
| 4 | | | | | | | 2 | | | | | 1 | | | 3 |
| 5 | | | | | | | | 1 | | | | | | | 1 |
| 6 | | | | | | | 1 | | | | | | | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.3. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: All biological data. APE=9.22. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -7 | | 5 | | | | | | | | | | | | | 5 |
| -6 | | | 3 | | | | | | | | | | | | 3 |
| -5 | | | | 3 | 1 | | | | | | | | | | 4 |
| -4 | | | | | 10 | | | | | | | | | | 10 |
| -3 | | | | | | | | | | | | | | | 0 |
| -2 | 2 | | | | | | 1 | | | | | | | | 3 |
| -1 | | 3 | | | | 9 | 2 | 2 | | | | 3 | 4 | | 23 |
| **0** | **7** | **4** | **32** | | | | **37** | **10** | **2** | | | | **10** | **4** | **106** |
| 1 | | 3 | 2 | 1 | | | | 2 | 2 | | | | | | 10 |
| 2 | | | | | 4 | | | 1 | 2 | 1 | | | | | 8 |
| 3 | | | | | | | | | | | | 2 | | 1 | 3 |
| 4 | | | | | | | | | | | 2 | | | | 2 |
| 5 | | | | | | | | | | | | | | 4 | 4 |
| 6 | | | | | | | 1 | | | | | | | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.4. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1. APE=18.64. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -12 | | | 1 | | | | | | | | | | | | 1 |
| -11 | | | | | | | | | | | | | | | 0 |
| -10 | | | | | 1 | | | | | | | | | | 1 |
| -9 | | 1 | | | | | | | | | | | | | 1 |
| -8 | 1 | | 1 | | | | | | | | | | | | 2 |
| -7 | | 3 | | | | | | | | | | | | | 3 |
| -6 | | | 7 | | 3 | | 2 | | | | | | | | 12 |
| -5 | | | | 1 | 2 | | | | | | | | | | 3 |
| -4 | | | | | 5 | | | | | | | | | | 5 |
| -3 | | | | | | | | | | | | | | | 0 |
| -2 | 5 | | | | | 1 | 1 | | | | | | | | 7 |
| -1 | 3 | 4 | | | | 8 | 4 | | | | | | | | 19 |
| **0** | | **7** | **22** | | | | **30** | **2** | **2** | | | | **3** | | **66** |
| 1 | | | 6 | 1 | | | | 11 | 2 | | | | | | 20 |
| 2 | | | | 2 | 1 | | | | 2 | | | | | | 5 |
| 3 | | | | | 3 | | | | | 1 | | | | | 4 |
| 4 | | | | | | | | | | | 2 | 1 | 1 | | 4 |
| 5 | | | | | | | | | | | | 3 | | 1 | 4 |
| 6 | | | | | | | 1 | | | | | | 9 | 3 | 13 |
| 7 | | | | | | | 3 | | | | | | | 4 | 7 |
| 8 | | | | | | | | 2 | | | | | | | 2 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | | 0 |
| 11 | | | | | | | | | | | | | | | 0 |
| 12 | | | | | | | | | | | | 1 | 1 | | 2 |
| 13 | | | | | | | | | | | | | | 1 | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.5. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=8.32. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | 3 | | | | | | | | | | | 3 |
| -4 | | | | | 7 | | | | | | | | | | 7 |
| -3 | | 1 | | | | | | | | | | | | | 1 |
| -2 | 2 | | 1 | | | | | | | | | | | | 3 |
| -1 | | 4 | | | | 6 | 3 | 1 | | | 1 | 3 | 1 | | 19 |
| **0** | **7** | **8** | **27** | | **1** | **3** | **35** | **3** | **1** | | | **1** | **11** | **6** | **103** |
| 1 | | 2 | 6 | 1 | | | 1 | 11 | 2 | | | | 1 | | 24 |
| 2 | | | 2 | | 5 | | | | 3 | 1 | | | | 2 | 13 |
| 3 | | | | | 2 | | | | | | 1 | | | | 3 |
| 4 | | | | | | | | | | | | 1 | | | 1 |
| 5 | | | | | | | | | | | | | 1 | | 1 |
| 6 | | | | | | | 1 | | | | | | | 1 | 2 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.6. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: Harmonics from 2. APE=12.46. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | 3 | | 1 | | | | | | | | | | 4 |
| -5 | | | | 1 | | | | | | | | | | | 1 |
| -4 | | | | | 4 | | | | | | | | | | 4 |
| -3 | | | | | | 1 | | | | | | | | | 1 |
| -2 | 3 | | | | | 1 | 2 | | | | | | | | 6 |
| -1 | 6 | 4 | | | | 7 | 1 | | | | | 1 | | | 19 |
| **0** | | **11** | **23** | | **1** | | **35** | **3** | **4** | | | | **6** | | **83** |
| 1 | | | 11 | 1 | | | | 12 | 1 | | | | | | 25 |
| 2 | | | | 2 | 5 | | | | 1 | | 1 | | | | 9 |
| 3 | | | | | 4 | | | | | 1 | 1 | 1 | | | 7 |
| 4 | | | | | | | | | | | | | 4 | | 4 |
| 5 | | | | | | | | | | | | 2 | 2 | 4 | 8 |
| 6 | | | | | | | 2 | | | | | | 2 | | 4 |
| 7 | | | | | | | 1 | | | | | | | 4 | 5 |
| 8 | | | | | | | | | | | | | | | 0 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | | 0 |
| 11 | | | | | | | | | | | | 1 | | | 1 |
| 12 | | | | | | | | | | | | | | | 0 |
| 13 | | | | | | | | | | | | | | 1 | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.7. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=7.44. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | 1 | | | | | 1 | | | | | | 2 |
| -4 | | | | | 10 | | | | | | | | | | 10 |
| -3 | | 2 | | | | | | | | | | | | | 2 |
| -2 | | | | | | 1 | | | | | | | | | 1 |
| -1 | 3 | 2 | | | | 6 | 2 | 1 | | | | 4 | 2 | | 20 |
| **0** | **6** | **8** | **30** | | **1** | **2** | **38** | **5** | **4** | | | | **11** | **7** | **112** |
| 1 | | 3 | 5 | 2 | | | | 9 | 1 | | | | 1 | 1 | 22 |
| 2 | | | 2 | 1 | 1 | | | | | 1 | | | | | 5 |
| 3 | | | | | 3 | | | | | | 2 | | | | 5 |
| 4 | | | | | | | | | | | | | | | 0 |
| 5 | | | | | | | | | | | | 1 | | | 1 |
| 6 | | | | | | | 1 | | | | | | | 1 | 2 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.8. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3. APE=17.53. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | 1 | | | | | | | | | | | | | | 1 |
| -8 | | | | | | 2 | | | | | | | | | 2 |
| -7 | | | 3 | | | | 1 | | | | | | | | 4 |
| -6 | | | | 1 | | | | 1 | | | | | | | 2 |
| -5 | | | 2 | 2 | 5 | | | | | | | | | | 9 |
| -4 | | | | | 3 | | | | | | | | | | 3 |
| -3 | | | | | | | | | | | | | | | 0 |
| -2 | 3 | | | | | 1 | 2 | | | | | | | | 6 |
| -1 | | 10 | | | | 4 | 10 | 2 | | | | | | | 26 |
| **0** | **5** | **1** | **29** | | | | **21** | **4** | **1** | | | | **1** | **2** | **64** |
| 1 | | 4 | 1 | 1 | | | | 8 | 2 | | | | | | 16 |
| 2 | | | 2 | | 7 | | | | 3 | 1 | | | | | 13 |
| 3 | | | | | | | | | | | 2 | 1 | | | 3 |
| 4 | | | | | | | | | | | | 1 | 1 | | 2 |
| 5 | | | | | | 1 | | | | | | 3 | 7 | | 11 |
| 6 | | | | | | | 5 | | | | | | 2 | 3 | 10 |
| 7 | | | | | | 1 | | | | | | | | 1 | 2 |
| 8 | | | | | | | 2 | | | | | | | | 2 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | | 0 |
| 11 | | | | | | | | | | | | | | 1 | 1 |
| 12 | | | | | | | | | | | | | 2 | | 2 |
| 13 | | | | | | | | | | | | | | 2 | 2 |
| 14 | | | | | | | | | | | | | 1 | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.9. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE= 8.49. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | 1 | 1 | | | | | | | | | | | 2 |
| -5 | | | | | 2 | | | | | | | | | | 2 |
| -4 | | | | | 7 | | | | | | | | | | 7 |
| -3 | | | | | | | | | | | | | | | |
| -2 | | | | | | | 3 | | | | | 1 | | | 4 |
| -1 | 1 | 7 | | | | 9 | 2 | | | | | 3 | 1 | | 23 |
| **0** | **8** | **5** | **30** | | | | **33** | **6** | **1** | | | | **11** | **6** | **100** |
| 1 | | 3 | 4 | 2 | | | | 9 | 3 | | | | | | 21 |
| 2 | | | 2 | 1 | 5 | | | | 2 | 1 | | | | | 11 |
| 3 | | | | | 1 | | | | | | 2 | | | | 3 |
| 4 | | | | | | | | | | | | 1 | 1 | | 2 |
| 5 | | | | | | | | | | | | | 1 | | 1 |
| 6 | | | | | | | 3 | | | | | | | 3 | 6 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.10. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4. APE= 16.96. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -8 | 2 | | | | | | | | | | | | | | 2 |
| -7 | | 1 | | | | | | | | | | | | | 1 |
| -6 | | | 9 | | | | | | | | | | | | 9 |
| -5 | | | | 3 | | | | | | | | | | | 3 |
| -4 | | | | | 7 | | | | | | | | | | 7 |
| -3 | | | | | 1 | | | | | | | | | | 1 |
| -2 | 2 | | | | | | | | | | | | | | 2 |
| -1 | 4 | 4 | | | | 8 | | | | | | 1 | | | 17 |
| **0** | **1** | **10** | **25** | | | | **37** | | | | | | | | **73** |
| 1 | | | 3 | | | | | 14 | | | | | | | 17 |
| 2 | | | | 1 | 5 | | | | 6 | | | | | | 12 |
| 3 | | | | | 2 | | | | | 1 | | | | | 3 |
| 4 | | | | | | | | | | | 2 | | | | 2 |
| 5 | | | | | | 1 | | | | | | 4 | | | 5 |
| 6 | | | | | | | 4 | | | | | | 10 | | 14 |
| 7 | | | | | | | | | | | | | | 8 | 8 |
| 8 | | | | | | | | 1 | | | | | | | 1 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | | 0 |
| 11 | | | | | | | | | | | | | | | 0 |
| 12 | | | | | | | | | | | | | 3 | | 3 |
| 13 | | | | | | | | | | | | | 1 | 1 | 2 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.11. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=9.12. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -7 | | 2 | | | | | | | | | | | | | 2 |
| -6 | | | 5 | | | | | | | | | | | | 5 |
| -5 | | | | 1 | | | | | | | | | | | 1 |
| -4 | | | | | 9 | | | | | | | | | | 9 |
| -3 | | | | | | | | | 1 | | | | | | 1 |
| -2 | 1 | | | | | | | | | | | 1 | | | 2 |
| -1 | | 5 | | | | 8 | | 1 | | | | 3 | 3 | | 20 |
| **0** | **8** | **5** | **30** | | | | **39** | **2** | | | | | **10** | **8** | **102** |
| 1 | | 3 | 1 | 2 | | | | 12 | | | | | | | 18 |
| 2 | | | 1 | 1 | 6 | | | | 4 | 1 | | | | | 13 |
| 3 | | | | | | | | | 1 | | 1 | | | | 2 |
| 4 | | | | | | | | | | | 1 | | 1 | | 2 |
| 5 | | | | | | 1 | | | | | | 1 | | | 2 |
| 6 | | | | | | | 2 | | | | | | | 1 | 3 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.12. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5. APE=15.24. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -14 | 1 | | | | | | | | | | | | | | 1 |
| -13 | | | | | | | | | | | | | | | |
| -12 | | | | | | | | | | | | | | | |
| -11 | | | | | | | | | | | | | | | |
| -10 | | | | | 1 | | | | | | | | | | 1 |
| -9 | | | | | | | | | | | | | | | |
| -8 | | | | | | | | | | | | | | | |
| -7 | | 2 | 1 | | | | | | | | | | | | 3 |
| -6 | | | 7 | | | | 4 | | | | | | | | 11 |
| -5 | | | | 1 | | | | 2 | | | | | | | 3 |
| -4 | | | | | 7 | | | | | | | | | | 7 |
| -2 | 7 | | | | | | | | | | | | | | 7 |
| -1 | 1 | 8 | | | | 8 | 1 | | | | | 2 | | | 20 |
| **0** | | **5** | **25** | | **1** | | **34** | **1** | **1** | | | | **7** | | **74** |
| 1 | | | 4 | | | | 1 | 11 | 1 | | | | | 1 | 18 |
| 2 | | | | 3 | 6 | | | | 4 | | | | | | 13 |
| 3 | | | | | | | | | | 1 | | | | | 1 |
| 4 | | | | | | | | | | | 2 | | | | 2 |
| 5 | | | | | | | | | | | | 3 | 1 | | 4 |
| 6 | | | | | | 1 | 1 | | | | | | 6 | 1 | 9 |
| 7 | | | | | | | | | | | | | | 7 | 7 |
| 8 | | | | | | | | 1 | | | | | | | 1 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | | 0 |
| 11 | | | | | | | | | | | | | | | 0 |
| 12 | | | | | | | | | | | | | 3 | | 3 |
| 13 | | | | | | | | | | | | | 1 | 1 | 2 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.2.13. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE= 7.13. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | 1 | | | | | | | | | | | 1 |
| -4 | | | | 1 | 8 | | | | | | | | | | 9 |
| -3 | | | | | | | | | | | | | | | 0 |
| -2 | | | | | | | 1 | | | | | 1 | | | 2 |
| -1 | 5 | 8 | | | | 9 | 2 | | | | | 3 | 4 | | 31 |
| **0** | **4** | **4** | **35** | | **1** | | **37** | **6** | **1** | | | | **8** | **8** | **104** |
| 1 | | 3 | 2 | | | | | 9 | 2 | | | | 1 | 1 | 18 |
| 2 | | | | 2 | 6 | | | | 3 | 1 | | | | | 12 |
| 3 | | | | | | | | | | | 2 | | | | 2 |
| 4 | | | | | | | | | | | | 1 | 1 | | 2 |
| 5 | | | | | | | | | | | | | | | 0 |
| 6 | | | | | | | 1 | | | | | | | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.3.1. Age difference table for black bream from, network type: probabilistic: data inputs: All biological, all transect data and all transect length. APE=8.68. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | 1 | | | 1 | | | | | | | 2 |
| -4 | | | | | | | | | | | | | | | 0 |
| -3 | | 2 | | | 1 | | 3 | | 1 | | | | | | 7 |
| -2 | | | 2 | | | 3 | 3 | 2 | | | | 1 | | | 11 |
| -1 | 3 | 3 | 3 | 1 | 2 | 2 | 8 | 1 | | | | 2 | 1 | | 26 |
| **0** | **6** | **7** | **25** | **2** | **5** | **4** | **11** | **7** | **2** | | **1** | **1** | **11** | **8** | **90** |
| 1 | | 3 | 5 | | 2 | | 10 | 3 | 2 | 1 | | | | | 26 |
| 2 | | | 2 | | 2 | | | | 1 | | 1 | | 1 | | 7 |
| 3 | | | | 1 | 1 | | 1 | | | | | | 1 | | 4 |
| 4 | | | | | 1 | | 3 | | | | | 1 | | | 5 |
| 5 | | | | | | | 1 | | | | | | | | 1 |
| 6 | | | | | | | 1 | | | | | | | 1 | 2 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.3.2. Age difference table for black bream from, network type: probabilistic: data inputs: All biological and all transect lengths. APE=6.99. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | 1 | | | | | | | | | | | 1 |
| -4 | 1 | | | | 1 | | 1 | | | | | | | | 3 |
| -3 | | 3 | | | 3 | | | | | | | | | | 6 |
| -2 | | 2 | 1 | | | | | | | | | | | | 3 |
| -1 | | 2 | 1 | 1 | 3 | 2 | 2 | 2 | | | | 1 | 1 | | 15 |
| **0** | **8** | **6** | **29** | **2** | **6** | **5** | **29** | **7** | **3** | | **2** | **1** | **11** | **5** | **114** |
| 1 | | 2 | 5 | | | | 2 | 2 | 2 | | | 1 | 1 | 2 | 17 |
| 2 | | | | | 2 | 2 | | | 1 | | | | 1 | 1 | 7 |
| 3 | | | | | | | 5 | | | | | 1 | | 1 | 7 |
| 4 | | | | | | | 1 | 3 | | 1 | | | | | 5 |
| 5 | | | | | | | | 1 | | | | | | | 1 |
| 6 | | | | | | | 1 | | | | | | | | 1 |
| 7 | | | | | | | | | | | | 1 | | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.3.3. Age difference table for black bream from, network type: probabilistic: data inputs: All biological data. APE=8.61. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -7 | | | | | 1 | | | | | | | | | | 1 |
| -6 | | | 2 | | | | | | | | | | | | 2 |
| -5 | | | | 1 | | | | | | | | | | | 1 |
| -4 | 1 | | | | 3 | | 1 | | | | | | | | 5 |
| -3 | | 2 | | | 1 | | | | 1 | | | | | | 4 |
| -2 | | | 4 | | | | 1 | | | | 1 | | | | 6 |
| -1 | | 3 | | 1 | | 3 | | 4 | | | | 3 | 4 | | 18 |
| **0** | **8** | **7** | **27** | **2** | **7** | **6** | **24** | **6** | **1** | | **1** | **1** | **9** | **5** | **104** |
| 1 | | 3 | 4 | | | | 5 | 1 | 1 | | | | | 1 | 15 |
| 2 | | | | | 3 | | | | 1 | | | | 1 | 3 | 8 |
| 3 | | | | | | | 4 | | 1 | | | 1 | | | 6 |
| 4 | | | | | | | 3 | 2 | | 1 | | | | | 6 |
| 5 | | | | | | | 2 | 1 | | | | | | | 3 |
| 6 | | | | | | | 1 | 1 | | | | | | | 2 |
| 7 | | | | | | | | | 1 | | | | | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.3.4. Age difference table for black bream from, network type: probabilistic: data inputs: Harmonics from transect 1. APE=22.73. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -10 | | 1 | | | | | | | | | | | | | 1 |
| -9 | | | 3 | | | | | | | | | | | | 3 |
| -8 | | | 2 | | | | | | | | | | | | 2 |
| -7 | | 1 | 1 | | 1 | | 4 | | | | | | | | 7 |
| -6 | | | 3 | | 1 | | 1 | | | | | | | | 5 |
| -5 | | | 1 | 2 | 2 | | 2 | | 1 | | | | | | 8 |
| -4 | | | | | 4 | | 1 | | 1 | | | | | | 6 |
| -3 | | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | | | | | | 7 |
| -2 | 3 | 1 | 4 | 1 | | 2 | 5 | | | | | | | | 16 |
| -1 | 2 | 3 | 1 | 1 | | 2 | 8 | | | | | 1 | 3 | | 21 |
| **0** | **4** | **2** | **9** | | **1** | | **11** | **4** | | | | | **1** | | **32** |
| 1 | | 5 | 6 | | 1 | | 2 | 3 | | | | | | | 17 |
| 2 | | | 4 | | 1 | 1 | | 2 | 1 | | | | | | 9 |
| 3 | | | | | 1 | | | | | | | | | 1 | 2 |
| 4 | | | | | 1 | | 1 | 2 | | | | 1 | 1 | | 6 |
| 5 | | | | | | 2 | | 1 | | | | 2 | 1 | 1 | 7 |
| 6 | | | | | | | 3 | 2 | | | | | 2 | 1 | 8 |
| 7 | | | | | | | 1 | | | 1 | | | | 2 | 4 |
| 8 | | | | | | | | | | | 2 | | | 2 | 4 |
| 10 | | | | | | | | | | | | 1 | 1 | | 2 |
| 11 | | | | | | | | | | | | | 1 | | 1 |
| N | **9** | **14** | **35** | **4** | **14** | **8** | **40** | **15** | **4** | **1** | **2** | **5** | **10** | **7** | **168** |

Table 5.3.5. Age difference table for black bream from, network type: probabilistic: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=9.82. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | | | | | | | | | | | | 0 |
| -4 | | | | 1 | 2 | | 1 | | | | | | | | 4 |
| -3 | 1 | 2 | | | 1 | | 2 | | | | | | | | 6 |
| -2 | | 2 | 2 | | | | 5 | | | | | 1 | | | 10 |
| -1 | | 1 | 4 | 2 | 1 | 2 | 1 | 3 | | | 1 | 3 | 3 | | 21 |
| **0** | **8** | **7** | **17** | | **4** | **6** | **18** | **7** | **4** | | **1** | | **9** | **5** | **86** |
| 1 | | 3 | 13 | 1 | 3 | | 5 | 2 | 1 | | | | 1 | | 29 |
| 2 | | | | | 1 | 1 | | 1 | 1 | | | | 1 | 2 | 7 |
| 3 | | | | | 3 | | 1 | | | | | | | 1 | 5 |
| 4 | | | | | | | 5 | 2 | | 1 | | | | | 8 |
| 5 | | | | | | | 2 | | | | | | | 1 | 3 |
| 6 | | | | | | | 1 | | | | | | | | 1 |
| 7 | | | | | | | | | | | | | | | 0 |
| 8 | | | | | | | | | | | | 1 | | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.3.6. Age difference table for black bream from, network type: probabilistic: data inputs: Harmonics from transect 2. APE=16.01. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -11 | | | 1 | | | | | | | | | | | | 1 |
| -10 | | | | | | | | | | | | | | | 0 |
| -9 | | | | | | | | | | | | | | | 0 |
| -8 | | | | | | | | | | | | | | | 0 |
| -7 | | | | | | | 2 | | | | | | | | 2 |
| -6 | | | | | | | 2 | 1 | | | | | | | 3 |
| -5 | | | 1 | | 1 | | | | | | | | | | 2 |
| -4 | | | | | | | | | 1 | | | | | | 1 |
| -3 | | | | | | 1 | 1 | | | | | | | | 2 |
| -2 | 2 | | 2 | | | 3 | 1 | | | | | 1 | | | 9 |
| -1 | 2 | 6 | 1 | 1 | | 3 | 11 | | | | | 1 | | | 25 |
| **0** | **4** | **8** | **16** | | **3** | | **10** | **3** | | | | | **4** | **2** | **50** |
| 1 | | 1 | 9 | 2 | 1 | | 6 | 7 | 2 | | | | 4 | | 32 |
| 2 | | | 5 | 1 | 7 | | | | 1 | 1 | | | 1 | | 16 |
| 3 | | | | | 2 | | | | | | 1 | | | | 3 |
| 4 | | | | | 1 | 1 | 3 | | | | 1 | 2 | | | 8 |
| 5 | | | | | | | | 1 | | | | | | 1 | 2 |
| 6 | | | | | | | 3 | | | | | | 3 | 2 | 8 |
| 7 | | | | | | | | 2 | 1 | | | | | 3 | 6 |
| 8 | | | | | | | 1 | | | | | | | | 1 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | 1 | | 1 |
| 11 | | | | | | | | | | | | 1 | | 1 | 2 |
| N | **8** | **15** | **35** | **4** | **15** | **8** | **40** | **14** | **5** | **1** | **2** | **5** | **13** | **9** | **174** |

Table 5.3.7. Age difference table for black bream from, network type: probabilistic: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=9.37. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | | 1 | | | | | | | | | | 1 |
| -4 | | | | | 3 | | | | | | | | | | 3 |
| -3 | | 1 | | | 1 | 1 | | 1 | | | | | | | 4 |
| -2 | | 1 | 3 | | | 2 | 3 | | | | | | | | 9 |
| -1 | 1 | 2 | | 1 | 2 | 2 | 6 | 3 | | | | 3 | 2 | | 22 |
| **0** | **8** | **8** | **21** | **1** | **5** | **3** | **21** | **7** | **3** | | **1** | **1** | **8** | **3** | **90** |
| 1 | | 3 | 6 | 1 | | | 6 | 3 | 1 | 1 | 1 | | 3 | 2 | 27 |
| 2 | | | 7 | 1 | 1 | | | 1 | 1 | | | | 1 | 1 | 13 |
| 3 | | | | | 1 | | 2 | | | | | | | 1 | 4 |
| 4 | | | | | 1 | 1 | 2 | | | | | 1 | | | 5 |
| 5 | | | | | | | | | | | | | | 1 | 1 |
| 6 | | | | | | | 1 | | 1 | | | | | 1 | 3 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.3.8. Age difference table for black bream from, network type: probabilistic: data inputs: Harmonics from transect 3. APE=22.98. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -15 | 1 | | | | | | | | | | | | | | 1 |
| -14 | | 1 | | | | | | | | | | | | | 1 |
| -13 | | 1 | 2 | | | | | | | | | | | | 3 |
| -12 | | | | 1 | | | | | | | | | | | 1 |
| -11 | | | | | | | | | | | | | | | 0 |
| -10 | | | | | | | | | | | | | | | 0 |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -8 | | | | 1 | | | | | | | | | | | 1 |
| -7 | | | | | | | 3 | | | | | | | | 3 |
| -6 | | | 1 | | | 1 | 5 | 1 | | | | | | | 8 |
| -5 | | | | | 2 | | 5 | | 1 | | | | | | 8 |
| -4 | 1 | 1 | | 1 | 2 | | 1 | | 1 | | | | | | 7 |
| -3 | | | 1 | | 2 | 1 | | | | | | | | | 4 |
| -2 | | | 4 | | | 1 | 3 | | | | 1 | | | | 9 |
| -1 | | 2 | 2 | | | 3 | 6 | 4 | | | | | 1 | | 18 |
| **0** | **7** | **3** | **11** | | **4** | | **5** | **3** | | | | | **5** | **1** | **39** |
| 1 | | 7 | 10 | | 1 | | 2 | 4 | | | | 1 | | 1 | 26 |
| 2 | | | 5 | | 2 | | | 1 | 2 | | | | | 1 | 11 |
| 3 | | | | 1 | | 1 | 2 | | | | | 1 | 1 | | 6 |
| 4 | | | | | 2 | | 3 | | | | 1 | | 1 | | 7 |
| 5 | | | | | | | 1 | | 1 | | | 1 | | | 3 |
| 6 | | | | | | 1 | 3 | 1 | | | | | 3 | 1 | 9 |
| 7 | | | | | | 1 | | | | | | | 1 | | 2 |
| 8 | | | | | | | 1 | | | | | | | | 1 |
| 9 | | | | | | | | | | 1 | | 1 | | | 2 |
| 10 | | | | | | | | | | | | | | 2 | 2 |
| 11 | | | | | | | | | | | | 1 | 1 | 1 | 3 |
| 12 | | | | | | | | | | | | | | | 0 |
| 13 | | | | | | | | | | | | | 1 | 2 | 3 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **40** | **14** | **5** | **1** | **2** | **5** | **14** | **9** | **179** |

