

EUROSQUID CRUISE 1995

REPORT

Cruise 208 of RV POSEIDON (POS 208)
west of Portugal and Spain, 1 - 22 June 1995

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1. INTRODUCTION

In the 1990s long-time investigations were established to study the biology and the fishery potential of squid populations in the North East Atlantic. For example, in 1990 the ICES Study Group on Squid Biology was re-established. Later in 1994 it was changed into an ICES Working Group on Cephalopod Fisheries and Life History. One of its main tasks is to collect data on biology and fishery statistics of North East Atlantic cephalopod species. Further, in 1989 and with support by the EU (European Union) transnational European projects were started to study the biology, population parameters, age, stock interactions, recruitment indices and current fisheries of commercially important cephalopods and to evaluate management models for future controlled fishery exploitation. The coverage of a current project “Stock Dynamics, Interactions and Recruitment in North East Atlantic Squid Fisheries“ (AIR1-3003-92-0573) within the framework of the Agriculture and Agro-Industry Including Fisheries Programme of the EU extends throughout the entire geographical range of the North East Atlantic waters relevant to the Common Fisheries Policy. Participating institutions are the University of Aberdeen, Scotland (Coordinator); the Scottish Marine Laboratory, Aberdeen, Scotland; the University of the Algarve in Faro, Portugal; the Instituto Nacional de Investigação das Pescas in Lisbon (IPIMAR), Portugal; the University of the Azores in Horta, Azores, Portugal; the Instituto de Investigaciones Mariñas in Vigo (IIM), Spain; the University of Caen, France; and the Institut für Meereskunde in Kiel (IFM), Germany.

The target cephalopod species of the investigations are the long-finned squids *Loligo forbesi* and *Loligo vulgaris* and the ommastrephid squids *Todarodes sagittatus*, *Todaropsis eblanae* and *Illex coindetii*. All of them are of increasing importance in terms of ecology and fisheries in the European shelf waters and around banks, islands and seamounts in the North East Atlantic. However, knowledge on their life cycles, biology and distribution is still fragmentary. Their spawning grounds are completely unknown.

Within the EU-project one of the main responsibilities of the Institut für Meereskunde Kiel is to coordinate and conduct oceanographic research cruises in the North East Atlantic in order to sample the early life stages of the cephalopods. The cruises should take place in selected target regions to detect possible spawning grounds of the most important species. The research cruise 208 of the German RV POSEIDON was a major contribution to this task.

2. RESEARCH PROGRAMME

In early 1995 research teams of the IFM Kiel, the IPIMAR in Lisbon and the IIM in Vigo developed a research programme for the RV POSEIDON to study the distribution and biology

of cephalopods, particularly their early life stages, and the accompanying nekton and zooplankton fauna in the waters west of the Iberian Peninsula and near the Galicia Bank. The cruise was scheduled for the early summer. The cephalopods were caught with zooplankton nets and fishery trawls (Bongo net, IKMT and a pelagic fishery trawl).

Further studies concentrated on the hydrography of the investigated area. Water salinity and temperature were measured with CTDs. Accompanying seawater samples were taken with water bottles to analyse ambient oxygen and nutrient values.

The investigated area covered a region ranging from ca. 39°20'N to 44°20'N and from 7°30'W to 11°50'W (Fig. 1). Number and position of the oceanographic stations are shown in Fig. 2 (leg 1; 1-11 June 1995) and Fig. 3 (leg 2; 13-22 June 1995). Station lists with exact position data etc. are compiled in the Annex. The organization of the cruise (EUROSQUID Cruise 1995) profited from the excellent experience made during the EUROSQUID Cruise 1994 where RV POSEIDON had operated in waters south and southwest of Portugal, a region adjoining southerly to the present study area.

The investigations revealed a considerable amount of new scientific data. After final evaluations the results will be jointly published in international scientific journals by the scientists involved.

3. ITINERARY OF THE CRUISE

Cruise 208 of RV POSEIDON was divided into two legs. Leg 1 started in Vigo, Spain at 1 June 1995 and ended in Vigo at 11 June 1995. After two days stay in Vigo RV POSEIDON started to the second leg in the early afternoon of 13 June 1995 and returned to Vigo in the morning of 22 June 1995. During the break in Vigo a part of the scientific team was changed. The transects of the oceanographic stations are shown in Fig. 1. Exact station positions separated for each of the two legs are mapped in Figs. 2 and 3. All relevant station data are summarized in the Annex.

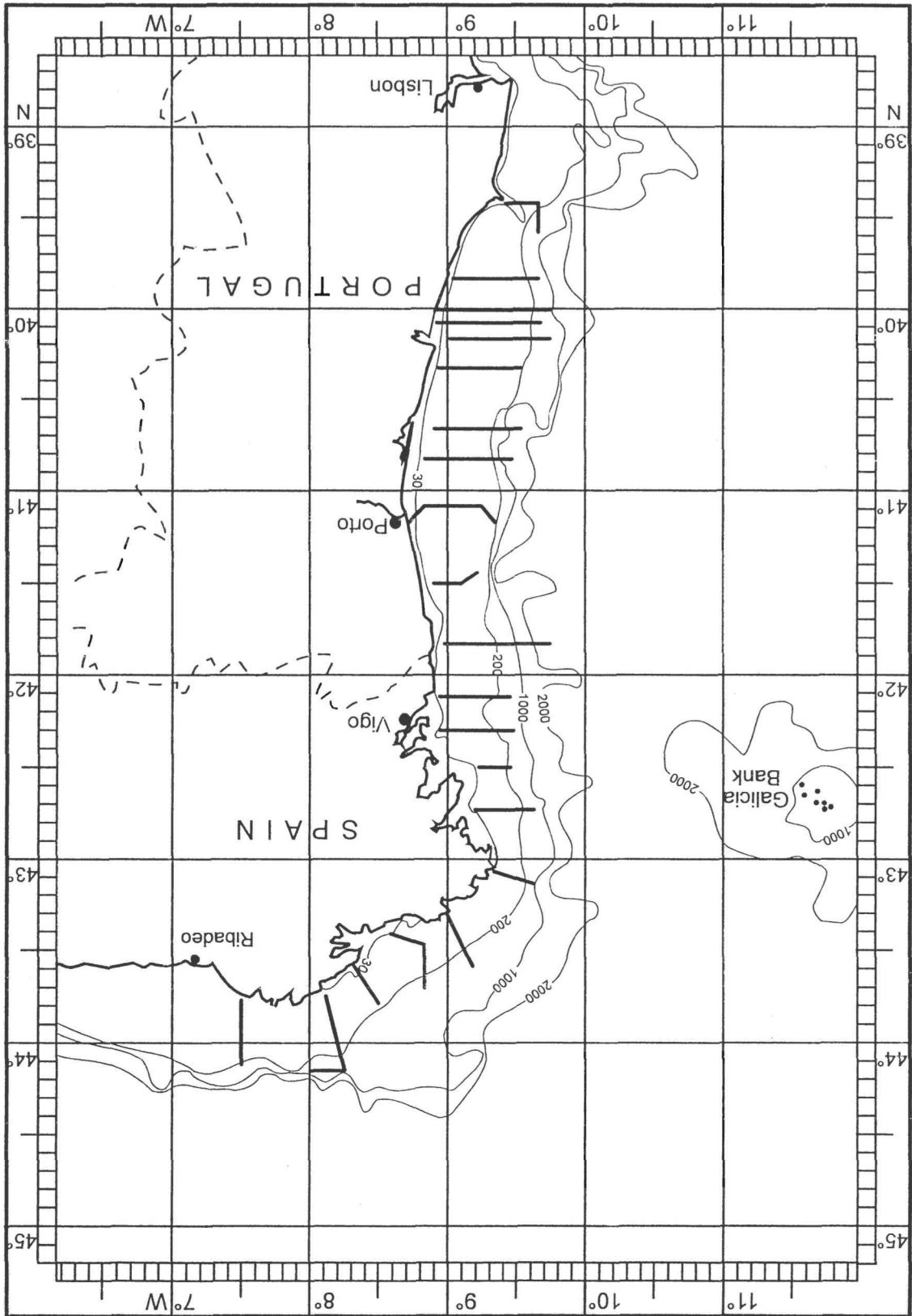
Leg 1. In the morning of 1 June 1995 RV POSEIDON left Vigo harbour and sailed to the first oceanographic station at the southern entrance of the Ria de Vigo. Station work began in the early afternoon with the first CTD-cast, water samples and a Bongo net trawl. Four additional stations were performed along a transect towards the shelf-break. In the following days nine further station-transects were conducted perpendicular to the Galician coast (see Fig. 2). They ranged from shallow coastal areas to offshore waters at the shelf-break approximately above the 200m depth contour. These station transects were chosen in order to cover a wide range of possible spawning grounds of squid along and off the Galician coast. Each station started with a CTD-cast, followed by water samples and Bongo net hauls. At stations close to

the shelf-break or offshore additional hauls were performed with either a pelagic Engel trawl (PT) or the Isaac Kidds Midwater Trawl (IKMT). Due to heavy weather conditions and rapidly changing wind speeds numerous stations scheduled in the northeast of Cape Finisterre had to be cancelled. Therefore, RV POSEIDON had to steam southwards and concentrated the station work west of Galicia. The area seemed to be very productive. This was attributed to the local strong upwelling which had been induced by the heavy storms and which was indicated by rich zooplankton samples. They contained numerous species that had been transported from offshore regions to the coastal zones. The last CTD/Bongo station was performed in the morning of 11 June 1996. Thereafter RV POSEIDON sailed back to Vigo to exchange personnel. She reached Vigo harbour on 11 June 1996 at 14:00 hours.

Leg 2. In the early afternoon of 13 June RV POSEIDON left Vigo to start the second leg. Weather conditions throughout this leg were excellent, and scientific station work went well during the whole time. Main purpose of this cruise part was a detailed study on hydrography and meso-scale distribution of squid and zooplankton along several station transects. They were located perpendicular to the west coast of Portugal between the Spanish border in the north and Nazare in the south (Fig. 3). RV POSEIDON first steamed to the southernmost station where in the morning of 14 June 1996 the work was started with a CTD cast and a haul with the pelagic Engel trawl. Two other stations with CTD and PT were performed in the southern area before the ship started with ten station transects perpendicular to the Portuguese west coast. Like during the first leg the standard station consisted of CTD casts, water samples and Bongo net hauls. At the most offshore station of each transect the PT was used additionally to sample juvenile and adult squid. No IKMT hauls were performed during this leg. The oceanographic stations were conducted at positions of traditional fishery survey stations of the Portuguese Fishery Institute (IPIMAR). The last transect station was completed in the night of 19 June 1995. Fine weather conditions allowed RV POSEIDON to sail to the Galicia Bank where some CTD casts, Bongo net and PT hauls could be performed during the 20 June 1995 (see inserted map in Fig. 3). In the morning of 21 June 1995 scientific activities stopped and the ship steamed back to Vigo. She arrived in the Ria de Vigo in the morning of 22 June 1995 and moored in due time in Vigo harbour (07:30 hours).

