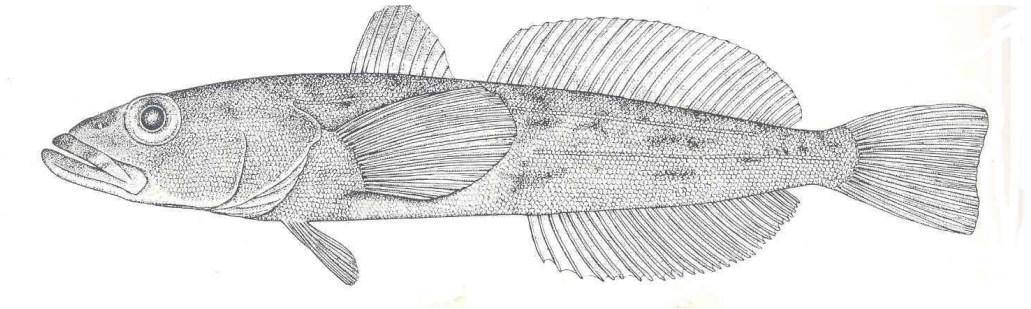
Scientific Report

Fisheries Research Cruise ZDLH1-07-2006



Fisheries Department
Falkland Islands Government

Scientific Report

Fisheries Research Cruise

ZDLH1-07-2006

FPRV Dorada

11th to 28th July 2006

Fisheries Department
Falkland Islands Government
Stanley
Falkland Islands

Participating Scientific Staff	Principle author of Section
Dr. Alexander Arkhipkin	*1.2 and 9.2*
Dr. Paul Brickle	*Editor and 1.0 – 9.0*
Dr. Vladimir Laptikhovski	*3.0*
Joost Pompert	*Chart preparation*
Dr. Yves Cherel	
Henk-Jan Hoving	
Jonathan Moir	
Tiffany May	

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Summary

In July 2006 (11th to 28th) a FIFD research cruise, ZDLH1-07-2006, was conducted on the Falkland Islands Government's *RV Dorada*. The primary objectives of the cruise were to carry out a semi-pelagic survey of the spawning grounds of *Dissostichus eleginoides* on the northern side of the Falklands' Trough and on the Burdwood Bank. Secondary objectives included an oceanographic survey of the area and to collect tissue samples from a wide range of animals for stable isotope studies in order to examine the trophic ecology of the area.

During the cruise oceanographic data were collected from 22 stations on the shelf and offshore waters. A total of 24 bottom trawl stations were conducted with over 150 species caught. In terms of weight the greatest catches included the grenadier *Macrourus carinatus*, cases of the polychaet worm *Chaetopterus* sp., blue antimora *Antimora rostrata* and the Patagonian toothfish *Dissostichus eleginoides.* Significant catches of *Munida* spp. (lobster krill), *Coelorhynchus faciatus* (grenadier), *Neolithodes diomedeae* (deep-water kingcrab) and *Moroteuthis ingens* (greater hooked squid) were also taken. Also 24 species of cephalopod were caught during the survey comprising 18 species of squids, 5 species of octopuses and one sepiolid (bobtail squid). More the 14 species were caught in the *ad hoc* plankton survey. This report describes the activities of Falkland Islands Government Fisheries Department research cruise ZDLH1-07-2006.

1.0 Introduction

In July 2006, a research cruise was undertaken on the slopes the southern part of the Falkland Islands shelf and on the slopes of the Burdwood Bank using the Falkland Islands Research and Patrol Vessel *Dorada*. Figure 1 illustrates the sampling locations undertaken during the cruise. The primary objective of the cruise was to carry out a semi-pelagic deep water survey of the spawning grounds of the Patagonian toothfish (*Dissostichus eleginoides*).

1.1 Cruise objectives

The cruise objectives were to:

1. Conduct a semi-pelagic deep-water survey the spawning grounds of *D. eleginoides.*
2. Conduct a survey of the cephalopod fauna ichthyofauna of the southern part of the Falkland Islands slope and the slope of the Burdwood Bank.
3. To study the oceanographic conditions of the survey area.
4. To collect *ad hoc* acoustic data along the track of the survey.
5. To collect toothfish gonads for fecundity studies.
6. To collect eggs and sperm from running females in order to conduct experiments with fertilized eggs.

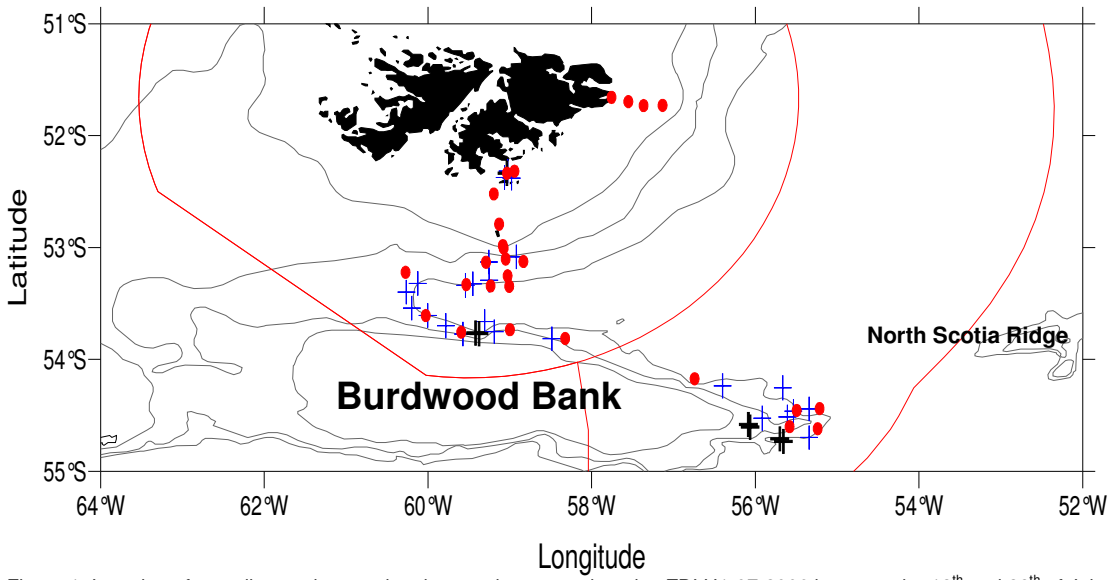


Figure 1: Location of sampling stations undertaken on the research cruise ZDLH1-07-2006 between the 12th and 28th of July 2006 (Trawl stations = blue crosses; CTDs = red circles; and plankton trawls = thick black squares)

1.2 Cruise Plan and key dates

The vessel departed from Stanley at 6 p.m. in the evening of 11 July and proceeded overnight to the Beauchêne Island area where the next day one haul was conducted at 550 m depth. Then the weather deteriorated badly, and in the next two days (13-14 July) three trawls were performed in shallow waters between Sea Lion Islands and East Falkland. Between 15 and 19 July, three deepwater trawls were made daily on or near the bottom in the western part of the Falkland trough. Bad weather interrupted the work on 18 July, and only one pelagic trawl was conducted that day. On 20 July, the vessel relocated to the eastern part of the Burdwood Bank, where the ground was too rough trawl effectively with the semi-pelagic net. After the third tow on 21 July,

the net was badly broken, and it took three full days to repair it. Two to three plankton tows were made daily at this time to investigate the plankton fauna of the region. Two deepwater trawls were then performed in the eastern part of the Burdwood Bank on 25 July, but unfortunately next day the belly of the trawl was completely taken off by the rough ground and that brought the survey to its end. During the next two days, two standard oceanographic transects (P5 and P1) were carried out, and the vessel arrived to Stanley at 8 a.m. of 28 July.

1.3 Vessel Characteristics

The cruise was conducted on the RVFP *Dorada*, which is registered in the Falkland Islands. The *Dorada's* characteristics are shown in table 1.

Table 1: Vessel characteristics

Callsign	ZDLH1
Length	76 m
GRT	2360 mt
NRT	708 mt
Crew	16 people

1.4 Personnel and responsibilities

The following personnel participated in the cruise:

Dr. Alexander Arkhipkin	Chief Scientist
Dr. Paul Brickle	Trawl survey/plankton survey
Dr. Vladimir Laptikhovsky	Oceanographic survey/plankton survey
Joost Pompert	Trawl survey
Dr. Yves Cherel	Stable isotope analysis
Henk-Jan Hoving	Cephalopod biology
Jonathan Moir	Toothfish aquaculture and embryology.
Tiffany May	Trawl survey/trainee.

1.5 Equipment used

1.5.1 Acoustics

The acoustic equipment was similar to that used on previous research cruises and included:

1. Simrad EK500 scientific echo-sounder with hull mounted split transducers at 38 kHz and 120 kHz; and
2. SonarData Echolog_EK v1.50 (data acquisition and Echo View (post processing) software.

The EK500 had a ping interval of approximately 2 seconds. Unfortunately the triggering time was not synchronised with the Furuno Current Doppler Profiler and this resulted in quite a large amount of interference. The calibration of the EK500 was not carried out during this research cruise. All data were logged with an expanded bottom echogram of approximately 15 m range, starting at 10 m above the substrate. The range of the echogram was automatically adjusted to cover the entire water column.

1.5.2 Trawling

An ENGEL semi-pelagic trawl with "Super-V" doors was used at all trawl stations. It had a 40.2 m headline and a 38.7 m footrope equipped with rockhoppers. Simrad ITI net monitor sensors has been attached to the upper panel of the trawl. The vertical opening was between 6.9 and 17 m (mean = 11.50 m) and the codend mesh size was 95 mm.

1.5.3 Oceanographic

The oceanographic equipment used on ZDLH1-07-2006 was the same as was used on previous surveys and included:

1. CTD SBE 25 with SeaTech fluorometer and an oxygen sensor; and
2. Thermosalinometer SBE45.

2.0 Sampling

2.1 Acoustic surveying

During the survey acoustic data were logged along the entire cruise track. The data were archived in SonarData EK5 format on a PC in the dry lab running the SonarData Echolog500.

2.3 Trawl stations and biological sampling

During the ZDLH1-07-2006 research cruise the station numbers ranged from 2465 to 2522 (Table 2). The catches at all stations were weighed using an electronic marine adjusted balance (POLS, min 10 g, and max 80 kg).

Finfish and rajids were measured (total, pre-anal and disc width) to the nearest centimetre below and sex and stage of maturity were recorded for all specimens sampled. Individual weights were measured to the nearest gram using a POLS balance or, for larger specimens, to the nearest 20 grams using the Scanvaegt balances.

Cephalopods were analysed for length, sex, maturity and weight, with statoliths extracted from sub samples.

Table 2: Dates, locations, modal depth and duration of oceanographic (C), trawl (S&P) and plankton trawls (I).

