# THE DISCOVERY COLLECTIONS

K.C. CHIDGEY

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NATURAL ENVIRONMENT RESEARCH COUNCIL

INSTITUTE OF OCEANOGRAPHIC SCIENCES

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WORMLEY

# The Discovery Collections

by

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INTRODUCTION AND HISTORY

Discovery Collections consist of the accumulated catches of ships of the Discovery Committee (1924-1949), the National Institute of Oceanography (NIO) (1949-1973) and the Institute of Oceanographic Sciences (IOS) (1973-present). A brief history of the biological collections and research at the IOS has been given by Baker and Chidgey (in press). Despite the changes in title, there has been continuity of methods and ships throughout.

The Discovery Committee's investigations were initiated in response to requests from several Government bodies for research relevant to the regulation of the Whaling Industry (Anon. 1920).

In the early days of Antarctic whaling, processing of the catches took place at shore stations, most of which were sited in British territories. As is usually the case in such circumstances, taxes were levied on the whale products. Even before the first World War there was a feeling among the whalers that the stocks of whales were not maintaining themselves against the pressures of whale catching and that the Government, which was collecting the taxes, should do something about it. In 1913 there was a meeting of representatives of Government departments to consider steps to regulate catches. However, the advent of the war prevented any immediate action, but in 1920 an Interdepartmental Committee recommended that investigations be initiated to establish a sound scientific basis for regulating the whaling industry. A ship sub-committee was formed in 1922 which advised the purchase of SS Discovery, the ship which had been specially built for the National Antarctic Expedition of 1901-03. The ship's name was given to the investigations which came into being in 1923 under the auspices of the Colonial Office (Discovery Committee 1937; Mackintosh 1950).

The ship was equipped according to the standards of the time for an oceanic research expedition (Kemp, Hardy and Mackintosh, 1929) and much of the early equipment was hardly ever used during subsequent commissions. Most of the gear was modified for the later commissions but it was considered important to standardise collecting routines as soon as possible, so as to ensure comparability, and much of the gear remained unchanged up to 1951. The single commission of RRS Discovery demonstrated that she was totally unsuited to oceanic research.

At the time of this first commission (1925-27), it was expected that most of the scientific problems could be solved by a study of the whaling grounds around South Georgia coupled with a shore-based investigation of the whales landed and processed at the island. However, two factors changed this view. The first was the observation that the hydrological and biological characteristics of the waters around South Georgia were found to be dependent on conditions in the Southern Ocean in general, and the second was that whaling became progressively less dependent on land based stations following the advent of whale-factory ships, so that whaling became steadily more pelagic. In 1929 therefore a new specially designed ship RRS Discovery II was built and began work (Ardley & Mackintosh 1936; Herdman 1963a). After some teething troubles she proved to be an excellent ship. She continued to be operational until 1962 when, mainly because she lacked the electrical capacity needed in modern oceanography, she was paid off and broken up. She worked six Antarctic commissions, (1929-31, 31-33, 33-35, 35-37, 37-39 and 50-51), was employed on war service from 1940-46 and operated from 1952-62 in the NE Atlantic.

The Discovery Committee also owned another ship, the RRS William Scoresby, which was essentially a whale catcher in form, but slower. She was employed from 1926 onwards for whale marking, trawling (she worked a full sized commercial otter trawl) and for making both plankton and hydrological observations. In 1931 she made a classic survey of the Peru Current followed almost immediately by an extensive trawling survey of the Patagonian Shelf. After the second world war she carried out a single commission during which she made two surveys of the Benguela Current. She was finally paid off in 1952.

In 1962 RRS Discovery was specially designed as a new research ship (Herdman 1963b; Currie 1963a) and entered service at the end of that year. Her first commission was in the Indian Ocean taking part in the International Indian Ocean Expedition from June 1963 to September 1964. She is still in full commission. A fuller account of her work and the changes in the working patterns is given by Baker and Chidgey (in press).

