I.O.S.

RRS CHALLENGER
CRUISE 17/80
(IOS Cruise 509)

4 NOVEMBER 1980 - 16 NOVEMBER 1980

BENTHIC BIOLOGY OF THE PORCUPINE SEABIGHT

CRUISE REPORT NO. 107
1980

INSTITUTE OF
OCEANOGRAPHIC
SCIENCES

NATURAL ENVIRONMENT RESEARCH COUNCIL

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RRS CHALLENGER

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Benthic biology of the Porcupine Sea-Bight.

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Institute of Oceanographic Sciences,
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ITINERARY

Depart Barry 1400hGMT 4 November 1980
Arrive Barry 1000hGMT 16 November 1980

OBJECTIVES

1. To obtain benthic samples with the I.O.S. epibenthic sledge and semi-balloon otter trawl at a variety of depths in the Porcupine Sea-Bight.

2. To obtain quantitative samples of the megabenthos at approximately 500m depth intervals from about 500m to 4000m.

3. To obtain near-bottom amphipod samples using a pop-up trap system.

4. To test a deployed pop-up camera system (Bathysnap) designed to obtain a sequence of photographs of the same portion of the sea-bed over a period of hours or days, and at the same time to obtain a sediment sample and near-bottom current data.

NARRATIVE

Challenger was originally scheduled to sail from Barry at 0700/4 November but, owing to a National Seaman's Union Strike on the previous day, she could not be loaded until the morning of 4th and sailing was accordingly delayed until 1400/4. Even then the ship sailed short of one greaser and had to anchor in Barry Roads to await a replacement. We finally left for the Porcupine Sea-Bight at 1800/4.

The passage to the Sea-Bight was made in freshening easterly winds and by the time the first station was reached at 0530/6 the wind had reached force 8 and a considerable swell was running. The available bathymetric chart suggests that this location (50901), at a depth of about 2200m on the eastern side of the Sea-Bight is crossed by a small canyon which we hoped to sample with the otter-trawl for comparison with catches made at similar depths in non-canyon areas. However, a short echo-sounding survey revealed no obvious canyon and the trawl was accordingly shot at 0800/6 and fished downwind. Although 6000m of wire were paid out the net failed to fish effectively, for on retrieval at

1245/6 it contained no benthic organisms. This failure was attributed to excessive ship's speed in the following wind and sea. The ship therefore proceeded to the second station in the hope that conditions would have improved by the time we arrived. During the passage tilt switches were added to the telemetering system and these greatly increased the information available about the behaviour of the net during the hauls (see gear report).

The second station, in 2000m at about 51°N: 13°W, was to have been the first and deepest of a series of stations running up to about 500m in the northwestern part of the Sea-Bight at which various combinations of the otter trawl, epibenthic sledge, amphipod trap and Bathysnap were to have been used. In the event, bad weather prevented all but the otter-trawl sampling in this part of the cruise programme, for during the afternoon of the 6th the sea state deteriorated and by the time we reached the proposed station the forecast was for winds of force 7-8, locally 9. We therefore proceeded to the first otter-trawl station of the series, in a depth of about 1800m, and hove to overnight. By mid-morning on 7th the N.E. wind had decreased to 25-30kts and by 0830/8 successful hauls with the trawl, all downwind, had been obtained at this station (50902), at 1250m (50903) and at 1000m (50904). Moreover, wire tests of the release gears for the amphipod trap and Bathysnap had been completed at the latter two stations.

During these hauls the vessel had experienced considerable slamming under the stern from the following seas and, in order to avoid this, the next haul, at a depth of 750m (50905), was made head to wind into an increasing swell. Possibly as a result of this, the catch was very small and all subsequent trawl hauls were therefore made downwind.

By the time the 750m station had been completed at about 1630/8 the weather had once more deteriorated and the swell was too high for further trawling in the immediate future. The more northerly shallower proposed station was therefore abandoned and the ship moved south, towards a proposed 2600m station in the centre of the Sea-Bight in the hope of an improvement in conditions which would permit the other gears to be used.