Table 5.3.9. Age difference table for black bream from, network type: probabilistic: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=9.35. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | 1 | 2 | | | | | | | | | | 3 |
| -4 | | | | 1 | | | | | | | | | | | 1 |
| -3 | | 1 | 1 | | 3 | 1 | | | | | | | | | 6 |
| -2 | | 1 | | | | 1 | 4 | 1 | | | | 1 | | | 8 |
| -1 | 2 | 2 | 2 | | | 1 | 7 | 1 | | | | 2 | 1 | | 18 |
| **0** | **7** | **8** | **22** | | **6** | **4** | **14** | **6** | **5** | | **2** | **1** | **9** | **8** | **92** |
| 1 | | 3 | 12 | 1 | | | 9 | 1 | 1 | | | 1 | 3 | | 31 |
| 2 | | | | 1 | 2 | | | 3 | | 1 | | | 1 | | 8 |
| 3 | | | | | 2 | | 1 | | | | | | | | 3 |
| 4 | | | | | | 2 | 1 | 2 | | | | | | | 5 |
| 5 | | | | | | | 1 | | | | | | | 1 | 2 |
| 6 | | | | | | | 3 | | | | | | | | 3 |
| 7 | | | | | | | 1 | | | | | | | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.3.10. Age difference table for black bream from, network type: probabilistic: data inputs: Harmonics from transect 4. APE=22.77. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -13 | | | 1 | | | | | | | | | | | | 1 |
| -12 | | | | | | | | | | | | | | | 0 |
| -11 | | | | | | | | | | | | | | | 0 |
| -10 | | 1 | | | | | | | | | | | | | 1 |
| -8 | | | 2 | | | | | | | | | | | | 2 |
| -7 | | 1 | | | 1 | 2 | 1 | | | | | | | | 5 |
| -6 | | | 1 | | | | | 1 | | | | | | | 2 |
| -5 | | | 2 | | | | 2 | | | | | | | | 4 |
| -4 | | | | | 2 | | | 1 | 3 | 1 | | | | | 7 |
| -3 | | | | | 2 | | | | | | 1 | | | | 3 |
| -2 | | | 4 | | | 1 | 3 | 1 | | | | | | | 9 |
| -1 | 3 | 3 | 2 | 1 | 2 | 1 | 4 | 2 | | | | | 3 | | 21 |
| **0** | **6** | **6** | **14** | **1** | **1** | **2** | **14** | **2** | | | | | **2** | **1** | **49** |
| 1 | | 4 | 2 | | 2 | | 8 | 3 | | | | | | | 19 |
| 2 | | | 9 | 2 | 2 | | | 1 | 2 | | | | 1 | | 17 |
| 3 | | | | | 1 | | 1 | | | | 1 | | | | 3 |
| 4 | | | | | 1 | 2 | 1 | 1 | | | | 1 | | | 6 |
| 5 | | | | | | 1 | 3 | 1 | | | | | 1 | | 6 |
| 6 | | | | | | | 2 | 1 | 1 | | | | | 1 | 5 |
| 7 | | | | | | | | | | | | | | 3 | 3 |
| 8 | | | | | | | 1 | 1 | | | | | | 1 | 3 |
| 9 | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | 2 | | | 2 |
| 11 | | | | | | | | | | | | | 1 | 1 | 2 |
| 12 | | | | | | | | | | | | | 2 | | 2 |
| 13 | | | | | | | | | | | | 2 | 1 | 1 | 4 |
| 14 | | | | | | | | | | | | | 3 | 1 | 4 |
| N | **9** | **15** | **37** | **4** | **14** | **9** | **40** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **180** |

Table 5.3.11. Age difference table for black bream from, network type: probabilistic: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=9.40. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | 1 | | | | | 1 | | | | | | | 2 |
| -5 | | | | 1 | 1 | | | | | | | | | | 2 |
| -4 | | | | | 1 | | | | 1 | | | | | | 2 |
| -3 | | 1 | | | 2 | | 1 | | | | 2 | | | | 6 |
| -2 | | | 3 | | | 1 | 4 | | | | | | | | 8 |
| -1 | 2 | 2 | 4 | | | 5 | 3 | 4 | | | | 3 | 3 | | 26 |
| **0** | **7** | **9** | **24** | **1** | **5** | **2** | **16** | **7** | | | | **1** | **9** | **8** | **89** |
| 1 | | 3 | 5 | 2 | 2 | | 7 | | 2 | 1 | | | 2 | | 24 |
| 2 | | | | | 1 | | | 1 | 1 | | | | | | 3 |
| 3 | | | | | 3 | | 5 | | 2 | | | | | | 10 |
| 4 | | | | | | | 2 | 1 | | | | 1 | | | 4 |
| 5 | | | | | | 1 | 1 | 1 | | | | | | 1 | 4 |
| 6 | | | | | | | 2 | | | | | | | | 2 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

Table 5.3.12. Age difference table for black bream from, network type: probabilistic: data inputs: Harmonics from transect 5. APE=22.35. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -11 | | | 1 | | 1 | | | | | | | | | | 2 |
| -10 | | | | | | | | | | | | | | | |
| -9 | | | | | | | | | | | | | | | |
| -8 | | | | 1 | | | | | | | | | | | 1 |
| -7 | | | 1 | | | | 4 | | | | | | | | 5 |
| -6 | | 1 | | 1 | | | 8 | 1 | | | | | | | 11 |
| -5 | | | | | 1 | | 1 | 1 | | | | | | | 3 |
| -4 | | 1 | | | 4 | | | | | | | | | | 5 |
| -3 | | | 1 | | 1 | | | | | | | | | | 2 |
| -2 | 1 | 1 | 2 | | | 3 | 6 | | | | | 1 | | | 14 |
| -1 | 6 | 4 | 1 | | | 3 | 5 | 1 | | | | | 1 | | 21 |
| **0** | **2** | **5** | **13** | **1** | **3** | **2** | **10** | **2** | | | | **1** | **3** | | **42** |
| 1 | | 3 | 7 | | | | 1 | 2 | 2 | | | | 1 | 1 | 17 |
| 2 | | | 11 | | 2 | | | 4 | 1 | 1 | | | 1 | | 20 |
| 3 | | | | 1 | 2 | | | | 1 | | | | | | 4 |
| 4 | | | | | 1 | | 3 | | | | 1 | 2 | | | 7 |
| 5 | | | | | | | 1 | 1 | | | 1 | 1 | 2 | | 6 |
| 6 | | | | | | 1 | | 1 | | | | | 2 | 1 | 5 |
| 7 | | | | | | | 1 | 1 | 1 | | | | 1 | 2 | 6 |
| 8 | | | | | | | | | 1 | | | | | 1 | 2 |
| 9 | | | | | | | | 1 | | | | | | | 1 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| 11 | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | 2 | 3 | 5 |
| 13 | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | 1 | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **40** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **181** |

Table 5.3.13. Age difference table for black bream from, network type: probabilistic: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=8.47. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | 1 | 1 | | | | 1 | | | | | | 3 |
| -4 | | | | 1 | 1 | | | | | | | | | | 2 |
| -3 | | 1 | | | 1 | | | | | | 1 | | | | 3 |
| -2 | | 2 | 1 | | | 1 | 2 | | | | | 1 | | | 7 |
| -1 | 2 | 3 | 3 | | | 3 | 8 | 2 | | | | 2 | 2 | | 25 |
| **0** | **7** | **5** | **25** | | **7** | **4** | **17** | **5** | **1** | | **1** | **1** | **8** | **3** | **84** |
| 1 | | 4 | 8 | 1 | 2 | | 6 | 5 | 3 | | | | 4 | 4 | 37 |
| 2 | | | | 1 | 3 | 1 | | 3 | 1 | 1 | | | | 1 | 11 |
| 3 | | | | | | | 2 | | | | | | | | 2 |
| 4 | | | | | | | 3 | | | | | 1 | | | 4 |
| 5 | | | | | | | 1 | | | | | | | | 1 |
| 6 | | | | | | | 1 | | | | | | | 1 | 2 |
| 7 | | | | | | | 1 | | | | | | | | 1 |
| N | **9** | **15** | **37** | **4** | **15** | **9** | **41** | **15** | **6** | **1** | **2** | **5** | **14** | **9** | **182** |

### *Sand flathead*

Table 6.1.1. Age difference table for sand flathead from, network type: back propagation: data inputs: All biological, all transect data and all transect length. APE=11.99. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -7 | | | | | | | 1 | | | | | | | | 1 |
| -5 | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | 1 | | | | | | | 1 | | | | | 2 |
| -3 | | | | | | 3 | | | | | | | | | 3 |
| -2 | 1 | 3 | 7 | | 1 | | 2 | | | 1 | | 5 | | | 20 |
| -1 | | 3 | 7 | 3 | | 1 | 1 | 5 | 1 | | | | | | 21 |
| **0** | | **1** | **11** | **19** | **15** | | **12** | | **10** | | | **7** | | **2** | **77** |
| 1 | | | | 2 | 5 | 9 | | 10 | | 5 | | | 1 | | 32 |
| 2 | | | | | | 4 | 1 | | 3 | | 3 | | | 1 | 12 |
| 3 | | | | | | | 1 | 2 | | 2 | | 4 | 1 | | 10 |
| 4 | | | | | | | | 1 | 3 | | | | | | 4 |
| 5 | | | | | | | | | | 2 | | 5 | | | 7 |
| 6 | | | | | | | | | | | | | 1 | | 1 |
| 9 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.1.2. Age difference table for sand flathead from, network type: back propagation: data inputs: All biological and all transect lengths. APE=11.31. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | | | | 1 | | | | | | | | 1 |
| -4 | | | | | | | | 4 | | | | | | | 4 |
| -3 | | | | | | 1 | | | 6 | | | | | | 7 |
| -2 | | 1 | | | 4 | 1 | | | | 5 | | 2 | | | 13 |
| -1 | 1 | 2 | 16 | 1 | 2 | 8 | | 2 | | | 2 | | 1 | | 35 |
| **0** | | **4** | **5** | **21** | **6** | **1** | **13** | **1** | **1** | | | **18** | | **2** | **72** |
| 1 | | | 4 | 2 | 8 | 2 | | 10 | 2 | 1 | | | 2 | | 31 |
| 2 | | | | | 1 | 4 | 2 | 1 | 8 | | | | | 1 | 17 |
| 3 | | | | | | | 2 | | | 5 | | 1 | | | 8 |
| 4 | | | | | | | | | 1 | | 1 | | | | 2 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.1.3. Age difference table for sand flathead from, network type: back propagation: data inputs: All biological data. APE=20.10. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -6 | | | | | | 1 | | | | | | | | | 1 |
| -4 | | | | | | | | 3 | | | | | | | 3 |
| -3 | 1 | | | | | | | | 1 | | | | | | 2 |
| -2 | | 5 | | | | | | | | 2 | | 4 | | | 11 |
| -1 | | 2 | 20 | | | 3 | | | | | 1 | | | | 26 |
| **0** | | | **5** | **19** | | | **5** | | | | | **11** | | **2** | **42** |
| 1 | | | | 5 | 16 | | | 6 | | | | | 3 | | 30 |
| 2 | | | | | 5 | 13 | | | 10 | | | | | 1 | 29 |
| 3 | | | | | | | 13 | | | 7 | | | | | 20 |
| 4 | | | | | | | | 9 | | | 1 | | | | 10 |
| 5 | | | | | | | | | 7 | | | 4 | | | 11 |
| 6 | | | | | | | | | | 2 | | | | | 2 |
| 7 | | | | | | | | | | | 1 | | | | 1 |
| 8 | | | | | | | | | | | | 1 | | | 1 |
| 9 | | | | | | | | | | | | 1 | | | 1 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.1.4. Age difference table for sand flathead from, network type: back propagation: data inputs: Harmonics from transect 1. APE=17.08. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -7 | | | | | 1 | | | | | | | | | | 1 |
| -4 | | | 2 | | | | | 1 | | 1 | | | | | 4 |
| -3 | | | | 3 | | | | | 3 | | | | | | 6 |
| -2 | 1 | 2 | 1 | | 5 | | 2 | 2 | | 2 | | 1 | | | 16 |
| -1 | | 5 | 7 | 1 | | 4 | | 1 | 2 | | | | | | 20 |
| **0** | | | **15** | **16** | **5** | | **9** | | **3** | | | **10** | | **1** | **59** |
| 1 | | | | 4 | 5 | 2 | | 7 | | 3 | | | 2 | | 23 |
| 2 | | | | | 5 | 8 | 1 | | 8 | | 2 | | | 2 | 26 |
| 3 | | | | | | 3 | 5 | 1 | | 2 | | 4 | | | 15 |
| 4 | | | | | | | 1 | 3 | 1 | | 1 | | 1 | | 7 |
| 5 | | | | | | | | 3 | | | | 6 | | | 9 |
| 6 | | | | | | | | | 1 | 1 | | | | | 2 |
| 7 | | | | | | | | | | 2 | | | | 1 | 3 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.1.5. Age difference table for sand flathead from, network type: back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=11.58. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -4 | | | | | | | | | | 1 | | | | | 1 |
| -3 | | | | | 1 | 2 | | | 1 | | | | | | 4 |
| -2 | 1 | 2 | | | 2 | | 2 | 3 | | | | 4 | | | 14 |
| -1 | | 5 | 12 | 2 | | 6 | | 5 | 1 | | | | | | 31 |
| **0** | | | **13** | **20** | **6** | **1** | **11** | | **8** | **3** | | **12** | | **1** | **75** |
| 1 | | | | 2 | 11 | | | 9 | | 4 | 1 | | 3 | | 30 |
| 2 | | | | | 1 | 8 | | | 6 | | 1 | 2 | | 1 | 19 |
| 3 | | | | | | | 5 | | | 3 | | 2 | | | 10 |
| 4 | | | | | | | | 1 | 1 | | 1 | | | 1 | 4 |
| 5 | | | | | | | | | 1 | | | 1 | | | 2 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.1.6. Age difference table for sand flathead from, network type: back propagation: data inputs: Harmonics from 2. APE=19.09. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -7 | | 1 | | | | | | | | | | | | | 1 |
| -5 | | | | | | | 2 | | | | | | | | 2 |
| -4 | | | | | | | | 1 | | | | | | | 1 |
| -3 | | 1 | 3 | 1 | 1 | 1 | | | 2 | | | | | | 9 |
| -2 | 1 | 3 | 2 | 2 | 1 | | 5 | | | 2 | | | | | 16 |
| -1 | | 2 | 17 | 2 | | 2 | 1 | 7 | 1 | | 1 | | | | 33 |
| **0** | | | **3** | **17** | **5** | **4** | **4** | | **9** | | | **5** | | | **47** |
| 1 | | | | 2 | 14 | 2 | 2 | 2 | | 4 | | | 2 | | 28 |
| 2 | | | | | | 8 | | 1 | 1 | | | | | 2 | 12 |
| 3 | | | | | | | 4 | 3 | 2 | 1 | | 7 | | | 17 |
| 4 | | | | | | | | 3 | | | 1 | | 1 | | 5 |
| 5 | | | | | | | | 1 | 3 | | 1 | 1 | | | 6 |
| 6 | | | | | | | | | | 2 | | 2 | | | 4 |
| 7 | | | | | | | | | | 2 | | 2 | | | 4 |
| 8 | | | | | | | | | | | | 4 | | | 4 |
| 10 | | | | | | | | | | | | | | 2 | 2 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.1.7. Age difference table for sand flathead from, network type: back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=11.90. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | | | | 1 | | | | | | | | 1 |
| -4 | | | 1 | | | | | 4 | | | | | | | 5 |
| -3 | | | 1 | | | | | | 2 | | | | | | 3 |
| -2 | | 1 | 1 | 1 | 4 | | 3 | 1 | | 3 | | 4 | | | 18 |
| -1 | 1 | 1 | 8 | 2 | | 8 | | 6 | 2 | | 1 | | | | 29 |
| **0** | | **5** | **8** | **18** | **6** | **2** | **11** | | **5** | | | **12** | | **1** | **68** |
| 1 | | | 6 | 3 | 11 | 1 | 1 | 7 | 1 | 4 | | | 3 | | 37 |
| 2 | | | | | | 6 | | | 6 | 2 | | 3 | | 2 | 19 |
| 3 | | | | | | | 2 | | | 1 | | 1 | | | 4 |
| 4 | | | | | | | | | | | 2 | | | | 2 |
| 5 | | | | | | | | | 2 | 1 | | 1 | | | 4 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.1.8. Age difference table for sand flathead from, network type: back propagation: data inputs: Harmonics from transect 3. APE=21.89. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -8 | | | | | | 1 | | | | | | | | | 1 |
| -7 | | | | | 1 | | | | | | | | | | 1 |
| -6 | | | | 1 | | | | 1 | | | | | | | 2 |
| -5 | | | | | | | 1 | | 1 | | | | | | 2 |
| -4 | | | | | 1 | 2 | | | | | | | | | 3 |
| -3 | | | | | 1 | | | | 2 | | | | | | 3 |
| -2 | 1 | 5 | 2 | | 1 | 1 | | 1 | | 3 | | | | | 14 |
| -1 | | 1 | 10 | 3 | | 1 | | 2 | | | 1 | 1 | 1 | | 20 |
| **0** | | **1** | **9** | **16** | **6** | | **6** | **2** | **6** | **3** | | **6** | | | **55** |
| 1 | | | 5 | 2 | 7 | 3 | | 5 | | 1 | | | 1 | | 24 |
| 2 | | | | 2 | 3 | 4 | 4 | | 2 | | 1 | 9 | | 1 | 26 |
| 3 | | | | | 1 | 3 | 4 | 1 | | 2 | | | 1 | | 12 |
| 4 | | | | | | 2 | 1 | 3 | | | | | | | 6 |
| 5 | | | | | | | 2 | 1 | 3 | | | 1 | | | 7 |
| 6 | | | | | | | | 2 | 1 | 2 | | | | | 5 |
| 7 | | | | | | | | | 3 | | | 1 | | | 4 |
| 8 | | | | | | | | | | | 1 | 1 | | | 2 |
| 9 | | | | | | | | | | | | 1 | | 1 | 2 |
| 10 | | | | | | | | | | | | 1 | | 2 | 3 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.1.9. Age difference table for sand flathead from, network type: propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=9.45. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -4 | | | | | | | | 1 | | | | | | | 1 |
| -3 | | | | | | 1 | 1 | | 4 | | 1 | | | | 7 |
| -2 | 1 | 1 | 2 | | 2 | 1 | 5 | | | 2 | | 3 | | | 17 |
| -1 | | 3 | 6 | 5 | 1 | 5 | 2 | 5 | 3 | | 1 | 1 | 2 | | 34 |
| **0** | | **3** | **16** | **17** | **12** | | **9** | **5** | **6** | **3** | | **14** | | **1** | **86** |
| 1 | | | 1 | 2 | 3 | 7 | | 5 | 3 | 3 | | | 1 | | 25 |
| 2 | | | | | 3 | 1 | 1 | | 1 | 1 | 1 | 3 | | 2 | 13 |
| 3 | | | | | | 2 | | 2 | | 2 | | | | | 6 |
| 5 | | | | | | | | | 1 | | | | | | 1 |
| 9 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.1.10. Age difference table for sand flathead from, network type: back propagation: data inputs: Harmonics from transect 4. APE=16.41. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -8 | | | | | | 1 | | | | | | | | | 1 |
| -7 | | | | | | | 1 | | | | | | | | 1 |
| -6 | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | | | 1 | | 1 | | | | | | 2 |
| -3 | | | | 1 | | 1 | 1 | | | | 1 | | | | 4 |
| -2 | | | 1 | 1 | 2 | | 3 | 1 | | 2 | | 3 | | | 13 |
| -1 | 1 | 1 | 7 | 3 | | | | 6 | 3 | | | | | | 21 |
| **0** | | **6** | **16** | **17** | **8** | | **6** | | **4** | **4** | | **7** | | **1** | **69** |
| 1 | | | 2 | 2 | 9 | 3 | 1 | 4 | | 2 | | | 1 | | 24 |
| 2 | | | | | 2 | 3 | 1 | | 3 | | | | | | 9 |
| 3 | | | | | | 5 | 4 | 2 | 2 | 2 | | 8 | 1 | | 24 |
| 4 | | | | | | 4 | | 3 | 1 | | 1 | | | | 9 |
| 5 | | | | | | | | | 3 | 1 | | 1 | | | 5 |
| 6 | | | | | | | | 1 | | | 1 | | | | 2 |
| 7 | | | | | | | | | 1 | | | 1 | | | 2 |
| 8 | | | | | | | | | | | | 1 | 1 | | 2 |
| 9 | | | | | | | | | | | | | | 2 | 2 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.1.11. Age difference table for sand flathead from, network type: back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=10.68. Data from production set.

| | | | | | | | Observed Age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | | | | 1 | | | | | | | | 1 |
| -3 | | | | | | 1 | | | 1 | | | | | | 2 |
| -2 | | 1 | | 2 | 3 | 3 | 3 | 1 | | 2 | | 5 | | | 20 |
| -1 | 1 | 2 | 10 | 2 | 3 | 7 | | 6 | 1 | | 1 | 2 | 1 | | 36 |
| **0** | | **4** | **15** | **15** | **5** | **1** | **10** | **1** | **8** | **1** | | **9** | **1** | **2** | **72** |
| 1 | | | | 5 | 7 | | 4 | 7 | 3 | 5 | | | 1 | | 32 |
| 2 | | | | | 3 | 2 | | 1 | 5 | | 1 | | | 1 | 13 |
| 3 | | | | | | 3 | | | | 3 | | 4 | | | 10 |
| 4 | | | | | | | | 2 | | | 1 | | | | 3 |
| 5 | | | | | | | | | | | | 1 | | | 1 |
| 9 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.1.12. Age difference table for sand flathead from, network type: back propagation: data inputs: Harmonics from transect 5. APE=16.41. Data from production set.

