

Value Adding Silver Warehou
(*Seriolella punctata*)

Basic Handling and Sensory Analyses Studies

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on behalf of
Southland Fish Supplies Pty Ltd

for
Seafood Services Australia
Product and Process Development



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1. Non-technical Summary

Silver warehou (*Seriolella punctata*) is one of the most abundant species of the South East (Trawl) Fishery but in terms of culinary appeal, compares poorly to many other fish. Consequently it is not popular in food service markets, reducing its opportunity for price growth.

Anecdotal evidence, however, suggested that the eating quality of silver warehou might be affected by on-board handling, and that 'in-kitchen' preparation, storage and cooking methods might also significantly affect its culinary appeal.

This project was a preliminary investigation to test the anecdotal evidence and provide direction for further research in specific areas if warranted.

Stage 1

Sampling and sensory analyses were inconclusive in demonstrating a direct correlation between on-board handling practices and the subsequent culinary attributes of silver warehou. The results obtained suggested no correlation but observations during the experiment point to the possibility of over-riding factors.

It is possible that seasonal changes in the physiology of silver warehou (eg. variations in oil content, and the effects of spawning) might effect flesh quality and subsequent culinary appeal, and that these changes have far greater consequence than variations in on-board handling (within the range of normal handling practices).

These changes might be responsible for a number of characteristics observed during the experiment and subsequent observations, including variations to flesh colour, and flakiness, texture and 'after-taste' when cooked. These might well be commercially important attributes which indicate when, rather than how, silver warehou are caught for maximum value.

To verify this, more research is needed into seasonal changes to silver warehou flesh, and into its market appeal during these various stages. (There is evidence, for instance, that Japanese buyers prefer silver warehou when the oil content is highest.)

The experiment also indicated that quality indexing is a useful tool for establishing tangible links between handling/storage methods and fish quality; for extending fishers' knowledge of fish quality; and for establishing reliable sales parameters.

Stage 2

The cooking experiments indicated very convincingly that cooking methods have a dominant effect on the subsequent culinary appeal of silver warehou, and most likely over-ride any variation to reasonable handling/storage practices by fishers.

The trials showed silver warehou is extremely susceptible to inappropriate cooking styles (eg. easily toughened by over-cooking; creation of unpleasant after-tastes) and that chef/consumer education is probably a more commercially important element of successful adding value to, or marketing, silver warehou than variations to normal production/post harvest practices.

The production of appropriate recipes (later incorporated into a consumer education brochure) also indicated that the provision of sound consumer advice will improve demand for silver warehou, and that this is a more cost effective application of resources than most production/post harvest initiatives to date.

2. Background

Silver warehou is commercially quite significant to the Australian seafood industry in terms of its current and potential value. Although under quota protection, the stock appears robust with an annual quota of 4,000 tonnes.

The vast majority of the catch is sold as chilled whole fish in the main fish markets in Sydney and Melbourne. Wholesale prices are at the lower end of the range for trawl fish.

The presentation/appearance of silver warehou in chilled fillet form compares poorly with many other species, with excessive flaking and discolouration two of the problems. The eating quality of the cooked flesh is also poor by comparison with other trawled fish, with the 'chewy' texture particularly unpopular. Therefore the species is competitive only in terms of price. It is not popular in the food service sector and is sold mainly for 'in-home' consumption (ie. retailed), further reducing its capacity for price growth.

However, there is anecdotal evidence to suggest that both the presentation and eating quality of silver warehou may be affected by on-board handling to a greater degree than other species; and that 'in-kitchen' preparation, storage and cooking methods may also significantly affect its culinary appeal.

South East Fishery managers, as well as fishers, have come under increasing pressure in recent years to better utilise the SEF resource and there has been considerable discussion about adding value to quota species and by-catch.

3. Need

Southland Fish Supplies Pty Ltd is a large operator in the South East Fishery (SEF), and is based in Eden in southern NSW. It owns a significant tonnage of quota, operates two vessels of its own, and processes, packs and transports fish for itself and other producers.

