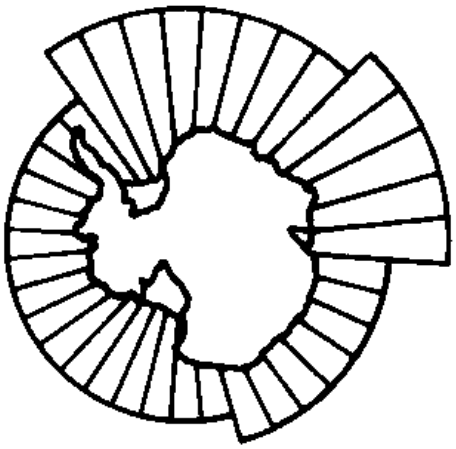
COMMISSION FOR THE CONSERVATION
OF ANTARCTIC MARINE LIVING RESOURCES

SCHEME OF INTERNATIONAL SCIENTIFIC OBSERVATION



SCIENTIFIC OBSERVERS MANUAL

(OBSERVATION GUIDELINES AND REFERENCE MATERIALS)

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AUSTRALIA

- COMMISSION FOR THE CONSERVATION OF ANTARCTIC MARINE LIVING RESOURCES
- COMMISSION POUR LA CONSERVATION DE LA FAUNE ET LA FLORE MARINES DE L'ANTARCTIQUE
- КОМИССИЯ ПО СОХРАНЕНИЮ МОРСКИХ ЖИВЫХ РЕСУРСОВ АНТАРКТИКИ
- COMISIÓN PARA LA CONSERVACIÓN DE LOS RECURSOS VIVOS MARINOS ANTÁRTICOS

This manual is produced in the official languages of the Commission: English, French, Russian and Spanish. Copies are available from the CCAMLR Secretariat at the address below.

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INTRODUCTION

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), at its 1992 Meeting, adopted a Scheme of International Scientific Observation as required under Article XXIV of the Convention. The Scheme is designed to gather and validate scientific information essential for assessing the status of populations of Antarctic marine living resources and for assessing the impact of fishing on those populations and populations of related and dependent species. The Scheme is applied equally to harvesting and research vessels.

In order to assist CCAMLR Members and their observers in planning observation programs and recording data, the CCAMLR Secretariat, in consultation with the Scientific Committee and its working groups, has developed this *Scientific Observers Manual*. The manual contains a number of guidelines for scientific observations and reference materials.

At its meeting in 2005, the Scientific Committee approved the recommendation from the Working Group on Fish Stock Assessment (WG-FSA) that the observer logbook forms and instructions be removed from the manual and made available in electronic format. Accordingly, the logbook data recording and reporting sheets and instructions are now available from the CCAMLR website (www.ccamlr.org/pu/e/sc/obs/logbooks.htm) or by contacting the Secretariat.

PART 1

PLANNING SCIENTIFIC OBSERVATIONS

SECTION 1

TEXT OF THE CCAMLR SCHEME OF INTERNATIONAL SCIENTIFIC OBSERVATION

TEXT OF THE CCAMLR SCHEME OF INTERNATIONAL SCIENTIFIC OBSERVATION[1]

A. Each Member of the Commission may designate observers referred to in Article XXIV of the Convention.

(a) Activities of scientific observers on board vessels will be specified by the Commission. These activities are laid down in Annex I and may be modified taking into account advice from the Scientific Committee.

(b) Scientific observers shall be nationals of the Member who designates them and shall conduct themselves in accordance with the customs and order existing on the vessel on which they are operating.

(c) Members shall designate scientific observers who shall be familiar with the harvesting and scientific research activities to be observed, the provisions of the Convention and the measures adopted under it and who are adequately trained to carry out competently the duties of scientific observers as required by the Commission.

(d) Scientific observers shall be able to communicate in the language of the Flag State of the vessels on which they carry out their activities.

(e) Scientific observers shall each carry a document issued by the designating Member in a form approved by the Commission identifying them as CCAMLR scientific observers.

(f) Scientific Observers shall submit to the Commission through the designating Member, not later than one month after the completion of the observer cruise or after the return of the observer to his/her home country, a report of each observation assignment undertaken, using the observation formats approved by the Scientific Committee. A copy shall be sent to the Member whose vessel was involved.

B. In order to promote the objectives of the Convention, Members agree to take on board their vessels engaged in scientific research or harvesting of marine living resources designated scientific observers, who shall operate in accordance with bilateral arrangements concluded.

In such a bilateral arrangement, the Member wishing to place scientific observers on board a vessel of another Member shall be referred to as the 'Designating Member' whilst the Member who accepts on board its vessel shall be referred to as the 'Receiving Member'.

Such a bilateral arrangement shall include the following principles:

(a) The scientific observers shall be given the status of ship's officers. Accommodation and meals for scientific observers on board shall be of a standard commensurate with this status.

(b) Receiving Members shall ensure that their vessel operators cooperate fully with the scientific observers to enable them to carry out the tasks assigned to them by the Commission. This will include access to data and to those operations of the vessel necessary to fulfil the duties of a scientific observer as required by the Commission.

[1] As adopted at CCAMLR-XI (paragraph 6.11) and amended at CCAMLR-XVI (paragraph 8.21).

(c) Receiving Members shall take appropriate action on board their vessels to ensure the security and welfare of scientific observers in the performance of their duties, provide them with medical care and safeguard their freedom and dignity.

(d) Arrangements shall be made for messages to be sent and received on behalf of scientific observers using the vessel's communications equipment and operator. Reasonable costs of such communications shall normally be borne by the Designating Member.

(e) Arrangements involving the transportation and boarding of scientific observers shall be organised so as to minimise interference with harvesting and research operations.

(f) Scientific observers shall provide to the relevant masters copies of such records, prepared by the scientific observers, as the masters may wish to retain.

(g) Designating Members shall ensure that their scientific observers carry insurance satisfactory to the Parties concerned.

(h) Transportation of scientific observers to and from boarding points shall be the responsibility of the Designating Member.

(i) Unless otherwise agreed the equipment, clothing and salary and any related allowances of a scientific observer shall normally be borne by the Designating Member. The vessel of the Receiving Member shall bear the cost of on board accommodation and meals of the scientific observer.

C. The Designating Members shall provide details of observation programs to the Commission at the earliest possible opportunity and no later than upon the conclusion of each bilateral arrangement. For each observer deployed, the following details shall be supplied:

(a) date of signing the arrangement;

(b) name and flag of the vessel receiving the observer;

(c) Member designating the observer;

(d) area of fishing (CCAMLR statistical area, subarea, division);

(e) type of data to be collected by the observer and submitted to the Secretariat (e.g. by-catch, target species, biological data);

(f) expected dates of the start and end of the observation program; and

(g) expected date of returning the observer to his/her home country.

D. Members who have designated scientific observers will take the initiative in implementing assignments identified by the Commission.

E. The scope of functions and tasks described in Annex I should not be interpreted to suggest in any way the number of required observers which will be accepted on board a vessel.

ANNEX I

FUNCTIONS AND TASKS OF INTERNATIONAL SCIENTIFIC OBSERVERS ON BOARD VESSELS ENGAGED IN SCIENTIFIC RESEARCH OR HARVESTING OF MARINE LIVING RESOURCES

1. The function of scientific observers on board vessels engaged in scientific research or harvesting of marine living resources is to observe and report on the operation of fishing activities in the Convention Area with the objectives and principles of the Convention for the Conservation of Antarctic Marine Living Resources in mind.

2. In fulfilling this function, scientific observers will undertake the following tasks, using the observation formats approved by the Scientific Committee:

(i) record details of the vessel's operation (e.g. partition of time between searching, fishing, transit etc., and details of hauls);

(ii) take samples of catches to determine biological characteristics;

(iii) record biological data by species caught;

(iv) record by-catches, their quantity and other biological data;

(v) record entanglement and incidental mortality of birds and mammals;

(vi) record the procedure by which declared catch weight is measured and collect data relating to the conversion factor between green weight and final product in the event that catch is recorded on the basis of weight of processed product;

(vii) prepare reports of their observations using the observation formats approved by the Scientific Committee and submit them to CCAMLR through their respective authorities;

(viii) submit copies of reports to captains of vessels;

(ix) assist, if requested, the captain of the vessel in the catch recording and reporting procedures;

(x) undertake other tasks as may be decided by mutual agreement of the parties involved;

(xi)[1] collect and report factual data on sightings of fishing vessels in the Convention Area, including vessel type identification, position and activity; and

(xii)[2] collect information on fishing gear loss and garbage disposal by fishing vessels at sea.

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1 Added in accordance with CCAMLR-XVII (paragraph 8.16). The Commission decided to review the effectiveness and the need to continue this activity after a two-year trial period (CCAMLR-XVII, paragraph 8.17).

2 Added in accordance with CCAMLR-XVIII (paragraph 8.21).

SECTION 2

LIST OF CURRENT RESEARCH PRIORITIES IDENTIFIED BY THE SCIENTIFIC COMMITTEE FOR CONDUCTING SCIENTIFIC OBSERVATIONS ON COMMERCIAL FISHING VESSELS

LIST OF CURRENT RESEARCH PRIORITIES IDENTIFIED BY THE SCIENTIFIC COMMITTEE FOR CONDUCTING SCIENTIFIC OBSERVATIONS ON COMMERCIAL FISHING VESSELS

The list below represents priority research tasks which have been defined and are kept under periodical review by the Scientific Committee. Scientific observers are not required to conduct the full set of tasks defined below. The list of tasks actually undertaken by an observer should conform with the scientific objectives of bilateral arrangements between Members designating and receiving scientific observers, and depends on the type of the vessel, the number of observers involved and their professional skills.

1. Fishery for *Champsocephalus gunnari*:

   (i) representative length-frequency distributions
   (ii) observations on sex and maturity stage
   (iii) collection of otoliths for age determination
   (iv) observations of the by-catch of other species
   (v) the incidental mortality of predators (birds and seals).

2. Longline fishery for *Dissostichus eleginoides*:

   (i) representative length frequency distributions;

   (ii) observations on sex and maturity stage;

   (iii) collection of otoliths and scales for age determination;

   (iv) loss rate of fish from hooks during longline hauling; catching performance of different hook sizes and types; observations on the condition of fish on capture (for tagging experiments);

   (v) monitoring of total incidental mortality of seabirds by species, sex and age;

   (vi) assessment of seabird mortality per unit of fishing effort and relative vulnerability of different species;

   (vii) collection of bird bands and notification of other study markings;

   (viii) evaluation of the efficacy of mitigation measures;

   (ix) investigation of the practicalities of the implementation of different mitigation measures;

   (x) weighing a sample of longline weights while the vessel is alongside the wharf.

3. Fishery for *Electrona carlsbergi*:

   (i) observations of fishing operations
   (ii) observations of the by-catch of other species

4. Fishery for *Euphausia superba* including by-catch of fish:

   (i) observations of fishing operations
   (ii) collection of haul-by-haul catch and effort data
   (iii) representative length frequency distributions
   (iv) representative sex and maturity stage distributions
   (v) observations on feeding intensity
   (vi) observations of the by-catch of juvenile fish
   (vii) observations of incidental mortality of predators (birds and seals).

5. Fishery for *Paralomis* spp. (stone crabs):

   (i) observations of fishing operations
   (ii) collection of haul-by-haul catch and effort data
   (iii) representative length frequency distributions
   (iv) representative sex and maturity stage distributions
   (v) collection of samples of ovaries and eggs
   (vi) representative length frequency distributions by sex and maturity stages from catches of bottom trawls (bottom trawl surveys).

SECTION 3

DATA COLLECTION AND SAMPLING REQUIREMENTS FOR CONDUCTING SCIENTIFIC OBSERVATIONS ON COMMERCIAL FISHING VESSELS

DATA COLLECTION AND SAMPLING REQUIREMENTS FOR CONDUCTING SCIENTIFIC OBSERVATIONS ON COMMERCIAL FISHING VESSELS

Details of the vessel's fishing operations, oceanographic and weather information should be collected for each haul of a trawl, drift of a jig or set of a longline or pot string.

2. Information on the ship's activities (in particular, during krill fishing) could be collected daily by the observer at 20 randomly-selected intervals over the whole of the observation period. A list of standard activities carried out on board the vessel could be drawn up by the observer to be recorded against each time interval, including such activities as fishing, processing of catch, searching for krill aggregations, etc. An example of a timesheet for collection of random samples over the month is given in Table 1.

3. Observers should record details of the movements of birds and mammals including observations of their migratory movements and behaviour in relation to fishing operations. These observations need not be restricted to periods during which fishing is carried out but should be noted as the opportunity arises.

4. Details of the incidental mortality of seabirds and mammals and of the by-catch of fish other than the target species and other marine organisms in fishing operations, should be recorded for each haul of a trawl, drift of a jig or set of a longline or pot string.

5. Due to the technical complexities involved in recording data on incidentalmortality of seabirds, two scientific observers, including one international observer, should be present on longline vessels for this purpose whenever this is logistically possible. Members are encouraged to put this advice into practice in appropriate circumstances.

6. Biological samples from commercial species should be taken by sampling randomly from the catch. Demographic information should be recorded in as much detail as possible from as many hauls as possible. As a guideline:

(i) for the krill fishery, length measurements should be taken from at least 100 krill should be taken from as many hauls per day as possible;

(ii) for commercial species of fish, a representative sample of fish of each species caught should be measured from as many hauls per day as possible. In addition, as many specimens of other non-commercial species of fish in a by-catch as possible should be measured; and

(iii) for the crab fishery, length measurement, determination of sex, maturity and relative carapace age of at least 100 specimens per day should be carried out.

7. In addition to length, the following should be recorded:

- for krill - sex and maturity stages for 100 specimens; or
- for fish - weight, sex, maturity and age of 100 specimens.

8. In the krill fishery, samples of the catch should be taken specifically to determine the levels of by-catch of young fish. As many hauls as possible should be analysed for the presence of juvenile and post-larval fish.

9. An agreement on the fate of data and samples, and plans for their analysis, should be considered at the initiation of observer arrangements by Members designating and receiving observers. Where neither Designating nor Receiving Member is able to process samples in a timely fashion, consideration should be given to sending them elsewhere for processing.

10. All data from observer programs which could be entered into existing CCAMLR databases should be submitted to CCAMLR. A copy of all other data from observer programs should also be lodged with the Secretariat where it will be kept as a hard copy only. All data from observer programs submitted to CCAMLR would be subject to the CCAMLR rules on data access which are given in Section 6 of Part I.

Table 1: CCAMLR Observer Program. Random times of day to be used when recording krill fishing vessel activity. Activity type should be recorded in the boxes provided. Note: Observers are encouraged to use other series of random time whenever possible.

Activity codes:

F = Fishing (haul in progress)
S = Vessel searching/steaming
P = Vessel stopped while processing of previous catch is completed
A = Vessel stationary either at anchor or hove to
T = Transhipping catch
R = Vessel repositioning in preparation for next haul
L = Passage to or from fishing grounds
TS = Trawl setting
TH = Trawl hauling
SR = Combined search and repositioning

day 1		2		3		4		5		6		7		8		9		10	
date:		date:		date:		date:		date:		date:		date:		date:		date:		date:	
0:51		0:49		0:23		0:17		0:18		0:57		1:51		0:51		1:07		0:02	
1:12		2:37		1:13		0:28		0:26		1:55		2:01		3:33		2:36		2:36	
2:18		2:46		4:40		1:36		2:08		2:49		2:49		4:24		3:06		3:15	
3:17		4:23		6:41		3:45		2:12		3:17		3:08		5:50		3:18		3:29	
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8:17		8:41		8:02		8:24		7:41		8:38		5:13		14:59		6:45		10:28	
10:36		8:57		8:39		10:25		8:17		8:49		7:13		15:55		7:13		10:29	
10:40		9:30		9:04		10:28		9:47		13:22		8:35		16:10		7:36		11:16	
11:35		10:43		10:46		11:38		10:53		14:02		8:58		17:26		7:39		11:19	
11:47		10:54		13:21		15:12		15:16		14:49		9:06		17:50		11:00		11:35	
12:43		11:42		13:33		16:03		16:25		14:58		9:46		18:58		14:42		11:51	
13:09		12:10		14:20		16:48		17:01		15:11		12:13		19:53		16:20		14:32	
13:23		15:32		15:53		17:37		17:19		18:47		15:31		19:56		16:48		17:12	
16:22		15:51		17:55		20:02		18:05		22:17		17:41		20:14		17:35		18:09	
18:14		16:22		19:14		21:47		18:47		22:59		18:56		21:02		17:46		18:50	
19:10		18:26		20:27		22:11		19:43		23:07		18:57		21:27		17:56		20:48	
20:09		19:20		23:22		22:14		20:16		23:35		19:02		21:30		19:07		21:50	
21:34		20:12		23:56		23:12		20:57		23:56		23:20		23:38		21:12		23:15	

Table 1 (continued)

day																					
11		12		13		14		15		16		17		18		19		20	
date:		date:		date:		date:		date:		date:		date:		date:		date:		date:	
0:18		0:09		0:21		0:23		1:03		1:07		0:38		0:18		1:41		1:26	
2:39		0:17		0:29		1:40		1:07		1:42		1:01		2:27		2:18		3:45	
3:34		0:44		0:49		2:51		2:11		2:46		1:33		5:38		3:22		4:02	
3:41		3:02		3:55		3:15		2:37		2:56		3:07		10:12		4:36		4:22	
5:28		3:58		4:03		3:41		3:02		6:22		3:08		13:34		4:40		5:02	
6:44		5:27		4:03		4:04		3:14		8:36		8:41		15:32		4:51		5:28	
6:49		7:18		5:25		4:19		4:46		8:55		9:12		15:45		5:18		5:39	
7:42		10:42		7:27		4:42		7:01		9:39		10:04		16:18		8:26		12:34	
9:30		10:45		8:08		4:58		7:52		11:34		10:58		16:43		9:08		13:19	
10:29		12:37		9:44		6:34		9:21		11:46		11:30		18:26		9:22		13:32	
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11:26		13:54		12:45		10:59		11:03		15:23		12:48		20:32		11:29		14:14	
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21:09		23:12		22:33		21:07		20:29		23:03		22:50		23:27		23:15		21:42	
22:06		23:32		23:31		23:54		21:18		23:17		23:18		23:34		23:50		22:03	

Table 1 (continued)

day																					
21		22		23		24		25		26		27		28		29		30		31	
date:		date:		date:		date:		date:		date:		date:		date:		date:		date:		date:	
0:58		0:19		1:08		0:05		0:48		1:57		0:04		1:55		0:27		0:32		0:32	
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23:28		23:32		23:38		21:56		20:48		22:39		23:17		23:53		23:14		21:39		23:58	

SECTION 4

RECORDING AND REPORTING RESULTS OF SCIENTIFIC OBSERVATIONS ON COMMERCIAL FISHING VESSELS

RECORDING AND REPORTING RESULTS OF SCIENTIFIC OBSERVATIONS ON COMMERCIAL FISHING VESSELS

GENERAL

Scientific observers designated in accordance with the CCAMLR Scheme of International Scientific Observation are required to complete Scientific Observer Logbooks.

2. The scientific observer data forms combine records of a vessel's fishing operations, target species, by-catch, incidental mortality of seabirds and interactions between marine mammals and fishing operations.

3. A set of forms for recording this information is included in Part II of this manual. It is the responsibility of the observer to ensure that for each cruise he/she has sufficient quantities of all forms and all pertinent reference materials from Parts III and IV of this manual.

- **Longline:** **Form L1**, 'Vessel and Observation Program Details', should be completed once, with some data fields on the form to be completed at the beginning and others at the end of the observation program. Observers should have several copies of **Form L2**, 'Fishing Description'. In general, this form should be completed once at the beginning of the cruise, unless the vessel changes from one type of longline gear to another, e.g. from double-line 'Spanish' longline to single-line gear, or if substantial changes have been made to the design of the bird-scaring device (i.e. streamer line). Where this is the case, the new fishing gear and streamer line should be described on a new form. **Form L3**, 'Daily Work Schedule of Observer', is for recording data several times during the cruise (completion is optional). **Forms L4**, 'Daily Setting Observations', **L5**, 'Daily Hauling Observations', and **L6**, 'Biological Data Collection', should be completed for every set and haul. If there are no observations made, details on the setting and hauling (L4(ii) and L5(ii)) should still be collected. **Form L7**, 'Conversion Factors', should be completed when appropriate (see instructions).

- **Trawl:** **Form T1**, 'Vessel and Observer Program Details', should be completed once, with some data fields on the form to be completed at the beginning and others at the end of the observation program. **Form T2**, 'Fishing Gear and Processing Details', is designed to collect information on up to six different trawl designs, if the vessel exceeds this number, more forms should be completed. **Form T3**, 'Trawl Details' – details on every trawl made should be recorded on this form, each form can accommodate up to five complete trawls. **Forms T4,** 'Length and Sex Composition', **T5**, 'Otolith / Scale Samples' and **T6**, 'Maturity and Age Determination for Finfish', are to be used for the collection of biological information and should be completed in accordance with the priorities outlined in each observer's program. **Form T7**, 'Conversion Factors', should be completed when appropriate (see instructions).

- **Squid:** **Form S1**, 'Vessel and Observer Program Details', should be completed once, with some data fields on the form to be completed at the beginning and others at the end of the observation program. **Form S2**, 'Catch Information', should be completed for every drift. **Form S3**, 'Biological Data', is to be used for the collection of biological data and should

be completed in accordance with the priorities outlined in each observer's program. **Form S4**, 'Conversion Factors', should be completed when appropriate (see instructions).

4. Upon the completion of the observation program, the observer should submit completed cruise logs, a summary report, samples of fishing gear (e.g. hooks or jigs) and biological samples to the technical coordinator of the scientific observer program of the country which nominated the observer. An outline of information to be included in scientific observer summary reports to CCAMLR is given in Part 1, Section 5 of this manual. It is the responsibility of the technical coordinator to forward copies of these documents to CCAMLR, together with information on the final destination of collected samples.

THE FUNCTIONS AND TASKS OF SCIENTIFIC OBSERVERS

5. The list of current research priorities identified by the Scientific Committee for scientific observations on commercial fishing vessels is given in Part I, Section 2.

6. Table 1 represents priority research tasks for observations on board longline vessels. These tasks have been defined by the CCAMLR Scientific Committee and are kept under periodical review. Scientific observers are not necessarily required to carry out all the tasks listed. The actual list of tasks undertaken by an observer should conform with the scientific objectives of bilateral arrangements between designating Members and Members receiving the scientific observer, and depends on the type of vessel on which observation is undertaken, the number of observers involved and their professional skills.

Table1: Priorities for CCAMLR scientific observers on board longline fishing vessels.

Priority	Form*	Description
High	L5(vi)	As many length measurements of fish as possible per haul, not exceeding 60.
High	L5(vii)	Fish sex and maturity information.
High	L5(v)	Monitoring the incidental mortality of seabirds. Collecting and recording of bird band information.
High	L2(ii)	Description of streamer lines used.
High	L4(iv)	Information on whether the streamer line was used during every longline set.
Medium	L5(viii)	Estimation of commercial and by-catch species in numbers and weight, per number of hooks observed for each set.
Medium	L5(viii)	Recording fish discards (both target and by-catch species) per number of hooks observed for each set.
Medium	–	Evaluation of the efficiency of mitigation measures.
Medium	L5(vii)	Collection of fish scales and otoliths for age determination.
Medium	L4(iv)	Monitoring the location and time of offal discharge.
Low	L5(v)	Retaining (whole or head and leg) samples of birds for age and species identification.
Low	L5(iv)	The estimation of the number of fish per haul damaged during interaction with marine mammals.
Low	L5(ii)	Estimation of the number of hooks lost.

* See Part II of this manual for forms.

7. Whenever possible, two scientific observers should be present on each vessel. Ideally, one observer should record the seabird data and the other the relevant data on fish and fishing operations. The observer who undertakes the fish-related observations during a voyage, which will principally occur during line hauling, can also accomplish some aspects of seabird data collection. Similarly, the seabird observer can also assist in the collection of fish-related data required during line setting observations.

8. As regards the collection of seabird data, the highest priorities for a single scientific observer are as follows:

(i) observation of the whole of any longline setting and hauling operation (or parts thereof), together with the appropriate complete records of the number and species of seabirds caught;

(ii) observation of at least 50% of the line hauling process, ideally divided into periods covering the early, middle and late stages, with a record of the times and numbers of hooks observed and the appropriate complete record of the species of seabirds caught;

(iii) the retention and labelling of whole specimens from the by-catch (in priority order – albatrosses, giant petrels, white-chinned petrels);

(iv) documentation of the streamer line used; and

(v) documentation of the location and timing of offal discharge.

OPERATIONAL PROCEDURE

9. Observers must complete every field of their daily data sheets accurately; this will entail observations during all parts of the fishing operation. It should be remembered that the usefulness of an observer's work relies on his/her recording the duration of observation periods, the actual time at which events occur and on precise knowledge of fishing operations (e.g. the number of baited hooks set, the number of hooks hauled and the observed number of hooks hauled).

10. On all forms, observed data refers to data collected by the **observer personally**. No data derived from the crew should be included unless verified by the observer (e.g. the setting positions from the track plotter). Data reported by the crew should be supplied separately or noted on cruise log forms.