| | | | | | | | Observed Age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -8 | | | | | | 1 | | | | | | | | | 1 |
| -7 | | | | | | | 1 | | | | | | | | 1 |
| -6 | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | | | 1 | | 1 | | | | | | 2 |
| -3 | | | | 1 | | 1 | 1 | | | | 1 | | | | 4 |
| -2 | | | 1 | 1 | 2 | | 3 | 1 | | 2 | | 3 | | | 13 |
| -1 | 1 | 1 | 7 | 3 | | | | 6 | 3 | | | | | | 21 |
| **0** | | **6** | **16** | **17** | **8** | | **6** | | **4** | **4** | | **7** | | **1** | **69** |
| 1 | | | 2 | 2 | 9 | 3 | 1 | 4 | | 2 | | | 1 | | 24 |
| 2 | | | | | 2 | 3 | 1 | | 3 | | | | | | 9 |
| 3 | | | | | | 5 | 4 | 2 | 2 | 2 | | 8 | 1 | | 24 |
| 4 | | | | | | 4 | | 3 | 1 | | 1 | | | | 9 |
| 5 | | | | | | | | | 3 | 1 | | 1 | | | 5 |
| 6 | | | | | | | | 1 | | | 1 | | | | 2 |
| 7 | | | | | | | | | 1 | | | 1 | | | 2 |
| 8 | | | | | | | | | | | | 1 | 1 | | 2 |
| 9 | | | | | | | | | | | | | | 2 | 2 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.1.13. Age difference table for sand flathead from, network type: layer back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=12.42. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | | | | 1 | | | | | | | | | 1 |
| -4 | | | 1 | | | | | | | | | | | | 1 |
| -3 | | | | | | 2 | | | 1 | | | | | | 3 |
| -2 | | 3 | | | 6 | 1 | 2 | 1 | | 1 | | 7 | | | 21 |
| -1 | 1 | 3 | 13 | | | 6 | | 6 | | | | | 2 | | 31 |
| **0** | | **1** | **11** | **23** | **3** | | **12** | | **4** | **2** | | **11** | | **1** | **68** |
| 1 | | | 1 | 1 | 9 | | | 9 | 1 | 4 | 1 | | 1 | | 27 |
| 2 | | | | | 3 | 7 | 2 | | 8 | | 1 | 1 | | 1 | 23 |
| 3 | | | | | | | 2 | | | 4 | | | | | 6 |
| 4 | | | | | | | | 2 | 3 | | 1 | | | 1 | 7 |
| 5 | | | | | | | | | 1 | | | 2 | | | 3 |
| 9 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.1. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: All biological, all transect data and all transect length. APE=12.02. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | 3 | | 2 | | | | | 5 |
| -3 | | | 1 | | 1 | | 1 | | 3 | | 1 | | | | 7 |
| -2 | 1 | 2 | 3 | | | 1 | 1 | 2 | | 3 | | 4 | | | 17 |
| -1 | | 2 | 5 | 2 | | 1 | 2 | 2 | 2 | | 1 | 1 | | | 18 |
| **0** | | **3** | **14** | **20** | **11** | **5** | **11** | **3** | **5** | **1** | | **10** | | **1** | **84** |
| 1 | | | 2 | 2 | 7 | 2 | 2 | 3 | 1 | 2 | | | 1 | | 22 |
| 2 | | | | | 2 | 5 | 1 | 2 | 4 | 1 | 1 | 3 | | 1 | 20 |
| 3 | | | | | | 3 | | 1 | | 2 | | | 1 | | 7 |
| 4 | | | | | | | | 1 | | | | 1 | | 1 | 3 |
| 5 | | | | | | | | 1 | 2 | | | | 1 | | 4 |
| 8 | | | | | | | | | | | | 2 | | | 2 |
| 9 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.2. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: All biological and all transect lengths. APE=11.31. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | | | | 1 | | | | | | | | 1 |
| -4 | | | | | | | | 4 | | | | | | | 4 |
| -3 | | | | | | 1 | | | 6 | | | | | | 7 |
| -2 | | 1 | | | 4 | 1 | | | | 5 | | 2 | | | 13 |
| -1 | 1 | 2 | 16 | 1 | 2 | 8 | | 2 | | | 2 | | 1 | | 35 |
| **0** | | **4** | **5** | **21** | **6** | **1** | **13** | **1** | **1** | | | **18** | | **2** | **72** |
| 1 | | | 4 | 2 | 8 | 2 | | 10 | 2 | 1 | | | 2 | | 31 |
| 2 | | | | | 1 | 4 | 2 | 1 | 8 | | | | | 1 | 17 |
| 3 | | | | | | | 2 | | | 5 | | 1 | | | 8 |
| 4 | | | | | | | | | 1 | | 1 | | | | 2 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.3. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: All biological data. APE=13.62. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -6 | | | | | | 1 | | | | | | | | | 1 |
| -4 | | | 1 | | 1 | | | 7 | | | | | | | 9 |
| -3 | | | | 2 | | 2 | | | 6 | | | | | | 10 |
| -2 | | | | | 3 | | 3 | | | 7 | | 2 | | | 15 |
| -1 | 1 | 3 | 11 | 2 | | 7 | | 6 | | | 2 | | 1 | | 33 |
| **0** | | **4** | **10** | **13** | **4** | | **10** | | **6** | | | **16** | | **1** | **64** |
| 1 | | | 3 | 5 | 7 | 2 | | 5 | | 3 | | | 2 | | 27 |
| 2 | | | | 2 | 6 | 4 | 4 | | 4 | | | | | 2 | 22 |
| 3 | | | | | | | 1 | | | 1 | | 1 | | | 3 |
| 4 | | | | | | 1 | | | 2 | | 1 | | | | 4 |
| 5 | | | | | | | | | | | | 1 | | | 1 |
| 7 | | | | | | | | | | | | 1 | | | 1 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.4. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1. APE=15.88. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -8 | | | | 1 | | | | | | | | | | | 1 |
| -6 | | | 3 | | | | | | | | | | | | 3 |
| -5 | | | | 1 | | | | | | | | | | | 1 |
| -4 | | | 1 | | | | | 1 | | | | | | | 2 |
| -3 | | | | 2 | | 1 | | | 2 | | | | | | 5 |
| -2 | 1 | 3 | | | 5 | | 3 | 2 | | 2 | | 1 | | | 17 |
| -1 | | 4 | 12 | 1 | | 2 | | 5 | 3 | | | | | | 27 |
| **0** | | | **9** | **16** | **5** | **3** | **8** | | **9** | **2** | | **7** | | | **59** |
| 1 | | | | 3 | 8 | 1 | | 4 | | 4 | 2 | | 1 | | 23 |
| 2 | | | | | 3 | 10 | 1 | 3 | 3 | | | 2 | | 1 | 23 |
| 3 | | | | | | | 4 | 1 | 1 | 2 | | 6 | | | 14 |
| 4 | | | | | | | 2 | 1 | | | 1 | | 2 | 1 | 7 |
| 5 | | | | | | | | 1 | | | | 5 | | 2 | 8 |
| 7 | | | | | | | | | | 1 | | | | | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.5. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=11.93. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -4 | | | | | | | | | | 1 | | | | | 1 |
| -3 | | | | | 1 | 1 | | | 2 | | | | | | 4 |
| -2 | 1 | | 4 | | 1 | 1 | 1 | 2 | | 2 | 1 | 5 | | | 18 |
| -1 | | 7 | 6 | 8 | | 2 | | 6 | | | | 1 | | | 30 |
| **0** | | | **15** | **12** | **11** | **2** | **7** | **1** | **13** | | | **11** | | **2** | **74** |
| 1 | | | | 4 | 8 | 4 | 1 | 4 | | 5 | 1 | | 3 | | 30 |
| 2 | | | | | | 7 | 1 | 1 | 1 | | | 2 | | 1 | 13 |
| 3 | | | | | | | 8 | 4 | 1 | 2 | | 2 | | | 17 |
| 4 | | | | | | | | | 1 | | 1 | | | | 2 |
| 5 | | | | | | | | | | 1 | | | | | 1 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.6. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: Harmonics from 2. APE=16.75. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **1** | **2** | **3** | **4** | **5** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -6 | | | | | | | | 1 | | | | | | | 1 |
| -5 | | | | | | | 3 | | 1 | | | | | | 4 |
| -4 | | | | | 1 | | | 1 | | | | | | | 2 |
| -3 | | 1 | | 1 | | 1 | 1 | | 2 | | | | | | 6 |
| -2 | 1 | 2 | 3 | 1 | 1 | | 4 | | | 2 | | 1 | | | 15 |
| -1 | | 2 | 17 | 1 | | 1 | 1 | 8 | 2 | | 1 | | | | 33 |
| **0** | | **2** | **2** | **14** | **8** | **3** | **3** | | **8** | | | **8** | | **1** | **49** |
| 1 | | | 3 | 7 | 10 | 2 | 2 | 2 | 1 | 6 | 2 | | 2 | | 37 |
| 2 | | | | | 1 | 7 | 3 | 1 | 1 | | | 3 | | 2 | 18 |
| 3 | | | | | | 2 | | 3 | 1 | | | 5 | | | 11 |
| 4 | | | | | | 1 | 1 | 2 | | 1 | | | 1 | | 6 |
| 5 | | | | | | | | | 2 | | | | | | 2 |
| 6 | | | | | | | | | | | | 1 | | | 1 |
| 7 | | | | | | | | | | 2 | | 1 | | | 3 |
| 8 | | | | | | | | | | | | 1 | | | 1 |
| 9 | | | | | | | | | | | | 1 | | 1 | 2 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.7. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=10.77. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | | | | 1 | | | | | | | | 1 |
| -4 | | | | | | | | 3 | | | | | | | 3 |
| -3 | | | | | 1 | 1 | | | 1 | | | | | | 3 |
| -2 | | 1 | 4 | 1 | 1 | 2 | 4 | 1 | | 2 | | 4 | | | 20 |
| -1 | 1 | 3 | 6 | 6 | | 5 | 2 | 5 | 1 | | 1 | | | | 30 |
| **0** | | **3** | **14** | **11** | **8** | **2** | **10** | **2** | **9** | **2** | | **14** | | **2** | **77** |
| 1 | | | 1 | 6 | 11 | 3 | | 6 | 1 | 4 | | | 3 | | 35 |
| 2 | | | | | | 3 | | 1 | 5 | 2 | 1 | 2 | | 1 | 15 |
| 3 | | | | | | 1 | 1 | | | | | | | | 2 |
| 4 | | | | | | | | | | | 1 | 1 | | | 2 |
| 5 | | | | | | | | | 1 | | | | | | 1 |
| 6 | | | | | | | | | | 1 | | | | | 1 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.8. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3. APE=18.49. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -7 | | | | | | | 1 | | | | | | | | 1 |
| -6 | | | | | | 1 | | | | | | | | | 1 |
| -5 | | 2 | | | | | 1 | | | | | | | | 3 |
| -3 | | | | | 1 | | 1 | | 2 | | | | | | 4 |
| -2 | 1 | 2 | 4 | | 3 | | | | | | | | | | 10 |
| -1 | | 3 | 7 | 6 | | 3 | | 2 | 2 | | 1 | | 1 | | 25 |
| **0** | | | **14** | **15** | **10** | | **8** | **3** | **4** | **2** | | **7** | | | **63** |
| 1 | | | | 3 | 5 | 7 | | 6 | 5 | 2 | | | | | 28 |
| 2 | | | | | 2 | 2 | 5 | | 1 | 1 | | 3 | | 2 | 16 |
| 3 | | | | | | 4 | | 2 | | 2 | | 3 | 1 | | 12 |
| 4 | | | | | | | 2 | 3 | 2 | | | | | | 7 |
| 5 | | | | | | | | 2 | | | | 1 | 1 | | 4 |
| 6 | | | | | | | | | 2 | | 2 | | | | 4 |
| 7 | | | | | | | | | | 4 | | 2 | | | 6 |
| 8 | | | | | | | | | | | | 1 | | | 1 |
| 9 | | | | | | | | | | | | 4 | | 1 | 5 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.9. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=9.34. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -6 | | | | | | 1 | | | | | | | | | 1 |
| -5 | | | | 1 | | | 1 | | | | | | | | 2 |
| -4 | | | | | 1 | | | | | | | | | | 1 |
| -3 | | 2 | | | | 2 | 1 | | 1 | | 1 | | | | 7 |
| -2 | 1 | | 3 | | 4 | | 1 | | | 1 | | 4 | | | 14 |
| -1 | | 1 | 5 | 5 | 1 | 9 | | 10 | 1 | | 2 | | | | 34 |
| **0** | | **4** | **16** | **14** | **9** | | **14** | **2** | **13** | **2** | | **15** | | **1** | **90** |
| 1 | | | 1 | 4 | 4 | 5 | | 6 | | 5 | | | 3 | | 28 |
| 2 | | | | | 2 | | 1 | | 2 | | | 1 | | 2 | 8 |
| 3 | | | | | | | | | | 3 | | 1 | | | 4 |
| 6 | | | | | | | | | 1 | | | | | | 1 |
| 9 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.10. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4. APE=14.30. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -8 | | | | 1 | | | | | | | | | | | 1 |
| -7 | | | | | | | 1 | | | | | | | | 1 |
| -6 | | | 1 | | | | | 1 | | | | | | | 2 |
| -5 | | | | | 1 | | 2 | | | | | | | | 3 |
| -3 | | | | 1 | | 4 | 1 | | | | | | | | 6 |
| -2 | 1 | | 2 | 1 | 2 | | 3 | 1 | | 2 | | 1 | | | 13 |
| -1 | | 3 | 3 | | 2 | 2 | | 7 | 4 | | | | | | 21 |
| **0** | | **4** | **18** | **18** | **6** | | **7** | | **8** | **3** | | **9** | | **2** | **75** |
| 1 | | | 2 | 3 | 6 | 4 | | 6 | | 3 | | | 1 | | 25 |
| 2 | | | | | 4 | 1 | 3 | 1 | 2 | | | 1 | | 1 | 13 |
| 3 | | | | | | 6 | | | | 2 | | 7 | 1 | | 16 |
| 4 | | | | | | | 1 | 2 | | | 1 | | | | 4 |
| 5 | | | | | | | | | 3 | 1 | 1 | 1 | | | 6 |
| 6 | | | | | | | | | 1 | | | | | | 1 |
| 7 | | | | | | | | | | | 1 | 1 | | | 2 |
| 8 | | | | | | | | | | | | 1 | 1 | 1 | 3 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.11. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=10.96. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | 1 | | | | | | | | | | | | 1 |
| -4 | | | | | | 1 | | | | | | | | | 1 |
| -3 | | | | | | 5 | 2 | | 1 | | | | | | 8 |
| -2 | | 1 | 1 | | 2 | 1 | 3 | 1 | | 5 | | 8 | | | 22 |
| -1 | 1 | 1 | 4 | 4 | 4 | 5 | 1 | 8 | 4 | | 2 | | 2 | | 36 |
| **0** | | **5** | **17** | **14** | **8** | | **10** | | **10** | | | **12** | | **2** | **78** |
| 1 | | | 3 | 5 | 3 | 1 | | 6 | | 2 | 1 | | 1 | | 22 |
| 2 | | | | 1 | 4 | 1 | 2 | 1 | 1 | | | | | 1 | 11 |
| 3 | | | | | | 3 | | 1 | | 2 | | | | | 6 |
| 4 | | | | | | | | 1 | 2 | | | | | | 3 |
| 5 | | | | | | | | | | 2 | | 1 | | | 3 |
| 9 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.12. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5. APE=17.98. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | | | 1 | | | | | | | | | | 1 |
| -8 | | | | | | 2 | | | | | | | | | 2 |
| -7 | | | | | | | 2 | | | | | | | | 2 |
| -6 | | | | | | 1 | | | | | | | | | 1 |
| -5 | | | | 2 | | | 1 | | 2 | | | | | | 5 |
| -4 | | | | | | | | | | 2 | | | | | 2 |
| -3 | | | | | 1 | 3 | | | 1 | | 1 | | | | 6 |
| -2 | | 2 | | | 4 | 1 | 5 | | | | | 5 | | | 17 |
| -1 | 1 | 3 | 7 | | | 1 | | 7 | | | | | 1 | | 20 |
| **0** | | **2** | **16** | **15** | **2** | **1** | **6** | **2** | **7** | | | **7** | | **1** | **59** |
| 1 | | | 3 | 6 | 6 | 1 | | 5 | 2 | 6 | | | | | 29 |
| 2 | | | | 1 | 7 | 4 | | | 1 | | 1 | | | 1 | 15 |
| 3 | | | | | | 1 | 3 | | | | | 7 | | | 11 |
| 4 | | | | | | 2 | 1 | 4 | 1 | | 1 | | | | 9 |
| 5 | | | | | | | | | 4 | | | 1 | | | 5 |
| 6 | | | | | | | | | | 2 | | | | | 2 |
| 7 | | | | | | | | | | | | 1 | | | 1 |
| 8 | | | | | | | | | | 1 | | | | | 1 |
| 9 | | | | | | | | | | | | | 1 | 1 | 2 |
| 10 | | | | | | | | | | | | | 1 | 1 | 2 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.2.13. Age difference table for sand flathead from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=13.59. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -6 | | | | | | 1 | | | | | | | | | 1 |
| -4 | | | | | | | | 2 | | | | | | | 2 |
| -3 | | | | | | 2 | 3 | | 4 | | 1 | | | | 10 |
| -2 | | 1 | 1 | | 1 | 1 | 1 | 1 | | 4 | | 6 | | | 16 |
| -1 | 1 | 4 | 7 | | | 4 | | 6 | 1 | | 1 | | 1 | | 25 |
| **0** | | **2** | **14** | **17** | **4** | **1** | **9** | **1** | **7** | **1** | | **13** | | **1** | **70** |
| 1 | | | 3 | 5 | 12 | | | 5 | | 3 | 1 | | 2 | | 31 |
| 2 | | | | 2 | 4 | 4 | 2 | 1 | 3 | | | 2 | | 1 | 19 |
| 3 | | | | | | 3 | 3 | 1 | | 2 | | | | | 9 |
| 4 | | | | | | 1 | | 1 | 1 | | | | | 1 | 4 |
| 5 | | | | | | | | | 1 | | | | | | 1 |
| 6 | | | | | | | | | 1 | 1 | | | | | 2 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.3.1. Age difference table for sand flathead from, network type: probabilistic: data inputs: All biological, all transect data and all transect length. APE=11.76. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -7 | | | | | | | 1 | | | | | | | | 1 |
| -5 | | | | | 1 | | | | 1 | | | | | | 2 |
| -4 | | | | | | | | | | 1 | | | | | 1 |
| -3 | | | | | 2 | 1 | 2 | 1 | 1 | 1 | | | | | 8 |
| -2 | | | 1 | | | 2 | 1 | 2 | | | | 7 | | | 13 |
| -1 | 1 | | 1 | 3 | 1 | 3 | 2 | 6 | 5 | 1 | 1 | 3 | 1 | | 28 |
| **0** | | **7** | **13** | **16** | **11** | **5** | **8** | **1** | **4** | **3** | **1** | **8** | | **2** | **79** |
| 1 | | | 11 | 3 | 4 | 2 | 3 | 5 | 3 | 1 | 1 | | | 1 | 34 |
| 2 | | | | 2 | | 1 | | 2 | 1 | 1 | | 1 | 2 | | 10 |
| 3 | | | | | 2 | 2 | | | 1 | 1 | | | | | 6 |
| 4 | | | | | | 1 | 1 | | 2 | 2 | | 1 | | | 7 |
| 5 | | | | | | | | 1 | | | | | | | 1 |
| 8 | | | | | | | | | | | | 1 | | | 1 |
| 9 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.3.2. Age difference table for sand flathead from, network type: probabilistic: data inputs: All biological and all transect lengths. APE=12.50. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -8 | | | 1 | | | | | | | | | | | | 1 |
| -4 | | | | | | 1 | 2 | 1 | | | | | | | 4 |
| -3 | | | | | 1 | | | 6 | | | | | | | 7 |
| -2 | | 1 | 2 | | 1 | | 1 | 1 | 7 | 1 | | 1 | | | 15 |
| -1 | 1 | 1 | 11 | 7 | 2 | 9 | 3 | 1 | 3 | 2 | | 7 | | | 47 |
| **0** | | **5** | **4** | **10** | **13** | **2** | **5** | **2** | **1** | **3** | **2** | **6** | **2** | **1** | **56** |
| 1 | | | 8 | 7 | 3 | 3 | 2 | 4 | 1 | 1 | | 6 | 1 | 1 | 37 |
| 2 | | | | | | 1 | 5 | 1 | 3 | 1 | 1 | 1 | | 1 | 14 |
| 3 | | | | | 1 | 1 | | 2 | | 1 | | | | | 5 |
| 4 | | | | | | | | | 3 | 1 | | | | | 4 |
| 5 | | | | | | | | | | 1 | | | | | 1 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.3.3. Age difference table for sand flathead from, network type: probabilistic: data inputs: All biological data. APE=12.91. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -7 | | | | | | 1 | | | | | | | | | 1 |
| -5 | | | | | | 2 | | 2 | | | | | | | 4 |
| -4 | | | | | 2 | 1 | 1 | 2 | | | | | | | 6 |
| -3 | | | 1 | 1 | | | | 4 | 2 | 1 | | | | | 9 |
| -2 | | | 2 | 1 | 2 | 1 | 6 | 1 | 3 | 3 | | 1 | | | 20 |
| -1 | 1 | 1 | 6 | 7 | 2 | 1 | 1 | 4 | 2 | 3 | 1 | 7 | 2 | | 38 |
| **0** | | **6** | **10** | **9** | **6** | **4** | **6** | **3** | **6** | **1** | | **7** | **1** | **1** | **60** |
| 1 | | | 6 | 6 | 5 | 5 | 2 | 1 | | 2 | 1 | 1 | | 1 | 30 |
| 2 | | | | | 4 | 1 | 2 | | 3 | | | 2 | | 1 | 13 |
| 3 | | | | | | 1 | | 1 | 1 | | | | | | 3 |
| 4 | | | | | | | | | 1 | 1 | | 1 | | | 3 |
| 5 | | | | | | | | | | | 1 | 1 | | | 2 |
| 7 | | | | | | | | | | | | 1 | | | 1 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.3.4. Age difference table for sand flathead from, network type: probabilistic: data inputs: Harmonics from transect 1. APE=27.08. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -7 | | | 1 | | | | 1 | | | | | | | | 2 |
| -6 | | | 2 | | | | | | | | | | | | 2 |
| -5 | | | | 1 | 1 | | | | 1 | | | | | | 3 |
| -4 | | | | 2 | | | | | | 1 | | | | | 3 |
| -3 | | | 2 | 4 | 4 | | 1 | | 2 | 1 | 2 | | | | 16 |
| -2 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | | | 3 | | | 10 |
| -1 | | 3 | 3 | 7 | | 2 | 2 | 4 | 3 | | | 2 | | | 26 |
| **0** | | **3** | **9** | **3** | **7** | **2** | **5** | **1** | **3** | **3** | | **1** | | | **37** |
| 1 | | | 7 | 2 | 4 | 3 | | 1 | 3 | 2 | 1 | | 2 | | 25 |
| 2 | | | | 3 | 2 | 1 | 1 | | 2 | 1 | | 2 | | | 12 |
| 3 | | | | 2 | | 1 | 2 | 6 | | 1 | | 3 | | | 15 |
| 4 | | | | | 2 | 4 | 1 | 2 | 1 | | | 2 | | 1 | 13 |
| 5 | | | | | | 3 | | 1 | 3 | | | 1 | 1 | | 9 |
| 6 | | | | | | | 4 | | | 1 | | | | | 5 |
| 7 | | | | | | | | 2 | | 1 | | 2 | | | 5 |
| 8 | | | | | | | | | | | | | | 1 | 1 |
| 9 | | | | | | | | | | | | 1 | | 1 | 2 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **17** | **3** | **4** | **188** |

Table 6.3.5. Age difference table for sand flathead from, network type: probabilistic: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=13.71. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | | | | 1 | | | | | | | | 1 |
| -4 | | | | | | 1 | | 1 | | | | | | | 2 |
| -3 | | | | 1 | 1 | | 1 | | 1 | | | | | | 4 |
| -2 | | | | | 1 | 1 | 1 | 5 | 1 | | | 2 | | | 11 |
| -1 | 1 | 1 | 7 | 4 | 2 | 3 | 2 | 2 | 5 | | | 5 | | | 32 |
| **0** | | **5** | **10** | **12** | **10** | **1** | **6** | **4** | **4** | **4** | | **11** | | **2** | **69** |
| 1 | | 1 | 7 | 3 | 7 | 3 | 1 | 1 | 1 | | 3 | 1 | 3 | | 31 |
| 2 | | | 1 | 4 | | 5 | 4 | 1 | 3 | 4 | | 2 | | 1 | 25 |
| 3 | | | | | | 3 | 2 | 4 | | 2 | | | | | 11 |
| 4 | | | | | | | | | 2 | | | | | | 2 |
| 5 | | | | | | | | | 1 | | | | | | 1 |
| 6 | | | | | | | | | | 1 | | | | | 1 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.3.6. Age difference table for sand flathead from, network type: probabilistic: data inputs: Harmonics from transect 2. APE=27.42. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -6 | | | | 1 | | | | | | | | | | | 1 |
| -5 | | | | | | | | 1 | | | | | | | 1 |
| -4 | | 1 | 1 | | | | | | 1 | | | | | | 3 |
| -3 | | | | 2 | 1 | 1 | | 1 | 1 | | | | | | 6 |
| -2 | | 1 | 4 | | 1 | 1 | 3 | 1 | | | | 2 | | | 13 |
| -1 | | 1 | 2 | 5 | 1 | | 2 | 2 | 1 | 1 | | 1 | | | 16 |
| **0** | **1** | **2** | **6** | **6** | **10** | **1** | **4** | **4** | **3** | **1** | | **3** | **1** | **1** | **43** |
| 1 | | 2 | 11 | 6 | 3 | 1 | 3 | 4 | 1 | 1 | | 1 | | | 33 |
| 2 | | | 2 | 2 | 1 | 4 | 3 | | 2 | 2 | | | | | 16 |
| 3 | | | | 1 | 3 | 6 | | | 1 | 2 | | | 1 | | 14 |
| 4 | | | | | 1 | 1 | 1 | 1 | | | | 2 | | | 6 |
| 5 | | | | | | 1 | | 1 | 1 | 1 | | 1 | | | 5 |
| 6 | | | | | | | 1 | 1 | 4 | | | | 1 | | 7 |
| 7 | | | | | | | | 1 | 3 | 1 | | 2 | | 1 | 8 |
| 8 | | | | | | | | | | | 1 | 1 | | | 2 |
| 9 | | | | | | | | | | | | 4 | | | 4 |
| 10 | | | | | | | | | | | | 1 | | | 1 |
| 11 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **23** | **21** | **16** | **17** | **17** | **18** | **9** | **1** | **18** | **3** | **3** | **180** |

Table 6.3.7. Age difference table for sand flathead from, network type: probabilistic: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=12.92. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -9 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | | | 1 | 1 | | | | | | | | 2 |
| -4 | | | | | | | 1 | 1 | | | | | | | 2 |
| -3 | | | | | 1 | | | 2 | 1 | | | | | | 4 |
| -2 | | 1 | 3 | 1 | 1 | 1 | 2 | 1 | 3 | 1 | | 4 | | | 18 |
| -1 | 1 | 2 | 7 | 5 | 2 | 2 | 1 | 3 | 4 | 1 | | 2 | | | 30 |
| **0** | | **4** | **6** | **12** | **11** | **3** | **6** | **2** | **1** | **5** | **2** | **11** | **2** | **1** | **66** |
| 1 | | | 8 | 5 | 5 | 7 | 5 | 5 | 1 | | | 2 | 1 | 1 | 40 |
| 2 | | | 1 | 1 | 1 | 2 | 2 | 2 | 2 | | | 1 | | 1 | 13 |
| 3 | | | | | | 1 | | 2 | 3 | 2 | 1 | 1 | | | 10 |
| 4 | | | | | | | | | 3 | 1 | | | | | 4 |
| 5 | | | | | | | | | | 1 | | | | | 1 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.3.8. Age difference table for sand flathead from, network type: probabilistic: data inputs: Harmonics from transect 3. APE=27.19. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -11 | | 1 | | | | | | | | | | | | | 1 |
| -10 | | | 4 | | | | | | | | | | | | 4 |
| -9 | | | | | 1 | | | | | | | | | | 1 |
| -7 | | | | | | 1 | 1 | | | | | | | | 2 |
| -6 | | | 2 | | | | | 2 | | | | | | | 4 |
| -5 | | 1 | 1 | | | | | | 2 | | | | | | 4 |
| -4 | | | 1 | 1 | | 1 | 1 | | 1 | 1 | | | | | 6 |
| -3 | | 1 | 1 | 2 | | | 2 | | 2 | | | | | | 8 |
| -2 | | 1 | 1 | 1 | 2 | 1 | | 1 | | | | 2 | | | 9 |
| -1 | 1 | 1 | 4 | 2 | 3 | 3 | 2 | 5 | 4 | | | 2 | 1 | | 28 |
| **0** | | **2** | **10** | **7** | **6** | **1** | **7** | | **5** | **3** | | **3** | | | **44** |
| 1 | | | 2 | 5 | 3 | 1 | | 2 | 1 | 3 | | 2 | | | 19 |
| 2 | | | | 4 | 2 | 1 | | 1 | 2 | 1 | 1 | | | 1 | 13 |
| 3 | | | | 2 | 2 | 4 | | 1 | | | | 2 | | | 11 |
| 4 | | | | | | 3 | 3 | 2 | | 1 | | 1 | | | 10 |
| 5 | | | | | | 1 | 2 | 1 | 1 | | | 1 | 1 | 1 | 8 |
| 6 | | | | | | | | 2 | | | 1 | | | | 3 |
| 7 | | | | | | | | 1 | | | | 2 | | | 3 |
| 8 | | | | | | | | | | 2 | | | | | 2 |
| 9 | | | | | | | | | | | 1 | 1 | | 1 | 3 |
| 10 | | | | | | | | | | | | 3 | | | 3 |
| 11 | | | | | | | | | | | | | 1 | 1 | 2 |
| N | **1** | **7** | **26** | **24** | **19** | **17** | **18** | **18** | **18** | **11** | **3** | **19** | **3** | **4** | **188** |

Table 6.3.9. Age difference table for sand flathead from, network type: probabilistic: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=12.00. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -11 | | | 1 | | | | | | | | | | | | 1 |
| -6 | | | | | 1 | | 1 | 1 | | | | | | | 3 |
| -5 | | | | | 1 | | | | 1 | | | | | | 2 |
| -4 | | 1 | | | 1 | 1 | 1 | 1 | 1 | 1 | | | | | 7 |
| -3 | | | 1 | | | 1 | | 1 | 2 | | | | | | 5 |
| -2 | | | 1 | 1 | 4 | 1 | | 3 | 1 | 2 | 1 | 4 | | | 18 |
| -1 | 1 | | 4 | 3 | 2 | 7 | | 5 | 7 | | | 3 | 1 | | 33 |
| **0** | | **5** | **12** | **17** | **8** | **3** | **13** | **1** | **2** | **1** | | **12** | **1** | | **75** |
| 1 | | 1 | 7 | 1 | 2 | | 2 | 4 | 1 | 3 | | 1 | 1 | 2 | 25 |
| 2 | | | | 2 | 2 | 3 | | 1 | 3 | 3 | 1 | 1 | | | 16 |
| 3 | | | | | | | 1 | 1 | | 1 | 1 | | | | 4 |
| 4 | | | | | | 1 | | | | | | | | 1 | 2 |
| 9 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.3.10. Age difference table for sand flathead from, network type: probabilistic: data inputs: Harmonics from transect 4. APE=20.86. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -7 | | | | 1 | | | 1 | | | | | | | | 2 |
| -6 | | | | 1 | 3 | | | 1 | | | | | | | 5 |
| -5 | | | 1 | | | | 1 | | 1 | | | | | | 3 |
| -4 | | | | 3 | 1 | | | | | | | | | | 4 |
| -3 | | | | | | | 1 | | 2 | 1 | | | | | 4 |
| -2 | | | 2 | | | 2 | 2 | 1 | 1 | 1 | | 2 | | | 11 |
| -1 | | | 2 | 3 | 4 | 2 | 2 | 4 | | 1 | | 3 | | | 21 |
| **0** | **1** | **7** | **11** | **11** | **3** | **4** | **6** | **1** | **3** | **2** | | **2** | | **2** | **53** |
| 1 | | | 9 | 4 | 5 | 2 | 2 | 6 | 3 | 1 | | | 1 | | 33 |
| 2 | | | 1 | | 2 | 1 | | 1 | 4 | | | 1 | | | 10 |
| 3 | | | | 1 | 2 | 1 | 1 | 3 | 1 | 2 | 1 | 5 | | | 17 |
| 4 | | | | | 1 | 5 | 1 | 1 | 1 | 1 | 1 | | | | 11 |
| 5 | | | | | | | 1 | | | 1 | | 3 | | | 5 |
| 7 | | | | | | | | | 1 | | | 3 | | | 4 |
| 8 | | | | | | | | | 1 | 1 | 1 | 1 | | | 4 |
| 9 | | | | | | | | | | | | | 1 | 1 | 2 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| 11 | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **20** | **3** | **4** | **191** |