The scientific equipment had already been packed on the way back to Vigo and was discharged on 22 June 1995. At the same day the chief scientist delivered the scientific responsibilities to his successor, Dr. W. Koeve (IFM Kiel).

Fig. 1. POSEIDON cruise 208. Transects of oceanographic stations.



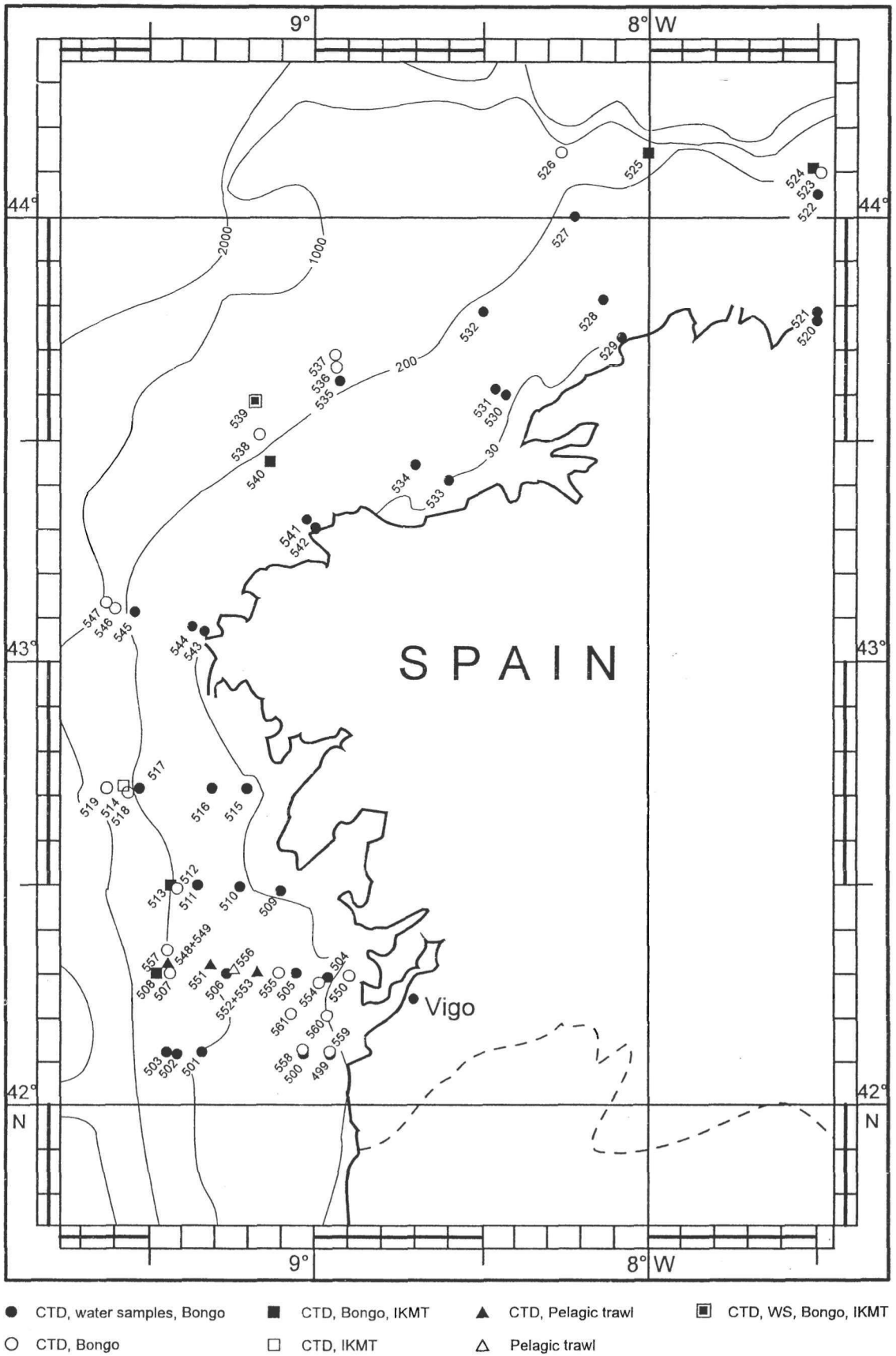


Fig. 2. POSEIDON cruise 208. Oceanographic stations of leg 1.

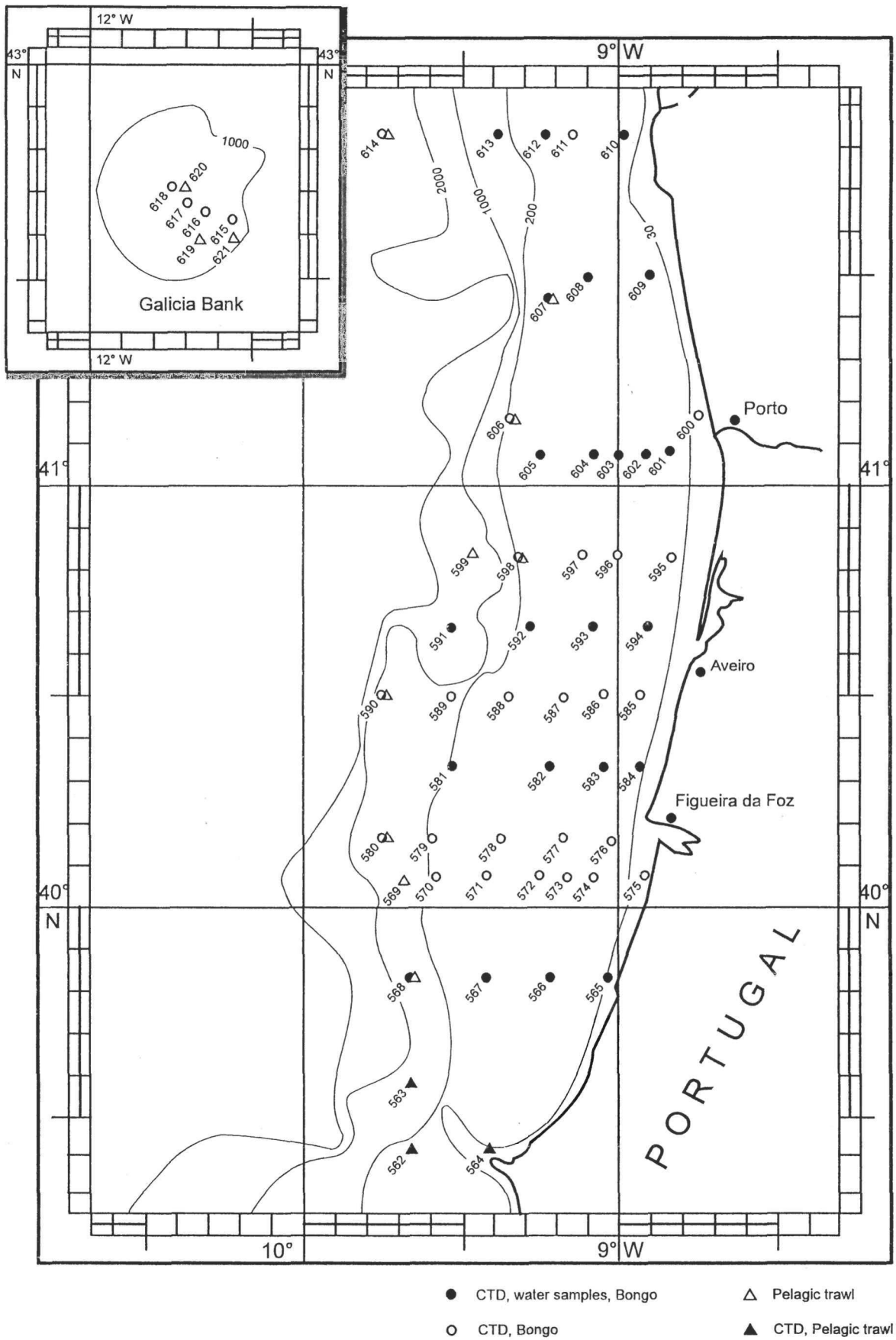


Fig. 3. POSEIDON cruise 208. Oceanographic stations of leg 2.

4. SCIENTIFIC REPORT AND FIRST RESULTS

4.1 PHYSICAL OCEANOGRAPHY

The physical oceanography of the Galician Sea (NW Iberian Peninsula) during leg 1 was studied by the Biogeochemistry Group of the IIM. Salinity and temperature were measured at 48 stations located along ten transects off the Galician coast (Fig. 4). The stations were situated above 80, 120, 200, 400 and 600 m depth. The measurements were made with a CTD (SEABIRD Seacat SBE19-01 self contained conductivity-temperature-depth probe). The salinity sensor was calibrated with seawater samples taken during the cruise and measured in an “Autosal” conductivimeter. Seawater samples were taken at the three stations of each transect which were nearest to the coastline (80, 120, and 200 m depth; Figs 5 and 6) with General Oceanics and Hydrobios bottles (1.2-1.5 liter). From these samples dissolved oxygen was analysed on board using the Winkler method. 20 ml of each water sample was frozen for later analysis of nutrients in the IIM.