SPECIAL DEFINITIONS AND TERMS

11. Certain terms are used throughout the scientific observer data forms to describe the various fishing processes. The event of fishing with one longline once is called a single longline **set**. This single set is made up of three phases: **setting** the line (paying out the line with baited hooks attached), fishing (the time between setting and hauling, frequently referred to as 'soak' time) and **hauling** the line (taking the line back into the vessel, and removing fish from hooks). For the trawl fishery, a **trawl** refers to the act of setting, towing and hauling the gear. For the squid fishery, a **drift** refers to a jigging operational period where the jigs are in use.

12. A **streamer line** refers to any bird-scaring device which consists of a pole and long section of line with streamers attached. This is positioned over the stern during

longline setting. This type of gear has also been described in other publications as 'tori pole', 'bird line' or 'pole and line'. The CCAMLR streamer line is the design adopted by CCAMLR. Its configuration is given in Part III, Section 12.

TIME ZONE

13. It is very important that each observer maintains a constant time frame during the cruise. Because vessels move around the ocean through varying time zones, and because local time zones vary due to the imposition of daylight saving, etc., observers are required to nominate the time zone they will use when completing their logs. It is usually most convenient to use the time zone that the vessel is using, irrespective of whether the vessel is actually in that time zone. The time zone used must be specified on the 'Vessel and Observation Program Details' form, and must be specified in the number of hours by which this time zone differs from GMT (refer to map of World Time Zones in Part IV, Section 2). For instance, the time zone for South Georgia Island would be specified as GMT-3 hrs.

UNITS

14. If units of measurement are specified beside a data field, care should be taken to record the information in those units, and also in the format indicated. If this is not possible, the field should be highlighted and the units used documented to enable conversion to be carried out later.

GENERAL FORMATS

15. The following formats are used throughout the log:

Field	Format	Explanation
Date	ddmmyy	d = day, m = month, y = year
Time	hhmm	h = hours, m = minutes
Latitude and Longitude	dddmm H	d = degrees, m = minutes, H - hemisphere (i.e. S, E or W)

OBSERVATION GUIDELINES AND SPECIES IDENTIFICATION

16. A set of guidelines for scientific observation in the CCAMLR Convention Area is given in Part III of this manual. For identification of seabirds, observers may refer to the seabird identification plates contained in the book *Fish the Sea Not the Sky* (CCAMLR, 1996), *Identification of Seabirds of the Southern Ocean* (Onley and Bartle, 1999), or any of the many species identification handbooks which are available. For identification of whales and seals, see other available publications, e.g. Volume II of the FAO/CCAMLR Species Identification Sheets for the CCAMLR Convention Area (Fischer, W. and J.-C. Hureau (Eds), 1985).

SECTION 5

SCIENTIFIC OBSERVER CRUISE REPORT

The cruise report has been deleted from this manual and is now available only in electronic format. The document may be obtained from the CCAMLR website (www.ccamlr.org/pu/e/sc/obs/logbooks.htm) or by contacting the Secretariat's Scientific Observer Data Analyst (eric@ccamlr.org).

SECTION 6

RULES FOR ACCESS AND USE OF CCAMLR DATA

RULES FOR ACCESS AND USE OF CCAMLR DATA

The following Rules for Access and Use of CCAMLR Data were adopted by the Twenty-Second Meeting of the Commission (CCAMLR-XXII, paragraphs 12.1 to 12.6)*:

It is recognised that:

1. All data submitted to the CCAMLR Secretariat, and maintained by the CCAMLR Data Centre, shall be freely available to Members for analysis and preparation of documents for the Commission, Scientific Committee and their subsidiary bodies.

2. Such data may be analysed in respect of:

   (a) work specifically outlined and endorsed by the Commission or Scientific Committee;

   (b) work not specifically endorsed by the Commission or the Scientific Committee.

3. Inclusion of data, analyses or results from data held in the CCAMLR Data Centre into Working Papers, Background Papers, and any other documents tabled at meetings of the Commission, Scientific Committee or one of their subsidiary bodies does not constitute publication and therefore is not a release into the public domain.

4. Inclusion of data held in the CCAMLR Data Centre into the published reports of the Commission, Scientific Committee, Working Groups, *CCAMLR Science*, the *Statistical Bulletin* or any other CCAMLR publication constitutes release into the public domain.

5. Inclusion of data held in the CCAMLR Data Centre in any publication outside CCAMLR constitutes release into the public domain.

6. Subject to paragraphs (1) to (3), originators/owners of data have the right to:

   (a) be consulted (including assignation of authorship) on the preparation, if necessary including publication, of documents describing analyses and interpretation of their data;

   (b) approve the level of detail revealed in documents using their data;

   (c) stipulate terms and/or levels of data security if necessary.

* These rules replace those adopted at the Eleventh Meeting of the Commission (CCAMLR-XI, paragraph 4.35). The current 'Rules for Access to CDS Data' (CCAMLR-XIX, paragraph 5.23) should remain in place alongside the new standard rules until such times as all aspects of CDS data handling are duly taken into account in the new standard rules (CCAMLR-XXII, paragraph 7.22).

Accordingly,

7. Requests to the Secretariat for access and/or use of data maintained by the CCAMLR Data Centre by individual Member scientists/officials shall be approved in writing as appropriate by that Member's Commission Representative, Scientific Committee Representative, or CDS Officer in consultation with the Commission Representative. Members are responsible for informing individual scientists or individuals requesting data of the rules governing access and use of CCAMLR data and for obtaining agreement to comply with such rules.

8. Requests in support of analyses endorsed under (2)(a) above should include the type of data requested, the degree of data aggregation required, the spatial and temporal detail required, and the anticipated format to be used in presenting results of the analyses. For such requests, the Secretariat shall ensure that each request meets the conditions of the approval granted for the original endorsement, and, if so, release the data and inform the data owner(s)/originator(s) accordingly. Release of data by the Secretariat to the requestor does not constitute permission to publish or release data into the public domain. Such permission remains a matter to be determined between the requestor and the data originator(s).

9. Requests in support of non-endorsed analyses under (2)(b) above should include the information listed in (8) as well as details of the analytical procedures to be used and the opportunity for data owner(s)/originator(s) to be involved. For such requests, the Secretariat shall be satisfied that each request contains the required information before forwarding it to the data originator(s) for approval within a specified time period. Once approval has been received the Secretariat shall release the data. Release of data does not constitute permission to publish or for release into the public domain. Such permission remains a matter to be determined between the requestor and the data owner(s)/originator(s).

10. If approval for data release under (9) is not forthcoming within the specified period, the Secretariat shall initiate and facilitate consultation between the data requestor and data owner(s)/originator(s). The Secretariat shall not release data without the written approval of the data owner(s)/originator(s). Failure to achieve agreement shall be brought to the attention of the Scientific Committee and Commission.

11. The following statement shall be placed on the cover page of all Working Papers, Background Papers and any other papers tabled at meetings of the Commission, Scientific Committee or their subsidiary bodies:

> 'This paper is presented for consideration by CCAMLR and may contain unpublished data, analyses, and/or conclusions subject to change. Data in this paper shall not be cited or used for purposes other than the work of the CCAMLR Commission, Scientific Committee or their subsidiary bodies without the permission of the originators and/or owners of the data.'

PART II

LOGBOOK FORMS AND INSTRUCTIONS FOR RECORDING RESULTS OF SCIENTIFIC OBSERVATIONS ON COMMERCIAL FISHING VESSELS

The logbook forms and instructions have been deleted from this manual and are now available only in electronic format. The documents may be obtained from the CCAMLR website (www.ccamlr.org/pu/e/sc/obs/logbooks.htm) or by contacting the Secretariat's Scientific Observer Data Analyst (eric@ccamlr.org).

PART III

GUIDELINES FOR SCIENTIFIC OBSERVERS

SECTION 1

STANDARD MEASUREMENTS FOR KRILL, FISH, CRABS AND SQUID

STANDARD MEASUREMENTS FOR KRILL, FISH, CRABS AND SQUID

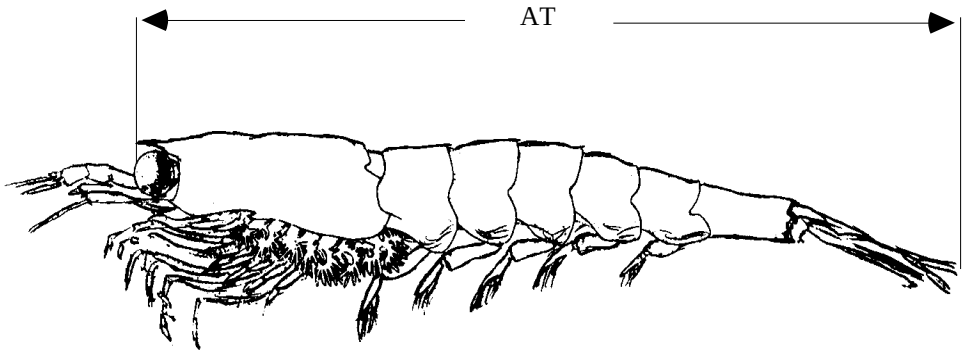


Figure 1: Measurement of total body length (AT) of krill caught during commercial fishing operations: front of eye to tip of telson, to the nearest millimetre below (SC-CAMLR-VIII, Annex 5, Appendix 10).

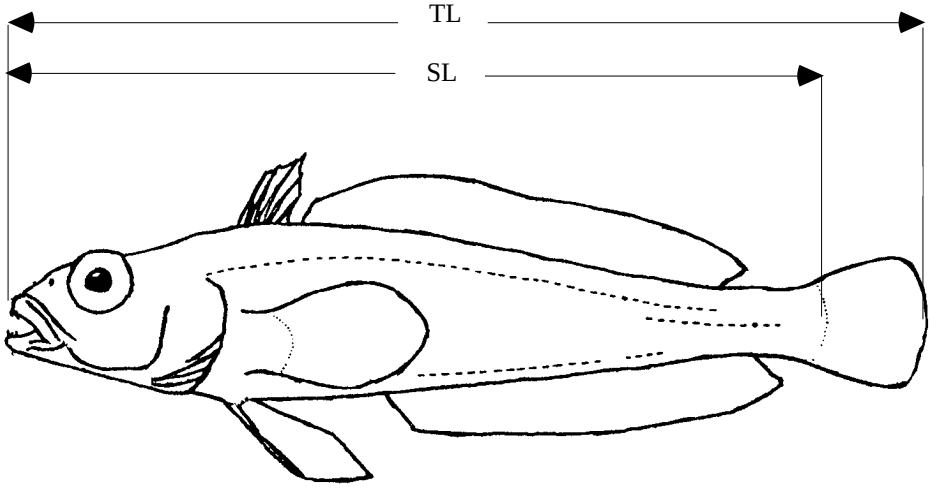


Figure 2: Standard body length measurements of fish: TL - Total Length is from the most anterior part of the snout to the most posterior part of the caudal fin when this fin is extended along the length of the body; SL - Standard Length is from the most anterior part of the snout to the end of the vertebral column (usually marked by a vertical groove in the caudal peduncle when it is flexed).

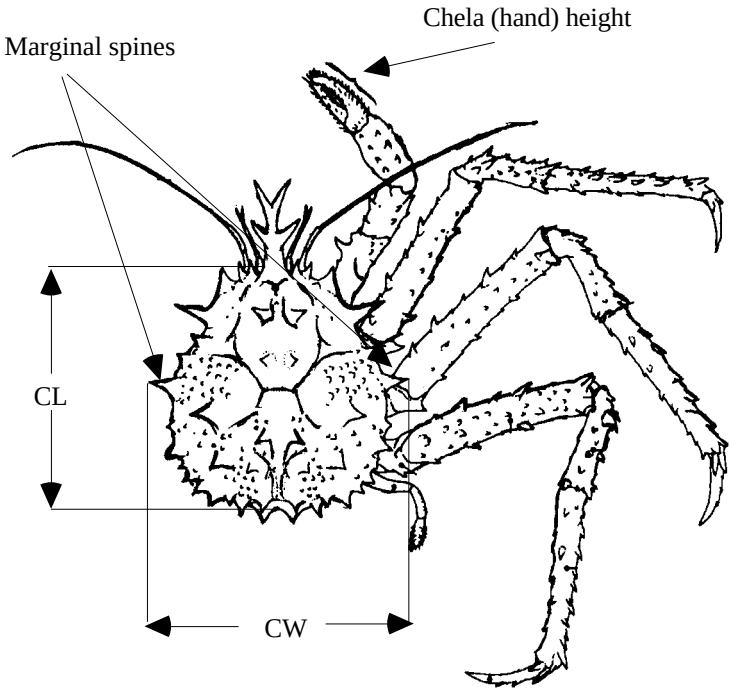


Figure 3: Standard carapace measurements of crab: CL - carapace length is from the posterior edge of the eye socket to median posterior carapace; CW - carapace width is the largest width across the carapace including marginal spines.

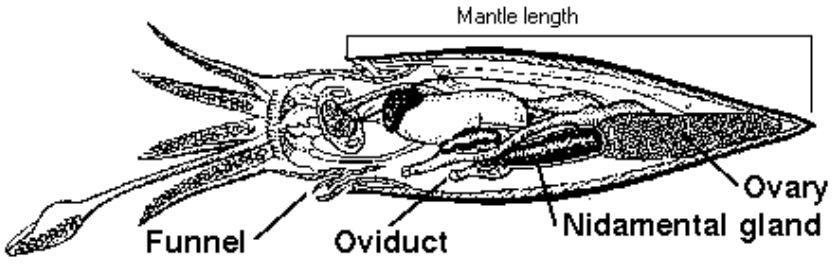


Figure 4: Location of the nidamental gland and the measurement position for mantle length.

SECTION 2

ASSESSMENT OF KRILL SIZE COMPOSITION

ASSESSMENT OF KRILL SIZE COMPOSITION

Taking measurements from a large number of specimens is not a difficult task, however certain rules must be observed in order to guarantee the representativeness of data obtained. First of all, it is essential that samples to be measured are taken properly. In order to obtain accurate data on krill size composition it is necessary to measure at least 100 krill, although this is by no means a set number and more than this number is usually measured. Before measuring begins, the entire sample is divided into subsamples (in half, in half again and so on until subsamples will contain about 200 krill each).

2. The standard measurement of krill (AT) is from the front of the eye to the tip of the telson, the thin, tapered triangular plate at the end of the abdomen.

3. Graph paper or a ruler with a scale of 1 mm is recommended for measuring krill. A size grouping of 1 mm should be used. A magnifying glass equipped with a light should be used when grouping krill by size. These groups are known as size classes. Measurements of individual krill are recorded in appropriate size class columns on the tally table. The appearance of clear maximum peaks in some size classes indicates that enough krill have been measured and that it is possible to stop measuring (i.e., there is no need to analyse the next subsample). If no clear peaks are evident measuring should be continued. However, if more than 300 specimens are measured and no peaks appear, measuring should be stopped. The absence of size peaks in such cases does not reflect a lack of material, but rather an especially complex size composition. There are special methods for assessing such samples which are not discussed in this manual.

4. Upon completion of measurements, the number of specimens in each size class is recorded and the total number of krill measured is calculated. It is also useful to represent the results of measurements as length frequency distribution curves or histograms.

5. The results thus obtained indicate the krill size composition of the catch. Maximum values on the length-frequency distribution correspond to the modal values of krill length. Sometimes when it is difficult to distinguish one modal class from the next most frequent classes (the number of specimens in each size class) these values can be included in a larger range. Size classes containing the smallest and largest specimens over the entire size range are also identified.

SECTION 3

KRILL FEEDING OBSERVATIONS

KRILL FEEDING OBSERVATIONS

Krill is a filter-feeder whose primary food is phytoplankton. Once inside the krill's body, the cell contents of algae colour the compartments of the digestive system green. The colour change of the liver is most striking, usually bright green in actively feeding krill. The contents of the intestinal tract of live, transparent krill are clearly visible. These factors make it possible to quickly determine feeding intensity of krill, indicators of which are colouration details of krill carapace and liver.

ANALYSIS OF KRILL BY ITS COLOURATION

2. Krill colouration should be determined by using the coloured illustrations (Figure 1) together with the description of krill colouration in Table 1. Carapace and liver colour, as well as liver transparency, are identified during the analysis.

The following points should be borne in mind when analysing krill colouration:

(i) only live or fresh krill should be used;
(ii) krill specimens should have no mechanical damage; and
(iii) sorting and analysis should be conducted in a cold, well-lit area immediately after the catch has been emptied from the trawl onto the deck.

3. Krill are arranged into colour groups against a white background. No less than 100 specimens are to be used. After sorting, krill of each type are counted. The group weight for each type is then determined.

4. The percentage of specimens belonging to each type is calculated using the following formula:

$$K_n = \frac{N_i}{N_s} \cdot 100 \qquad (1)$$

and the weight percentage of specimens of each type:

$$K_w = \frac{W_i}{W_s} \cdot 100 \qquad (2)$$

where K_n, K_w are the percentage of krill specimens of a given colour type in the sample by number and biomass respectively;
N_i, W_i are the number and biomass of krill specimens of a particular colour type in the sample; and
N_s, W_s are the overall number and biomass of krill in the sample.

Table 1: Krill colouration details (see Figure 1).

Plate Number	Carapace Colour	Liver Colour	Liver Transparency
I	red (pink)	colourless or slightly green	transparent
II	light green	light green	transparent
III	green	green	slightly transparent
IV	dark green	various shades of dark green	totally opaque

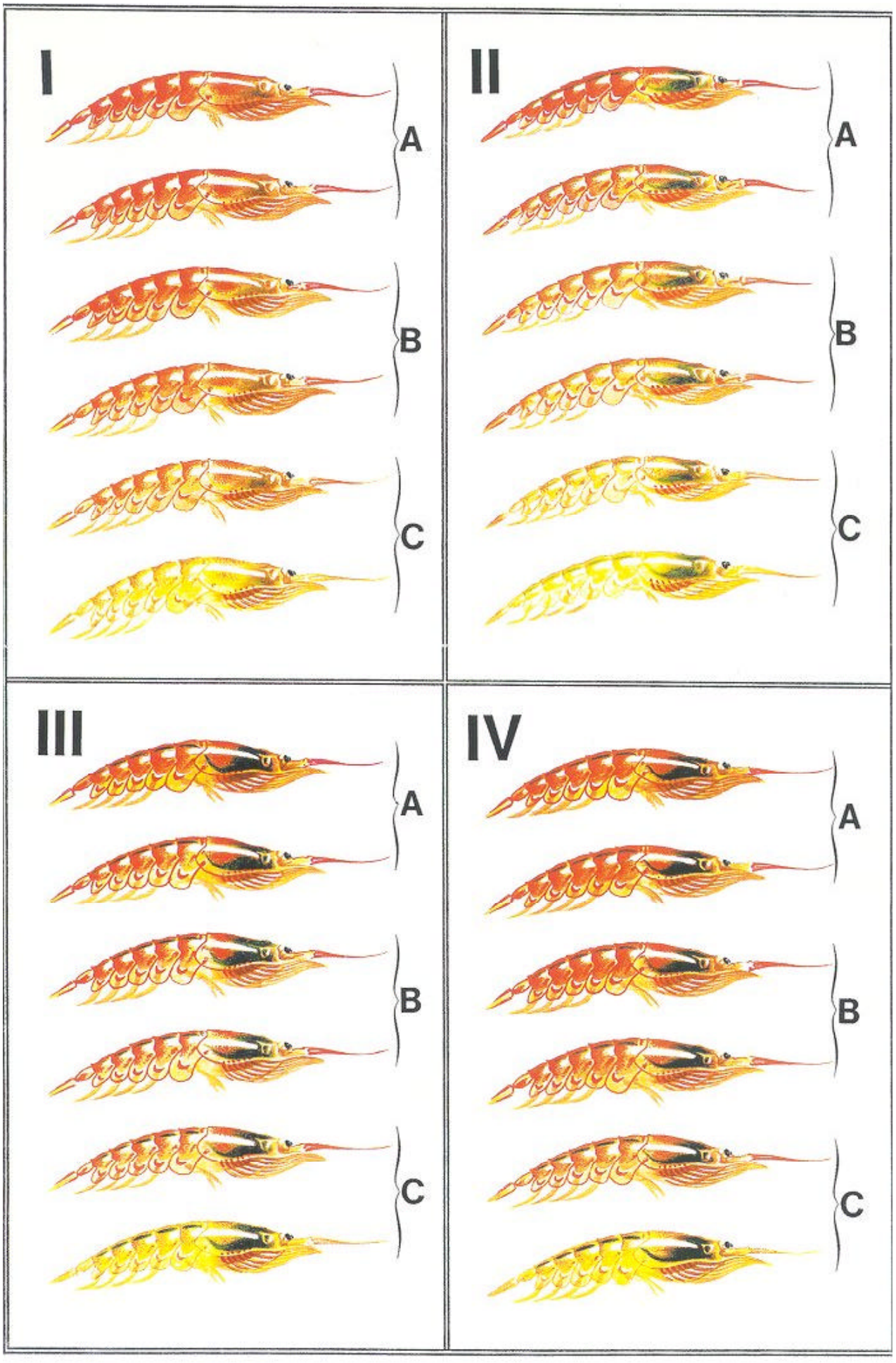


Figure 1: Chart of krill colouration types.
Figure 1: Planche des différentes colorations du krill.
Рисунок 1: Типы окраски криля.
Figura 1: Cuadro de las distintas coloraciones del kril.

SECTION 4

MATURITY STAGES OF KRILL

MATURITY STAGES OF KRILL

Features of sexual dimorphism which make it possible to distinguish males from females appear after krill have entered the final phase of maturation. Mature males and females are outwardly easily differentiated (Figure 1A and B). As a rule, females are not as brightly pigmented as males (especially in the thorax area). Sexually mature males have wider abdominal segments of a somewhat angular shape and stronger pleopods. As a rule, the carapace of males is shorter and the eyes larger.

2. Females have a thinner abdomen and a proportionally longer carapace. As the maturation process progresses to later stages, males acquire more distinguishing features. Females, by contrast, have the appearance of immature specimens until almost full maturation. After spawning, males lose features of sexual dimorphism and are often confused with females (if assessments are made only on the strength of outward appearance). Therefore, great care should be taken at first, and in the absence of the necessary experience it is advisable to examine internal reproductive organs of krill to ensure that the sex has been correctly determined.

3. The most distinguishing feature of maturing and mature female krill which can be detected with very little experience is the red spot in the ventral posterior region of the thorax, the thelycum. It is set a little back from the point at which the cephalothorax is separated from the abdomen. The male has a red-coloured formation known as the 'ampulla' in approximately the same place as the female, on the lower part of the body. This is where spermatophores develop. However, while the thelycum is a singular structure, the ampulla is a dual organ. Also, the ampullae are located at the very edge of the abdomen, whereas the thelycum is set slightly back from it. It should also be noted that the thelycum is situated at the base of the last pair of thoracic legs while the ampullae are near the extreme end of the thorax where there are no legs.

4. Note also that the thelycum is often not bright red but brownish in colour. The mature thelycum usually carries spermatophores which are generally empty. Spermatozoa are quickly transferred inside the thelycum. Only the brown tips of spermatophores are visible from the outside, which gives the thelycum a reddish-brown appearance. If spermatophores are still full, two white spots are clearly visible on the thelycum (on the rare occasion there may be more, for example four, six or even eight). Only the empty thelycum has a bright red pigmentation.

5. When one is in the initial stage of examining krill, a magnifying glass or binocular microscope should be used. Moreover, krill should be placed in water in a Petri dish. The thelycum, and especially the ampulla, are covered by gill fibres and are not immediately distinguishable.

6. On some occasions it may be difficult to identify sex, in which case dissection is required. The thelycum, for example, has no pigmentation in autumn or if it is analysed after being preserved, a process which causes krill to discolour. Apart from dissection, it is possible to sex fairly large specimens, primarily those which are in late stages of development, using slight magnification under a binocular microscope.

7. In the case of females, as we have already indicated, the thelycum is the main characteristic feature used in sex identification. Situated at the base of the last pair of thoracic legs, it has a tri-lobed structure (Figure 1F). The edges of these lobes are smooth in fully developed thelycum; the side lobes are slightly longer than the central one.

8. For males the corresponding feature is the presence of petasmae (Figure 1E). This dual organ appears as modified endopods of the first pair of pleopods.

DISTINGUISHING JUVENILES FROM MATURING MALES

9. As we have seen, the thelycum is used to differentiate maturing females from mature ones. However, we still have to distinguish males from juveniles. Some males can be identified by characteristics of sexual dimorphism. However, these features are only obvious in fully mature males, which necessitates the following procedure. Experience has shown that those specimens similar in size to females with a coloured thelycum are in fact males. By concentrating on the smallest specimens with a coloured thelycum (the lower size limit) it is possible to divide maturing males from females, ending up with two groups of krill of either sex. Krill which are smaller still and do not have a red spot on the thelycum are juveniles. The difference between juveniles and maturing krill is not always clear-cut since pigmentation of the thelycum varies in intensity (in less mature females the thelycum is pale pink). However an absolute delineation between maturing and completely immature specimens (juveniles) is not of primary importance for the purpose of assessing sex composition of catch samples.

10. Of course, if the necessity arises one can always sex specimens of any size under magnification. In this case, sorting is governed by the presence of petasmae. This organ in its various forms (stage of development) appears in males from approximately 28 mm in length. Beginning from this size, all specimens being sorted which do not have a petasma are females. The petasmae are usually folded back and tucked inside the plate of the swimming leg next to the lobes. Juveniles are easily identified as having no external sexual characteristics, either petasma or thelycum. Subadults or maturing krill will need to be identified under magnification.

