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**I.O.S.**

RRS CHALLENGER  
CRUISE 8/86

25 NOVEMBER - 18 DECEMBER 1986

BIOLOGICAL STUDIES  
ON THE PORCUPINE ABYSSAL PLAIN  
48°50'N, 16°30'W  
AND IN THE PORCUPINE SEABIGHT  
52°00'N, 13°44'W

CRUISE REPORT NO. 196  
1987

INSTITUTE OF  
OCEANOGRAPHIC SCIENCES  
DEACON LABORATORY

NATURAL ENVIRONMENT  
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INSTITUTE OF OCEANOGRAPHIC SCIENCES

DEACON LABORATORY

CRUISE REPORT No.196

RRS CHALLENGER

Cruise 8/86

25 November - 18 December 1986

Stations 52401 - 52405

Biological studies  
on the Porcupine Abyssal Plain  
48°50'N, 16°30'W  
and in the Porcupine Seabight  
52°00'N, 13°44'W

Principal Scientist

H.S.J. Roe

1987

## DOCUMENT DATA SHEET

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ABSTRACT  The report describes <i>Challenger</i> Cruise 8/86 conducted in November/December 1986 on the Porcupine Abyssal Plain and in the Porcupine Seabight.  The objectives were:  1. To establish a station on the Porcupine Abyssal Plain (48°50'N, 16°30'W) and to sample the midwater and benthic fauna thereof.  2. To sample the existing IOS transect in the Porcupine Seabight with benthic and near bottom midwater trawls.  3. To obtain material for CASE students N. Cartwright (Foraminifera) and M. Atrill (Decapoda).  4. To obtain experimental material for trace metal analyses.		
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## CONTENTS

	Page
Itinerary	7
Scientific Personnel	7
Ship's Officers and Crew	7
Objectives	9
Narrative	9
Sampling Equipment and Instrumentation	
RMT Nets	13
Box Coring	14
Electronics and Acoustics	15
Underwater Cameras and Mechanical Instruments	16
Biological Investigations	
Midwater Biology	16
Particulate Flux in the Water Column	18
Benthic Biology	18
Necrophagous Amphipods	20
Holothurian Feeding Studies	20
Chemical Fluxes across the Sediment Water Interface	21
Foraminifera	21
Ornithology	22
Gear Abbreviations in Station List	24
Station List	25
Track Chart	28

**ITINERARY**

Depart Barry 2030h 25 November 1986

Arrive Barry 0738h 18 December 1986

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**OBJECTIVES**

1. To establish a station on the Porcupine Abyssal Plain (48°50'N, 16°30'W) and to sample the midwater and benthic fauna thereof.

This objective is a forerunner to a two year EEC Stimulation Programme between IOS, Institut für Hydrobiologie und Fischereiwissenschaft (Hamburg), University College Galway, Queen's University Belfast and the Laboratório Marítimo da Guia (Portugal). The programme starts in January 1987.

2. To sample the existing IOS transect in the Porcupine Seabight with benthic and near bottom midwater trawls.

3. To obtain material for CASE students N. Cartwright (Foraminifera) and M. Atrill (Decapoda).

4. To obtain experimental material for trace metal analyses.

**NARRATIVE (Fig. 1)**

Challenger sailed from Barry at 2030h on the 25 November after an overnight delay due to bad weather and a further delay due to the ship's cook being injured whilst storing. A short meeting was held on the 26 November to outline the proposed programme, the PES fish was deployed at 1500h the following afternoon and PES watches started thereafter.

The first station on the Goban Spur was reached at 0858h on the 28 November. The multiple corer was deployed in a heavy swell together with a Bathysnap release for testing. During the deployment the bow prop failed; the corer failed to sample due to a faulty collar locating mechanism but the release gear worked. We proceeded into slightly deeper water where Bathysnap was deployed for subsequent recovery in August next year, a successful multiple core was taken - which included the foraminiferan Pelosina and the first Box core attempted. The Box Corer apparently operated but no sample was taken - the first of several failures.