During the cruise an intense upwelling affected the coast of Galicia. The upwelled subsurface seawater was clearly indicated by the relatively low surface temperature (Fig. 4). The usual seawater temperature in spring, 16°C, had decreased to less than 13°C in the northern zone of Cape Finisterre and Cape Prior. The greatest upwelling intensity occurred in the vicinity of Cape Finisterre where a typical plume of cool water (<14°C) was moving away from the coast. This peculiar hydrographical situation was mainly caused by the strong winds blowing from the north. Their speed varied from 10 to 15 ms⁻¹ during the cruise. Salinity did not vary much with values between 35.6 and 35.7 in front of Cape Finisterre (Fig. 5). The maximum salinity was observed at 40-70m depth corresponding with the upper layer of the Eastern North-Atlantic Central Water (ENAW) which upwelled near the coast. Generally, the ENAW is stratified between 150 and 400m depth off the Galician coast. This strong case of upwelling was also documented by the isopycnic slope (Fig. 6). The vertical profiles of temperature and density were similar because the salinity did not change very much. The influence of the upwelling near the coastline was also characterized by the oxygen values (see Station 61 of insert in Fig. 6). At this station and in the subsurface water the seawater was oxygen-undersaturated (near 90%) while the more offshore waters were supersaturated (near 110%) probably due to biological activity.

The same hydrographical measurements were made during the second leg. Conditions of weak easterly wind prevailed for most of the period, resulting in the prevalence of warm water flowing northward along the Portuguese west coast.

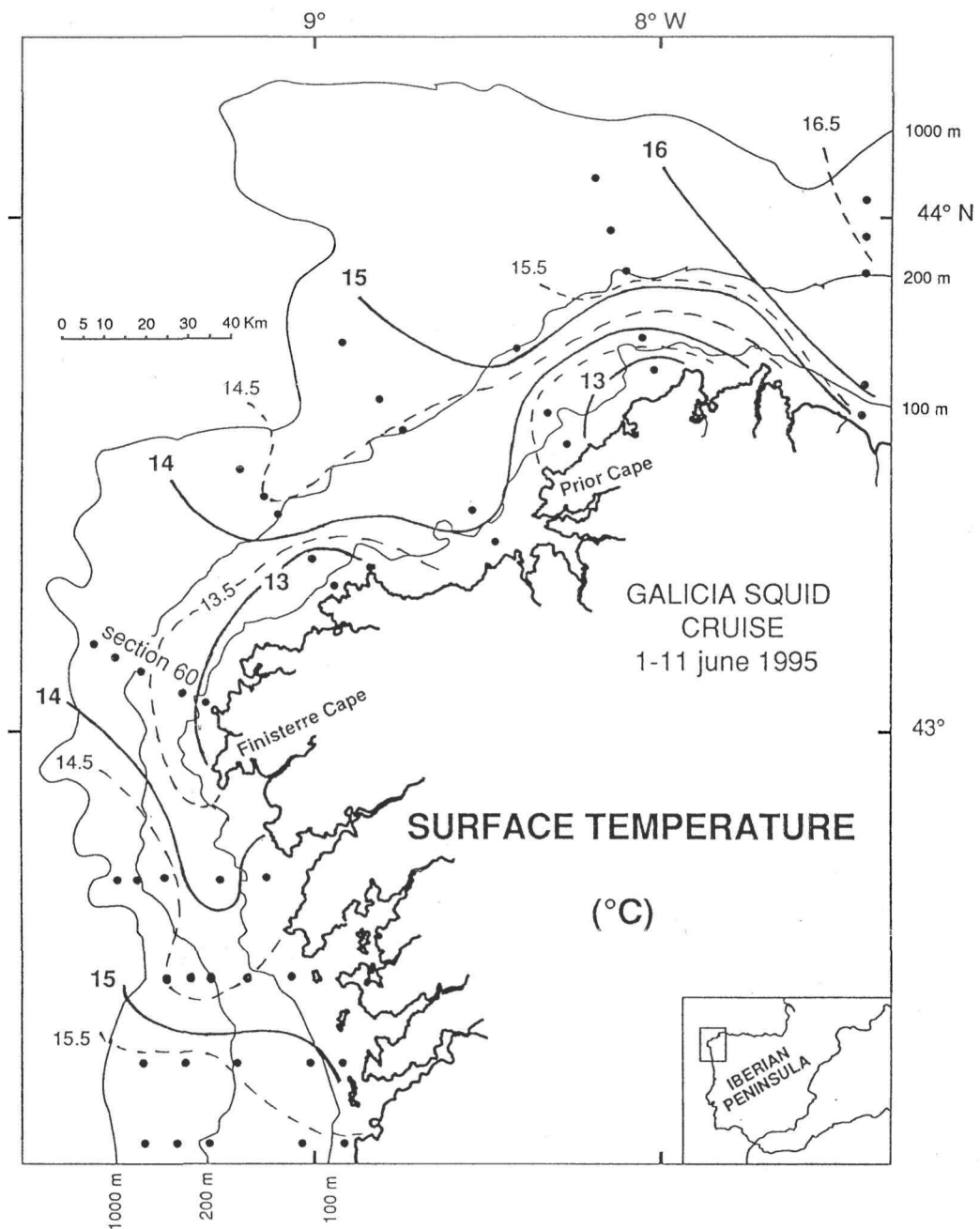


Fig. 4. Surface seawater temperature during RV POSEIDON cruise 208; leg 1.

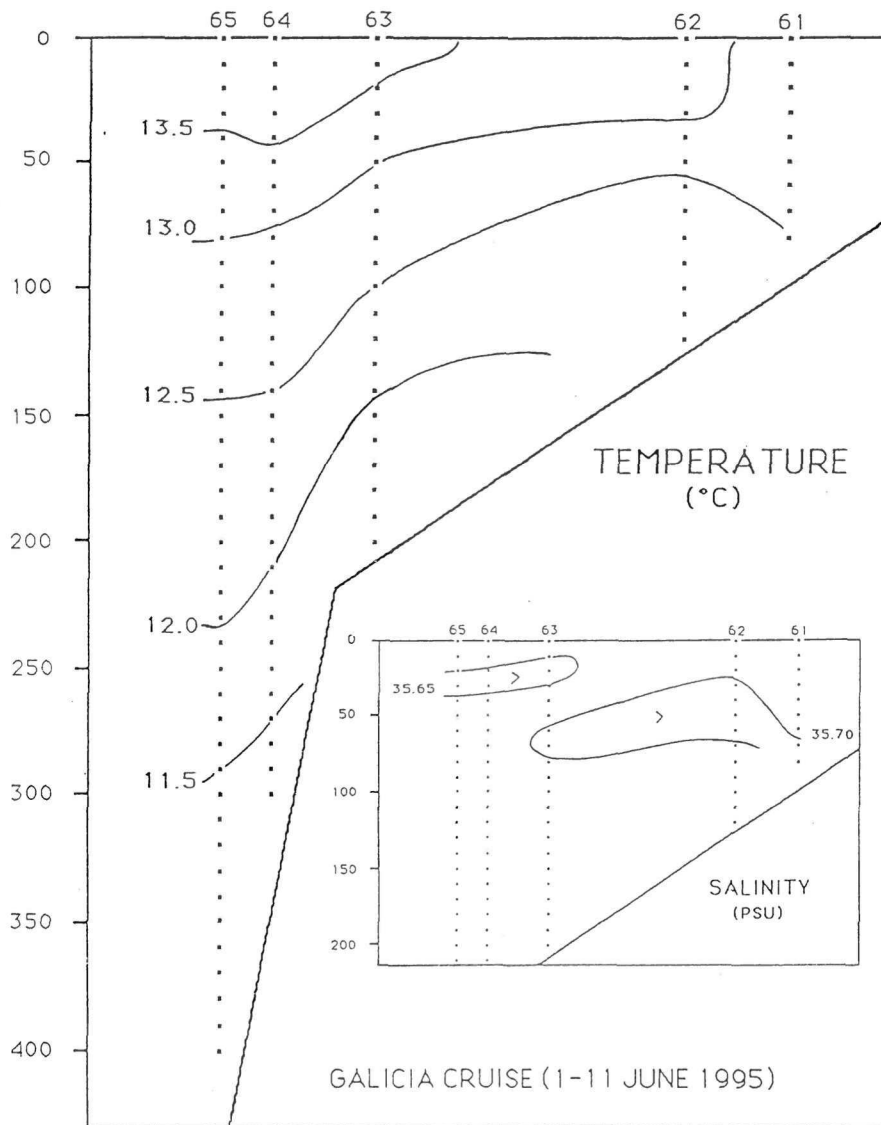


Fig. 5. Isoline profiles along section 60 (see Fig. 4) of seawater temperature and salinity during RV POSEIDON cruise 208; leg 1.

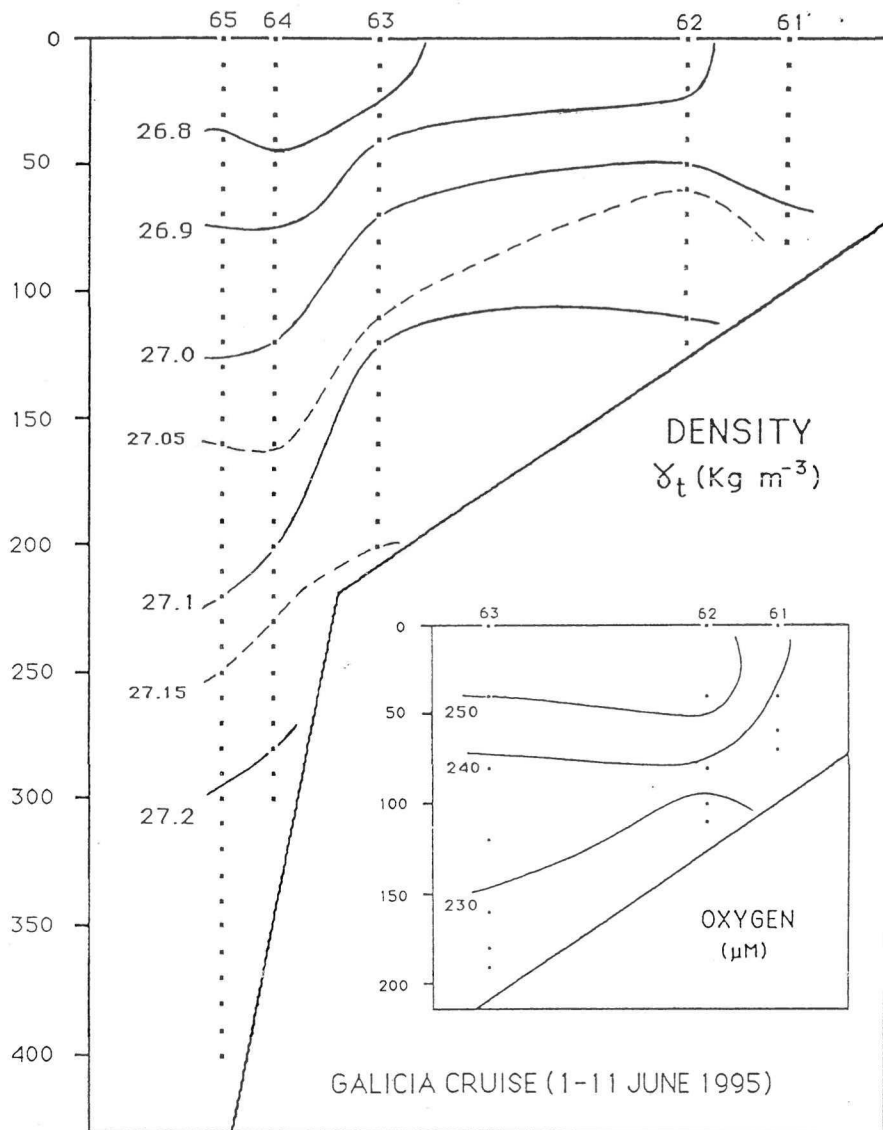


Fig. 6. Isoline profiles along section 60 (see Fig. 4) of seawater density and dissolved oxygen during RV POSEIDON cruise 208; leg 1.