Station	Activity	Date	Time	Start Latitude		Start Longitude		Finish Latitude		Finish Longitude		Modal depth (m)	Duration
2465	C	12/07/2006	13.05	53	7.5	58	50.00	53	7.10	58	48.50	526	23
2466	S	12/07/2006	17.47	53	5	58	55.20	53	9.40	59	3.10	517	165
2467	S	13/07/2006	13.20	52	22.8	58	58.70	52	22.30	58	52.10	70	86
2468	P	14/07/2006	12.30	52	19	59	1.60	52	23.70	59	1.50	66	80
2469	S	14/07/2006	14.20	52	22.5	59	3.80	52	20.50	59	4.40	64	42
2470	C	15/07/2006	8.05	53	7.9	59	17.40	53	8.00	59	16.10	523	21
2471	S	15/07/2006	8.34	53	7.8	59	15.30	53	7.50	59	2.90	531	96
2472	S	15/07/2006	13.12	53	17.5	59	15.10	53	18.60	59	29.20	771	169
2473	S	15/07/2006	16.17	53	19.4	59	27.10	53	20.40	59	14.10	1050	147
2474	C	15/07/2006	19.03	53	20.6	59	14.07	53	20.90	59	13.20	1105	37
2475	C	16/07/2006	6.59	53	19.9	59	31.90	53	19.10	59	32.30	942	36
2476	S	16/07/2006	7.53	53	20.3	59	32.50	53	18.80	59	46.60	992	156
2477	S	16/07/2006	12.56	53	19.3	60	7.50	53	24.30	60	13.30	1001	150
2478	S	16/07/2006	15.42	53	23.9	60	15.80	53	17.50	60	16.50	992	154
2479	C	16/07/2006	20.10	53	13.3	60	16.40	53	31.40	60	16.50	941	36
2480	S	17/07/2006	7.49	53	32.5	60	11.80	53	36.10	60	1.70	995	142
2481	C	17/07/2006	10.33	53	36.5	60	1.60	53	36.10	60	1.30	1010	44
2482	S	17/07/2006	11.23	53	36.4	60	0.10	53	39.60	59	48.10	1022	155
2483	S	17/07/2006	14.26	53	41.9	59	46.90	53	45.60	59	35.70	1000	149
2484	C	17/07/2006	17.20	53	45.4	59	35.60	53	45.10	59	36.30	998	35
2485	I	17/07/2006	20.13	53	45.9	59	25.10	53	40.40	59	22.10	1000	32
2486	I	17/07/2006	20.53	53	46.2	59	22.50	53	45.70	59	21.30	1020	72
2487	P	18/07/2006	18.56	53	39.7	59	18.50	53	39.30	59	1.70	1737	234
2488	S	19/07/2006	8.15	53	46.4	59	34.30	53	46.60	59	21.40	1014	153
2489	S	19/07/2006	11.37	53	45.1	59	11.30	53	44.20	58	59.60	1003	146
2490	C	19/07/2006	14.27	53	44.1	58	59.90	53	44.30	58	59.80	992	38
2491	S	19/07/2006	16.48	53	48.9	58	29.10	53	46.90	58	19.20	630	129
2492	C	19/07/2006	19.15	53	48.8	58	19.40	53	48.40	58	19.70	723	25
2493	C	20/07/2006	7.35	54	10.4	56	44.50	54	10.10	56	44.70	1089	39
2494	S	20/07/2006	10.14	54	14.2	56	24.00	54	11.90	56	35.60	934	152
2495	P	20/07/2006	19.00	54	15.2	55	39.90	54	22.40	55	25.80	1555	209
2496	C	21/07/2006	7.31	54	27.4	55	29.70	54	27.90	55	30.10	766	32
2497	S	21/07/2006	9.28	54	27.7	55	32.10	54	27.80	55	22.50	848	107
2498	I	22/07/2006	20.13	54	44	55	39.40	54	44.90	55	36.80	760	53
2499	I	22/07/2006	21.39	54	42.6	55	42.10	54	44.90	55	39.00	630	78
2500	I	23/07/2006	20.15	54	34.9	56	5.10	54	36.00	56	4.20	350	60
2501	I	23/07/2006	21.06	54	36.3	56	3.80	54	38.10	56	1.50	380	74
2502	P	24/07/2006	17.48	54	31.6	55	54.90	54	36.90	55	42.60	431	186
2503	C	25/07/2006	8.05	54	36.1	55	34.90	54	35.80	55	35.70	449	18
2504	S	25/07/2006	10.48	54	30.9	55	36.50	54	33.80	55	46.50	545	90
2505	S	25/07/2006	16.42	54	41.9	55	20.60	54	35.20	55	17.70	985	78
2506	C	25/07/2006	21.23	54	37.2	55	14.30	54	36.70	55	13.60	1178	42
2507	C	26/07/2006	7.30	54	26.4	55	12.90	54	25.50	55	12.60	1082	39
2508	S	26/07/2006	10.32	54	26.5	55	20.50	54	26.10	55	6.40	1008	156
2509	C	27/07/2006	2.06	53	20.8	59	0.40	53	20.80	58	58.40	1150	38
2510	C	27/07/2006	3.27	53	15.2	59	1.60	53	15.20	59	0.20	666	31
2511	C	27/07/2006	5.05	53	6.2	59	3.00	53	6.10	59	1.30	507	20
2512	C	27/07/2006	6.11	53	0.4	59	4.50	53	0.50	59	3.70	349	16
2513	C	27/07/2006	6.47	52	59	59	5.10	52	59.10	59	4.60	235	9
2514	C	27/07/2006	9.29	52	47.5	59	7.80	52	47.60	59	7.60	103	6
2515	C	27/07/2006	12.42	52	31.3	59	11.70	52	31.30	59	11.40	58	5
2516	C	27/07/2006	15.01	52	19.1	58	56.60	0		0		66	4
2517	I	27/07/2006	18.15	52	20.2	59	2.10	52	20.2	59	5.3	66	50
2518	C	27/07/2006	19.30	52	20.2	59	2.10	0		0		60	5
2519	C	28/07/2006	2.29	51	43.8	57	8.00	51	43.5	57	7.8	294	12
2520	C	28/07/2006	3.55	51	43.9	57	21.90	51	43.5	57	21.7	192	8
2521	C	28/07/2006	4.54	51	41.8	57	33.10	51	41.6	57	33.1	96	6
2522	C	28/07/2006	7.11	51	39.5	57	45.40	51	39.5	57	45.3	19	3

3.0 Oceanography

3.1 Methods

A logging CTDO (SBE-25, Sea-Bird Electronics Inc., Bellevue, USA) was deployed from the surface to 1-20 m above the bottom to obtain profiles of temperature (ºC), salinity (PSU), and dissolved oxygen (ml l^{-1}). The CTD was deployed for the first one minute at about 8-10 m depth to allow the polarisation of the oxygen sensor. It was then retrieved to 1 m depth and deployed again either to depth of about 1000 m or to approximately 10 m from the bottom. The speed of deployment was c. 1m/s and was monitored by use of a wire counter. Temperature was measured directly whereas the other variables were calculated using Seasoft v.4.326 software (Sea-Bird Electronics Inc.) from the following measured parameters: pressure (db), conductivity (S/m), oxygen current (µA) and temperature (ºC). The CTDO sensors are calibrated annually by Sea-Bird Electronics Inc. For each station, vertical profiles of temperature, salinity and density were constructed using the Seasoft software. Profiles for each transect and iso-surfaces were constructed using the VG griding method included in the Ocean Data View package v. 3.0-2005 (Schlitzer 2005).

3.2 Results

Oceanographic data were collected at 22 stations. These stations were conducted mostly before the first and after the last trawl of a particular day (Figure 2).

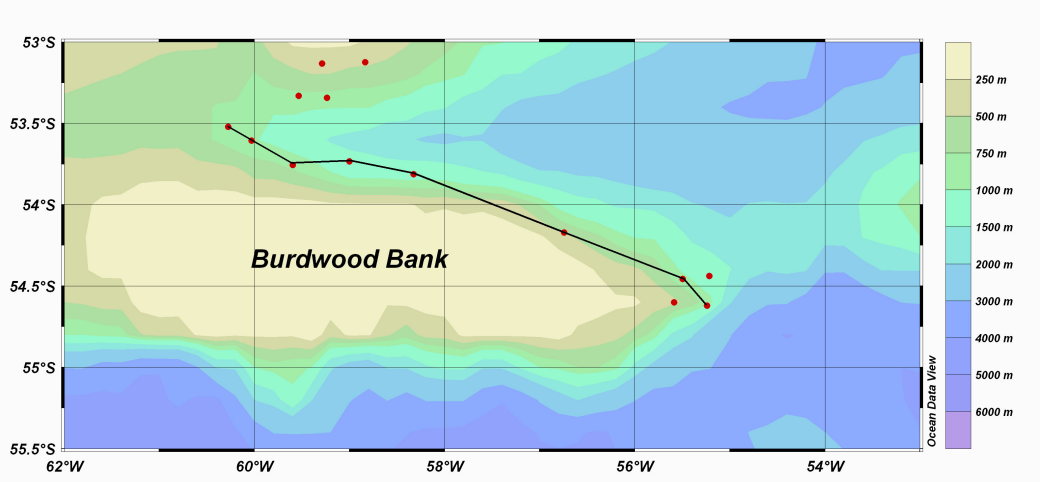


Figure 2: Locations of oceanographic stations conducted on ZDLH1-07-2006. The black line indicates the transect for the profile.

The survey was aimed at assessing oceanographic situation over the toothfish spawning grounds and surrounding areas.

Stations were situated on and around the Burdwood Bank above depths of 456-1,148 m. Temperatures ranged from 3.14º to 5.97ºC, salinity from 33.67 to 34.37 psu, and densities from 26.53 to 27.37 kg/m^3. Analysis of T-S curves demonstrated the presence of five water masses and their modifications around the area (Figure 3), which is in agreement with data collected the previous year.

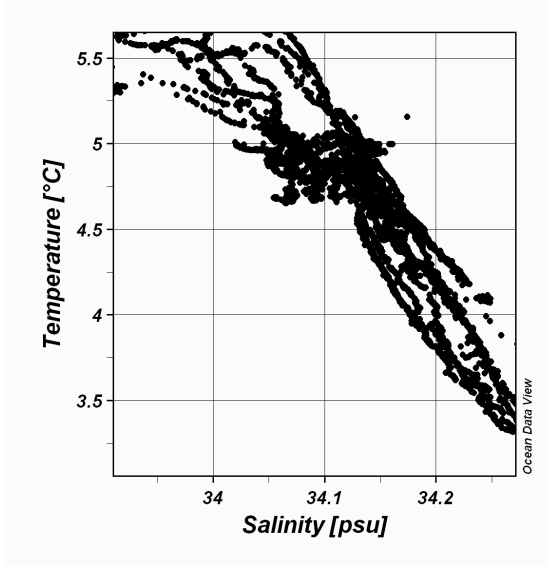


Figure 3:T-S curves of water masses around the Burdwood Bank on ZDLH1-07-2006

Distributions of temperature and salinity along the northern slope of the Burdwood bank are shown on Figure 4, and at the surface and at the horizons of 200 and 800 m - in Figure 5.

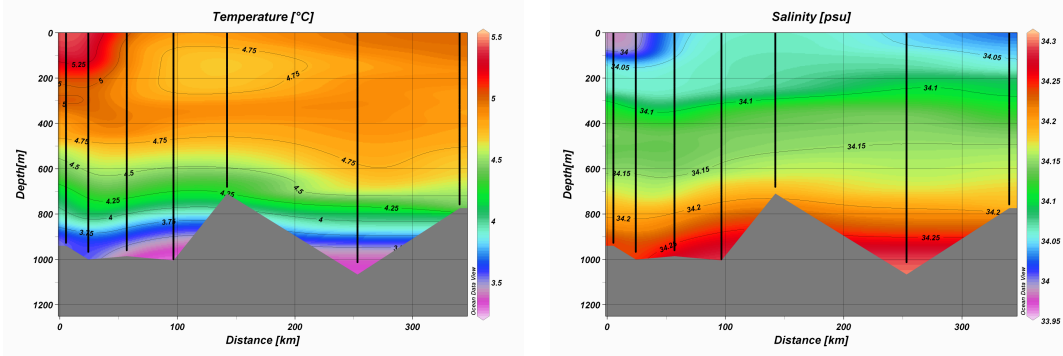
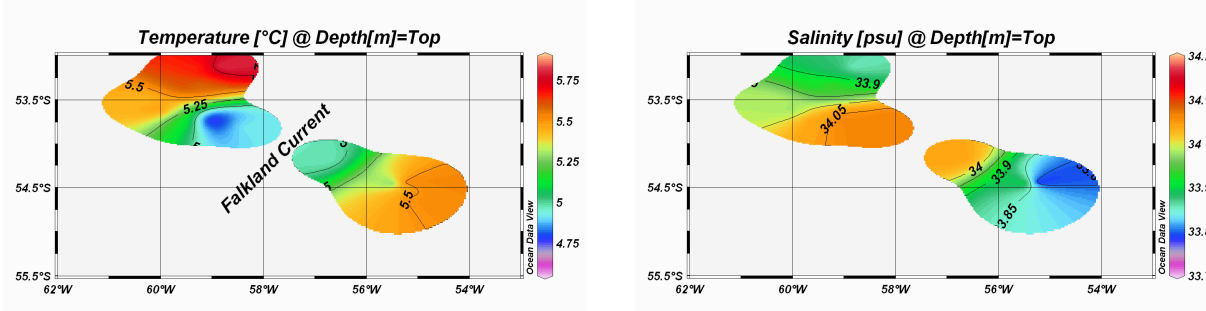


Figure 4:Temperature and salinity on the transect along the northern slope of Burdwood Bank



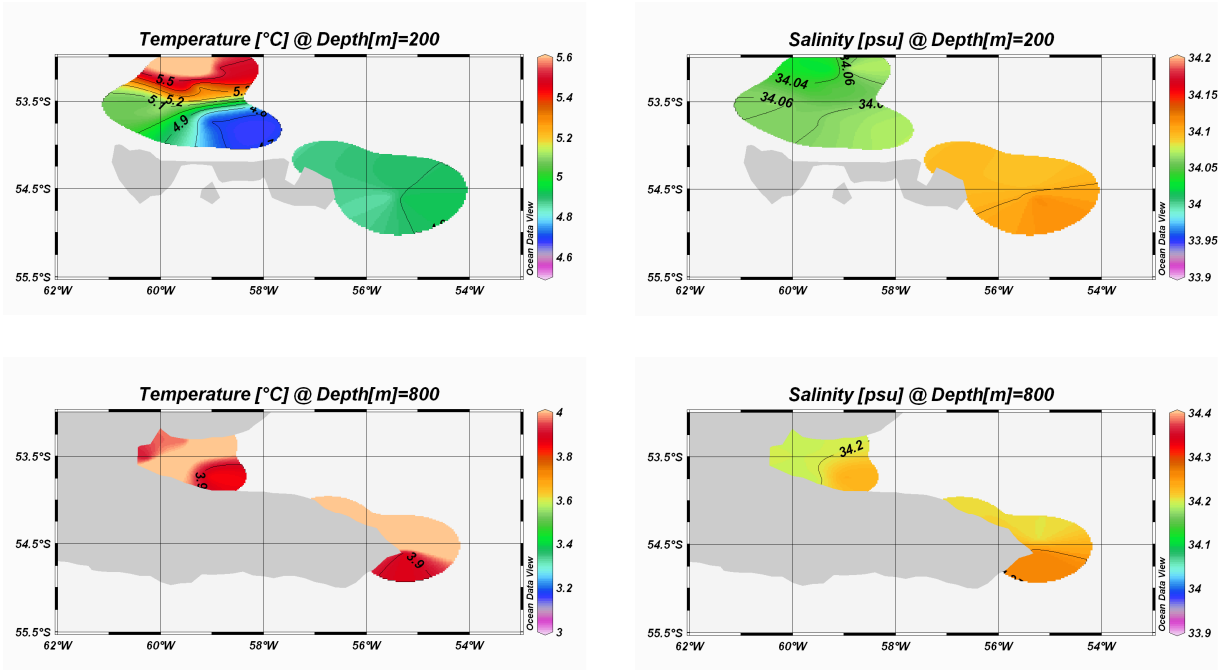


Figure 5: Distribution of temperature and salinity around the Burdwood Bank on the surface and at the depth of 200 and 800 m (July 2006)