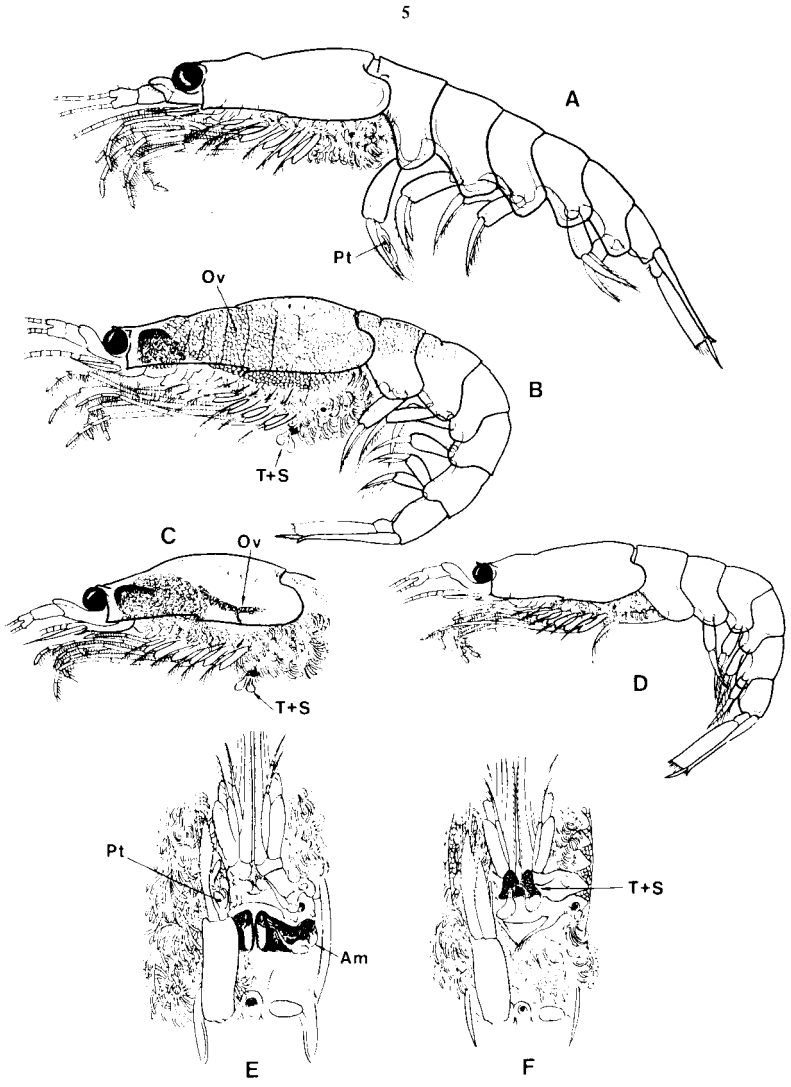


Figure 1: *Euphausia superba*. A - mature male (Stage IV); B - mature female, ready to spawn (Stage IV); C - newly spent female (Stage V); D - juvenile or adolescent (Stage I or II); E - ventral view of male with gills partly removed from one side; F - ventral view of female, with gills partly removed from one side. Am - ejaculatory duct; Ov - ovary; Pt - petasma; T+S = thelycum plus spermatophores (from *BIOMASS Handbook*, No. 11).

STAGES OF KRILL MATURITY (FRESHLY- CAUGHT ANIMALS)

11. Individuals within samples should be classified according to the following scheme (stages indicated in brackets are given according to Makarov and Denys, 1980):

Stages of krill maturity:

Maturity Stage	Males	Females
I. Juveniles	Secondary sexual characteristics are not visible. Krill at this stage usually can be sexed only by histological examination (I).	Secondary sexual characteristics are not visible. Krill at this stage usually can be sexed only by histological examination (I).
II. Beginning of maturation – Subadults	Petasma is not fully developed and usually feebly chitinised. Spermatophores in ejaculatory ducts are absent (IIA).	Thelycum is observed at different stages of the development, from not fully developed thelycum with bristles on lateral plates to fully developed thelycum. Spermatophores are rarely observed. Thorax is not swollen. Ovary has two rows of lobes in the front section. Ovary may be swollen. All oocytes are translucent and are of similar size (IIA-IIIA) .
III. Completion of maturation	Petasma is almost fully developed, however proximal wing of the inner lobe has no flattened knife-edge extension. Ampullae have small spermatophores having similar symmetric condyles (IIIA).	Thelycum is fully developed, pink in colour and usually with spermatophores. Thorax is clearly swollen. Ovary is noticeably swollen. Cytoplasm is not translucent in all or in part of oocytes, but nuclei are visible as circles of lighter colour (IIIB,C).
IV. Fully matured	Petasma is fully developed. Proximal wing of the inner branch has two knife-edge extensions. Ampullae have large spermatophores with asymmetric condyles (IIIB).	Thelycum is fully developed, coloured and usually with full or empty spermatophores. Thorax is noticeably swollen. Ovary is swollen, its posterior lobe extends up to first and second abdominal segments. Oocytes are large, non-translucent and filled with granular substance. Nuclei are not visible (IIID).

Maturity Stage	Males	Females
V. Spawn	Petasma is the same as in the previous stage. Ejaculatory duct ampullae are empty. Ejaculatory duct openings are enlarged and pink in colour.	Thelycum is fully developed, coloured and usually has empty spermatophores. Thorax is noticeably swollen. Ovary is small, subsided, flabby and irregularly formed. Small immature oocytes are located sporadically or in groups along the ovarian walls. Several un-spawned large oocytes may be found in the ovary (IIIE).
VI*. Transition to resting stage	Petasma is reduced. Petasma wings are usually of irregular form. Ejaculatory duct openings are decreased but noticeable, not coloured or pale-coloured. Ampullae are empty.	Thelycum is reduced, not coloured or pale-coloured. Spermatophores are absent. Thorax is not swollen or slightly swollen. Ovary is in the process of shrinking longitudinally or transversally. Ovary is flabby or mellow. Several un-spawned whole or partially resorbed oocytes may be present in the ovary.
VI-VII*. Resting stage (diapause)	Petasma is reduced to the size at Stage II (beginning of maturation). Ejaculatory duct openings are not visible. Males at Stage VI-VII can be distinguished from males at Stage II only by their larger sizes.	Thelycum is reduced and not coloured. Spermatophores are absent. Thorax is not swollen. Ovary is completely shrunken and resembled ovary at Stage II. Its characteristic features are: (i) rounded posterior part; (ii) twice as many frontal lobes; (iii) resorbed remnants of mature oocytes. Females at this stage are larger than newly matured females.

* It is possible to distinguish between these two stages in a well-equipped laboratory ashore. Some degree of expertise beyond that normally expected from an observer under at-sea conditions would be required. For practical reasons these two stages may be described as Stage II.

SECTION 5

MATURITY SCALES OF ANTARCTIC FISH

MATURITY SCALES OF ANTARCTIC FISH

Maturity scales for nototheniids and channichthyids based on ovarian and testis cycles in *Notothenia coriiceps*, *Champsocephalus gunnari*, *Chaenocephalus aceratus* and *Pseudochaenichthys georgianus* (from Kock and Kellerman, 1991).

ICEFISH (Channichthyidae)

Females

Maturity Stage:	Description:
1. Immature	Ovary small, firm, no eggs visible to the naked eye
2. Maturing virgin or resting	Ovary more extended, firm, small oocytes visible, giving ovary a grainy appearance
3. Developing	Ovary large, starting to swell the body cavity, colour varies according to species, contains oocytes of two sizes
4. Gravid	Ovary large, filling or swelling the body cavity, when opened large ova spill out
5. Spent	Ovary shrunken, flaccid, contains a few residual eggs and many small ova

Males

Maturity Stage:	Description:
1. Immature	Testis small, translucent, whitish, long, thin strips lying close to the vertebral column
2. Developing or resting	Testis white, flat, convoluted, easily visible to the naked eye, about $^1/_4$ length of the body cavity
3. Developed	Testis large, white and convoluted, no milt produced when pressed or cut
4. Ripe	Testis large, opalescent white, drops of milt produced when pressed or cut
5. Spent	Testis shrunk, flabby, dirty white in colour

LANTERN FISH (Myctophidae)

Based on observations of *Electrona antarctica*
(from Anon., 1983)

Females

Maturity Stage:	Description:
1. Immature	Ovaries small and transparent, membrane thin. Maturity index no higher than 1.5%. Oocytes small and transparent having a diameter from 0.25 to 0.3 mm; visible to the naked eye. Oocytes the size of protoplasm and oogonia are visible in histological preparations.
2. Developing	Initially and repeatedly maturing fish. Ovaries more extended yellowish in colour, membrane thin and semi-transparent. Opaque ovarian cells visible - diameter 0.3 to 0.7 mm. Maturity index from 1.5 to 7%.
3. Mature	Ovaries maximum size, yellow in colour, opaque. Maturity index 11 to 14%. As oil droplets and protein granules blend, oocytes become transparent and ovaries become semi-transparent. The larger oocytes have a diameter of 1 to 1.2 mm. Apart from the larger and often semi-transparent cells, opaque cells with a diameter up to 0.5 mm are visible.
4. Gravid	Gravid stage.
5. Spent	Appears similar to maturity stage 3, the difference here being a wrinkled and somewhat thicker membrane and also the presence of remaining mature water-filled oocytes in the ovarian cavity.

SECTION 6

MATURITY SCALE OF STONE CRABS, *PARALOMIS* SPP.

MATURITY SCALE OF STONE CRABS, *PARALOMIS* SPP.

Females

Maturity Stage:	Description:
1. Eggs uneyed	Eggs orange to yellow in colour, no eye spots
2. Eggs eyed	Eggs orange to yellow in colour with distinctive, black eye spots
3. Eggs dead	Eggs entirely white, black or brown
4. Empty egg cases	Eggs absent but egg cases still attached to pleopods
5. Non-ovigerous	Eggs absent, no reproductive tissue attached to pleopods

SECTION 7

MATURITY SCALE OF SQUIDS

MATURITY SCALE OF SQUIDS

Squid Maturity Scale Codes (Lipinski, 1979)

Maturity Stage	Female	Male
I. Juvenile	Sexual organs very hard to find with the naked eye. The oviducts and nidamental glands appear (if at all) as very fine transparent strips. Ovary translucent and membranous.	Sexual organs very hard to find with the naked eye. Spermatophoric complex appears (if at all) as a transparent or translucent spot. Testes transparent, membranous.
II. Immature	Sexual organs translucent or whitish. Oviducts and nidamental glands form clearly visible translucent or whitish strips. The oviducts meander visible, nidamental glands small; all viscera behind them easily observable. The ovary clearly visible, in most cases immature ova invisible.	Sexual organs translucent or whitish; separate parts of the Spermatophoric complex clearly visible; testes small and their structure invisible.
III. Preparatory	The sexual organs are not translucent. Meander of the oviducts is extended. Nidamental glands enlarged covering some internal organs. Immature ova clearly visible.	Sexual organs not translucent; vas deferens whitish or white, spermatophoric organ with white streak; testes in most cases white or pink, their structure invisible.
IV. Maturing	Nidamental glands large, covering the kidneys and distal part of the digestive gland; oviductal glands fleshy and swollen. Plenty of eggs in the oviducts; meanders hardly noticeable. Eggs not translucent and pressed together, at least in the proximal part of the oviduct.	Vas deferens white, meandering, enlarged; spermatophoric sac long with structureless whitish particles inside, but without formed spermatophores; testis firm and its structure visible.
V. Mature	As above, but the eggs are translucent, at least in the proximal part of the oviduct. Cut open, the nidamental glands secrete a viscous substance	As above, except that spermatophores are present in the spermatophoric sac.

SECTION 8

REMOVAL AND STORAGE OF OTOLITHS

REMOVAL AND STORAGE OF OTOLITHS

INTRODUCTION

Otoliths are small calcareous concretions in the inner ear of fish. They are involved in maintaining the fish's balance and orientation in the water, and in sound detection. Because they increase in size as the fish grows, their structure displays bands reflecting fast or slow growth in a manner analogous to tree-rings. These bands are used by biologists to estimate the age of the fish. The use of otoliths is especially important when scales, the other important hard part used for ageing, are either absent (as in Channichthyids) or lost from the fish by the time it is brought on deck (*Electrona carlsbergi*).

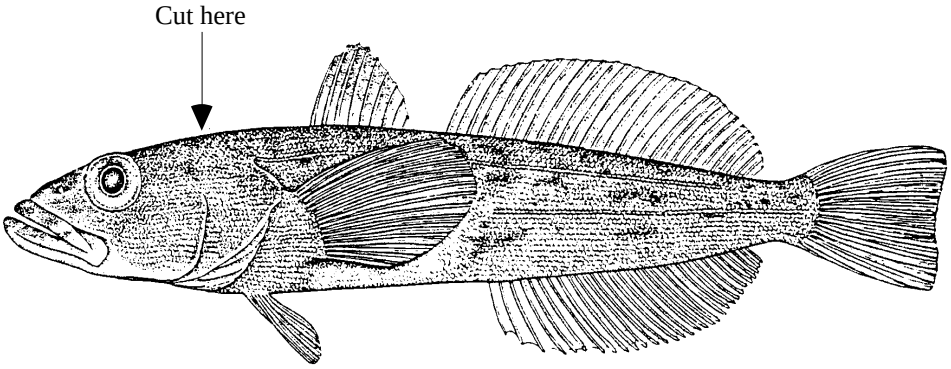
OTOLITH REMOVAL

2. The inner ear on each side has three otoliths, but two of these are usually very small and only one of each set (the sagitta) is usually useful or even visible. The inner ear apparatus is found usually nestling in a pouch-like extension of the cranium (the otic bulla) in the postero-ventral part of the skull. The best technique for speedy and reliable otolith removal depends on the size of the fish.

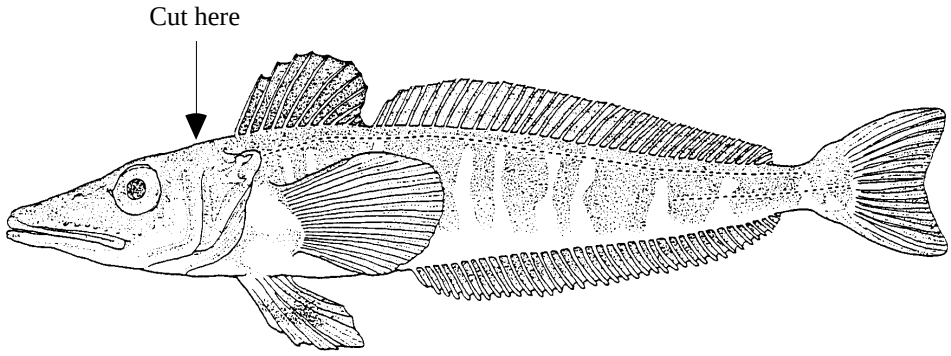
Nototheniids and Channichthyids

3. Equipment - a large knife with a rigid blade, fine-point forceps.

4. Technique - place the fish belly-down on a firm table and make a vertical cut through the head with the knife in the position indicated in Figure 1. The exact position has to be learnt by trial and error, as each species is slightly different. The aim is to make the cut either just anterior or just posterior to the otoliths, so that these can be picked out. An error of a few millimetres can mean that the otoliths themselves are sliced in half. Cut at least half-way down through the head, so that the anterior part can be bent forward and down to expose the cranium. The vertical section of the head thus exposed should resemble Figure 2B (assuming you have cut behind the otoliths and are looking towards the fish's snout). The otoliths are to be found in the small depressions in the floor of the cranium (otic bulla). They are easily recognisable by their bright white opaque colour, in contrast to the creamy colour of the brain tissue and the translucent bone. They are usually still encased in the inner ear membranes, and can be picked out with the forceps. If you cannot find them, try making another cut a little anterior or posterior of the first one.



Dissostichus eleginoides



Champsocephalus gunnari

Figure 1: Positions to make incisions for otolith removal.

5. An alternative technique is to remove the roof of the cranium and look for the otoliths below the brain. This technique is slower than the first one, but is useful for inexperienced people to help them learn the precise position of the otic bulla. In this method, make a shallow vertical cut with the knife at the posterior extremity of the head, but sufficiently deep to reach the brain cavity. Then continue this cut forward so as to slice off the top of the cranium and expose the brain. The otoliths can be found in the very bottom of the brain case below the hind part of the brain (Figure 2A).

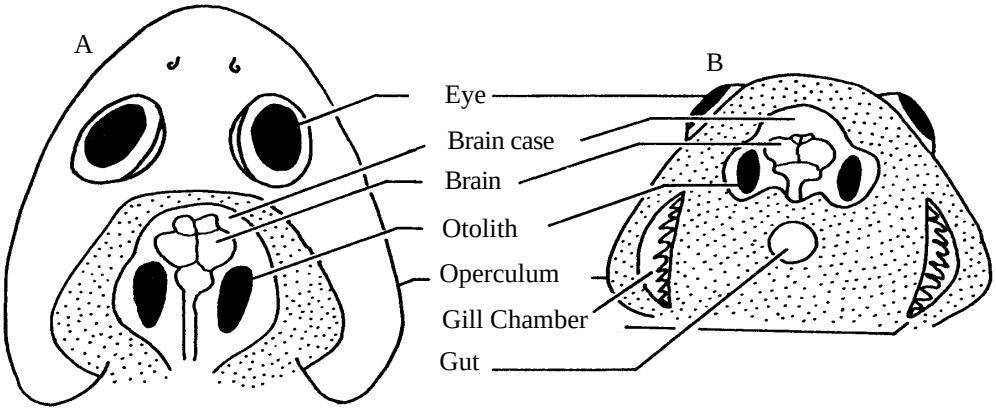


Figure 2: Positions of otoliths in the head: (A) dorsal view, (B) vertical section through head.

Electrona carlsbergi

6. Equipment - jeweller's fine point forceps, small scalpel.

7. Technique - lay the fish on its side and lift the operculum. With the scalpel, carefully cut away the dorsal end of the anteriormost gill arch where it attaches to the underside of the cranium, and the surrounding tissue. This should expose the bone of the otic bulla, through which the relatively large white sagittal otolith can be seen. This bone is very thin and can be easily pierced with the forceps, and the otolith removed. Repeat the operation on the other side of the fish.

DATA RECORDING AND OTOLITH STORAGE

8. Otoliths are best stored in small manilla envelopes, about 50 mm x 75 mm, with a gummed flap. Plastic or other non-porous bags are not recommended, as they do not allow the contents to dry out. If any tissue remains on the otolith, it will rot and tend to damage the otolith if it cannot dry out. In any case, rub the otoliths between the fingers to remove as much tissue as possible before placing in the envelopes. Small otoliths should first be put in a small capsule (empty gelatin capsules, as used in the pharmaceutical industry, are best) to prevent them being lost in the cracks of the envelope or damaged.

9. On the outside of the envelope record the information as shown in Figure 3. A rubber stamp for printing the headings is very useful to avoid excessive writing, and batches of envelopes should be prepared beforehand.

10. Keep the otoliths in their packets in a dry place and safe from having heavy weights put on them, or other damage.

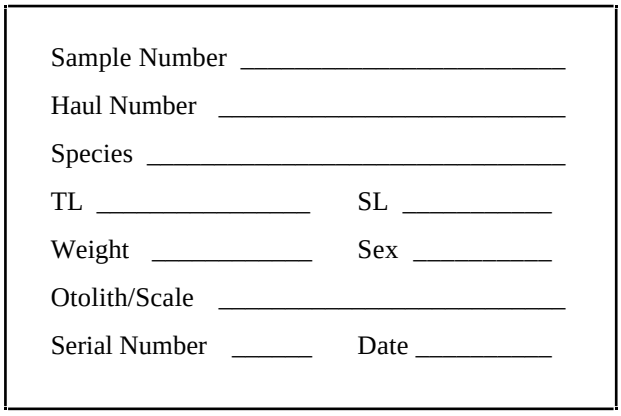


Figure 3: An example of data to be written on the otolith/scale packet.

SECTION 9

COLLECTION AND STORAGE OF SCALES

COLLECTION AND STORAGE OF SCALES

INTRODUCTION

During development, scales first appear in the dermis as tiny aggregations of cells, most often forming first on the caudal peduncle and spreading from there. Such an aggregation soon forms a scale platelet, the focus of the definitive scale. These platelets make their first appearance at different sizes of individual in different fishes; a typical size at which scales first appear is about 20 mm for most species. Soon ridges are deposited on the outward surface of the growing scale. The rate of deposition undergoes seasonal changes which causes the patterns of circuli formation that are characteristic of annuli.

2. The scales lie in pockets in the skin of the fish and are divided into two areas: an embedded area covered with striations and concentric rings (circuli), and an exposed area which is unstriated.

3. Scales vary in shape depending on the contours of the fish, and tests should be carried out to determine the most suitable site from which to sample them. This site would have the fewest replacement scales, and the scales should exhibit the maximum number of annuli.

COLLECTION

4. Scrape the mucus and loose scales from the fish with a knife before taking the sample. Clean the knife. This is to ensure that each sample of scales is from only one fish. Lift off scales from the side of the fish with a clean knife blade.

5. A large number of scales (at least 20) should be taken from each fish. (This is because many scales are replacement scales and consequently lack detail in the central region.) The best location on the fish body for taking scales is usually underneath the pectoral fin as shown in Figure 1.

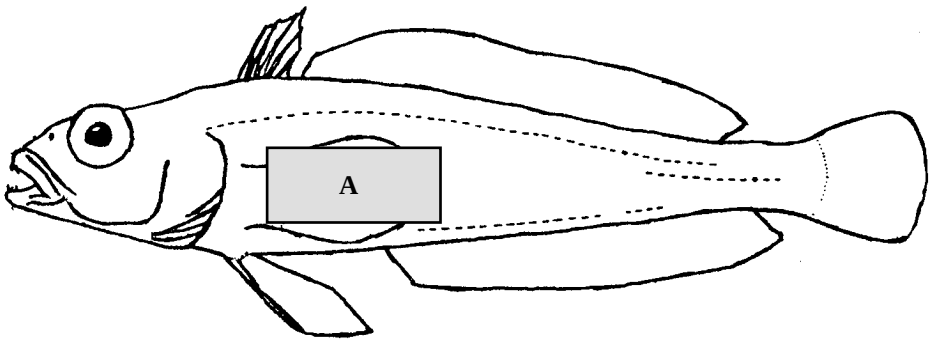


Figure 1: Recommended location (A) for scale sampling on the fish body.

6. Scales should be air-dried and stored in labelled paper envelopes. Plastic or other non-porous bags are not recommended, as they do not allow the contents to dry out.

7. On the outside of the envelope record the information as shown in Figure 2. A rubber stamp for printing the headings is very useful to avoid excessive writing, and batches of labelled envelopes should be prepared beforehand.

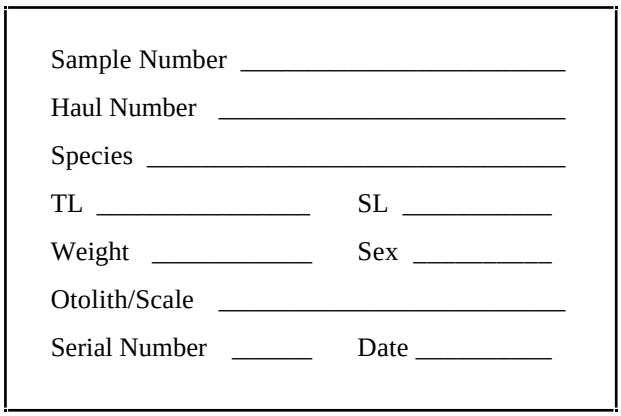


Figure 2: An example of data to be written on the otolith/scale packet.

SECTION 10

SEX AND RELATIVE AGE DETERMINATION OF STONE CRABS *PARALOMIS* SPP.

SEX AND RELATIVE AGE DETERMINATION OF STONE CRABS, *PARALOMIS* SPP.

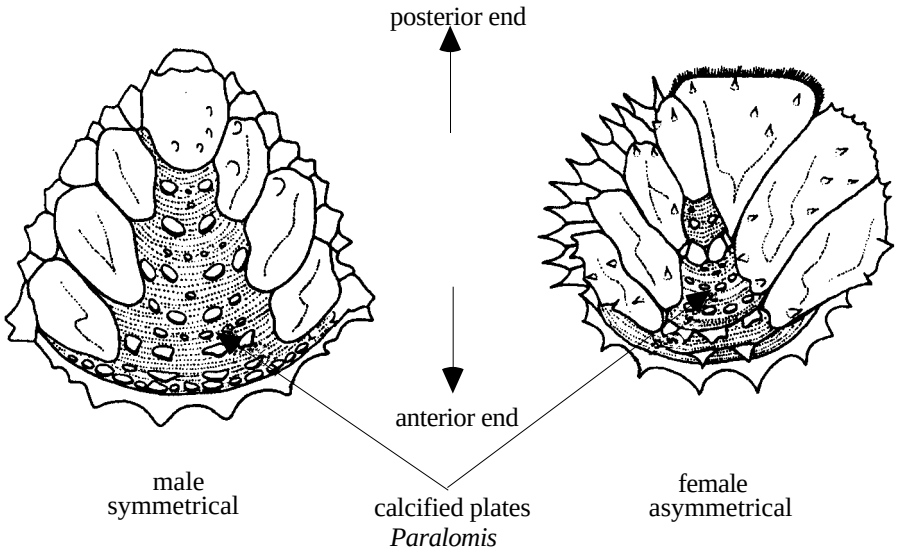


Figure 1: Ventral view of abdomen of stone crabs, *Paralomis* spp.