Southland has taken steps to improve its marketing in terms of quality controls and management of its distribution procedures, and its returns for most species have improved as a result. However, the company had been unable to significantly influence the demand for silver warehou.

The silver warehou quota is a relatively large portion of the overall SEF allocation, and for operators in the fishery such as Southland (facing proportionally large and increasing costs per kilogram to manage, catch and market fish), the consistently poor return for such a large percentage of quota is of great concern.

Southland has limited financial resources for R&D, and before more costly and lengthy research projects were devised, it felt some investigation into the anecdotal suggestions should occur which could provide a documented summary of (preliminary) findings to guide researchers.

It was also felt that not only would this help to set the parameters of further research; it might provide some timely information of immediate assistance to fishers, marketers and consumers; and might even foreshadow the product development needs of this fishery, and its potential price growth prospects.

4. Objectives

There were two main objectives of the project.

1. To undertake a series of experiments to establish if on-board handling is a significant factor in the appearance and eating quality of silver warehou flesh. The outcomes of this were to :
 - a) provide specific direction for more technical research if deemed warranted (as opposed to purely anecdotal evidence); and
 - b) to provide some immediate advice to fishers and buyers if significant differences were found.

2. To develop cooking methods, recipes and preparation/storage techniques which are most appropriate to silver warehou and will enhance its eating qualities. The outcomes of this were:
 - a) to assist fishers and traders target markets most suited to the usage characteristics of the species;
 - b) to provide immediate information for marketers, trade-end users and consumers about the best utilisation of silver warehou.

5. Project Stages

Objective 1

Step 1: Development of a simple Quality Index chart for silver warehou.

Step 2: Development of experimental on-board handling, transport and storage protocols for silver warehou.

Step 3: Crew briefing and obtaining samples.

Step 4: Assessment of samples by sensory analysis.

Step 5: Conclusions and pointers to further research.

Objective 2

Step 1: The development of preparation and cooking techniques most appropriate to silver warehou.

Step 2: The development of recipes based on these cooking methods.

Step 3: The development of brochure information to educate consumers.

6. Methodology, Results and Conclusions

6.1. Stage 1

6.1.1 Quality Indexing

Prior to the selection of samples, Southland was asked to perform a simple quality indexing trial to assist with observations of silver warehou quality. A number of quality parameters were agreed on, and scored from 0 - 2. (See Appendix B)

Six silver warehou were selected in port from good fish; put in a clean box with ice, covered, and held in a coolroom for 14 days. The fish were observed daily and scored. After an initial period of mild deterioration, the QI score flattened for the remainder of the trial. (After 14 days, the fish were filleted, cooked and eaten and were said to be comparable with much fresher fish - anecdotal).

This trial result surprised Southland staff and indicated that quality indexing could be extremely beneficial to fishers in learning more about product handling and its effect on fish quality.

The trial also indicated that silver warehou, with good handling and storage, has a relatively long chilled storage life and has the potential to maintain culinary appeal (to a large extent) during that period of storage.

6.1.2. On Board Handling, Storage and Transport

A small range of practical handling protocols was devised which, from anecdotal evidence, seem to offer the best opportunities for detecting changes in the eating quality of the fish - relative to effects caused by on-board handling, transport and storage. Southland vessels conducted the trials and the company forwarded the various samples to Sydney for basic sensory analysis.

The protocols developed embraced the following main elements:

Minimum time in the trawl

This was to reduce lactic acid build-up; to reduce physical damage in the cod-end; to reduce time held at ambient sea temperature; and to benefit from any extension of the period of rigor.

Rapid chilling and use of ice slurry

This was to reduce the body temperature of the fish as rapidly as possible; to prevent enzymes destroying 'taste' acids; and to prevent bacterial decay.

Consistent storage temperature

After pre-chilling in ice slurry to reduce core temperature, the sample fish were labelled and well iced in plastic bins with lids. These were held in the vessel's fish hold at a consistent, low ambient temperature. The pre-chilling and low core temperature reduced the melt rate of the ice and a consistent low temperature seemed to be maintained. (The bins were not data logged for temperature monitoring.) The period of unloading and transfer to refrigerated transport was minimised.