Challenger then proceeded to the EEC site (48°50'N, 16°30'W) where we arrived in good weather at 1606h 29 November. En route to the site the main warp was streamed to tension the distal 6900m subsequent to the resplicing at Barry. The RMT 1+8M and sediment traps were prepared for launching and on arrival at the EEC site two Bathysnap releases were tested to 4000m. One release worked but the second failed to turn on. A second trial of two more releases followed - neither worked. The first RMT 1+8M was launched at 0300h on the 30 November after delays caused by an inoperative monitor. The net apparently operated, albeit the open/closing operation was sluggish. On recovery however, it was found that the opening bridles of the second RMT 8 had caught around the top bar - resulting in 3 good RMT 1 catches but only a single oblique RMT 8 sample.

The sediment trap array was successfully deployed at 1335h on the 30th; one trap was 100m above the bottom, the second 400m above the bottom. A second midwater trawl was launched and recovered due to monitor failure; a further attempt followed but the monitor again failed resulting in a single RMT 1 and a single RMT 8 catch only. Both monitors were wire tested during the night of the 30/1December but neither could be made to work. A second box core was attempted but this too failed and it was found that the pulley wheels were jamming and preventing the spade from seating correctly. This was rectified by some judicious welding.

In deteriorating weather, and in the absence of other functional gear, it was decided to go for a respiration hang with a multiple corer. The first deployment was apparently successful, oxygen and sediment samples were taken. The second deployment started at 1410h but had to be terminated after 8½ hours because of increasing wind and swell. Challenger hove to in winds of up to 45 knots until the weather moderated early in the morning of December 3.

The otter trawl was deployed at 1318h on December 3 in winds of ca. 15-20 knots and a big swell. During fishing the net snagged the bottom three times in quick succession, strains of up to 6.5 tons being recorded. On hauling the net to the surface the ground line was seen to have parted; the net contained a large rectangular object with a total load of ca. 1½ tons. Whilst lifting this on board the cod end tore off and the contents of the net lost. The benthic sledge was launched at 0339 on the 4 December and successfully fished. The



of acoustic records. Hauling commenced and it was found that the splice made prior to sailing (at 6800m) had sprung, and that the warp had parted at 2149m. Since only 4651m of wire were now available distal to the splice, any further work at the EEC position (depth 4800m) was impossible. Course was therefore set for the top of the Porcupine Seabight where a transect downslope was planned.

Challenger hove to at 2243h on 11 December in 50+ knot winds with a forecast of hurricane force winds to the NE. Bad weather continued throughout the 12th but we resumed course at 0845h on the 13 December. We arrived on station at 2250h on the 13th and successfully fished a near bottom RMT1+8M followed by a bottom sledge. Two box cores followed during the morning of the 14 December but neither were successful.

The weather again intervened; we stopped work at 1313h on the 14 December and although the wind was down to ca. 20 knots by the following morning the swell was too large to allow fishing. The wind then increased again, gusting in excess of 50 knots and Challenger remained hove to until 0825h on the 16 December when I decided to terminate the cruise because of the present weather conditions and future forecast.

Challenger arrived at Barry at 0738h on 18 December; the wind in the Porcupine Seabight remained between force 8-10 throughout our passage home and there would have been no possibility of working had we stayed in the area until our scheduled departure on the 19th.

Clearly Challenger cruise 8/86 was not a total success. Neither was it a total disaster however. On the minus side the weather was terrible, especially during the latter half of the cruise. We experienced gale force 11, force 9 was commonplace and latterly a big swell further reduced our opportunities. Hurricane force winds were blowing to the north and east of our position and record low pressures for the NE Atlantic were recorded during the cruise. In total we worked for 212 hours but lost 286 hours due to bad weather (including lost time at the beginning and end of the cruise). We had some problems with the main winch and lost a substantial amount of equipment. The failure of some of our equipment was very disappointing, particularly the sediment traps, and there are clearly problems to be solved in the rigging and handling of our

weather deteriorated during the sledge haul and the gear was recovered in 40-45 knot winds and heavy seas. Challenger hove to and the weather had moderated sufficiently by the evening to prepare a further otter trawl. This was launched at 2212h and resulted in a successful catch of holothurians, decapods, a large angler fish (Gigantactis?) and considerable quantities of clinker.