The predominating regional oceanographic body was the Falkland Current that crossed the area from south-west to north-east with velocities about 5 cm/s in the upper 200m-layer (Figure 6). In the surface layers it was characterised by colder and saltier waters than those on the shelf. Low-saline and relatively warm shelf waters occupied the northwest part of the area. As in July 2005, the border between the Falkland Current and shelf waters was situated at the level of Falkland Trough. Moderate salinity and temperature were observed towards the eastern edge of the Burdwood Bank. The current oceanographic situation was very similar to that in the year 2005, but the water was slightly warmer. The sea surface temperature around the Burdwood Bank was characterised by positive anomalies, being 0.7-1.5˚C warmer than the annual mean (Figure 7).

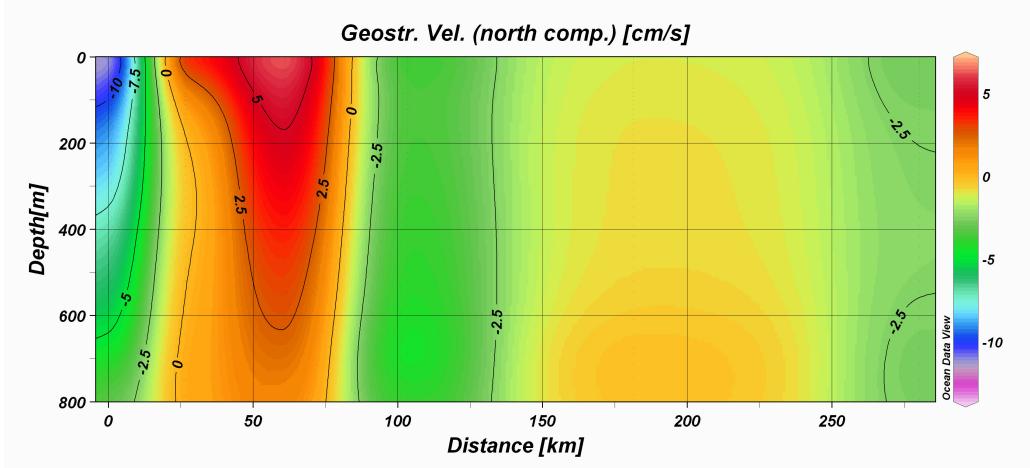


Figure 6: Geostrophic flows across the transect along the northern edge of the Burdwood Bank

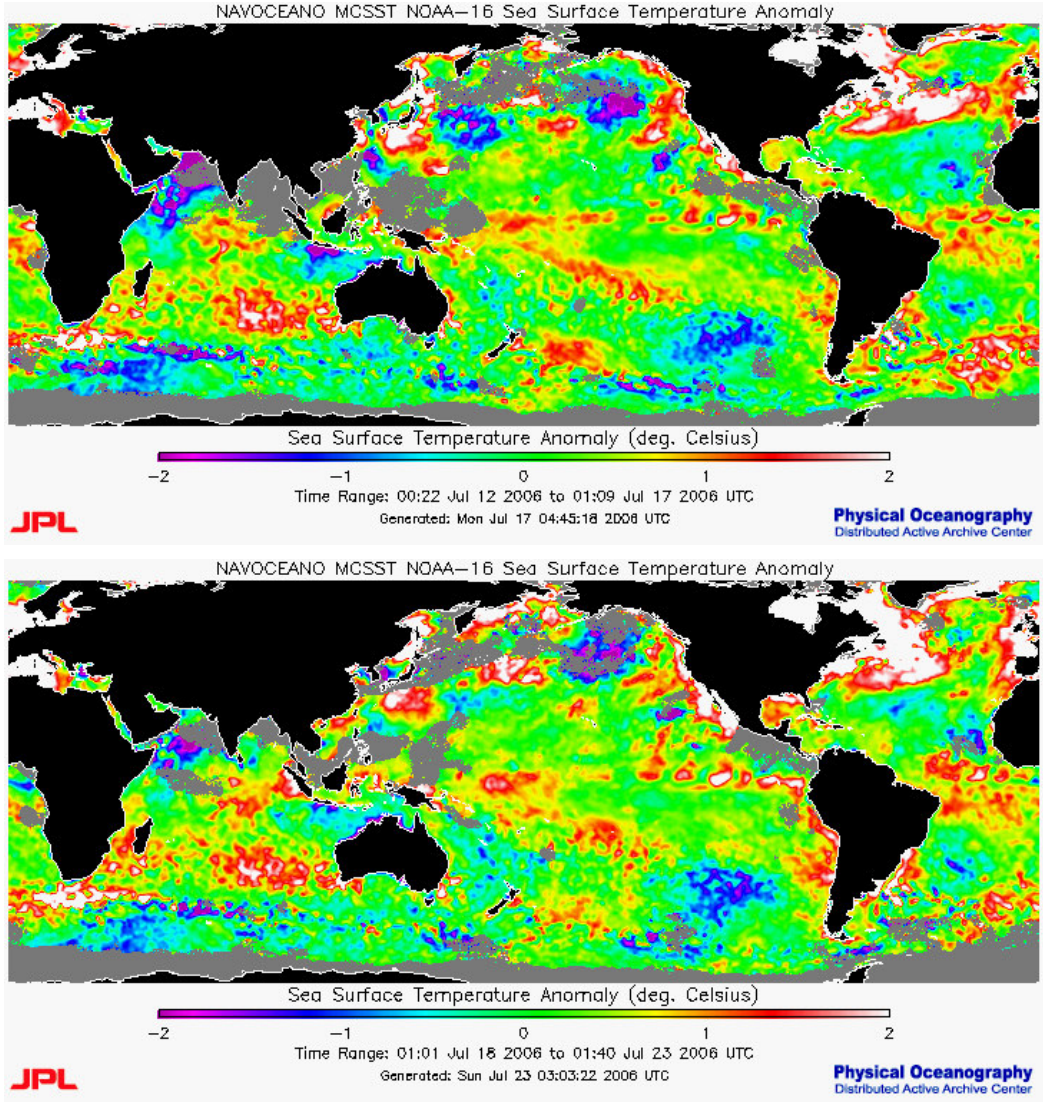


Figure 7: Sea surface temperature anomalies during the cruise (http://nereids.jpl.nasa.gov/cgi-bin/nereids.cgi)

4.0 Biological Sampling

4.1 Catch and by-catch

Trawling was conducted on 24 stations on the southern Falkland slope and on the slopes of the Burdwood Bank comprising 20 semi-pelagic stations and one pelagic station (Figure 1). Trawling time on horizon varied between 22 and 120 minutes, with an average time at horizon of 62 minutes.

A total of 7,909 kg, consisting of over 150 species, was caught during the cruise (Table 3). In terms of weight, the greatest catches during the cruise were the grenadier *Macrourus carinatus*, cases of the polychaete worm *Chaetopterus* sp., blue antimora *Antimora rostrata* and the Patagonian toothfish *Dissostichus eleginoides.* These four species accounted for over 80% of the catch. Significant catches *Munida* spp. (lobster

krill), *Coelorhynchus fasciatus* (grenadier), *Neolithodes diomedeae* (deep-water kingcrab) and *Moroteuthis ingens* (greater hooked squid) were also taken.

Table 3: Total catch of trawl stations during research cruise ZDLH1-07-2006

Species Code	*Species name*	***Total Catch (kg)***	***Total Sampled (kg)***	***Total Discarded (kg)***	***Proportion (%)***
GRC	*Macrourus carinatus*	5,289.285	1,507.505	5,278.420	66.87%
WRM	Worm cases (*Chaetopterus* sp.)	613.878	0.000	613.878	7.76%
ANR	*Antimora rostrata*	329.790	7.544	329.790	4.17%
TOO	*Dissostichus eleginoides*	220.647	220.647	23.710	2.79%
MUG	*Munida gregaria*	168.550	1.027	168.550	2.13%
MUN	*Munida* spp.	163.231	0.010	163.221	2.06%
GRF	*Coelorhynchus fasciatus*	103.785	15.490	103.785	1.31%
MED	*Medusae* sp.	79.562	0.000	79.562	1.01%
NED	*Neolithodes diomedeae*	67.480	67.480	27.200	0.85%
SQT	Ascidiacea	61.446	0.000	61.446	0.78%
PAC	*Pasiphaea acutifrons*	60.641	16.280	44.361	0.77%
ING	*Moroteuthis ingens*	46.762	46.748	41.964	0.59%
ANM	Anemone	44.047	0.000	44.047	0.56%
GRH	*Macrourus holotrachys*	41.851	41.851	41.361	0.53%
RGR	*Bathyraja griseocauda*	41.454	41.454	41.454	0.52%
PYM	*Physiculus marginatus*	38.654	10.132	38.654	0.49%
ECC	*Echiodon cryomargarites*	31.378	0.246	31.378	0.40%
BLU	*Micromesistius australis*	30.019	24.502	30.019	0.38%
WHI	*Macruronus magellanicus*	27.260	5.850	27.260	0.34%
RMG	*Bathyraja magellanica*	26.890	26.890	26.890	0.34%
SPN	Sponges	26.623	0.000	26.623	0.34%
HAJ	*Halargyreus johnsonii*	24.880	24.880	24.880	0.31%
NOC	*Notacanthus chemnitzi*	22.820	6.951	22.820	0.29%
RBZ	*Bathyraja cousseauae*	22.413	22.413	22.413	0.28%
SHT	Mixed invertebrates	21.800	0.000	21.800	0.28%
ICA	*Icichthys australis*	21.369	21.369	21.369	0.27%
LOL	*Loligo gahi*	15.597	10.276	15.597	0.20%
RDO	*Raja doellojuradoi*	12.057	12.057	1.577	0.15%
MXX	Myctophidae	11.870	4.830	11.870	0.15%
GYN	*Gymnoscopelus nicholsi*	11.307	0.000	11.307	0.14%
OCM	*Octopus megalocyathus*	10.798	10.798	0.000	0.14%
GYM	*Gymnoscopelus* spp.	10.163	0.000	10.155	0.13%
RAL	*Bathyraja albomaculata*	10.139	10.139	10.139	0.13%
GYB	*Gymnoscopelus bolini*	10.075	1.660	10.075	0.13%
RPA	*Bathyraja papilionifera*	9.740	9.740	9.740	0.12%
CET	*Ceratias tentaculatus*	9.661	9.661	0.551	0.12%
MAM	*Mancopsetta milfordi*	9.388	9.388	3.530	0.12%
PTE	*Patagonotothen tessellata*	9.000	0.185	9.000	0.11%
AST	Asteroidea	8.941	1.170	7.771	0.11%
COS	*Coryphaenoides subserrulatus*	8.271	6.528	7.720	0.10%
SUN	Sunstar *Labidaster radiosus*	7.713	0.000	7.713	0.10%
PAR	*Patagonotothen ramsayi*	7.063	1.465	7.063	0.09%
RSC	*Bathyraja scaphiops*	6.821	6.821	6.821	0.09%
BAT	*Bathylagus antarcticus*	6.546	1.336	5.777	0.08%
GYR	*Gymnoscopelus braueri*	6.217	0.016	6.217	0.08%