Challenger reached this station (50906) at 0330/9 but, although a slight moderation in the weather was forecast, a heavy swell was still running and the ship hove to until daybreak. At 0930/9 the trawl was shot in 2600m and retrieved

with a good catch at 1500/9. Conditions were still unsuitable for the epibenthic sledge and Challenger therefore moved south towards a proposed 3200m station (50907) within an apparent canyon. After an echosounding survey the trawl was shot at 0000/10 downwind and downslope, the intention being to obtain a sample at 3100-3300. In fact, the trawl grounded at about 2850m, left the bottom at a depth of 3100m and was all in with a good catch by 0530/10.

Challenger now steamed west to a 4000m station, arriving at c. 0900/10. Although the wind had decreased to about 20 kts during the night the swell was still too high for shooting the epibenthic sledge and Bathysnap was launched instead. On the first attempt the pyros fired prematurely when the pinger was jarred against the ship's stern as she heaved, but after re-rigging the system and lengthening the strop between the frame and the buoyancy package (see gear report) the rig was successfully launched at 1200/10 (50908) and a good fix on the system after it had reached the bottom in 3945m was obtained by 1300/10. The amphipod trap was now rigged, successfully launched and fixed on the bottom in 3905m by 1607/10 (50909).

During these launches the wind had again freshened to 25-30 kts and raised the sea beyond the limits for the epibenthic sledge. Accordingly, we steamed SW to a proposed trawling station (50910) at about 4200m which was successfully completed by 0230/11.

Challenger now returned to the amphipod trap position, making only about 5 kts into the wind and sea, arriving within one mile of the trap by 1030/11. After a search of only 45 minutes the trap was released successfully and taken inboard by 1240/11.

The ship now returned to the Bathysnap position and again after only a very short search the gear was released at 1341/11. As it neared the surface at 1515/11 the pinger signal was lost and a visual search was begun. In fairly heavy swell we were fortunate in sighting the buoyancy at 1610/11 and after one unsuccessful pass, and some difficulty because the stray-line was fouled, the gear was grappled on the starboard side by 1650/11 and made fast to the ancillary winch wire. As the rig moved aft towards the starboard quarter it became fouled in the Kort nozzle assembly and was lost at 1720/11 during the attempt to free it.

Challenger steamed NE to a 3000m station and the amphipod trap was successfully launched at 2155/11 and fixed on the bottom at a depth of 2850m by 2230/11 (50911).

The trawl was now shot in a depth of 2750m on a southerly course approximately parallel to the expected isobaths and with the wind on the port quarter. The net reached the bottom at 0050/12 with 8500m wire out and was fished until 0208 but on hauling it was found to be fast and a load of 7.5 tons was registered on the strain gauge. Hauling was stopped, way taken off the ship and hauling slowly recommenced. At 0231, with a registered tension of 5.5 tons the warp parted at the splice between the 13mm and 16mm sections reached the main sheave on the A-frame losing the gear and 7692m of wire, the entire 13mm section (see gear report).

The position of the trawl was accurately fixed and the ship returned to the amphipod trap position. The trap was readily located and released at 0801/12 and sighted on the surface at 0910. At 0920, before it could be grappled, the pinger trace on the Mufax revealed that the traps had parted company from the buoyancy which alone was retrieved at 0945/12.

Having lost three major pieces of gear within the space of 16 hours we were running out of things to throw over the wall. Fortunately, however, the wind and sea-state had by now moderated considerably and after fixing the amphipod trap position two epibenthic sledge hauls were successfully completed by 0300/13, one at about 3000m (50913) and one at about 2800m (50914).

The ship now proceeded to what was to be the final station of the cruise at a depth of 2500m in the centre of the Sea-Bight and a successful epibenthic sledge haul was completed at 1000/13 (50915), the wind having by now veered to the south-west.