Table 1: Carapace condition/relative age of Antarctic crabs.

Relative Age Code	Carapace Condition	Description
1.	Soft	Carapace flexible and generally lightly coloured
2.	New hard	Carapace hard, no fouling organisms on exterior of carapace
3.	Old	Carapace hard, fouling organisms present on exterior of carapace
4.	Very old	Carapace hard, fouling organisms present, tips of spines and joints discoloured (often black)

SECTION 11

OBSERVATION OF BY-CATCH OF FISH LARVAE IN KRILL CATCHES

OBSERVATION OF BY-CATCH OF FISH LARVAE IN KRILL CATCHES

By-catch analysis starts with sampling larval fish from krill catches. In order to obtain comparable data, standard samples of about 40 to 50 kg of krill must be taken from all trawls.

2. For the most accurate count of larval fish in krill catches, samples should be taken from particular areas of the trawl bag (Figure 1). After the trawl has been brought on deck, the mesh in the top cylindrical part of the trawl bag is opened by undoing access seams and one to two samples are taken from each part of the trawl bag. If samples cannot be taken from the trawl bag for safety reasons, they can be taken from the conveyer belt in the fish factory area. There is no possibility that krill from the sampled catch is mixed with krill from the previous catch because krill catches intended for food processing in the fish factory are generally small (5 to 7 tonnes). By the time a trawl is raised on deck the previous catch has already been completely processed. In order to ascertain the level of homogeneity of juvenile fish distribution in krill catches it is best to analyse each sample individually and then extrapolate the values obtained over the entire catch. When sampling larvae and fry, one should be mindful of their relatively small size (40 to 70 mm) since they are close in size to euphausiids and can be hard to separate from the krill mass. Therefore each sample should be divided into small subsamples. Each subsample should be spread over a table or dark-coloured plastic sheet since larval Antarctic fish are usually almost transparent or are very lightly coloured. Krill are removed one by one from this subsample; larvae and fry remaining after all the krill have been removed are collected into containers (one for each sample) and labelled. After separating larvae and fry from all samples they are counted and their species identified. Difficulties can arise in determining species composition when dealing with juveniles. An identification key of larval Antarctic fish, published by BIOMASS (*BIOMASS Scientific Series* No. 10, 1989) is recommended for species identification. In case of any doubts in species identification a sample should be preserved for further examination.

3. Collected specimens are grouped according to species. The total number of fry of each species in the sample and then in the catch is determined; these data are then subdivided according to times of the day. Then the total or standard length of larvae and fry of each species is measured separately and the various size classes are weighed collectively. After measuring and weighing, the fry and larvae collected for further examination (e.g., morphometric measurements, analysis of diet, etc.) are fixed in a 4% solution of formaline and stored in labelled jars until the end of the cruise.

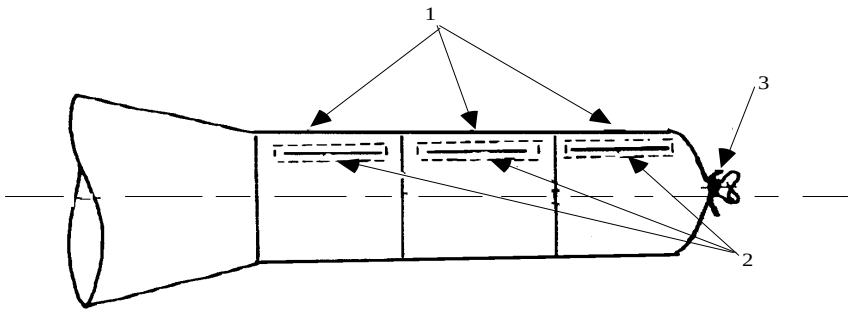


Figure 1: Sections of the trawl bag from which samples are taken (1), access seams (2) and codline (3).

4. Following sampling, the proportion of juvenile fish by-catch in the total catch is calculated as:

$$Y_n = \frac{P_{n_1} + P_{n_2} + P_{n_3}}{P_1 + P_2 + P_3} Y,$$

where Y_n is by-catch in the trawl bag, kg;
$P_{n_1}, P_{n_2}, P_{n_3}$ is by-catch in samples 1, 2 and 3 respectively, kg;
P_1, P_2, P_3 is total mass of samples 1, 2 and 3 respectively, kg; and
Y is total catch, kg.

5. It is known that pelagic juveniles of Antarctic fish make daily vertical migrations. Therefore the size of by-catch of juvenile fish in krill catches can greatly depend on the time of day. As a result, it is essential to take into consideration when fishing took place and to group catches according to the time of day when recording by-catch data for juveniles. For ease of data recording, a 24-hour period can be divided into appropriate periods according to the season. A table showing the dependence of juvenile by-catch (absolute and relative values) on the time of day should also be compiled.

6. When data are plotted onto maps it is essential to show trawling sites and the amount of juvenile fish caught. Points of similar values for juvenile by-catch are joined by isolines; contoured sites show areas where krill and juvenile fish are distributed. These maps of spatial distribution of by-catch provide a good illustration of the presence of juveniles in areas of krill concentrations. Moreover, it is possible to map both absolute and relative values of juvenile fish, i.e. per 1 tonne of krill caught and per fishing effort.

SECTION 12

OBSERVATIONS OF INTERACTIONS OF SEABIRDS AND MARINE MAMMALS WITH LONGLINE FISHING OPERATIONS

OBSERVATIONS OF INTERACTIONS OF SEABIRDS AND MARINE MAMMALS WITH LONGLINE FISHING OPERATIONS

OBJECTIVES OF OBSERVATIONS

Scientific observations of seabirds and marine mammals are carried out on board longline vessels with the following objectives:

(i) to document and quantify seabird catch rates and determine the specific identity, age and sex of all birds caught;

(ii) to assess the relative vulnerability of different seabird species;

(iii) to monitor the mortality of seabirds per unit of fishing effort;

(iv) to document all aspects of a vessel's fishing strategy, methods and equipment which have an impact on seabirds and marine mammals;

(v) to assess the effectiveness of CCAMLR measures aimed at reducing the incidental mortality of seabirds;

(vi) to ascertain what, in terms of a vessel's fishing operations, contributes to the bird catch rates observed, and to collect data relevant to factors that influence bird catch rates;

(vii) to estimate the abundance of marine mammals and record their interactions with longline fishing operations;

(viii) to document data on catch rates of fish, wherever this is relevant to the assessment of seabird and marine mammal interactions; and

(ix) to collect and retain biological samples.

2. A complete set of seabird-related data can only be collected where two observers are present on a vessel, and, where this is the case, consideration of an appropriate observation strategy as discussed above will be unnecessary. The observer who undertakes the fish-related observations, which will principally occur during line hauling, can also accomplish some aspects of seabird data collection for this period. Similarly, all data required on line setting can be collected by the seabird observer.

3. As regards collection of seabird data, the highest priorities for a single scientific observer are as follows:

(i) observation of the whole of any longline setting and hauling operation (or parts thereof) carried out in daylight, at dusk or at dawn, together with the appropriate complete records of the number and species of seabirds caught;

(ii) observation of at least 50% of the line hauling process, ideally divided into periods covering the early, middle and late stages, with a record of the times and numbers of hooks observed and the appropriate complete record of the species of seabirds caught;

(iii) the retention and labelling of specimens from the by-catch (albatrosses, giant petrels, white-chinned petrels in priority order for retention as whole specimens);

(iv) documentation of the streamer line used; and

(v) documentation of the location and timing of offal discharge.

OPERATIONAL PROCEDURE

4. Observers must complete every section of their daily data sheets accurately, and this will entail observation during both line-setting and line-hauling operations. It must be remembered that the usefulness of all of an observer's work relies on recording the duration of observation periods, the actual time at which events occur and on knowing precisely what level of fishing effort these observations relate to - the number of baited hooks set and the number hauled.

5. Ideally the whole of each set and haul should be observed. If this is impractical, a routine should be established to ensure that observations made during the line-hauling period cover the same portion of the line as that observed during the line-setting period.

6. Experience shows that following a fixed daily work routine can be the most efficient and sustainable strategy, but variation of this routine may be necessary to avoid any biases in the data collected. When establishing a daily routine, the observer should take account of the fact that catch rate data (bird and fish) may vary depending upon which portion of each set is observed, so variation of the this routine may be essential. It should be remembered that the vessel's operating strategies may also be deliberately varied, e.g. offal discharge time, or whether or not a bird line is set.

DESCRIPTION OF FISHING OPERATIONS AND DAILY SET AND HAUL DETAILS

7. Special attention should be paid to the longline design as it may differ considerably from vessel to vessel. A detailed diagram of the gear should be drawn, showing all names and dimensions of its elements. Some examples of longline gear design used in the CCAMLR Convention Area are shown in Figure 1.

8. If a bird line is deployed, it should be described in detail and the method of its deployment shown. A detailed diagram of the bird line used, giving all dimensions, should be drawn. The CCAMLR streamer line configuration is given in Figure 2.

9. An assessment should be made of any aspects of setting technique and equipment which are causing birds to get caught or take bait, e.g. vessel speed, type and condition of baits used, weights and their distance apart, how weights are deployed, condition of the hook-setting boxes, etc.

DAILY OBSERVATIONS OF SEABIRDS AND MARINE MAMMALS DURING SETTING OF LONGLINES

10. Line-setting observations should be carried out from a position on the ship that provides a clear view of the line entering the water. This is normally at the stern directly above the point at which the longline leaves the ship.

11. Data-recording tasks to be carried out during longline setting include observations of the abundance of seabirds, and their interaction with fishing operations.

12. Seabird abundance - Under ideal conditions, counts of the abundance of all birds by species should be carried out at 30-minute intervals throughout setting, within the area to 500 m astern and 250 m on each side, i.e. a 500 x 500 m square. An object should be dropped overboard and traced, at a given ship speed, to the point 500 m astern or, alternatively, a known distance between longline buoys should be used, in order to define the count area accurately. One efficient count procedure is to first count the total number of birds present, and then to count again for each species starting with the least abundant first. A description of weather and sea conditions prevailing during each count should be given.

13. For identification of seabirds refer to the identification plates for seabirds given in *Fish the Sea Not the Sky* (CCAMLR, 1996) and *Identification of Seabirds of the Southern Ocean* (Onley and Bartle, 1999), or to any of the many seabird identification handbooks which are available. For identification of whales and seals, see Volume II of the FAO/CCAMLR species identification sheets for the CCAMLR Convention Area. (Fischer, W. and J.-C. Hureau (Eds), 1985).

14. Interactions of seabirds with fishing operations - Every interaction with birds which occurs during line setting should be recorded. Obviously an observer's opportunities to undertake this work may be limited by the requirement that vessels set only at night.

15. For each event it is desirable to record the following:

(i) time;

(ii) distance astern;

(iii) species;

(iv) surface attempt or dive attempt to take baits;

(v) attempt success, i.e. whether or not baits are actually taken;

(vi) outcome of successful attempt - was a bird *hooked*, *not hooked*, or is this uncertain? (Line hauling observations of birds on hooks should be checked later to see whether these correlate to all birds observed hooked during line setting);

(vii) the cause of each event (e.g., weather conditions, ship speed at the time being too slow or too fast, streamer line not correctly set etc.); and

(viii) as they occur, any changes in circumstances that affect, or could affect, bird activity (e.g., time of ship course change, weather factors, sea conditions, vessel speed, moonlight, offal discharge, etc.).

16. An estimate should be made of the number of baits lost to birds and of the number of birds hooked. Other data-recording activities permitting, a daily count of the proportion of hooks set that actually have bait on them should be carried out.

DAILY SEABIRD AND MARINE MAMMAL OBSERVATIONS DURING LONGLINE HAULING

17. Because it will be necessary to collect biological material (all dead birds etc.), the observer's work station for line hauling should obviously be situated with this in mind. This need for the observer to be on the hauling work deck itself may compromise his or her ability to document with certainty everything that is actually caught on hooks. It is possible for the fishermen to discard by-catches surreptitiously! Also, seabirds are occasionally caught during hauling operations, and detection of this requires a specific effort.

18. Seabirds are attracted to the line-hauling area by offal discards from the vessel's fish-processing plant and by bait that has remained on hooks throughout the set. Consequently birds can be inadvertently caught on hooks at this time and the probability of this occurring increases significantly when sections of the hook line have broken, permitting numerous hooks to remain on the surface amongst large numbers of birds.

19. Assessing bird catch rates during the haul can only be done accurately by observations made from the outside working deck, because on many vessels a work station on the ship's bridge or factory can obscure visibility.

20. It should be remembered that all or most birds caught during the haul will be alive, whereas those caught during setting will be dead. However, the body temperature of all dead birds should be checked to note whether the bird is warm or cold. As for line setting, bird catch rates during hauling require the recording of observation time so that the number of hooks monitored can be determined.

21. For each bird that is caught during hauling, the degree of hook damage should be described and an assessment made of the bird's survival prospects upon release. Obviously the age, sex and species of released birds (as opposed to dead birds that are retained for subsequent identification etc.) is essential.

22. Data-recording tasks to be carried out during longline hauling include observations of seabirds caught on longlines, collection of seabird samples and observation of fisheries interactions with marine mammals.

23. Seabird observations - The primary objectives are to record what is caught and when, and to ensure that accurate records are maintained regarding the proportion of fishing effort observed, the number of hooks set and the proportion of hooks with baits lost due to interactions with birds.

24. If time permits, patterns in the occurrence of hooking should be looked for. Are all or most birds caught on hooks nearest floats, near weights or near the main line, or on a particular type of bait? How are they hooked? Are hooks swallowed, or caught in the bodies of birds?

25. An attempt should also be made to monitor the proportion of hooks which retain bait on them throughout the set.

26. As mentioned in the section of these instructions dealing with line setting, any observations made of birds hooked during setting must be correlated to the haul. The number of birds observed hooked should be compared with the number of birds actually hauled on board. Why should this be done? - It allows an assessment to be made of the proportion of birds actually observed to have become hooked, but which are not hauled aboard because they are eaten by fish, pulled off hooks, etc.

27. Sampling - The requirement for birds is that all seabirds that are taken aboard dead are retained as intact frozen samples, all labelled with date, time taken aboard, species, vessel name, observer's name and a label number which corresponds to that used on the haul data sheets. Labels should be inserted into the bird's throat through the bill before freezing. All birds should be checked for bands upon landing. It is necessary to ensure that each sample has a corresponding entry on the haul data sheet.

28. As a last resort only, if it is impossible to retain all whole specimens, then at least the head and one leg of every bird should be retained and labelled appropriately.

29. Some albatrosses have colour markings which have been applied at the breeding colonies. Any colour-marked albatrosses sighted during the line setting operations, or at other times, should be recorded (i.e., the number of birds marked, the colour(s) of the dye, and the date and location of the sighting).

30. An instruction on handling of collected bird samples and/or bands at the end of the observation program and on their final destination should be included in each observation assignment, issued and signed by the national authorities of the CCAMLR Member designating the observer.

31. Marine mammal interactions - Any observations on marine mammals attempting to feed on fish caught on line should be recorded and the species observed. The number of fish lost to interactions with marine mammals should be estimated.

Figure 1: Examples of Longline Designs used in the CCAMLR Convention Area

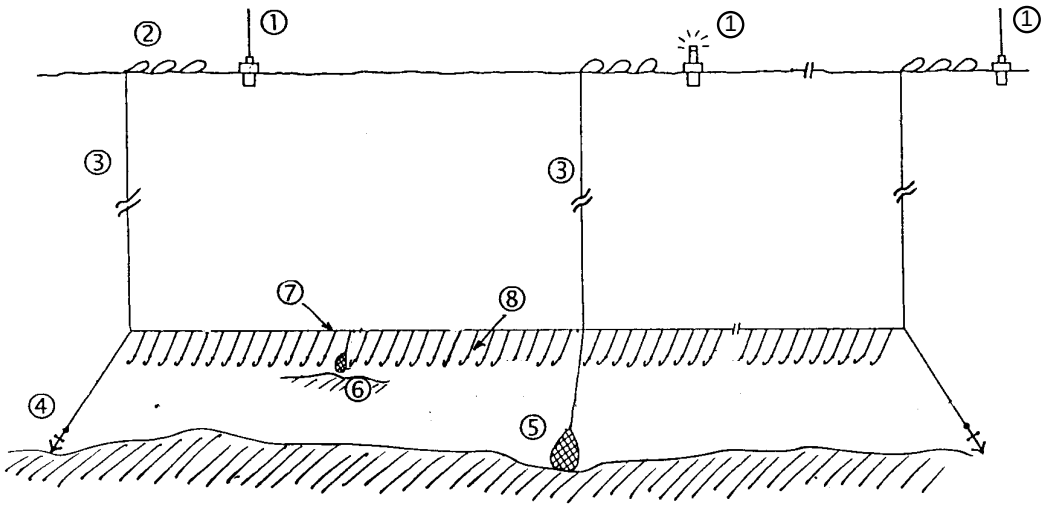


Figure 1(a): Configuration of a 'traditional' bottom longline.
① – Buoys; ② – Floats; ③ – Buoy line; ④ – Anchor; ⑤ and ⑥ – Stone anchors;
⑦ – Main line (ground line); and ⑧ – Branchlines (snoods) with hooks.

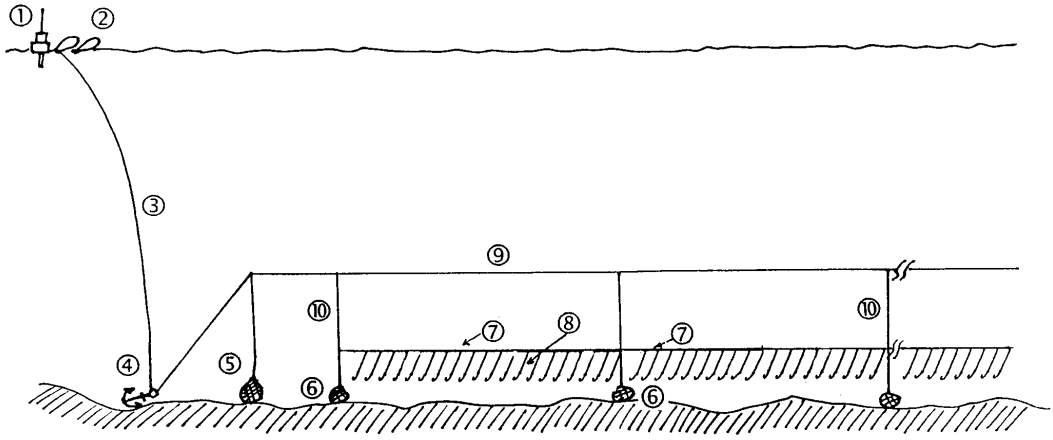
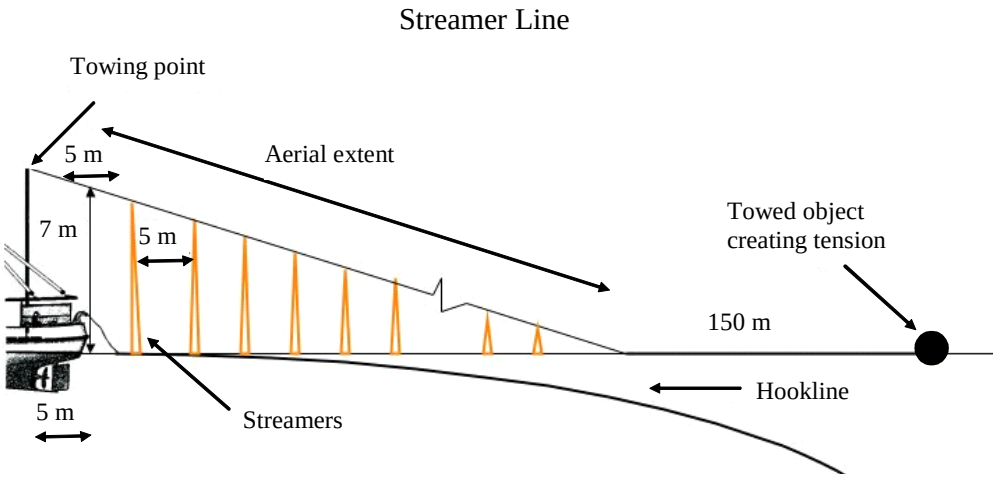


Figure 1(b): Configuration of a 'Spanish type' bottom longline.
① – Buoy; ② – Floats; ③ – Buoy line; ④ – Anchor; ⑤ and ⑥ – Stone anchors;
⑦ – Fishing line; ⑧ – Branchlines (snoods) with hooks; ⑨ – Main line; and ⑩ – Railing.

Figure 2: CCAMLR Streamer Line Design and Measurements



1. The aerial extent of the streamer line, which is the part of the line supporting the streamers, is the effective seabird deterrent component of a streamer line. Vessels are encouraged to optimise the aerial extent and ensure that it protects the hookline as far astern of the vessel as possible, even in crosswinds.

2. The streamer line shall be attached to the vessel such that it is suspended from a point a minimum of 7 m above the water at the stern on the windward side of the point where the hookline enters the water.

3. The streamer line shall be a minimum of 150 m in length and include an object towed at the seaward end to create tension to maximise aerial coverage. The object towed should be maintained directly behind the attachment point to the vessel such that in crosswinds the aerial extent of the streamer line is over the hookline.

4. Branched streamers, each comprising two strands of a minimum of 3 mm diameter brightly coloured plastic tubing or cord, shall be attached no more than 5 m apart commencing 5 m from the point of attachment of the streamer line to the vessel and thereafter along the aerial extent of the line. Streamer length shall range between minimums of 6.5 m from the stern to 1 m for the seaward end. When a streamer line is fully deployed, the branched streamers should reach the sea surface in the absence of wind and swell. Swivels or a similar device should be placed in the streamer line in such a way as to prevent streamers being twisted around the streamer line. Each branched streamer may also have a swivel or other device at its attachment point to the streamer line to prevent fouling of individual streamers.

5. Vessels are encouraged to deploy a second streamer line such that streamer lines are towed from the point of attachment each side of the hookline. The leeward streamer line should be of similar specifications (in order to avoid entanglement the leeward streamer line may need to be shorter) and deployed from the leeward side of the hookline.

Figure 2(a): CCAMLR streamer line (from CCAMLR Conservation Measure 25-02 (2004)).

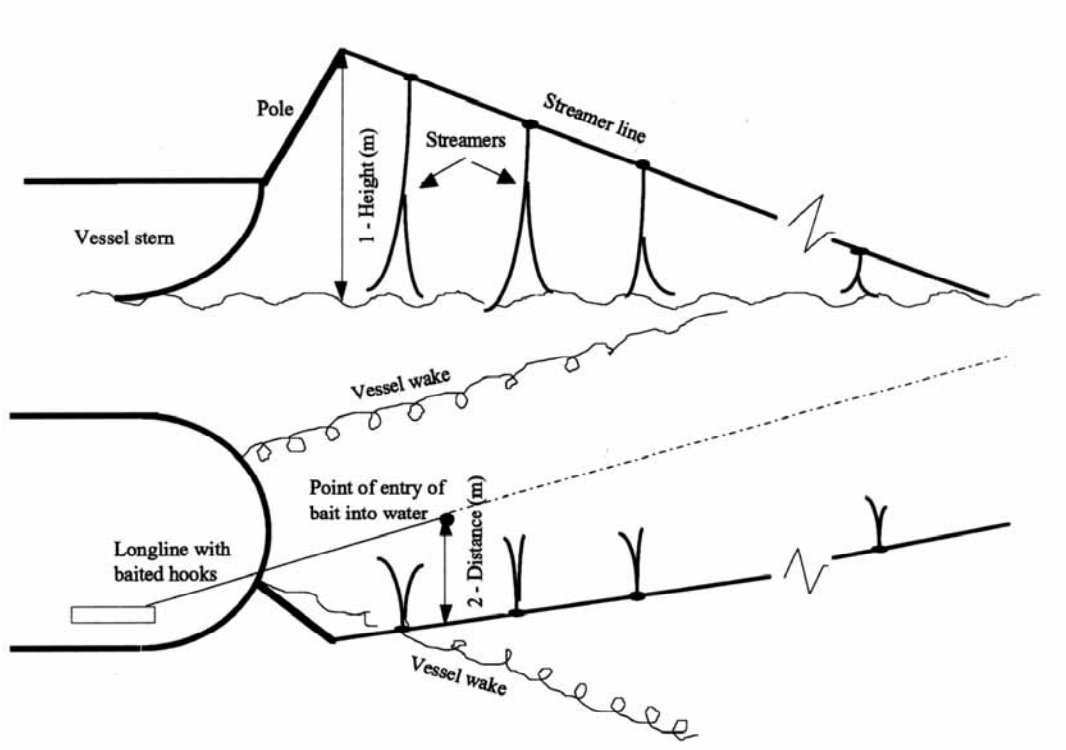


Figure 2(b): Details of measurements: 1 – height of the streamer line attachment above the water; 2 – distance between the point of entry of bait into the water and the streamer line position over the water.