Species Code	***Species name***	***Total Catch (kg)***	***Total Sampled (kg)***	***Total Discarded (kg)***	***Proportion (%)***
COL	*Cosmasterias lurida*	5.454	0.000	5.454	0.07%
PAW	*Patagonotothen wiltoni*	5.406	0.558	5.406	0.07%
LEE	*Lepidion ensiferus*	5.262	2.502	5.262	0.07%
ALP	*Alepocephalus productus*	4.779	4.779	4.779	0.06%
RME	*Bathyraja meridionalis*	4.710	4.710	4.710	0.06%
MGP	*Magnisudis prionosa*	4.239	4.239	4.239	0.05%
AUX	*Austrocidaris* sp.	4.102	0.000	4.102	0.05%
GOC	*Gorgonocephalas chilensis*	3.890	0.000	3.890	0.05%
COT	*Cottunculus granulosus*	3.828	3.403	3.828	0.05%
TRM	*Trigonolampa miriceps*	3.292	1.130	3.292	0.04%
PAT	*Merluccius australis*	3.114	3.114	0.000	0.04%
ACP	*Acanthephyra pelagica*	2.841	0.390	2.451	0.04%
AUC	*Austrocidaris canaliculata*	2.416	0.000	2.416	0.03%
MYF	*Myxine fernholmi*	2.114	2.114	2.114	0.03%
PSM	*Pseudocyttus maculatus*	2.095	2.095	2.095	0.03%
PAG	*Paralomis granulosa*	2.041	0.000	2.041	0.03%
EEL	*Iluocoetes fimbriatus*	2.017	1.989	2.017	0.03%
COG	*Patagonotothen guntheri*	1.801	0.165	1.801	0.02%
COK	*Coelorinchus kaiyomaru*	1.755	1.630	1.755	0.02%
RBR	*Bathyraja brachyurops*	1.745	1.745	1.745	0.02%
LAA	*Lampinictus achurus*	1.714	1.148	1.714	0.02%
RPX	*Psammobatis* spp.	1.708	1.708	1.708	0.02%
RMC	*Bathyraja macloviana*	1.554	1.554	1.554	0.02%
ANT	Anthozoa	1.535	0.000	1.535	0.02%
CAV	*Campylonotus vagans*	1.487	1.487	0.000	0.02%
AGP	*Agrostichthys parkeri*	1.335	1.335	1.335	0.02%
CHE	*Champsocephalus esox*	1.157	1.157	1.157	0.01%
MUO	*Muraenolepis orangiensis*	1.153	1.153	1.148	0.01%
BOA	*Borostomias antarcticus*	1.139	0.724	1.139	0.01%
CHS	*Chauliotus sloani*	1.036	0.831	1.036	0.01%
PGR	*Paradiplospinus gracilis*	1.002	0.813	1.002	0.01%
ANP	*Anotopterus pharaoh*	0.930	0.930	0.930	0.01%
EUO	*Eurypodius longirostris*	0.904	0.000	0.904	0.01%
MMA	*Mancopsetta maculata*	0.891	0.891	0.891	0.01%
POA	*Porania Antarctica*	0.848	0.000	0.848	0.01%
CGO	*Cottoperca gobio*	0.804	0.015	0.804	0.01%
GON	*Gonatus antarcticus*	0.786	0.786	0.786	0.01%
OPX	*Opistoteuthis* spp.	0.770	0.770	0.000	0.01%
XXX	Unidentified animal	0.689	0.689	0.000	0.01%
GYH	*Gymnoscopelus hintonoides*	0.686	0.000	0.686	0.01%
SLC	*Slosarczykovia circumantarctica*	0.646	0.646	0.646	0.01%
GRN	*Graneledone yamana*	0.644	0.644	0.000	0.01%
SOR	*Solaster regularis*	0.628	0.000	0.628	0.01%
HIE	*Histioteuthis eltarinae*	0.574	0.574	0.574	0.01%
LIY	*Liparid* spp.	0.549	0.549	0.000	0.01%
THB	*Thymops birsteini*	0.510	0.072	0.438	0.01%
LEM	*Lepidonotothen macrophthalma*	0.500	0.500	0.500	0.01%
BAA	*Bathyteuthis abyssicola*	0.467	0.007	0.467	0.01%
POC	*Poromitra crassiceps*	0.443	0.433	0.443	0.01%

Species Code	*Species name*	***Total Catch (kg)***	***Total Sampled (kg)***	***Total Discarded (kg)***	***Proportion (%)***
BAS	*Batoteuthis scolips*	0.413	0.413	0.413	0.01%
PAP	*Paralomis spinosissima*	0.410	0.410	0.410	0.01%
MOP	*Momonatira paulini*	0.364	0.353	0.189	<0.01%
BEE	*Benthoctopus eureka*	0.364	0.000	0.364	<0.01%
STG	*Stomias gracilis*	0.336	0.336	0.336	<0.01%
STE	*Sterechinus* sp.	0.321	0.000	0.321	<0.01%
CAS	*Campylonotus semistriatus*	0.311	0.000	0.311	<0.01%
MKN	*Moroteuthis knipovichi*	0.305	0.305	0.305	<0.01%
EUL	*Eurypodius latreillei*	0.279	0.000	0.279	<0.01%
PES	*Peltarion spinosulum*	0.236	0.000	0.236	<0.01%
ELE	Eledoninae-like octopod	0.230	0.230	0.000	<0.01%
CHV	*Chiroteuthis veranyi*	0.223	0.223	0.223	<0.01%
TAX	*Taonius* spp.	0.223	0.223	0.000	<0.01%
CHI	Chiasmodontidae	0.213	0.213	0.052	<0.01%
BAY	*Bathylagus* spp.	0.184	0.000	0.184	<0.01%
HOL	Holothuroidea	0.183	0.000	0.183	<0.01%
HYD	Hydrozoa	0.180	0.000	0.180	<0.01%
PAZ	*Pasiphaea* spp.	0.160	0.055	0.105	<0.01%
BEZ	*Bellonella* spp.	0.150	0.150	0.000	<0.01%
PAA	*Pandalopsis ampla*	0.148	0.000	0.000	<0.01%
BRP	*Brachiopod* spp.	0.147	0.000	0.147	<0.01%
STY	Stomiidae	0.147	0.147	0.000	<0.01%
NOW	*Paranotothenia magellanica*	0.141	0.141	0.141	<0.01%
ADA	*Adelomelon ancilla*	0.139	0.000	0.139	<0.01%
ARD	*Arbacia dufresni*	0.136	0.136	0.000	<0.01%
MMC	*Mancopsetta m. antarctica*	0.135	0.135	0.135	<0.01%
NEC	*Neorossia caroli*	0.125	0.125	0.082	<0.01%
KOL	*Kondakovia longimana*	0.115	0.115	0.115	<0.01%
GAU	*Galiteuthis suhmi*	0.110	0.110	0.110	<0.01%
POL	Polychaeta	0.110	0.110	0.000	<0.01%
MAS	*Mastigoteuthis psychrophila*	0.107	0.107	0.102	<0.01%
GAG	*Galiteuthis glacialis*	0.096	0.096	0.096	<0.01%
PSL	*Psychroteuthis glacialis*	0.083	0.083	0.083	<0.01%
PSY	*Psychroteuthis* spp.	0.076	0.076	0.000	<0.01%
WLK	Whelks	0.076	0.026	0.050	<0.01%
BOX	*Borostomias* spp.	0.075	0.075	0.000	<0.01%
PMG	*Protomictophum gemmatum*	0.055	0.036	0.055	<0.01%
GYO	*Gymnoscopelus opisthopterus*	0.053	0.053	0.053	<0.01%
NUD	Nudibranchia	0.047	0.000	0.047	<0.01%
ROR	*Rosenblattia robusta*	0.045	0.045	0.022	<0.01%
STX	*Stomias* spp.	0.044	0.023	0.044	<0.01%
SER	*Serolis* spp.	0.043	0.019	0.024	<0.01%
CYP	*Cynomacrurus piriei*	0.041	0.041	0.000	<0.01%
SCH	*Scopelosaurus hamiltoni*	0.039	0.039	0.039	<0.01%
MAX	*Mastigoteuthis* sp.	0.033	0.033	0.033	<0.01%
AVI	*Avocettina infans*	0.031	0.031	0.007	<0.01%
BAJ	*Bathydraco joannae*	0.028	0.000	0.028	<0.01%
PMC	*Protomictophum choriodon*	0.028	0.020	0.028	<0.01%
LAX	*Lampinictus* spp.	0.023	0.023	0.013	<0.01%

Species Code	*Species name*	***Total Catch (kg)***	***Total Sampled (kg)***	***Total Discarded (kg)***	***Proportion (%)***
BAC	*Salilota australis*	0.020	0.020	0.020	<0.01%
NOZ	*Notosudis* spp.	0.019	0.019	0.000	<0.01%
ELS	*Electrona subaspera*	0.018	0.018	0.000	<0.01%
LOE	*Loligo gahi* egg mass	0.016	0.016	0.000	<0.01%
MAY	Malacosteidae	0.015	0.015	0.000	<0.01%
PMX	*Protomictophum* spp.	0.015	0.010	0.015	<0.01%
GYF	*Gymnoscopelus fraseri*	0.006	0.006	0.006	<0.01%
AGO	*Agonopsis chiloensis*	0.004	0.000	0.004	<0.01%
DGH	*Schroederichthys bivius*	0.003	0.000	0.003	<0.01%
KRA	*Krefftichthys anderssoni*	0.002	0.002	0.002	<0.01%
PMB	*Protomictophum bolini*	0.002	0.002	0.002	<0.01%
		7,909.553	**2,264.182**	**7,591.484**	

4.2 The Nototheniidae – rockocods

4.2.1 Dissostichus eleginoides

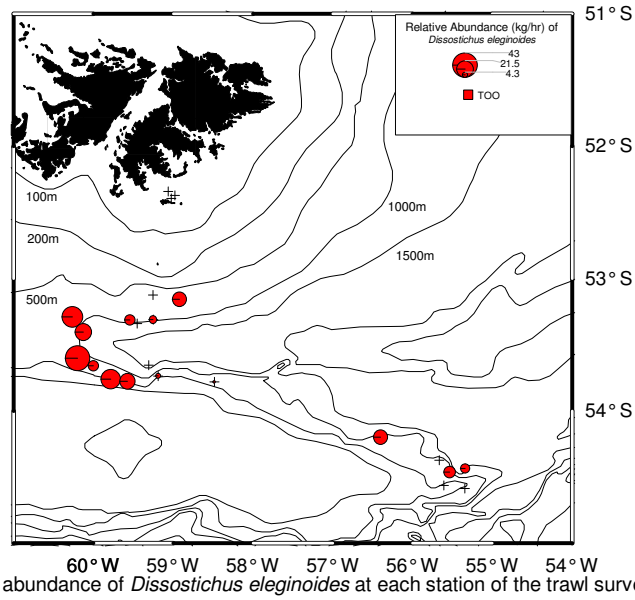


Figure 8: Relative abundance of *Dissostichus eleginoides* at each station of the trawl survey ZDLH1-07-2006

Dissostichus eleginoides were caught on 14 of the 24 trawl stations and were caught between 516 and 1027 m during the survey. The abundance of toothfish was greatest on the northern slopes of the Burdwood Bank at about 060^0W (Figure 8).

A total of 57 toothfish ranging in size from 45 to 112 cm L_T (mean = 69.14 ± 15.73) were sampled on this research cruise (Figure 9). Toothfish maturities ranged from I to IV with the majority of both females and males at stage II with only one male and one female at stages IV and III respectively (Figure 10). Unfortunately no spawning animals were found.

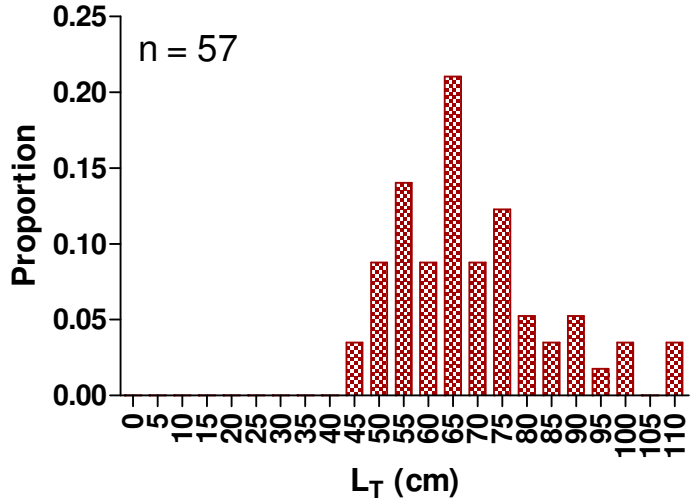


Figure 9: Combined length frequency distribution of *Dissostichus eleginoides*

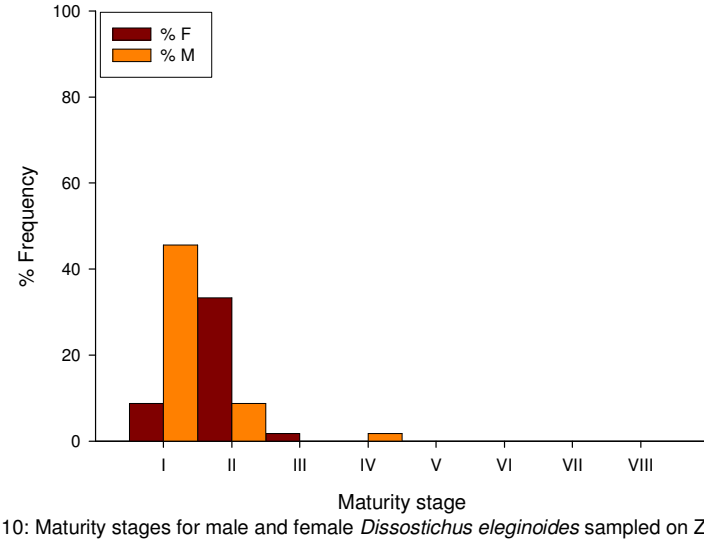


Figure 10: Maturity stages for male and female *Dissostichus eleginoides* sampled on ZDLH1-07-2006

One of the secondary aims of the cruise was to fertilize toothfish eggs that could later be reared in the hatchery. Unfortunately, only one male at maturity stage IV was encountered. As no running males or females were caught on the cruise, this experiment could not be carried out.