Rapid dispatch to market

Although the Quality Index experiment indicated a long shelf life under optimum selection and storage conditions (as assessed by the observation of external characteristics), the rate of deterioration was still assumed to relate to the post-harvest age of the fish, and the aim was to keep this to a practical minimum.

Sample Variations

In addition to these basic criteria, some additional variations were included in the trial.

Bleeding

One sample batch was to be bled as soon as the fish were landed. This was to (possibly) hasten the fall in body temperature and remove some toxins from the flesh.

Fish size

One sample batch of smaller fish were to be selected. This was to see if a significant difference in eating characteristics could be associated with fish age (size).

Control Batch Samples

In addition, six fish were selected in port from all the other fish caught during the trip, and handled under normal conditions. They were consigned to Sydney at the same time as the trial batch samples, in a normal plastic fish bin.

6.1.3. Crew Briefing

Prior to the trial, background information was supplied to the skipper and crew of the vessel involved in the trial, on each of the following subjects, so that they would more fully understand the purpose of the criteria and steps required.

1. Lactic Acid
2. Rigor Mortis
3. Time In The Trawl
4. Selection and On -Deck Handling
5. Fish Size
6. Bleeding
7. Temperature Reduction and Ice Slurry Chilling
8. Salt Water Ice Or Refrigerated Spray Brine
9. Storage Temperature
10. Storage Period

A detailed information sheet on the use and purpose of ice slurry was also prepared and circulated.

6.1.4. Crew Instructions Batch 1 (Basic): Selection & Handling Process

On-board:

1. Batch to be taken from a short trawl, no more than two days before return to port. (A short trawl is two hours or less, or the shortest trawl available).
2. Select six fish of similar size (about 1.2 kilos) from the top of the pound. (ie. fish which have been in the trawl for the least amount of time).
3. They should have no obvious physical damage (to reduce contamination).
4. Immediately wash to remove any slime (to reduce contamination).
5. Immediately place into ice slurry for 10 minutes or more. (Prepare slurry beforehand according to formula - see instructions).
6. Transfer quickly to storage bin with fresh ice. The bin should be clean and free from any contamination including cleaning compounds. Use a thick layer of ice on the bottom, place three fish flat on that, add another thick layer of ice, place the remaining three fish flat on that, and completely cover with another thick layer of ice.
7. Secure lid and attach label marked **Batch 1 (Basic)** and the date. Store box in coldest location and do not disturb until unloading.

In port:

8. Transfer box as quickly as possible to cold store. Check ice and if necessary, remove fish briefly and add three new layers of ice. Secure lid.
9. Ensure fish is kept cold during road transport.
10. Label box for easy identification at market.

Crew Instructions Batch 2 (Bled): Selection & Handling Process
(Same as for batch 1 but with one additional step - indicated in italics).

On-board:

1. Batch to be taken from a short trawl, no more than two days before return to port. (A short trawl is two hours or less, or the shortest trawl available).
2. Select six fish of similar size (about 1.2 kilos) from the top of the pound. (ie. fish which have been in the trawl for the least amount of time).
3. They should have no obvious physical damage (to reduce contamination).
4. *Bleed by cutting throats with a clean, sharp knife and leaving fish in a container of fresh seawater for 10 minutes.*
5. Wash to remove any slime or blood (to reduce contamination).
6. Immediately place into ice slurry for 10 minutes or more. (Prepare slurry beforehand according to formula - see instructions).
7. Transfer quickly to storage bin with fresh ice. The bin should be clean and free from any contamination including cleaning compounds. Use a thick layer of ice on the bottom, place three fish flat on that, add another thick layer of ice, place the remaining three fish flat on that, and completely cover with another thick layer of ice.
8. Secure lid and attach label marked **Batch 2 (Bled)** and the date. Store box in coldest location and do not disturb until unloading.

In port:

9. Transfer box as quickly as possible to cold store. Check ice and if necessary, remove fish briefly and add three new layers of ice. Secure lid.
10. Ensure fish is kept cold during road transport.
11. Label box for easy identification at market.