4.2 FISH

Investigations on fish concentrated on the fish fauna composition sampled by the pelagic Engel trawl.

The nineteen hauls with the pelagic Engel trawl revealed at least 32 different species. Catch biomass varied considerably between less than 1 and 228 kg per haul. The blue whiting (*Micromesistius poutassou*) was most abundant in terms of numbers and biomass. It occurred at 15 stations with a maximum catch of 156 kg (17,940 specimens) at station 552 close to the entrance of the Ria de Vigo. A typical length-frequency distribution is shown for station 548 (Fig. 11). Other important fish were the carangids *Trachurus trachurus* and *Trachurus picturatus*, and the scombrids *Scomber scombrus* and *Scomber japonicus*. Eel-like fish were rare and, like midwater fish, only occurred at stations off the shelf-break. It was striking that myctophids were only caught during the second leg when RV POSEIDON was operating west of Portugal.

The regular occurrence of swim crabs (possibly *Polibus henslowi*) in nearly each catch with the pelagic trawl was another conspicuous feature. Again at station 552 a record catch of 64 kg swim crabs was yielded.

4.3 CEPHALOPODS

A compilation of the cephalopod catches from both cruise legs is presented in Table 1. A total of 566 specimens were caught by the three nets (Bongo net, IKMT, PT). All animals were measured (DML in mm) and, if possible, sex and maturity were determined. Preliminary identifications revealed at least 28 different taxa. With a total of 122 specimens the loliginid squid *Loligo vulgaris* was the most abundant species. 55 animals were paralarvae smaller than 6 mm DML indicating spawning grounds in the region. The sepiolids *Rondeletiola minor* (N = 119) and *Sepietta oweniana* (N = 96) were next in abundance. *Sepiolo ligulata* (N = 2) was caught for the first time off the Portuguese coast; two yet not identified male specimens of the genus *Sepiolo* belong probably to a new species. They were also caught near the Portuguese coast and will be described in detail after consulting taxonomy experts. Ommastrephid paralarvae (rhynchoteuthions) occurred with 26 specimens, all captured by the Bongo net in the coastal region west off Galicia. The distribution patterns of the paralarvae caught with the Bongo net during leg 1 is shown in Figs. 7 and 8. Fig. 9 shows the length frequency distribution of *Loligo* spp. sampled during the first leg; Fig. 10 gives information on the length frequency distribution of ommastrephid paralarvae (rhynchoteuthions) sampled by the Bongo net during cruise leg 1.

The cephalopod collection of this cruise again provided new and exciting information on the distribution and possible spawning grounds of key species like loliginids and ommastrephids. The results will be finally worked out in close collaboration between the scientists involved in the sampling and then submitted to refereed scientific journals.

Table 1. Cephalopods caught during EUROSQUID Cruise 1995 (RV POSEIDON cruise No. 208).

Cephalopod Taxon	Bongo Net	IKMT	Pelagic Trawl	Total
<i>Sepia orbignyana</i>	0	0	1	1
<i>Rondeletiola minor</i>	3	0	116	119
<i>Sepiola atlantica</i>	1	0	40	41
<i>Sepiola ligulata</i>	0	0	2	2
<i>Sepiola rondeleti</i>	0	0	2	2
<i>Sepiola</i> sp.	11	0	13	24
<i>Sepietta neglecta</i>	0	0	6	6
<i>Sepietta obscura</i>	0	0	2	2
<i>Sepietta oweniana</i>	1	0	95	96
<i>Sepietta</i> sp.	13	0	9	22
Sepiolidae indet.	1	0	19	20
<i>Loligo forbesi</i>	7	0	0	7
<i>Loligo vulgaris</i>	56	0	66	122
<i>Loligo</i> sp.	28	0	0	28
<i>Alloteuthis subulata</i>	0	0	1	1
<i>Alloteuthis</i> sp.	9	0	0	9
<i>Abralia veranyi</i>	2	0	0	2
<i>Histioteuthis bonnellii</i>	0	0	1	1
<i>Histioteuthis corona corona</i>	0	3	0	3
<i>Histioteuthis elongata</i>	0	0	1	1
<i>Histioteuthis</i> sp.	0	1	0	1
<i>Todaropsis eblanae</i>	0	0	1	1
Ommastrephidae paralarvae	26	0	0	26
<i>Teuthowenia megalops</i>	1	0	2	3
Teuthoidea indet.	2	0	0	2
<i>Octopus vulgaris</i>	20	0	1	21
<i>Eledone cirrhosa</i>	1	0	0	1
Octopodidae indet.	2	0	0	2
TOTAL	184	4	378	566

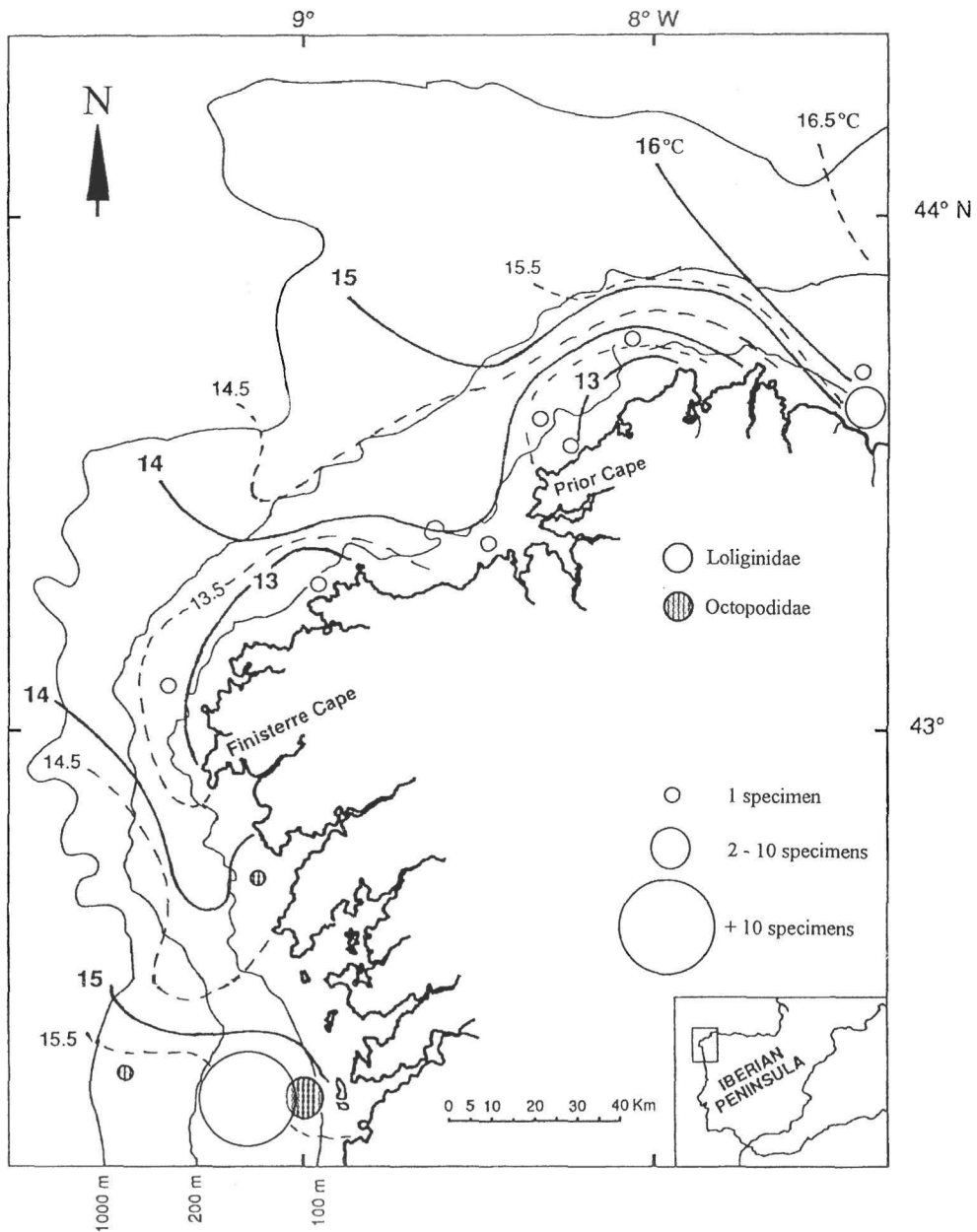


Fig. 7. Distribution patterns of Loliginidae and Octopodidae paralarvae caught with the Bongo net during leg 1.