Discovery Collections were housed in a hut at the back of the British Museum (Natural History) from 1925 until 1953 apart from a war-time sojourn at Strathfieldsaye House. In 1953 most of the Collections were moved to the premises of the newly formed National Institute of Oceanography at Wormley in Surrey.

The rest of the Collections remained in London until 1976 when it, too, was moved to Wormley, apart from a quantity of sorted Antarctic material and type material which remained at the B.M. (Nat. Hist.).

The Collections consist mainly of plankton and micronekton samples, but there is also a considerable amount of Antarctic benthic material and a rapidly growing collection of recent deep benthic samples from the NE Atlantic. Until 1976 it included a certain amount of whaling material but this was transferred to the Marine Mammals Group of NERC at Cambridge. There is also a relatively small amount of Antarctic geological material mostly in the form of sediment samples.

Unlike most early oceanic expeditions, Discovery Investigations were primarily interested in the ecology of the ocean and the collection of rare or little known forms was of secondary interest. The tendency therefore has been to regard the sample or the net haul rather than the different taxonomic groups as the important unit. However, especially in the pre-war years, much material was made available to outside specialists, which resulted in many definitive works on the fauna of the Southern Ocean, which were published in Discovery Reports. Interest in the Southern Ocean from a taxonomic and zoogeographic viewpoint diminished over the years and recently less material has been lent to outside specialists. In the last decade, however, the use of more precise collecting methods and the systematic exploration of deeper layers of the ocean has again aroused the interest of specialists both in the United Kingdom and abroad and once again the volume of material being sent out on loan is increasing. This has resulted in a dual system being adopted, for while the whole net sample remains the basic unit around which the Collections are organised, more and more identified material is accumulating and is stored according to taxonomic groups. However type material is deposited and registered at the British Museum (Nat. Hist.).

It can be seen from Appendix I, which is a list of gear used on biological cruises, that many different pieces of apparatus have been operated. Much of the gear has however been used infrequently and the vast majority of samples in the Collections have been collected with a few standard samplers. During the Antarctic commissions, the 1m stramin, the 70cm bolting silk net and the 50cm phytoplankton net were used routinely at almost every station. The 2m young fish trawl was used, particularly on passage to and from the UK to the Southern Ocean, but not routinely in the Antarctic. For a short time the Indian Ocean

Standard net and the Isaacs Kidd Midwater trawl were used routinely, particularly during the International Indian Ocean Expedition, but since 1968 the rectangular nets (RMT 8 and RMT 1) developed at IOS have been used extensively.

Station lists have been published in the Discovery Reports for cruises up to the end of 1951. These list all the gear used, times, positions, chemical and physical data. Between 1952 and 1962 reports on cruises were not published but a small number of duplicated copies of internal reports exist, some of which contain abbreviated Station Lists. With the commissioning of the present RRS Discovery a new series of 'Cruise Reports' was started. The Royal Society of London published the first three issues, which covered the International Indian Ocean Expedition, and NIO and then IOS have produced the Cruise Reports for all the subsequent cruises. These are produced as internal reports and are circulated to most major oceanographic institutes. The data recorded in the station lists back to 1968 is also stored in the Biological Data Base (Domanski 1981).

The Discovery biological Collections are mainly preserved in glass Kilner storage jars, but in recent years with larger hauls resulting from improved gear, plastic tubs have had to be used as well. There have been quite a variety of types and sizes of Kilner jar employed both on board ship and for permanent storage. At first in 1925 Kilner jars were available in 1lb, 2lb, 3lb and 5lb sizes, with rubber washers, glass tops and specially manufactured copper screw bands. Also in the 1920's a small type of spring clip jar, stoneware jars and cast-iron tanks were used. The jars must be completely air-tight and the metal bands greased to prevent corrosion. Special wooden boxes were constructed for conveying the various sizes of jars to and from the ship and for storage in the ship's hold. In the 1930's a ½lb size and a 7lb size Kilner jar also became available. Over the years the shapes and styles have changed and some are no longer available. Since 1970 there has been difficulty in obtaining sufficient numbers of Kilner jars and a series of glass jars with plastic snap-on lids are now used solely for storage in the Collections and the Kilner jars are recycled for use at sea. There are 2 types of plastic tubs in use, one type is for use mainly at sea with capacities of 10ℓ, 15ℓ, 20ℓ, 25ℓ, 80ℓ and 100ℓ and the other type of a lighter design, with capacities of 5ℓ, 12.5ℓ and 15ℓ is used for shelf storage only.