Table 6.3.11. Age difference table for sand flathead from, network type: probabilistic: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=11.65. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -4 | | | | | | | 2 | 1 | 1 | | | | | | 4 |
| -3 | | | 1 | | | 1 | | 1 | 2 | | 2 | | | | 7 |
| -2 | | 1 | 1 | | | 4 | 3 | 4 | 3 | 1 | | 3 | | | 20 |
| -1 | 1 | | 4 | 7 | 7 | 4 | 2 | 5 | 2 | 2 | | 5 | 1 | | 40 |
| **0** | | **6** | **14** | **12** | **7** | **1** | **7** | | **5** | **3** | | **8** | **1** | **2** | **66** |
| 1 | | | 6 | 4 | 4 | 3 | 1 | 4 | 3 | 3 | | | | | 28 |
| 2 | | | | 1 | 2 | 3 | 2 | 2 | 1 | | | 3 | | | 14 |
| 3 | | | | | 1 | | 1 | | | 2 | | 1 | | 1 | 6 |
| 4 | | | | | | 1 | | 1 | 1 | | | | | | 3 |
| 5 | | | | | | | | | | | 1 | 1 | 1 | | 3 |
| 9 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

Table 6.3.12. Age difference table for sand flathead from, network type: probabilistic: data inputs: Harmonics from transect 5. APE=21.51. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -10 | | | | 1 | | | | | | | | | | | 1 |
| -9 | | | | | 1 | | | | | | | | | | 1 |
| -8 | | | | | | 1 | | | | | | | | | 1 |
| -7 | | | | 1 | 1 | | 2 | | | | | | | | 4 |
| -6 | | | | | | 1 | | | | | | | | | 1 |
| -5 | 1 | | 1 | | 1 | 1 | | | 1 | | | | | | 5 |
| -4 | | | 1 | 1 | | 1 | | | 1 | | | | | | 4 |
| -3 | | | 1 | | 1 | 1 | 1 | | | | | | | | 4 |
| -2 | | | | 2 | 1 | 1 | 4 | 1 | | 2 | | 3 | | | 14 |
| -1 | | 2 | 4 | 2 | 4 | 1 | 2 | 6 | 2 | | 1 | 2 | 1 | | 27 |
| **0** | | **4** | **9** | **10** | **3** | **1** | **4** | **2** | **3** | **5** | | **2** | | | **43** |
| 1 | | 1 | 9 | 4 | 3 | 3 | 1 | 3 | 3 | | 1 | 1 | | | 29 |
| 2 | | | 1 | 3 | 1 | 2 | 1 | 4 | 4 | | | | | 1 | 17 |
| 3 | | | | | 5 | 3 | | | 1 | 3 | | | | | 12 |
| 4 | | | | | | 1 | 2 | 2 | 2 | | | 3 | | 1 | 11 |
| 5 | | | | | | | | | | | | 4 | | | 4 |
| 6 | | | | | | | | | | 1 | 1 | 3 | 1 | | 6 |
| 7 | | | | | | | | | 1 | | | 1 | | | 2 |
| 9 | | | | | | | | | | | | 1 | 1 | 1 | 3 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **17** | **18** | **18** | **11** | **3** | **20** | **3** | **3** | **189** |

Table 6.3.13. Age difference table for sand flathead from, network type: probabilistic: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=11.11. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **All** |
| -7 | | | 1 | | | | | | | | | | | | 1 |
| -5 | | | | | | 2 | 1 | | | | | | | | 3 |
| -4 | | | | | | | 1 | 1 | | | | | | | 2 |
| -3 | | | | | 1 | 1 | 2 | | 1 | | 1 | | | | 6 |
| -2 | | 1 | 1 | | 1 | 3 | 6 | 4 | 2 | 1 | 2 | 5 | | | 26 |
| -1 | 1 | | 8 | 4 | 4 | 3 | 2 | 4 | 7 | 1 | | 4 | 2 | | 40 |
| **0** | | **6** | **10** | **16** | **10** | **2** | **4** | **6** | **4** | **5** | | **9** | | **1** | **73** |
| 1 | | | 6 | 4 | 2 | 4 | | 3 | 1 | 1 | | 1 | | 2 | 24 |
| 2 | | | | | 2 | 2 | 2 | | | | | | | | 6 |
| 3 | | | | | 1 | | | | | 3 | | | | | 4 |
| 4 | | | | | | | | | 2 | | | 2 | | | 4 |
| 5 | | | | | | | | | 1 | | | | 1 | | 2 |
| 10 | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **7** | **26** | **24** | **21** | **17** | **18** | **18** | **18** | **11** | **3** | **21** | **3** | **4** | **192** |

## *Blue grenadier*

Table 7.1.1. Age difference table for blue grenadier from, network type: back propagation: data inputs: All biological, all transect data and all transect length. APE=6.55. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | | | 1 | | | | | | | | | | 1 |
| -4 | | | | | | | 1 | | | | | | | | | 1 |
| -3 | 1 | | | | | | 1 | | | | | | | | | 2 |
| -2 | 1 | 1 | | | | | | | 4 | 3 | | | | | | 9 |
| -1 | | 22 | 19 | | | | | 1 | 2 | 9 | 4 | 1 | | | | 58 |
| **0** | | | **74** | **53** | | | | | | **1** | **7** | **4** | **1** | | | **140** |
| 1 | | | | 39 | 10 | | | | | 1 | 6 | 6 | 2 | | | 64 |
| 2 | | | | | 4 | | | | | | 1 | 1 | 4 | 2 | | 12 |
| 3 | | | | | | 1 | | | | | | | 2 | 2 | 5 | 10 |
| 4 | | | | | | | 1 | | | | | | | | 2 | 3 |
| 5 | | | | | | | | | | | | | | | 1 | 1 |
| 7 | | | | | | | | | | | 1 | | | | | 1 |
| 8 | | | | | | | | | | | 3 | | | | | 3 |
| 10 | | | | | | | | | | | | | 1 | | | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.1.2. Age difference table for blue grenadier from, network type: back propagation: data inputs: All biological and all transect lengths. APE=6.79. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -4 | | | | | | | 2 | 1 | | | | | | | | 3 |
| -3 | 1 | | | | | | | | | | | | | | | 1 |
| -2 | 1 | 6 | | | | | | | 5 | 4 | | | | | | 16 |
| -1 | | 17 | 31 | | | | | | | 5 | 6 | | | | | 59 |
| **0** | | | **62** | **64** | | | | | | **3** | **7** | **4** | | | | **140** |
| 1 | | | | 28 | 14 | | | | | | 4 | 8 | 5 | | | 59 |
| 2 | | | | | | | | | | | | | 3 | 2 | 1 | 6 |
| 3 | | | | | | 2 | 1 | | | | | | 2 | 2 | 4 | 11 |
| 4 | | | | | | | | | | | | | | | 3 | 3 |
| 5 | | | | | | | | | 1 | | | | | | | 1 |
| 6 | | | | | | | | | | 2 | | | | | | 2 |
| 7 | | | | | | | | | | | 4 | | | | | 4 |
| 8 | | | | | | | | | | | 1 | | | | | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.1.3. Age difference table for blue grenadier from, network type: back propagation: data inputs: All biological data. APE=5.89. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | | | 2 | | | | | | | | | | 2 |
| -4 | | | | | | | 3 | | | | | | | | | 3 |
| -3 | | | | | | | | 1 | | | | | | | | 1 |
| -2 | 2 | 7 | | | | | | | 6 | | | | | | | 15 |
| -1 | | 16 | 34 | | | | | | | 14 | | | | | | 64 |
| **0** | | | **59** | **70** | | | | | | | **21** | | | | **1** | **151** |
| 1 | | | | 22 | 14 | | | | | | | 12 | | | 1 | 49 |
| 2 | | | | | | | | | | | | | 10 | | 1 | 11 |
| 3 | | | | | | | | | | | | | | 3 | | 3 |
| 4 | | | | | | | | | | | | | | | 5 | 5 |
| 8 | | | | | | | | | | | 1 | | | | | 1 |
| 10 | | | | | | | | | | | | | | 1 | | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.1.4. Age difference table for blue grenadier from, network type: back propagation: data inputs: Harmonics from transect 1. APE=15.34. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | 3 | | | | | | | | | | | | | 3 |
| -7 | | | | | 1 | | | | | | | | | | | 1 |
| -5 | | | | | | | | 1 | | | | | | | | 1 |
| -3 | | | | | | | | | 1 | 2 | | | | | | 3 |
| -2 | 2 | 2 | | | | | | | | 1 | | | | | | 5 |
| -1 | | 21 | 19 | | | | | | | 2 | 2 | | | | | 44 |
| **0** | | | **71** | **52** | | | | | | | **1** | **3** | | | | **127** |
| 1 | | | | 40 | 7 | | | | | | | 1 | | 1 | | 49 |
| 2 | | | | | 6 | | | | | | | | 2 | | | 8 |
| 3 | | | | | | 2 | | | | | | | | | | 2 |
| 4 | | | | | | | 3 | | | | | | | | 1 | 4 |
| 5 | | | | | | | | | 1 | | | | | | | 1 |
| 6 | | | | | | | | | 4 | 1 | | | | | | 5 |
| 7 | | | | | | | | | | 8 | 1 | | | | | 9 |
| 8 | | | | | | | | | | | 18 | | | | | 18 |
| 9 | | | | | | | | | | | | 8 | 2 | 1 | | 11 |
| 10 | | | | | | | | | | | | | 6 | 1 | | 7 |
| 11 | | | | | | | | | | | | | | 1 | 2 | 3 |
| 12 | | | | | | | | | | | | | | | 5 | 5 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.1.5. Age difference table for blue grenadier from, network type: back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=6.35. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -4 | | | | | | | 2 | | | | | | | | | 2 |
| -3 | 1 | | | | | | | 1 | | | | | | | | 2 |
| -2 | 1 | 3 | | | | | 1 | | 3 | 4 | | | | | | 12 |
| -1 | | 20 | 27 | | | | | | 1 | 2 | 9 | 1 | | | | 60 |
| **0** | | | **66** | **61** | | | | | **1** | **4** | **9** | **5** | | | | **146** |
| 1 | | | | 31 | 11 | | | | | 1 | 3 | 4 | 3 | 2 | | 55 |
| 2 | | | | | 3 | | | | | | | 2 | 3 | 2 | 2 | 12 |
| 3 | | | | | | 2 | | | | | | | 4 | | 4 | 10 |
| 5 | | | | | | | | | 1 | | | | | | 2 | 3 |
| 7 | | | | | | | | | | 3 | | | | | | 3 |
| 8 | | | | | | | | | | | 1 | | | | | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.1.6. Age difference table for blue grenadier from, network type: back propagation: data inputs: Harmonics from 2. APE=16.75. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | | 1 | | | | | | | | | | 1 |
| -2 | 2 | 2 | | | | | | 1 | 1 | 1 | | | | | | 7 |
| -1 | | 21 | 13 | | | | | | | | | | | | | 34 |
| **0** | | | **80** | **28** | | | | | | **2** | **1** | **2** | | | | **113** |
| 1 | | | | 64 | 4 | | | | | | | | | | | 68 |
| 2 | | | | | 10 | | | | | | | | | | | 10 |
| 3 | | | | | | 1 | | | | | | | | | 1 | 2 |
| 4 | | | | | | | 3 | | | | | | | | | 3 |
| 5 | | | | | | | | | | | | | | | 1 | 1 |
| 6 | | | | | | | | | 5 | | | | | | | 5 |
| 7 | | | | | | | | | | 11 | 2 | | | | | 13 |
| 8 | | | | | | | | | | | 19 | 2 | | | | 21 |
| 9 | | | | | | | | | | | | 8 | | | | 8 |
| 10 | | | | | | | | | | | | | 10 | | | 10 |
| 11 | | | | | | | | | | | | | | 4 | 2 | 6 |
| 12 | | | | | | | | | | | | | | | 4 | 4 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.1.7. Age difference table for blue grenadier from, network type: back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=6.24. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | | | | 1 | | | | | | | | | 1 |
| -4 | | | | | | 1 | | 1 | | | | | | | | 2 |
| -3 | 1 | | | | | | 1 | | 3 | | | | | | | 5 |
| -2 | 1 | 2 | | | | | | | | 10 | | | | | | 13 |
| -1 | | 21 | 22 | | | | | | 3 | | 14 | 1 | | | | 61 |
| **0** | | | **71** | **55** | | | | | | **4** | **4** | **7** | **2** | | | **143** |
| 1 | | | | 37 | 9 | | | | | | 1 | 1 | 6 | | | 54 |
| 2 | | | | | 5 | | | | | | | 3 | | 3 | 1 | 12 |
| 3 | | | | | | 1 | 1 | | | | | | 2 | | 7 | 11 |
| 4 | | | | | | | | | | | | | | 1 | | 1 |
| 8 | | | | | | | | | | | 3 | | | | | 3 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.1.8. Age difference table for blue grenadier from, network type: back propagation: data inputs: Harmonics from transect 3. APE=14.73. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | 2 | | | | | | | | | | | | | | 2 |
| -8 | | | 1 | | | | | | | | | | | | | 1 |
| -5 | | | | | | 1 | | | | | | | | | | 1 |
| -3 | | | | | | | | | 1 | | | | | | | 1 |
| -2 | 2 | 2 | | | | | 1 | | 3 | | | | | | | 8 |
| -1 | | 19 | 10 | | | | | | | 6 | 1 | | | | | 36 |
| **0** | | | **80** | **25** | | | | | | | **6** | **1** | | | | **112** |
| 1 | | | 2 | 67 | 1 | | | | | | | 4 | | | | 74 |
| 2 | | | | | 13 | | | | | | | | 1 | | | 14 |
| 3 | | | | | | 1 | | | | | | | | | | 1 |
| 4 | | | | | | | 2 | | | | | | 1 | | 3 | 6 |
| 5 | | | | | | | | 1 | | | | | | 1 | | 2 |
| 6 | | | | | | | | | 1 | 1 | | | | | | 2 |
| 7 | | | | | | | | | 1 | 7 | 4 | | | | | 12 |
| 8 | | | | | | | | | | | 10 | | | | | 10 |
| 9 | | | | | | | | | | | 1 | 7 | 2 | | | 10 |
| 10 | | | | | | | | | | | | | 6 | | | 6 |
| 11 | | | | | | | | | | | | | | 2 | 2 | 4 |
| 12 | | | | | | | | | | | | | | 1 | 3 | 4 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.1.9. Age difference table for blue grenadier from, network type: propagation neural network: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=6.14. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | | | 1 | | | | | | | | | | 1 |
| -4 | | | | | | 1 | | | | | | | | | | 1 |
| -3 | 1 | | | | | | 2 | 1 | | 2 | | | | | | 6 |
| -2 | 1 | 3 | | | | | | | 4 | | 6 | | | | | 14 |
| -1 | | 20 | 22 | | | | | | 2 | 6 | | 3 | | | | 53 |
| **0** | | | **71** | **56** | | | | | | **6** | **7** | | **4** | | | **144** |
| 1 | | | | 36 | 11 | | | | | | 7 | 5 | | | | 59 |
| 2 | | | | | 3 | | | | | | | 4 | 5 | | 4 | 16 |
| 3 | | | | | | | 1 | | | | | | 1 | 3 | | 5 |
| 4 | | | | | | | | | | | | | | 1 | 4 | 5 |
| 8 | | | | | | | | | | | 2 | | | | | 2 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.2.1. Age difference table for blue grenadier fom, network type: multiple hidden layer back propagation: data inputs: All biological, all transect data and all transect length. APE=6.65. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age class | | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | | | | 1 | | | | | | | | 1 |
| -4 | | | | | | 1 | | | | 1 | | | | | | 2 |
| -3 | 1 | | | | | | 1 | | | | 2 | 1 | | | | 5 |
| -2 | 1 | 3 | | | | | | | | 2 | | 1 | | | | 7 |
| -1 | | 20 | 25 | | | | | | 6 | | 4 | | 3 | | | 58 |
| **0** | | | **68** | **62** | | | | | | **9** | | **1** | | | **1** | **141** |
| 1 | | | | 30 | 11 | | | | | 2 | 12 | | 2 | | | 57 |
| 2 | | | | | 3 | | | | | | 1 | 9 | | | | 13 |
| 3 | | | | | | 1 | 1 | | | | | | 5 | | 3 | 10 |
| 4 | | | | | | | 1 | | | | | | | 4 | | 5 |
| 5 | | | | | | | | | | | | | | | 3 | 3 |
| 7 | | | | | | | | | | | 1 | | | | | 1 |
| 8 | | | | | | | | | | | 2 | | | | | 2 |
| 11 | | | | | | | | | | | | | | | 1 | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.2.2. Age difference table for blue grenadier from, network type: multiple hidden layer back propagation: data inputs: All biological and all transect lengths. APE=5.78. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age class | | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | | | 1 | | 1 | | | | | | | | 2 |
| -4 | | | | | | | 2 | | | | | | | | | 2 |
| -3 | | | | | | | 1 | | | 4 | | | | | | 5 |
| -2 | 2 | 6 | | | | | | | 5 | | 2 | | | | | 15 |
| -1 | | 17 | 25 | | | | | | 1 | 6 | | | | | | 49 |
| **0** | | | **68** | **58** | | | | | | **4** | **14** | | **4** | | **1** | **149** |
| 1 | | | | 34 | 12 | | | | | | 6 | 9 | | 3 | | 64 |
| 2 | | | | | 2 | 1 | | | | | | 3 | 4 | | 3 | 13 |
| 3 | | | | | | | | | | | | | 2 | 1 | | 3 |
| 4 | | | | | | | | | | | | | | | 3 | 3 |
| 5 | | | | | | | | | | | | | | | 1 | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.2.3. Age difference table for blue grenadier from, network type: multiple hidden layer back propagation: data inputs: All biological data. APE=6.00. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age class | | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | | | 2 | | | | | | | | | | 2 |
| -4 | | | | | | | 1 | | | | | | | | | 1 |
| -3 | | | | | | | 2 | 1 | | 2 | | | | | | 5 |
| -2 | 2 | 7 | | | | | | | 6 | | 4 | | | | | 19 |
| -1 | | 16 | 27 | | | | | | | 11 | | 1 | | | | 55 |
| **0** | | | **66** | **58** | | | | | | **1** | **16** | | **4** | | **2** | **147** |
| 1 | | | | 34 | 12 | | | | | | 1 | 8 | | 1 | | 56 |
| 2 | | | | | 2 | | | | | | | 3 | 6 | | 4 | 15 |
| 3 | | | | | | | | | | | | | | 2 | | 2 |
| 4 | | | | | | | | | | | 1 | | | | 2 | 3 |
| 10 | | | | | | | | | | | | | | 1 | | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.2.4. Age difference table for blue grenadier from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1. APE=13.76. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age class | | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | | 1 | | | | | | | | | | | | | 1 |
| -8 | | 1 | | | | | | | | | | | | | | 1 |
| -7 | | | 1 | | | | | | | | | | | | | 1 |
| -6 | | | | 3 | | 1 | | | | | | | | | | 4 |
| -4 | | | | | | 1 | | | | | | | | | | 1 |
| -3 | | | | | | | 1 | | | | | | | | | 1 |
| -2 | 2 | 1 | | | | | | | 1 | | | | | | | 4 |
| -1 | | 21 | 24 | | | | | | 2 | 2 | | | | | | 49 |
| **0** | | | **67** | **48** | | | | | | **5** | **2** | **1** | | | | **123** |
| 1 | | | | 41 | 7 | | | | | | 5 | 2 | 1 | | | 56 |
| 2 | | | | | 7 | | | | | | | 3 | 2 | 2 | | 14 |
| 4 | | | | | | | 2 | | | | | | | 1 | 1 | 4 |
| 5 | | | | | | | | 1 | | | | | | | 1 | 2 |
| 6 | | | | | | | | | 3 | | | | | | | 3 |
| 7 | | | | | | | | | | 7 | 1 | | | | | 8 |
| 8 | | | | | | | | | | | 14 | 1 | | | | 15 |
| 9 | | | | | | | | | | | | 5 | 2 | | | 7 |
| 10 | | | | | | | | | | | | | 5 | | | 5 |
| 11 | | | | | | | | | | | | | | 1 | 1 | 2 |
| 12 | | | | | | | | | | | | | | | 5 | 5 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.2.5. Age difference table for blue grenadier from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=5.77. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | | | 1 | | | | | | | | | | 1 |
| -4 | | | | | | | 3 | 1 | | | | | | | | 4 |
| -3 | | | | | | | | | | 1 | | | | | | 1 |
| -2 | 2 | 3 | | | | | | | 6 | 4 | 2 | | | | | 17 |
| -1 | | 20 | 15 | | | | | | | 9 | 1 | | | | | 45 |
| 0 | | | 78 | 50 | | | | | | | 19 | 2 | 1 | | | 150 |
| 1 | | | | 42 | 8 | | | | | | | 10 | 2 | 1 | | 63 |
| 2 | | | | | 6 | | | | | | | | 7 | 2 | 2 | 17 |
| 3 | | | | | | 1 | | | | | | | | 1 | 2 | 4 |
| 4 | | | | | | | | | | | | | | | 4 | 4 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.2.6. Age difference table for blue grenadier from, network type: multiple hidden layer back propagation: data inputs: Harmonics from 2. APE=13.88. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -10 | | 2 | | | | | | | | | | | | | | 2 |
| -8 | | | 1 | | | | | | | | | | | | | 1 |
| -7 | | | | 1 | 1 | | | | | | | | | | | 2 |
| -5 | | | | | | 1 | | | | | | | | | | 1 |
| -3 | 1 | | | | | | 1 | | | | | | | | | 2 |
| -2 | 1 | 7 | | | | | | 1 | 1 | | | | | | | 10 |
| -1 | | 14 | 38 | | | | | | 1 | 1 | | | | | | 54 |
| **0** | | | **54** | **61** | | | | | | **4** | **4** | | | | | **123** |
| 1 | | | | 30 | 8 | | | | | | 4 | 1 | 1 | | | 44 |
| 2 | | | | | 5 | 1 | | | | | | 4 | 1 | | | 11 |
| 3 | | | | | | | 1 | | | | | | 1 | | 1 | 3 |
| 4 | | | | | | | 1 | | | | | | | 2 | | 3 |
| 5 | | | | | | | | | 2 | | | | | | 2 | 4 |
| 6 | | | | | | | | | 2 | 2 | | | | | | 4 |
| 7 | | | | | | | | | | 7 | 6 | | | | | 13 |
| 8 | | | | | | | | | | | 8 | 4 | | | | 12 |
| 9 | | | | | | | | | | | | 3 | 1 | | | 4 |
| 10 | | | | | | | | | | | | | 6 | | | 6 |
| 11 | | | | | | | | | | | | | | 2 | 3 | 5 |
| 12 | | | | | | | | | | | | | | | 2 | 2 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.2.7. Age difference table for blue grenadier from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=5.79. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | | | 2 | | | | | | | | | | 2 |
| -4 | | | | | | | 3 | | | | | | | | | 3 |
| -3 | 1 | | | | | | | 1 | | | | | | | | 2 |
| -2 | 1 | 2 | | | | | | | 6 | | | | | | | 9 |
| -1 | | 21 | 22 | | | | | | | 14 | | | | | | 57 |
| **0** | | | **71** | **56** | | | | | | | **21** | | **2** | | | **150** |
| 1 | | | | 36 | 11 | | | | | | | 12 | | | | 59 |
| 2 | | | | | 3 | | | | | | | | 8 | | 2 | 13 |
| 3 | | | | | | | | | | | | | | 4 | 1 | 5 |
| 4 | | | | | | | | | | | | | | | 5 | 5 |
| 8 | | | | | | | | | | | 1 | | | | | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.2.8. Age difference table for blue grenadier from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3. APE=13.27. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -9 | | 1 | | | | | | | | | | | | | | 1 |
| -8 | | 3 | | | | | | | | | | | | | | 3 |
| -7 | | | 7 | | | | | | | | | | | | | 7 |
| -6 | | | | 3 | | | 1 | | | | | | | | | 4 |
| -5 | | | | | 1 | | | | | | | | | | | 1 |
| -4 | | | | | | 1 | | | | | | | | | | 1 |
| -3 | | | | | | | 1 | | | 1 | | | | | | 2 |
| -2 | 2 | 1 | | | | | | 1 | | | | | | | | 4 |
| -1 | | 18 | 13 | | | | | | 6 | | | | | | | 37 |
| **0** | | | **73** | **25** | | | | | | **11** | | | | | | **109** |
| 1 | | | | 64 | 4 | | | | | | 13 | | | | | 81 |
| 2 | | | | | 9 | | | | | | | 5 | | | | 14 |
| 3 | | | | | | 1 | 1 | | | | | | 4 | | | 6 |
| 4 | | | | | | | | | | | | | | 3 | | 3 |
| 5 | | | | | | | | | | | | | | | 3 | 3 |
| 6 | | | | | | | | | | 1 | | | | | | 1 |
| 7 | | | | | | | | | | 1 | 6 | | | | | 7 |
| 8 | | | | | | | | | | | 3 | | | | | 3 |
| 9 | | | | | | | | | | | | 7 | 1 | | | 8 |
| 10 | | | | | | | | | | | | | 5 | | | 5 |
| 11 | | | | | | | | | | | | | | 1 | 1 | 2 |
| 12 | | | | | | | | | | | | | | | 4 | 4 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.2.9. Age difference table for blue grenadier from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=6.80. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -7 | | | | | | | 1 | | | | | | | | | 1 |
| -6 | | | | | | | 1 | | | | | | | | | 1 |
| -5 | | | | | | 1 | | | | | | | | | | 1 |
| -4 | | | | | | | | | | 2 | | | | | | 2 |
| -3 | 1 | | | | | | 1 | | 2 | | 2 | | | | | 6 |
| -2 | 1 | 4 | | | | | | | 1 | 7 | | 2 | | | | 15 |
| -1 | | 17 | 20 | | | | | 1 | 2 | 3 | 14 | | 3 | | | 60 |
| **0** | | **2** | **68** | **46** | | | | | **1** | **2** | **3** | **6** | **1** | **1** | | **130** |
| 1 | | | 5 | 43 | 7 | | | | | | 2 | | 4 | | 3 | 64 |
| 2 | | | | 3 | 6 | | | | | | 1 | 3 | 2 | 1 | | 16 |
| 3 | | | | | 1 | | | | | | | 1 | | 1 | 3 | 6 |
| 4 | | | | | | 1 | | | | | | | | | 1 | 2 |
| 5 | | | | | | | | | | | | | | 1 | | 1 |
| 6 | | | | | | | | | | | | | | | 1 | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.3.1. Age difference table for blue grenadier from, network type: probabilistic: data inputs: All biological, all transect data and all transect length. APE=8.31. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -8 | | | | | | | 1 | | | | | | | | | 1 |
| -5 | | | | | | | | | | 4 | | | | | | 4 |
| -4 | | | | | | 1 | | 1 | | | 5 | | | | | 7 |
| -3 | | | | | | | 1 | | | | 1 | 3 | | | | 5 |
| -2 | | 1 | 7 | | | 1 | | | 3 | 2 | | | 1 | | | 15 |
| -1 | 1 | 9 | 25 | 21 | | | | | 2 | 3 | 5 | 2 | 2 | 2 | | 72 |
| **0** | | **12** | **39** | **38** | **4** | | **1** | | | **3** | **5** | **2** | **1** | | **3** | **108** |
| 1 | 1 | 1 | 22 | 24 | 7 | | | | 1 | 1 | 4 | 2 | 3 | | | 66 |
| 2 | | | | 8 | 1 | | | | | 1 | 1 | | | | 1 | 12 |
| 3 | | | | 1 | 1 | | | | | | 1 | 1 | 1 | 1 | 2 | 8 |
| 4 | | | | | | | | | | | | 2 | | | | 2 |
| 5 | | | | | 1 | | | | | | | | 1 | 1 | 1 | 4 |
| 6 | | | | | | | | | | | | | 1 | | 1 | 2 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.3.2. Age difference table for blue grenadier from, network type: probabilistic: data inputs: All biological and all transect lengths. APE=7.88. Data from production set.