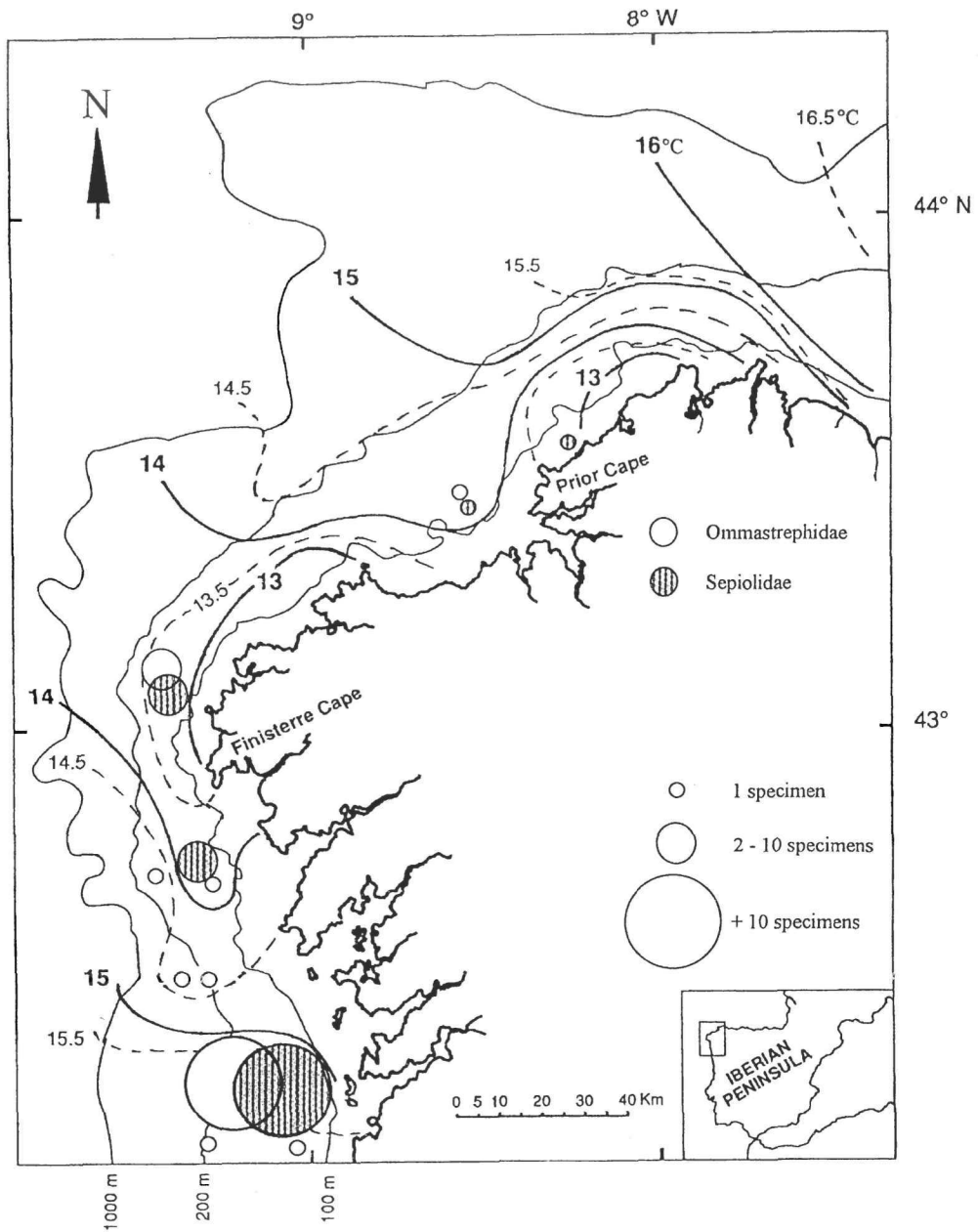


Fig. 8. Distribution patterns of Ommastrephidae and Sepiolidae paralarvae caught with the Bongo net during leg 1.

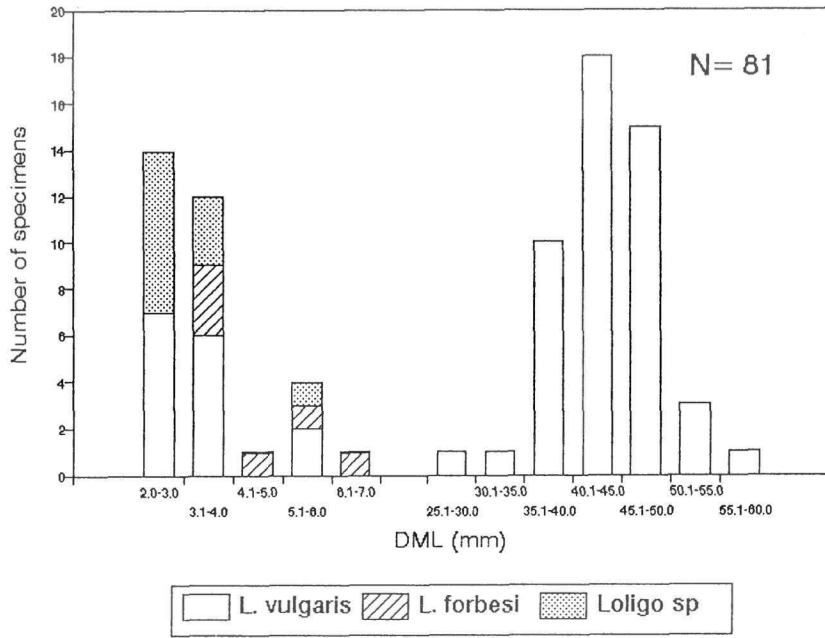


Fig. 9. Length-frequency distribution of *Loligo* spp. sampled during leg 1.

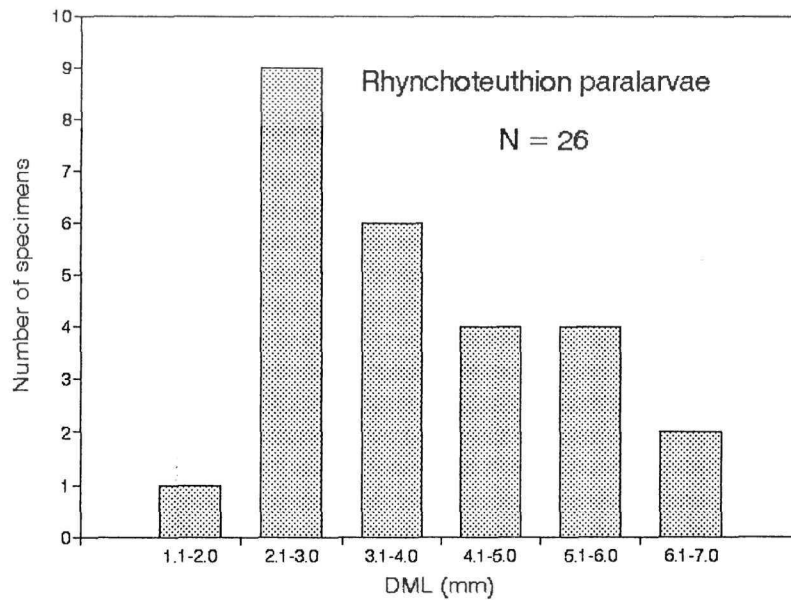


Fig. 10. Length-frequency distribution of ommastrephid paralarvae (rhynchoteuthions) sampled by the Bongo net during leg 1.

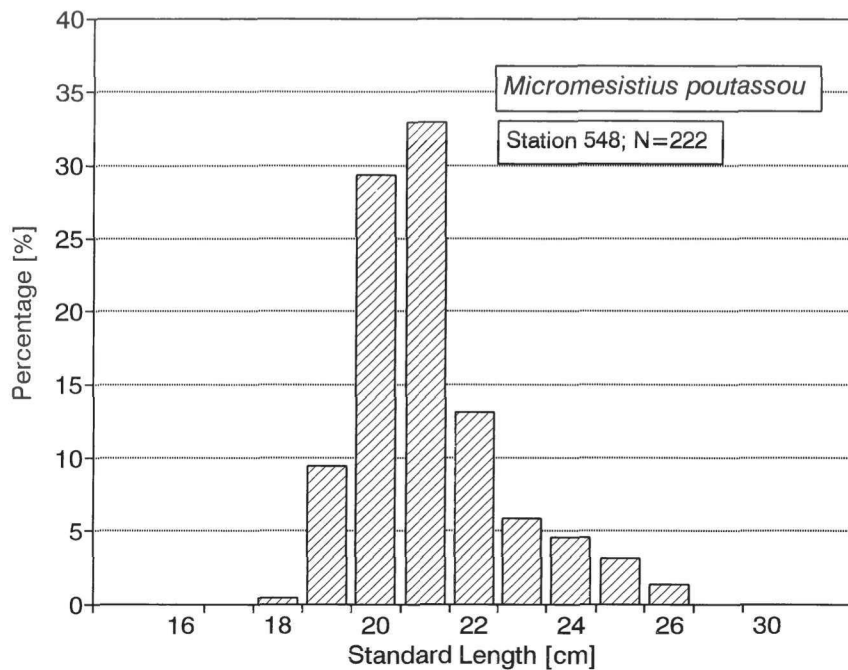


Fig. 11. Length-frequency distribution of Blue whiting (*Micromesistius poutassou*) caught with the pelagic trawl at Station 550.

4.4 ZOOPLANKTON AND MIKRONEKTON

Sorting of the numerous zooplankton/micronekton samples is still under progress. The samples of the 115 Bngo net hauls and the 7 IKMT hauls will be evaluated to study the meso- and fine-scale distribution patterns of zooplankton and micronekton. They will be related to hydrography and nutrient distribution and the strong upwelling which occurred during leg 1 off Galicia.

5. SCIENTIFIC CREW

5.1 1st LEG VIGO - VIGO (1 - 11 JUNE 1995):

PIATKOWSKI, Uwe; chief scientist	- IFM
CASAS, Fernando; technician	- IIM
da CUNHA, Manuela Morais; scientist	- IPIMAR
HEVIA, Martin; scientist	- IFM
MEES, Svend; technician	- IFM
PETERSEN, Dietrun; scientist	- IFM
PREGO, Ricardo; scientist	- IIM
ROCHA, Francisco; scientist	- IIM
STREHLOW, Beate; scientist	- URO
WIELAND, Kai; scientist	- IfM

5.2 2nd LEG VIGO - VIGO (13 - 22 JUNE 1995):

PIATKOWSKI, Uwe; chief scientist	- IFM
CASAS, Fernando; technician	- IIM
GUERRA, Angel; scientist	- IIM
HEINEMANN, Heidrun; student	- IFM
MEES, Svend; technician	- IFM
MORENO, Ana; scientist	- IPIMAR
PEREIRA, João; scientist	- IPIMAR
PETERSEN, Dietrun; scientist	- IFM
STREHLOW, Beate; scientist	- URO
WIELAND, Kai; scientist	- IFM

5.3 PARTICIPATING INSTITUTIONS

IFM	- Institut für Meereskunde, University of Kiel, Germany
IIM	- Instituto de Investigaciones Mariñas, CSIC, Vigo, Spain
IPIMAR	- Instituto Português de Investigação Marítima, Lisbon, Portugal
URO	- University of Rostock, Department of Fishery Biology, Rostock, Germany

6. SCIENTIFIC EQUIPMENT

- CTD (SeaBird Seacat SBE 19-01 self contained conductivity-temperature-depth probe); 57 casts
- CTD (ME-Sond OTS 1500); 56 casts
- Water bottles (General Oceanics and Hydrobios bottles; 1.2-1.5 liter capacity); 54 casts
- Bongo net (with 335 and 500 μ m meshes), 110 hauls
- IKMT (with 4mm meshes in codend), 7 hauls
- Pelagic Engel trawl, 308 meshes (with 10mm meshes in codend), 19 hauls

7. FINAL REMARKS, ACKNOWLEDGEMENTS

The international team work between scientists and technicians from Germany, Portugal and Spain was particularly stimulating and resulted into an immense amount of new research data. Definitely, the cruise was an ever memorable and enjoyable experience to everybody.