4.3 The Macrouridae – grenadiers

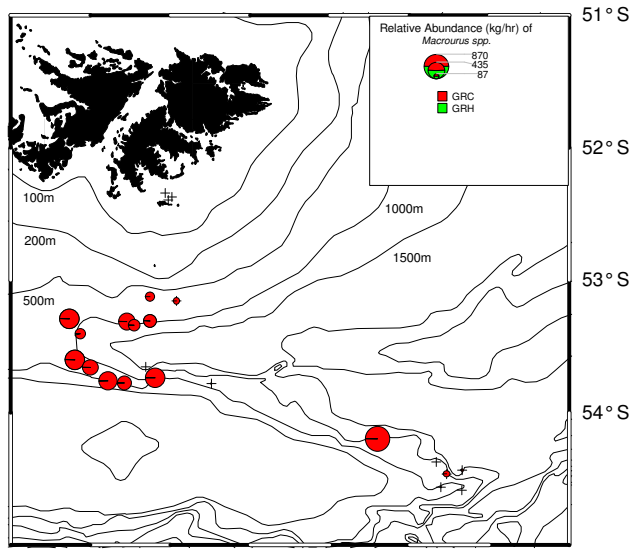


Figure 11: Relative abundance of *Macrourus carinatus* and *Macrourus holotrachys* at each station sampled during ZDLH1-07-2006

4.3.1 Macrourus carinatus

This is a common grenadier and is found from sub Antarctic to temperate waters and all round the Southern Ocean. It is abundant between 300 and 1,000 m and is potentially commercial in the Falkland Islands.

Macrourus carinatus were caught on 17 of the 24 trawl stations on the cruise and their catches ranged from 516 to 1027 kg (mean = 859.11 ± 196.91). The greatest abundances were encountered between 700 and 1,000 m on the northern and eastern slopes of the Burdwood Bank (Figure 11).

A total of 1294 individual *M. carinatus* were sampled during the cruise. The animals ranged from 40 to 31 cm L_{PA} (mean = 20.22 ± 4.79) (Figure 12). Females were on average larger than the males and individuals of both sexes were found to be at all stages of maturity (Figure 13).

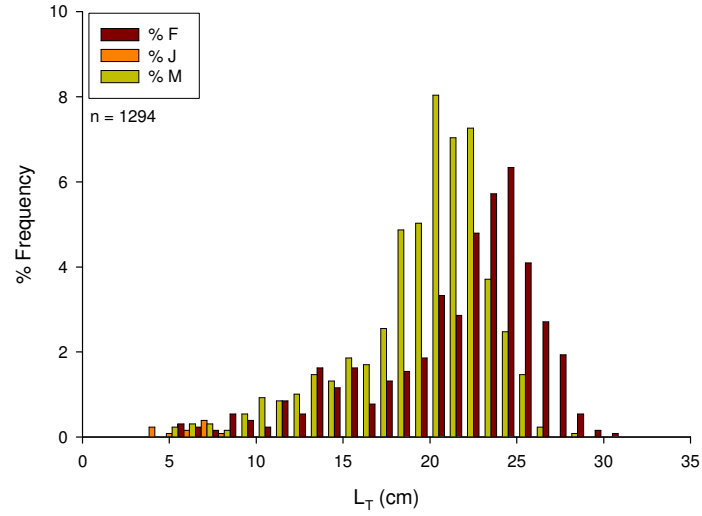


Figure 12: Length frequency distribution of male, female and juvenile *Macrourus carinatus* sampled on ZDLH1-07-2006

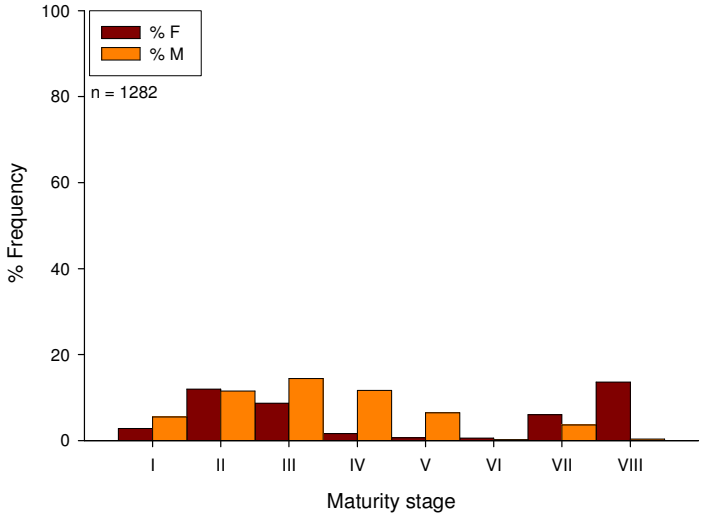


Figure 13: Maturity stages of male and female *Macrourus carinatus* sampled on ZDLH1-07-2006

4.3.2 Macrourus holotrachys

Macrourus holotrachys is slightly smaller than *M. carinatus*. It occurs on the Patagonian Shelf from the Rio de la Plata to the Falkland Islands. It is also found around South Georgia and Shag Rocks. Both species are very similar and can be easily confused. *Macrourus holotrachys* is bentho-pelagic inhabiting depths from 300 to more than 1,500 m. In the Falkland Islands it is more abundant at depths greater than 900 m. Both species are separated by depth to possibly reduce inter-specific competition. Figure 14 illustrates their depth distribution in the Falkland Islands.

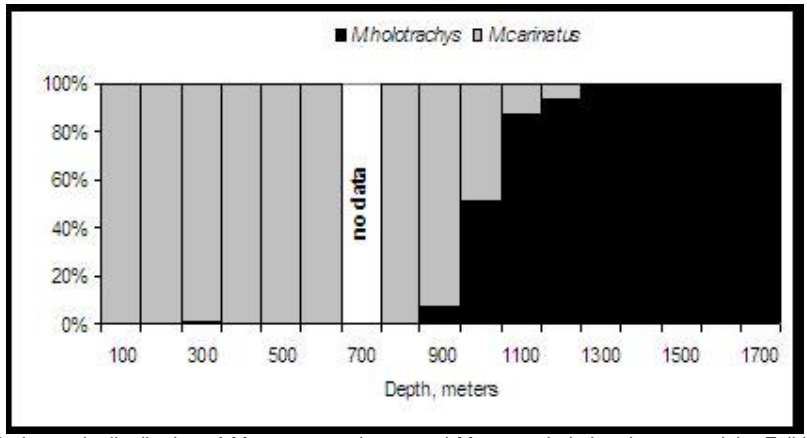


Figure 14: Bathymetric distribution of *Macrourus carinatus* and *Macrurus holothrachys* around the Falkland Islands.

Macrourus holotrachys were caught in much smaller quantities than *M. carinatus* as a result of the depths sampled during ZDLH1-07-2006 (Figure 11). This species was caught on 12 of the 24 trawl stations during the cruise and catches ranged from 0.72 and 10.01 kg (mean = 3.49 ± 3.06). The greatest catches were at depths of around 1,000 m.

Figure 15 illustrates the length frequency distribution of *M. holotrachys*. Individuals ranged from 2 to 25 cm L_{PA} (mean = 14.66 ± 4.57) with females larger than males on average. Most animals were found to be at maturity stages I to IV with fewer numbers at VII and VIII. Ripe (V) and running (VI) individuals were not encountered (Figure 16).

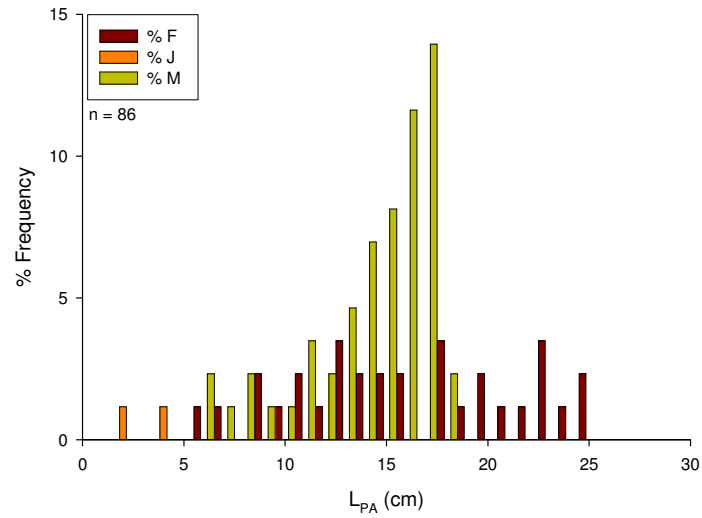


Figure 15: Length frequency distribution of female, male and juvenile *Macrourus holotrachys* sampled on ZDLH1-07-2006

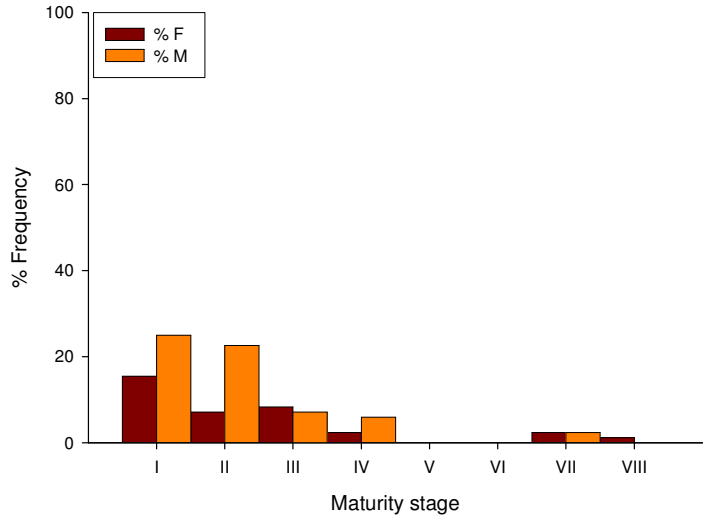


Figure 16: Maturity stages for male and female *Macrourus holotrachys* sampled on ZDLH1-07-2006

4.3.3 Coelorhynchus fasciatus

This is a small grenadier and it is found around the tips of South America, South Africa, Southern Australia and New Zealand. This was not an abundant species during the survey because of the sampling depths. Catches ranged between 0.14 and 90.84 kg (mean = 34.60 ± 49.12) and was only found at depths of around 500 m on the southern slope of the Falkland Islands shelf and was present in 3 of the 24 trawl stations (Figure 17).

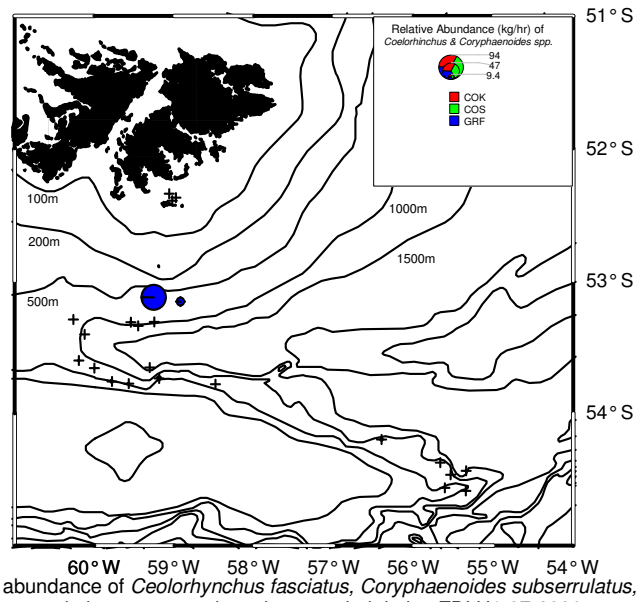


Figure 17: Relative abundance of *Ceolorhynchus fasciatus, Coryphaenoides subserrulatus,* and *Ceolorhynchus kaiyomaru* at each station sampled during ZDLH1-07-2006

Figure 18 illustrates the length frequency distribution of *C. fasciatus* samples during the cruise. Their lengths ranged between 7 and 12 cm L_{PA} (mean = 10.12 ± 1.17).

