ISSN 0817 - 3680

Technical Report 8

Collection and Storage of Data in the Trawl, Purse Seine and Drop-line Fisheries

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CONTENTS

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ABSTRACT

Since 1979 the Department of Sea Fisheries has collected detailed catch and effort statistics from all commercial trawl and Danish seine vessels operating in Tasmanian waters. The data is collected through a comprehensive daily fishing log and is supplemented by research data. Historical data collected prior to the introduction of the logbooks exists for some well documented research work.

Logbooks have also been developed to enable data collection from other fisheries. These are; the purse seine fishery exploiting the jack mackerel resource in south eastern Australian waters, and the drop-line fishery.

To handle data collected with the logbooks, extensive software structures have been developed, for use on either CSIRONET or an in-house computing system. The data bases allow input of log returns to be in different formats, and offers considerable flexibility in generating reports. Data bases developed for CSIRONET are now being transferred to an in-house system.

This report describes the logbook formats and outlines the basic structure of the data bases and gives examples of their applications.

INTRODUCTION

The trawl, purse seine and drop-line fisheries of Tasmania are essentially developing fisheries. As the resources have only recently been discovered no information relevant to their economic capacity or future management has been available. It has been the Department of Sea Fisheries, Tasmania (D.S.F.T.) policy to initiate monitoring programs on these types of fisheries.

In the mid 1970's resource surveys by the D.P.I. and D.S.F.T. demonstrated that considerable potential existed for deep water trawling (Anon, 1977, 1978, 1980; Webb and Wolfe, 1977). As a result a project aimed at providing assessments of Tasmania's demersal trawl fish resources was introduced by the D.S.F.T. in 1979.

At the commencement of the project, a comprehensive daily fishing log was introduced to all commercial trawl and Danish seine vessels operating in Tasmanian waters to supplement data collected during surveying by research cruises.

The principal aims in the initial stages were to define the temporal and spatial distribution and abundance of the trawl species. Aims in the development of the data base were for it to facilitate in the analysis of potential yields, the standardisation of effort in the developing fishery and the delineation of species assemblages. A subsidiary role was to provide monthly summaries of logbook information to the commercial fishermen participating in the project. This together with trawl ground plots provided a tangible benefit to those fishermen participating in the program.

In 1981 a resource survey of the drop-line fishery on the south western and north western slope areas was started (Wilson, 1981). The drop-line log was introduced to commercial vessels in 1981 and has been maintained to the present time.

During 1985 a purse seine fishery for jack mackerel started on the east coast of Tasmania. The Department initiated a monitoring project of catches at this time with funds from FIRTA. Originally the DPI purse seine logbook was introduced to the fishery. This log was found to be unsuitable due to the type of data collected and the difficulty fishermen had in using it. A new purse seine log (based on the format used in the trawl fishery) was developed by the D.S.F.T. and introduced to the fishery. Software for the purse seine data base (PUSSY) was developed on an in-house system and deals with returns and biological information collected from 8 boats involved in the jack mackerel fishery. As this project started at the same time as the fishing venture it is unusual in its complete coverage of a developing fishery.

This report presents an outline of the logs and data storage facilities developed for the trawl, Danish seine, purse seine and dropline fisheries.

1 LOGBOOK DESIGN REQUIREMENTS

The main objectives in designing the fishing logs were to collect catch effort and

biological data of high and consistent quality. The collection of data by a logbook system can be divided into three major components. These are;

i). the reliability of data entered,

ii). the relative importance and nature of the data required,

and iii). the end use of the data.

As fishermen were acting as data collectors, the log had to promote an attitude that would ensure that reliable and complete records were kept. To account for this the logbooks were designed to serve the fishermen for their own information and replace their record keeping. The data had to be simple and minimal, and the questions asked by the log needed to be uneqivocable in interpretation.

Confidentiality of the data collected was assured. In addition some fishermen were reluctant to part with information they considered secret, such as the position of small grounds they alone fished. This was countered by giving them choices in how they completed the data, without losing consistency or quality in the body of data collected. In this case an option was given to nominate a general fishing area by refering to a block map rather than giving latitudes and longitudes.

It is easy to endlessly improve on logbook formats, especially after field trials of logs. However each version will meet resistance from fishermen who will not see the point of changes. To counter this situation it was decided that the logbooks would be 'right' from the time of introduction, and no changes would be made.

With regard to the relative importance and nature of the data required, the end use of the information needed to be considered in some detail, prior to the development of the logbooks or the software. The principal aim therefore was to minimise the data collected but ensure that it covered all existing and potential uses.

The result of these requirements was a basic daily fishing log book format which incorporated a description of each shot or shot per day, a catch-effort log and a deck log. Being a daily fishing log, records are easily referenced and sorted. It was decided that the deck log should be prominent on the page and confidential in that no carbon copy was

produced from it, to promote the use of the log for personal records. The shot information and catch-effort data components contain elements which overlap, such as time and duration of the operation, location and depth. By combining these components the data could be minimised. The result was a table of shot/catch-effort data, and a description of the catch.

This format has been the basis of the three logbooks described below. The logs are well recieved by fishermen and all have a 100 per cent return rate (except the drop-line log which is run on an *ad hoc* basis). No major shortcomings have been found in their operation in the field and so no changes are envisaged for future printing runs of them.

2 THE LOGBOOKS

2.1 The trawl and Danish seine logbook

2.11 Commercial data

Commercial data collected through this logbook is on a daily shot-by-shot basis. The form is presented in Figure 1. The information specifies the vessel, gear and general activity of the boat on days when it is out of port. On days when fishing takes place the time, position and duration of each shot is recorded, as is the validity of the operation (ie. whether it was good or gear failures were experienced).

As an alternative to filling in latitude and longitude, block maps of south eastern Australian waters are issued with the logbooks and so position can be referenced by block number (Figure 2). The blocks are of 30' squares. Commercial trawl data includes information on the depth of bottom, position at the end of the shot and weather conditions.

The total catch of the shot is then recorded followed by a breakdown by weight or numbers of species in the catch. Whilst most of the commercial species likely to be caught are listed in the log, room has been left for additional species to be added by the fishermen. A final catagory is for discards. A comparison of the total catch with the sum of the catch breakdown allows for a validation check to be made of the data. To validate the estimates

of total commercial catch by shot, the total weight by species landed is recorded for each fishing trip.

Basic information of vessel specifications (L.O.A., trawling speeds, and net measurements) were collected at the time the first logbook is issued to a boat. A file listing the specifications of every net used in the fishery has been maintained, an individual gear code is assigned to the nets and listed in the logs.

The successful introduction of the logs to all boats fishing in Tasmanian waters would not have been possible without funds granted from Rural Credits which allowed a log book coordinator to be employed. This field support was followed up by the presence of D.S.F.T. personnel in the ports and on vessels to assist with any enquiries about the logs.

2.12 Research data

Three logs are used for the collection of research data, they are; a trawl station log (Figure 3), catch composition log (Figure 4), and a biological log (Figure 5).

As well as collecting the basic shot information outlined for the commercial log, the trawl station log details the direction and speed of trawls. Surface, sonde and bottom temperature are collected as is bottom type and thermocline depth. Additional weather descriptions are also recorded.

The catch composition logs list the species and weight or number of all species caught. Three separate lists are used depending on the depth zone of the shots. The depth zones used are 0-200 m (shelf species), 220-650 m (upper slope species) and 650-1200 m (mid slope species). This data is often enhanced with length frequency data collected at sea and recorded on the biological data log.