| | Observed Age | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | 1 | | | 1 | | | | | 2 |
| -3 | | | | | | | | | 1 | 1 | 2 | | | | | 4 |
| -2 | | 3 | 4 | | | | 2 | | 3 | 1 | 2 | 1 | | | | 16 |
| -1 | 1 | 6 | 24 | 11 | | | | | 1 | 6 | 2 | 2 | 1 | | | 54 |
| **0** | | **12** | **44** | **44** | **2** | **1** | | | | | **3** | **2** | | | | **108** |
| 1 | 1 | | 18 | 23 | 9 | 1 | | | 1 | 3 | 5 | 1 | 3 | | | 65 |
| 2 | | 1 | 1 | 10 | 1 | | | | | | 2 | 4 | 3 | 1 | 1 | 24 |
| 3 | | | | | 1 | | 1 | | | 1 | | | 1 | | 1 | 5 |
| 4 | | | | | | | | | | | 2 | | 1 | | | 3 |
| 5 | | | | | | | | | | | | 1 | | 1 | 1 | 3 |
| 6 | | | | | | | | | | | | | 1 | | | 1 |
| 7 | | | | | | | | | | | | | | | 1 | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.3.3. Age difference table for blue grenadier from, network type: probabilistic: data inputs: All biological data. APE=9.12. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -5 | | | | | | | 1 | | 1 | 2 | | | | | | 4 |
| -4 | | | | | | | | | 1 | 2 | 2 | | | | | 5 |
| -3 | | | | | | | | | | | 1 | | | | | 1 |
| -2 | | 1 | 11 | | | 2 | | | 1 | 3 | 2 | | | | | 20 |
| -1 | 1 | 6 | 17 | 30 | | | 1 | | 2 | 1 | 3 | 1 | 3 | | | 65 |
| **0** | | **13** | **32** | **34** | **6** | | **1** | | **1** | | **3** | **5** | | | | **95** |
| 1 | 1 | 2 | 32 | 18 | 6 | | | | | 4 | 5 | 1 | 1 | 2 | | 72 |
| 2 | | 1 | 1 | 10 | 2 | | | 1 | | 1 | 3 | 1 | | | 1 | 21 |
| 3 | | | | | | | | | | 1 | | 2 | 2 | | 1 | 6 |
| 4 | | | | | | | | | | | 1 | | 2 | 1 | 1 | 5 |
| 5 | | | | | | | | | | | 1 | 1 | 1 | | | 3 |
| 6 | | | | | | | | | | | | 1 | | | 1 | 2 |
| 7 | | | | | | | | | | | | | 1 | | | 1 |
| 10 | | | | | | | | | | | | | | 1 | | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.3.4. Age difference table for blue grenadier from, network type: probabilistic: data inputs: Harmonics from transect 1. APE=14.50. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -11 | 1 | | 2 | 1 | | | | | | | | | | | | 4 |
| -10 | | | 3 | | | | | | | | | | | | | 3 |
| -9 | | | | 1 | | | | | | | | | | | | 1 |
| -8 | | 1 | 1 | 1 | | | | | | | | | | | | 3 |
| -7 | | 1 | 3 | 1 | | | | | | | | | | | | 5 |
| -6 | | | 1 | 2 | | 1 | | | | | | | | | | 4 |
| -5 | | | | | | | 1 | | | 1 | | | | | | 2 |
| -4 | | | | | | 1 | 1 | | 1 | | | | | | | 3 |
| -3 | 1 | 2 | | 1 | | | | | | 1 | 2 | | | | | 7 |
| -2 | | 2 | 7 | | | | 1 | | 1 | | 3 | | | | | 14 |
| -1 | | 11 | 16 | 14 | | | | | 2 | 3 | 2 | 3 | | | | 51 |
| **0** | | **5** | **38** | **31** | **4** | | | **1** | | **1** | **3** | **2** | **1** | | | **86** |
| 1 | | 1 | 19 | 27 | 5 | | | | | 3 | 5 | 1 | 1 | | | 62 |
| 2 | | | 3 | 12 | 2 | | | | | | 1 | 1 | 2 | | 1 | 22 |
| 3 | | | | 1 | 3 | | | | | | | 1 | | | 1 | 6 |
| 4 | | | | | | | | | | | | 1 | 1 | 1 | 1 | 4 |
| 5 | | | | | | | | | 1 | | 2 | | 2 | | 1 | 6 |
| 6 | | | | | | | | | 1 | | | | | | | 1 |
| 7 | | | | | | | | | | 2 | 2 | 1 | | 1 | | 6 |
| 8 | | | | | | | | | | 1 | 2 | 1 | 1 | | | 5 |
| 9 | | | | | | | | | | | | | 2 | | 1 | 3 |
| 10 | | | | | | | | | | | | 1 | | | 1 | 2 |
| 12 | | | | | | | | | | | | | | | 1 | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.3.5. Age difference table for blue grenadier from, network type: probabilistic: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=8.73. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | | | | 1 | | | | | | | | 1 |
| -5 | | | | | | 1 | 1 | | | 1 | | | | | | 3 |
| -4 | | | | | | 1 | 1 | | | 2 | 1 | | | | | 5 |
| -3 | | | | | | | 1 | | | 1 | | 3 | | | | 5 |
| -2 | 1 | 3 | 7 | | | | | | 2 | | 3 | 2 | 1 | | | 19 |
| -1 | | 11 | 23 | 20 | | | | | 2 | 3 | 3 | 2 | 2 | | | 66 |
| **0** | | **8** | **39** | **43** | **3** | | | | | **2** | **4** | **2** | **2** | | | **103** |
| 1 | 1 | | 23 | 21 | 5 | | | | 1 | 3 | 4 | 1 | 1 | | 1 | 61 |
| 2 | | 1 | 1 | 7 | 5 | | | | 1 | 1 | 4 | 1 | | 1 | | 22 |
| 3 | | | | 1 | 1 | | | | | | 1 | 1 | | | 1 | 5 |
| 4 | | | | | | | | | | | | | 1 | 1 | 2 | 4 |
| 5 | | | | | | | | | | | 1 | | 3 | 1 | 1 | 6 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.3.6. Age difference table for blue grenadier from, network type: probabilistic: data inputs: Harmonics from transect 2. APE=25.27. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -13 | | 1 | | | | | | | | | | | | | | 1 |
| -12 | | 1 | 4 | | | | | | | | | | | | | 5 |
| -11 | | 1 | 3 | 6 | | | | | | | | | | | | 10 |
| -10 | | 3 | 8 | 4 | | | | | | | | | | | | 15 |
| -9 | | | 5 | 5 | | | | | | | | | | | | 10 |
| -8 | | 1 | 3 | 2 | | | | | | | | | | | | 6 |
| -7 | | 1 | 1 | 2 | 2 | | | | | | | | | | | 6 |
| -6 | | 1 | 4 | 2 | 1 | | | | | | | | | | | 8 |
| -5 | | | 2 | 3 | 1 | | | | | | | | | | | 6 |
| -4 | | | | | | | 1 | | | 1 | 2 | | | | | 4 |
| -3 | | | 4 | 1 | | | 1 | | 1 | 1 | 1 | 1 | | | | 10 |
| -2 | | 3 | 8 | | | 1 | | | | 1 | 3 | | 1 | | | 17 |
| -1 | 2 | 5 | 19 | 19 | 1 | | 1 | 1 | 1 | 3 | 2 | 1 | | | | 55 |
| **0** | | **4** | **21** | **18** | **1** | | | | | **1** | **2** | | **2** | | | **49** |
| 1 | | | 6 | 14 | 5 | | | | 1 | 3 | 1 | 2 | 1 | | | 33 |
| 2 | | 2 | 4 | 9 | 1 | 1 | | | | 1 | 2 | 3 | | 1 | 1 | 25 |
| 3 | | | 1 | 4 | 1 | | | | | | 1 | 1 | | 1 | 1 | 10 |
| 4 | | | | 3 | | | | | | | | | | | | 3 |
| 5 | | | | | 1 | | | | 1 | | | | | | | 2 |
| 6 | | | | | | | | | 2 | | 1 | | | | | 3 |
| 7 | | | | | | | | | | | 2 | 1 | | | | 3 |
| 8 | | | | | | | | | | 2 | 4 | | 1 | | | 7 |
| 9 | | | | | | | | | | | 1 | | 1 | | | 2 |
| 10 | | | | | | | | | | 1 | | 3 | 3 | | | 7 |
| 11 | | | | | | | | | | | | | | | 1 | 1 |
| 12 | | | | | | | | | | | | | 1 | 1 | 1 | 3 |
| 13 | | | | | | | | | | | | | | | 1 | 1 |
| 14 | | | | | | | | | | | | | | 1 | 2 | 3 |
| 15 | | | | | | | | | | | | | | | 1 | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.3.7. Age difference table for blue grenadier from, network type: probabilistic: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=8.30. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | | 1 | | | | | | | | | | 1 |
| -5 | | | | | | | | | | 2 | | | | | | 2 |
| -3 | | | 1 | | | | 2 | | 1 | 1 | 2 | | | | | 7 |
| -2 | | 2 | 9 | 1 | | 1 | | 1 | 1 | 2 | 3 | 1 | 1 | | | 22 |
| -1 | 1 | 6 | 20 | 22 | | | | | 1 | 2 | 3 | | 1 | | | 56 |
| **0** | **1** | **13** | **38** | **41** | **6** | | | | **1** | **3** | **4** | **2** | | | **1** | **110** |
| 1 | | 1 | 23 | 19 | 6 | | | | 2 | 2 | 3 | 3 | 4 | | 3 | 66 |
| 2 | | 1 | 2 | 8 | 1 | | | | | 2 | 3 | 3 | | 2 | 2 | 24 |
| 3 | | | | 1 | 1 | | 1 | | | | 2 | 1 | 2 | | 1 | 9 |
| 4 | | | | | | | | | | | | 1 | 1 | | | 2 |
| 5 | | | | | | | | | | | 1 | 1 | 1 | 2 | | 5 |
| 7 | | | | | | | | | | | | | | | 1 | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.3.8. Age difference table for blue grenadier from, network type: probabilistic: data inputs: Harmonics from transect 3. APE=23.24. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -14 | 1 | | | | | | | | | | | | | | | 1 |
| -13 | | 1 | | | | | | | | | | | | | | 1 |
| -12 | | | 4 | | | | | | | | | | | | | 4 |
| -11 | | 3 | 6 | 1 | | | | | | | | | | | | 10 |
| -10 | | | 4 | 4 | | | | | | | | | | | | 8 |
| -9 | | | 4 | 3 | | | | | | | | | | | | 7 |
| -8 | | | | 4 | | | | | | | | | | | | 4 |
| -7 | | | 3 | 5 | 2 | | | | | | | | | | | 10 |
| -6 | | 1 | 2 | 3 | | | | | 1 | | | | | | | 7 |
| -5 | | | | | 1 | 1 | | | | | | | | | | 2 |
| -4 | 1 | | 4 | | | | | 1 | 1 | | | | | | | 7 |
| -3 | | | 1 | 3 | | | | | 1 | | 1 | | | | | 6 |
| -2 | | 3 | 5 | | | | | | 1 | 1 | 2 | | | | | 12 |
| -1 | | 7 | 23 | 4 | | | | | | 2 | 3 | | | | | 39 |
| **0** | | **6** | **19** | **22** | **2** | | | | **1** | **4** | **2** | **2** | **2** | | | **60** |
| 1 | | 1 | 10 | 24 | 7 | | | | | 1 | | 1 | | | | 44 |
| 2 | | | 2 | 7 | 1 | 1 | | | | | | 1 | | | | 12 |
| 3 | | | 1 | 5 | | | 2 | | | | 1 | | 1 | | 3 | 13 |
| 4 | | | | 2 | | | | | | | 1 | | | 2 | | 5 |
| 5 | | | | | | | | | | | | 1 | 1 | | | 2 |
| 6 | | | | | | | | | 1 | 1 | 2 | | 1 | | 2 | 7 |
| 7 | | | | | | | | | | 3 | 2 | | | 1 | | 6 |
| 8 | | | | | | | | | | | 1 | | | | | 1 |
| 9 | | | | | | | | | | | 2 | 3 | 1 | | | 6 |
| 10 | | | | | | | | | | | | 3 | 1 | | 1 | 5 |
| 11 | | | | | | | | | | | 1 | | 3 | | | 4 |
| 12 | | | | | | | | | | | | | | 1 | 1 | 2 |
| 13 | | | | | | | | | | | | | | | 1 | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

Table 7.3.9. Age difference table for blue grenadier from, network type: probabilistic: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=9.75. Data from production set.

| | Observed Age | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | |
| Difference | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -8 | | | | 1 | | | | | | | | | | | | 1 |
| -7 | | | | | 1 | | | | | | | | | | | 1 |
| -4 | | | | | | | | 1 | | | 1 | | | | | 2 |
| -3 | | 1 | | | | 1 | | | | | | | | | | 2 |
| -2 | | 1 | 8 | 1 | | 1 | 1 | | 1 | 3 | 3 | 2 | 1 | | | 22 |
| -1 | 1 | 10 | 25 | 10 | | | 1 | | 1 | 2 | 6 | 1 | 1 | | | 58 |
| **0** | | **10** | **36** | **37** | **2** | | | | | **2** | **4** | **1** | **1** | | | **93** |
| 1 | 1 | | 18 | 31 | 10 | | | | 3 | 4 | 1 | 2 | 2 | 1 | 2 | 75 |
| 2 | | 1 | 6 | 10 | | | 1 | | | 2 | 2 | | | 1 | | 23 |
| 3 | | | | 2 | 1 | | | | 1 | | 1 | 4 | 1 | | 1 | 11 |
| 4 | | | | | | | | | | | | 1 | 1 | | 2 | 4 |
| 5 | | | | | | | | | | | | | | 1 | | 1 |
| 6 | | | | | | | | | | | 2 | | 3 | | 2 | 7 |
| 7 | | | | | | | | | | | | | | 1 | | 1 |
| N | **2** | **23** | **93** | **92** | **14** | **2** | **3** | **1** | **6** | **14** | **22** | **12** | **10** | **4** | **8** | **306** |

### *Ocean perch (offshore form)*

Table 8.1.1. Age difference table for ocean perch from, network type: back propagation: data inputs: All biological, all transect data and all transect length. APE=15.09. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -10 | | | | | | | | | 1 | | | | | | | | | | | 1 |
| -9 | | | | | | | | | | 7 | | | | | | | | | | 7 |
| -8 | | | | | | | | 1 | | | 1 | | | | | | | | | 2 |
| -6 | | | | | | | | | | | | | 4 | | | | | | | 4 |
| -5 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | | | | | | | | 2 | | | | | 2 |
| -3 | 1 | | | | 2 | | | | | | | | | | | 1 | | | | 4 |
| -2 | | 3 | | | | | | | | 2 | | | | | | | | | | 5 |
| -1 | | | 3 | | | | 3 | | | | 1 | | | | | | | 2 | | 9 |
| **0** | | | | **6** | | | | **1** | | | | | | | | | | | **22** | **29** |
| 1 | | | | | 6 | | | | | | | | | | | | 1 | | | 7 |
| 2 | | | | | | 7 | | | | | | 1 | | 1 | | | | | | 9 |
| 3 | | | | | | | 5 | | | | 1 | | | | | | | | | 6 |
| 4 | | | | | | | | 4 | | | | | | | | | | | | 4 |
| 5 | | | | | | | | | 7 | | 1 | | 1 | | | | 1 | | | 10 |
| 6 | | | | | | | | | | 3 | | 1 | | 1 | | | | | | 5 |
| 7 | | | | | | | | | | | 2 | | 2 | | | | | | | 4 |
| 8 | | | | | | | | | | | | 2 | | | | | | | | 2 |
| 9 | | | | | | | | | | | | | 2 | | | | | | | 2 |
| 12 | | | | | | | | | | | | | | | | 1 | | | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.1.2. Age difference table for ocean perch from, network type: back propagation: data inputs: All biological and all transect lengths. APE=8.41. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -8 | | | | | | | | | | | 1 | | | | | | | | | 1 |
| -7 | | | | | | | | | 1 | | | | | | | | | | | 1 |
| -6 | | | | | | | | | | 4 | | | | | | | | | | 4 |
| -5 | | | | | | | | | | | 1 | | | 1 | | | | | | 2 |
| -4 | | | | | 1 | | | 1 | | | | 2 | | | | | | | | 4 |
| -3 | 1 | | | | 1 | 5 | | | | | | | 4 | | | 1 | | | | 12 |
| -2 | | 2 | 1 | 2 | | | 4 | | | | | | | 2 | | | | | | 11 |
| -1 | | | 2 | 1 | 5 | | | 4 | 1 | | | | | | | | | 1 | | 14 |
| **0** | | **1** | | **3** | | **2** | | | **6** | **2** | | | | | | | | | **20** | **34** |
| 1 | | | | | 1 | | 4 | | | 5 | | | 1 | | | | 1 | | | 12 |
| 2 | | | | | | | | 1 | | 1 | 4 | | | | | | | | | 6 |
| 3 | | | | | | | | | | | | 1 | 1 | | | | | | 2 | 4 |
| 4 | | | | | | | | | | | | 1 | 2 | | | | | | | 3 |
| 5 | | | | | | | | | | | | | 1 | | | | | | | 1 |
| 6 | | | | | | | | | | | | | | | 2 | 1 | | | | 3 |
| 9 | | | | | | | | | | | | | | | | | 1 | 1 | | 2 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.1.3. Age difference table for ocean perch from, network type: back propagation: data inputs: All biological data. APE=9.10. Data from production set.

| | | | | | | | | | | Observed age | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -9 | | | | | | | | | | 2 | | | | | | | | | | 2 |
| -8 | | | | | | | | | | | 1 | | | | | | | | | 1 |
| -7 | | | | | 1 | | | | | | | | | | | | | | | 1 |
| -6 | | | | | | | | | | 1 | | | 3 | | | | | | | 4 |
| -5 | | | | | | | 1 | | | | | | | 1 | | | | | | 2 |
| -4 | | | | | | 1 | | | | 1 | | 1 | | | | | | | | 3 |
| -3 | | | | | | | 3 | | | | 1 | | | | | 1 | | | | 5 |
| -2 | | 3 | 1 | | | | | 3 | | 4 | | | | 1 | | | | | | 12 |
| -1 | 1 | | 2 | 3 | | | | | 5 | | 3 | | | | | | | | | 14 |
| **0** | | | | **3** | **6** | **1** | | | | **2** | | **1** | | | | | | | **21** | **34** |
| 1 | | | | | 1 | 5 | | | | | | | 4 | | | | | | | 10 |
| 2 | | | | | | | 4 | 1 | | | | 1 | | 1 | | | | | | 7 |
| 3 | | | | | | | | 2 | | | | | 2 | | 1 | | | | 1 | 6 |
| 4 | | | | | | | | | 3 | | | | | | | | | 1 | | 4 |
| 5 | | | | | | | | | | 2 | | | | | 1 | | 2 | | | 5 |
| 6 | | | | | | | | | | | 1 | | | | | 1 | | 1 | | 3 |
| 7 | | | | | | | | | | | | 1 | | | | | | | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.1.4. Age difference table for ocean perch from, network type: back propagation: data inputs: Harmonics from transect 1. APE=22.64. Data from production set.