Challenger moved north to a proposed 2000m station in freshening winds, arriving at the desired position at 1400/13. With the ship hove to the weather worsened throughout the day until by 2300/13 the wind speed was up to 40 kts and a very heavy swell was running. After a most uncomfortable night hove to the ship moved eastward to a 2000m position in the east of the Sea-Bight. By 1500/14 it was clear that we would be unable to fish in the

immediate future and with a forecast of winds of force 8-9, occasionally 10, it was decided to curtail the cruise by one day. Challenger accordingly proceeded to Barry where she docked at 1000/16.

SHIP'S INSTRUMENTS

Reliable operation of the P.E.S. Mark III facsimile recorder was essential for every aspect of the science conducted on this cruise. As usual it ran continuously throughout the cruise without problem. Similarly the P.E.S. fish performed its task well. Some cable fairing clips required replacement, the top section of fairing can probably be dispensed with, and the recorder helix blade is now quite notched by the depth scales and should be replaced. The practice of disconnecting one of the fish elements for use with the Acoustic Command System is almost a permanent feature of the P.E.S. system; running the P.E.S. system on only 8 elements does not worry the systems output amplifier, and to depths of 5000m does not affect system sensitivity.

The trawl winch monitors performed without problem and the hydrographic winch was used twice to 1000m without problem.

The satellite navigator performed well and has considerably simplified mooring and station relocation. However the absence of the athwartships component from its E.M. log signals restricted the accuracy of dead reckoning positions between fixes; periods which sometimes exceeded 4 hours.

Greg Phillips

SEMI-BALLOON OTTER TRAWL (OTSB 14)

Seven successful tows were made with the OTSB 14 over the sounding range 755-4320m. All were accomplished under moderately heavy sea conditions in winds of force 6-8. The standard trawl rig was maintained and the telemetering beacon was mounted horizontally behind one of the 'V' doors, as on the previous cruise. A warp scope of 3 times the depth was used in all hauls. On the first station, however, this proved to be insufficient to make the bottom, despite telemetered information on the approach of the net to the bottom and in situ temperatures suggesting that the gear was fishing

properly. This failure was attributed to the affect of high following winds and sea on the speed of the ship.

Such an experience prompted modification of the beacon to incorporate two tilt switches, with the intention of indicating a change in attitude of the trawl door as it grounded and towed along the sea-bed. It was a most successful addition. The telemetered information showed that the axis of the transducer on the beacon, set at right angles to the vertical axis of the door, lay between 40°-70° to the vertical as the net descended through the water column. A change in signal on bottom contact indicated that the axis of the transducer then tilted forward to between 90°-110° to the vertical, as the door canted forward with the pressure of the ground against the foot. The signal reverted to the original mode as the door lost contact with the bottom on hauling, to give an accurate indication of the duration of bottom contact on the trace of the shipboard precision echo sounder.

Disaster befell the final tow of the OTSB 14, the 100th operation of this gear and the 59th from RRS Challenger, in soundings of around 3000m. The net successfully made the bottom and fished for just over 1 hour. On hauling, however, it came fast, the first occasion this has happened. Way was taken off the ship and slow hauling commenced to bring the ship back towards the gear. Strong winds and following seas hampered this procedure and, at a load of 5.5 tons registering on the dynamometer, the wire parted as the spliced junction of the 16mm and 13mm sections bent over the sheave on the 'A' frame. Thus, 7667m of main warp and the entire trawl gear were lost.

One positive outcome of the accident was that, by the subsequent exact location of the trawl from the continuing beacon signal, the net was found to have been towing 4.2 nautical miles astern of the ship. This is consistent with the calculated distance from trigonometry, assuming the warp forms an essentially straight line to the net and in length was 3 times the sounding of c. 3000m.

N.R. Merrett

EPIBENTHIC SLEDGE

The epibenthic sledge was basically as used on Challenger cruise 9/79

(I.O.S. cruise 506, Cruise Report 89). However, for the hauls intended to estimate the megafaunal biomass (50914 and 50915) the two coarse and one fine mesh nets were replaced by a single net with a 4.5mm mesh throughout.