The biological data log can be used either for field measurements of length frequencies or for more detailed information collected from specimens retained for analysis at the laboratories. These types of samples are routinely collected from research and

commercial cruises and the basic biological data recorded is species, length, weight, sex, gonad weight and condition, an otolith register number (if otoliths are kept) and age (from otoliths or scales). Additional information may be collected at times on processed weights of fillets (headed weight, headed and gutted weight), displaced volume of gut and ova diameter.

2.2 The purse seine logbook

The format of the Purse Seine Daily Fishing Log is given in Figure 6. As with the trawl logbook it records the vessel, gear and general activity of the boat on days when it is out of port. The port and time of leaving/arriving is given and on days when fishing takes place the time, position and duration of each shot is recorded, as is the validity of the operation.

Latitude and longitude are not generally used in this log although space is left to collect this information. Instead, block maps of Tasmanian waters are issued with the logbooks and position is referenced by block number [Figures 7(a-b)]. The blocks are 7.5' squares.

Additional shot information includes the number of hours spent searching prior to the shot, the means by which the target was located, the type and percentage of the school caught and the sea surface temperature.

For each shot the total catch and catch breakup by species is recorded. In addition a column is set aside for recording the actual landed catch at the end of each trip.

The catch breakdown is aimed mainly at the jack mackerel fishery and its by catch species of slimy mackerel, redbait and barracouta. It also lists species such as skipjack, albacore and slender tuna which may be caught by the fishery. Squid has been included along with the by catch species of Australian anchovy and pilchard, to accomodate the likely development of a significant local squid purse seine fishery.

Information concerning the dimensions of the vessel and particulars of the gear used

is collected with the form given in Figure 8, when the logbooks are issued to fishing vessels.

2.3 The drop-line logbook

An example of the format used for the Drop-line Daily Fishing Log is presented in Figure 9. As with the other logbooks it records the vessel, gear and general activity of the boat on days when it is out of port. On days when fishing takes place the time, position and duration of each shot is recorded, as is the validity of the operation. Validity of a shot may be influenced by loss or fouling of gear, or by interference in the operation by seals or killer whales.

Latitude and longitude is not used in this log, instead position by 30' square is referenced by block number (Figures 2). Additional shot information includes the number of lines used, the total number of hooks, the bottom depth and bait type. Further information on sea condition, wind and current direction and force is requested.

For each shot the total catch and catch breakup (in numbers per species) by species is given. The log accepts information on a maximum of five shots per day.

3 DATA BASES

3.1 Trawl and Danish seine data base

The data base CRASS (Catch Return Analysis & Storage System) was originally developed in FORTRAN IV on the Cyber 76. In 1984 it was transfered to the Cyber 205 running under NOS. It is now being adapted for use on an in-house computing system.

Data entry is via three main routes. These are; biological data, commercial fishing returns, and research data. On the CSIRONET version data is input from tape, the in-house system supports both this system and an interactive facility. Initial routines screen the data for typographical and logical errors before preliminary reports are generated. The trawl, Danish seine and research information is then converted to a

standard format before the new data is merged onto the permanent data base. Biological information is only in one format and so enters the data base by a more direct route.

The data base is comprised of three linked data files and three reference files. The linked files contain all the fishing and biological data. The reference files relate the following information to codes appearing in the data. A vessel code gives access to information on the towing speeds, tonnage, and nets for a particular boat. Gear codes relate nets to vessels and gives their specifications and relative fishing power. Species codes are cross referenced with the CSIRO 6-digit species codes and list the scientific and common names and taxonomic status of fish registered.

The linked data files are organised so that any record on one file can be referenced to records on the other files. The files are structured so that one file contains all the data relating to the position and time of the shot, another contains the catch breakup, and the last holds any biological information related to a species for that shot. This organisation is shown in Figure 10.

A unique identifier is generated (from the vessel code, date and shot number) during the editing process to annotate information from each shot. This identifier is used on each record for the shot, catch breakup and biological data files to cross reference the records.

Retrieval of the data can be made in all combinations and permutations of the following criteria;

> species caught, vessel name, cruise number, position of shot (lat-long or block), date (year and/or month and/or day, range or specified), gear code (range or specified), time of day (range or specified), bottom depths (range or specified), temperature (range or specified), season and region (range or specified).

Regions are an arbitrary grouping of blocks for analysis. Descriptions of the regions used in past analysis are presented in Figure 11 (Wilson, 1984).

CRASS now services information collected from 30 commercial and research boats. The current size of the data base is 6Mb. Software constraints limit the potential size of the

existing structure to 16Mb.

3.2 Purse seine data base

The hardware for this system is comprised of a network of Apple Macintoshes™, a Sunol™ 65 Mb hard disk and various output devices. The software is a hybrid of FORTRAN 77 macro routines and OMNIS 3™ software.

PUSSY (PUrse seine Storage SYstem) was constructed after all the development work had gone into CRASS. Because of this it shares all the major design characteristics, such as the data base file structure and reference files. However it differs markedly from CRASS in that data input is interactive. Whilst editing and screening for errors on CRASS was done on large blocks of data, data entered to PUSSY is screened interactively on a shot by shot basis.

Biological data enhancing the shot and catch information can be entered at any time. These records do not need to be complete and so length, weight, sex, etc. data can be entered at an early stage whilst otolith and ageing data requiring more time to collect is added later.

Data retrieval and some of the analysis are done using the OMNIS 3 software. This offers a highly flexible access to the data, with selection being possible for any variable. It also allows for sophisticated reports to be developed in it's data base language. These features are very easy to use and so reduce development or implementation time. It also allows an easier access to the data by staff unfamiliar with programming.

A further advantage of the micro-computer system is the ease with which data can be transfered from the data base to other software packages. In this area micro-computer systems are gaining a great advantage with the quality and sophistication of integrated statistical and graphic software packages currently being released.

PUSSY currently services information collected from six commercial boats. The data set is 3Mb with a software constraint of 16Mb on maximum size.

3.3 Drop-line data base

Data from the drop-line fishery is currently being stored in a data base (DROSS, DROp-line Storage System) of similar design to PUSSY.

DISCUSSION

The principal application of the logbooks have been to record catch-effort in developing and experimental fisheries. They have proved invaluable in monitoring catch composition and giving insights to the spatial and temporal distribution of commercial species.

The trawl and Danish seine data base (CRASS) now deals with returns from approximately 30 boats operating in Tasmanian waters, and biological data collected from research cruises. Under the terms of the South East Trawl Management Policy Anon (1984) responsibility for the collection of trawl data has been assumed by he Commonwealth Department of Primary Industry (AFS). Because of the Tasmanian log's success as a research and management tool, it is now being used to cover all commercial fishing in the South East Trawl Sector (see Peterson, 1985 for a description of the modified logbook).

No biomass estimates existed for the deep water trawl fishery at its commencement in the mid 1970's. The data collected with the Trawl and Danish Seine Daily Fishing Log have been used to provide the only valid estimates of abundance for the major species caught in the developing fishery (Wilson, 1982, 1984). Estimates of stock abundance, using techniques applicable in developed fisheries are currently being derived from the existing data base.

Biomass estimates have involved developing routines for length frequency calculation and analysis. Ageing information is analysed through routines which calculate marginal increments, allocate ages and determine ages at length.