| | | | | | | | | | | Observed age | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -18 | 1 | | | | | | | | | | | | | | | | | | | 1 |
| -17 | | 2 | | | | | | | | | | | | | | | | | | 2 |
| -16 | | | 3 | | | | | | | | | | | | | | | | | 3 |
| -15 | | | | 5 | | | | | | | | | | | | | | | | 5 |
| -14 | | | | | 6 | | | | | | | | | | | | | | | 6 |
| -13 | | | | | | 3 | | | | | | | | | | | | | | 3 |
| -12 | | | | | | | 5 | | | | | | | | | | | | | 5 |
| -11 | | | | | | | | 3 | | | | | | | | | | | | 3 |
| -10 | | | | | | | | | 5 | | | | | | | | | | | 5 |
| -9 | | | | | | | | | | 9 | | | | | | | | | | 9 |
| -8 | | | | | | | | | | | 5 | | | | | | | | | 5 |
| -7 | | | | | | | | | | | | 1 | | | | | | | | 1 |
| -6 | | | | | | | | | | | | | 6 | | | | | | | 6 |
| -5 | | 1 | | | | 1 | 1 | | | | | | | 2 | | | | | | 5 |
| -4 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| -3 | | | | | | | | 1 | | | | | | | | 2 | | | | 3 |
| -2 | | | | 1 | 2 | | | | | 1 | | | | | | | 2 | | | 6 |
| -1 | | | | | | 3 | | | | | | | | | | | | 1 | | 4 |
| **0** | | | | | | | **1** | | | | | **1** | | | | | | | **22** | **24** |
| 1 | | | | | | | 1 | 1 | | | | | | | | | | | | 2 |
| 2 | | | | | | | | 1 | 3 | | | 1 | | | | | | | | 5 |
| 3 | | | | | | | | | | 2 | | | | | | | | | | 2 |
| 4 | | | | | | | | | | | 1 | | | | | | | | | 1 |
| 5 | | | | | | | | | | | | 1 | | | | | | | | 1 |
| 6 | | | | | | | | | | | | | 3 | | | | | | | 3 |
| 7 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| 8 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| 11 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.1.5. Age difference table for ocean perch from, network type: back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=11.67. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -14 | | | | | 2 | | | | | | | | | | | | | | | 2 |
| -10 | | | | | | | | | 3 | | | | | | | | | | | 3 |
| -9 | | | | | | | | | | 4 | | | | | | | | | | 4 |
| -8 | | | | | | | | 1 | | | 3 | | | | | | | | | 4 |
| -7 | | | 1 | | | | | | | | | | | | | | | | | 1 |
| -6 | | | | 2 | | | | | | | | | 4 | | | | | | | 6 |
| -5 | | | | | 2 | | | | | | | | | 1 | | | | | | 3 |
| -4 | | | | | | 4 | 2 | | 1 | | | | | | 1 | | | | | 8 |
| -3 | 1 | | | | | | 4 | | | 1 | | | | | | 2 | | | | 8 |
| -2 | | 1 | | 1 | 2 | | | 4 | | 1 | | | | | | | 1 | | | 10 |
| -1 | | 1 | 1 | | 1 | 2 | | | 3 | 2 | | 1 | | | | | | 1 | | 12 |
| **0** | | **1** | **1** | **3** | | **1** | **1** | | | **4** | **2** | | **1** | | | | | | **22** | **36** |
| 1 | | | | | 1 | | 1 | 1 | | | | 1 | 1 | | | | | | | 5 |
| 2 | | | | | | | | | | | | 1 | | | | | | | | 1 |
| 3 | | | | | | | | | 1 | | | | 3 | | | | | | | 4 |
| 4 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| 5 | | | | | | | | | | | 1 | 1 | | | | | | | | 2 |
| 7 | | | | | | | | | | | | | | | | | 1 | | | 1 |
| 8 | | | | | | | | | | | | | | 1 | 1 | | | 1 | | 3 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.1.6. Age difference table for ocean perch from, network type: back propagation: data inputs: Harmonics from 2. APE=20.90. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -17 | | 3 | | | | | | | | | | | | | | | | | | 3 |
| -16 | | | 1 | | | | | | | | | | | | | | | | | 1 |
| -15 | | | | 4 | | | | | | | | | | | | | | | | 4 |
| -14 | | | | | 5 | | | | | | | | | | | | | | | 5 |
| -13 | | | | | | 2 | | | | | | | | | | | | | | 2 |
| -12 | | | | | | | 5 | | | | | | | | | | | | | 5 |
| -11 | | | | | | | | 3 | | | | | | | | | | | | 3 |
| -10 | | | | | | | | | 2 | | | | | | | | | | | 2 |
| -9 | | | | | | | | | | 7 | | | | | | | | | | 7 |
| -8 | | | | | | | | | | | 5 | | | | | | | | | 5 |
| -7 | | | | | | | | | | | | 1 | | | | | | | | 1 |
| -6 | | | | | | | | | | | | | 7 | | | | | | | 7 |
| -5 | 1 | | | | | 1 | | | | | | | | 2 | | | | | | 4 |
| -4 | | | | 1 | | 1 | 1 | | | | | | | | 2 | | | | | 5 |
| -3 | | | 2 | | 2 | | | 1 | | | | | 1 | | | 2 | | | | 8 |
| -2 | | | | 1 | | 2 | | | 1 | | | | | | | | | | | 4 |
| -1 | | | | | 1 | | | | 1 | | | | | | | | | 2 | | 4 |
| **0** | | | | | | | | **1** | | **1** | | **1** | | | | | | | **19** | **22** |
| 1 | | | | | | | 2 | | 1 | | | 1 | | | | | | | | 4 |
| 2 | | | | | | 1 | | 1 | | | | | 1 | | | | | | | 3 |
| 3 | | | | | | | | | 3 | | 1 | | | | | | | | | 4 |
| 4 | | | | | | | | | | 4 | | 1 | | | | | | | | 5 |
| 6 | | | | | | | | | | | | | | | | | 1 | | | 1 |
| 8 | | | | | | | | | | | | | | 1 | | | | | 1 | 2 |
| 9 | | | | | | | | | | | | | | | | | | | 2 | 2 |
| 11 | | | | | | | | | | | | | | | | | 1 | | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.1.7. Age difference table for ocean perch from, network type: back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=11.90. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -14 | | | | | 1 | | | | | | | | | | | | | | | 1 |
| -10 | | | | | | | | | 2 | | | | | | | | | | | 2 |
| -9 | | | | | | | | | | 6 | | | | | | | | | | 6 |
| -8 | | | | | 1 | | | | | | 4 | | | | | | | | | 5 |
| -6 | | | | 1 | | | | | | | | | 4 | | | | | | | 5 |
| -5 | | | | | 2 | 1 | | | | | | | | 2 | | | | | | 5 |
| -4 | | | | | | 3 | | | 1 | | | | | | 2 | | | | | 6 |
| -3 | | | 1 | 1 | | 1 | 4 | | | 2 | | | | | | 2 | | | | 11 |
| -2 | | 2 | | | 2 | | | 2 | | | | | | | | | 1 | | | 7 |
| -1 | 1 | | 2 | 1 | 1 | 1 | | | 1 | 1 | | | | | | | | 2 | | 10 |
| **0** | | **1** | | **2** | | | **1** | | **1** | **2** | | | | | | | | | **21** | **28** |
| 1 | | | | | 1 | | 2 | 1 | 1 | | 2 | 1 | | | | | | | | 8 |
| 2 | | | | 1 | | | 1 | 1 | | | | 3 | | | | | | | | 6 |
| 3 | | | | | | | | 2 | 2 | 1 | | | 5 | | | | | | | 10 |
| 4 | | | | | | 1 | | | | | | | | 1 | | | | | | 2 |
| 7 | | | | | | | | | | | | | | | | | 1 | | | 1 |
| 9 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.1.8. Age difference table for ocean perch from, network type: back propagation: data inputs: Harmonics from transect 3. APE=22.73. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -18 | 1 | | | | | | | | | | | | | | | | | | | 1 |
| -17 | | 2 | | | | | | | | | | | | | | | | | | 2 |
| -16 | | | 1 | | | | | | | | | | | | | | | | | 1 |
| -15 | | | | 3 | | | | | | | | | | | | | | | | 3 |
| -14 | | | | | 4 | | | | | | | | | | | | | | | 4 |
| -13 | | | | | | 3 | | | | | | | | | | | | | | 3 |
| -12 | | | | | | | 5 | | | | | | | | | | | | | 5 |
| -11 | | | | | | | | 5 | | | | | | | | | | | | 5 |
| -10 | | | | | | | | | 4 | | | | | | | | | | | 4 |
| -9 | | | | | | | | | | 8 | | | | | | | | | | 8 |
| -8 | | | 1 | | | | | | | | 6 | | | | | | | | | 7 |
| -7 | | | | | | | | | | | | 4 | | | | | | | | 4 |
| -6 | | | | 1 | 1 | | | | | | | | 4 | | | | | | | 6 |
| -5 | | | | | 1 | 1 | | | | | | | | 3 | | | | | | 5 |
| -4 | | | | | | 2 | 1 | | | | | | | | 2 | | | | | 5 |
| -3 | | | 1 | | | | 1 | | | | | | | | | 1 | | | | 3 |
| -2 | | 1 | | 2 | | | | | 2 | | | | | | | | 1 | | | 6 |
| -1 | | | | | 2 | | | | | | | | | | | | | 2 | | 4 |
| **0** | | | | | | **1** | | | | **1** | | | | | | | | | **20** | **22** |
| 2 | | | | | | | | 1 | | | | | 2 | | | | | | | 3 |
| 3 | | | | | | | 1 | | 1 | | | | 1 | | | | | | | 3 |
| 4 | | | | | | | | | | 3 | | | | | | | | | | 3 |
| 5 | | | | | | | | | 1 | | | | | | | | | | | 1 |
| 7 | | | | | | | | | | | | | 2 | | | | | | | 2 |
| 10 | | | | | | | | | | | | | | | | 1 | | | | 1 |
| 11 | | | | | | | | | | | | | | | | | 1 | | | 1 |
| 13 | | | | | | | | | | | | | | | | | | | 2 | 2 |
| 11 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.1.9. Age difference table for ocean perch from, network type: back propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=12.55. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -14 | | | | | 1 | | | | | | | | | | | | | | | 1 |
| -11 | | | | | | | | 1 | | | | | | | | | | | | 1 |
| -10 | | | | | | | | | 2 | | | | | | | | | | | 2 |
| -9 | | | | | | | | | | 6 | | | | | | | | | | 6 |
| -8 | | | | | | | | | | | 5 | | | | | | | | | 5 |
| -7 | | | | | | | | | | | | 3 | | | | | | | | 3 |
| -6 | | | 1 | 1 | | | | | | | | | 5 | | | | | | | 7 |
| -5 | | | | 1 | 1 | | | | | | | | | 1 | | | | | | 3 |
| -4 | | | | | | 4 | | | 1 | | | | | | 1 | | | | | 6 |
| -3 | 1 | | | | 1 | 1 | 4 | | | | | | | | | 1 | | | | 8 |
| -2 | | 3 | | 1 | 2 | | | 4 | | | | | | | | | 2 | | | 12 |
| -1 | | | 2 | | 2 | 2 | | | 1 | | | | | | | | | 1 | | 8 |
| **0** | | | | **3** | | | **4** | **1** | | **3** | | | | | | | | | **22** | **33** |
| 1 | | | | | 1 | | | | | | 1 | | | | | | | | | 2 |
| 2 | | | | | | | | | 3 | 1 | | 1 | | | | | | | | 5 |
| 3 | | | | | | | | | | 2 | | | 2 | | | | | | | 4 |
| 4 | | | | | | | | | 1 | | | | 1 | 1 | | | | | | 3 |
| 5 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| 6 | | | | | | | | | | | | | 1 | | | 1 | | | | 2 |
| 7 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| 10 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.1.10. Age difference table for ocean perch from, network type: back propagation: data inputs: Harmonics from transect 4. APE=20.79. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -18 | 1 | | | | | | | | | | | | | | | | | | | 1 |
| -17 | | 2 | | | | | | | | | | | | | | | | | | 2 |
| -16 | | | 1 | | | | | | | | | | | | | | | | | 1 |
| -15 | | | | 5 | | | | | | | | | | | | | | | | 5 |
| -14 | | | | | 2 | | | | | | | | | | | | | | | 2 |
| -13 | | | | | | 1 | | | | | | | | | | | | | | 1 |
| -12 | | | | | | | 4 | | | | | | | | | | | | | 4 |
| -11 | | | | | | | | 3 | | | | | | | | | | | | 3 |
| -10 | | | | | | | | | 4 | | | | | | | | | | | 4 |
| -9 | | | | | | | | | | 7 | | | | | | | | | | 7 |
| -8 | | | | | | | | | | | 2 | | | | | | | | | 2 |
| -7 | | | | | 3 | | | | | | | 4 | | | | | | | | 7 |
| -6 | | | | | 1 | | | | | | | | 6 | | | | | | | 7 |
| -5 | | | | | | | | | | | | | | 2 | | | | | | 2 |
| -4 | | 1 | | | | | | | | | | | | | 2 | | | | | 3 |
| -3 | | | 1 | | | | | | | | | | | | | 2 | | | | 3 |
| -2 | | | | 1 | | 1 | | | | 1 | | | | | | | 2 | | | 5 |
| -1 | | | 1 | | 2 | | | | | 1 | 1 | | | | | | | 2 | | 7 |
| **0** | | | | | | **3** | | | | | | | | | | | | | **20** | **23** |
| 1 | | | | | | | 4 | | | | | | | | | | | | | 4 |
| 2 | | | | | | 2 | | 2 | | | | | 1 | | | | | | | 5 |
| 3 | | | | | | | | | 1 | | | | | | | | | | | 1 |
| 4 | | | | | | | | 1 | | 2 | | | | | | | | | | 3 |
| 5 | | | | | | | | | 3 | | 3 | | | | | | | | | 6 |
| 6 | | | | | | | | | | 1 | | | | | | | | | | 1 |
| 7 | | | | | | | | | | | | | 2 | | | | | | 1 | 3 |
| 10 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| 15 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.1.11. Age difference table for ocean perch from, network type: back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=13.30. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -11 | | | | | | | | 1 | | | | | | | | | | | | 1 |
| -10 | | | | | | | | | 4 | | | | | | | | | | | 4 |
| -9 | | | | | | | | | | 6 | | | | | | | | | | 6 |
| -8 | | | | | | | | | | | 3 | | | | | | | | | 3 |
| -7 | | | | | | | | | | | | 3 | | | | | | | | 3 |
| -6 | | | | | | | | | | | | | 6 | | | | | | | 6 |
| -5 | | | | | | | | | | | | | | 3 | | | | | | 3 |
| -4 | | | 1 | | | | | | | | | | | | | | | | | 1 |
| -3 | 1 | | | 1 | | 2 | | | | | | | | | | 2 | | | | 6 |
| -2 | | 3 | | 1 | 1 | | 2 | | | | | | | | | | 2 | | | 9 |
| -1 | | | 2 | 1 | 2 | 1 | | | | | | | | | | | | 2 | | 8 |
| **0** | | | | **3** | **4** | **2** | **3** | | | | | | | | | | | | **22** | **34** |
| 1 | | | | | 1 | 2 | 1 | 1 | | | | | | | | | | | | 5 |
| 2 | | | | | | | 2 | | 1 | | | | | | | | | | | 3 |
| 3 | | | | | | | | 4 | | | | | | | | | | | | 4 |
| 4 | | | | | | | | | 3 | 1 | 2 | | | | | | | | | 6 |
| 5 | | | | | | | | | | 5 | | | | | | | | | | 5 |
| 6 | | | | | | | | | | | 1 | | 1 | | | | | | | 2 |
| 7 | | | | | | | | | | | | 1 | | | | | | | | 1 |
| 8 | | | | | | | | | | | | | 2 | | 1 | | | | | 3 |
| 10 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.1.12. Age difference table for ocean perch from, network type: back propagation: data inputs: Harmonics from transect 5. APE=21.80. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -17 | | 3 | | | | | | | | | | | | | | | | | | 3 |
| -16 | | | 1 | | | | | | | | | | | | | | | | | 1 |
| -15 | | | | 4 | | | | | | | | | | | | | | | | 4 |
| -14 | | | | | 5 | | | | | | | | | | | | | | | 5 |
| -13 | | | | | | 4 | | | | | | | | | | | | | | 4 |
| -12 | | | | | | | 7 | | | | | | | | | | | | | 7 |
| -11 | | | | | | | | 2 | | | | | | | | | | | | 2 |
| -10 | | | | | | | | | 5 | | | | | | | | | | | 5 |
| -9 | | | | | | | | | | 7 | | | | | | | | | | 7 |
| -8 | | | | | | | | | | | 6 | | | | | | | | | 6 |
| -7 | | | | | | | | | | | | 2 | | | | | | | | 2 |
| -6 | 1 | | | | | | | | | | | | 5 | | | | | | | 6 |
| -5 | | | | | | | | | | | | | | 2 | | | | | | 2 |
| -4 | | | 2 | | | | | | | | | | | | 2 | | | | | 4 |
| -3 | | | | 2 | | 1 | | | | | | | | | | 1 | | | | 4 |
| -2 | | | | | 2 | | | | | | | | | | | | 2 | | | 4 |
| -1 | | | | | 1 | 2 | | | | | | | | | | | | 2 | | 5 |
| **0** | | | | | | | **1** | | | | | | | | | | | | **22** | **23** |
| 1 | | | | | | | | 3 | | 1 | | | | | | | | | | 4 |
| 2 | | | | | | | | 1 | 3 | | | | | | | | | | | 4 |
| 3 | | | | | | | | | | 4 | | | | | | | | | | 4 |
| 5 | | | | | | | | | | | | 1 | | | | | | | | 1 |
| 6 | | | | | | | | | | | | 1 | 4 | | | | | | | 5 |
| 7 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| 9 | | | | | | | | | | | | | | | | 1 | | | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.1.13. Age difference table for ocean perch from, network type: layer back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=13.30. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -11 | | | | | | | | 1 | | | | | | | | | | | | 1 |
| -10 | | | | | | | | | 4 | | | | | | | | | | | 4 |
| -9 | | | | | | | | | | 6 | | | | | | | | | | 6 |
| -8 | | | | | | | | | | | 3 | | | | | | | | | 3 |
| -7 | | | | | | | | | | | | 3 | | | | | | | | 3 |
| -6 | | | | | | | | | | | | | 6 | | | | | | | 6 |
| -5 | | | | | | | | | | | | | | 3 | | | | | | 3 |
| -4 | | | 1 | | | | | | | | | | | | | | | | | 1 |
| -3 | 1 | | | 1 | | 2 | | | | | | | | | | 2 | | | | 6 |
| -2 | | 3 | | 1 | 1 | | 2 | | | | | | | | | | 2 | | | 9 |
| -1 | | | 2 | 1 | 2 | 1 | | | | | | | | | | | | 2 | | 8 |
| **0** | | | | **3** | **4** | **2** | **3** | | | | | | | | | | | | **22** | **34** |
| 1 | | | | | 1 | 2 | 1 | 1 | | | | | | | | | | | | 5 |
| 2 | | | | | | | 2 | | 1 | | | | | | | | | | | 3 |
| 3 | | | | | | | | 4 | | | | | | | | | | | | 4 |
| 4 | | | | | | | | | 3 | 1 | 2 | | | | | | | | | 6 |
| 5 | | | | | | | | | | 5 | | | | | | | | | | 5 |
| 6 | | | | | | | | | | | 1 | | 1 | | | | | | | 2 |
| 7 | | | | | | | | | | | | 1 | | | | | | | | 1 |
| 8 | | | | | | | | | | | | | 2 | | 1 | | | | | 3 |
| 10 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.1. Age difference table for ocean perch from, network type: multiple hidden layer back propagation: data inputs: All biological, all transect data and all transect length. APE=17.25. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -9 | | | | | | | | 1 | | 2 | | | | | | | | | | 3 |
| -8 | | 1 | | | 1 | | | | | | 3 | | | | | | | | | 5 |
| -7 | | | | | 1 | | | | | 1 | | 1 | | | | | | | | 3 |
| -6 | | | | 1 | | | | | | | | | 2 | | | | | | | 3 |
| -5 | 1 | | | | 2 | | 1 | | | | | | | 1 | | | | | | 5 |
| -4 | | | | | | 2 | | | | | | | | | | | | | | 2 |
| -3 | | | 2 | | | | 1 | | 1 | | | | | | | 1 | | | | 5 |
| -2 | | | | 2 | | | | 2 | | 1 | | | | | | | | | | 5 |
| -1 | | | | | 3 | 2 | 1 | | 1 | | | | | | 1 | | | 1 | | 9 |
| **0** | | **2** | | | | **2** | **3** | | | **3** | | | | | | | | | **21** | **31** |
| 1 | | | 1 | | | | 2 | 1 | | 1 | | | 1 | | | | | | | 6 |
| 2 | | | | 3 | | | | 1 | | | | 2 | | | | | | | | 6 |
| 3 | | | | | 1 | | | | 3 | | | | 3 | | | | | | | 7 |
| 4 | | | | | | 1 | | | | 1 | 1 | | | | | | | | | 3 |
| 5 | | | | | | | | | | | 1 | | | | | | | | | 1 |
| 6 | | | | | | | | 1 | | | | | | 1 | | 1 | | | | 3 |
| 7 | | | | | | | | | 3 | | | | 2 | | | | | | | 5 |
| 8 | | | | | | | | | | 3 | | | | | | | | | | 3 |
| 9 | | | | | | | | | | | 1 | | | | | | | | 1 | 2 |
| 10 | | | | | | | | | | | | 1 | | | | | | | | 1 |
| 11 | | | | | | | | | | | | | 1 | | | | 2 | | | 3 |
| 12 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| 13 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| 16 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.2. Age difference table for ocean perch from, network type: multiple hidden layer back propagation: data inputs: All biological and all transect lengths. APE=7.84. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -7 | | | | | 1 | | | | 1 | | | | | | | | | | | 2 |
| -6 | | | | | | | | | | 2 | | | | | | | | | | 2 |
| -5 | | | | | | | 2 | | | | 1 | | | 1 | | | | | | 4 |
| -4 | | | | | | | | 2 | | | | 1 | | | | | | | | 3 |
| -3 | 1 | | | | | | | | 4 | | | | 1 | | | 1 | | | | 7 |
| -2 | | 3 | 1 | 2 | 1 | | | | | 7 | | | | | | | | | | 14 |
| -1 | | | 2 | 1 | 4 | 1 | | | | 2 | 5 | | | | | | | | | 15 |
| **0** | | | | **3** | **1** | **5** | **2** | | | | | **3** | | | | | | | **20** | **34** |
| 1 | | | | | 1 | 1 | 3 | 2 | | | | | 7 | | | | | | | 14 |
| 2 | | | | | | | 1 | 2 | 1 | | | | | 1 | | | | | | 5 |
| 3 | | | | | | | | | 2 | | | | | 1 | 2 | | | | 2 | 7 |
| 4 | | | | | | | | | | 1 | | | | | | 1 | | | | 2 |
| 5 | | | | | | | | | | | | | | | | | 2 | | | 2 |
| 6 | | | | | | | | | | | | | | | | | | 2 | | 2 |
| 7 | | | | | | | | | | | | | 1 | | | | | | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.3. Age difference table for black bream from, network type: multiple hidden layer back propagation: data inputs: All biological data. APE=8.68. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -9 | | | | | | | | | | 2 | | | | | | | | | | 2 |
| -8 | | | | | | | | | | | 1 | | | | | | | | | 1 |
| -6 | | | | | | | | | | 1 | | | 3 | | | | | | | 4 |
| -5 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | 1 | | | | | | 1 | | | | | | | | 2 |
| -3 | 1 | | | | | | 3 | | 1 | | | | | | | 1 | | | | 6 |
| -2 | | 3 | 1 | | 4 | | | 2 | | 2 | | | | | | | | | | 12 |
| -1 | | | 2 | 3 | | 1 | | | 3 | 3 | 2 | | | | | | | | | 14 |
| **0** | | | | **3** | **3** | | **3** | | | **2** | **1** | **3** | | | | | | | **21** | **36** |
| 1 | | | | | 1 | 5 | | 3 | | | | | 3 | | | | | | | 12 |
| 2 | | | | | | | 2 | | 3 | | | | | | | | | | | 5 |
| 3 | | | | | | | | 1 | | | | | 2 | 1 | 1 | | | | 1 | 6 |
| 4 | | | | | | | | | 1 | | 2 | | | 1 | | | | | | 4 |
| 5 | | | | | | | | | | 2 | | | | | | | 2 | | | 4 |
| 6 | | | | | | | | | | | | | 1 | | | 1 | | 1 | | 3 |
| 7 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| 8 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.4. Age difference table for ocean perch from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1. APE=10.79. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -17 | | 2 | | | | | | | | | | | | | | | | | | 2 |
| -16 | | | 2 | | | | | | | | | | | | | | | | | 2 |
| -15 | | | | 4 | | | | | | | | | | | | | | | | 4 |
| -14 | | | | | 6 | | | | | | | | | | | | | | | 6 |
| -13 | | | | | | 1 | | | | | | | | | | | | | | 1 |
| -12 | | | | | | | 4 | | | | | | | | | | | | | 4 |
| -11 | | | | | | | | 1 | | | | | | | | | | | | 1 |
| -10 | | | | | | | | | 3 | | | | | | | | | | | 3 |
| -9 | | | | | | | | | | 8 | | | | | | | | | | 8 |
| -8 | | | | | | | | | | | 4 | | | | | | | | | 4 |
| -7 | | | | | | | | | | | | 1 | | | | | | | | 1 |
| -6 | | | | | | 1 | | | | | | | 4 | | | | | | | 5 |
| -5 | 1 | | 1 | | | | 3 | | | | | | | 1 | | | | | | 6 |
| -4 | | 1 | | 1 | | 1 | | 2 | | | | | | | | | | | | 5 |
| -3 | | | | | | | | | | | | | | | | 2 | | | | 2 |
| -2 | | | | 1 | | 2 | | | | 2 | | | | | | | 1 | | | 6 |
| -1 | | | | | 1 | | | | 1 | | 1 | | | | | | | 1 | | 4 |
| **0** | | | | | | | | **3** | | | | **1** | | | | | | | **19** | **23** |
| 1 | | | | | 1 | | 1 | | 2 | | | | 1 | | | | | | | 5 |
| 2 | | | | | | 2 | | | | 2 | | | | | | | | | | 4 |
| 3 | | | | | | | | | 2 | | 1 | | | | | | | | | 3 |
| 4 | | | | | | | | | | | | 2 | | | | | | | | 2 |
| 5 | | | | | | | | | | | | | 1 | | | | | | | 1 |
| 6 | | | | | | | | | | | | | | 2 | | | | | | 2 |
| 7 | | | | | | | | | | | | | 1 | | 2 | | | | 2 | 5 |
| 9 | | | | | | | | | | | | | 2 | | | | 1 | | | 3 |
| 11 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 14 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| 12 | | | | | | | 1 | | 1 | | | | 1 | | 1 | | | | | 4 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.5. Age difference table for ocean perch from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=10.79. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -9 | | | | | | | | | | 3 | | | | | | | | | | 3 |
| -8 | | | | | 1 | | | | | | 2 | | | | | | | | | 3 |
| -7 | | | | 1 | | | | | | | | | | | | | | | | 1 |
| -6 | | | | | | | 1 | | | | | | 2 | | | | | | | 3 |
| -5 | | | | | | | | 1 | | | | | | 1 | | | | | | 2 |
| -4 | | | | | 1 | | 1 | | 3 | 1 | | 1 | | | | | | | | 7 |
| -3 | | | | | | 1 | | 1 | | 1 | 1 | | | 1 | | 1 | | | | 6 |
| -2 | 1 | | 1 | 1 | 1 | | 1 | | | 1 | | | | | | | | | | 6 |
| -1 | | 3 | | 1 | 1 | 3 | | 1 | | 1 | | 1 | | | | | | 1 | | 12 |
| **0** | | | **2** | | **3** | | **1** | | | **3** | | | **2** | | | | | | **22** | **33** |
| 1 | | | | 3 | | 3 | 2 | 1 | | | | 1 | 1 | | | | | | | 11 |
| 2 | | | | | 1 | | 2 | | 1 | 1 | | | 1 | | | | | | | 6 |
| 3 | | | | | | | | 2 | 1 | 1 | 1 | | 1 | 1 | | 1 | | | | 8 |
| 4 | | | | | | | | | 3 | | | | | | | | | | | 3 |
| 5 | | | | | | | | | | | | 1 | 1 | | | | | | | 2 |
| 6 | | | | | | | | | | | 2 | | 1 | | | | 2 | | | 5 |
| 8 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| 10 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| 11 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.6. Age difference table for ocean perch from, network type: multiple hidden layer back propagation: data inputs: Harmonics from 2. APE=22.99. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -17 | | 2 | | | | | | | | | | | | | | | | | | 2 |
| -16 | | | 2 | | | | | | | | | | | | | | | | | 2 |
| -15 | | | | 4 | | | | | | | | | | | | | | | | 4 |
| -14 | | | | | 5 | | | | | | | | | | | | | | | 5 |
| -13 | | | | | | 4 | | | | | | | | | | | | | | 4 |
| -12 | | | | | | | 6 | | | | | | | | | | | | | 6 |
| -11 | 1 | | | | | | | 2 | | | | | | | | | | | | 3 |
| -10 | | | | | | | | | 2 | | | | | | | | | | | 2 |
| -9 | | | | | | | | | | 9 | | | | | | | | | | 9 |
| -8 | | | | 1 | | | | | | | 5 | | | | | | | | | 6 |
| -7 | | | | | | | | | | | | 2 | | | | | | | | 2 |
| -6 | | | | | | 1 | | | | | | | 6 | | | | | | | 7 |
| -5 | | | | | | | 1 | | | | | | | 2 | | | | | | 3 |
| -4 | | | | 1 | | | | | | | | | | | 2 | | | | | 3 |
| -3 | | | 1 | | 1 | | | | | | | | | | | 2 | | | | 4 |
| -2 | | 1 | | | 1 | 1 | | | | | | | | | | | | | | 3 |
| -1 | | | | | | | 1 | | | | | | | | | | | 2 | | 3 |
| **0** | | | | | | | | **4** | | | | | | | | | | | **18** | **22** |
| 1 | | | | | 1 | | | | 2 | | | | 1 | | | | | | | 4 |
| 2 | | | | | | 1 | | | | 1 | | | | 1 | | | | | | 3 |
| 3 | | | | | | | | | 2 | | 1 | | | | | | | | | 3 |
| 4 | | | | | | | | | | 1 | | 2 | | | | | | | | 3 |
| 5 | | | | | | | | | 2 | | | | | | | | | | | 2 |
| 6 | | | | | | | | | | 1 | | | | | | | | | | 1 |
| 7 | | | | | | | | | | | | | 1 | | | | | | 2 | 3 |
| 9 | | | | | | | | | | | | | 1 | | | | 1 | | | 2 |
| 11 | | | | | | | | | | | | | | | | | 1 | | 2 | 3 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.7. Age difference table for ocean perch from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=11.09. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -10 | | | | | | | | | 1 | | | | | | | | | | | 1 |
| -9 | | | | | | | | | | 2 | | | | | | | | | | 2 |
| -8 | | | | | | | | | | | 2 | | | | | | | | | 2 |
| -7 | | | | | 2 | | | | | | | | | | | | | | | 2 |
| -6 | | | | | | | | | | | | | 4 | | | | | | | 4 |
| -5 | | | | | | | 1 | | | | | | | 1 | | | | | | 2 |
| -4 | | | | | 1 | | | 2 | | | | 1 | | | 2 | | | | | 6 |
| -3 | 1 | | | 2 | | 1 | | | 2 | | | | | | | 1 | | | | 7 |
| -2 | | 3 | 1 | | 2 | 1 | 1 | | | 4 | | | | | | | 1 | | | 13 |
| -1 | | | 1 | 1 | | 2 | | | | | 3 | | | | | 1 | | | | 8 |
| **0** | | | **1** | **3** | **2** | | **3** | | **1** | | | **2** | | | | | | | **21** | **33** |
| 1 | | | | | 1 | 3 | 1 | 1 | | | | | 2 | | | | | | | 8 |
| 2 | | | | | | | 2 | | | 2 | | | | 1 | | | | | | 5 |
| 3 | | | | | | | | 3 | | 2 | 1 | | | | | | | | 1 | 7 |
| 4 | | | | | | | | | 4 | | | | | | | | | | | 4 |
| 5 | | | | | | | | | | 2 | | 1 | | | | | 1 | | | 4 |
| 6 | | | | | | | | | | | | | 3 | | | | | 1 | | 4 |
| 7 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| 13 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.8. Age difference table for ocean perch from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3. APE=22.06. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -18 | 1 | | | | | | | | | | | | | | | | | | | 1 |
| -17 | | 1 | | | | | | | | | | | | | | | | | | 1 |
| -15 | | | | 1 | | | | | | | | | | | | | | | | 1 |
| -14 | | | 1 | | 3 | | | | | | | | | | | | | | | 4 |
| -13 | | | | 1 | | 1 | | | | | | | | | | | | | | 2 |
| -12 | | | | | 1 | | 3 | | | | | | | | | | | | | 4 |
| -11 | | | | | | 1 | | 2 | | | | | | | | | | | | 3 |
| -10 | | 1 | | | | | | | 3 | | | | | | | | | | | 4 |
| -9 | | | 1 | | | | | | | 5 | | | | | | | | | | 6 |
| -8 | | | | 1 | | | | | | | 5 | | | | | | | | | 6 |
| -7 | | | | 1 | 3 | | | | | 2 | | 4 | | | | | | | | 10 |
| -6 | | | 1 | 1 | | 3 | | | | | | | 4 | | | | | | | 9 |
| -5 | | | | 1 | | 1 | 2 | | | | | | | 2 | | | | | | 6 |
| -4 | | | | | 1 | | 2 | 3 | | | | | | | 1 | | | | | 7 |
| -3 | | | | | | | | 1 | 4 | | | | | | | | | | | 5 |
| -2 | | 1 | | | | | 1 | | | 3 | | | | | | | 1 | | | 6 |
| -1 | | | | | | | | | | | 1 | | | | | 1 | | 1 | | 3 |
| **0** | | | | | | | | | **1** | | | | | | | | **1** | | **17** | **19** |
| 1 | | | | | | | | | | 2 | | | 3 | | | | | | | 5 |
| 2 | | | | | | 1 | | | | | | | | 1 | | | | | 1 | 3 |
| 3 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| 4 | | | | | | | | | | | | | 1 | | | 1 | | | | 2 |
| 6 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| 7 | | | | | | | | | | | | | | | | | | | 3 | 3 |
| 9 | | | | | | | | | | | | | 1 | | | | | | | 1 |
| 10 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.9. Age difference table for ocean perch from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=10.12. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -11 | | | | | | | | 1 | | | | | | | | | | | | 1 |
| -9 | | | | | | | | | | 2 | | | | | | | | | | 2 |
| -8 | | | | | | | | | | | 2 | | | | | | | | | 2 |
| -7 | | | | | 1 | | | | | | | 2 | | | | | | | | 3 |
| -6 | | | | | | | | | | | | | 2 | | | | | | | 2 |
| -5 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | | | 1 | | | | | | | | | | 1 |
| -3 | 1 | | | | 1 | 1 | | | 1 | | | | | | | 1 | | | | 5 |
| -2 | | 3 | 1 | 1 | 3 | 1 | 1 | | | 3 | | | | | | | 1 | | | 14 |
| -1 | | | 2 | 2 | 2 | 3 | 2 | 1 | | | 1 | | | | | | | 1 | | 14 |
| **0** | | | | **3** | | **1** | **4** | **2** | **2** | **1** | | **1** | | | | | | | **22** | **36** |
| 1 | | | | | 1 | 1 | | 1 | 1 | | | | 2 | | | | | | | 6 |
| 2 | | | | | | | 1 | | 2 | 2 | 1 | | | | | | | | | 6 |
| 3 | | | | | | | | 1 | 1 | 2 | | | | | | | | | | 4 |
| 4 | | | | | | | | | 1 | | 1 | | 2 | | | | | | | 4 |
| 5 | | | | | | | | | | 1 | 1 | | 3 | | | | 1 | | | 6 |
| 6 | | | | | | | | | | | | 1 | | 1 | 1 | | | | | 3 |
| 7 | | | | | | | | | | | | | | 1 | 1 | 1 | | | | 3 |
| 10 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.10. Age difference table for ocean perch from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4. APE=19.43. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -17 | | 2 | | | | | | | | | | | | | | | | | | 2 |
| -16 | | | 1 | | | | | | | | | | | | | | | | | 1 |
| -15 | | | | 4 | | | | | | | | | | | | | | | | 4 |
| -14 | | | | | 1 | | | | | | | | | | | | | | | 1 |
| -13 | | | | | | 1 | | | | | | | | | | | | | | 1 |
| -12 | | | | | | | 4 | | | | | | | | | | | | | 4 |
| -11 | 1 | | | | | | | 3 | | | | | | | | | | | | 4 |
| -10 | | | | | | | | | 4 | | | | | | | | | | | 4 |
| -9 | | | 1 | | | | | | | 6 | | | | | | | | | | 7 |
| -8 | | | | 1 | | | | | | | 1 | | | | | | | | | 2 |
| -7 | | 1 | | | 3 | | | | | 1 | | 3 | | | | | | | | 8 |
| -6 | | | | 1 | | 3 | | | | | | | 6 | | | | | | | 10 |
| -5 | | | | | 2 | | 2 | | | | | | | 3 | | | | | | 7 |
| -4 | | | | | | | | 1 | | | | | | | 2 | | | | | 3 |
| -3 | | | | | | 2 | | | 3 | | | | | | | 1 | | | | 6 |
| -2 | | | | | | | 2 | | | 5 | | | | | | | 1 | | | 8 |
| -1 | | | 1 | | 1 | | | 2 | | | 2 | | | | | | | 1 | | 7 |
| **0** | | | | | | | | | | | **3** | | | | | | | | **20** | **23** |
| 1 | | | | | 1 | | | | | | | 1 | 1 | | | | | | | 3 |
| 2 | | | | | | 1 | | | | | | | 1 | | | | | | | 2 |
| 3 | | | | | | | | | | | | | 1 | | | | | | | 1 |
| 5 | | | | | | | | | 1 | | | | | | | | 1 | | | 2 |
| 6 | | | | | | | | | | | | | | | | 1 | | | | 1 |
| 7 | | | | | | | | | | | | | | | | | | | 2 | 2 |
| 8 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| 10 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.11. Age difference table for ocean perch from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=11.12. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -11 | | | | | | | | 1 | | | | | | | | | | | | 1 |
| -10 | | | | | | | | | 1 | | | | | | | | | | | 1 |
| -9 | | | | | | | | | | 3 | | | | | | | | | | 3 |
| -8 | | | | | | | | | | | 1 | | | | | | | | | 1 |
| -7 | | | | | | | | | | | | 3 | | | | | | | | 3 |
| -6 | | | | | 1 | | | | | | | | 4 | | | | | | | 5 |
| -5 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| -4 | | | | | | | | | 1 | | | | | | | | | | | 1 |
| -3 | | | | | | | | | | | | | | 1 | | 1 | | | | 2 |
| -2 | 1 | 1 | 1 | | | | 1 | | | 1 | | | | | | | 1 | | | 6 |
| -1 | | 2 | | 3 | 1 | | 1 | | 1 | 1 | | | | | | | | | | 9 |
| **0** | | | **2** | **1** | **5** | | | | **1** | | **1** | | | | | | | | **22** | **32** |
| 1 | | | | 2 | | 7 | 2 | | 1 | | | | | | | | | | | 12 |
| 2 | | | | | 1 | | 4 | | 1 | 4 | 1 | | 1 | | | | | | | 12 |
| 3 | | | | | | | | 5 | | | 1 | | 2 | | | | | | | 8 |
| 4 | | | | | | | | | 2 | | 1 | | | 1 | 1 | | | 1 | | 6 |
| 5 | | | | | | | | | | 3 | | | 1 | | | | | | | 4 |
| 6 | | | | | | | | | | | 1 | | | | | 1 | | | | 2 |
| 7 | | | | | | | | | | | | 1 | | | 1 | | | | | 2 |
| 8 | | | | | | | | | | | | | 1 | | | | | | | 1 |
| 9 | | | | | | | | | | | | | | | | | 1 | | | 1 |
| 10 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.12. Age difference table for ocean perch from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5. APE=19.27. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -17 | | 2 | | | | | | | | | | | | | | | | | | 2 |
| -16 | | | 1 | | | | | | | | | | | | | | | | | 1 |
| -15 | | | | 2 | | | | | | | | | | | | | | | | 2 |
| -14 | | | | | 2 | | | | | | | | | | | | | | | 2 |
| -13 | | | | | | 1 | | | | | | | | | | | | | | 1 |
| -12 | | | | | | | 6 | | | | | | | | | | | | | 6 |
| -11 | | | | | | | | 1 | | | | | | | | | | | | 1 |
| -10 | | | | | | | | | 3 | | | | | | | | | | | 3 |
| -9 | | | | | | | | | | 5 | | | | | | | | | | 5 |
| -8 | | | | | | | | | | | 4 | | | | | | | | | 4 |
| -7 | | | | | 1 | | | | | | | | | | | | | | | 1 |
| -6 | 1 | | | | 1 | 1 | | 1 | | | | | 5 | | | | | | | 9 |
| -5 | | | | | | 1 | | | | | | | | 2 | | | | | | 3 |
| -4 | | | | 2 | | | 1 | 1 | | 1 | | | | | 2 | | | | | 7 |
| -3 | | | | | 3 | | | 1 | | | | | | | | 1 | | | | 5 |
| -2 | | 1 | | | 1 | 3 | | | 1 | | | | | | | | | | | 6 |
| -1 | | | 2 | | | | 1 | | | 1 | | | 1 | | | | | 2 | | 7 |
| **0** | | | | **2** | | | | **2** | | | | **1** | | | | | | | **19** | **24** |
| 1 | | | | | | | | | 2 | | | | | | | | | | | 2 |
| 2 | | | | | | 1 | | | | 4 | | | | | | | | | | 5 |
| 3 | | | | | | | | | | | 2 | | | | | | 1 | | | 3 |
| 4 | | | | | | | | | | | | 2 | | | | | | | | 2 |
| 5 | | | | | | | | | 2 | | | | 2 | | | | | | | 4 |
| 6 | | | | | | | | | | 1 | | | | 1 | | | | | | 2 |
| 8 | | | | | | | | | | | | 1 | | | | 1 | | | | 2 |
| 9 | | | | | | | | | | | | | 1 | | | | 1 | | | 2 |
| 11 | | | | | | | | | | | | | | | | | | | 2 | 2 |
| 13 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.2.13. Age difference table for ocean perch from, network type: multiple hidden layer back propagation: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=17.24. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -10 | | | | | | | | | 1 | | | | | | | | | | | 1 |
| -9 | | | | | | | | | | 2 | | | | | | | | | | 2 |
| -8 | | | | | | | | | | | 2 | | | | | | | | | 2 |
| -6 | | | | | | | | | | | | | 3 | | | | | | | 3 |
| -5 | | | 1 | | | | | | | | | | | 1 | | | | | | 2 |
| -4 | | | | 2 | | | | | | 2 | | | | | | | | | | 4 |
| -3 | 1 | | | 1 | 3 | | | | | | | | | | | 1 | | | | 6 |
| -2 | | 3 | | | 2 | 4 | | | | | 1 | 1 | | | | | | | | 11 |
| -1 | | | 2 | | 1 | 3 | 3 | | 1 | | | 1 | 2 | | | | | 1 | | 14 |
| **0** | | | | **3** | **1** | | **2** | **2** | | **1** | | | **1** | | | | | | **21** | **31** |
| 1 | | | | | 1 | | 1 | 3 | 1 | | | | | | 1 | | | | | 7 |
| 2 | | | | | | | 2 | | 2 | 3 | | | | | | | | | | 7 |
| 3 | | | | | | | | 1 | | 3 | 2 | | 1 | | | | 1 | | | 8 |
| 4 | | | | | | | | | 3 | | 1 | 2 | | | | | | | | 6 |
| 5 | | | | | | | | | | 1 | | | 2 | | | | | | | 3 |
| 6 | | | | | | | | | | | | | | 2 | | 1 | | | | 3 |
| 7 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| 10 | | | | | | | | | | | | | | | | | 1 | 1 | | 2 |
| 11 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.3.1. Age difference table for ocean perch from, network type: probabilistic: data inputs: All biological, all transect data and all transect length. APE=11.91. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -10 | | | | | | 1 | | | | | | | | | | | | | | 1 |
| -8 | | | | | 2 | | | 1 | | | | | | | | | | | | 3 |
| -7 | | | | 1 | | | | | | | | | | | | | | | | 1 |
| -6 | | | | | | | 2 | 1 | | | | | | | | | | | | 3 |
| -5 | | | | 1 | 1 | | | | | | | | | 1 | | | | | | 3 |
| -4 | | | | | 1 | 2 | 3 | | | 1 | | | | | | | | | | 7 |
| -3 | 1 | | | | 2 | | 1 | | | | 2 | | 2 | | | 1 | | | | 9 |
| -2 | | | 1 | | | 2 | 2 | 1 | | 2 | | | | | | | | | | 8 |
| -1 | | | | 1 | 1 | | | | 1 | 4 | | 1 | 1 | | | | | | | 9 |
| **0** | | **1** | | **1** | **1** | **1** | | | **2** | **1** | | | **1** | | | | | | **15** | **23** |
| 1 | | 2 | | | | | | 2 | 3 | 2 | | 1 | | 1 | 1 | | | | 1 | 13 |
| 2 | | | 2 | 1 | | | | | 1 | 2 | | | 1 | | | | 1 | | 1 | 9 |
| 3 | | | | 1 | | | | 1 | 1 | | 2 | 1 | | | | | | 2 | 1 | 9 |
| 4 | | | | | | | | | | | | | 2 | | | | | | 2 | 4 |
| 5 | | | | | | 1 | | | | | 2 | | 2 | | | | | | 1 | 6 |
| 6 | | | | | | | | | | | | 1 | | 1 | | | 1 | | 1 | 4 |
| 7 | | | | | | | | | | | | | | | 1 | 1 | | | | 2 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.3.2. Age difference table for ocean perch from, network type: probabilistic: data inputs: All biological and all transect lengths. APE=5.6. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -7 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| -6 | | | | | | | | | | | 1 | | | | | | | | | 1 |
| -5 | | | | | | | | | | | | 1 | | | 1 | 1 | | | | 3 |
| -4 | | | | | | | | | | | | | | 1 | | 1 | 1 | | | 3 |
| -3 | | | | | | | | | | | | | 1 | 2 | | 1 | 1 | | | 5 |
| -2 | | | | | | 1 | 1 | | | | 1 | 1 | | | | | | | | 4 |
| -1 | | | 1 | | 2 | 2 | 1 | 2 | | 2 | 2 | | | 1 | | | | | | 13 |
| 0 | 1 | 2 | 3 | 2 | 3 | 1 | 2 | 2 | 1 | 2 | | 1 | | | | | 1 | | 16 | 37 |
| 1 | | | 1 | 1 | 5 | 1 | 2 | 2 | 1 | 1 | 1 | 3 | 1 | | 1 | | | 2 | | 22 |
| 2 | | | | | 2 | 1 | | 3 | | 1 | | | 1 | | | | | | | 8 |
| 3 | | | | | | 1 | | 1 | | 3 | | | 1 | | | 2 | | | | 8 |
| 4 | | | | | 1 | | 1 | | | 1 | | | | 2 | 2 | | | | | 7 |
| 5 | | | | | | | | | | 1 | | | | | | | | | | 1 |
| 7 | | | | | | | | | | 1 | | | | | | | | | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.3.3. Age difference table for ocean perch from, network type: probabilistic: data inputs: All biological data. APE=8.05. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -8 | | | | | | | | | 1 | | | | | | | | | | | 1 |
| -7 | | | | | | | | 1 | | | | | | | | | | | | 1 |
| -6 | | | | | | | | | | 1 | 1 | | | | | | | | | 2 |
| -5 | | | | | | | 2 | | | 1 | 1 | | | | | | | | | 4 |
| -4 | | | | | 1 | | | 1 | | 2 | | | 1 | 2 | | | | | | 7 |
| -3 | | | | 1 | | | | | | | 2 | | 1 | | | | | | | 4 |
| -2 | | | | | 2 | | 1 | | 1 | 3 | | | 1 | | 1 | | | | | 9 |
| -1 | | 1 | | 1 | | 2 | 1 | 1 | | | | 2 | 1 | | | | | | | 9 |
| **0** | **1** | **2** | **2** | **2** | **4** | **1** | | | **1** | **1** | | **1** | | | | | | | **16** | **31** |
| 1 | | | 1 | 1 | 1 | 4 | 1 | 2 | 3 | | | 1 | 3 | | | 1 | | | 2 | 20 |
| 2 | | | | 1 | | | 2 | 1 | 1 | 4 | | | | | | | | | | 9 |
| 3 | | | | | | | | | | | 1 | | 1 | | | 1 | 1 | | 2 | 6 |
| 4 | | | | | | | 1 | | 1 | | 1 | | 1 | 1 | | | | | 2 | 7 |
| 6 | | | | | | | | | | | | | | | 1 | | | 1 | | 2 |
| 7 | | | | | | | | | | | | | | | | | 1 | 1 | | 2 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.3.4. Age difference table for ocean perch from, network type: probabilistic: data inputs: Harmonics from transect 1. APE=19.19. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -14 | | | | | 1 | | | | | | | | | | | | | | | 1 |
| -11 | | | | 1 | | 1 | | | | | | | | | | | | | | 2 |
| -10 | | 1 | 1 | | | 1 | | | | | | | | | | | | | | 3 |
| -9 | | | | | 1 | | 1 | | | 2 | | | | | | | | | | 4 |
| -8 | 1 | | | | | | | 2 | | | | | | | | | | | | 3 |
| -7 | | | | | | | 1 | | | | | | | | | | | | | 1 |
| -6 | | | 1 | | 1 | | | 1 | | | | | | | | | | | | 3 |
| -5 | | | | 1 | | | | 1 | | | | | 1 | | | | | | | 3 |
| -4 | | | | 1 | 1 | 1 | 1 | 1 | | 2 | | | | | | | | | | 7 |
| -3 | | | | 1 | 1 | | | | 1 | | 1 | | | | | | | | | 4 |
| -2 | | 1 | | | 1 | | | | | 2 | | 1 | | | | | | | | 5 |
| -1 | | | | | | 1 | | | 2 | | | | | | | 1 | | 1 | | 5 |
| **0** | | **1** | | | | | | **1** | **1** | **1** | | | **2** | | | | | **1** | **9** | **16** |
| 1 | | | | | | | 1 | | | | 1 | | 1 | | | 1 | | | 1 | 5 |
| 2 | | | 1 | | | 2 | | | 1 | 1 | | | | | | | | | 2 | 7 |
| 3 | | | | 1 | 1 | | 1 | | 2 | 1 | 1 | | | | | | 1 | | | 8 |
| 4 | | | | | | | | | | | 1 | 1 | | | | | | | 2 | 4 |
| 5 | | | | | | | 1 | | | | 1 | 1 | | 1 | 2 | | | | 1 | 7 |
| 6 | | | | | | | | | | 1 | | | | | | | | | 1 | 2 |
| 7 | | | | | | | | | | | 1 | | 2 | | | | | | 1 | 4 |
| 8 | | | | | | | | | | | | | 1 | 1 | | | 1 | | 1 | 4 |
| 9 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| 11 | | | | | | | | | | | | | 1 | | | | | | | 1 |
| 12 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 14 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 18 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **3** | **3** | **5** | **7** | **6** | **6** | **6** | **7** | **10** | **6** | **3** | **8** | **3** | **2** | **2** | **2** | **2** | **21** | **103** |