A successful sledge haul and multiple core dip followed but the weather again deteriorated. Challenger hove to at 0230 on the 6 December and the weather remained bad (40-45+ knot winds and heavy swell) throughout the day. By the afternoon of the 7 December conditions had improved. The net monitors were working again and a near bottom RMT 1+8M was launched. Difficulty was experienced in paying out the winch sufficiently slowly and the acoustic reception was poor - due to the sea state and lack of beam steering. The net was recovered at 2353h when it was found that the nets had tangled up around the bars, resulting in the loss of two RMT8s and two RMT1s.

A successful release test and STD dip followed and a new RMT 1+8M system constructed during the morning of the 8 December. The amphipod trap was deployed in mid afternoon in good weather and a further RMT 1+8M haul attempted. This too resulted in nets and bridles tangling and the poor acoustic reception led to the nets lying on the bottom for ca. 20 minutes. (As a bonus this resulted in a good catch of the elusive holothurian Kolga hyalina!).

The amphipod trap (containing several hundred necrophagous amphipods) was successfully recovered on the morning of the 9th, and the sediment trap array deployed on 30 November was also recovered. Unfortunately the alignment of the sediment chambers was adrift and consequently the data were meaningless. Subsequent inspection of these, and the two other sediment traps, revealed faults which could not be repaired on board and further sediment trap deployments were abandoned. The box corer again failed to sample and the weather again turned foul until the evening of the 10 December, when a sledge haul was made across the putative Kolga patch. A successful small catch resulted - needless to say without any Kolga.

A third otter trawl was shot at 0210 on the 11 December. Shortly after the net reached bottom a sudden strain of ca. 8 tons was recorded, followed by loss

the sea bed, making a series of repeated hauls with the RMT 1+8M equipped with the near bottom echo sounder. Apart from the EEC site it was also planned to carry out near-bottom tows on the continental slope with the specific objective of trying to locate larval/juvenile macrourid fish.

In the event none of the objectives were fulfilled. At the start of fishing at the EEC position monitor problems (plus net tangling) dogged the total water column sampling. Four plankton samples were successfully taken between 0-1620m, but only a single successful RMT 8 haul was obtained (1150-1620m). The catches comprised mostly Euchaeta spp., Periphylla, Atolla, Eucopia, Acanthephyra, Ephyrina, Benthoosema and Argyropelecus; they were typical for the depth and area. Large numbers of the amphipod Parathemisto gaudichaudi were frozen for future trace metal analysis. The RMT 1 catches were subsampled and half the catches frozen for future biomass determinations.

After the monitors had been repaired, two near-bottom tows were attempted at the EEC site. On both occasions acoustic reception was very poor - due to the sea state and absence of beam steering and on one haul (52403#21-23) the RMT 1+8M was briefly placed on the bottom, this resulted in a good catch of the holothurian Kolga. The NBES worked successfully but unfortunately the nets tangled around the net bars and no midwater samples were taken.

Deteriorating weather precluded any further midwater sampling at the EEC site. A near-bottom haul was made at the top of the continental slope in a depth of 470m. The nets operated successfully and the catch consisted mainly of euphausiids; however, a release gear strop broke during the haul so that RMT 8 catches one and two were not quantitative. This was the last midwater trawl since bad weather caused the cruise to be terminated early.

The midwater programme was clearly unsuccessful - due partly to the weather and partly to gear failure. The RMT system had to be modified for this cruise because it was necessary to collapse the nets to deploy and recover them from Challenger. The modifications were successful from the point of view of deck handling, but unfortunately they had knock on effects so that the nets were free to ride up and the bridles tangle around an unprotected top bar. The bad weather and consequent reduction in available time meant that corrective

measures on board were minimal, but clearly the RMT system should be rebuilt prior to any future Challenger cruises.

H.S.J. Roe

### **Particulate flux in the water column**

The intention was to deploy two moorings of time series sediment traps during the cruise, one at the EEC site and the other at the mouth of the Porcupine Seabight. These were to be at altitudes of 100 and 400m to sample the sinking material at one month intervals for a period of nine months. The material was to be preserved in 10% formalin in a high density brine filtered through a 0.45µm filter. A bathysnap module was to be part of one of the moorings to determine the visual effects of a known rate of deposition of detritus.

One mooring was deployed on reaching the EEC site for a short trial period to confirm the satisfactory operation of the traps. Unfortunately neither of the traps worked properly and the remaining two traps were also found to be faulty. The programme was therefore abandoned, a particularly distressing outcome in view of the importance of this work to the IOS biology and chemistry departments and to the U.K. BOFS programme.