Additional work to which CRASS is being used are in the analysis of the effects of gear types in the fishery, optimal means of standardising effort, species assemblage (eg. Last and Harris, 1981) and the monitoring of long-term trends in the fishery.

As the purse seine fishery for jack mackerel is only recent, the use of PUSSY has been limited to documenting spatial and temporal trends in catch-effort and size composition of the catch, age and ageing studies, standardising the unit of effort and acting as a general information service to the industry. Future work is expected to develop it in line with CRASS in the use of time series analysis and other methods being developed for measuring stock abundance.

Returns from the Drop-line Daily Fishing Log are still being collected from boats participating in the fishery. However, analysis of data stored on DROSS has been suspended due to lack of resources. Future work is intended to use the data for catch-effort modelling and analysis of the species composition and distribution.

ACKNOWLEDGEMENTS

The trawl and drop-line logbook system and the development of CRASS were initiated by Marc Wilson. The original programing development work was due to Ken Harris. Thanks are also extended to all the fishermen who have participated in the program.

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DAILY FISHING LOG

VESSEL CODE | DAY | MONTH | YEAR

IF NOT FISHING: STEAMING | IN PORT | OTHER FISHING

GEAR CODE

	1	2	3	4	5	6	7	8
TRAWL NUMBER								
TIME START								
START POSITION LATITUDE	° '	° '	° '	° '	° '	° '	° '	° '
START POSITION LONGITUDE	° '	° '	° '	° '	° '	° '	° '	° '
TIME FINISH								
FINISH POSITION LATITUDE	° '	° '	° '	° '	° '	° '	° '	° '
FINISH POSITION LONGITUDE	° '	° '	° '	° '	° '	° '	° '	° '
DEPTH (METRES)								
TRAWL VALID YES 1 NO 2								
CURRENT DIR/FORCE								
WIND DIR/FORCE								
SEA CONDITION								
TOTAL COM CATCH (kgs)								
CATCH BREAKUP (kgs)								
BLUE GRENADIER	GRE,	GRE,	GRE,	GRE,	GRE,	GRE,	GRE,	GRE,
KING DORY	DOK,	DOK,	DOK,	DOK,	DOK,	DOK,	DOK,	DOK,
SPIKY DORY	DOP,	DOP,	DOP,	DOP,	DOP,	DOP,	DOP,	DOP,
GEMFISH	GEM,	GEM,	GEM,	GEM,	GEM,	GEM,	GEM,	GEM,
RED GURNARD PERCH	REG,	REG,	REG,	REG,	REG,	REG,	REG,	REG,
LING	LIG,	LIG,	LIG,	LIG,	LIG,	LIG,	LIG,	LIG,
TREVALLA DEEP SEA	TRD,	TRD,	TRD,	TRD,	TRD,	TRD,	TRD,	TRD,
TREVALLA SPOTTED	TRS,	TRS,	TRS,	TRS,	TRS,	TRS,	TRS,	TRS,
SHARK SCHOOL	SHS,	SHS,	SHS,	SHS,	SHS,	SHS,	SHS,	SHS,
SHARK DOG	SHD,	SHD,	SHD,	SHD,	SHD,	SHD,	SHD,	SHD,
SHARK GUMMY	SHG,	SHG,	SHG,	SHG,	SHG,	SHG,	SHG,	SHG,
ELEPHANT SHARK	ELE,	ELE,	ELE,	ELE,	ELE,	ELE,	ELE,	ELE,
SQUID	SQD,	SQD,	SQD,	SQD,	SQD,	SQD,	SQD,	SQD,
MORWONG	MOW,	MOW,	MOW,	MOW,	MOW,	MOW,	MOW,	MOW,
SILVER DORY	DOS,	DOS,	DOS,	DOS,	DOS,	DOS,	DOS,	DOS,
LATCHET	LAT,	LAT,	LAT,	LAT,	LAT,	LAT,	LAT,	LAT,
FLATHEAD	FLT,	FLT,	FLT,	FLT,	FLT,	FLT,	FLT,	FLT,
FLOUNDER	FDR,	FDR,	FDR,	FDR,	FDR,	FDR,	FDR,	FDR,
WHITING SCHOOL	WHS,	WHS,	WHS,	WHS,	WHS,	WHS,	WHS,	WHS,
OTHER COMMERCIAL	OTR,	OTR,	OTR,	OTR,	OTR,	OTR,	OTR,	OTR,
TRASH FISH	TRS,	TRS,	TRS,	TRS,	TRS,	TRS,	TRS,	TRS,

Figure 1. The trawl and Danish seine Daily Fishing Log form.

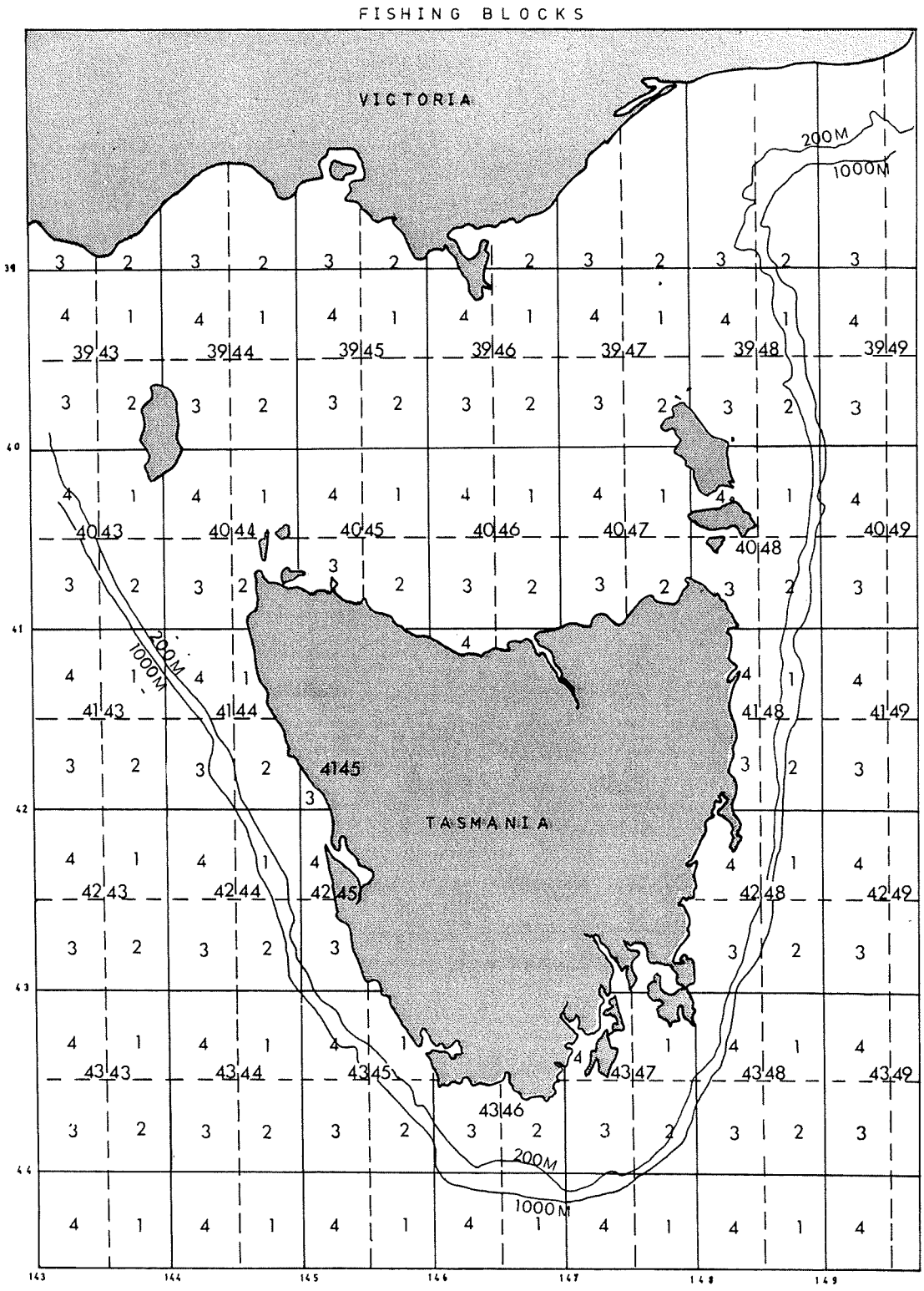

Figure 2. Block map of south eastern Australian waters for trawlers and Danish seiners.