ANNEX: Station table of RV POSEIDON cruise 208

BON : Bongo net (with 335 and 500µm meshes)
 CTD : 1st leg SeaBird Seacat SBE 19-01; 2nd leg ME-Sond OTS 1500
 IKMT : Isaac Kidds Midwater Trawl (with 4mm meshes in codend)
 PT : Pelagic Engel trawl, 308 meshes (with ca. 10 mm meshes in codend)
 WS : Water samples (General Oceanics and Hydrobios bottles; 1.2-1.5 liter)

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)	
01.06.95		09:30	Departure Vigo harbour					
	499	13:05	42°07.0'	08°57.4'	83	CTD	0-80	
		13:12						
		13:17	42°06.8'	08°57.4'	82	WS	0-80	
		13:29						
		15:12	42°07.0'	08°57.1'	81	BON	0-63	
		15:30	42°07.7'	08°57.3'				
	500	16:08	42°07.0'	09°02.0'	122	WS	0-120	
		16:31						
		16:32	42°06.9'	09°02.2'	123	CTD	0-120	
		16:42						
		16:55	42°07.1'	09°01.8'	122	BON	0-110	
		17:24						
	501	19:10	42°07.0'	09°20.6'	223	CTD	0-200	
		19:25						
		19:28	42°07.0'	09°20.9'	222	WS	0-200	
		20:01						
		20:10	42°07.7'	09°20.9'	232	BON	0-200	
		21:02	42°10.0'	09°19.6'				
	502	21:44	42°06.8'	09°24.9'	422	CTD	0-400	
		22:01						
		22:09	42°07.1'	09°25.0'	462	BON	0-200	
		22:51	42°08.9'	09°24.1'				
503	23:28	42°07.2'	09°27.5'	840	CTD	0-600		
	23:46							
	23:52	42°07.6'	09°27.4'	880	BON	0-200		
02.06.95	504	00:42						
		08:02	42°17.5'	08°57.6'	82	CTD	0-80	
		08:12						
		08:12	42°17.4'	08°57.7'	83	WS	0-80	
		08:25						
		08:33	42°17.4'	08°57.4'	84	BON	0-82	
		08:47	42°18.2'	08°57.0'				
	505	09:30	42°18.0'	09°04.0'	114	WS	0-110	
		09:51						
		09:52	42°17.8'	09°04.0'	114	CTD	0-110	
		10:00						
		10:04	42°17.9'	09°03.8'	113	BON	0-110	
		10:25	42°18.7'	09°03.3'				

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)	
02.06.95	506	11:30	42°17.8'	09°15.9'	200	CTD	0-200	
		11:42						
		11:45	42°17.9'	09°16.0'	202	WS	0-200	
	507	12:10						
		12:16	42°18.1'	09°15.9'	201	BON	0-195	
		14:05	42°18.0'	09°26.2'	900	CTD	0-600	
		14:24						
		14:30	42°20.4'	09°25.1'	900	BON	0-200	
		15:10						
	508	15:45	42°17.8'	09°28.8'	880	CTD	0-600	
		16:04						
		16:10	42°18.1'	09°28.6'	900	BON	0-200	
		17:01						
		17:50	42°18.2'	09°28.5'	920	IKMT	0-200	
		18:50	42°20.6'	09°29.8'				
03.06.95	509	08:12	42°29.3'	09°06.1'	87	CTD	0-80	
		08:24						
		08:26	42°29.5'	09°06.0'	87	WS	0-80	
	510	08:39						
		08:45	42°29.5'	09°05.6'	87	BON	0-80	
		08:55	42°29.6'	09°05.1'				
		09:50	42°29.8'	09°13.7'	120	CTD	0-120	
		09:59						
		10:00	42°29.6'	09°13.7'	121	WS	0-120	
	511	10:15						
		10:20	42°29.6'	09°13.4'	123	BON	0-105	
		10:35	42°30.0'	09°12.7'				
		11:20	42°30.0'	09°21.3'	200	CTD	0-200	
		11:30						
		11:33	42°30.0'	09°21.5'	201	WS	0-200	
		12:00						
		12:10	42°30.1'	09°21.4'	199	BON	0-170	
		12:45						
	512	13:29	42°19.6'	09°25.2'	480	CTD	0-400	
		13:41						
		13:45	42°29.6'	09°25.3'	485	BON	0-200	
513	14:21							
	14:50	42°29.8'	09°25.4'	600	CTD	0-600		
	15:10							
	15:30	42°27.2'	09°26.5'	900	BON	0-200		
	16:13							
	16:25	42°29.3'	09°26.5'	800	IKMT	0-400		
514	18:45	42°35.2'	09°30.8'					
	20:35	42°43.2'	09°34.3'	600	IKMT	0-400		
	23:50	42°51.5'	09°36.3'					
04.06.95	515	08:00	42°42.9'	09°12.0'	91	CTD	0-80	
		08:10						
		08:12	42°42.9'	09°12.0'	91	WS	0-80	
		08:29						
		08:43	42°42.0'	09°12.6'	98	BON	0-80	
		08:58	42°42.6'	09°11.7'				

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)	
04.06.95	516	09:37	42°42.8'	09°18.5'	121	WS	0-120	
		09:53						
		09:54	42°42.7'	09°18.5'	121	CTD	0-120	
			10:03					
			10:05	42°42.8'	09°18.7'	121	BON	0-110
			10:29	42°43.5'	09°17.7'			
		517	12:22	42°42.6'	09°31.9'	260	CTD	0-200
			12:32					
			12:33	42°42.6'	09°32.0'	275	WS	0-200
			12:53					
			13:00	42°42.6'	09°32.7'	290	BON	0-200
			13:42					
		518	14:14	42°42.9'	09°33.9'	500	CTD	0-400
			14:30					
			14:35	42°43.2'	09°33.8'	460	BON	0-200
			15:05	42°44.5'	09°33.0'			
		519	15:40	42°42.8'	09°37.3'	1015	CTD	0-600
	15:55							
	16:00		42°42.8'	09°37.7'	950	BON	0-200	
	16:42							
05.06.95	520	11:04	43°46.0'	07°30.1'	82	CTD	0-80	
		11:13						
		11:13	43°46.3'	07°31.1'	88	WS	0-80	
		11:24						
			11:30	43°46.4'	07°30.9'	96	BON	0-80
			12:10					
		521	12:29	43°47.0'	07°30.3'	120	CTD	0-120
			12:39					
			12:41	43°47.2'	07°30.5'	120	WS	0-120
			12:58					
			13:03	43°47.5'	07°30.4'	120	BON	0-100
			13:34					
		522	15:15	44°02.8'	07°30.0'	206	WS	0-200
			15:41					
			15:42	44°03.0'	07°30.2'	216	CTD	0-200
			15:55					
			16:12	44°03.2'	07°30.4'	225	BON	0-200
			17:25	44°03.2'	07°30.1'			
		523	18:00	44°06.2'	07°30.4'	434	BON	0-200
			18:45	44°06.3'	07°27.1'			
			19:01	44°06.3'	07°29.4'	440	CTD	0-400
			19:23					
			19:24	44°06.5'	07°29.5'	500	CTD	0-400
		19:50						
	524	20:00	44°06.8'	07°29.4'	614	CTD	0-600	
		20:21						
		20:24	44°07.1'	07°29.1'	649	BON	0-200	
		21:09	44°07.0'	07°25.6'				
		23:05	44°08.0'	07°30.8'	500	IKMT	0-300	
06.06.95		02:11	44°08.5'	07°18.7'				

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)	
06.06.95	525	05:25	44°09.0'	08°00.0'	1000	IKMT	0-325	
		08:09	44°10.6'	08°13.7'				
		08:38	44°11.0'	08°13.8'	667	CTD	0-600	
			09:02					
			09:09	44°11.5'	08°13.5'	1000	BON	0-200
			09:53	44°11.6'	08°10.4'			
		526	10:40	44°09.4'	08°15.8'	400	CTD	0-400
			11:01					
			11:05	44°09.9'	08°15.2'	433	BON	0-200
			11:38					
		527	13:03	44°00.8'	08°13.1'	240	CTD	0-200
			13:11					
			13:15	44°01.0'	08°13.0'	250	WS	0-200
			13:35					
			13:40	44°01.2'	08°12.6'	250	BON	0-200
			14:25					
		528	15:55	43°48.9'	08°08.1'	120	CTD	0-120
			16:01					
			16:03	43°48.9'	08°08.2'	125	WS	0-120
			16:16					
			16:20	43°49.2'	08°08.0'	129	BON	0-115
			17:00					
		529	17:53	43°43.7'	08°04.9'	90	CTD	0-80
			18:00					
			18:02	43°43.9'	08°04.8'	100	WS	0-80
			18:12					
			18:35	43°44.2'	08°06.8'	100	BON	0-90
			19:03					
		530	20:44	43°35.7'	08°20.4'	90	CTD	0-80
			20:52					
	21:00		43°39.9'	08°20.4'	92	WS	0-80	
	21:10							
		21:31	43°35.3'	08°22.2'	80	BON	0-70	
		22:11						
	531	22:25	43°37.0'	08°21.9'	121	CTD	0-120	
		22:36						
		22:38	43°37.2'	08°21.8'	120	WS	0-120	
		22:50						
		22:55	43°37.5'	08°21.6'	120	BON	0-110	
		23:36						
07.06.95	532	01:30	43°47.0'	08°30.2'	205	CTD	0-200	
		01:40						
		01:42	43°48.1'	08°30.2'	210	WS	0-200	
			02:01					
			02:05	43°48.4'	08°30.4'	215	BON	0-200
			03:10					
		533	06:39	43°24.6'	08°35.9'	80	CTD	0-80
			06:47					
			06:50	43°24.7'	08°35.8'	80	WS	0-80
		07:01						