A.L. Rice

AMPHIPOD TRAPS

An experimental system of traps to obtain necrophagous benthic Amphipoda was used twice. The rig consisted of two rosettes, each holding six 2ℓ bottles, with funnels in place of lids. The rosettes were separated by an 8m wire strop and were set so that the lower was 2m above the bottom and the upper 10m. Ballast (100 kg) was jettisoned using a standard IOS release system, and buoyancy supplied by 3 17" Corning spheres. Traps were baited with fish obtained from OTSB 14 catches.

The first drop was made in 3900m of water and remained on the bottom for 19 hours. Descent and ascent speeds of 1.3 and 1.1 m/s were achieved. Launching and recovery posed no problems, despite less than favourable weather and sea conditions. About 150 specimens were obtained, all except 2 in the lower rosette. Eurythenes gryllus was the dominant species, but at least 2 other species were present. Differential rotating forces during descent and ascent or while on the bottom resulted in the strop between the rosettes partially unlaying. This was replaced, and two swivels were incorporated, one between the rosettes and one between the upper rosette and the buoyancy.

The second drop was made in 2850m. All proceeded smoothly until after the rig had been brought to the surface. Just prior to the lazy line being picked up, the Mufax record showed the pinger to be moving away from the ship. On recovery, the top eyebolt on the upper rosette was found to be unscrewed. This resulted in the loss of both rosettes and the release.

M.H. Thurston

BATHYSNAP

"Bathysnap" is an entirely new item of gear and was principally designed to photograph an area of sea bed over a period of days. It also carries an

Aanderaa current meter, a sediment corer and a compass. Based on the IOS tide gauge, it is a free fall device which rises to the surface after an acoustic signal which releases ballast via a pyro-release mechanism.

The position and angles of the camera and flash units relative to the sea bed and to each other were the same as currently used on the epibenthic sledge and the area to be photographed was therefore $2m^2$ (camera lens 79cm high and 30° tilt down, flash 56 cm high). The sediment corer was designed to take a 6cm diameter core of 10 cm length. The lower end was fitted with a "finger type" core catcher whilst the top of the tube had a cap which was held closed by a spring after the dissolution of a soluble link. The compass consists of a pivoted magnet within a tube. After a soluble link has dissolved a spring forces a piston up the tube and the magnet is clamped to give a reading of the orientation and tilt of the structure.

On launching, the structure weighed 41 kg in water and it descended at 1.10 m/sec. After release of ballast, it had a net buoyancy of 14 kg and it ascended at 0.52m/sec. Two springs gave an extra lift of 18 kg over the first 10cm to assist in extracting the corer.

The operation and ultimate loss of Bathysnap are described in the narrative but no major changes in design are anticipated when a new one is constructed.

R.S. Lampitt

ACOUSTIC CONTROL AND MONITORING

Shipborne systems

Much monitoring, in particular mooring location can be carried out using the P.E.S. fish transducers; shallow angle long range towed systems however normally exceed P.E.S. fish capabilities. For this purpose a lightweight towed body (dolphin) containing a P.E.S. type transducer inclined such that its peak sensitivity is at 300 degrees to the horizontal behind the ship was deployed to monitor all net tows. The dolphin is matched into the auxillary input of the P.E.S recorder by a dedicated amplifier with a set of attenuation ranges comparable to that of the P.E.S. The P.E.S. may be operated normally

at the same time as the dolphin system but at the low signal levels present at extreme ranges (8 to 12 Km) some electrical interference does occur and if possible the P.E.S. gain should be turned down.

Mooring location and release was carried out using the prototype Deck Control System Mark IV interfacing the P.E.S. fish single element and the P.E.S. recorder. During the search for Bathysnap sudden loss of beacon signal could possibly have been explained by propagation problems so a dolphin fitted with a wide angle, ceramic ring transducer was deployed.

Benthic Sledge Monitor

J19 was used on all three tows. On the first tow the odometer wheel did not work; this was checked on recovery and found to be electronically alright and so was changed for the other unit with modified tread; this worked well on the other two hauls. The inclinometer was left on between tows two and three and by the end of tow three the batteries had deteriorated enough to affect the display. This did not affect the other traces, the net being fished normally.