PRESERVATION AND FIXATION

Throughout formaldehyde has been used as the main fixative for most animals. The formaldehyde solution received from the manufacturers contains approximately 40% by weight formaldehyde in water and this has led to much confusion when referring to the concentration when it is diluted. The term formalin or concentrated formalin has been widely used when referring to 40% formaldehyde and consequently 10% formalin, i.e. a dilution 1:10 of the manufacturers product is used to mean 4% formaldehyde. Steedman (1976) has advocated the use of the term formaldehyde and the real percentages and experience with the Discovery Collections suggests that adherence to this would greatly reduce the risk of confusion. The formaldehyde used in the Discovery Collection is grade 38/10 and the manufacturer's specifications are given in Table I.

Kemp, Hardy and Mackintosh (1929) describing the first cruises of Discovery and William Scoresby gave the following methods adopted for the fixation and preservation of material. For general fixation 4% formaldehyde was used but weak spirit was also used for fish, crustacea and some delicate material. Special fixatives such as Bouins were also used. The formaldehyde was neutralised by the addition of 5 grams borax (sodium tetraborate) to one litre undiluted formaldehyde, as advocated by Atkins (1922). The alcohol was ordinary industrial 95% spirit. They were diluted with sea water and fresh water respectively. Marr (1963) referring to pre-war samples states that the fixative used on board for most benthic material was neutralised 4% formaldehyde diluted with sea water. Twelve or twenty-four hours after fixing, the animals were changed into 40-50% alcohol. This was decanted off after a further 12-24 hours and a final preservative of 75% alcohol was used. For the mid-water non-calcareous material the same fixative was used and then changed for a final preservative of 4% formaldehyde.

Smith (1947) proposed the use of hexamine (hexamethylene tetramine) as a buffering agent for formaldehyde as it was readily available and cheap. He recommended that 200 grams of hexamine should be added to each litre of 40% formaldehyde solution. So in 1950, when work started again on Discovery II, the material collected was fixed and preserved in exactly the same way as before except that the formaldehyde was neutralised with hexamine. However, in the late sixties, following the rapid deterioration of material collected during the International Indian Ocean Expedition, the use of hexamine as a buffer was much

Table I 38/10 Formaldehyde Specifications
(from Synthite, manufacturers)

| | |
|---|---|
| Formaldehyde content (% by weight) | 35.0 ± 0.1 |
| Formaldehyde content (lb per Imp. gall.) approx | 3.80 |
| Methanol content (% by weight) | 10.0 ± 0.2 |
| Specific gravity 15/15°C | 1.084 - 1.086 |
| " " 25/25°C | 1.080 - 1.083 |
| Acidity as Formic acid (% by weight) | 0.025 max |
| Ash content (% by weight) | 0.01 max |
| Iron as Fe (p.p.m.) | 2 max |
| Copper as Cu (p.p.m.) | 5 max |
| pH | 2.8 - 5.0 |
| Flash point °F (Pensky-Martens Closed Cup) | 148 |