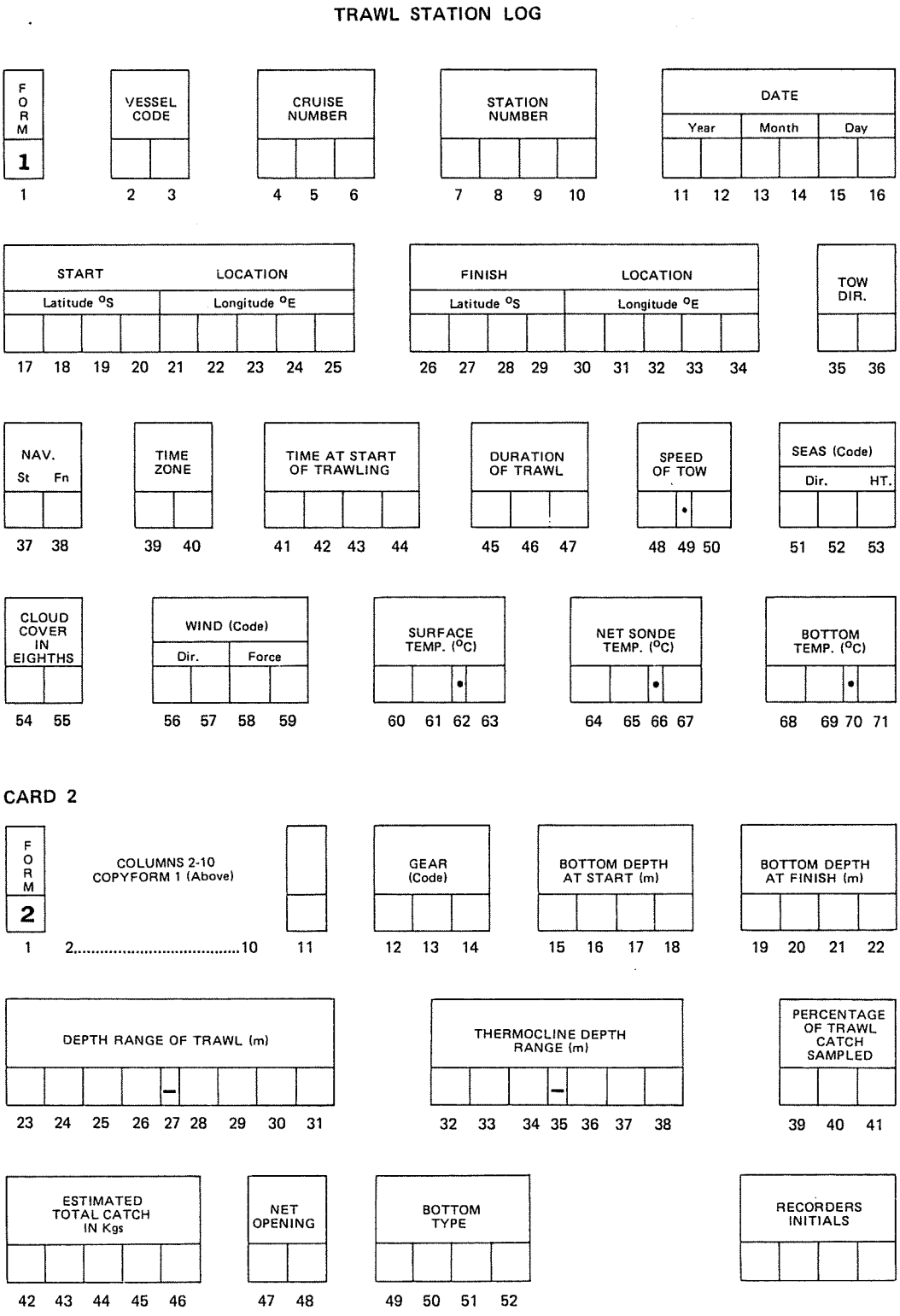

Figure 3. Trawl station log form for research cruises.

TYPE 3: DEMERSAL SPECIES LIST — MID SLOPE (650–1200 m)

FORM	VESSEL CODE	CRUISE NUMBER	STATION NUMBER	TOTAL NO. OF BASKETS	TOTAL WEIGHT	SITE: DAY	MONTH	YEAR	DEPTH MIN.	DEPTH MAX.	TIME	TEMPERATURE Surface	TEMPERATURE Bottom	SPECIES NO.
1	2 3	4 5 6	7 8 9 10	31 32 33	34 35 36 37									