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)
07.06.95	533	07:07	43°25.0'	08°35.3'	90	BON	0-82
	534	07:51	43°25.9'	08°32.1'			
		08:43	43°27.0'	08°42.0'	129	CTD	0-120
		08:51					
		08:52	43°27.0'	08°42.0'	129	WS	0-120
		09:06					
	535	09:20	43°27.0'	08°41.7'	129	BON	0-112
		10:10	43°28.1'	08°38.6'			
		12:04	43°38.2'	08°49.8'	200	CTD	0-200
		12:13					
		12:17	43°38.4'	08°49.8'	205	WS	0-200
		12:35					
		12:40	43°38.6'	08°49.7'	225	BON	0-200
		13:20					
		14:00	43°40.7'	08°50.2'	480	CTD	0-400
		14:15					
	536	14:15	43°41.2'	08°47.1'	480	BON	0-200
		15:00					
		15:20	43°41.0'	08°48.9'	415	CTD	0-400
		15:35					
		15:52	43°41.7'	08°50.5'	800	CTD	0-600
	537	16:10					
		16:15	43°41.9'	08°50.4'	825	BON	0-200
16:55							
20:10		43°31.1'	09°10.8'	410	CTD	0-400	
538	20:30						
	20:41	43°31.8'	09°10.3'	430	BON	0-200	
	21:34	43°32.7'	09°06.5'				
	23:10	43°34.9'	09°11.4'	822	BON	0-200	
	00:05						
08.06.95	539	00:25	43°36.0'	09°06.4'	680	IKMT	0-325
		02:50	43°39.5'	08°56.3'			
		04:10	43°35.8'	09°10.7'	710	CTD	0-600
	540	04:30					
		05:30	43°27.5'	09°08.4'	230	CTD	0-200
		05:40					
		05:42	43°27.5'	09°08.4'	235	CTD	0-200
		06:15					
		06:16	43°27.9'	09°08.5'	245	WS	0-200
		06:30					
		06:43	43°28.2'	09°08.0'	244	IKMT	0-210
		08:05	43°29.7'	09°02.1'			
		08:43	43°28.2'	09°07.8'	244	BON	0-200
	541	09:39	43°29.3'	09°03.6'			
		11:05	43°19.4'	09°01.1'	120	CTD	0-120
		11:14					
		11:15	43°19.6'	09°01.1'	123	WS	0-120
		11:29					
		11:34	43°19.9'	09°00.8'	126	BON	0-112
		12:17					

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)	
08.06.95	541	12:45	43°19.5'	09°01.3'	126	CTD	0-120	
	542	12:52	43°18.6'	09°00.1'	80	CTD	0-80	
		13:27						
		13:33	43°18.7'	09°00.2'	90	WS	0-80	
		13:37						
		13:44	43°17.7'	09°02.1'	100	BON	0-90	
		14:05						
	14:44	543	17:10	43°04.1'	09°19.8'	80	CTD	0-80
	17:15		43°04.1'	09°19.8'	80	WS	0-80	
	17:17							
	17:28		43°04.4'	09°19.7'	100	BON	0-80	
	17:30							
	18:19		544	18:50	43°06.2'	09°17.4'	125	CTD
	19:00	43°05.0'		09°22.3'				
	19:02				43°05.1'	09°22.3'	128	WS
	19:16							
	19:21	43°05.3'		09°22.0'	128	BON	0-110	
	20:00							
	21:20	545	21:20	43°06.4'	09°19.3'	200	CTD	0-200
	21:31		43°06.9'	09°32.7'				
	21:31				43°07.0'	09°32.6'	200	WS
	21:53							
	21:57		43°07.2'	09°32.4'	196	BON	0-180	
22:42								
23:25	546	23:25	43°08.3'	09°29.3'	390	CTD	0-380	
23:39		43°07.7'	09°35.9'					
23:40				43°07.9'	09°35.9'	380	BON	0-200
09.06.95	547	01:06	43°08.2'	09°36.9'	750	CTD	0-600	
		01:20	43°08.5'	09°37.0'				
		02:08			43°08.5'	09°37.0'	750	BON
	15:26	42°19.3'	09°26.8'	400				
	16:35	42°26.6'	09°26.4'	430	CTD	0-400		
	18:29	42°20.8'	09°26.8'					
	18:44	550	21:48	42°17.6'	08°48.4'	84	CTD	0-80
21:57	42°16.6'		08°59.3'	98	BON	0-77		
22:23								
22:51	42°18.0'		08°57.8'	230	PT	0-210		
07:05	42°19.0'	09°18.9'						
10.06.95	551	08:30	42°23.9'	09°16.9'	230	CTD	0-200	
		09:58	42°17.9'	09°18.8'				
		10:10	42°18.4'	09°10.7'	149	PT	0-120	
		11:18						
	13:00	42°26.2'	09°07.7'	148	CTD	0-120		
	14:40	42°18.0'	09°10.5'					
	14:50							

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)	
10.06.95	554	15:45	42°16.6'	08°59.2'	98	CTD	0-80	
		15:52						
		15:55	42°16.9'	08°58.9'	98	BON	0-90	
		16:24	42°17.5'	08°58.0'				
		16:45	42°16.3'	08°59.4'	95	BON	0-52	
		555	17:18					
			18:15	42°18.2'	09°06.2'	122	CTD	0-120
			18:22					
			18:28	42°18.4'	09°06.1'	131	BON	0-120
			19:03					
	556	20:58	42°18.3'	09°14.7'	190	PT	0-160	
		23:40	42°24.9'	09°14.4'				
11.06.95	557	00:55	42°20.8'	09°26.7'	430	BON	0-200	
		02:05						
	558	06:10	42°07.1'	09°02.0'	124	CTD	0-120	
		06:18						
		06:21	42°07.3'	09°02.0'	123	BON	0-110	
		559	07:00					
			07:27	42°06.8'	08°57.5'	82	CTD	0-80
			07:33					
		560	07:44	42°06.8'	08°58.0'	95	BON	0-80
			08:24					
			08:59	42°12.3'	08°57.8'	95	CTD	0-80
		561	09:07					
			09:12	42°12.3'	08°57.8'	95	BON	0-80
			09:49					
	10:49		42°12.8'	09°04.5'	128	CTD	0-120	
		10:56						
		11:01	42°13.0'	09°04.3'	129	BON	0-110	
		11:42	42°14.6'	09°02.5'				
		14:00	Arrival Vigo harbour					
13.06.95		12:30	Departure Vigo harbour					
14.06.95	562	06:07	39°25.0'	09°40.3'	1000	CTD	0-600	
		06:28						
		07:14	39°23.9'	09°38.7'	500-1400	PT	0-300	
		563	09:05	39°28.5'	09°42.0'			
			09:53	39°35.0'	09°40.0'	ca. 1000	CTD	0-600
			10:12					
		564	10:15	39°36.0'	09°40.2'	500-1000	PT	0-295
			12:08	39°37.9'	09°33.9'			
			13:13	39°34.8'	09°24.9'	900	CTD	0-600
			13:31					
		565	14:10	39°34.8'	09°26.5'	780	PT	0-400
			16:05	39°36.5'	09°16.5'			
			18:23	39°49.8'	09°02.0'	18	CTD	0-15
			18:31					
			18:34	39°49.8'	09°02.3'	19	WS	0-15
	18:42							
	18:49		39°50.1'	09°02.3'	22	BON	0-21	
		19:05						

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)		
14.06.95	566	19:59	39°49.9'	09°13.0'	92	CTD	0-80		
		20:10							
		20:12	39°49.9'	09°13.2'	95	WS	0-80		
		20:24							
		20:28	39°50.1'	09°13.4'	95	BON	0-90		
	567	21:05							
		22:00	39°50.0'	09°25.0'	125	CTD	0-120		
		22:13							
		22:15	39°49.9'	09°25.2'	125	WS	0-120		
		22:31							
15.06.95	568	22:36	39°50.0'	09°25.4'	126	BON	0-120		
		23:23							
		00:37	39°50.0'	09°40.0'	696	CTD	0-600		
		00:53							
		00:55	39°50.0'	09°40.3'	773	WS	0-200		
	569	01:20							
		01:25	39°50.0'	09°40.5'	850	BON	0-200		
		02:25							
		03:20	39°50.7'	09°40.4'	710	PT	0-200		
		04:52	39°57.3'	09°40.8'					
		06:00	40°03.6'	09°41.2'	500	PT	0-300		
		08:35	40°10.5'	09°41.3'					
		570	09:30	40°04.7'	09°35.2'	204	CTD	0-200	
			09:44						
			09:50	40°04.7'	09°35.2'	227	BON	0-190	
	10:54								
	12:01		40°05.0'	09°25.1'	133	CTD	0-120		
	571	12:12							
		12:15	40°05.2'	09°25.3'	134	BON	0-120		
		13:02							
572	13:58	40°05.0'	09°14.7'	102	CTD	0-80			
	14:05								
	14:08	40°05.0'	09°14.8'	102	BON	0-80			
573	14:43								
	15:10	40°04.8'	09°10.2'	98	CTD	0-80			
	15:20								
574	15:25	40°04.8'	09°10.0'	95	BON	0-80			
	16:00								
	16:20	40°04.9'	09°05.1'	68	CTD	0-60			
	16:30								
575	16:33	40°05.0'	09°05.2'	68	BON	0-55			
	17:05								
	17:58	40°05.0'	08°55.4'	16	CTD	0-15			
	18:04								
576	18:09	40°05.0'	08°55.4'	16	BON	0-10			
	18:24								
	19:10	40°09.8'	09°01.1'	52	CTD	0-50			
	19:19								
	19:23	40°09.9'	09°01.3'	55	BON	0-45			
		19:42							