Table 8.3.5. Age difference table for ocean perch from, network type: probabilistic: data inputs: Harmonics from transect 1, biological data and transect lengths. APE=9.77. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -8 | | | | | 1 | | | | | | | | | | | | | | | 1 |
| -7 | | | | 1 | | 1 | | | | | | | | | | | | | | 2 |
| -6 | | | | | | 1 | | | 1 | 1 | | | | | | | | | | 3 |
| -5 | | | | 1 | | | | 1 | | 4 | | | | | | | | | | 6 |
| -4 | | | | | | | | 1 | | | 2 | | | 1 | | | | | | 4 |
| -3 | | | | | 2 | 2 | | 1 | | 1 | 1 | | | | | | | | | 7 |
| -2 | | | | | 1 | | | | 1 | | | 1 | 2 | | | | | | | 5 |
| -1 | | | 1 | 1 | | 1 | | 2 | 1 | | | 1 | 2 | | | | | | | 9 |
| **0** | **1** | **1** | **1** | **1** | **2** | **1** | **2** | **1** | | **2** | | | | | | **1** | | | **16** | **29** |
| 1 | | 2 | 1 | 1 | 1 | | 4 | | 2 | 1 | | | 1 | 2 | | 1 | | | | 16 |
| 2 | | | | 1 | 1 | 1 | 2 | | 1 | | | | | | | | 2 | | 2 | 10 |
| 3 | | | | | | | | | 1 | 1 | 3 | 2 | 3 | | | | | 1 | 2 | 13 |
| 4 | | | | | | | | | | 2 | | | | | | | | | | 2 |
| 5 | | | | | | | | | 1 | | | | | | 2 | | | | 2 | 5 |
| 9 | | | | | | | | | | | | | 1 | | | | | | | 1 |
| 12 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **5** | **7** | **6** | **6** | **6** | **7** | **10** | **6** | **3** | **8** | **3** | **2** | **2** | **2** | **2** | **21** | **103** |

Table 8.3.6. Age difference table for ocean perch from, network type: probabilistic: data inputs: Harmonics from transect 2. APE=22.51. Data from production set

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -15 | | | | 1 | | | | | | | | | | | | | | | | 1 |
| -14 | | | | | 1 | | | | | | | | | | | | | | | 1 |
| -13 | | | | | 1 | 1 | | | | | | | | | | | | | | 2 |
| -12 | | | | | 1 | | | | | | | | | | | | | | | 1 |
| -11 | 1 | 1 | 1 | | 1 | | 1 | 1 | | | | | | | | | | | | 6 |
| -10 | | | 1 | 1 | | | | | | | | | | | | | | | | 2 |
| -9 | | | | | | | 1 | 1 | | 1 | | | | | | | | | | 3 |
| -8 | | 1 | | | | | 2 | 1 | | 1 | 1 | | | | | | | | | 6 |
| -6 | | | | 1 | 1 | | 1 | | | | 1 | | | | | | | | | 4 |
| -5 | | 1 | | 1 | 1 | | | | 1 | | | 1 | | | | | | | | 5 |
| -4 | | | | 1 | 1 | 1 | 1 | | 1 | | | | 1 | | | | | | | 6 |
| -3 | | | | | | | 1 | | 1 | | | | | | | 1 | | | | 3 |
| -2 | | | 1 | | 1 | 4 | | | 2 | | | | | 1 | | | | | | 9 |
| -1 | | | | | | | | | | | | 1 | | | | | | | | 1 |
| **0** | | | | **1** | | **1** | **1** | | | | | | **2** | | | | | | **8** | **13** |
| 1 | | | | | | | | | | 1 | 1 | | | | | | | | 2 | 4 |
| 2 | | | | | | | | | | 2 | | | | | 1 | | | | 2 | 5 |
| 3 | | | | | | | | 2 | 2 | 1 | 1 | | 2 | | | | 1 | | | 9 |
| 4 | | | | | | | | | 1 | 3 | | | 1 | 1 | | 1 | | 1 | | 8 |
| 5 | | | | | | | | 1 | | | | | 1 | | 1 | | | 1 | 1 | 5 |
| 6 | | | | | | | | | | | 1 | | | | | | | | 2 | 3 |
| 7 | | | | | | | | | | 1 | | 1 | | 1 | | | | | | 3 |
| 8 | | | | | | | | | | 1 | | 1 | | | | | | | 1 | 3 |
| 9 | | | | | | | | | | | 1 | | 1 | | | | | | 1 | 3 |
| 10 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 11 | | | | | | | | | | | | | 1 | | | | 1 | | 1 | 3 |
| 13 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 15 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 18 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **11** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **113** |

Table 8.3.7. Age difference table for ocean perch from, network type: probabilistic: data inputs: Harmonics from transect 2, biological data and transect lengths. APE=9.75. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -10 | | | | | | | | 1 | | | | | | | | | | | | 1 |
| -8 | | | | | | | | | | 1 | | | | | | | | | | 1 |
| -6 | | | | | | | | | | 2 | 1 | | | | | | | | | 3 |
| -5 | | | | | 1 | | | 1 | | | | | | | | | | | | 2 |
| -4 | | | | 2 | | | 2 | | | | 1 | 2 | | | | | | | | 7 |
| -3 | | | | | 2 | 1 | | 1 | | 3 | | | 2 | | | | | | | 9 |
| -2 | | 1 | 2 | | 1 | 2 | | | 2 | 1 | | | 1 | | | | | | | 10 |
| -1 | 1 | | | | | 1 | 2 | | 2 | 2 | 1 | | 1 | | | | | | | 10 |
| **0** | | **1** | | **2** | **3** | **1** | **2** | | | **1** | **1** | | **2** | | | **1** | | | **13** | **27** |
| 1 | | 1 | 1 | | 1 | 2 | 1 | 1 | 1 | | | | | 1 | | | | | 3 | 12 |
| 2 | | | | 1 | | | 1 | 1 | | 2 | | 1 | | 1 | 1 | | 1 | | 1 | 10 |
| 3 | | | | 1 | | | | 1 | 1 | | 2 | | | 1 | | 1 | 1 | | 2 | 10 |
| 4 | | | | | | | | | 2 | | | 1 | | | | | | | 2 | 5 |
| 5 | | | | | | | | | | | | | 3 | | | | | 1 | | 4 |
| 6 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 7 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| 10 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.3.8. Age difference table for ocean perch from, network type: probabilistic: data inputs: Harmonics from transect 3. APE=23.44. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -16 | 1 | | | | | | | | | | | | | | | | | | | 1 |
| -15 | | 1 | | | | | | | | | | | | | | | | | | 1 |
| -14 | | 1 | | | | | | | | | | | | | | | | | | 1 |
| -13 | | | | 1 | | | | | | | | | | | | | | | | 1 |
| -12 | | | | | | 2 | | | | | | | | | | | | | | 2 |
| -10 | | | | | | | | | 1 | | | | | | | | | | | 1 |
| -9 | | | | | 1 | | | 1 | | 2 | | | | | | | | | | 4 |
| -8 | | | | | | | | | | | 1 | | | | | | | | | 1 |
| -7 | | | | | | | 2 | | | 1 | | | | | | | | | | 3 |
| -6 | | | | 2 | 1 | | | 2 | | 1 | | | 1 | | | | | | | 7 |
| -5 | | | | | 1 | 1 | | | | | | 2 | | 1 | | | | | | 5 |
| -4 | | | | 1 | | | 1 | | | 1 | | | | | | | | | | 3 |
| -3 | | | 1 | | | | | | | | | 1 | | | | 1 | | | | 3 |
| -2 | | 1 | | | 2 | 2 | | | 1 | 1 | | | | | | | 1 | | | 8 |
| -1 | | | 1 | | 1 | 1 | 1 | | | 1 | | | | | | | | | | 5 |
| **0** | | | | | **1** | | | **1** | | | | | | | | | | | **6** | **8** |
| 1 | | | | | | | 1 | | | | 1 | | 1 | 1 | | | | | 1 | 5 |
| 2 | | | | | 1 | | | 1 | | 2 | | | 1 | | | | | | | 5 |
| 3 | | | | 2 | | | 1 | | 1 | 1 | | | | | | | 1 | | 1 | 7 |
| 4 | | | | | | | 1 | 1 | | | | | 1 | | | | | | 1 | 4 |
| 5 | | | | | | | 1 | | | | 1 | 1 | | 1 | | | | | 2 | 6 |
| 6 | | | | | | | | | 5 | | 1 | | 3 | | | 1 | | | | 10 |
| 7 | | | | | | | | | | | 1 | | 1 | | | | | | 2 | 4 |
| 8 | | | | | | | | | | 1 | | | | | | | | | 1 | 2 |
| 9 | | | | | | | | | | | 1 | | | | 1 | | | | | 2 |
| 10 | | | | | | | | | | | | | | | | | | | 2 | 2 |
| 11 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 12 | | | | | | | | | | | | | | | 1 | | | | 3 | 4 |
| 13 | | | | | | | | | | | | | | | | | | 1 | 1 | 2 |
| 16 | | | | | | | | | | | | | | | | | | 1 | 1 | 2 |
| N | **1** | **3** | **2** | **6** | **8** | **6** | **8** | **6** | **8** | **11** | **6** | **4** | **8** | **3** | **2** | **2** | **2** | **2** | **22** | **110** |