Bathysnap

Command release 2300 was used on this mooring. It was successfully wire tested to 1000m and then deployed in 3945 metres. The descent was monitored and after touch down acoustically accurately located. The following day it was acoustically relocated and successfully released. During deployment of this experimental rig a handling problem occurred which resulted in the rig swinging in hard towards the ship's stern. In fending off the rig to protect the camera assembly the command release package was pivoted into the stern rail sufficiently hard to operate the internal firing relay. This fired both pyroreleases and dropped the ballast frame. The rig was then altered to ease handling and redeployed without further problem. During recovery the beacon in the release ceased operation 15 minutes before it was due to surface; this has not occurred before and was probably due to a component failure. The mooring was located visually but lost due to an unfortunate and unusual combination of circumstances. The release is acoustically inoperable.

Amphipod Traps

Command Release 2301 was used on this mooring. It was successfully wire tested to 1000m and then deployed in 3910 metres. Deployment was without problem. The descent was monitored and after touch down acoustically accurately located. The following day it was acoustically relocated, successfully released and its ascent monitored. There were no problems on recovery but a length of wire had badly birdcaged. The rig was redeployed that evening in 2850m with swivels protecting the new length of wire. Descent was monitored and the position acoustically fixed. The following morning it was acoustically relocated, successfully released and its ascent monitored. As we approached the buoyancy for recovery the release began indicating that it was sinking this proved true when the buoyancy was recovered without the mooring. The descent was monitored. After impact it would not time out and so will not be locatable in the future.

Otter Trawl Monitor

This unit was mounted behind the trawl door with a right angled adaptor on one end allowing the acoustic transducer to point back towards the ship through a hole on the door. This monitor telemeters temperature. During the first haul in 2250m with 6000m wire out the received signals were of good strength but the bottom echoes were poor and vanished at about 20m off. From the catch it was thought never to have touched the bottom. Subsequent hauls all fished the bottom successfully but the bottom echo was not usable below 1000m. Inspection of the monitor during a battery change showed no serious vibration problems so I decided to investigate using mercury tilt switches to indicate bottoming. After careful consideration I decided that the characteristics of two designs of tilt switch could be simply used to provide resolution of six towing orientations. These were installed and gave clear incidation of the steady midwater towing angle, a fairly quite transition to the bottom fishing angle, and a slower transition when lifting off the bottom. Several successful hauls were made greatly aided by this facility including one in 4200m with 12500m of wire out. The monitor was later lost with the trawl and 7600m of wire but accurately described the circumstances of its loss.

Greg Phillips

CAMERA SYSTEM

Three Mk 4 camera systems were made available for this cruise, two of these being allocated for operation on the epibenthic sledge while the third was required to cover initial Bathysnap trials.

All photographic units were modified to gain a frame count from the data chamber in place of the more conventional elapsed time print out. In addition, one unit was adjusted effectively to cover the transmission of data on to a specific colour emulsion.

The Bathysnap camera control circuit had been extensively modified, prior to the cruise, to increase the normal operational period from 36 to 110 hours. This was regarded as an interim step in achieving time scales of up to three months. Unfortunately the loss of this equipment during the first station precluded the possibility of monitoring the performance of the new system under normal operational conditions.

Three stations were achieved with the epibenthic sledge. Erratic performance of the frame count output was experienced initially and this was attributed to a series of random pulses received from external control circuits. Incorporation of additional suppression in the camera eventually overcame this problem.

E.P. Collins

BENTHIC INVERTEBRATES

As a result of the extensive sampling carried out in the Porcupine Sea-Bight on previous cruises, it is now possible to predict the dominant invertebrate megafauna expected in a catch. There were, however, some interesting discoveries, particularly at deeper depths sampled.