Females were slightly larger than males on average. Individuals sampled were found to range from maturity stage I to V. Stages II and III were most common for the males whereas stages IV and V were more common for the females. Interestingly no males were seen at stage V (Figure 19).

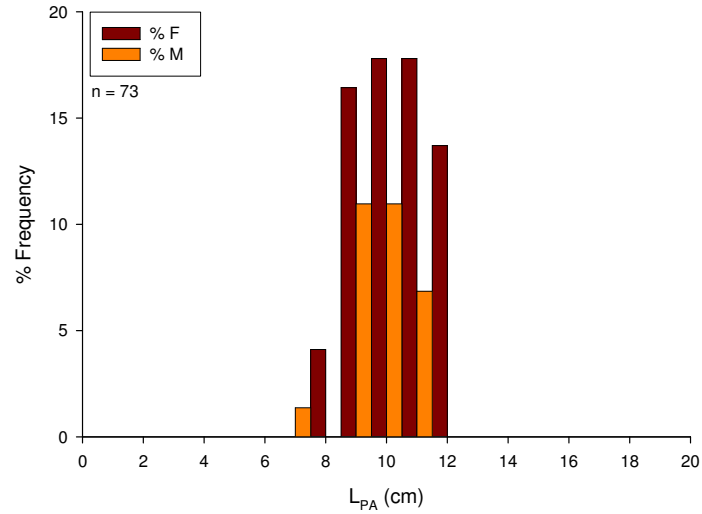


Figure 18: Length frequency distribution of female and male *Ceolorhynchus fasciatus* sampled on ZDLH1-07-2006

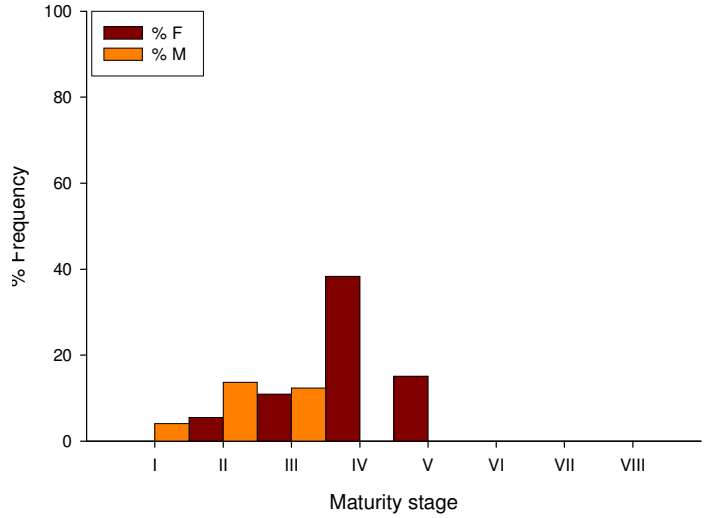


Figure 19: Maturity stages for male and female *Ceolorhynchus fasciatus* sampled on ZDLH1-07-2006

4.3.4 Coryphaenoides subserrulatus

This is another small species which occurs off New Zealand, south of Tasmania, South Africa and the Southwest Atlantic. It has only ever been reported around the Burwood Bank previously.

During the survey *C. subserrulatus* was caught on the southern slopes of the Falkland Islands and on the northern and eastern slopes of the Burdwood Bank (Figure 17) at depths between 939 and 1,027 m on 8 of the 24 trawl stations. *Coryphaenoides subserrulatus* were caught in small quantities and their catches ranged from 0.28 to 2.62 kg (mean = 1.03 ± 0.96). Figure 20 illustrates the length frequency distribution of

C. subserrulatus sampled on the cruise. They ranged in length from 2 to 10 cm L_{PA} (mean = 5.28 ± 236) and exhibited a bimodal distribution. Individuals range from maturity stages I to V with the majority of males and females in stages I and II (Figure 21).

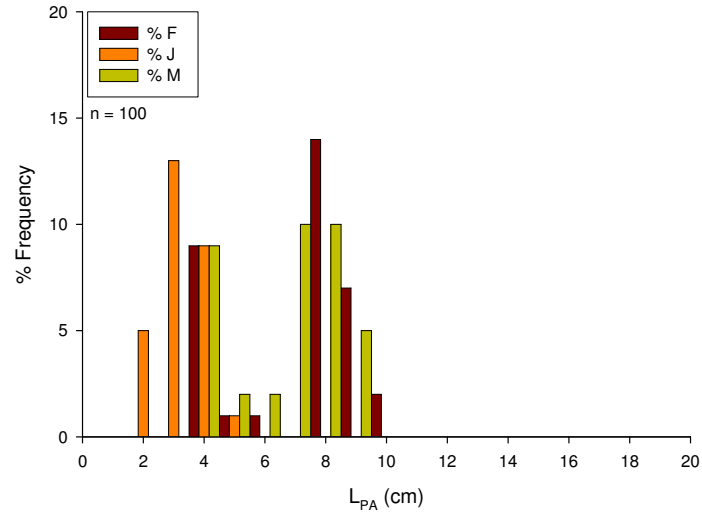


Figure 20: Length frequency distribution of male, female and juvenile *Coryphaenoides sunserrulatus* sampled on ZDLH1-07-2006.

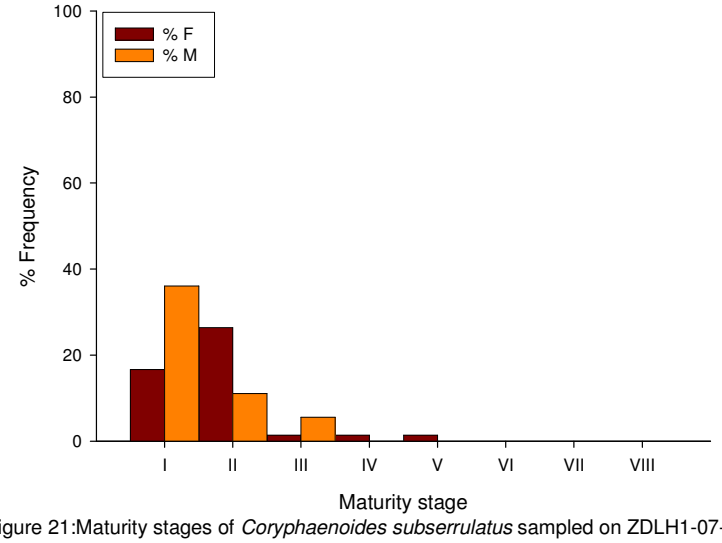


Figure 21:Maturity stages of *Coryphaenoides subserrulatus* sampled on ZDLH1-07-2006

4.3.5 Coelorhynchus kaiyomaru

This is also a very small grenadier and it is characterised by a long pointed snout and dark band surrounding its trunk (Figure 22). It is found off New Zealand, Tasmania, Falkland Islands, and around Gough and the Discovery Table mounts. It is bentho-pelagic and inhabits depths ranging from 340 to 1,340 m in the Atlantic.

During the cruise this species was only caught on 5 of the 24 trawl stations. Its catches ranged between 0.1 and 0.7 kg and were taken between 939 and 1,023 m

depth. It was found in small quantities on the northern and eastern slopes of the Burdwood Bank (Figure 17).

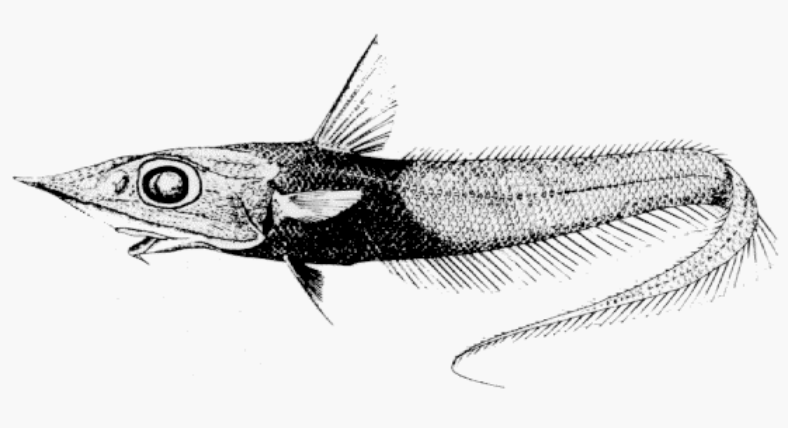


Figure 22: *Coelorhynchus kaiyomaru* after FAO

A total of 19 individuals were sampled during the cruise and they ranged in size from 2 to 10 cm L_{PA} (mean = 8.38 ± 1.77). For both sexes their maturities were spread equally between stages I, II and III.

4.4 The Moridae – deepsea cods

4.4.1 Antimora rostrata

This is a deep water morid cod and it was encountered in 12 of the 24 trawl stations. During the cruise it was caught between 581 to 1,027 m (mean = 925.92 ± 133.55) and it was common in most of the deepwater stations except for those on the eastern slopes of the Burdwood Bank (Figure 23).

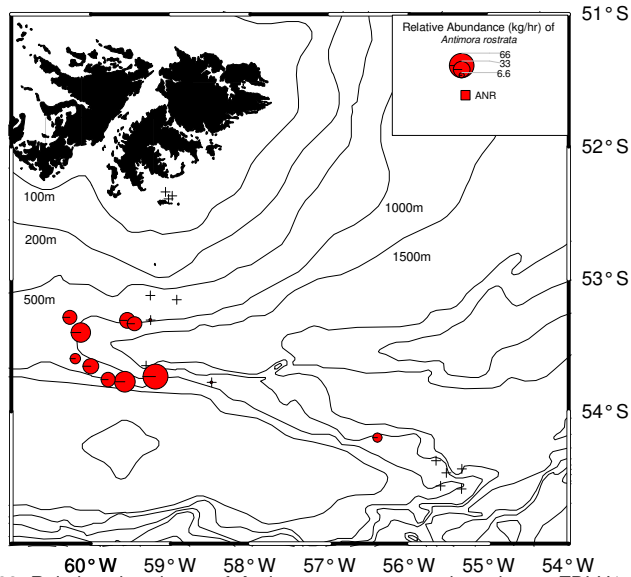


Figure 23: Relative abundance of *Antimora rostrata* at each station on ZDLH1-07-2006

4.4.2 Halargyreus johnsonii

This is a medium sized morid that reaches a total length of 60 cm L_T. During the survey it was caught on 4 of the 24 trawl stations in small quantities. Catches ranged between 0.18 and 9.40 kg and were restricted to the northern and eastern slope of the Burdwood Bank (Figure 24).

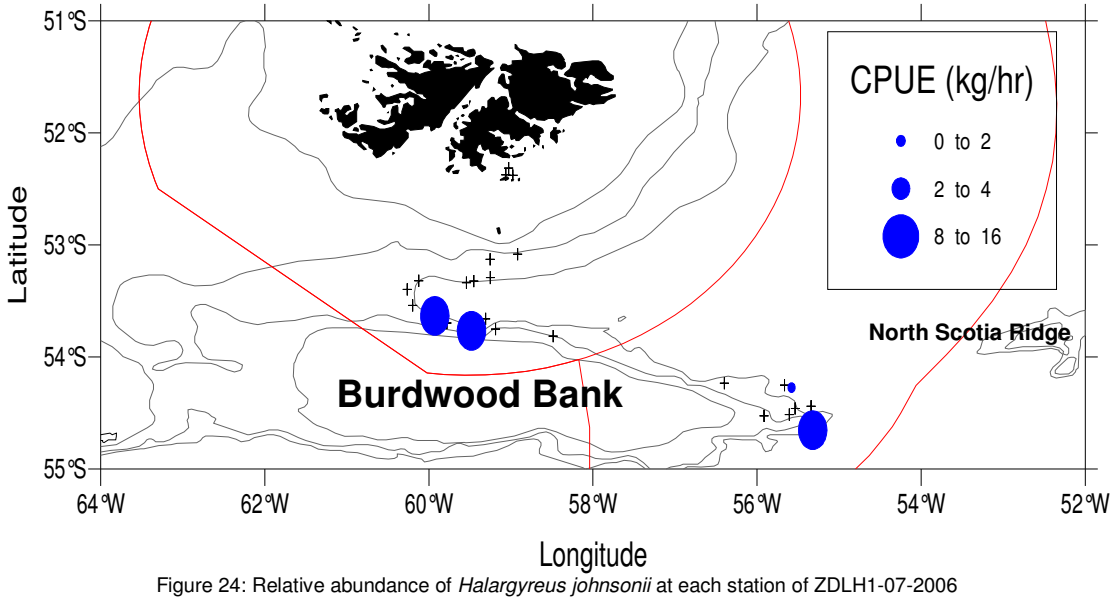


Figure 24: Relative abundance of *Halargyreus johnsonii* at each station of ZDLH1-07-2006

A total of 35 individuals were sampled on this cruise. The animals ranged from 20 to 51 cm L_T (mean = 39.34 ± 8.79) and most of the animals sampled were in maturity stages I and II with one male at stage IV.