Crew Instructions Batch 3 (Small): Selection & Handling Process

(Same as for batch 1 but selecting small fish)

On-board:

1. Batch to be taken from a short trawl, no more than two days before return to port. (A short trawl is two hours or less, or the shortest trawl available).
2. Select six fish of similar **small** size (**about .7 kilos**) from the top of the pound. (ie. fish which have been in the trawl for the least amount of time).
3. They should have no obvious physical damage (to reduce contamination).
4. Immediately wash to remove any slime (to reduce contamination).
5. Immediately place into ice slurry for 10 minutes or more. (Prepare slurry beforehand according to formula - see instructions).
6. Transfer quickly to storage bin with fresh ice. The bin should be clean and free from any contamination including cleaning compounds. Use a thick layer of ice on the bottom, place three fish flat on that, add another thick layer of ice, place the remaining three fish flat on that, and completely cover with another thick layer of ice.
7. Secure lid and attach label marked **Batch 3 (Small)** and the date. Store box in coldest location and do not disturb until unloading.

In port:

8. Transfer box as quickly as possible to cold store. Check ice and if necessary, remove fish briefly and add three new layers of ice. Secure lid.
9. Ensure fish is kept cold during road transport.
10. Label box for easy identification at market.

6.1.5. Sensory Analysis

All the sample batches were consigned by refrigerated transport to the Sydney Fish Market where they were held in refrigerated storage overnight. The next morning they were filleted by a professional fish processor, and immediately taken to the Sydney Seafood School test kitchen for the sensory analysis.

Sydney Fish Market home economist, Maria Papadopoulos, undertook the final preparation and cooking of the samples.

Two basic cooking methods were used - poaching and pan frying.

Score sheets were prepared for the eight member tasting panel. These noted:

- Colour (white, off white, light grey, grey)
- Odour (slight, none, fairly strong, strong/off)
- Flesh Construction (very flaky, slightly flaky, bound, fine)
- Texture (tough, firm, smooth, soft)
- Moisture (watery, moist, neutral, dry)
- Flavour (strong, light, mild, none)

Each characteristic was rated as: very appealing; slightly appealing; slightly unappealing; very unappealing; and scored from 1 to 4 accordingly.

Results

Batch A - the basic 'good practice' sample, scored highest, but only marginally higher than the control sample.

None of the batches tasted were outstanding, and the culinary appeal of the samples overall was rated moderate to low by all but one panellist.

6.1.6. Conclusions

1. That within the normal range of at-sea handling (eg. from best practice to average), there is no significant change in the culinary appeal of fresh silver warehou - at least within two days of landing.
2. That within the range of normal on-board handling and storage, these methods may not be as important as cooking methods to final culinary appeal.
3. That seasonal physiological changes to the fish could over-ride any culinary difference (eg. changing oil levels or spawning changes).

Subsequent desk research indicates that seasonal variations influence demand for silver warehou in Japan, and that this is based on oil content.

6.2. Stage 2

6.2.1 Cooking Methods

To establish if the culinary appeal of silver warehou flesh was significantly influenced by different preparation and cooking methods, a series of kitchen experiments (separate to those undertaken at the Sydney Fish Market) was devised and carried out by professional chef, home economist and nutritionist, Sally James. Four different cooking methods were examined - poaching, pan frying, microwaving and oven bake.

The fish chosen were 'run-of catch' and selected from normal consignments to the Sydney Fish Market in September. However, the fish were considered to be in 'excellent condition' based on freshness parameters of colour and firmness typically used by professional processors (filleters) at the Market. In particular, cream (rather than grey) coloured fillets are considered to be better quality by the SFM professional processors.

All the fish portions cooked were prepared from fillets with the skin removed. The fillets were stored overnight in a domestic refrigerator before use, and were contained in a ceramic bowl covered by metal foil. From previous experience, the home economist noted that fillets stored in plastic bags overnight could develop off-odours and off-tastes when cooked. She had also found no difference in fillets which had been allowed to freeze slightly overnight - providing they were used the next day.