SECTION 13

IDENTIFICATION GUIDE TO *DISSOSTICHUS* SPP. AND SIMILAR FISH

IDENTIFICATION GUIDE TO *DISSOSTICHUS* SPP. AND SIMILAR FISH

The Patagonian toothfish (*Dissostichus eleginoides*) supports substantial fisheries by CCAMLR Members off the coasts of South America and around most of the sub-Antarctic islands and banks of the Atlantic and Indian Oceans. Vessels of several CCAMLR Members are now starting to explore the more southern latitudes, close to the continental shelf of East Antarctica and the Antarctic Peninsula. In these more southern regions *Dissostichus mawsoni*, which is superficially very similar to *D. eleginoides*, is likely to be found. A third similar species, the rare *Gvozdarus svetovidovi*, also occurs near the Antarctic continental shelf. The boundary between the distributions of *D. eleginoides* and *D. mawsoni* is not well known, but the two species may overlap in certain places. It is clearly important to know which species is being exploited in various areas, and scientific observers are requested to take special care to identify the species correctly. The following identification guide is provided to assist in this task.

2. This group of three species is unique among Antarctic fish fauna. It contains large to very large fish with well-developed canine teeth in both jaws.

3. Key to species:

1a Top of head naked, upper lateral line very short (9–11 tubed scales), middle lateral line absent or without tubed scales. Anal fin with 31 rays, longer than the second dorsal (Figure 4)
…… *Gvozdarus svetovidovi*

1b Top of head scaled at least as far forward as anterior margin of eyes, upper lateral line long (>80 tubed scales), middle lateral line present with at least 35 tubed scales. Anal fin with 25–31 rays, as long as, or shorter than second dorsal
…… 2

2a Dorsal surface of head with narrow elongate scale-free areas, middle lateral line extends forwards to tip of pectoral fin (Figures 1(a) and 2)
…… *Dissostichus eleginoides*

2b Dorsal surface of head lacks scale-free areas; middle lateral line shorter, not reaching tip of pectoral fin (Figures 1(b) and 3)
…… *Dissostichus mawsoni*

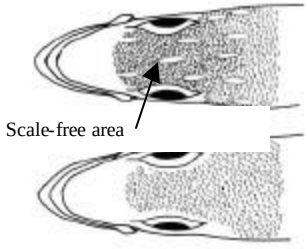


Figure 1: Scales on the head of *Dissostichus* spp.: (a) *eleginoides* ; (b) *mawsoni*.

Dissostichus eleginoides

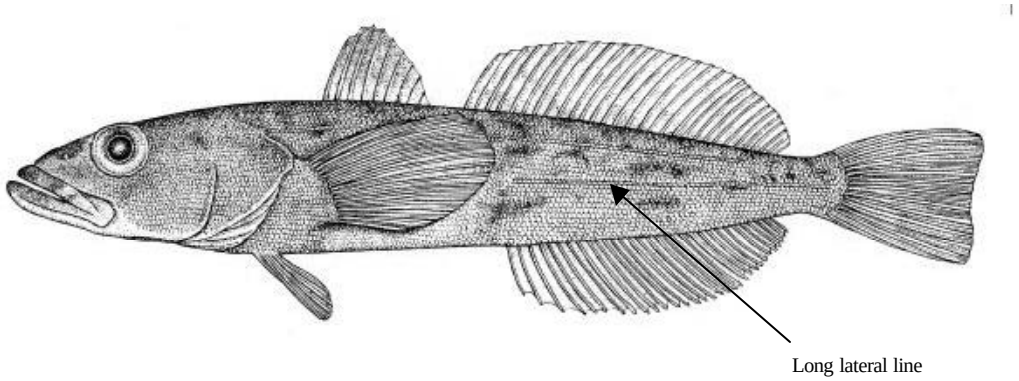


Figure 2: *Dissostichus eleginoides*, about 58 cm SL (after Fischer and Hureau, 1985).

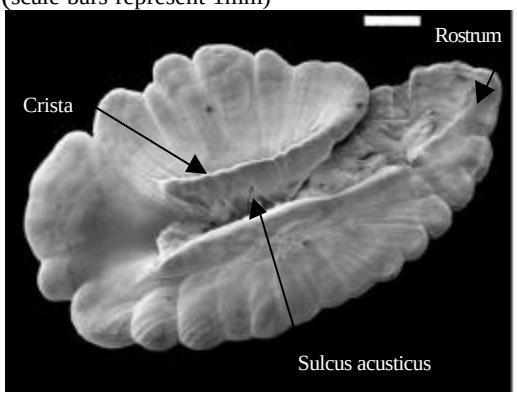
4. Widespread and common in sub-Antarctic waters over peri-insular shelves and banks from South Georgia in the west to Macquarie Island in the east. Also found off the coasts of Chile and Argentina and on the Campbell Plateau south of New Zealand. Southern limit not precisely known, but probably does not occur in water at temperatures less than 1°C. This is equivalent to about 57°S in most areas but probably further south in the area south of New Zealand, where the Polar Front tends to be in a more southerly position.

5. Grows to over 2 m in length and 100 kg in weight, but specimens over 1.5 m are uncommon. A bentho-pelagic species which feeds mainly on mesopelagic fish and squid, but some bottom-living prey such as prawns and crabs are taken. Larval and young juvenile stages are pelagic, but older juveniles and adults are mostly caught on the bottom. Depth range is 300 m to over 2 000 m, with younger fish generally in shallower water.

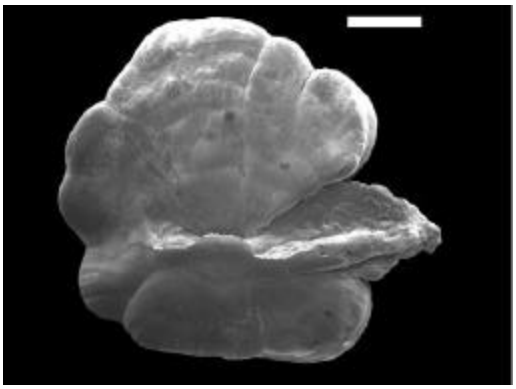
6. Apart from those mentioned in the key above, other features which can be used to distinguish *D. eleginoides* from *D. mawsoni* are:

- otolith morphology – despite these fish being closely related and very similar in external morphology, the otoliths are very distinctive and are one of the best ways to distinguish between the two species. Otoliths of *D. eleginoides* are elongate with a deep sulcus acusticus and prominent cristae (ridges bordering the sulcus acusticus), crenate margin and prominent rostrum. Otoliths of *D. mawsoni* are oval to quadrate in shape, have a much less prominent sulcus acusticus and cristae, a generally smooth or roundly lobed margin and less prominent rostrum. The accompanying figures illustrate the technical terms used and the differences between the two species. The otoliths of *G. svetovidovi* are not known.

(scale bars represent 1mm)



Otolith of *D. eleginoides*



Otolith of *D. mawsoni*

- colour – fresh specimens of *D. eleginoides* are generally a pale to dark khaki-brown with bronze highlights, while *D. mawsoni* tends to be paler and greyer with irregular dark and light markings.

- fin formula – *D. eleginoides* D VIII-XI,26-31; A26-31; P25-26
  D. mawsoni D VII-IX,24-27; A25-28; P26-29

Dissostichus mawsoni

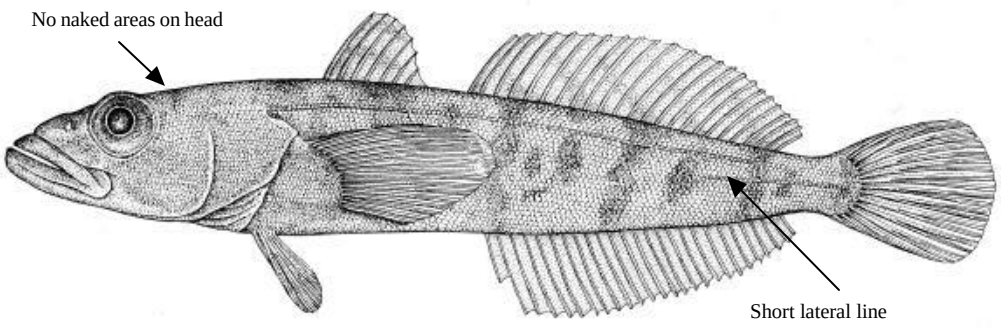


Figure 3: *Dissostichus mawsoni*, about 66 cm SL (after Fischer and Hureau, 1985).

7. Very similar externally to *D. eleginoides*, but shorter middle lateral line and otolith morphology should be sufficient to identify this species. Colour differences between the two species are not completely reliable, but could serve as an 'early warning' to prompt a more detailed inspection.

8. *D. mawsoni* inhabits the higher latitudes of the Southern Ocean, over the Antarctic continental shelf, including the Antarctic Peninsula, and in the deeper ocean to the north. Its northern extent is not known precisely, but remains from sperm whale stomachs have been found as far north as 57°S in the Indian Ocean. There is probably a zone where the distributions of *D. mawsoni* and *D. eleginoides* overlap. In size and habits, *D. mawsoni* appears to be similar to *D. eleginoides*, except that *D. mawsoni* may be more pelagic than *D. eleginoides*.

Gvozdarus svetovidovi

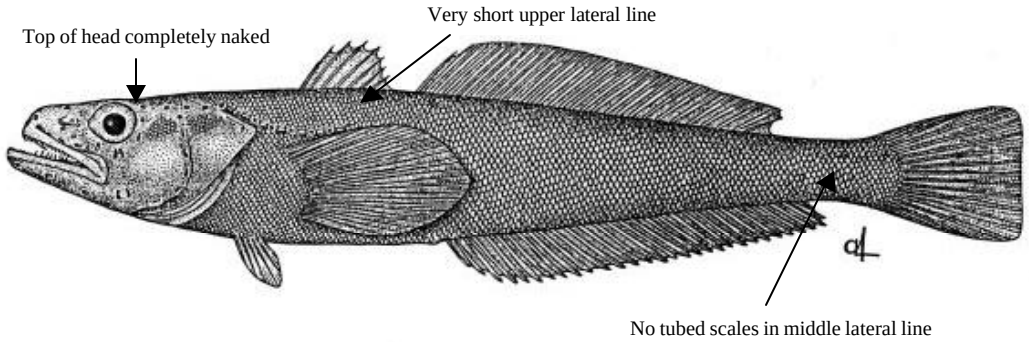


Figure 4: *Gvozdarus svetovidovi*, holotype, 53 cm TL (after Balushkin, 1989).

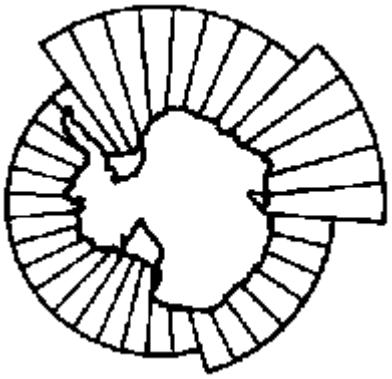
9. A very rare fish, known only from two specimens. Any specimens of this fish should be kept for taxonomic study. Apart from *Dissostichus* spp., it is the only notothenioid which grows to large size and has canine teeth. Size of known specimens is up to 650 mm TL. The naked top of head and one short lateral line should distinguish this species easily. As well, the inside of the mouth and body cavity lining (peritoneum) are black in this species. Both specimens have been taken south of 65°S, one in the Ross Sea and one near Prydz Bay. It appears to be pelagic.

ACKNOWLEDGEMENTS

10. The fish illustrations are reproduced from Gon and Heemstra, 1990, *Fishes of the Southern Ocean*. Otolith images were provided by R. Williams (Australian Antarctic Division).

February 2002

Commission for the Conservation of Antarctic Marine Living Resources



CCAMLR Species Identification Sheets

February 2002

Part III: S13-5

Background Notes for CCAMLR Observers

The enclosed sheets have been prepared at the request of the Working Group on Fish Stock Assessment (WG-FSA) to assist you in making accurate identification of as many species as possible that appear in longline catches. WG-FSA recognises the amount of work involved in identifying fish and understands the difficulties you face. The aim has been to compress as much information into a simple format that will allow you to identify most species as quickly as possible.

Good identification to species level is important for two major reasons. Firstly it helps WG-FSA recognise those by-catch species that need a more detailed assessment. Secondly it helps WG-FSA to identify species assemblages, a topic of importance for understanding distribution and also biodiversity.

I have prepared these sheets following correspondence with members of WG-FSA. Much of the information has come from the standard reference texts; these are generally based on preserved specimens. Wherever possible, additional information has come from direct observation on fresh caught or live fish. There may be further points that you have used or noted during the course of your work that help you identify particular species – if you think that others may benefit from this knowledge please include this information in your Observer Report. We are also keen to improve the general quality of the sheets, so if there are pointers about presentation or content that you wish to have considered, please include these also in your report. Also if you find unusual species, particularly Chimaerids, please retain them for detailed taxonomic examination. Ultimately we are looking to produce a photographic guide, so if you are able to obtain good digital images of key diagnostic features please forward these, along with supporting information, to your Technical Coordinator for transmission to the CCAMLR Secretariat.

The sheets were produced following consultation within the WG-FSA community. Contributions were received from: Karl-Hermann Kock, Eric Appleyard, Esteban Barrera-Oro, Guy Duhamel, Mike Endicott, Edith Fanta, Stuart Hanchet, Volodymyr Herasymchuk, David Ramm, Marino Vacchi, Barry Watkins, Dick Williams.

Inigo Everson
Coordinator

December 2001

Acknowledgements

Illustrations and diagnostic features in these sheets were based largely on publications by Gon and Heemstra (1990), Fischer and Hureau (1985) and Macpherson (1988), and unpublished information provided by Mathias Stehmann (Federal Research Centre for Fisheries, Hamburg, Germany). CCAMLR wishes to thank the authors for their permission to use this material.

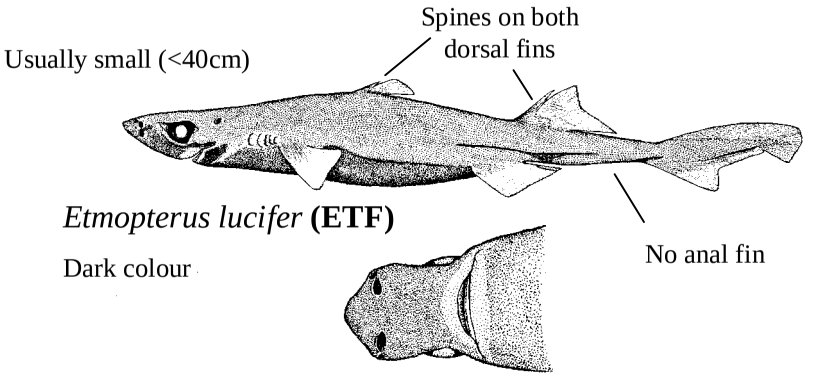
References

Fischer, W. and J.-C. Hureau (Eds). 1985. *FAO Species Identification Sheets for Fishery Purposes. Southern Ocean (CCAMLR Convention Area Fishing Areas 48, 58 and 88)*, Vols I and II. Prepared and published with the support of the Commission for the Conservation of Antarctic Marine Living Resources. FAO, Rome.

Gon, O. and P.C. Heemstra (Eds) 1990. *Fishes of the Southern Ocean*. J.L.B. Smith Institute of Ichthyology, Grahamstown, South Africa: 462 pp.

Macpherson, E. 1988. Revision of the family Lithodidae Samouelle, 1819 (Crustacea, Decapoda, Anomura) in the Atlantic Ocean. *Monogr. Zool. Mar*., 2: 9–153.

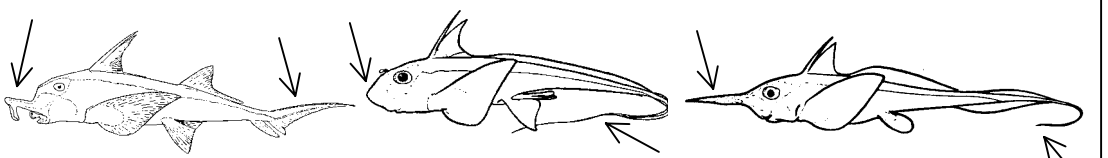
Elasmobranchs



Etmopterus lucifer **(ETF)**

Chimaeras

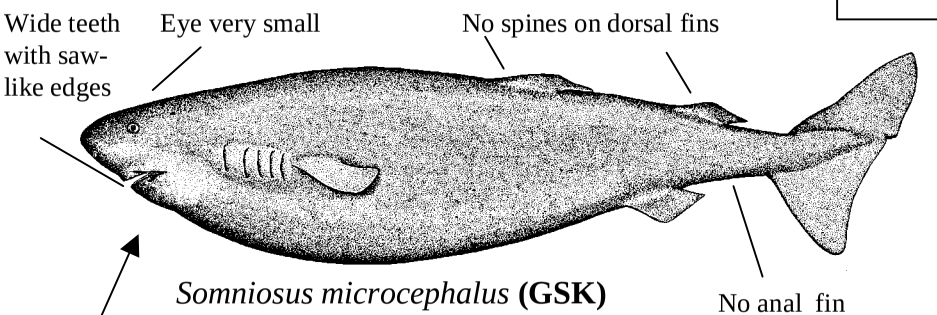
All have two dorsal fins, the first erectile with a short base and preceded by an erectile spine. Note snout and tail configuration.



Elephant fish
Callorhinchidae **(CAH)**

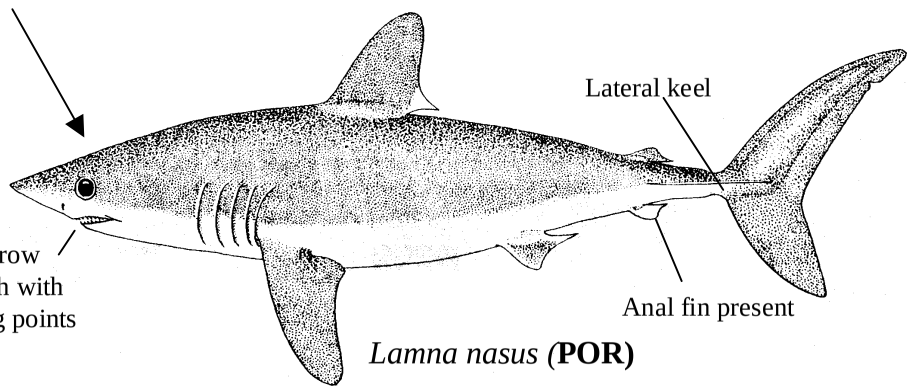
Shortnose chimaeras or ratfishes
Hydrolagus spp. **(HYD)**

Longnose chimaeras
Rhinochimaera spp. **(RHC)**



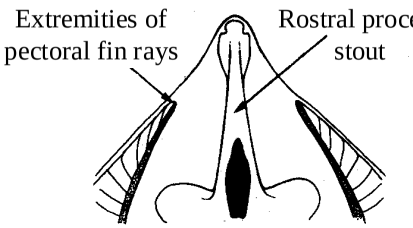
Somniosus microcephalus **(GSK)**

Usually large (> 1 m)



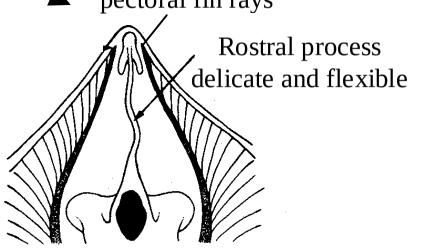
*Lamna nasus (***POR)**

Rajidae (SRX)



Raja spp. **(RAJ)**

Hardnosed Rays



Bathyraja spp. **(BHY)**

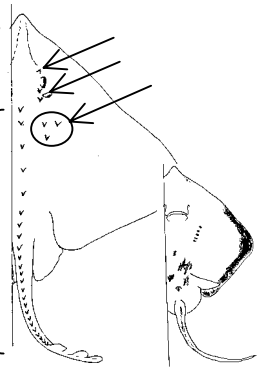
Soft nosed rays

see sheet ‘Rajid 1’

Raja (Hard nosed Rays)

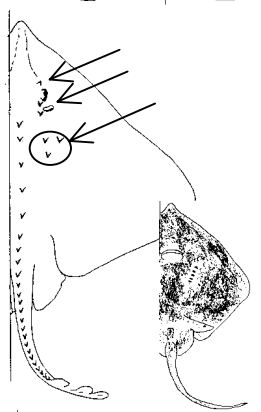
R. georgiana **(SRR)**

16-28 thorns median row



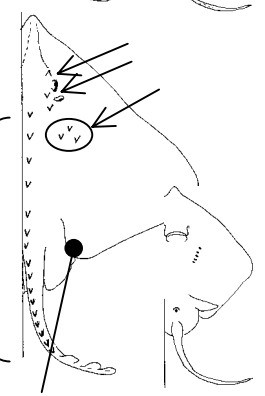
R. georgiana dark morph **(SRR)**

16-28 thorns median row



R. taaf **(RFA)**

15-20 thorns median row



Upper surface of pelvic fins under disc often pale

Bathyraja (Soft nosed Rays)

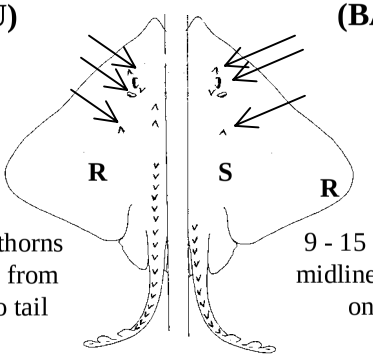
Underside pale

B. murrayi **(BMU)**

12 - 26 thorns midline from nape to tail

B. maccaini **(BAM)**

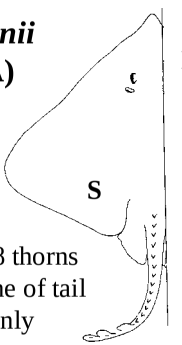
9 - 15 thorns midline of tail only



B. eatonii **(BEA)**

No pre or post orbital thorns

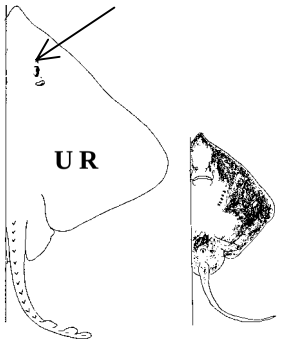
8 - 18 thorns midline of tail only



Underside pigmented

B. irrasa **(BYR)**

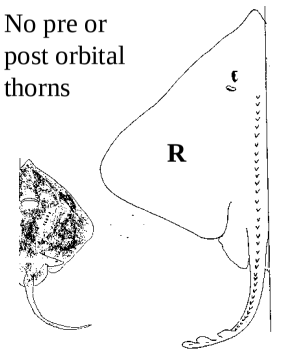
9 - 23 thorns on midline of tail



No pre or post orbital thorns

B. meridionalis **(BYE)**

37 - 39 thorns in continuous median row



NOTES

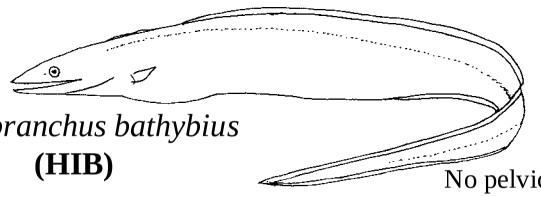
R = rough, S = smooth, UR = uniformly rough (unshaven feel)
Arrows indicate non median thorns or groups of thorns

Dorsal views to show distribution of thorns,
Ventral views (smaller) to show pigmentation

No Obvious tail

Dorsal, ventral and tail fins appear combined

One dorsal fin

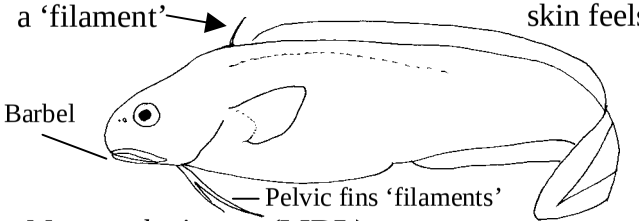


Histiobranchus bathybius
(HIB)

No pelvic fins

First dorsal a 'filament'

Scales present but skin feels smooth



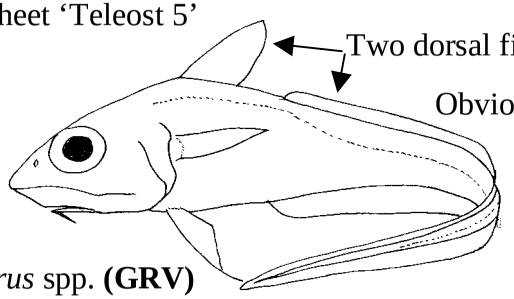
Barbel

Pelvic fins 'filaments'

Muraenolepis spp. **(MRL)**
see sheet 'Teleost 5'

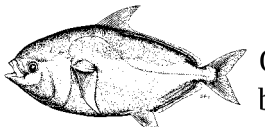
Two dorsal fins

Obvious scales



Macrourus spp. **(GRV)**
see sheet 'Teleost 2'

Obvious tail



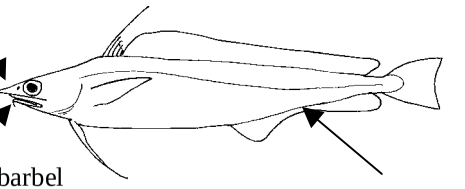
Opahs: *Lampris immaculatus* **(LAI)**. Unmistakable, body coloured blue-grey and looks 'powerful', fins bright orange

Slickheads: *Alepocephalus* spp. **(ALH)**. Dorsal and Ventral fin bases opposite, no swimbladder.