Table 8.3.9. Age difference table for ocean perch from, network type: probabilistic: data inputs: Harmonics from transect 3, biological data and transect lengths. APE=11.27. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -10 | | | | 1 | | | | | | | | | | | | | | | | 1 |
| -9 | | | | 1 | | | | | | | | | | | | | | | | 1 |
| -8 | | | 1 | | 1 | | | | | 1 | | | | | | | | | | 3 |
| -7 | | | | 1 | 1 | 2 | | 1 | | 2 | | | | | | | | | | 7 |
| -6 | | | | | | | 1 | | | 2 | | | | | | | | | | 3 |
| -5 | | | | | | | 1 | | | | | 1 | | | | | | | | 2 |
| -4 | | | | | | 1 | | | 2 | 1 | 2 | | | | | | | | | 6 |
| -3 | | | | | | | | 2 | | 2 | 3 | | 2 | | | | | | | 9 |
| -2 | | | | | 2 | | | | 1 | 2 | | 1 | 3 | | | | | | | 9 |
| -1 | | 1 | 1 | | 1 | 2 | 1 | | 1 | 1 | | 1 | | 1 | | | | | | 10 |
| **0** | **1** | **1** | **1** | **1** | **1** | | **3** | **1** | | **1** | | | **1** | | | **1** | | | **13** | **25** |
| 1 | | 1 | | | | 2 | | 2 | | | | | 1 | | | | | | | 6 |
| 2 | | | | 2 | 2 | | 2 | | 3 | | | | 1 | | | | | | 2 | 12 |
| 3 | | | | | | | | | | | | | | 1 | 1 | 1 | 2 | | 2 | 7 |
| 4 | | | | | | | | | | | 1 | 1 | 1 | | | | | 1 | 4 | 8 |
| 5 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| 6 | | | | | | | | | 1 | | | | | 1 | | | | 1 | 1 | 4 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.3.10. Age difference table for ocean perch from, network type: probabilistic: data inputs: Harmonics from transect 4. APE=24.05. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -12 | | | | 1 | | 1 | | | | | | | | | | | | | | 2 |
| -11 | | | | | | 1 | | | | | | | | | | | | | | 1 |
| -10 | | | | | | 1 | | | | | | | | | | | | | | 1 |
| -9 | | | | | 1 | | | | 1 | | | | | | | | | | | 2 |
| -8 | | | | | 1 | 1 | 1 | | 1 | | | | | | | | | | | 4 |
| -7 | | | | 1 | 1 | | | | | | | | | | | | | | | 2 |
| -6 | | 2 | | 1 | | | 1 | 1 | | | | | | | | | | | | 5 |
| -5 | | | | 1 | | | 1 | | 1 | 1 | 1 | 1 | | 1 | | | | | | 7 |
| -4 | 1 | | 1 | 1 | 2 | 1 | | | | | 1 | | | | | | | | | 7 |
| -3 | | | 1 | 1 | | | | | | | | | | | | | | | | 2 |
| -2 | | 1 | 1 | | 1 | | 1 | | | | | | | | | | | | | 4 |
| -1 | | | | | | | | 1 | | 1 | | | | | | | | 1 | | 3 |
| **0** | | | | | | | **1** | | **1** | | | **1** | | | | | | | **7** | **10** |
| 1 | | | | | | | 1 | 1 | 1 | 2 | | | | | | | 1 | | | 6 |
| 2 | | | | | 1 | 2 | | | 1 | 3 | | | | | | | | | | 7 |
| 3 | | | | | | | | 2 | | 1 | 1 | | 1 | | | 1 | | | | 6 |
| 4 | | | | | 1 | | | | | | 2 | | 1 | 1 | | | | | | 5 |
| 5 | | | | | | | | | | 2 | | | 2 | | | | | | 2 | 6 |
| 6 | | | | | | | 2 | 1 | | | | | 2 | 1 | | | | | 2 | 8 |
| 7 | | | | | | | | | 1 | | | | | | | | | | 2 | 3 |
| 8 | | | | | | | | | | | 1 | | | | | | | | 2 | 3 |
| 9 | | | | | | | | | | 1 | | | 1 | | | | 1 | | 1 | 4 |
| 10 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| 11 | | | | | | | | | | | | 1 | 2 | | | 1 | | | 2 | 6 |
| 12 | | | | | | | | | | | | | | | 1 | | | | 1 | 2 |
| 14 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 16 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 17 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **7** | **11** | **6** | **3** | **9** | **3** | **2** | **2** | **2** | **2** | **21** | **110** |

Table 8.3.11. Age difference table for ocean perch from, network type: probabilistic: data inputs: Harmonics from transect 4, biological data and transect lengths. APE=9.11. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -8 | | | | | | | | | 1 | 1 | | | | | | | | | | 2 |
| -7 | | | | | | | | | 1 | 1 | | | | | | | | | | 2 |
| -6 | | | | | 1 | | | | | | | | | | | | | | | 1 |
| -4 | | | | | | | | 1 | 1 | | 1 | | 2 | | | | | | | 5 |
| -3 | | | | | 1 | | | | | | 1 | | | 1 | | | | | | 3 |
| -2 | | | | 1 | 1 | 2 | 1 | | 1 | 2 | | | 2 | | | | | | | 10 |
| -1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | | 2 | | 1 | 1 | | | | | | | 14 |
| **0** | | **1** | | | **3** | **1** | **2** | **1** | **1** | | **1** | **1** | | | | | | | **16** | **27** |
| 1 | | 1 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | | | 2 | | 1 | 1 | | | 2 | 19 |
| 2 | | | | 1 | | | 2 | | 1 | 4 | | | | 1 | | | | | 1 | 10 |
| 3 | | | | 1 | | | | 1 | | 1 | 1 | | | | | | 1 | | 1 | 6 |
| 4 | | | | | | | | | | | 2 | 2 | 1 | 1 | | | | 1 | 1 | 8 |
| 5 | | | | | | | | | 1 | | | | | | | | 1 | | | 2 |
| 6 | | | | | | | | | | | | | 1 | | | 1 | | | | 2 |
| 7 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| 9 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 11 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

Table 8.3.12. Age difference table for ocean perch from, network type: probabilistic: data inputs: Harmonics from transect 5. APE=25.46. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -17 | | 1 | | | | | | | | | | | | | | | | | | 1 |
| -14 | 1 | | 1 | | | | | | | | | | | | | | | | | 2 |
| -13 | | | 1 | | | | | | | | | | | | | | | | | 1 |
| -11 | | | | | | | 1 | | | | | | | | | | | | | 1 |
| -10 | | 1 | | | | 1 | | | | | | | | | | | | | | 2 |
| -9 | | | 1 | | 1 | | 1 | | | 2 | | | | | | | | | | 5 |
| -8 | | | | 1 | | 1 | | | | | | | | | | | | | | 2 |
| -7 | | | | | | | 1 | | 1 | 2 | | | | | | | | | | 4 |
| -6 | | 1 | | | 1 | | | | | 2 | | | 2 | | | | | | | 6 |
| -5 | | | | 1 | | | | 1 | | | | | | | | | | | | 2 |
| -4 | | | | | 1 | | | 1 | 3 | | 1 | | | | | | | | | 6 |
| -3 | | | | | 1 | | | | 2 | | | | | | | | | | | 3 |
| -2 | | | | 1 | 1 | 1 | 1 | | | | | | 1 | | | | | | | 5 |
| -1 | | | | | 2 | | | | 1 | 1 | 1 | 2 | | | | | | | | 7 |
| **0** | | | | **1** | | **1** | **2** | **1** | | | | | | | | | | | **6** | **11** |
| 1 | | | | 1 | | 1 | 1 | 1 | | 1 | 1 | | | | | | 1 | | | 7 |
| 2 | | | | | 1 | | | | | | 2 | | | | | | | | | 3 |
| 3 | | | | 1 | | | | | 1 | 3 | | | 1 | | | 1 | | | | 7 |
| 4 | | | | | | | | | | | 1 | | | 1 | | 1 | | | | 3 |
| 5 | | | | | | 2 | 1 | | | | | | | | | | | | 2 | 5 |
| 6 | | | | | | | | 1 | | | | | 2 | | | | | | 2 | 5 |
| 7 | | | | | | | | 1 | | | | | 1 | 1 | | | | | 1 | 4 |
| 8 | | | | | | | | | | | | | | | | | 1 | | | 1 |
| 9 | | | | | | | | | | 1 | | | | | 1 | | | | | 2 |
| 10 | | | | | | | | | | | | | 1 | | | | | | | 1 |
| 11 | | | | | | | | | | | | 2 | | | | | | 2 | 1 | 5 |
| 13 | | | | | | | | | | | | | | 1 | | | | | | 1 |
| 16 | | | | | | | | | | | | | | | | | | | 2 | 2 |
| 18 | | | | | | | | | | | | | | | | | | | 5 | 5 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **8** | **3** | **1** | **2** | **2** | **2** | **19** | **109** |

Table 8.3.13. Age difference table for ocean perch from, network type: probabilistic: data inputs: Harmonics from transect 5, biological data and transect lengths. APE=11.35. Data from production set.

| | Observed age | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age class | | | | | | | | | | | | | | | | | | | |
| Difference | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -9 | | | | | | | 1 | | | | | | | | | | | | | 1 |
| -8 | | | | | 1 | | | | | | | | | | | | | | | 1 |
| -7 | | | | | 1 | | | | | 1 | 1 | | | | | | | | | 3 |
| -6 | | | | | 1 | 1 | | 1 | | 2 | | | | | | | | | | 5 |
| -5 | | | | 1 | | | | | | 1 | | | | | | | | | | 2 |
| -4 | | | | | | | | | 1 | 1 | 1 | 1 | | | | | | | | 4 |
| -3 | | | | | | 3 | | | | 2 | | | 1 | | | | | | | 6 |
| -2 | | | | | 2 | 1 | 1 | 1 | 1 | | 1 | | 1 | | | | | | | 8 |
| -1 | | | | 1 | 1 | | 2 | 1 | 2 | 1 | 1 | | 1 | | | | | | | 10 |
| **0** | **1** | **1** | **1** | | **1** | **1** | | | **1** | | **1** | **1** | **2** | | | | | | **12** | **22** |
| 1 | | 2 | 1 | 3 | | | 1 | 2 | 1 | 2 | | | | | | | 1 | | 2 | 15 |
| 2 | | | 1 | 1 | 1 | 1 | 2 | | 1 | 2 | | | 1 | 1 | | | 1 | | 2 | 14 |
| 3 | | | | | | | 1 | 1 | 1 | | | | | | | 1 | | | 3 | 7 |
| 4 | | | | | | | | | | | 1 | | | 1 | | | | 1 | | 3 |
| 5 | | | | | | | | | | | | 1 | 2 | | | | | | 1 | 4 |
| 6 | | | | | | | | | | | | 1 | | | | 1 | | | 1 | 3 |
| 7 | | | | | | | | | | | | | 1 | | | | | | 1 | 2 |
| 8 | | | | | | | | | | | | | | 1 | 1 | | | | | 2 |
| 9 | | | | | | | | | | | | | | | 1 | | | | | 1 |
| 11 | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **1** | **3** | **3** | **6** | **8** | **7** | **8** | **6** | **8** | **12** | **6** | **4** | **9** | **3** | **2** | **2** | **2** | **2** | **22** | **114** |

### *Biological data models*

Table 9.1.1. Age difference table for pilchards (combined areas) from, network type: probabilistic: data inputs: Biological, date of capture and area of capture. APE=7.64%

| | Age class | | | | | | |
|---|---|---|---|---|---|---|---|
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **All** |
| -4 | 1 | | | | | | 1 |
| -3 | | | 3 | | | | 3 |
| -2 | | 2 | 3 | 3 | | | 8 |
| -1 | | 17 | 52 | 28 | 17 | | 114 |
| **0** | **13** | **87** | **196** | **89** | **47** | **35** | **467** |
| 1 | | 1 | 33 | 27 | 16 | 16 | 93 |
| 2 | | | 2 | | 1 | | 3 |
| 3 | | | | 2 | | | 2 |
| N | **14** | **107** | **289** | **149** | **81** | **51** | **691** |

Table 9.1.2. Age difference table for pilchards (combined areas) from, network type: back propagation: data inputs: Biological, date of capture and area of capture. APE=7.16%

| | Age class | | | | | | |
|---|---|---|---|---|---|---|---|
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **All** |
| -3 | 1 | | | | | | 1 |
| -2 | | | | 2 | | | 2 |
| -1 | 3 | 32 | 44 | 6 | 15 | | 100 |
| **0** | **10** | **75** | **233** | **95** | **18** | **30** | **461** |
| 1 | | | 12 | 46 | 47 | 18 | 123 |
| 2 | | | | | 1 | 3 | 4 |
| N | 14 | 107 | 289 | 149 | 81 | 51 | 691 |

Table 9.1.3. Age difference table for pilchards (combined areas) from, network type: multiple layer: data inputs: Biological, date of capture and area of capture. APE=6.41%

| | Age class | | | | | | |
|---|---|---|---|---|---|---|---|
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **All** |
| -4 | 1 | | | | | | 1 |
| -2 | | | 2 | 1 | | | 3 |
| -1 | 2 | 24 | 32 | 17 | 11 | | 86 |
| **0** | **11** | **83** | **242** | **81** | **39** | **23** | **479** |
| 1 | | | 13 | 50 | 30 | 26 | 119 |
| 2 | | | | | 1 | 2 | 3 |
| N | **14** | **107** | **289** | **149** | **81** | **51** | **691** |

Table 9.2.1. Age difference table for pilchards (Coffin Bay) from, network type: multiple layer: data inputs: Biological and date of capture. APE=6.71%

| | Age class | | | | | |
|---|---|---|---|---|---|---|
| Difference | **1** | **2** | **3** | **4** | **5** | **All** |
| -1 | 1 | 6 | 6 | 3 | | 16 |
| **0** | | **20** | **27** | **9** | **7** | **63** |
| 1 | | | 6 | 14 | | 20 |
| 2 | | | | 2 | 1 | 3 |
| N | **1** | **26** | **39** | **28** | **8** | **102** |

Table 9.2.2. Age difference table for pilchards (Lakes Entrance) from, network type: multiple layer: data inputs: Biological and date of capture. APE=4.37%

| | Age class | | | | |
|---|---|---|---|---|---|
| Difference | **1** | **2** | **3** | **4** | **All** |
| -1 | 2 | | | | 2 |
| **0** | **2** | **55** | **5** | | **62** |
| 1 | | | 13 | 1 | 14 |
| N | **4** | **55** | **18** | **1** | **78** |

Table 9.2.3. Age difference table for pilchards (Port Phillip Bay) from, network type: multiple layer: data inputs: Biological and date of capture. APE=5.65%

| | Age class | | | | | | |
|---|---|---|---|---|---|---|---|
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **All** |
| -1 | | 17 | 2 | 1 | | | 20 |
| **0** | **13** | **80** | **62** | **7** | **3** | **1** | **166** |
| 1 | | | 5 | 17 | 3 | 4 | 29 |
| N | **13** | **97** | **69** | **25** | **6** | **5** | **215** |

Table 9.2.4. Age difference table for pilchards (Port Lincoln) from, network type: multiple layer: data inputs: Biological and date of capture. APE=5.04%

| | Age class | | | | |
|---|---|---|---|---|---|
| Difference | 2 | 3 | 4 | 5 | All |
| -1 | | 10 | | 2 | 12 |
| **0** | **61** | **27** | **7** | **2** | **97** |
| 1 | 13 | 11 | 5 | | 29 |
| N | **74** | **48** | **12** | **4** | **138** |

Table 9.2.5. Age difference table for pilchards (Queensland) from, network type: multiple layer: data inputs: Biological and date of. APE=5.26%

| | Age class | | | | |
|---|---|---|---|---|---|
| Difference | **2** | **3** | **4** | **5** | **All** |
| -2 | 1 | | | | 1 |
| -1 | 6 | 16 | 3 | | 25 |
| **0** | **40** | **20** | **27** | **16** | **103** |
| 1 | | 3 | 11 | 11 | 25 |
| 2 | | | 2 | | 2 |
| N | **47** | **39** | **43** | **27** | **156** |

Table 9.3.1. Age difference table for school whiting from, network type: probabilistic: data inputs: Biological and date of capture. APE=7.18%

| | Age class | | | | | | |
|---|---|---|---|---|---|---|---|
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **All** |
| -2 | | 2 | 7 | 4 | | | 13 |
| -1 | 5 | 35 | 45 | 58 | 27 | | 170 |
| **0** | **12** | **110** | **214** | **170** | **48** | **43** | **597** |
| 1 | | 25 | 90 | 49 | 18 | 13 | 195 |
| 2 | | | 7 | 7 | 1 | 2 | 17 |
| 3 | | | | 1 | | 2 | 3 |
| N | **17** | **172** | **363** | **289** | **94** | **60** | **995** |

Table 9.3.2. Age difference table for snapper from, network type: probabilistic: data inputs: Biological and date of capture. APE=6.01%

| | Age class | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Difference | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **All** |
| -6 | | | | | | 1 | 2 | | | 1 | | | | | | | | 4 |
| -5 | | | | | | | | 2 | | | | | | | | | | 2 |
| -4 | | | | | | | 1 | 2 | 2 | 1 | 1 | | 1 | | | | | 8 |
| -3 | | | | | | 1 | | 1 | | 2 | 2 | | | 4 | | | | 10 |
| -2 | | 1 | 3 | 1 | 1 | | 3 | 1 | 4 | 1 | 2 | 2 | 1 | | | | | 20 |
| -1 | | 1 | 2 | 18 | 7 | 10 | 3 | 4 | 3 | 2 | 1 | 2 | 3 | 1 | 5 | 1 | | 63 |
| **0** | **7** | **24** | **25** | **82** | **27** | **33** | **16** | **15** | **4** | **1** | **5** | **3** | **5** | **2** | **1** | **2** | **9** | **261** |
| 1 | | | 6 | 8 | 4 | 6 | 6 | 9 | 9 | 2 | 1 | 1 | 1 | 3 | 3 | 2 | 5 | 66 |
| 2 | | | | 1 | | 2 | 1 | 3 | 2 | 3 | | 3 | 1 | 1 | 1 | 2 | 2 | 22 |
| 3 | | | | | | | | | 1 | | 2 | 1 | | 1 | 1 | 2 | 3 | 11 |
| 4 | | | | | | | | | | | | 2 | | | | | 1 | 3 |
| 5 | | | | | | | | | | | | | | | | 1 | | 1 |
| 6 | | | | | | | | | | | | | | | | | 2 | 2 |
| 7 | | | | | | | | | | | | | | 1 | | 1 | | 2 |
| N | **7** | **26** | **36** | **110** | **39** | **53** | **32** | **37** | **25** | **13** | **14** | **14** | **12** | **13** | **11** | **11** | **22** | **475** |

Table 9.3.3. Age difference table for ling from, network type: probabilistic: data inputs: Biological and date of capture. APE=9.88%

| | Age class | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **All** |
| -3 | | | | | 1 | | 1 | | | | | | | | 2 |
| -2 | | | 5 | | 1 | 2 | | 4 | 1 | | | | | | 13 |
| -1 | 5 | 17 | 29 | 25 | 5 | 3 | 2 | | 1 | 2 | 1 | 1 | | | 91 |
| **0** | **26** | **123** | **83** | **48** | **18** | **8** | | | | **1** | **1** | **2** | | **5** | **315** |
| 1 | | 31 | 77 | 42 | 9 | 3 | 5 | | 1 | | | | | | 168 |
| 2 | | | 11 | 13 | 2 | 2 | 1 | 1 | | | | | 1 | 1 | 32 |
| 3 | | | | 2 | | | | | | | | | | | 2 |
| N | **31** | **171** | **205** | **130** | **36** | **18** | **9** | **5** | **3** | **3** | **2** | **3** | **1** | **6** | **623** |

Table 9.3.4. Age difference table for blue grenadier (winter and non-winter fishery) from, network type: probabilistic: data inputs: Biological and date of capture. APE=5.73%

| | Age class | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
| -9 | | | | | | | | | | 1 | | | | | | | | | | | | 1 |
| -7 | | | | | | | | | | 1 | | | 2 | | | | | | | | | 3 |
| -6 | | | | | | | 1 | | | | | | 1 | | | | | | | | | 2 |
| -5 | | | | | 1 | | | 1 | | | | | | | 1 | | | | | | | 3 |
| -4 | | | | | | 1 | 1 | 6 | | | 2 | 2 | 2 | | 1 | | | | | | | 15 |
| -3 | | | | | | 1 | 1 | 2 | 8 | 3 | 1 | 2 | 2 | 1 | | 2 | 1 | | | | | 24 |
| -2 | | 3 | 2 | 2 | | | 2 | 1 | 6 | 23 | 5 | 1 | 1 | 2 | 3 | | | 1 | | | | 52 |
| -1 | 3 | 32 | 42 | 7 | 3 | 1 | | 1 | 13 | 18 | 29 | 5 | 2 | | 1 | 1 | | 2 | | | | 160 |
| **0** | | **56** | **196** | **100** | **3** | **8** | **2** | **1** | **6** | **27** | **14** | **33** | **11** | **1** | | | **1** | **1** | **2** | | | **462** |
| 1 | | | 4 | 25 | 34 | 5 | 6 | | | 2 | 14 | 16 | 17 | 6 | 2 | | | 1 | | 1 | | 133 |
| 2 | | | | 1 | 1 | 1 | 1 | 2 | | | 3 | 7 | 8 | 9 | 2 | | 1 | | 2 | 1 | | 39 |
| 3 | | | | | | | | | 1 | | | | 6 | 5 | 6 | 1 | 1 | 1 | | 1 | | 22 |
| 4 | | | | | | | | | | 2 | | | | 2 | 4 | 2 | 2 | | 3 | | 1 | 16 |
| 5 | | | | | | | | | | 1 | | | | | | | 2 | | | | | 3 |
| 6 | | | | | | | | | | | | | 1 | | | 1 | | | | | | 2 |
| 7 | | | | | | | | | | | | | | | | | | | | 1 | | 1 |
| 8 | | | | | | | | | | | | | | | | | | | | 1 | | 1 |
| N | **3** | **91** | **244** | **135** | **42** | **17** | **14** | **14** | **34** | **78** | **68** | **66** | **53** | **26** | **20** | **7** | **8** | **6** | **7** | **5** | **1** | **939** |

Table 9.3.5. Age difference table for blue grenadier (non-winter fishery) from, network type: probabilistic: data inputs: Biological and date of capture. APE=7.01%

| | Age class | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **20** | **All** |
| -7 | | | | | | | | | | 1 | | | | | | | | | 1 |
| -6 | | | | | | | | | | 1 | | | | | | | | | 1 |
| -5 | | | | | | | | | 1 | | 1 | | | | | | | | 2 |
| -4 | | | | | | | 1 | | 1 | 1 | | | 1 | | | | | | 4 |
| -3 | | | | 2 | | | | 1 | 3 | 1 | 5 | 3 | | 1 | 1 | | 1 | | 18 |
| -2 | | 4 | 3 | 3 | 1 | | | 1 | 1 | | | 3 | | 1 | | 1 | | | 18 |
| -1 | | 22 | 30 | 12 | 8 | 4 | 2 | 2 | 1 | 3 | | | 4 | 2 | 1 | | 1 | | 92 |
| **0** | **4** | **25** | **179** | **93** | **7** | **7** | | | **2** | **9** | **3** | **2** | | **1** | **1** | | **1** | **1** | **335** |
| 1 | | 36 | 6 | 10 | 21 | | 2 | | 2 | 3 | 3 | 1 | | | | 1 | | | 85 |
| 2 | | | | 1 | | | | | 4 | 2 | 1 | 1 | 1 | | | | | | 10 |
| 3 | | | | | | | | | 1 | 3 | 1 | | 1 | | | 1 | | | 7 |
| 4 | | | | | | | | | | | 2 | | | | | | | | 2 |
| 5 | | | | | | | | | | | | 1 | 2 | | | | | | 3 |
| N | **4** | **87** | **218** | **121** | **37** | **11** | **5** | **4** | **16** | **24** | **16** | **11** | **9** | **5** | **3** | **3** | **3** | **1** | **578** |

Table 9.3.6. Age difference table for blue grenadier (winter fishery) from, network type: probabilistic: data inputs: Biological and date of capture. APE=10.38%

| Difference | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **All** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -10 | | | | | | | | | | 1 | | | | | | | | | | | | 1 |
| -9 | | | | | | | | | | | 2 | | | | | | | | | | | 2 |
| -8 | | | | | | | | 1 | 1 | 1 | | 3 | | | | | | | | | | 6 |
| -7 | | | | | | | | | 2 | 2 | 1 | | 3 | 1 | | | | | | | | 9 |
| -6 | | | | | | | | | 1 | 4 | 10 | 3 | | 1 | 1 | | | | | | | 20 |
| -5 | | | | | | | | | 1 | | 1 | 7 | | | 4 | | | | | | | 13 |
| -4 | | | | | 1 | | 1 | | | 6 | | 2 | 2 | | 1 | 2 | | | | | | 15 |
| -3 | | | | | | | | | 1 | | 12 | 1 | 7 | 2 | 1 | 1 | | 2 | | | | 27 |
| -2 | | | | | | 1 | | 1 | 1 | 5 | 1 | 10 | 4 | 2 | 3 | | | | 2 | | | 30 |
| -1 | 1 | 1 | 7 | 1 | 2 | 2 | 1 | | 5 | 5 | 5 | | 4 | 2 | 1 | | 1 | | 4 | | | 42 |
| **0** | | **4** | **16** | **14** | | **3** | | **3** | **4** | **5** | **7** | **5** | **1** | **5** | **2** | **1** | | | **1** | **1** | **1** | **73** |
| 1 | | | 1 | 6 | 4 | 1 | 1 | 1 | 4 | 2 | 11 | 13 | 4 | | 4 | | | | | | | 52 |
| 2 | | | | | | | 2 | | | 5 | 3 | 7 | 4 | | 1 | | | | 1 | | | 23 |
| 3 | | | | | | | | | | 4 | 7 | 2 | 2 | 1 | | | | | | | | 16 |
| 4 | | | | | | 1 | | | | | 4 | 7 | 1 | 1 | 3 | | | | | 1 | | 18 |
| 5 | | | | | | | | | | | | | 4 | 2 | 1 | | | | 1 | | | 8 |
| 6 | | | | | | | | | | | | | 2 | 1 | | | | | | | | 3 |
| 7 | | | | | | | | | | | | | | | 2 | 1 | | | | | | 3 |
| N | **1** | **5** | **24** | **21** | **7** | **8** | **5** | **6** | **20** | **40** | **64** | **60** | **38** | **18** | **24** | **5** | **1** | **2** | **9** | **2** | **1** | **361** |