COMMON NAME	SCIENTIFIC NAME	Presence	SPECIES CODE	WT. (kg)	NO.	BOXES	COMMON NAME	SCIENTIFIC NAME	Presence	SPECIES CODE	WT. (kg)	NO.	BOXES
Deepsea Catshark	Apristurus sp. 1		015504				**BANDED WHIPTAIL**	Coelorinchus fasciatus		232002			
LONG-SNOUTED CATSHARK	Apristurus sp. 2		015505				Kanyomaru Whiptail	C. kanyomaru		232519			
School Shark	Galeorhinus australis		018002				Rough Large-nosed Whiptail	C. kermadecus		232520			
Black Shark	Dalatias licha		020002				**LARGE-HEADED WHIPTAIL**	C. matamua		232017			
Moller's Deep-sea Shark	Etmopterus lucifer		020005				Rudis Whiptail	Coryphaenoides rudis		232019			
ROUGH DEEP-SEA SHARK	Etmopterus baxteri		020505				**LONG-RAYED WHIPTAIL**	C. subserrulatus		232016			
Lord Plunket's Shark	Scymnodon plunketi		020013				**SERRULATE WHIPTAIL**	C. serrulatus		232015			
Nitson's Deep-sea Dogfish	Centrophorus squamosus		020009				Barbel Whiptail	C. sp. 1		232525			
Southern Dogfish	Centrophorus uyato		020011				Large-white Whiptail	Macrourus carinatus		232526			
GOLDEN DOGFISH	Centroscymnus crepidater		020012				**TOOTHED WHIPTAIL**	Lepidorhynchus denticulatus		232004			
OWSTON'S DOGFISH	C. owstoni		020506				Black Whiptail	Mesobius sp.		232521			
LARGE-SCALED DOGFISH	C. coelolepis		020507				Perfect Whiptail	Nezumia sp.		232522			
Green-eyed Dogfish	Squalus blainvillei		020007				Black-spotted Whiptail	Ventrifossa nigromaculata		232018			
BRIER SHARK	Deania calcea		020003				Pink Ling	Genypterus blacodes		228002			
Long-snouted Dogfish	D. quadrispinosa		020004				Lump Eel Pout	Melanostigma gelatinosum		231001			
Prickly Dogfish	Oxynotus bruniensis		210001				Small-scaled Crusthead	Scopeloberyx microlepis		251001			
Purple Skate	Bathyraja sp. 1.		031508				New Zealand Sawbelly	Hoplostethus mediterraneus		255001			
BROWN BIGHT SKATE	Raja gudgeri		031010				**RED ROUGHY**	H. atlanticus		255009			
Green-backed Skate	Raja sp.		031011				**PARINS SPINYFIN**	Diretmoides parini		254001			
Grey Skate	Raja sp.		031012				Imperador	Beryx decadactylus		258001			
Narrow-mouthed Skate	Raja sp.		031509				Alfonsin	B. splendens		258002			
DEEPWATER GHOST SHARK	Hydrolagus sp.		042004				King Dory	Cyttus traversi		264001			
Spookfish	Harriotta raleighana		044001				Ox-eyed Dory	Cyttosoma boops		266002			
SAWTAIL SPOOKFISH	Rhinochimaera pacifica		044502				**WARTY DORY**	Allocyttus verrucosus		264007			
Snipe Eel	Nemichthys sp.		076503				**SPIKY DORY**	Neocyttus rhomboidalis		266001			
BASKET-WORK EEL	Diastobranchus capensis		070001				**SPOTTED DORY**	Pseudocyttus maculatus		266003			
Deep-sea Conger Eel	Pseudoxenomystax hirsutus		067510				Banded Bellowsfish	Centriscops obliquus		279004			
Witch Eel	Nettastoma sp.		065501				Red Gurnard Perch	Helicolenus papillosus		287001			
Australian Halosaur	Halosaurus pectoralis		081002				**DEEPWATER GURNARD PERCH**	Sebastosemus sp.		287518			
Spiny Eel	Notacanthus sexspinis		083001				Spiny Flathead	Hoplichthys haswelli		297002			
COMMON SLICKHEAD	Alepocephalus sp.		114503				Australian Sculpin	Neophrynichthys marcidus		305001			
Alcock's Slickhead	Aleposomus squamilaterus		114001				**DEEPWATER SCULPIN**	Ebinania sp.		305502			
Silver Lightfish	Photichthys argenteus		106603				Hapuku	Polyprion oxygeneios		311006			
Large Hatchetfish	Argyropelecus gigas		109608				White Cardinalfish	Epigonus denticulatus		327010			
Viper Fish	Chauliodus sloani		111001				Big-eyed Cardinalfish	E. lenimen		327001			
SCALY DRAGONFISH	Stomias boa		112601				**ROBUST CARDINALFISH**	E. robustus		327018			
Bluntheaded Dragonfish	Malacosteus niger		110001				Scaled Stargazer	Pleuroscopus sp.		400503			
Gleaming-tailed Seadragon	Idiacanthus fasciola		113602				Gemfish	Rexea solandri		439002			
Large-scaled Lanternfish	Neoscopelus macrolepidotus		121001				New Zealand Ruffe	Schedophilus huttoni		445003			
Violet Cod	Antimora rostrata		224008				White Trevalla	Seriolella caerulea		445011			
Challenger Cod	Laemonema sp.		224508				Spotted Trevalla	S. punctata		445006			
Eucla Cod	Euclichthys polynemus		224001				Tasmanian Rudderfish	Tubbia tasmanica		445009			
JOHNSON'S DEEP-SEA COD	Halargyreus johnsoni		224009				Square Tail	Tetragonurus cuvieri		449001			
SMALL-HEADED COD	Lepidion microcephalus		224010										
Giant Cod	Lepidion sp.		224509										
Deep-sea Cod	Mora moro		224002										
Tasmanian Cod	Austrophycis marginata		224612										
Grenadier Cod	Tripterophycis gilchristi		224004										
New Zealand Rock Ling	Gaidropsarus novaezelandiae		226001										
Tasmanian Hake	Lyconus sp.		227501										
BLUE GRENADIER	Macruronus novaezelandiae		232006										
INNOTABLE WHIPTAIL	Coelorinchus innotabilis		232014										

Figure 4. An example of the catch composition log form for research cruises.

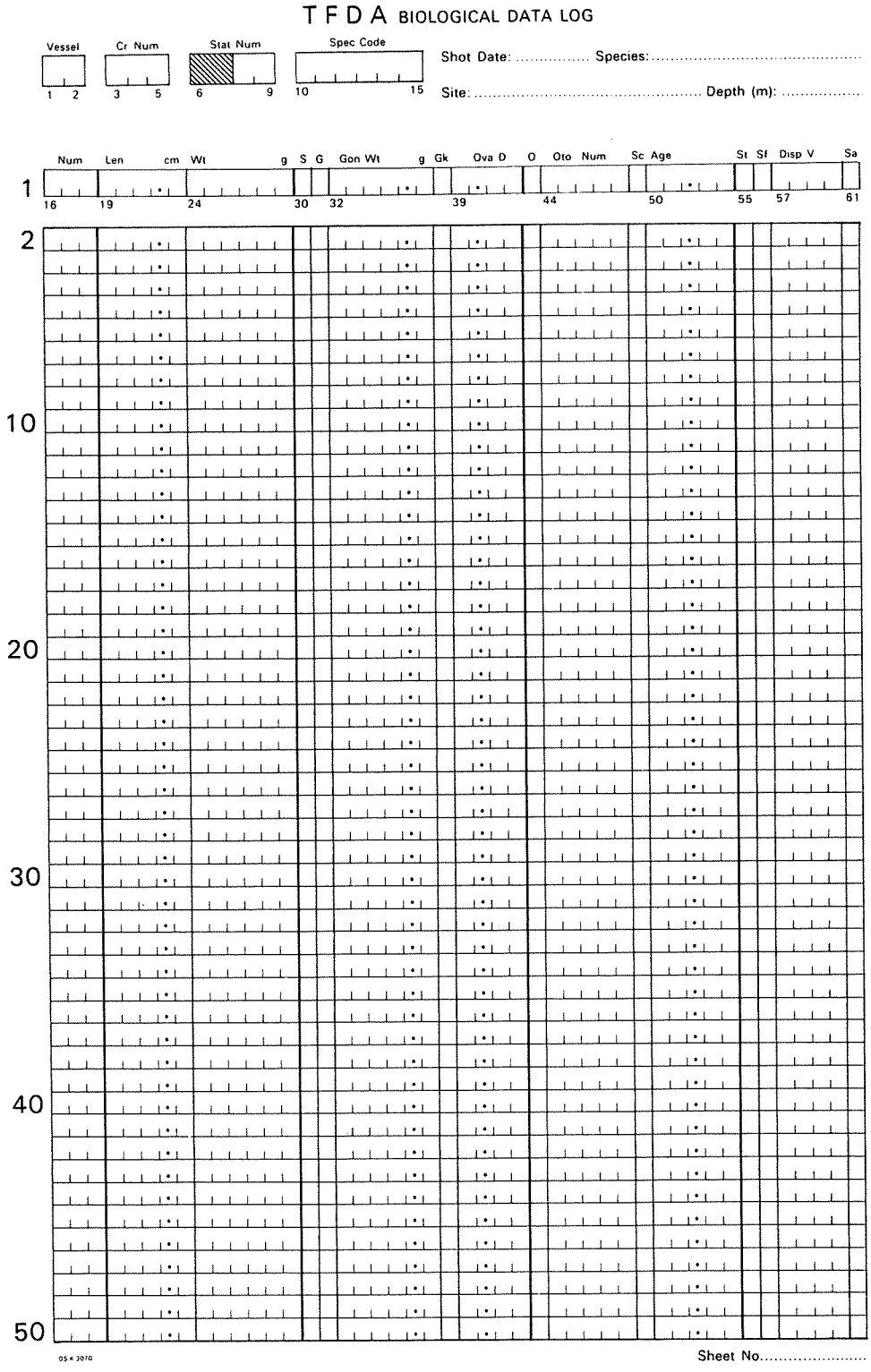

Figure 5. Biological data log form for research cruises and laboratory logging of data.