At St. 50910 (4300m) the otter trawl took a good catch dominated by the echinoderms in general, and the holothurians in particular. Several large Psychropotes longicauda and Benthodytes lingua were taken in addition to Deima validum and Oneirophanta mutabilis which were quite common. Pseudostichopus atlanticus and Paroriza ?prouhoi also occurred, each specimen bearing several

actinarian parasites, presumably Sicyopus commensalis. The asteroids Freyella spinosa and Dytaster sp. were also present and the large number of sipunculids were also a feature of this catch. Echinoderms again dominated a rather poor catch at St. 50913 (3000m), taken by the epibenthic sledge multiple net. As expected the holothurian Kolga hyalina was present, although the specimens were apparently smaller than those previously taken in this area. A specimen of the large holothurian Benthothuria also occurred, as well as a few specimens of Hymenaster membranaceous and a quantity of clinker. The epibenthic sledge, this time fitted with a single coarse net, sampled a similar catch at St. 50914 (2800m). Kolga hyalina was less abundant and the catch consisted mainly of small asteroids and ophiuroids. There were also a few bivalves and polychaetes, as well as a specimen of Parapagurus and 11 Glyphocrangon sculpta juveniles. Another trawl at a similar depth, St. 50907 (2900m), produced a larger catch with a considerable amount of clinker. Hermit crabs were common in the area, but also many of the gastropod shells in the catch were unoccupied, except for the occasional sipunculid. The rest of the fauna included the large crab Paralomis, the asteriod Hymenaster membranaceous, the ophiuroid Ophiura ljungmani, the echinothurian Hygrosoma, and the holothurians Psychropotes depressa (3 small specimens), Molpadia blakei, and a solitary Benthothuria. Slightly shallower, at St. 50906 (2600m), Hymenaster membranaceous completely dominated the catch, as expected, but there was also a very large specimen of Hymenaster giganteus. At this station also Peniagone azorica was taken for the first time in the Sea-Bight and the galatheid Munidopsis bairdii was also noteworthy since it had not been previously recorded in these latitudes. Solitary corals, sipunculids and polychaetes from the family Aphroditidae were common and another specimen of Paralomis was taken. Hymenaster membranaceous also dominated a smaller catch sampled using the epibenthic sledge at St. 50915 (2540m). Included in the catch was an intact specimen of the extremely fragile echinoid Echinosigra paradoxa, along with the necks of 18 less fortunate specimens of this species.

Larger catches were taken at depths shallower than 2000m using the otter trawl. At St. 50902 (1850m), some echinoderms were so plentiful that they had to be subsampled. Only 10% of the holothurian Benthogone rosea and the ophiuroid Ophiomusium lymani were retained, as well as a third of the asteroid Plutonaster bifrons. Large pieces of coal and clinker provided a foothold for a variety of fauna, including actinarians, cirripedes, ophiuroids and

sponges. Scaphopods were prevelent, as were empty gastropod shells, many housing sipunculids. At St. 50903 (1250m) the dominant animals were the holothurian Laetmogone violacea and the echinoid Phormosoma placenta, which again had to be subsampled. Two more large specimens of Hymenaster giganteus were taken, in addition to many Brisingia sp. arms. The asteroid Plutonaster bifrons, the holothurian Bathyplotes natans, solitary corals and pycnogonids were common. At St. 50904 (1020m) Laetmogone violacea and Phormosoma placenta were still as abundant, but the echinoid Echinus elegans joined the dominant animals. There were also many gorgonians with their attendant fauna, including nudibranchs and the ophiuroid Gorgonocephalus caput-medusae. The cephalopod Opisthoteuthis also occurred in this catch. Lastly a small catch was taken by the otter trawl at St. 50905 (800m) owing to inclement weather conditions. Surprisingly the diversity of animals taken belied the small catch, and contained pagurids, actinarians, pennatulids, gorgonians, cephalopods, and the echinoderms Phormosoma placenta, Gorgonocephalus caput-medusae, and Stichopus tremulus.