The kitchen tests experiments were simply structured : similar sized portions were cooked by each method and tasted by the home economist and assistant. All observations relating to differences during the process were noted.

The results of the experiments indicate that silver warehou is a fish that changes flavour and texture quite significantly with different cooking methods. When fresh and not over-cooked, it has a pleasant flavour that doesn't need to be hidden by curries or strong sauces as has been suggested in many cookbooks.

The predominant point noted is that silver warehou must not be over-cooked, and this is probably the cause of most problems encountered by chefs or home users. The flesh toughens and a distinct after-taste develops. Slightly under-cooked, the flesh is delicate (though still flaky) and the unique warehou flavour remains subtle. (It is noted that very fresh warehou can be used for sashimi - and is in Japan, although not preferred because it is not considered an 'expensive' fish).

Frying and Grilling

The kitchen experiments found pan frying and char grilling were two excellent methods of achieving the desired result: to quickly seal the outside of the fillets to retain moisture and flavour, and to protect the inside from over-cooking. A very hot pan or char-grill is beneficial in this process. Typically, a 150 gram portion should be removed after about 2 minutes cooking on each side, and placed on a warm plate to continue cooking on the inside - but away from direct heat.

The preparation prior to cooking consisted of simply brushing the fillets with olive oil. (Excessive oil, as often occurs when placed directly in the pan, can transfer too much heat to the fillets.) The fillets were not coated with flour first.

This method produced the best results in terms of retaining moisture, exposing the intrinsic flavour of the fish, and minimising cooking odours and after-taste.

As this method is extremely quick and simple, the scope of potential uses for silver warehou is enormous. The most obvious is as a meat substitute at barbeques. A hot barbecue plate or grill is the ideal cooking medium for silver warehou and the speed at which the portions can be cooked means very rapid turnover. In a commercial environment, the latter is obviously very beneficial.

Sealing the flesh to prevent over-cooking also has applications in some popular cooking styles - particularly those using coatings such as crumbs, nuts or seeds, to add complementary flavours. 'Cajun', or blackened fish, is one style particularly appropriate to silver warehou. The method is simple: crust the fillets in Cajun crumbs, place in a very hot pan (smoking) and blacken the crust, then quickly remove to prevent over-cooking.

A wok is another hot medium that is ideal for silver warehou, and opens the way for a different range of ideas.

Other Cooking Methods

The kitchen experiments also showed that oven cooking was a suitable method, although a high temperature was required - at least 210°C. The portions were wrapped in foil and a little olive oil added to prevent drying out.

The home economist also poached fillets in a mixture of white wine, rice wine and vinegar. Over-cooking was a problem and the experiment had to be repeated twice with even less cooking time than estimated, to be successful. (The white wine did not cover the subtle flavour of the silver warehou, and was hardly detectable.)

Microwaving was probably the biggest disappointment - although not unexpected. The portions toughened and after-taste was a problem. The conclusion drawn was that microwaving - cooking from the inside out - too quickly over-cooked the delicate inner flesh. The portions need to be seared first to seal in the moisture and then slow cooked.

6.2.2. Recipes

Based on the kitchen experiments, appropriate recipes were developed at the request of Southland, for use in a promotional brochure to assist retail sales in supermarkets. (See attachment A).

Several thousand brochures were subsequently produced (at Southland's expense) incorporating the recipes, and made available to consumers at point-of-sale in a number of outlets.

Southland reported that the brochures were effective in driving sales.

6.2.3. Broader Publication

Information from the cooking trials was published in Seafood Australia magazine in November 2000.

7. Benefits Of The Research

The kitchen experiments showed clearly that cooking methods are extremely important to the eating quality of silver warehou. (Similar, unrelated kitchen experiments indicate this could apply to many other species).

Arising from this is the likelihood that, in some cases, providing correct information and advice on appropriate cooking methods to food service operators and consumers could be more efficient and cost-effective than developing and implementing special on-board handling and storage practices by fishers.