PURSE SEINE DAILY FISHING LOG

VESSEL CODE | YEAR | MONTH | DAY

DEPARTING (1) AT SEA (2) OR ARRIVING (3) | PORT NUMBER | AT | HOURS | GEAR CODE

SET NUMBER	1	2	3	4	5	6	7	TOTAL LANDED CATCH (TONNES)
TIME START								
SET POSITION LATITUDE	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
SET POSITION LONGITUDE	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
or BLOCK								
SET VALID YES 1 NO 2								
DURATION OF SET								
HOURS SEARCHING								
LOCATED BY SONAR 1 ADVICE 2								
SURF SCHOOL? YES 1 NO 2								
% SCHOOL CAUGHT								
SURFACE TEMP. °C								
TOTAL CATCH (tonnes)								

CATCH BREAKUP (TONNES)

JACK MACKEREL	JMK	JMK	JMK	JMK	JMK	JMK	JMK	JMK
SLIMY MACKEREL	SMK	SMK	SMK	SMK	SMK	SMK	SMK	SMK
REDBAIT	RBT	RBT	RBT	RBT	RBT	RBT	RBT	RBT
BARRACOUTA	BCA	BCA	BCA	BCA	BCA	BCA	BCA	BCA
ANCHOVY	ANC	ANC	ANC	ANC	ANC	ANC	ANC	ANC
PILCHARD	PCD	PCD	PCD	PCD	PCD	PCD	PCD	PCD
ARROW SQUID	ASQ	ASQ	ASQ	ASQ	ASQ	ASQ	ASQ	ASQ
SKIPJACK TUNA	SJT	SJT	SJT	SJT	SJT	SJT	SJT	SJT
ALBACORE	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC
BLUEFIN TUNA	BFT	BFT	BFT	BFT	BFT	BFT	BFT	BFT
SLENDER TUNA	SLT	SLT	SLT	SLT	SLT	SLT	SLT	SLT
AUSTRALIAN SALMON	EAS	EAS	EAS	EAS	EAS	EAS	EAS	EAS
OTHER COMMERCIAL	OTR	OTR	OTR	OTR	OTR	OTR	OTR	OTR
TRASH FISH	TRS	TRS	TRS	TRS	TRS	TRS	TRS	TRS

FISHING DIARY

Figure 6. The Purse Seine Daily Fishing Log form.

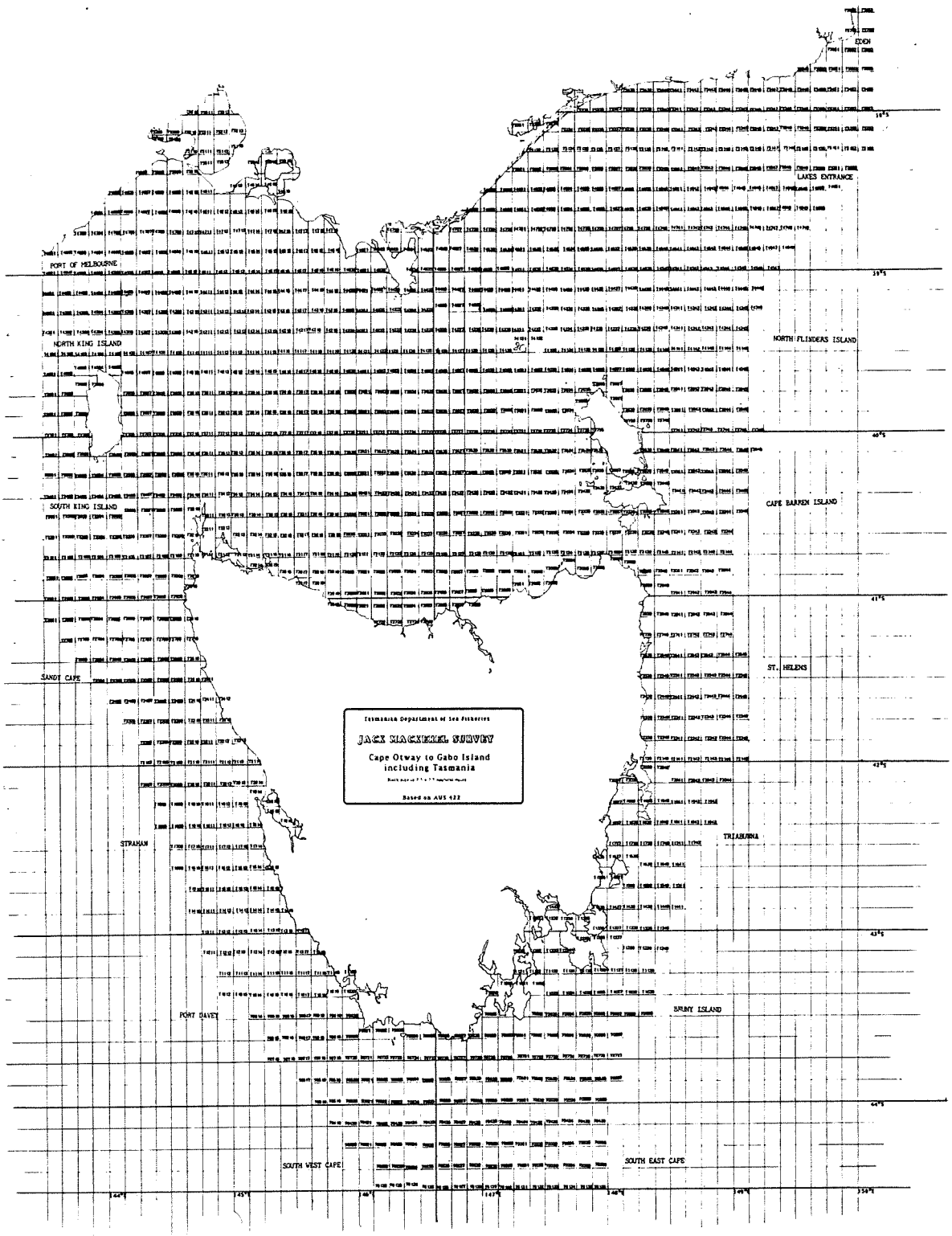

Figure 7(a). Block map of Tasmanian waters for purse seiners.