D.S.M. Billett

FISH

Seven samples of demersal fish were taken by the OTSB 14 at mid-depth soundings of 787, 1027, 1257, 1825, 2645, 2820 and 4292m. In addition, some fish were collected in all the BN1.5 samples (2540, 2800 and 3020m mid-depth soundings). Altogether 53 species were represented, with 2 additions (?Raja batis and Monognathus sp.) to those hitherto collected in the current survey of the Porcupine Sea-Bight. This overall diversity is somewhat less than on previous cruises, but the dominant species were found to be identical with earlier results. The total catch weighed 412.5kg and the maximum yield per $1000m^2$ trawled of 1.5kg occurred from the 1027m tow. In this case several species were responsible, but at 2645m the morid, Antimora rostrata, dominated the $1.4kg/1000m^2$ yield. Large catches were also made at the two deeper stations (2820m - $1.1kg/1000m^2$ and 4292m - $0.6kg/1000m^2$) which were largely due to the abundance of the rattail, Coryphaenoides (Nematonurus) armatus.

More than 1200 specimens of the common species were worked up on board and discarded at sea. Also, samples were processed for radioactivity analysis by the Fisheries Radiobiological Laboratory, MAFF Directorate of Fisheries Research, Lowestoft, and a sample of blood serum from Chimaera monstrosa was

collected for Dr. Lawson, Salford University.

N.R. Merrett

ORNITHOLOGY

Seabirds recorded during the cruise have provided no surprises. Kittiwakes (Rissa tridactyla) and fulmars (Fulmarus glacialis) have been seen during most observations, but rarely in any number. Less frequent sightings were made of great skuas (Catharacta skua) gannet (Sula bassana), greater black-backed gull (Larus marinus), herring gull (L. argentatus) and greater shearwater (Puffinus gravis). A single British storm petrel (Hydrobates pelagicus) was ringed.

Persistent easterly winds during the early part of the cruise account for the land birds seen at this time. Seven species were involved, redwing (Turdus iliacus) being the most abundant.