Swimbladder present - stomach usually everted through mouth when brought up from depth

Prominent snout

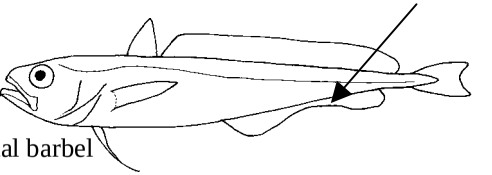
Antimora rostrata
(ANT)



Mouth inferior, mental barbel

Anal fin in two parts

Halargyreus johnsonii
(MHJ)

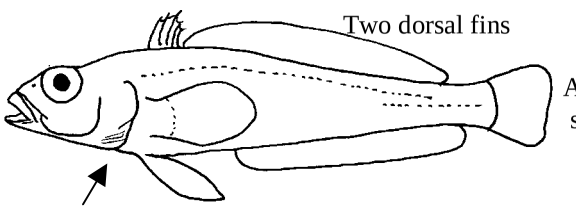


Mouth terminal, no mental barbel

No Swimbladder

Two dorsal fins

Notothenidae **(NOX)**
see sheet 'Teleost 3'

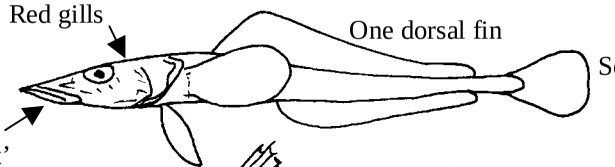


Always scaled

Red gills

One dorsal fin

Bathydraconidae



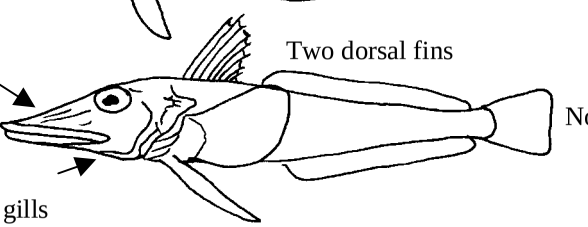
Sometimes scaled

Head 'flat'

Two dorsal fins

No scales

Channichthyidae *(***ICX)**
see sheet 'Teleost 4'



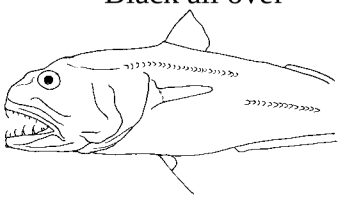
No scales

White gills

Macrouridae (Grenadiers)

Large fang-like teeth, mouth terminal

Black all over

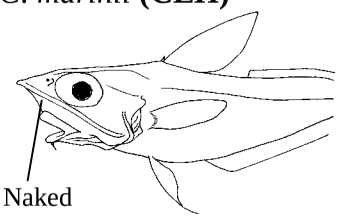


Cynomacrurus piriei **(MNI)**

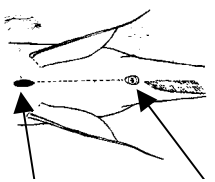
Leading edge of First Dorsal smooth

Caelorinchus spp.

C. marinii **(CEH)**

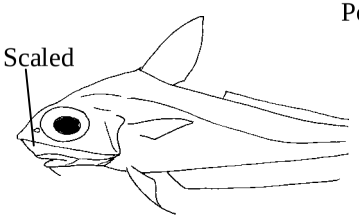


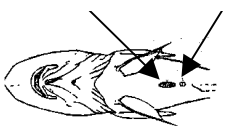
Naked



Position of Ventral fossa relative to Anus

Scaled





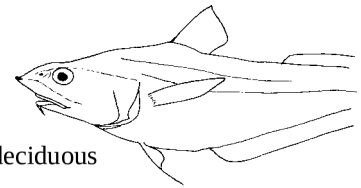
C. fasciatus **(CQF)**

Leading edge of first dorsal serrated

Infra-orbital ridge, if present, never ending in spine, eyes small, row of teeth in lower jaw

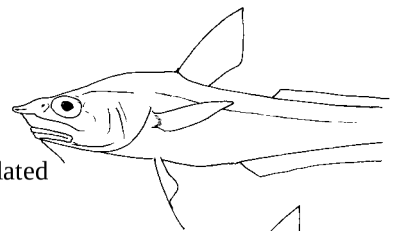
***Coryphaenoides* spp. (CVY)**

C. filicauda



Barbel thin and short, scales thin, fine and deciduous

C. ferrieri



Scales fairly firm and coarsely spinulated

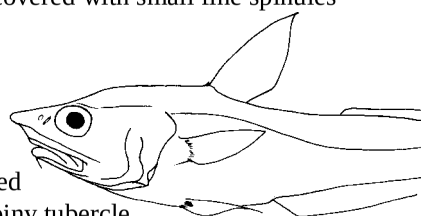
C. armatus **(CKH)**

Snout broad and blunt

No distinct terminal tubercle

Body scales deciduous covered with small fine spinules in parallel rows

C. lecointei

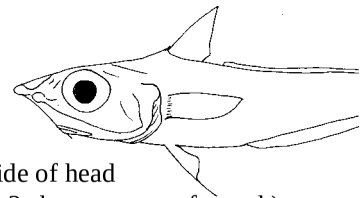


Snout narrow and pointed with distinct terminal spiny tubercle

Ridge from snout to pre-opercle ends in sharp point posteriorly, eyes large (NB species are difficult to distinguish)

***Macrourus* spp. (GRV)**

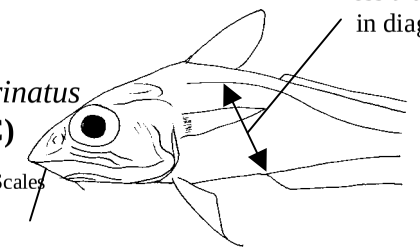
M. holotrachys **(MCH)**



No scales on underside of head (NB there may be 1 -3 above corner of mouth)

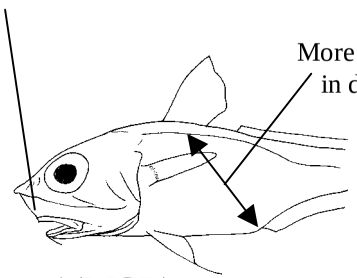
Less than 27 scales in diagonal line

M. carinatus **(MCC)**



Scales

More than 27 scales in diagonal line



M. whitsoni **(WGR)**

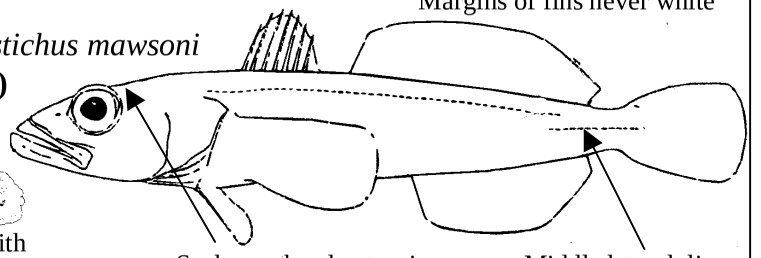
Notothenioidae

Red blood, two dorsal fins, scales on body

Large canine-like teeth

Margins of fins never white

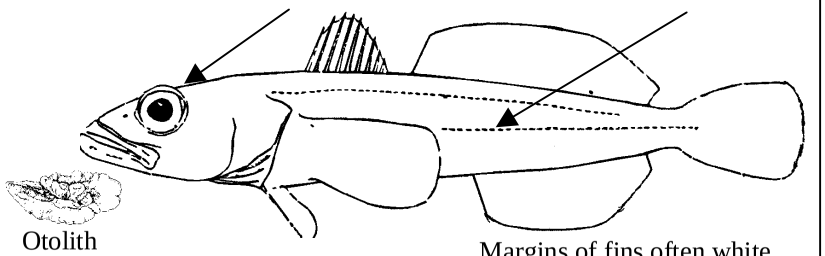
Dissostichus mawsoni **(TOA)**



Otolith

Scales on head extensive

Middle lateral line



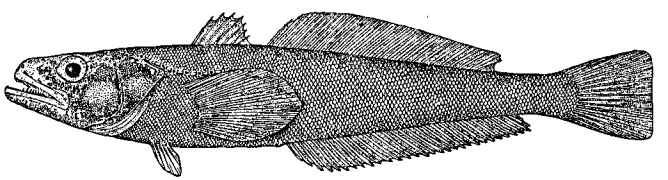
Otolith

Margins of fins often white

Dissostichus eleginoides **(TOP)**

No scales on head except for small patch posterior to eye

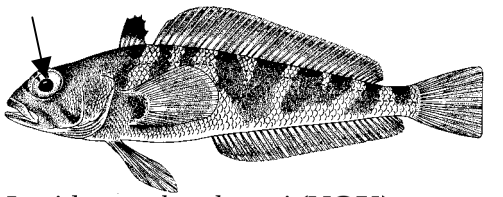
No obvious middle lateral line



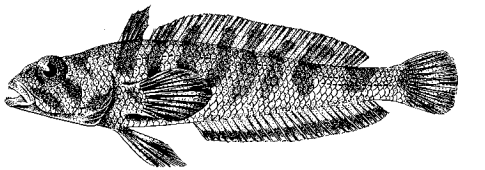
Gvozdarus svetovidovi **(GZV)**

Small villiform teeth, ctenoid scales over body and head, inter-orbital width narrow (< 12% head length)

Dark grey transverse band on upper part of eye

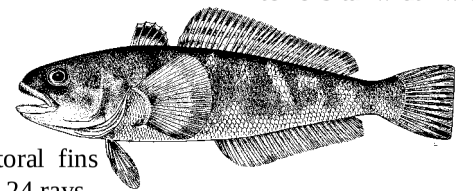


Lepidonotothen kempi **(NOK)**



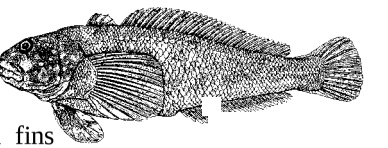
Lepidonotothen squamifrons **(NOS)**

Cycloid (smooth) scales over body, few scales on head, inter-orbital width wide (~30% head length)



Pectoral fins 21-24 rays

Notothenia rossii **(NOR)**

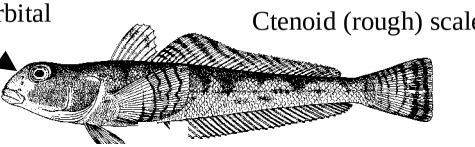


Pectoral fins 17-19 rays

Notothenia coriiceps **(NOC)**

Narrow inter-orbital "Bumphead"

Ctenoid (rough) scales

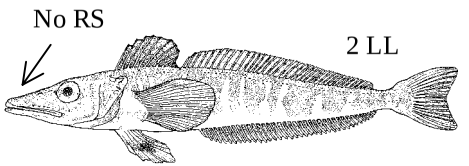


Gobionotothen gibberifrons **(NOG)**

Channichthyidae (ICX)

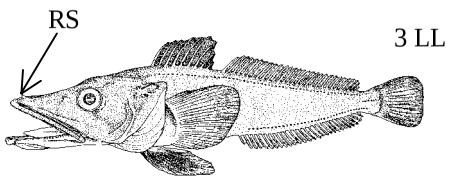
White blood and gills, two dorsal fins, no scales, opercular spines

Middle pelvic fin rays longest

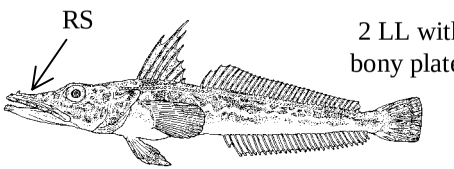


Champsocephalus gunnari **(ANI)**

Head depth=Snout *C. gunnari;* Head depth < Snout *C. esox*
P 25-28; A 35-40 = *C. gunnari;* P22-24; A 31-35= *C. esox*

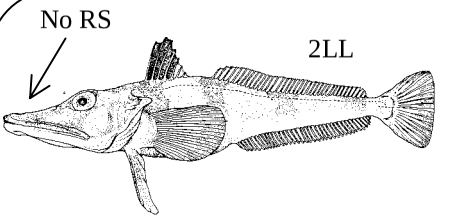


Pseudochaenichthys georgianus **(SGI)**

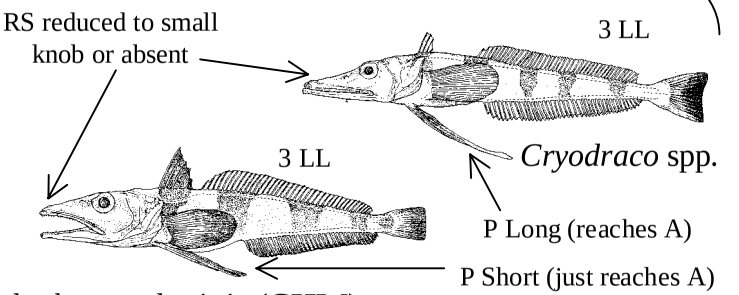


Channichthys rhinoceratus **(LIC)**

Leading pelvic fin rays longest, no spine on subopercle or interopercle

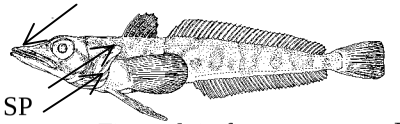


Chaenocephalus aceratus **(SSI)**



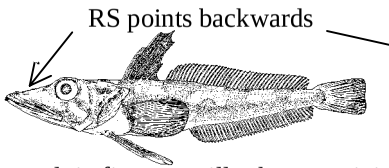
Chionobathyscus dewitti **(CHW)**
Resembles *Chaenocephalus* but has 3 LL

Spines on subopercle and interopercle, 3 LL



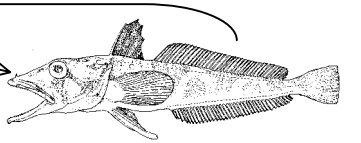
Five pelvic fin rays

Chionodraco myersi **(MIC)**



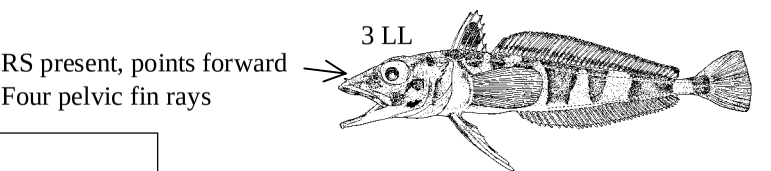
Five pelvic fin rays, gill rakers vestigial

Chionodraco hamatus **(TIC)**



Five pelvic fin rays,
gill rakers dentigerous

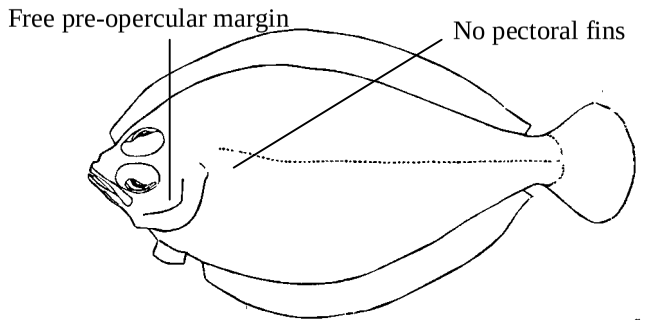
Chionodraco rastrospinosus **(KIF)**

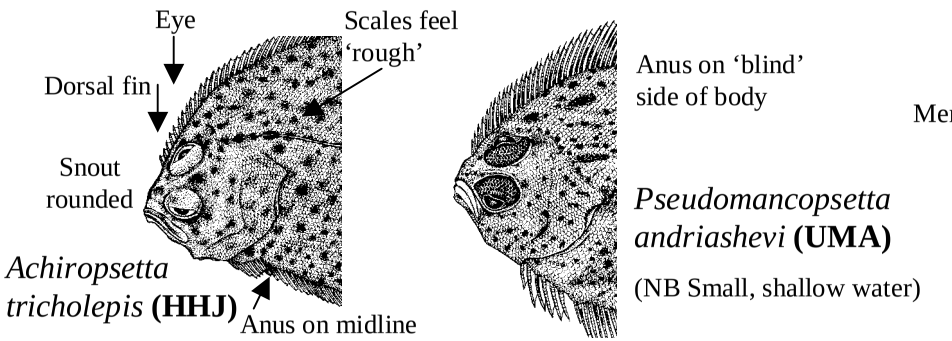


Chaenodraco wilsoni **(WIC)**

Notes
A=Anal fin; P=Pelvic fin;
LL=Lateral Line; RS=Rostral Spine; SP=Spine

Bothidae (Lefteye or Armless Flounders)

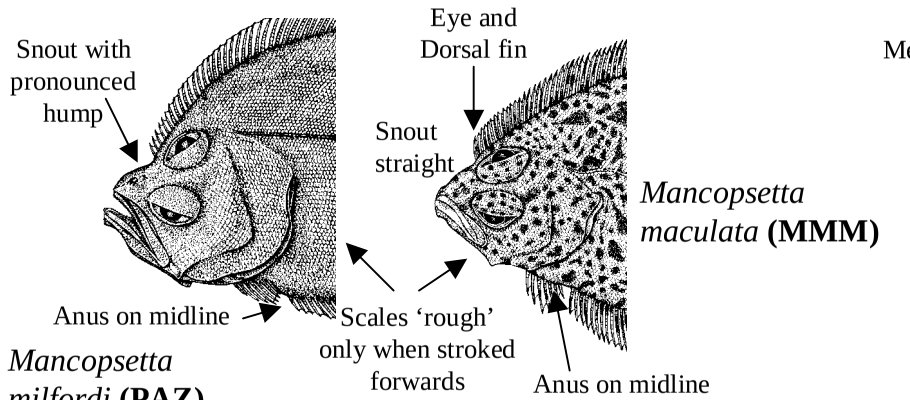




Achiropsetta tricholepis **(HHJ)**

Pseudomancopsetta andriashevi **(UMA)**

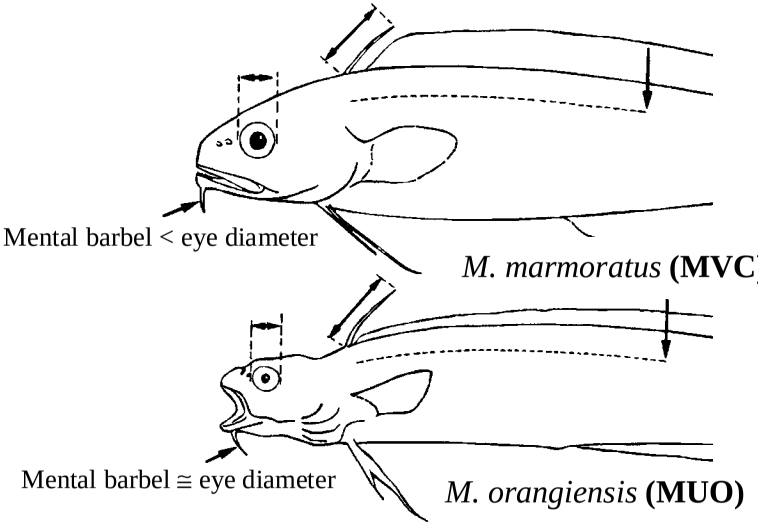
(NB Small, shallow water)



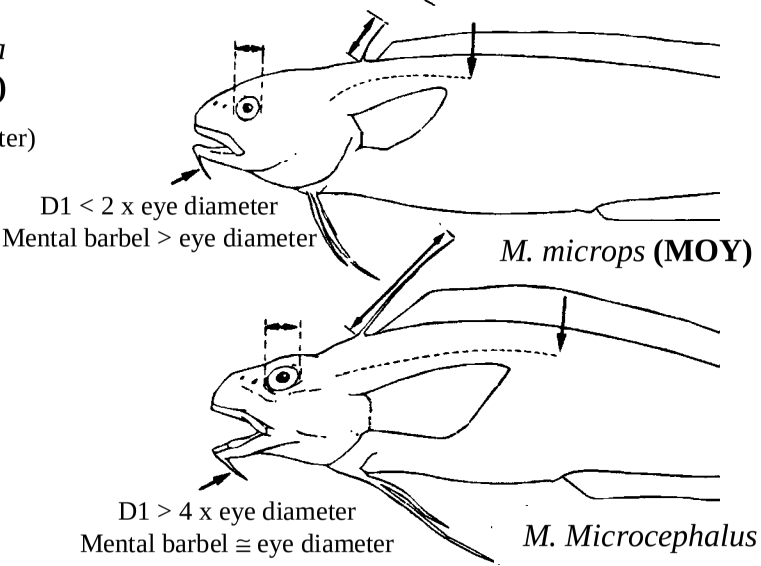
Mancopsetta maculata **(MMM)**

Mancopsetta milfordi **(PAZ)**

Muraenolepis **spp. (MRL)**



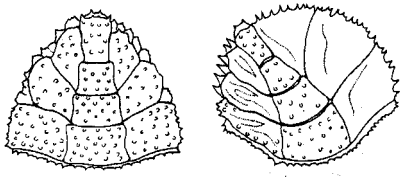
Distinct lateral line reaching to middle of D2

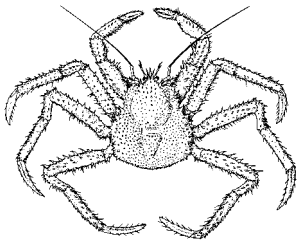


Indistinct short lateral line, normally no more than 2 pore

Lithodidae (Stone crabs, **KCX)**

Male Female





Abdomen without membraneous areas, the calcareous plates being continuous

***Paralomis* spp. (PAI)**

Rostrum

1. Carapace pear-shaped, covered by spinous tubercles:

   P. aculeata **(KCU)** →

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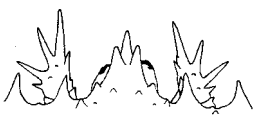
2. Carapace rounded, more or less covered with numerous granules:

   P. anamerae **(KDD)** →



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3. Entire dorsal surface of carapace covered with numerous spines:

   P. spinosissima **(KCV)** →

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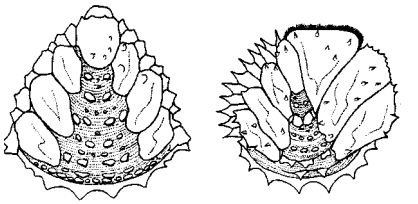
4. Carapace more or less pentagonal, as long as wide surface covered with small granules and a FEW spines:

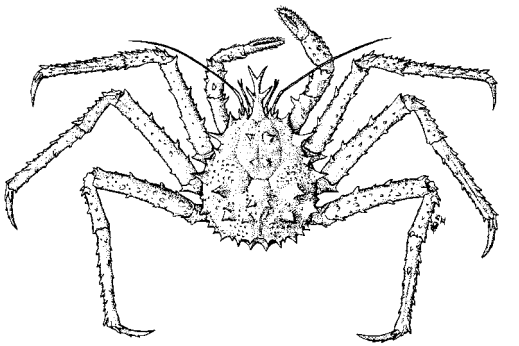
   P. formosa **(KCF)** →

Male Female



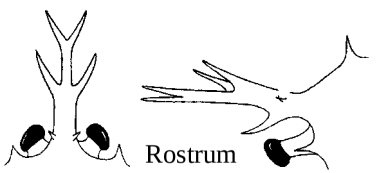
Abdomen with membraneous region containing calcareous nodules

***Lithodes* spp. (KCZ)**



Carapace and legs with unequal spines (sharp) and tubercles

L. murrayi **(KCM)**



Rostrum

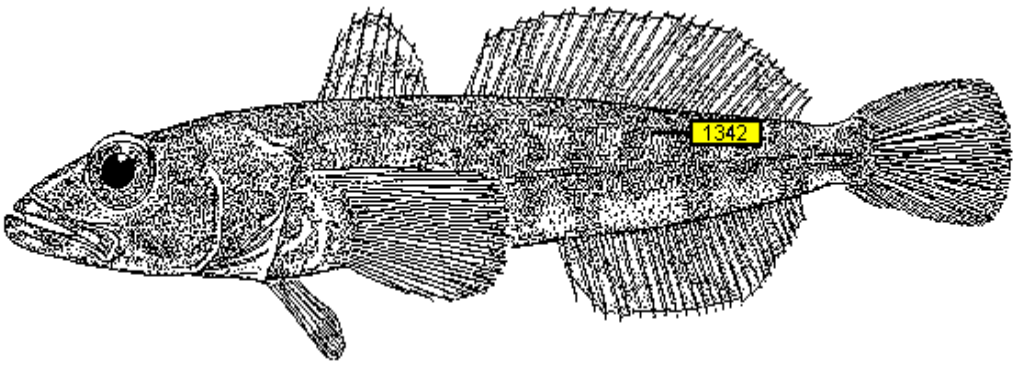
Dorsal + Lateral views

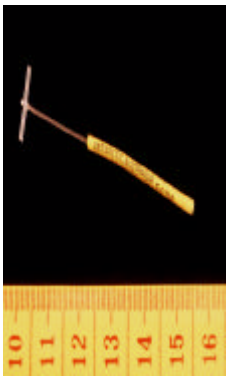
SECTION 14

NATIONAL PROGRAMS ON FISH TAGGING

AUSTRALIA – *DISSOSTICHUS ELEGINOIDES*

Australian scientists are conducting a tagging program on *Dissostichus eleginoides* (Patagonian toothfish, Legine Australe) in the Australian EEZ around Heard and McDonald Islands (CCAMLR Division 58.5.2). As it is possible that fish may move to adjacent fisheries areas, we would be grateful if the captains of vessels fishing for this species could organise for their crews to look out for and report any tagged fish captured.