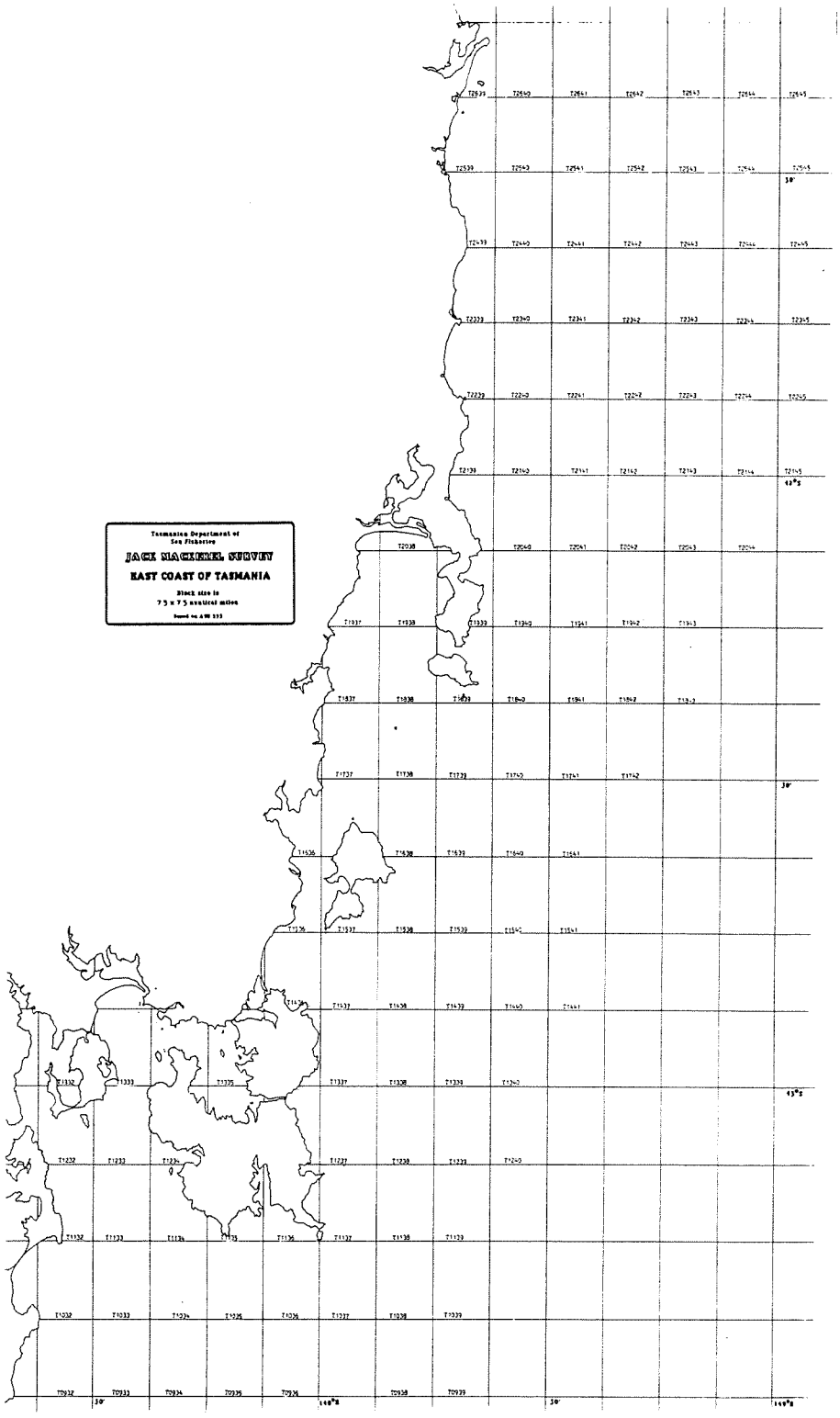

Figure 7(b). Block map of eastern Tasmanian waters for purse seiners.

CONFIDENTIAL

A. VESSEL SPECIFICATIONS

Boat name .....

Length (LOA) (m) .....

Gross tons .....

Usual cruising speed (knots) .....

Maximum range (nautical miles) .....

Fuel capacity (litres) .....

Maximum fish hold capacity (tonnes) .....

Deck load capacity (tonnes) .....

B. ECHO LOCATION EQUIPMENT

Sonar: Make and model .....

Frequency .....

Maximum range (m) .....

Preferred range for searching (m) .....

Sounder: Make and model .....

Frequency .....

Maximum range (m) .....

Preferred range for searching (m) .....

C. NET SPECIFICATION

Main net

Length of net (fathoms) .....

Depth (fathoms) - stretch mesh .....

- fishing depth .....

Bunt mesh size/range (mm) .....

Wing end mesh size/range (mm) .....

Number of bunts .....

Second net

Length of net (fathoms) .....

Depth (fathoms) - stretch mesh .....

- fishing depth .....

Bunt mesh size/range (mm) .....

Wing end mesh size/range (mm) .....

Number of bunts .....

Please complete this form and return in the enclosed self addressed envelope.

Figure 8. Other information collected for the purse seine data base.

DAILY FISHING LOG

VESSEL CODE | DAY MONTH YEAR | IF NOT FISHING | STEAMING | IN PORT | OTHER FISHING | GEAR CODE

	SET 1		SET 2		SET 3		SET 4		SET 5	
POSITION OF SETS										
NO. LINES USED										
TOTAL NO. HOOKS										
AVE TIME OF SET										
DEPTH (METRES)										
BAIT TYPE										
SHOT VALID										
CURRENT DIR/FORCE										
WIND DIR/FORCE										
SEA CONDITION										
TOTAL COM CATCH (kgs)										

CATCH BREAKUP (Nos. FISH) PLEASE RECORD TRIP WEIGHT IN LAST COLUMN

TREVALLA DEEP SEA	TRD	TRD	TRD	TRD	TRD	TRD	TRD	TRD	TRD	TRD
TREVALLA SPOTTED	TRS	TRS	TRS	TRS	TRS	TRS	TRS	TRS	TRS	TRS
LING	LIG	LIG	LIG	LIG	LIG	LIG	LIG	LIG	LIG	LIG
RED GURNARD PERCH	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG
SHARK SCHOOL	SHS	SHS	SHS	SHS	SHS	SHS	SHS	SHS	SHS	SHS
SHARK DOG	SHD	SHD	SHD	SHD	SHD	SHD	SHD	SHD	SHD	SHD
COD DEEP SEA	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD
GEMFISH	GEM	GEM	GEM	GEM	GEM	GEM	GEM	GEM	GEM	GEM
BLUE GRENADIER	GRE	GRE	GRE	GRE	GRE	GRE	GRE	GRE	GRE	GRE
KING DORY	DOK	DOK	DOK	DOK	DOK	DOK	DOK	DOK	DOK	DOK
HAPUKA	HAP	HAP	HAP	HAP	HAP	HAP	HAP	HAP	HAP	HAP
OTHER COMMERCIAL	OTR	OTR	OTR	OTR	OTR	OTR	OTR	OTR	OTR	OTR

Figure 9. The Drop-line Daily Fishing Log form.