R.S. Lampitt

### **Benthic Biology**

Bad weather curtailed the benthic sampling programme to such a degree that only four BN1.5/3M and three OTSB14 hauls were achieved. With the exception of a sledge deployment at 450m, all hauls were made at the EEC station (52403) centred on 48°50'N, 16°30'W, depth about 4840m. The sledge suffered some minor damage on haul #12; the trawl was torn in two and the cod end lost on haul #11; and on haul #26 the trawl came fast and was lost together with 2150m of main warp. Both sledge and trawl were rigged and fished as on previous cruises.

Although there were minor differences, the four deep catches obtained (#12, #13, #14, #25) were remarkably consistent in their contents. The dominant

megafaunal entity was the holothurian Oneirophanta mutabilis, of which over 200 were taken in the one successful trawl haul (#13). Other invertebrate organisms taken, mostly in small numbers, were several actinarians (including Sicyonis), zoanthideans on hexactinellid stalks, an impressive Umbellula, echiurids, annelids, typical abyssal plain decapods (Plesiopenaeus armatus, Glyphocrangon atlanticus, Munidopsis parfaiti, M. crassa, eryonids), gastropods, asteroids (Styrachaster, Dytaster, Freyella) and holothurians (Deima validum, Pseudostichopus atlanticus, Mesothuria candelabri, Psychropotes longicauda, Peniagone diaphana and Molpadia blakei). Preparations of the tentacles and dermis of the holothurians were fixed in osmium tetroxide and glutaraldehyde for electron microscope work. The ophiuroid Ophiocten hastatum was abundant in sledge catches. Fish catches were small and fairly mundane, confirming previous experience in this area at this depth. However, a large ceratioid angler (?Gigantactis) in #13 and two small almost pigmentless aphyonids (#14) were of note. Large quantities of clinker were taken in all nets, with a maximum of 78kg in the trawl (#13).

The RMT 1+8M system was laid on the bottom inadvertently at Stn 52403#21-#23. A significant part of the catch consisted of the elusive holothurian Kolga hyalina. This catch is particularly remarkable in that about 200 specimens were obtained despite short bottom contact. An attempt to sample this population with the sledge was unsuccessful.

The single sledge catch from 450m (Stn. 52404#4) contained a few pennatulids, ophiuroids, the holothurian Stichopus tremulus, and a few fish, but was dominated by crustaceans. The single most abundant species was Munida sarsi, a squat lobster, represented by over 400 specimens. This catch is very significant as it is the second largest in the IOS collections and the first to be taken in December. It fills an important gap in available seasonal coverage and adds substantially to the material available for a study of the biology of the species, and an investigation into the rhizocephalan parasites associated with it. Two rhizocephalans, Triangulus munidae and Tortugaster boschinai were found in this sample. Also of significance in this sample were about 30 specimens of Geryon tridens, including males, females and juveniles, as a study of this species is about to be initiated. Natantians taken included Dichelopandalus bonnierii and Pontophilus sp. Two Nephrops norvegicus, two small

Nephropsis atlanticus and a couple of large Pagurus variabilis were caught together with a few specimens of Goneplax rhomboides and Monodaeus couchi.

M.J. Atrill, D.S.M. Billett, N.R. Merrett, A.L. Rice, M.H. Thurston

### **Necrophagous amphipods**

Rough weather prevented all but one of the proposed amphipod trap deployments. The rig used was the stripped-down mark and recapture system incorporating only trap 2 and a standard IOS release. About 250g of Nematonurus armatus flesh was used as bait.

The deployment (52403#20) was made about 30km NNE of similar deployments on cruise 522 but at the same depth (c. 4850m). The rig was on the bottom for nearly 17 hours and took an estimated 500 specimens. No microscopical analysis has been possible as yet, but Eurythenes gryllus, Paralicella and Orchomene are known to be present. In terms of biomass E. gryllus is the dominant organism, while small Paralicella are the most abundant. The high number of small Paralicella relative to adults is of interest in that it contrasts with the situation found in June 1985, and may be indicative of seasonality of breeding.