criticised (Report to SCOR Working Group 23, 1970; Steedman 1976). The Working Group 23 of the Scientific Committee on Oceanic Research (SCOR) studied the problems of hexamine and other buffers and preservatives in detail and Steedman (1976) concluded that hexamine cannot be recommended as a buffer for formaldehyde. During 1971 hexamine ceased to be used as a buffer for formaldehyde in the Discovery Collections and now the catches are once again fixed in 4% formaldehyde in sea water neutralised with borax in the amount first recommended. After about 24 hours the solutions are changed and preservation is in either 4% neutralised formaldehyde or 80% alcohol. During sorting back at the IOS laboratories, the specimens in mid-water samples are transferred to Steedman's 'preserving fluid' (Steedman 1976). This contains propylene phenoxytol, propylene glycol, un-neutralised 40% formaldehyde and distilled water. Benthic samples, however, contain a variable amount of sediment in addition to the animals which are removed by sieving before they are fixed in neutralised 2% formaldehyde. Crustacea, echinoderms, ectoprocts, corals and most molluscs are later transferred into 80% alcohol; fish, worms, tunicates and some molluscs are preserved in formaldehyde. When particularly large and bulky benthic samples are collected it is often practical to subsample and discard some of the material after recording all the relevant data on this excess material. Attempts are made to reconcile the desire to retain as much of the material as possible and the need to restrain the growth in the volume of the Collections. Back at IOS any additional sorting is done on the benthic samples, all alcohol and some formaldehyde is changed and residues are resieved.

Net samples are irreplaceable and expensive to collect and great care should be taken in handling them. When the samples come inboard quick fixation is most important, especially in warm climates. Containers should not be more than 2/3rds full of material. Steedman (1976) suggested a ratio of volume of specimens to fixative as 1:9.

The earliest samples collected during the 1925-27 Antarctic Commission and preserved in formaldehyde are still in a good condition. Generally the pH of all the samples is slightly acidic. The pH of the commercial un-neutralised formaldehyde is usually between 3 and 4, but neutralisation increases the pH to between 7 and 8. Tests on neutralising small amounts of 40% formaldehyde with borax showed that this pH was reached at once. The pH of the neutralised 4% formaldehyde drops to between 6 and 7 after its addition to the material and this slightly

acidic solution seems to be the best for good preservation. In the Discovery Collections the preserving fluid of samples originally preserved in hexamine-buffered formaldehyde tends to have a higher pH than the fluid of samples buffered with borax. Some of the jars with samples containing hexamine have a white sediment in them and the condition of the material is generally poorer than corresponding material preserved in borax-buffered formaldehyde. Also I have not observed any differences either in the pH or in the condition of the preserved material between samples in formaldehyde diluted either with sea water or with distilled water. After long storage the pH of the commercial undiluted 40% formaldehyde drops and after neutralisation the pH does not rise above 5. The 40% formaldehyde should be kept between 10-25°C (manufacturer's recommendation). The Discovery Collections are kept in storage without natural light and in relatively constant temperature around 15°C.

## RECORDING METHODS

Station numbers without prefixes have run consecutively through all the cruises of the three Discovery ships from 1925 to the present. The stations worked by William Scoresby were numbered separately and are identified by the prefix WS. Material collected from the whaling factory SS Anglo-Norse near the South Sandwich Islands has the prefix SS and that from the whaling factory SS C.A. Larsen in the Ross Sea has the prefix RS. The prefix MS was used for material collected at the Marine Station in South Georgia. A station numbering system for ships other than RRS Discovery has been designed to suit the Biological Data base (Domanski 1981) and a numerical prefix is given e.g. a Challenger cruise is given the prefix 5, followed by two digits indicating the cruise number and a further two digits to indicate the station number. When many hauls are made at the same position, they are given the same station mumber and are then distinguished by serial (or haul) numbers e.g. 7406#1, 7406#2 etc. From the station number and haul number the exact latitude and longitude of the ship can be found by reference to either the appropriate station list, rough log or the data base. Three main logs are routinely kept during a biological cruise:- 1) the biological log which contains descriptions of the catch and any pertinent information about factors affecting it; 2) the biological rough log giving precise details of the haul such as times, depths, flow etc. and 3) the ship's log kept by the officer on watch which contains information on the ship's movements and station activities.