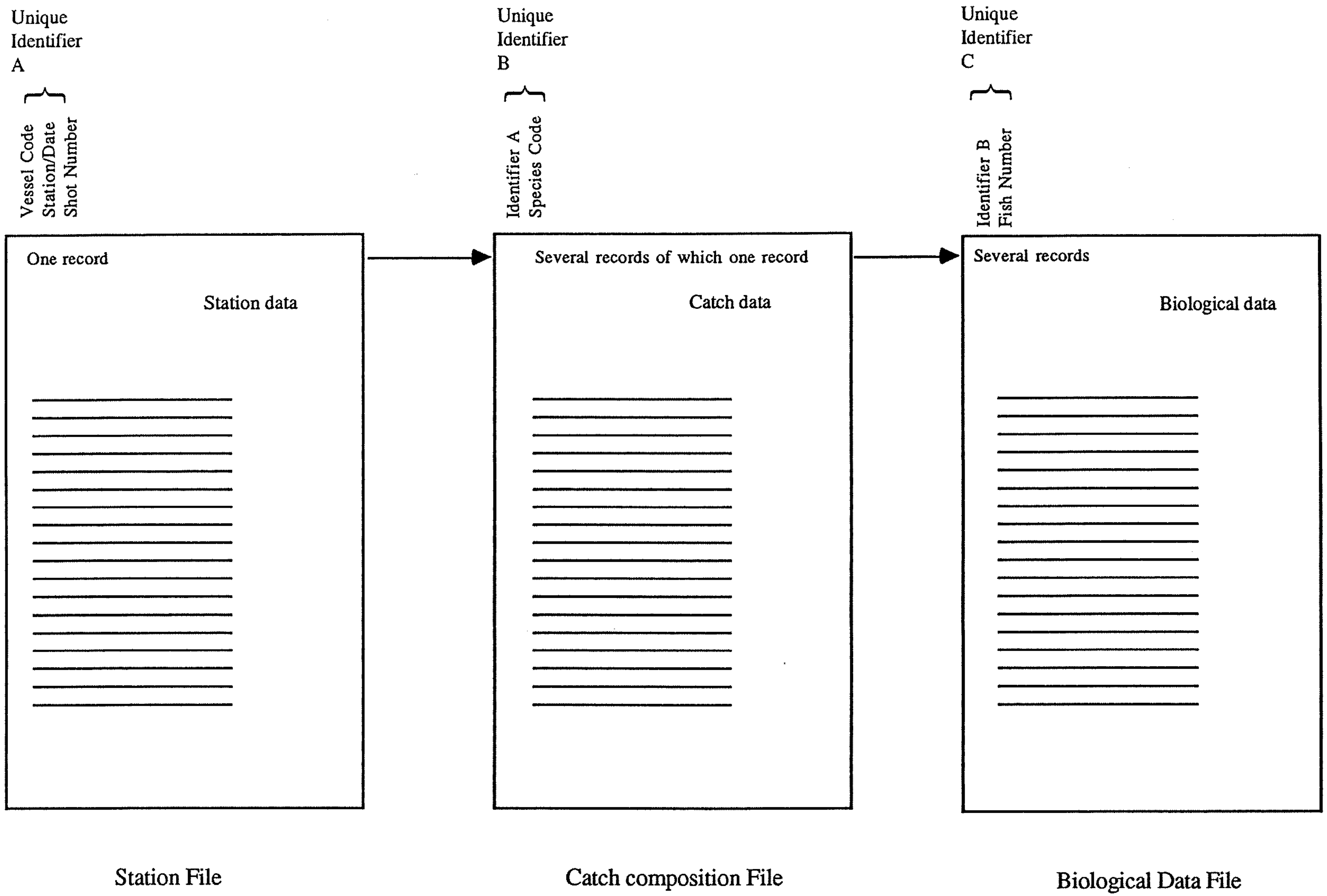

Figure 10. General file structure of the data bases.

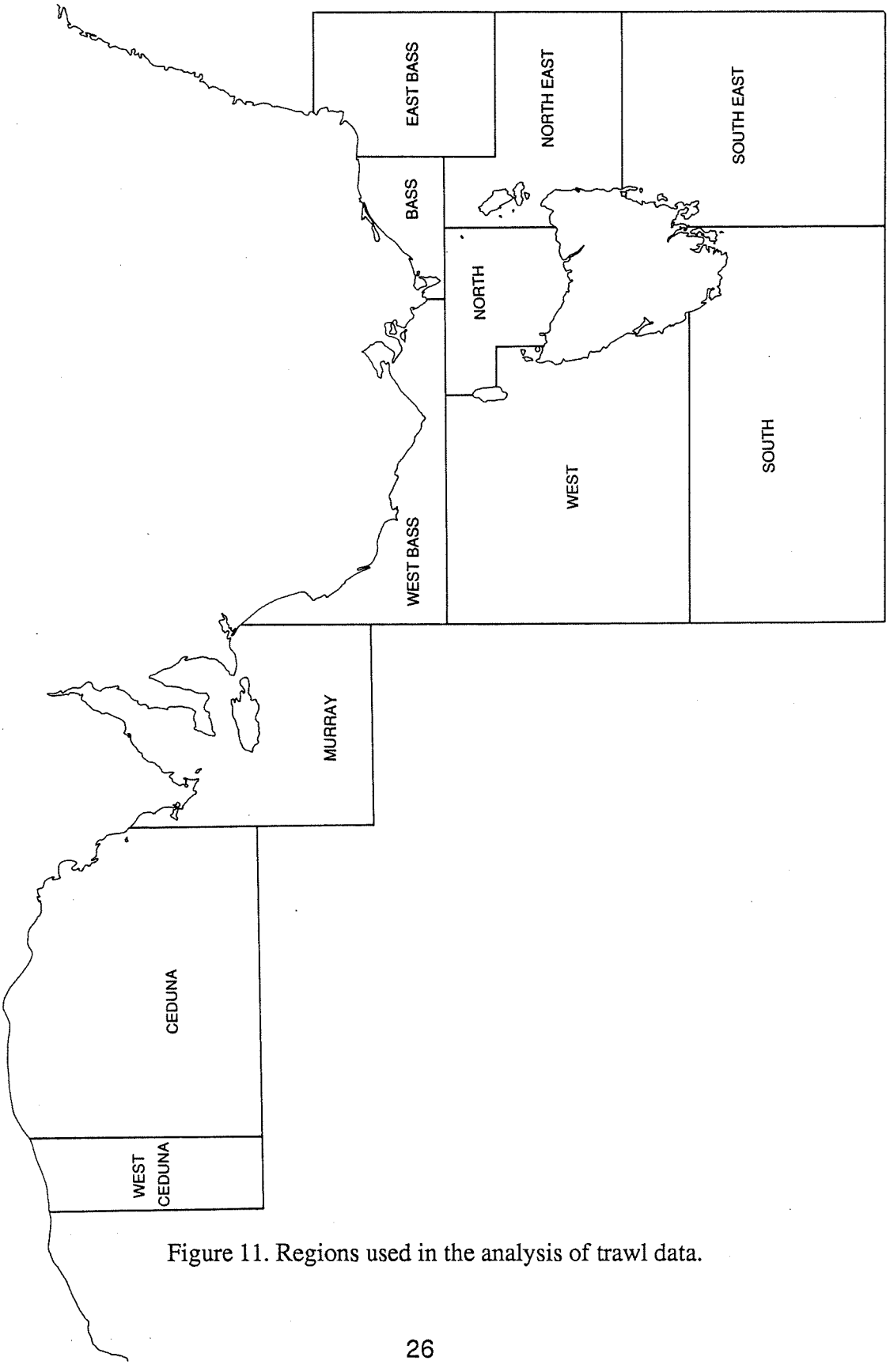

Figure 11. Regions used in the analysis of trawl data.