Fish are tagged on each side with a yellow plastic numbered tag placed below the second dorsal fin. Each tag is individually numbered and marked ANTARCTIC AUSTRALIA.

If a tagged fish is found, please record the numbers of both tags, the position and depth from which the fish was caught, the method of capture (e.g. longline, bottom or midwater trawl), the date recaptured and the name of the vessel. If possible, please also measure the total length of the fish and record its sex. Retain the tags and keep with the information collected.

Please give the information and the tags as soon as possible either:

- directly to Dick Williams at the Australian Antarctic Division, Channel Highway, Kingston Tasmania 7050, Australia, fax number +61 3 62323351, email dick_wil@antdiv.gov.au; or

- to the fisheries inspector or scientific observer on board, or pass it to your appropriate fishery authority at the earliest convenient time for forwarding to Australia.

Please note that all information supplied with the tags will be treated in the strictest confidence and will not be published in any way that can identify the vessel or the location at which the fish was caught.

This tagging program is providing important information on the biology of *D. eleginoides* which will improve the management of fisheries for this species. In particular, it gives information on:

- the movements of *D. eleginoides*, which will help in identifying different stocks of fish;
- the biomass of fish from the rate of recapture of tagged fish; and
- the growth rate of fish by measuring the length at initial tagging and at recapture.

Information on the recapture of tagged fish will ultimately be of benefit to all fisheries in the region, and we thank you in advance for your cooperation. The tagging program is likely to continue for several years.

Dick Williams
Fish Biologist
Australian Antarctic Division

NEW ZEALAND TAGGING STUDIES ON TOOTHFISH (*DISSOSTICHUS* SPP.) IN THE ROSS SEA

The Program

New Zealand is conducting a tagging program on *Dissostichus mawsoni* (Antarctic toothfish) and *D. eleginoides* (Patagonian toothfish) in CCAMLR Subarea 88.1, the western Ross Sea. This program is likely to be extended to Subarea 88.2, the eastern Ross Sea.

The overall objective of the tagging program in the long term is to determine the stock size of toothfish resources in Subarea 88.1 by tag and recapture experiments.

In the upcoming season, the specific objectives are to tag and release small toothfish taken in the longline fishery for the purpose of monitoring movements and growth rates of these fish, and, to determine the feasibility of an ongoing tag and release program from commercial vessels in this area.

Program History

This tagging program commenced in the 2000/01 fishing year. To date 280 *D. mawsoni*, and 1 *D. eleginoides* have been tagged.

The Tags

This program is using Floy® FD-94, super heavy filament 'T' bar tags. The tags are sequentially numbered 0001 to 3000, coloured white, each with the legend, RTN TO: NIWA, PO BOX 14-901, WGTN, NEW ZEALAND.

The tags are inserted on one side only.

Information to Collect on Recapture

New Zealand vessels have been provided with the attached 'Toothfish Tag Recapture Data Recording Sheet' and this describes all the data we would like collected if at all possible. Where possible the whole fish should be retained, but as an absolute minimum retain the tag, otoliths and paired scales.

Program Coordinator

This tagging program is being coordinated by:

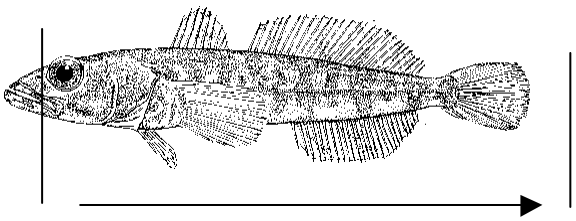
Neville Smith
Ministry of Fisheries
PO Box 1020
Wellington, New Zealand

Telephone: +64 4 470 2600
Fax: +64 4 470 2601
Email: smithn@fish.govt.nz

Toothfish Tag RECAPTURE Data Recording Sheet

Vessel Name:	**Date (d/m/yr):**	**Longline Reference number:**
Location (latitude/longitude):		
Time:		
For Each Tagged Toothfish Specimen RECAPTURED Record the Following:		
Tag Number:		
Recapture Location (lat/long):		
Length :* (cm)		
Weight: (gms)		
Sex:		
Gonad Stage:		
Fish Condition:		
Tag Site Condition**		
Retained Samples: (tick)	**Whole Fish**	**Otoliths**	**Scales**
General Notes:	

* Length – All samples are measured as illustrated to the centimetre below the tail length. i.e. a fish length of 33.7 cm is recorded as 33 cm.



** Tag location of recaptured fish should be photographed if possible.

NEW ZEALAND TAGGING STUDIES ON SKATES (RAJIDAE) IN THE ROSS SEA

The Program

New Zealand is conducting a tagging program on skates (Rajidae) in CCAMLR Subarea 88.1, the western Ross Sea. This program is likely to be extended to Subarea 88.2, the eastern Ross Sea.

The overall objective of the tagging program in the long term is to determine whether release of skates is a suitable method for reducing the effects of the toothfish fishery on this potentially vulnerable non-target catch.

In the upcoming season, the specific objectives are to tag and release skates taken incidentally in the toothfish longline fishery for the purpose of monitoring survival (and also movements and growth rates).

Program History

This tagging program commenced in the 1999/2000 fishing year. To date over 3 000 skates have been tagged.

The Tags

This program is using Floy® FIM-96, small billfish dart tags. The tags are sequentially numbered 0001 to 9000 (0001–2000 are orange, 2001–6000 are fluorescent green and 6001–9000 are also orange), each with the legend, RTN TO: NIWA, PO BOX 14-901, WGTN, NEW ZEALAND.

The tags are inserted on the left side of the dorsal block only.

Information to Collect on Recapture

New Zealand vessels have been provided with the attached 'Skate Tag Recapture Data Recording Sheet' and this describes all the data we would like collected if at all possible. Where possible the whole fish should be retained, but as an absolute minimum retain the tag, and a vertebrae sample.

Program Coordinator

This tagging program is being coordinated by:

Neville Smith
Ministry of Fisheries
PO Box 1020
Wellington, New Zealand

Telephone: +64 4 470 2600
Fax: +64 4 470 2601
Email: smithn@fish.govt.nz

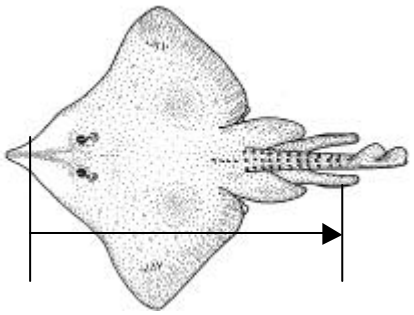
Skate Tag RECAPTURE Data Recording Sheet

Vessel Name:	**Date (d/m/yr):**	**Longline Reference number:**
Location (latitude/longitude):		
Time:		
For Each Tagged Skate Specimen RECAPTURED Record the Following:		

Tag Number:						
Species:						
Recapture Location (lat/long):						
Length :* (cm)						
Weight: (gms)						
Sex:						
Gonad Stage:						
Fish Condition:						
Tag Site Condition**						
Retained Samples: (tick)	**Whole Fish**		**Vertebrae**		**Stomach**	

General Notes:	

* Pelvic Length – All samples are measured as illustrated to the centimetre below the length. i.e. a fish length of 33.7 cm is recorded as 33 cm.



** Tag location of recaptured fish should be photographed if possible.

SOUTH AFRICA – *DISSOSTICHUS ELEGINOIDES*

Marine and Coastal Management, South Africa conducted a tagging program on Patagonian toothfish *(Dissostichus eleginoides)* in April 2001 in the Prince Edward Islands EEZ which falls under CCAMLR Subareas 58.6 and 58.7. Further tagging is planned to take place in these waters.

The April 2001 fish were tagged on the left side, with a single tag, below the second dorsal fin with 16 cm yellow tags. All tags are individually marked and bear the inscription SEA FISHERIES – CAPE TOWN.

Future tagging will be done with yellow spaghetti tags, 8 cm in length. Two numbered tags will be inserted, one on either side, placed below the second dorsal fin and bearing the inscription SEA FISHERIES.

Marine and Coastal Management kindly request that vessel crew are informed of the tagging program and are asked to report such fish to the officer on watch or to the scientific observer.

Any tagged fish recovered should be accompanied with the following information:

- date of recapture;
- name of vessel;
- coordinates of recapture;
- bottom depth of longline/pot/bottom trawl; depth of midwater trawl; and
- where possible, the total length and sex of the fish.

Please keep above information together with recovered tag/s.

All recapture information should be forwarded to:

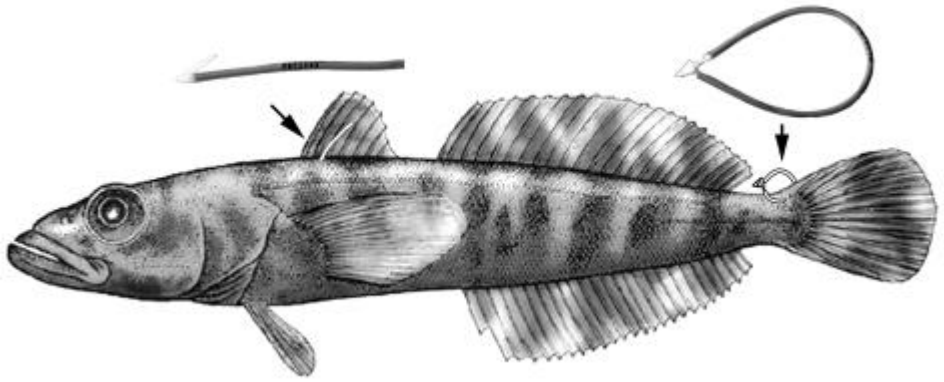
Barry Watkins
Marine and Coastal Management
Private Bag X2
Roggebay 8012
Cape Town
South Africa

Email: bwatkins@mcm.wcape.gov.za
Fax: + 27 21 421 8614.

ALL INFORMATION WILL BE TREATED
AS STRICTLY CONFIDENTIAL

USA – *DISSOSTICHUS MAWSONI*

US scientists have conducted a tagging program on *Dissostichus mawsoni* (Antarctic toothfish) in McMurdo Sound since 1973. Since it is now known that fish tagged in McMurdo Sound can move into the Ross Sea during part of the year (based on a single recapture in the northern Ross Sea last year), we would be grateful if the captains of vessels fishing for this species would have their fishing crew watch for, collect and report any tagged fish.



Fish are tagged through the upper part of the base of the caudal fin (tail fin) with a lock-on tail tag that is obvious. A three-inch dart tag is also inserted into the muscle mass at the base of the second fin ray on the first dorsal fin. Only a small segment (0.5 cm) of this tag may be visible. Over the course of this tagging study we have used yellow, red and blue tags that are numbered. Only the yellow tags have a return address of Scripps Institution of Oceanography, which is no longer valid. The other coloured tags have only a capital letter followed by five digits.

If a tagged fish is caught, please record the numbers of both tags, the position and depth, method of capture, date and name of vessel. Please also measure the total length and, if possible, its weight.

Recovery of the entire fish would be of great value because most of them have been injected with a small dose of tetracycline, which labels the bony structures (bones, otoliths and scales) and makes them fluoresce under ultraviolet light. This treatment helps determine the age of the fish. Retaining the entire fish in a frozen state would be ideal and the fishing company would be reimbursed for the wholesale cost of the specimen and its transport. Please contact Arthur L. DeVries, contact information below, to arrange for the transport of a whole fish, if collected and frozen.

If collection of the entire fish is not feasible, please collect the ear bones (otoliths) from inside of the skull, scrape off about 100 scales from the side of the fish and record the fish's length, weight and sex.

Please send any available information, samples and the tags as soon as possible to:

- Arthur L. DeVries, Biologist, University of Illinois, 524 Burrill Hall, Urbana, Illinois 61801, USA, fax number +1 217-333-1133, telephone number +1 217-333-4245, email adevries@uiuc.edu; or

- the fisheries inspector or scientific observer on board, or pass it to your appropriate fishery authority at the earliest convenient time for forwarding to the USA.

All information supplied with the tags will be treated in the strictest confidence and will not be published in any way that can identify the vessel or the location at which the fish was caught.

The tagging program is providing important information on the biology of *D. mawsoni*, which will be useful for management of the fisheries for this species. It will provide information on the growth rate of this cold-water fish and its yearly migration when it leaves McMurdo Sound at the end of each austral summer. Your cooperation will not only benefit the fishing industry but will further the knowledge about the biology of these cold-water Antarctic fishes.

SECTION 15

MATURITY STAGES OF ANTARCTIC SKATES

Maturity Stages of Antarctic Skates

Maturity data are needed to determine the *length* at maturity, and for all skates from which vertebrae and thorns are collected, to determine the *age* at maturity. Males can be staged externally, without dissection. Females need to be opened up to determine their maturity stage (from M.P. Francis, WG-FSA-03/42).

Males

1. Immature	Claspers short (not extending beyond pelvic fins) and uncalcified.
2. Maturing	Claspers extend beyond pelvic fins but are soft and uncalcified (rarely, some calcification may have begun).
3. Mature	Claspers extend well beyond pelvic fins and are hard, rigid and calcified.

Females: In small immature females, the ovary may be completely embedded in the epigonal organ and therefore invisible. The epigonal organ is a white to pink, soft, and easily torn organ (similar in consistency to the liver but softer). It runs much of the length of the body cavity, appearing as a strap on each side of the backbone.

1. Immature	Ovary invisible or contains only small (pinhead-sized) ova that have no trace of yellow or orange yolk. Uteri thread-like. No uterine egg cases.
2. Maturing	Ovary contains small to medium (up to marble-sized) white to orange ova. Uteri may have visible swellings at anterior or posterior ends. No uterine egg cases.
3. Mature	Ovary contains some large (greater than marble-sized) yellow or orange ova, in addition to small and medium ova. Uteri enlarged (>1 cm wide) and *may* contain egg cases. The presence of uterine egg cases guarantees that the female is mature, but females without uterine egg cases are still mature if they have some large ovarian eggs.

Note: This maturity scale, originally developed for New Zealand skates, has been used for *Amblyraja georgiana* and *Bathyraja eatonii* with good results, but has not been specifically tested on Antarctic skate species.

PART IV

REFERENCE MATERIAL

SECTION 1

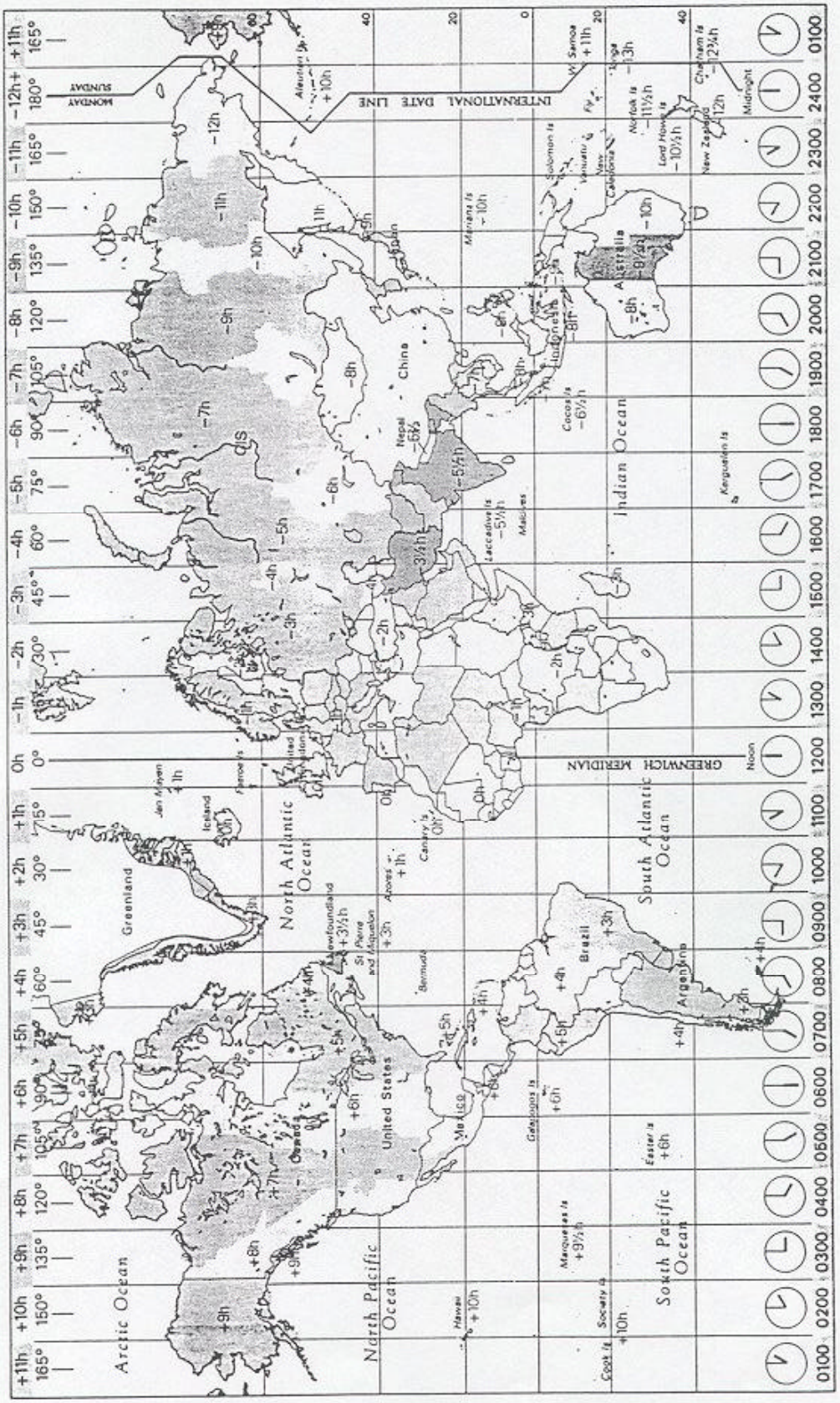
MAPS OF THE CCAMLR CONVENTION AREA

Convention Area maps are unavailable in pdf format.
Please contact the Secretariat for copies to be sent to you.

SECTION 2

WORLD TIME ZONES

WORLD TIME ZONES



SECTION 3

BEAUFORT SCALE OF WIND FORCE AND DEFINITION OF SEA HEIGHT AND SWELL

BEAUFORT SCALE OF WIND FORCE

Beaufort No.	Descriptive Term	Mean Wind Speed (knots)	Probable Wave Height* (m)	
0	Calm	<1		
1	Light air	1-3	0.1	(0.1)
2	Light breeze	4-6	0.2	(0.3)
3	Gentle breeze	7-10	0.6	(1)
4	Moderate breeze	11-16	1	(1.5)
5	Fresh breeze	17-21	2	(2.5)
6	Strong breeze	22-27	3	(4)
7	Near gale	28-33	4	(5.5)
8	Gale	34-40	5.5	(7.5)
9	Strong gale	41-47	7	(10)
10	Storm	48-55	9	(12.5)
11	Violent storm	56-63	11.5	(16)
12	Hurricane	64 and over	14	(-)

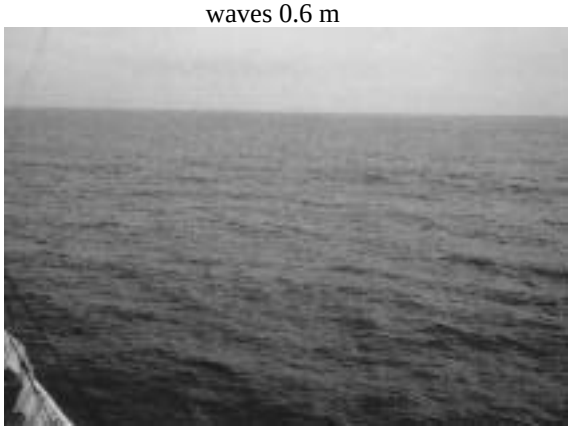
* This table is intended as a rough guide for the open sea. Figures in brackets indicate the probable maximum wave heights.

Beaufort No. 0: calm <1 knot, flat (not pictured)

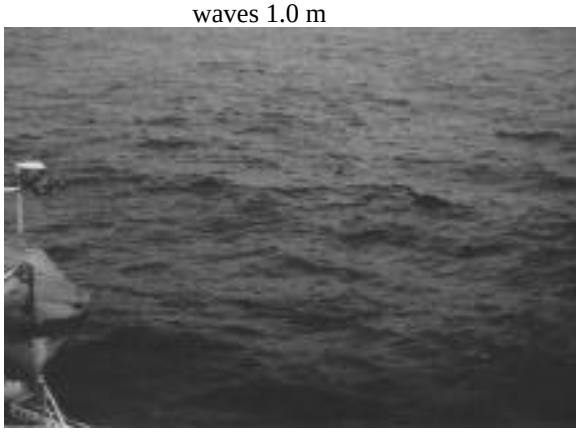
Beaufort No. 1: light air 1–3 knots
waves 0.1 m

Beaufort No. 2: light breeze 4–6 knots
waves 0.2 m

Beaufort No. 3: gentle breeze 7–10 knots
waves 0.6 m



Beaufort No. 4: moderate breeze 11–16 knots
waves 1.0 m



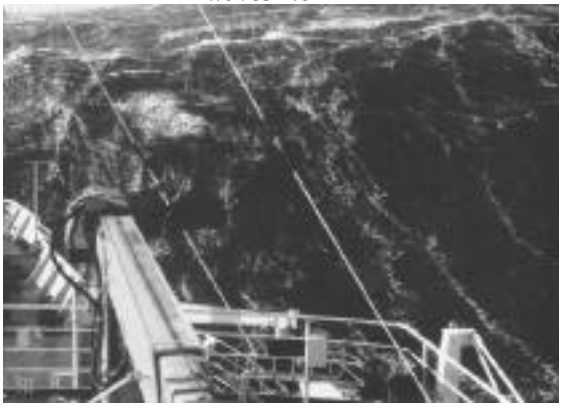
Beaufort No. 5: fresh breeze 17–21 knots
waves 2.0 m

Beaufort No. 6: strong breeze 22–27 knots
waves 3.0 m

Beaufort No. 7: near gale 28–33 knots
waves 4.0 m

Beaufort No. 8: gale 34–40
waves 5.5 m

Beaufort No. 9: strong gale 41–47 knots
waves 7.0 m



Beaufort No. 10: storm 48–55 knots
waves 9.0 m

Beaufort No. 11: violent storm 56–63 knots
waves 11.5 m

Beaufort No. 12: hurricane >64 knots
waves 14 m

DEFINITION OF SEA HEIGHT AND SWELL

'Sea waves' and 'swell waves' may be observed and defined as follows:

(i) Sea waves are generated locally and move in the same direction as the surface wind.

(ii) Swell waves have been generated elsewhere and have travelled out of the area in which they were generated.

(iii) Waves of both tyes travel in groups, each group being made up of a number of waves of varying height, with the higher waves occurring in the centre of the group. The groups are separated by a relatively flat area, consisting of two or more waves of slight development. Sea waves have a more irregular appearance than swell waves.

(iv) Swell waves travel in regular succession and in a well-defined direction, and generally have long and rounded crests. Good examples of swell waves may be observed when there has been little or no wind for several hours.

2. If only one wave system is observed, it should be classified as 'sea waves' if the surface wind is blowing in the same direction as the waves are moving; otherwise it should be recorded as 'swell waves'.

3. When the waves move in more than one direction, the sea waves will be those which are aligned with the surface wind direction, or those with the more irregular wave forms. Swell waves will in general have a more regular pattern.

4. If two wave forms are observed and their movement is in the direction of the surface wind, the system which has the longer distance between crests and the more regular form is considered to be the swell.

5. To estimate the height of a wave system, only the well-developed waves in the centre of the groups should be averaged. Wave height is measured as the distance from the trough to the crest of the wave.

6. Observations of waves are to be made where they are not deformed by shallow water, nor reflected or deflected by rocks, breakwaters, or other such objects. The observation point must be exposed to seaward and not sheltered by headland or shoals.

SECTION 4

NAUTICAL DAWN AND DUSK REFERENCE TABLE

NAUTICAL DAWN AND DUSK REFERENCE TABLE

The time intervals listed in this table are the periods of daylight, from nautical dawn (when the sun rises above 12° below the horizon) to nautical dusk (when the sun sets below 12° below the horizon). The length of the daylight period is determined by the latitude and date, remaining constant for a given latitude and date regardless of the longitude. Under Conservation Measure 25-02 (2003), paragraph 4, longline setting should not occur between nautical dawn and nautical dusk.

The times listed are the local times of nautical dawn and dusk at intervals of 5° latitude from 45° to 82°S for the first day of each month in 2005. For example, at South Georgia (55°S) on 1 May, daylight occurs from 5:59 to 17:53 h local time, no longlines should be set during this period. If fishing on 1 May at 57°30'S (halfway between 55°S and 60°S), daylight occurs from approximately 6:02 to 17:50 h. Note that time adjustments will need to be made if a vessel is operating on a time other than local time (including daylight saving). An adjustment will be necessary for estimating the times throughout each month. For example, nautical dawn on 15 May at 60°S would start at approximately 6:30 (halfway between 1 May and 1 June).