M.H. Thurston

### **Holothurian feeding studies**

As part of a study on the feeding rate and general behaviour of the holothurian Benthogone rosea, a Bathysnap module was deployed at 1600m on the Goban Spur, an area in which the species is abundant. Photographs will be taken every 4 hours until September 1987 when it is hoped the module will be recovered. No current meter was available so a current vane was placed in the field of view.

R.S. Lampitt

### Chemical fluxes across the sediment water interface

At the 2000m site in the centre of the Porcupine Seabight, spring, summer and autumn measurements of chemical fluxes have been made using the hanging core technique with the multiple corer. These have been primarily in terms of oxygen to give a measure of community metabolism but also in terms of nitrate, silicate, phosphate and dissolved organic carbon. It was hoped to repeat the measurements at 2000m to give a winter value and to make measurements at the EEC site for comparison with slope values. Several deployments were made with the multiple corer at the EEC site but the cores sank further into the seabed than expected due to the softness of the sediment and there was therefore only sufficient overlying water for O<sub>2</sub> determination. Furthermore the incubation had to be terminated prematurely due to deteriorating weather. Satisfactory values of ambient concentrations were not obtained for the same reason and no information was thus obtained. Due to the weather no incubation was attempted at the 2000m site.

R.S. Lampitt

### Foraminifera

Specimens of the genus Pelosina were collected at a bathymetric depth of 1400m on the Goban Spur, using the multiple corer. These were fixed for Transmission Electron Microscopy.

A number of cores had colloidal gold injected into the overlying water before the specimens were fixed, to investigate the potential of Pelosina as suspension feeders.

Further efforts to obtain samples using a box core at this station and at 800m in the Porcupine Seabight, failed.

N.G. Cartwright

## Ornithology

As on previous cruises, standard ten-minute observations were made throughout the cruise as and when other duties permitted. In addition, casual sightings were noted where appropriate.

The ship was beyond the continental shelf for 19 days (28 November - 16 December inclusive). During this period 106 standard observations were made, and 11 species of seabird were identified.

The cruise falls naturally into five sections: passage out, the EEC station centred on 48°50'N, 16°30'W, passage back to the Porcupine Seabight, the Seabight, and passage home. During the outward passage eight species were seen of which only kittiwakes (Rissa tridactyla) were common. Kittiwake numbers showed a marked decline as the ship crossed the 1500m line on the Goban Spur. The EEC station was occupied for 12½ days (29 November - 11 December). During this period only kittiwakes were at all regular in occurrence (present at 42 out of 68 observations: 62%), and then never in large numbers (< 40). Fulmars (Fulmarus glacialis) were seen in very small numbers (<4) at 18% of observations. During passage from the EEC station to the Seabight (12-13 December) only kittiwakes were seen at regular observations. Numbers showed a marked increase as the ship steamed up over the tail of the Porcupine Bank. Three days were spent in the Seabight (14-16 December), mostly over depths of 1000m or less. Kittiwakes were the most regular and abundant species once again, and fulmars were seen during most observations although rarely more than 10 at a time. Passage home was unexceptional.

Kittiwakes are attracted to ships. Throughout the period at the EEC station, on all days when more than 2-3 individuals were seen, maximum numbers occurred in the afternoon, and usually at the observation immediately before sunset. There was also a trend for the mean number seen per observation to increase from initial to final occupancy of the area. In the Seabight, when the ship was hove to in bad weather, kittiwakes remained close alongside during the night. They sat on the water in the area illuminated by the working lights and stayed there,



flying only if they drifted astern. Throughout the cruise juvenile kittiwakes were rather uncommon, forming at most 10% of the population.

Most birds seen were those species to be expected for the time and place, although a single sooty shearwater (Puffinus griseus) seen on 5 December was later than usual. The major surprise of the cruise occurred on 5 December, when an adult Yellow-nosed albatross (Diomedea chlororhynchus) of the nominate subspecies was watched for ten minutes at ranges of as little as 50m at a position of 49°08'N 16°08'W. Identifying characters were the grey head, underwing pattern and dark bill with yellow culminicorn.

Three British storm petrels (Hydrobates pelagicus) found on board were ringed prior to release.

A few land birds were seen on or around the ship on 28-29 November.