The principal scientist also keeps a narrative general scientific log. From 1965 onwards cruise reports have been published by the Institute giving basic descriptive information on the nature of the work, the gear used, a station list and track chart, and any preliminary conclusions that have been reached.

Date The date is always given in the order: day, month, year, using Roman numerals for the month.

Gear The abbreviations for the various types of gear are listed in Appendix I. This may be followed by the letters B, H, or V indicating the direction of the haul. B = oblique, H = horizontal, V = vertical. However since the RMT combination net is now most frequently used and it can be seen from the depth information that it is a horizontal haul, the H is omitted.

Depth This is given in metres and the lower depth is given first except in a number of oblique hauls fished downwards. If the second depth is in brackets it signifies that the net was hauled open to that depth after a horizontal tow at the first depth. The depth given for benthic catches is an indication of fishing direction i.e. upslope is 1600-1500m, downslope 1500-1600m.

Labels The labels are printed with an ink impervious to alcohol, formaldehyde and preserving fluid, on good quality paper. Marr (1963) says the paper used in pre-war days was "antique parchment, cream wove". Goatskin parchment 160 $g/m^2$ is now used for large labels and 120 $g/m^2$ for small labels. Labels are written onboard immediately the catch is recovered, with a 2B pencil. The label then remains with the sample until it is processed after fixation or preservation.

Analysis sheet A form, the 'analysis sheet' is started on board ship for each sample collected. It contains the following information:- station number and haul number, gear used, depth, date, size and number of containers for the sample, time and sample volume. For midwater samples a list of the species and number of specimens removed, the size and number of containers they are in and the signature of the person responsible is also noted under the heading "material preserved separately". If material is not to be recoverable later due to its being used for chemical analysis this is recorded. All further analysis or changes to the sample are recorded as they occur. Analysis sheets for benthic

samples perform the same function but their design and usage differs as they also act as coding forms for direct entry of data into the Biological Data Base (Domanski 1981). Any one benthic sample can be split into 20 or more containers during shipboard sorting and even more after laboratory sorting. Therefore the 'material preserved separately' section is only used for specimens which are unlikely to be incorporated into the Collections i.e. material frozen or destroyed or material retained by workers at institutions other than IOS.

Storage The Discovery Collections are stored at IOS, Wormley. Benthic material and mid-water material are kept separately.

Mid-water material is stored in two places, N70 and N50 samples or residues and some sorted groups are stored on metal shelving on the ground floor of the main building. The racks are divided into bays identified by letter and the shelves within each bay are numbered. All the N100 and RMT material, the remainder of the sorted groups and the benthic material are stored in a basement which has timber racking with adjustable shelves. This racking is a mobile system with a geared hand crank to drive the units along a floor mounted chain. This modern type of storage increases the available shelf space by about 55% compared to a static system. Each mobile unit has a number, the bays within each unit have an alphabetical letter and the shelves within each bay are numbered. In both stores the jars are arranged in station order on each shelf. After a sample has been sorted it is called a residue. The residues and unsorted samples are stored together in station order but are divided according to nets or other sampling gear used. The material picked out is stored in its own appropriate taxonomic group in station order. The mid-water Collections catalogue is kept on index cards. Every sample/residue has one index card only, even though it may be in more than one container, and this card gives the location of the sample and serves also as a record for loans. The groups of animals picked out are given a group index card and this is filed under the appropriate group in station order. Therefore the indexing is divided into two main parts: i) the sample/ residue ii) the sorted material.

The index card has the following information:-

a) Station number and series number (if any).
b) gear

c) depth

d) container size and number

e) time (if applicable)

f) mobile unit number (in basement), bay letter and shelf number.

g) any other relevant information e.g. fractioning.

The reverse of the card is signed whenever the material is removed from the shelves.