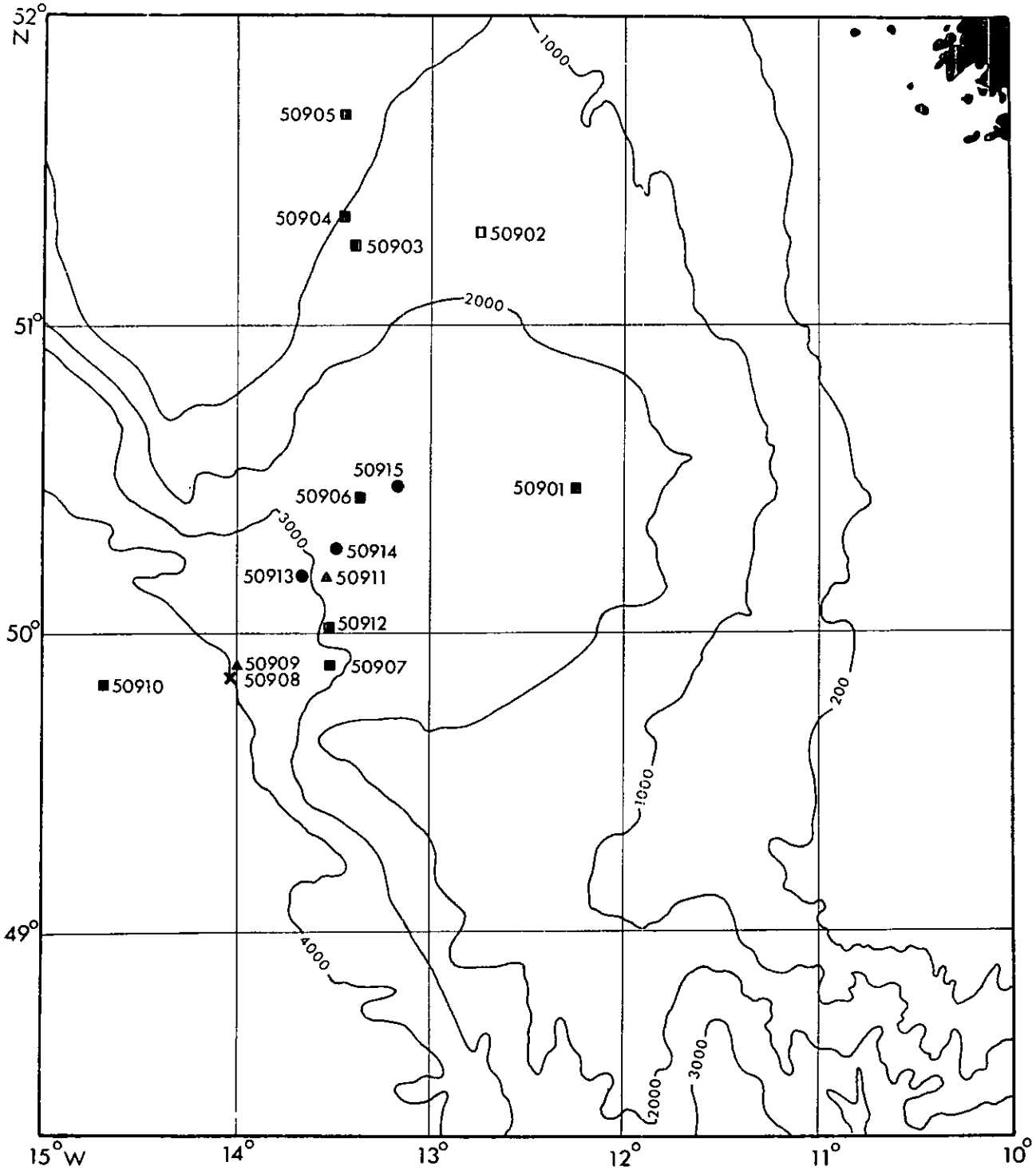
M.H. Thurston

EPILOGUE

"It is better to have launched and lost than never to have launched at all"

STATION LIST

STATION	DATE 1980	POSITION (START) N	W	POSITION (END) N	W	GEAR	SAMPLER DEPTH M	DURATION GMT	DISTANCE n.m.
50901	6/11	50°28.6'	12°15.4'	50°29.22'	12°18.4'	OTSB 14	2205-2270	1020-1120	3.0 log
50902	7/11	51°17.4'	12°45.2'	51°15.74'	12°49.19'	OTSB 14	1825-1866	1310-1440	3.1 "
50903	7/11	51°16.6'	13°23.3'	51°15.12'	13°25.12'	OTSB 14	1265-1250	2222-2330	2.9 "
50904	8/11	51°21.8'	13°27.4'	51°19.3'	13°30.12	OTSB 14	1035-1020	0434-0536	3.2 "
50905	8/11	51°41.78'	13°26.54'	51°43.14'	13°21.17	OTSB 14	755-820	1415-1520	3.2 "
50906	9/11	50°26.2'	13°20.8'	50°24.10'	13°34.91'	OTSB 14	2585-2705	1143-1328	5.2 "
50907	10/11	49°53.7'	13°30.4'	49°53.19'	13°33.55'	OTSB 14	2850-3100	0200-0335	5.4 "
50908	10/11	49°51.77'	14°02.52'	49°51.29'	14°01.52	Bsnap	3958	1228/10-1341/11	
50909	10/11	49°53.83'	14°00.36"	49°53.41'	14°00.26'	Tamph	3918	1607/10-1113/11	
50910	10/11	49°49.6'	14°40.5'	49°50.56'	14°49.63'	OTSB 14	4283-4341	2210/10-0026/11	5.8 "
50911	12/11	50°11.34'	13°32.22	50°11.21'	13°31.93'	Tamph	2850	2229/11-0801/12	
50912	11/11	50°06.43'	13°31.45'	Trawl lost		OTSB 14	2925		
50913	12/11	50°11.9'	13°39.8'	50°11.3'	13°41.3'	BN1.5/3M	3000-3040	1520-1555	1.5 "
50914	12/11	50°17.2'	13°29.4'	50°15.68'	13°31.23	BN1.5 C	2790-2810	2256/12-0008/13	1635m (odo.)
50915	13/11	50°28.9'	13°10.5'	50°28.70'	13°11.68'	BN1.5 C	2540-2540	0740-0816	719m (odo.)



CHALLENGER CRUISE 17/80 : STATION POSITIONS

- ■ OTSB
- ● BN
- ▲ Amphipod trap
- × Bathysnap