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)	
15.06.95	577	20:30	40°10.0'	09°11.0'	102	CTD	0-80	
		20:41						
			20:44	40°10.1'	09°11.3'	104	BON	0-95
			21:24					
	578	22:21	40°09.9'	09°23.0'	127	CTD	0-120	
16.06.95	579	22:32						
		22:36	40°10.1'	09°23.2'	127	BON	0-120	
		23:25						
			01:00	40°09.9'	09°35.9'	252	CTD	0-200
			01:15					
			01:18	40°09.9'	09°35.9'	252	BON	0-200
			02:18					
	580	03:12	40°10.0'	09°44.9'	675	CTD	0-600	
			03:28					
			03:30	40°09.9'	09°44.8'	656	BON	0-200
			04:20					
			04:40	40°13.5'	09°43.6'	668	PT	0-200
			07:00	40°20.5'	09°39.6'			
		581	07:45	40°20.1'	09°32.1'	173	CTD	0-120
			07:58					
			08:22	40°20.1'	09°32.0'	174	CTD	0-120
			08:34					
			08:35	40°20.0'	09°32.0'	174	WS	0-120
			08:57					
		09:01	40°19.8'	09°31.8'	171	BON	0-155	
		09:58						
	582	11:17	40°19.9'	09°11.3'	100	CTD	0-80	
		11:29						
		11:30	40°19.6'	09°11.5'	100	WS	0-80	
		11:42						
		11:49	40°19.3'	09°11.5'	102	BON	0-90	
		12:30						
	583	13:25	40°19.9'	09°03.0'	66	CTD	0-60	
		13:37						
		13:43	40°20.0'	09°02.9'	66	WS	0-60	
		13:52						
		13:57	40°19.9'	09°02.8'	66	BON	0-52	
		14:30						
	584	15:12	40°19.8'	08°56.0'	45	BON	0-35	
		15:35						
		15:50	40°19.9'	08°55.8'	45	CTD	0-40	
		15:56						
		15:58	40°19.9'	08°55.7'	43	WS	0-40	
		16:03						
	585	17:12	40°30.1'	08°55.8'	47	CTD	0-40	
		17:19						
		18:17	40°30.1'	08°55.9'	47	BON	0-42	
		18:41						
	586	19:22	40°30.1'	09°02.8'	70	CTD	0-60	
		19:31						

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)
16.06.95	586	19:36	40°29.8'	09°03.0'	72	BON	0-65
		20:10					
	587	20:57	40°29.9'	09°10.7'	101	CTD	0-80
		21:09					
		21:12	40°29.9'	09°10.9'	101	BON	0-95
	588	21:52					
22:38		40°30.0'	09°20.8'	130	CTD	0-120	
22:50							
17.06.95	589	22:54	40°30.1'	09°20.9'	129	BON	0-120
		23:39					
		00:36	40°30.0'	09°32.0'	1050	CTD	0-600
	590	00:55					
		00:58	40°29.7'	09°32.0'	830	BON	0-200
		01:42					
	591	02:44	40°30.1'	09°44.9'	2450	CTD	0-600
		03:00					
		03:05	40°29.9'	09°45.0'	2450	BON	0-200
		03:47					
		04:15	40°32.6'	09°42.5'	2460	PT	0-350
	592	06:48	40°38.8'	09°35.8'			
		07:07	40°39.8'	09°32.0'	2530	CTD	0-600
		07:25					
		07:28	40°39.7'	09°31.7'	2533	WS	0-200
		07:51					
		08:20	40°39.4'	09°31.2'	2543	BON	0-200
	593	08:55					
		09:51	40°40.0'	09°17.3'	160	CTD	0-120
		10:03					
		10:05	40°40.0'	09°17.2'	159	WS	0-120
10:22							
11:05		40°40.2'	09°17.1'	158	BON	0-145	
594	12:00						
	12:57	40°40.0'	09°05.0'	83	CTD	0-80	
	13:05						
	13:07	40°40.0'	09°04.8'	82	WS	0-80	
	13:20						
595	13:23	40°39.8'	09°04.5'	82	BON	0-70	
	13:56						
	14:44	40°40.0'	08°54.2'	42	CTD	0-40	
	14:53						
	14:54	40°40.0'	08°54.2'	42	WS	0-40	
	14:59						
596	15:02	40°40.0'	08°54.1'	42	BON	0-30	
	15:20						
	16:20	40°49.9'	08°49.9'	38	CTD	0-30	
	16:29						
597	16:35	40°50.0'	08°49.8'	38	BON	0-27	
	16:52						
	17:45	40°50.0'	09°09.0'	64	CTD	0-60	
		17:55					

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)
17.06.95	596	18:05	40°49.9'	09°00.0'	65	BON	0-55
		18:32					
	597	19:07	40°50.0'	09°06.9'	106	CTD	0-100
		19:19					
		19:23	40°50.0'	09°06.8'	107	BON	0-100
	598	20:08					
		21:08	40°49.8'	09°18.7'	210	CTD	0-200
		21:20					
		21:29	40°50.2'	09°19.2'	214	BON	0-190
		22:20					
18.06.95	599	23:07	40°50.8'	09°19.5'	220	PT	0-200
		01:05	40°56.9'	09°21.2'			
		02:40	40°50.6'	09°28.1'	2300	PT	0-185
	600	04:20	40°58.4'	09°31.5'			
		06:09	40°50.4'	09°27.9'	2500	BON	0-200
		07:01					
		10:47	41°10.0'	08°45.2'	27	CTD	0-600
	601	10:56					
		11:01	41°10.1'	08°45.2'	28	BON	0-20
		11:17					
	602	12:00	41°05.4'	08°50.0'	42	CTD	0-40
		12:09					
		12:09	41°05.4'	08°50.0'	42	WS	0-40
		12:15					
		12:20	41°05.6'	08°50.0'	42	BON	0-30
	603	12:40					
		13:09	41°05.0'	08°54.8'	61	CTD	0-60
		13:17					
		13:18	41°04.8'	08°54.8'	61	WS	0-60
		13:25					
		13:30	41°04.8'	08°54.9'	62	BON	0-50
	604	13:50					
		14:20	41°04.9'	08°59.9'	83	CTD	0-80
14:28							
14:30		41°04.9'	09°00.0'	82	WS	0-80	
14:36							
605	14:40	41°05.1'	09°00.0'	81	BON	0-68	
	15:14						
	15:52	41°05.0'	09°04.9'	104	CTD	0-100	
	16:00						
	16:01	41°05.0'	09°05.0'	102	WS	0-100	
	16:11						
	16:15	41°05.0'	09°05.2'	103	BON	0-86	
605	16:52						
	17:45	41°04.9'	09°14.8'	162	CTD	0-120	
	17:54						
	17:55	41°04.9'	09°15.0'	163	WS	0-120	
	18:11						
	18:15	41°05.1'	09°15.1'	163	BON	0-153	
	19:12						

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)
18.06.95	606	19:50	41°10.0'	09°21.0'	796	CTD	0-600
		20:09					
		20:13	41°10.3'	09°20.8'	900	BON	0-200
		21:23					
		22:10	41°10.3'	09°17.6'	300	PT	0-270
19.06.95		00:10	41°17.5'	09°13.4'			
	607	01:55	41°26.5'	09°12.8'	300	PT	0-140
		04:00	41°32.9'	09°13.8'			
		04:31	41°29.9'	09°16.1'	1094	CTD	0-600
		04:48					
		04:50	41°29.4'	09°16.4'	1350	WS	0-200
		05:12					
		05:20	41°30.0'	09°16.7'	1378	BON	0-200
		05:57					
	608	06:52	41°29.9'	09°06.0'	93	CTD	0-90
		07:05					
		07:06	41°29.8'	09°05.7'	93	WS	0-90
		07:18					
		07:54	41°29.2'	09°05.1'	93	BON	0-82
		08:48					
	609	09:23	41°30.0'	08°54.0'	62	CTD	0-60
		09:36					
		09:37	41°30.0'	08°53.7'	61	WS	0-60
		09:49					
		09:50	41°30.1'	08°53.7'	61	BON	0-50
		10:23					
	610	12:35	41°49.9'	08°59.2'	77	CTD	0-60
		12:45					
		12:47	41°49.8'	08°59.4'	77	WS	0-60
		12:57					
		13:00	41°49.8'	08°59.5'	79	BON	0-65
		13:23					
	611	14:12	41°49.9'	09°08.9'	116	CTD	0-110
		14:20					
		14:22	41°49.9'	09°08.8'	116	BON	0-105
		15:03					
	612	15:29	41°49.9'	09°14.0'	124	CTD	0-120
		15:39					
		15:40	41°49.7'	09°14.0'	126	WS	0-120
		15:55					
		15:57	41°49.5'	09°14.1'	116	BON	0-115
		16:31					
	613	17:11	41°50.0'	09°23.0'	779	CTD	0-600
		17:28					
		17:30	41°50.0'	09°23.4'	836	WS	0-200
		17:52					
		17:58	41°49.7'	09°23.5'	943	BON	0-200
		18:59					
	614	20:29	41°50.1'	09°44.5'	2390	CTD	0-600
		20:49					

Date	Station	Time local	Position N	W	Bottom depth (m)	Gear	Haul depth (m)		
19.06.95	614	20:54	41°50.6'	09°44.9'	2396	BON	0-200		
		21:50							
		22:20	41°53.6'	09°44.0'	2330	PT	0-320		
20.06.95	615	24:00	42°00.8'	09°43.5'					
		11:10	42°37.8'	11°33.8'	688	CTD	0-600		
		11:25							
	616	11:29	42°38.0'	11°34.1'	703	BON	0-200		
		12:22							
		12:27	42°39.1'	11°38.5'	700	CTD	0-600		
	617	12:40							
		12:42	42°39.1'	11°38.6'	732	BON	0-200		
		13:29							
	618	13:33	42°40.5'	11°41.9'	758	CTD	0-600		
		13:47							
		13:50	42°40.5'	11°41.7'	757	BON	0-200		
	21.06.95	620	14:36						
			14:42	42°42.4'	11°44.3'	762	CTD	0-600	
			14:57						
		621	15:01	42°42.6'	11°44.0'	766	BON	0-200	
			16:00						
			18:24	42°36.9'	11°40.0'	750	PT	0-430	
22.06.95	621	20:58	42°43.2'	11°44.3'					
		22:09	42°42.4'	11°41.9'	758	PT	0-490		
		00:38	42°34.8'	11°37.3'					
		02:15	42°35.7'	11°33.3'	700	PT	0-400		
		04:30	42°42.4'	11°38.1'					
		07:30	Arrival Vigo harbour						