This species were found to be infected with a large copepod parasite of the family Sphyriidea. *Lophorus magna* is attached to its host by a modified cepahlothorax to the individual's liver through the main body wall musculature (Figure 25). All of the parasites were very site specific, entering the body cavity just below the fish's' lateral line.

a


b

Figure 25: (a) *Lophorus magna* insertion point through the left flank just below the lateral line (b) and the cephalothorax embedded in the liver

The prevalence of *Lophorus magna* was 37% and parasites were significantly more common on the right ($\chi^2_{[1]} = 4.42$, $P<0.05$). Of those that were not parasitized, 7 had scars from previous infections and even had encapsulated cephalothoraxes in their livers. The parasite's total length was significantly positively correlated with host size ($r = 0.83$, <0.01) (Figure 26). This would suggest that the fish is infected at a young age and the parasite grows with it.

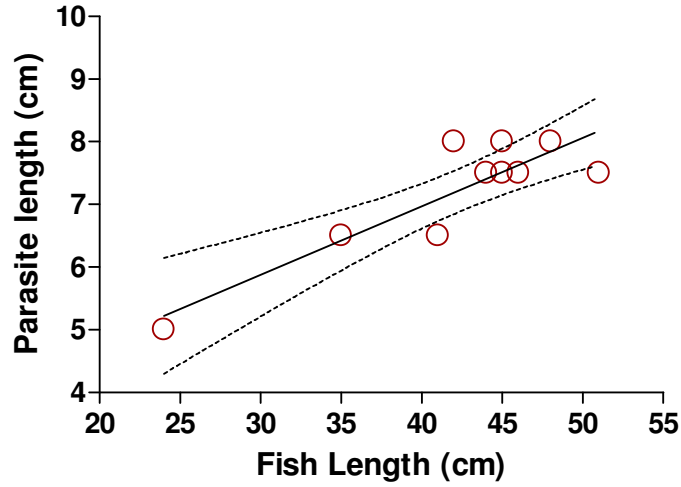


Figure 26: Correlation analysis of fish length and parasite total length

5.0 The Myctophidae – lantern fish

During the survey we encountered at least 14 species of myctophid. Some individual fish at each station were too badly damaged for positive identification and under these circumstances they were grouped together with the label "Myctophidae spp.". The number and arrangement of photophores are important taxonomic characteristics and these are easily damaged and lost during the trawl. Figure 26 illustrates the distribution of the species encountered on the cruise.

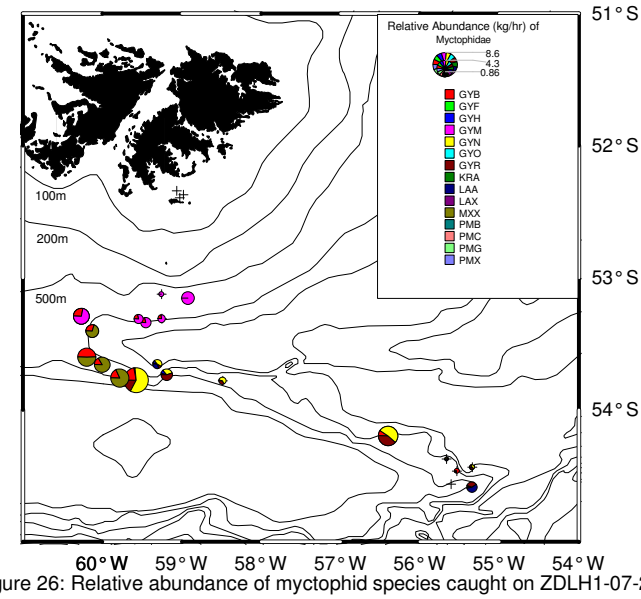


Figure 26: Relative abundance of myctophid species caught on ZDLH1-07-2005

The most commonly encountered mytophids were *Gymnoscopelus nicholsi, G. bolini and G. braueri*. Less common species included *Lampinictus achurus, G. hintonoides, Protomyctophum gemmatum* and *G. opisthopterus*. A number of other species occurred in smaller amounts (see Table 3).

6.0 The Achiropsettidae – southern flounders

These flat fish are not very common and tend to occur on the slope. They are characterised by having a compressed body with both eyes on the left side of the head. Three species were encountered during the cruise with *Mancopsetta milfordi* as the most common (9.4 kg) followed by *M. maculate maculata* (0.89 kg) and *M. maculata antarctica* (0.13 kg).

Mancopsetta milfordi were more common on the southern slopes of the Falklands Island shelf and on the northern slopes of the Burwood Bank. *Mancopsetta maculata maculate* also occurred in these areas but in lower quantities. *Mancopsetta m. antarctica* was found further south in small quantities on the eastern slopes of the Burdwood Bank (Figure 27), it was absent in the northern areas.

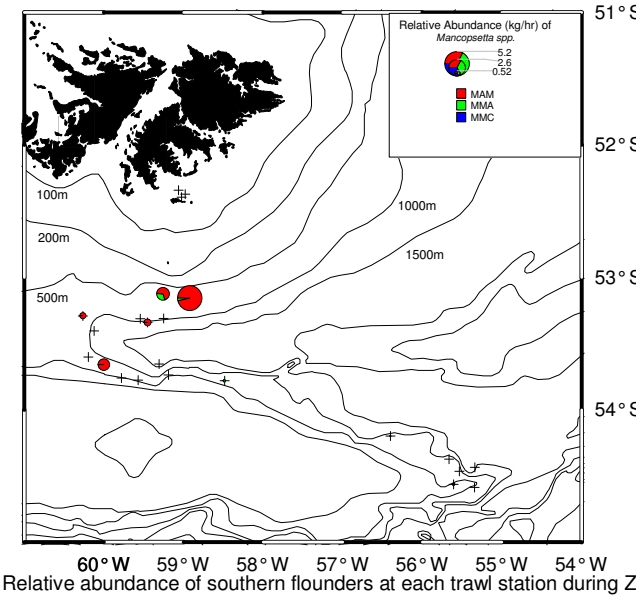


Figure 27: Relative abundance of southern flounders at each trawl station during ZDLH-07-2006

7.0 The Rajidae – Skates and rays

Skate and rays were caught on 14 of the 24 trawl stations during the cruise. A total of 11 species were caught during the cruise of which the most abundant were *Bathyraja griseocauda* (41.45 kg), *Bathyraja magellanica* (26.89 kg), and *Bathyraja cousseauae* (22.41 kg) (Table 2). Most of them exhibited marked bathymetric and geographical ranges (Figure 28).

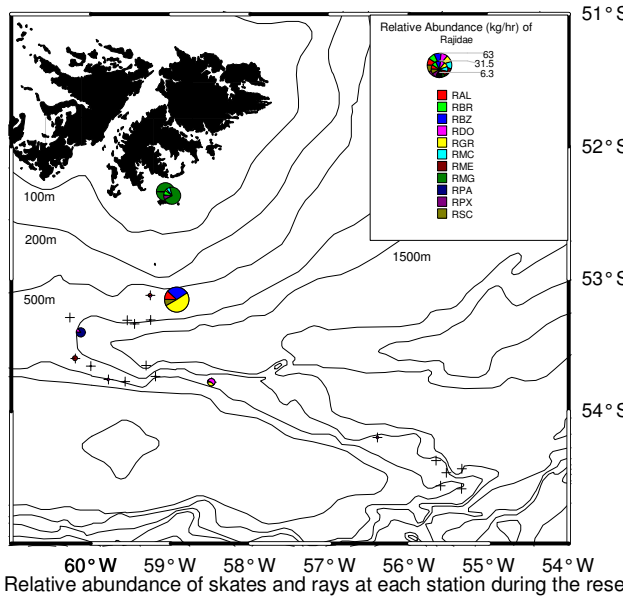


Figure 28: Relative abundance of skates and rays at each station during the research cruise.

Bathyraja magellanica, B. maclovina, B. brachyurops and *Psammobatis* spp. were only found in shallow waters to the north of Sealion Island. One *B. griseocauda* was also found north of Sea Lion Islands. On the southern slope of the Falkland Shelf *B. griseocauda* was most common but *B. couseauae, B. albomaculata, R. scaphiops, B. macloviana* were also present. In deeper water and on the northern slope of the Burdwood Bank the latter species disappeared and were replaced by *Bathyraja papilionifera*, *Bathyraja meridionalis* and *R. doellojuradoi*.

8.0 Crustaceans

8.1 Crabs

Three commercially important crab species were caught during the cruise (Table 2). *Paralomis granulosa* was only caught in shallow water (64 m) north of Sea Lion Islands in small amounts (2 kg). *Paralomis spinosissima* was only caught once (0.41 kg) at a depth of 987 m on the northern slope of the Burdwood Bank (Figure 29). The most commonly encountered crab during the cruise was *Neolithodes diomedeae*. This was only encountered on the southern slope of the Falkland Islands shelf and on the northern slope of the Burdwood Bank either side of the Falklands Trough (Figure 29).

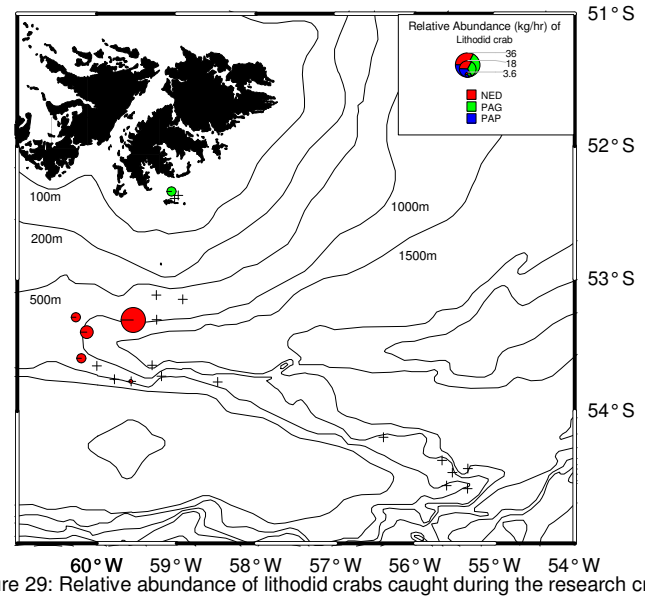


Figure 29: Relative abundance of lithodid crabs caught during the research cruise

A total of 62 *N. diomedeae* were sampled during the cruise. These were large crabs that weighed between 460 and 2755 g. Their carapace lengths ranged from 94 to 162 mm (mean = 120.82 ± 13.98). Figure 30 illustrates their length frequency distribution. Interestingly all of the animals encountered were males.

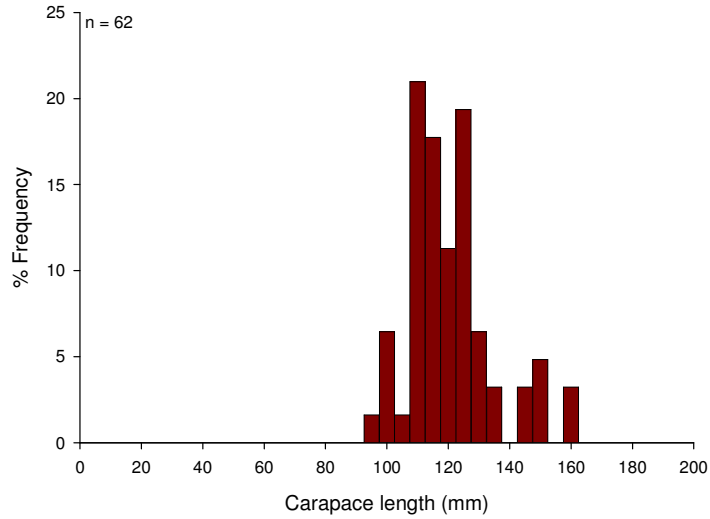


Figure 30: Length frequency distribution of male *Neolithodes diomedeae* caught on ZDLH1-07-2006

8.2 Shrimp and prawns

Six species of prawn were caught during the cruise. Interestingly they exhibited a geographical and bathymetric pattern. *Campylonotus vegans*, the painted shrimp, were caught on one station in shallow water (68 m) north of Sealion Island (Figure 31). *Campylonotus semistriatus* was found in deeper water between 516 and 581 m. *Acanthephyra pelagica* was caught on 8 stations during the cruise and were mainly encountered on the western slope of the Falkland Trough (Figure 31). The most abundant prawn encountered was *Pasiphaea acutifrons*. This species was caught between 581 and 1687 m depth with catches ranging between 0.01 and 21.86 kg. *Pasiphaea acutifrons* was caught on the southern slope of the Falkland shelf and also on the northern and eastern slopes of the Burdwood Bank.