The de-emphasis of special on-board handling could save South East Fishery considerable expense, and focus industry resources on areas where they are likely to produce immediate improvements in returns - as was the experience of Southland when it provided correct cooking advice and recipes to support retail sales.

With such a large volume involved, any significant price improvement would result in a substantial financial gain for fishers and merchants, as well as food service operators and consumers, and demonstrate better utilisation of the resource.

8. Further Development

More research is needed into the seasonal physiological changes to silver warehou. This research could include :

- monitoring of oil levels in the fish throughout the year, perhaps at monthly intervals;
- monitoring the effects of spawning on the appearance, texture and eating quality of silver warehou;
- international market research to better understand the Japanese preference for silver warehou with seasonally higher oil content.

The project also suggests quality indexing would be extremely beneficial to fishers in learning more about shelf life attributes of fish, in general. This information could be very beneficial to silver warehou in particular as it seems to have a lengthy chilled storage life, and is likely to be a species traded electronically in the future.

Appendix A

Text for silver warehou recipe brochure subsequently used by Southland Fish Supply to assist retail sales in supermarkets.

side 1

Silver Warehou (*Serirolella punctata*)

Silver warehou is, without doubt, one of Australia's hidden treasures of the sea. It is a flavoursome and versatile fish which can be cooked by any method and will take on most flavours - whether hot, sweet, spicy or rich.

Cooking Tips and Recipes

The golden rule for seafood is to keep it simple. No need for complicated lists of ingredients - just let the fish speak for itself. You'll get far more pleasure from silver warehou cooked this way, and end up spending a lot less time in the kitchen. Try the recipes inside.

Southland Fish Supplies Pty Ltd
Suppliers of fresh fish from Eden

Cooking Tips

- As for all fish, to retain the moist texture and tenderness of the fillet and bring out the most in its flavour, certain guidelines need to be kept in mind. One of the most important of these is not to overcook the fish.
- If you plan to pan fry, chargrill or barbecue silver warehou, make sure the pan or hot plate is very hot before adding the fish. You don't need to use much oil in the pan. Try brushing it on the fish rather than pouring it into the pan. Or add a crust like nuts, herbs or just pepper, and cook in a pan brushed with oil. Cook for 1 to 2 minutes on one side, then turn and cook only just until the flesh starts to flake.
- If you are adding liquid to the pan, try adding it just after you have done the first turn. That way the steam will carry the flavours through the flesh and help to keep it moist.
- Silver warehou is wonderful baked in the oven, whether in a rich tomato casserole or simply sprinkled with lemon and pepper and wrapped in baking paper. Or you may prefer it simply placed under the grill, brushed with some flavoursome olive oil to crisp the surface. Don't forget, it doesn't need long.
- For those with little time to spare, silver warehou is also ideal for microwave cooking. This is best done in a sauce so the steam or boiling liquid prevents the flesh drying out and becoming tough.

Buying

Silver warehou is sold as normal fillets, or in skinned and boned form. Choose fillets which have a creamy colour, rather than grey. Some dark red colouration on one side of the fillet is normal.

Portion Sizes

Silver warehou is a firm textured, rich fish so portions between 150g and 200g should be sufficient for most meals.

Home Storage

Keep well chilled. Silver warehou is rich in oils so it is not recommended for home freezing. The fish are usually available all year round so buy when you are ready to use, to get the best results.

Nutrition

Silver Warehou is the perfect choice for those keen to look after their health. Not only is it low in fat and high in protein, it also contains valuable amounts of the Omega 3 fatty acids. These are well documented to be of benefit for helping to prevent a range of illnesses, from heart disease to diabetes, even arthritis and other inflammatory conditions.

Silver warehou is also the dieter's choice, due to its low fat content. You can get the same amount of protein as a similar size piece of beef, but with less calories. Valuable minerals such as Potassium, Iodine and Magnesium are also found in silver warehou, as well as many vitamins such as A and E.

side 2

Citrus and Wine Pan-fried

Silver Warehou

4 fillets silver warehou
cracked black pepper to taste
1 tablespoon olive oil
juice and grated rind of 1 orange
juice and grated rind of 1 lemon or lime
1 /4 cup white wine or champagne

Heat a grill pan or non stick pan to high. Brush silver warehou with some of the oil and season with pepper.