M.H. Thurston

## GEAR ABBREVIATIONS IN STATION LIST

MC	Multiple Corer
B/SNAP	Bathysnap
BC	USNEL Box Corer
RMT 1+8M	Multiple Rectangular Midwater Trawl with three pairs of (nominally) 1m <sup>2</sup> mouth area nets (RMT 1) and 8m <sup>2</sup> mouth area nets (RMT 8).
NBES	Near Bottom Echo Sounder
TST	Time Series Sediment Trap
OTSB14	Semi-balloon otter trawl
BN1.5/3M	Bottom sledge with three nets
STD	Salinity Temperature Depth Probe
Amph. T.	Amphipod Trap

STATION NO	DATE	LAT. (N)	LONG (W)	GEAR	DEPTH (m)	FISHING TIME (GMT)	REMARKS
	1986						
52401	28.11	49°35.1'	12°02.7'	MC	1167	0914-0915	Corer failed. B/snap release worked.
52402#1	28.11	49°28.1'	12°55.9'	MC	1480	1530-1532	
52402#2	28.11	48°30.2'	12°58.8'	B/Snap	1526	2013-	No current meter. Recovery Aug. '87.
52402#3	28.11	49°30.4'	12°59.2'	BC	1534	2040-2041	No sample.
52403#1	30.11	48°47.4'	16°31.4'	RMT1M/1	0-400	0318-0518	Flow distance 6920m
		48°44.1'	16°32.8'	RMT8M/1	0-1200-0	0318-1006	RMT8 1 caught up.
52403#2	30.11	48°44.1'	16°32.8'	RMT1M/2	400-800	0518-0718	Flow distance 7730m
		48°40.1'	16°34.5'	RMT8M/2			No RMT8 sample.
52403#3	30.11	48°40.1'	16°34.5'	RMT1M/3	760-1200	0718-0920	Flow distance 7503m
		48°35.6'	16°35.6'	RMT8M/3			No RMT8 sample.
52403#4	30.11	48°56.5'	15°56.9'	TST	4839	1432(30.11)- 1528(9.12)	Traps misaligned, no samples
52403#5	30.11	48°35.8'	16°37.3'	RMT1M/1	1150-1620	1529-1735	Flow distance 7635m.
		48°33.1'	16°41.1'	RMT8M/1			
52403#6	30.11	48°33.1'	16°41.4'	RMT1M/2	2080-0	1735-2150	Nets did not close.
		48°27.2'	16°49.1'	RMT8M/2			
52403#7	30.11			RMT1M/3			Nets did not open.
				RMT8M/3			
52403#8	1.12	48°49.3'	16°29.9'	BC	4844	0333-0334	No sample.
52403#9	1.12	48°54.0'	16°29.0'	MC	4844	1014-1016	
52403#10	1.12	48°57.1'	16°26.1'	MC	4844	1410-2300	Respiration hang. 10 cores only.
52403#11	3.12	48°29.6'	16°52.4'	OTSB14	4840-4790	1318-1705	Distance run 1663m. Net torn, no sample.
		48°21.3'	16°47.4'				

52403#12	4.12	48°56.6'	15°45.4'	BN1.5/3M	4850-4860	0640-0807	Distance run 2095m odometer 4410m calculated
52403#13	5.12	48°58.0'	15°42.5'	OTSB14	4805-4810	0236-0515	Distance run 1500m? No monitor traces.
52403#14	5.12	49°02.4'	16°00.3'	BN1.5/3M	4850-4860	0640-0807	Distance run 4860m? Odometer faulty.
52403#15	5.12	49°04.3'	16°03.2'	MC	4846	2333	10 cores only.
52403#16	7.12	48°57.2'	16°16.7'	RMT1M/1 RMT8M/1 NBES			Nets tangled; no samples.
52403#17	7.12			RMT1M/2 RMT8M/2 NBES			Nets tangled; no samples.
52403#18	7.12			RMT1M/3 RMT8M/3 NBES			Nets tangled; no samples.
52403#19	8.12	48°56.8'	16°34.9'	STD	0-4000	0024-0320	Successful release test.
52403#20	8.12	48°55.0'	16°38.1'	Amph. T	4850	1545(8)-0829(9)	
52403#21	8.12	49°10.9'	16°16.7'	RMT1M/1 RMT8M/1 NBES			Nets tangled; no samples.
52403#22	8.12	49°15.2'	16°34.9'	RMT1M/2 RMT8M/2 NBES			Nets tangled; no samples.