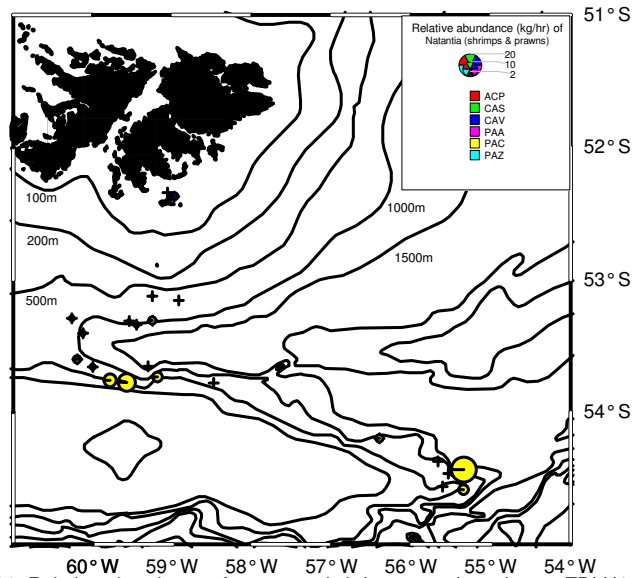


Figure 31: Relative abundance of pawns and shrimp at each station on ZDLH1-07-2006

Pandalopsis ampla and *Pasiphaea* sp. were also caught but in low numbers.

9.0 Cephalopoda

9.1 *Loligo gahi* and *Moroteuthis ingens*

Loligo gahi

Loligo gahi were caught on 4 out of the 24 trawl stations on the cruise and were only caught north of ɛg (Figure 32).

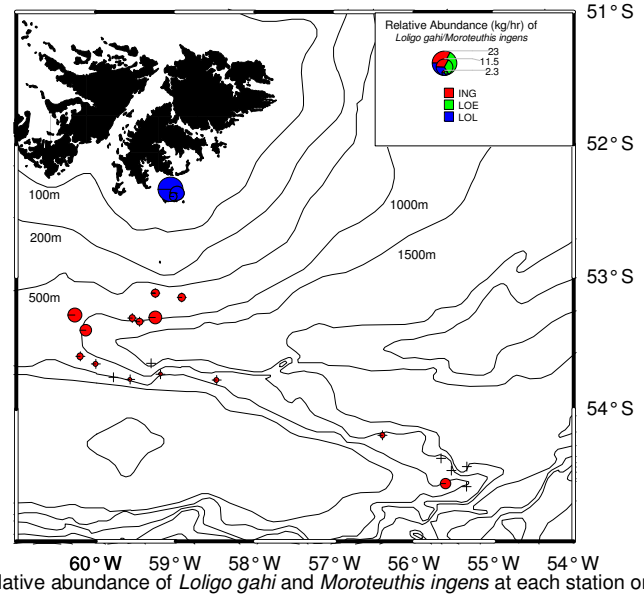


Figure 32: The relative abundance of *Loligo gahi* and *Moroteuthis ingens* at each station on ZDLH1-07-2006

A total of 572 *Loligo gahi* were sampled during the cruise. Figure 33 illustrates their length frequency distribution. Their dorsal mantle lengths ranged from 3.5 to 17 cm with males being larger than females on average.

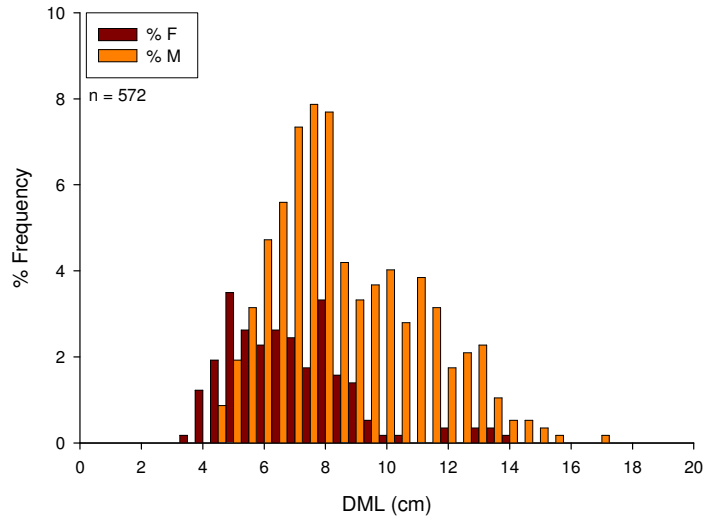


Figure 33: Length frequency distribution of *Loligo gahi* sampled on ZDLH1-07-2006

As was expected for this time of year *L. gahi* were found to be in most maturity stages from I through to IV (Figure 34).

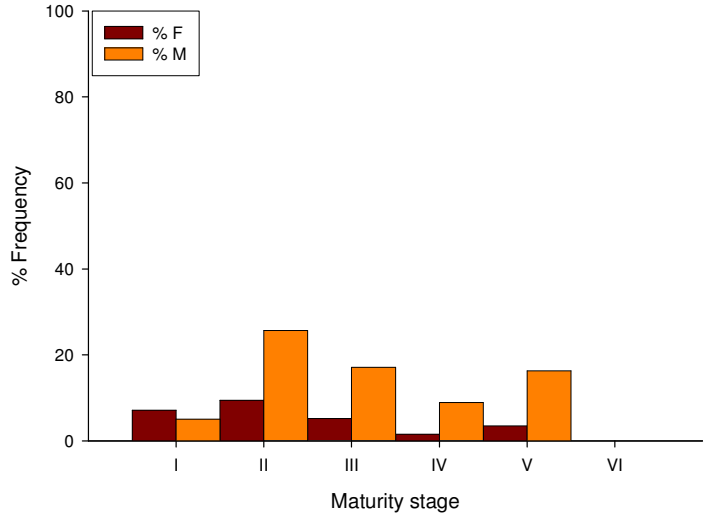


Figure 34:Maturity stages of *Loligo gahi* sampled on ZDLH1-07-2006

Moroteuthis ingens

Moroteuthis ingens were caught on 16 of the 24 trawl stations conducted on ZDLH1-07-2006. This species were common on the southern Falklands slope and on both the northern and eastern slopes of the Burdwood Bank (Figure 32). Catches ranged from 0.01 to 8.73 kg during the cruise.

A total of 55 individuals were sampled during the cruise and they ranged from 5 to 41 cm DML (mean = 27.69 ± 9.78). Figure 35 illustrates the length frequency distribution of *M. ingens* caught on the cruise.

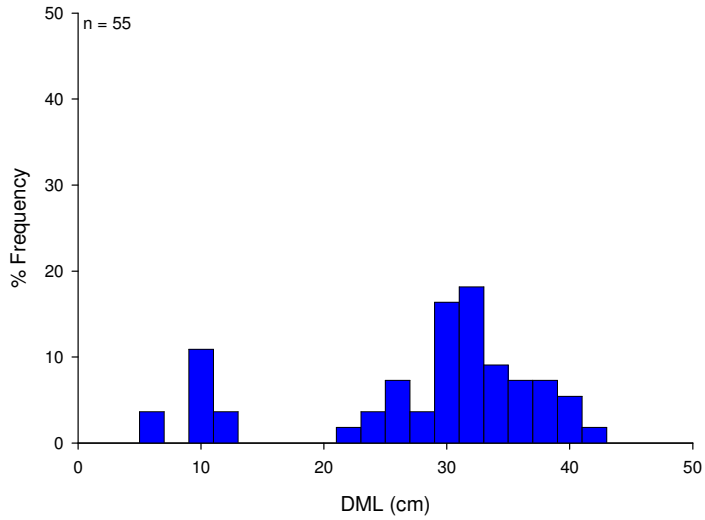


Figure 35: Length frequency distribution of *Moroteuthis ingens* sampled on ZDLH1-07-2006

Maturity stages ranged between I and VI. The most common female and male maturity was II and V respectively (Figure 36).

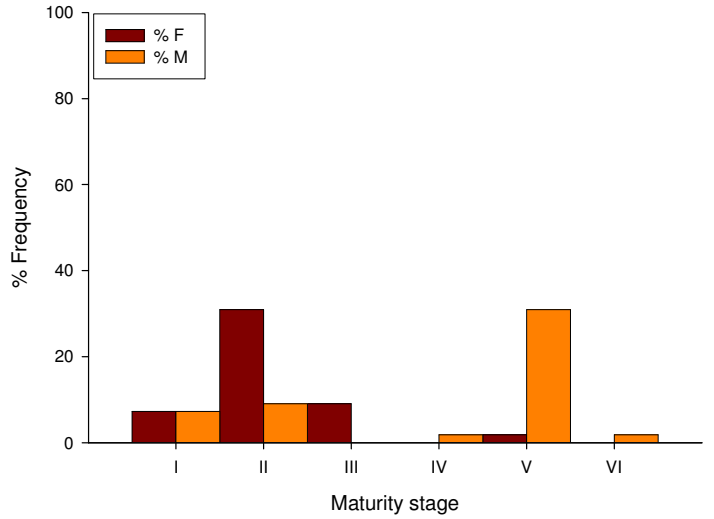


Figure 36: Maturity stages of *Moroteuthis ingens* sampled on ZDLH1-07-2006

9.2 Other cephalopods

A total of 24 species of cephalopods were caught during the survey, including 18 species of squids, 5 species of octopuses and 1 sepiolid *Neorossia caroli* (Table 1).

Apart from the shelf species *L. gahi*, all of the other squid were inhabitants of meso- and bathypelagic layers of the Southern Atlantic. Several typical Sub-Antarctic species such as *Psychroteuthis glacialis* and *Kondakovia longimana* were caught mainly on the eastern part of the Burdwood Bank, in waters derived from Circumpolar Current. Other species were common in temperate waters of the Atlantic, such as *G. antarcticus*, *Galiteuthis suhmi* and *Histioteuthis eltaninae.* Two species belonging to genera *Mastigoteuthis* and *Psychroteuthis* remained unidentified; it is possible that they have not been described yet.

Three different forms of octopods were caught. Benthic *Octopus* (*Enteroctopus*) *megalocyathus* was encountered on the shelf, whereas benthic *Graneledone yamana* and *Benthoctopus eureka* are typical inhabitants of deepwater slope waters. Pelagic *Opistoteuthis* sp. was caught by deepwater pelagic trawl.

The deepwater sepiolid *Neorossia caroli* is common and the most southern species of sepiolids. These large sepiolids penetrated to sub-Antarctic waters of the northern part of the Burdwood Bank.

10.0 Plankton

Seven Isaacs Kidd trawls were conducted during the cruise. Figure 37 illustrates their sampling locations and table 4 illustrates the wet weight caught and the catch composition.

ZDLH1 17/07/2006 to 27/07/2006

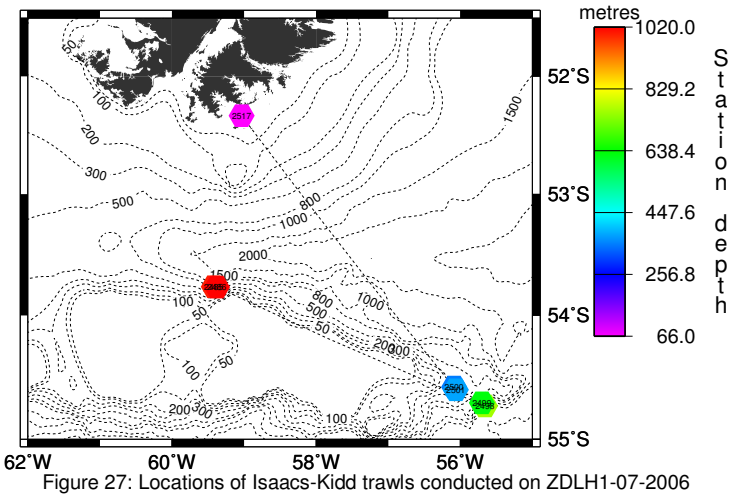


Figure 27: Locations of Isaacs-Kidd trawls conducted on ZDLH1-07-2006

Table 4: Species composition in plankton samples and the abundance of different taxonomic groups. D – dominant (30 – 80 %), A – abundant (5 – 20 %), C – common (1 – 5 %), O – occasional (<1%) and R – rare (1 to 2 individuals)

Station	2485	2486	2498	2499	2500	2501	2517
Wet weight	79	245	75	45	53	95	805
Name							
CHAETOGNATHA		O		O			
NEMATOSCELIS MEGALOPS				C		O	
THYSANOESSA VICINA	C			C	R		
EUPHAUSIA VALLENTINI	D	D	D	D	D	D	
MYSIDACEA							R
MUNIDA GREGARIA							D
PHRONIMIDAE		R			R	R	
PRYMNO MACROPA				R			
THEMISTO GAUDICHAUDI			O	C	R	O	R
SEPIOLIDAE SP.	R						
LOLIGO GAHI							R
POLYCHAETA		R		O			
PTEROPODA				R	R	R	
PROTOMICTOPHUM SPP.				R			
MYCTOPHID SPP.	O	C	O	O	R	R	
UNIDENTIFIED FINFISH		R					