Heat the remaining oil in the pan and add the fish. Cook for 2 minutes, turn and add the juices, rind and wine. Cook for 1-2 minutes or until fish just starts to flake when pressed with a fork.

Remove from pan and keep warm. Continue to cook the juices until they start to thicken. Serve the fish with the sauce spooned over.

*Microwave Silver Warehou
Tomato Casserole*

500g silver warehou, skin and bones removed
1 teaspoon olive oil
1 clove garlic, crushed
1 small white onion
1 stalk celery
1 tablespoon tomato paste
1 cup diced tinned tomatoes
1 /4 cup white wine
juice of 1/ 2 lemon
4-6 basil leaves, torn
ground pepper and salt to taste
cooked hot pasta, to serve

Cut the silver warehou into large chunks.

Place the oil, garlic, onion and celery in a microwave proof dish. Cook on high for 1 minute or until onion is soft. Stir in the tomato paste and cook for 10 seconds then add the tomatoes, wine, juice and basil. Cook for 5 minutes then add the fish.

Cook for 60-90 seconds on High, then test to see if fish is nearly cooked. It will be just turning opaque and becoming firm.

Cover and allow to sit for 3-4 minutes then season to taste with pepper and toss through hot noodles.

Keep in mind, that fish cooked in the microwave will continue to cook for 5 or so minutes after being removed from the oven, so don't allow it to cook fully first.

*Soy Glazed Baked
Silver Warehou*

2-3 cups chopped spinach leaves
4 fillets silver warehou
2 tablespoons soy sauce
1 tablespoon sherry or rice wine
1 tablespoon lemon or lime juice
1 teaspoon honey
1 teaspoon grated ginger
1 tablespoon sesame seeds

Lay spinach leaves in a lightly oiled casserole dish. Sprinkle spinach with a little water then place silver warehou fillets on top. Combine the remaining ingredients and spoon over the fish.

Cover loosely with foil and bake at 150°C for 10-15 minutes or until fish just starts to flake when pressed with a fork.

Serve straight away with steamed rice or noodles.

Appendix B

Quality index score sheet used in assessing deterioration of fish quality.
(see section 6.1.1)

QUALITY INDEX SCORE SHEET FOR WHOLE SILVER WAREHOU

Please write sample number here:

Please write date and time here: Date/...../99. Time: am/pm

Instructions:

1. Please inspect each sample once every day at the same time, until putrid.
2. Use one sheet per sample, per day. Hand the completed sheets to a supervisor.
3. Observe the sample and score each characteristic noted on the sheet (from 0 to 2 or 0 to 3) according to the closest description in column 3. Write the score in column 4.

Quality parameters		Characteristics observed	Points <i>Score here</i>
Column 1	Column 2	Column 3	Column 4
1) Appearance	1a) Flesh colour <i>Cut sample</i>	0: White 1: Off white 2: Brown	
	1b) Belly	0: No marking 1: Slight stain showing through 2: Signs of belly burst	
2) Consistency	2a) Skin/flesh elasticity	0: Won't easily depress 1: Bounces back when pressed 2: Reshapes slowly when pressed 3: Stays depressed	
	2b) Rigidity	0: Rigid when held by head 1: Slight tailedrop when held by head 2: Whole body bends from head 3: Floppy	
	2c) Flesh <i>Cut sample</i>	0: Very firm, flakes bound 1: Less firm, tendency to flake 2: Soft, flakes parted	
3) Eyes	4a) Shape of pupil	0: Round and firm 1: Slightly depressed 2: Sunken	
4) Gills	5a) Colour	0: Bright red 1: Dark red 2: Brown	
	5b) Smell	0: No off odour detectable 1: Slight fishy odour 2: Severe off-odour	
	5c) Slime	0: No slime 1: Slight traces of slime 2: Visible slime	
Total demerit points: (max 20)			