2005 Month	Latitude								
	45°S	50°S	55°S	60°S	65°S	70°S	75°S	80°S	82°S
1 January	2:51 – 21:15	2:07 – 21:59	*	*	*	*	*	*	*
1 February	3:41 – 20:44	3:14 – 21:11	2:33 – 21:50	1:11 – 23:07	*	*	*	*	*
1 March	4:30 – 19:52	4:16 – 20:06	3:57 – 20:25	3:30 – 20:51	2:46 – 21:33	0:57 – 23:09	*	*	*
1 April	5:14 – 18:52	5:10 – 18:55	5:06 – 19:00	4:59 – 19:06	4:48 – 19:16	4:32 – 19:32	4:01 – 20:01	2:49 – 21:08	1:26 – 22:17
1 May	5:49 – 18:04	5:54 – 17:59	5:59 – 17:53	6:05 – 17:47	6:13 – 17:39	6:23 – 17:29	6:37 – 17:14	7:05 – 16:45	7:25 – 16:24
1 June	6:18 – 17:37	6:28 – 17:26	6:41 – 17:14	6:56 – 16:58	7:17 – 16:38	7:47 – 16:08	8:39 – 15:15	No Sun	No Sun
1 July	6:28 – 17:39	6:39 – 17:28	6:53 – 17:14	7:10 – 16:57	7:33 – 16:34	8:06 – 16:01	9:07 – 15:00	No Sun	No Sun
1 August	6:09 – 18:03	6:17 – 17:56	6:25 – 17:48	6:35 – 17:38	6:47 – 17:26	7:04 – 17:09	7:32 – 16:42	8:27 – 15:47	9:15 – 15:00
1 September	5:25 – 18:35	5:24 – 18:36	5:23 – 18:37	5:21 – 18:40	5:17 – 18:44	5:10 – 18:52	4:57 – 19:06	4:28 – 19:36	4:06 – 20:01
1 October	4:27 – 19:12	4:17 – 19:22	4:04 – 19:36	3:46 – 19:55	3:18 – 20:23	2:31 – 21:13	*	*	*
1 November	3:27 – 20:01	3:04 – 20:24	2:32 – 20:57	1:39 – 21:51	*	*	*	*	*
1 December	2:45 – 20:53	2:06 – 21:32	0:52 – 22:49	*	*	*	*	*	*

* Indicates that a daylight period (including nautical dawn and dusk) extends over 24 hours, because the sun is continuously above an angle of 12° below the horizon. Conservation Measure 25-02 requires that longline fishing should not be conducted during such periods.

SECTION 5

SELECTION OF CCAMLR DATABASE CODES

SELECTION OF CCAMLR DATABASE CODES

LIST OF SPECIES AND CODES

Species Name	Code	English Name	French Name	Russian Name	Spanish Name
Pisces					
Amblyraja georgiana	SRR				
Antimora rostrata	ANT	Blue antimora	Antimore bleu	Клюворылая антимора	Mollera azul
Bathyraja eatoni	BEA	Eaton's skate	Raie d'Eaton	Skat Itona	Raya de Eaton
Bathyraja maccaini	BAM	McCain's skate	Raie de McCain	Скат Маккейна	Raya de McCain
Bathyraja murrayi	BMU	Murray's skate	Raie de Murray	Skat Murreya	Raya de Murray
Chaenodraco wilsoni	WIC	Spiny icefish	Grande-gueule épineuse	Четырехпалая белокровка	Draco espinudo
Chaenocephalus aceratus	SSI	Blackfin icefish	Grande-gueule antarctique	Крокодиловая белокровка	Draco antártico
Channichthyidae	ICX	Icefish	Poissons des glaces	Белокровные	Dracos
Channichthys rhinoceratus	LIC	Unicorn icefish	Grande-gueule	Носорогая белокровка	Draco rinoceronte
Champsocephalus gunnari	ANI	Mackerel icefish	Poisson des glaces	Ледяная рыба	Draco rayado
Chionodraco rastrospinosus	KIF	Ocellated icefish	Grande-gueule ocellée	Колючая белокровка	Draco ocelado
Chionodraco hamatus	TIC			Шиповатая белокровка	
Cryodraco antarcticus	FIC	Long-fingered icefish		Криодрако	
Dissostichus eleginoides	TOP	Patagonian toothfish	Légine australe	Патагонский клыкач	Bacalao de profundidad
Dissostichus mawsoni	TOA	Antarctic toothfish	Légine antarctique	Антарктический клыкач	Austromerluza antártica
Dissostichus spp.	TOT	Toothfish spp.	Légines antarctiques nca	Клыкачи	Austromerluzas nep
Electrona antarctica	ELN	Lanternfish	Lanternule	Антарктическая электрона	
Electrona carlsbergi	ELC	Lanternfish	Lanternule	Электрона Карлсберга	
Gobionotothen acuta	NOA	Triangular rockcod	Bocasse triangulaire	Нототения остролучка	Trama triangular
Gobionotothen angustifrons	NOF	Narrowhead rockcod	Bocasse obtuse	Узколобая нототения	Trama
Gobionotothen gibberifrons	NOG	Humped rockcod	Bocasse bossue	Зеленая нототения	Trama jorobada
Gymnoscopelus nicholsi	GYN	Lanternfish	Lanternule	Гимноскопель Никольса	
Lepidonotothen kempi	NOK	Striped-eyed rockcod	Bocasse aux yeux rayés	Чешуеглазка кемпа	Trama ojirayada
Lepidonotothen larseni	NOL	Painted rockcod	Bocassette écrivain	Нототения Ларсена	Doradillo escribano
Lepidonotothen squamifrons	NOS	Grey rockcod	Bocasse grise	Серая нототения	Trama gris
Lithodes murrayi	KCM	Stone crab	Crabe royal subantarctique	Краб муррайи	Centolla subantártica

List of species and codes (continued)

Species Name	Code	English Name	French Name	Russian Name	Spanish Name
Macrourus spp.	GRV	Rat tails, Grenadiers	Grenadiers	Макрурусы	Granaderos
Macrourus whitsoni	WGR	Bigeye grenadier	Grenadier grosyeux	Гребенчаточешуйный макрурус	Granadero ojisapo
Mancopsetta maculata	MMM	Antarctic armless flounder	Mancoglosse antarctique	Антарктическая пятнистая камбала	Mancolenguado antártico
Merluccius australis	HKN	Southern hake		Новозеландская мерлуза	
Micromesistius australis	WHB	Southern blue whiting	Merlan bleu austral	Южная путассу	Polaca argentina
*Micromesistius poutassou**	WHB	Blue whiting	Merlan bleu	Северная путассу	Bacaladilla
Muraenolepis microps	MOY	Smalleye moray cod	Gadomurène petit œil	Малоглазый паркетник	
Muraenolepis spp.	MRL	Moray cods	Gadomurènes	Паркетники	Gadimorenas
Myctophidae	LXX	Lanternfish	Lanternules	Миктофовые, светящиеся анчоусы	Linternillas
Neopagetopsis ionah	JIC			Китовая белокровка	
Notolepis coatsi	NTO	Antarctic Jonas fish	Barracudine antarctique	Антарктический нотолепис	
Notothenia (Gobionotothen) angustifrons	NOF	Narrowheaded rockcod	Bocasse obtuse	Узколобая нототения	
Notothenia coriiceps	NOC	Black rockcod	Bocasse noire	Субантарктическая голубая нототения	Trama negra
Notothenia (Gobionotothen) gibberifrons	NOG	Humped rockcod	Bocasse bossue	Зеленая нототения	
Notothenia (Lepidonotothen) kempi	NOK	Striped-eyed rockcod	Bocasse aux yeux rayés	Чешуеглазка кемпа	
Nototheniops (Lepidonotothen) larseni	NOL	Painted rockcod	Bocassette écrivain	Нототения Ларсена	
Notothenia mizops	NOZ	Toad rockcod	Bocassette crapaud	Кергеленская нототения, звездочет	Ojo de sapo
Notothenia neglecta	NON	Yellowbelly rockcod	Bocasse jaune	Антарктическая голубая нототения	Trama amarilla
Notothenia nudifrons	NOD	Yellowfin rockcod	Bocassette dégarnie	Лысая нототения, звездочет	Doradillo pobre
Notothenia rossii	NOR	Marbled rockcod	Bocasse marbrée	Мраморная нототения	Trama jaspeada
Nototheniidae	NOX	Rockcods	Calandres, légines, bocasses, bocassons, bocassettes	Нототениевые	Tramas, doradillos
Osteichthyes spp.	MZZ	Unidentified bony fish	Poissons osseux non pécifiés	Костные рыбы	Peces marinos nep
Pagothenia hansoni	TRH	Striped rockcod	Bocasson rayé	Трематом-полосатик	Austrobacalao rayado

* Used as bait in longline fishing in the CCAMLR Convention Area.

List of species and codes (continued)

Species Name	Code	English Name	French Name	Russian Name	Spanish Name
Osteichthyes spp. (continued)					
Parachaenichthys georgianus	PGE			Южногеоргианский парахенихт	
Paraliparis gracillis	PLG				
Paranotothenia magellanica	NOM	Magellanic rockcod	Bocasse magellanique	Синяя нототения	Trama común
Patagonotothen guntheri	NOT	Patagonian rockcod	Bocasse de Patagonie	Желтоперка	Trama patagónica
Pleuragramma antarcticum	ANS	Antarctic silverfish	Calandre antarctique	Антарктическая серебрянка	Diablillo antártico
Pogonophryne permitini	PGR	Plunder fish		Бородатка пермитина	
Protomyctophum tenisoni	PRE			Протомиктоф Тенисона	
Pseudochaenichthys georgianus	SGI	South Georgia icefish	Crocodile de Géorgie	Темная белокровка	Draco cocodrilo
*Sardinops sagax**	CHP	South American pilchard	Pilchard sudaméricain		Sardina
Scombridae*	MTX	Mackerel	Mackereaux	Тихоокеанская сардина	Caballas, jureles
Scorpaenidae	SCO	Scorpionfishes	Rascasses, scorpènes	Скумбриевые	Rascacios, gallinetas
Trachurus spp.*	JAX	Jack and horse mackerel	Chinchards noirs	Ставриды	Jurel del norte
Trematomus eulepidotus	TRL	Trematomus		Чешуйчатый трематом	
Trematomus spp.	TRT	Trematomus spp.	Bocassons	Трематомы	Austrobacalaos
Zanclorhynchus spinifer	ZSP	Antarctic horsefish	Cacique antarctique	Kolyuchka	Cacique antártico
Rajiformes spp.	SRX	Skates and rays	Raies nca	Скатовые	Rayas
Crustacea	FCX	Crustaceans	Crustacés	Ракообразные	Crustáceos
Euphausia crystallorophias	KRC	Ice krill	Krill des glaces	Подледный криль	Kril glacial
Euphausia frigida	KRF	Pygmy krill	Krill pygmée	Криль-фригида	Kril pigmeo
Euphausia spp.	KRX	Euphausiids	Euphausiacés	Эвфаузии	Eufáusidos
Euphausia superba	KRI	Antarctic krill	Krill antarctique	Антарктический криль	Kril antártico
Euphausia triacantha	KRT	Spiny krill	Krill épineux	Трехзубый криль	Kril espinudo
Euphausia vallentini	KRV	Northern krill	Krill subantarctique	Криль Валентина	Kril subantártico
Lithodidae	KCX	King and stone crabs	Crabes royaux et lithodes		
Lithodes murrayi	KCM	Sub-Antarctic stone crab	Crabe royal subantarctique	Краб муррайи	Centolla subantártica
Lithodes spp.	KCZ	King crabs	Crabes royaux	Антарктические крабы	Centollas
Paralomis spp.	KCS	King crabs	Crabes royaux	Антарктические крабы	Cangrejos rusos
Paralomis aculeata	KCU	Red stone crab	Crabe royal rouge	Марионский краб	Centolla colorada
Paralomis spinosissima	KCV	Antarctic king crab	Crabe royal de l'Antarctique	Антарктический краб	Centolla antártica
Thysanoessa macrura	KRM	Bigeye krill	Krill à gros yeux	Черноглазка антарктическая	Kril ojigrande

* Used as bait in longline fishing in the CCAMLR Convention Area.

List of species and codes (continued)

Species Name	Code	English Name	French Name	Russian Name	Spanish Name
Salpidae	SPX	Salps	Salpes	Сальпы	Salpas
Cephalopoda				Головоногие	
Ommastrephidae	SQU	Flying squids	Calmars, encornets	Летучие кальмары	Calamares, jibias, potas
Illex argentinus	SQA	Argentine shortfin squid	Encornet rouge argentin		Pota argentina
Loligo spp.	SQG	Common squids	Encornets		Calamares
Martialia hyadesi	SQS	Sevenstar flying squid	Encornet étoile	Кальмар мартиалия	Pota festoneada
Nototodarus sloani	TSQ	Wellington flying fish	Encornet minami		Pota neocelandesa
Ommastrephes, Illex	SQX	Shortfin, flying squids nei	Encornets rouges, faux encornets		Potas
Cetacea		Whales, dolphins and porpoises	Baleines, dauphins et marsouins	Киты, дельфины и морские свиньи	Ballenas, delfines y marsopas
Odontoceti	ODN	Toothed whales nei	Baleines odontocètes nca	Зубатые киты	Ballenas odontocetas nep
Physeter catodon	SPW	Sperm whale	Cachalot	Кашалот	Cachalote
Berardius arnuxii	BAW	Arnoux's beaked whale	Dauphin-à-bec d'Arnoux	Южный плавун	Ballenato de Arnoux
Hyperoodon planifrons	SRW	Southern bottlenose whale	Dauphin-à-bec austral	Южный бутылконос	Gran calderón austral
Cephalorhynchus commersonii	CMD	Commerson's dolphin	Dauphin de Commerson	Дельфин Коммерсона	Tonina overa
Delphinidae (*Delphinus* spp.)	DLP	Dolphins and Porpoises	Dauphins et marsouins	Дельфиновые и морские свиньи	Delfines y Marsopas
Globicephala melas	PIW	Longfinned pilot whale	Globicéphale noir	Обыкновенная гринда	Calderón de aleta larga
Lagenorhynchus cruciger	HRD	Hourglass dolphin	Dauphin crucigère	Крестовидный дельфин	Delfín cruzado
Lissodelphis peronii	RSW	Southern rightwhale dolphin	Dauphin de Péron	Южный дельфин	Delfín liso austral
Orcinus orca	KIW	Killer whale	Orque, épaulard	Касатка	Orca
Australophocaena dioptrica	SPP	Spectacled porpoise	Marsouin de Lahille	Очковая морская свинья	Marsopa de anteojos
Mysticeti	MYS	Baleen whales nei	Baleines mysticètes nca	Гладкие киты	Ballenas mysticetas nep
Balaenoptera acutorostrata	MIW	Minke whale	Petit rorqual	Малый полосатик	Rorcual enano
Balaenoptera borealis	SIW	Sei whale	Rorqual de Rudolphi	Сейвал	Rorcual del norte
Balaenoptera musculus	BLW	Blue whale	Rorqual bleu	Голубой (синний) кит	Ballena azul
Balaenoptera physalus	FIW	Fin whale	Rorqual commun	Финвал	Rorcual común
Eubalaena glacialis	EUG	Northern right whale	Baleine de Biscaye, baleine franche australe	Южный гладкий кит	Ballena franca
Megaptera novaeangliae	HUW	Humpback whale	Baleine à bosse	Горбатый кит	Rorcual jorobado

List of species and codes (continued)

Species Name	Code	English Name	French Name	Russian Name	Spanish Name
Otaridae, Phocidae	SXX	Seals	Otaries, phoques	Тюлени	Focas
Arctocephalus gazella	SEA	Antarctic fur seal	Otarie de Kerguelen	Южный морской котик	Lobo fino antártico
Hydrurga leptonyx	SEL	Leopard seal	Léopard de mer	Морской леопард	Foca leopardo
Leptonychotes weddellii	SLW	Weddell seal	Phoque de Weddell	Тюлень Уэдделла	Foca de Weddell
Lobodon carcinophagus	SET	Crabeater seal	Phoque crabier	Крабоед	Foca cangrejera
Mirounga leonina	SES	Southern elephant seal	Eléphant de mer austral	Южный морской слон	Elefante marino
Ommatophoca rossii	na	Ross seal	Phoque de Ross	тюлень Росса	Foca de Ross
Aves	BIZ	Birds	Oiseaux	Птицы	Aves
Diomedeidae	ALZ	Albatrosses	Albatros	Альбатросы	Albatros
Diomedea exulans	DIX	Wandering albatross	Grand albatros	Странствующий альбатрос	Albatros errante
Diomedea chionoptera	DCH	Snowy albatross			
Diomedea amsterdamensis	DAM	Amsterdam albatross	Albatros d'Amsterdam		
Diomedea epomophora	DIP	Southern royal albatross	Albatros royal antarctique	Королевский альбатрос	Albatros real
Diomedea sanfordi	DIS	Northern royal albatross	Albatros royal subantarctique		
Diomedea melanophrys	DIM	Southern black-browed albatross	Albatros à sourcils noirs de l'Antarctique	Чернобровый альбатрос	Albatros de ceja negra
Diomedea impavida	DMP	Northern black-browed albatross	Albatros à sourcils noirs de Nouvelle-Zélande		
Diomedea bulleri	DIB	Buller's albatross	Albatros de Buller		Albatros de Buller
Diomedea cauta	DCU	Shy albatross	Albatros timide		Albatros de frente blanca
Diomedea salvini	DSL	Salvin's albatross	Albatros de Salvin		
Diomedea eremita	DER	Chatham Island albatross			
Diomedea chlororhynchos	DCR	Yellow-nosed albatross	Albatros à bec jaune		Albatros de pico amarillo
Diomedea chrysostoma	DIC	Grey-headed albatross	Albatros à tête grise	Сероголовый альбатрос	Albatros de cabeza gris
Phoebetria fusca	PHU	Sooty albatross	Albatros fuligineux à dos sombre	Темноспинный дымчатый альбатрос	Albatros obscuro
Phoebetria palpebrata	PHE	Light-mantled sooty albatross	Albatros fuligineux à dos clair	Светлоспинный дымчатый альбатрос	Albatros obscuro de manto claro, Albatros obscuro de manto blanco

List of species and codes (continued)

Species Name	Code	English Name	French Name	Russian Name	Spanish Name
Procellariidae	PRX	Petrels and shearwaters	Pétrels et puffins		Petreles y fardelas
Macronectes giganteus	MAI	Southern giant petrel	Pétrel géant antarctique	Южный гигантский буревестник	Petrel gigante antártico
Macronectes halli	MAH	Northern giant petrel	Pétrel géant subantarctique	Северный гигантский буревестник	Petrel gigante subantártico
Fulmarus glacialoides	FUG	Southern fulmar	Fulmar antarctique		Petrel plateado
Thalassoica antarctica	TAA	Antarctic petrel	Pétrel antarctique	Антарктический буревестник	Petrel antártico
Daption capense	DAC	Cape petrel	Pétrel du Cap	Капский голубь	Petrel damero, Petrel moteado
Pterodroma macroptera	PDM	Great-winged petrel	Pétrel noir		Fardela de alas grandes
Procellaria aequinoctialis	PRO	White-chinned petrel	Pétrel à menton blanc	Белогорлый буревестник	Petrel de mentón blanco, Fardela negra grande
Procellaria cinerea	PCI	Grey petrel	Pétrel gris		Fardela gris
Procellaria conspicillata	PCN	Spectacled petrel	Pétrel à lunettes		
Procellaria westlandica	PCW	Westland petrel			Fardela de Nueva Zelanda
Procellaria parkinsoni	PRK	Parkinson's petrel			
Puffinus griseus	PFG	Sooty shearwater			Fardela negra
Puffinus tenuirostris	PFT	Short-tailed shearwater	Puffin à queue courte		
Calonectris diomedea	CDI	Cory's shearwater			
Puffinus gravis	PUG	Great sheawater			Fardela capirotada
Puffinus creatopus	PUC	Pink-footed shearwater			Fardela blanca
Puffinus carneipes	PFC	Flesh-footed shearwater	Puffin à pieds pales		Fardela negra de patas pálidas
Stercorariidae	SKZ	Skuas/jaegers	Skuas/labbes	Поморники	Salteadores
Catharacta skua	CSK	Great skua			Págalo grande
Catharacta chilensis	CTH	Chilean skua			Skuá (Salteador) chileno
Catharacta maccormicki	CAM	South polar skua	Skua antarctique	Южнополярный поморник	Skuá (Salteador) polar
Catharacta lönnbergi	CAQ	Antarctic skua	Skua subantarctique	Антарктический поморник	Skuá (Salteador) pardo
Laridae	LRD	Gulls	Laridés		Gaviotas
Larus dominicanus	LDO	Southern black-backed gull	Goéland dominicain		Gaviota dominicana
Oceanitidae					
Oceanites oceanicus	CCO	Wilson's storm petrel	Pétrel de Wilson	Вильсонова качурка	Petrel de Wilson

List of species and codes (continued)

Species Name	Code	English Name	French Name	Russian Name	Spanish Name
Spheniscidae	PYZ	Penguins	Manchots	Пингвниы	Pingüinos
Eudyptes chrysolophus	EUC	Macaroni penguin	Gorfou macaroni	Золотоволосый пингвин	Pingüino macaroni
Pygoscelis adeliae	PYD	Adélie penguin	Manchot Adélie	Пингвин Адели	Pingüino adelia
Pygoscelis antarctica	PYN	Chinstrap penguin	Manchot à jugulaire	Антарктический пингвин	Pingüino de barbijo
Pygoscelis papua	PYP	Gentoo penguin	Manchot papou	Папуасский пингвин	Pingüino papúa
Sterna vittata	SVI	Antarctic tern	Sterne subantarctique	Антарктическая крачка	Gaviotín antártico
Unknown	UNK	Unknown species	Espèce inconnue	Неизвестный вид	Especies desconocidas

FISHING GEAR CODES

Bottom trawls	
Otter trawls	OTB
Bottom trawls nei	TB
Midwater trawls	
Otter trawls	OTM
Midwater trawls nei*	TM
Trawls nei	TX
Hooks and Lines	
Set lines (longlines set)	LLS

* Not elsewhere included.

SQUID LURE COLOUR CODES

Blue	BLU
Brown	BRO
Green	GRE
Orange	ORA
Red	RED
White	WHI
Yellow	YEL
Mixed	MIX
Luminous Blue	LBLU
Luminous Brown	LBRO
Luminous Green	LGRE
Luminous Orange	LORA
Luminous Red	LRED
Luminous White	LWHI
Luminous Yellow	LYEL
Luminous Mixed	LMIX
Unknown	UNK

CATCH PROCESSING CODES

Headed and gutted	HAG
Filleted	FLT
Head and tail removed (trunked)	HAT
Whole	WHO
Squid mantle (tubed)	TUB
Tentacles	TEN
Gutted	GUT

LENGTH – TYPE OF MEASUREMENT CODES

Total length of a fish is from the most anterior part of the mouth to the most posterior of the caudal fin when this fin is extended along the length of the body. Fork length is from the most anterior part of the mouth to the end of the rays at the deepest part of the fork in the caudal fin. Standard length of a fish is from the most anterior point of the mouth to the end of the vertebral column. Standard length of krill is the total length from the anterior tip of the eye to the posterior end of the uropods, excluding terminal setae (Mauchline, *BIOMASS Handbook* No. 4).

Total	T
Fork	F
Standard	S
Unknown	U

LENGTH – UNITS AND SCALE OF MEASUREMENT CODES

Nearest mm below	01
Nearest 2 mm below	24
Nearest 3 mm below	25
Nearest 5 mm below	02
Nearest 1 cm below	03
Nearest 2 cm below	04
Nearest 3 cm below	05
Nearest 4 cm below	06
Nearest 5 cm below	07
Nearest mm	11
Nearest 2 mm	34
Nearest 3 mm	35
Nearest 5 mm	12
Nearest 1 cm	13
Nearest 2 cm	14
Nearest 3 cm	15
Nearest 4 cm	16
Nearest 5 cm	17
mm (unknown method)	91
5 mm (unknown method)	92
1 cm (unknown method)	93
2 cm (unknown method)	94
3 cm (unknown method)	95
4 cm (unknown method)	96
5 cm (unknown method)	97

WEIGHT – UNITS AND SCALE OF MEASUREMENT CODES

Nearest 1 g below	01
Nearest 5 g below	02
Nearest 10 g below	03
Nearest 20 g below	04
Nearest 50 g below	05
Nearest 100 g below	06
Nearest 200 g below	07
Nearest 300 g below	08
Nearest 500 g below	09
Nearest 1 g	11
Nearest 5 g	12
Nearest 10 g	13
Nearest 20 g	14
Nearest 50 g	15
Nearest 100 g	16
Nearest 200 g	17
Nearest 300 g	18
Nearest 500 g	19
Nearest 1 mg below	21
Nearest 5 mg below	22
Nearest 10 mg below	23
Nearest 20 mg below	24
Nearest 50 mg below	25
Nearest 100 mg below	26
Nearest 200 mg below	27
Nearest 300 mg below	28
Nearest 500 mg below	29
Nearest 1 mg	31
Nearest 5 mg	32
Nearest 10 mg	33
Nearest 20 mg	34
Nearest 50 mg	35
Nearest 100 mg	36
Nearest 200 mg	37
Nearest 300 mg	38
Nearest 500 mg	39
1 g (unknown method)	91
5 g (unknown method)	92
10 g (unknown method)	93
20 g (unknown method)	94
50 g (unknown method)	95
100 g (unknown method)	96
200 g (unknown method)	97
300 g (unknown method)	98

SECTION 6

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REFERENCES

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