Benthic material has been collected principally from three main areas: 1) Antarctic Ocean (1925-51) 2) off the west and northwest African coast (1966-79) and 3) in the Porcupine Seabight off southwest Ireland (1977 - onwards). Samples from each of these areas are stored separately, but arranged chronologically within each area. Decapods, fish, echinoderms, amphipods and isopods from the Porcupine Seabight are stored separately as they are currently being worked on. All the other parts of the sample are kept together, until work on the sample is completed, when they can be stored taxonomically. The information required for benthic material is the same as that from mid-water but it is recorded on edge punched cards.

GUIDE LINES FOR THE METHODS TO BE USED WHEN WORKING ON THE DISCOVERY COLLECTIONS

1) Write analysis sheets on board ship for all newly collected samples and write one at IOS if you work on an old sample for which there is not one already written.

2) No new material should be put into the Collections without an index card being written for it.

3) No container should be taken from, or returned to the Collections without a date and signature neatly written on the reverse of the index card.

4) If a sample is sorted or any material removed from it, give the details on the analysis sheet.

5) If the size of the container is changed or a sample is divided or combined note it on the analysis sheet, the index card, and the label.

6) Labels must be legibly written with a 2B pencil. Do not alter a wet label and use the appropriate size of label for the container.

7) Fill jars up to the neck with liquid and if using a Kilner jar, vaseline the metal ring, use a rubber ring and close tightly. (Do not vaseline the rubber ring, as this will destroy it). The Discovery Collections are a national collection and as such all material must be properly preserved and all relevant data properly recorded.

PROCEDURE FOR OUTSIDE LOANS

1) Obtain authority from the head of the Biology Department and inform the Curator of the Collections.

2) Give the loan the next BSL (biological sample/specimen loan) number by referring to the last entry in the loan file.

3) A top copy and two carbons of the loan form should be completed with full details of the specimens or samples. The container size(s) should also be given. Two copies are sent with the material one of which is sent back to say it has arrived safely and the third should be put in the loan file.

4) On the reverse of the appropriate index cards write the name of the person receiving the loan, the date, and BSL number.

5) If the material is to be packed by IOS stores (R and D), fill in a packing note and take it with the material to stores.

6) Normally returned material is addressed to the curator, but if material is returned to you, check that it is all there, return it to the Collections and cancel the loan on the appropriate index cards and on the form in the loan file. Inform the curator that this has been done.

7) It is preferable for material to be recorded at IOS and then sent out on loan rather than straight from the ship. When this is impossible or impractical,

then record the loan on the analysis sheet. Back at IOS, give the loan a BSL number and fill in a loan form for the file with all the details.

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Appendix I The Discovery Collections Nets and Gear

The station and date indicate when the gear was first used in biological work on Discovery or William Scoresby, and the reference indicates where further information can be sought.

Activity meter Prototype; to monitor continuously on deck the swimming activity of an animal as it is lowered to the depth at which it was caught.
St: 7118 Date: 1/XII/69
(NIO Cruise Rep. 30)

Allen dredge See under dredges.

Anchor dredge See under dredges.

Batfish Commercial undulating recorder to measure pressure, temperature, conductivity, oxygen concentration and chlorophyll fluorescence. (Now renamed Sea Soar).
St: 9500 Date: 28/III/77
(Dessureault 1976; Fasham, Pugh, Griffiths and Wheaton 1983)

BC Bottom camera. Also BCAM
(Laughton 1957)

BCMT British Columbia midwater trawl, a modification of the Larsen trawl. Large net fished with otter boards and a depressor on each of the lower sweep lines. Mouth about 30.5m (100') diameter, length about 91.5m (300'), with mesh graded from 50.8mm (2") to 12.7mm (½") at the cod end. Head line 16.8m (55').
St: 4023 Date: 14/III/59
(Barraclough & Johnson 1955)

BGN Paired vertical Bongo nets; mesh size 0.5mm and 0.3mm.
St: 8665 Date: 2/II/75
(McGowan & Brown 1966)

BIM Bathy-irradiance meter. See also LMD
St: 5767 Date: 21/IX/65
(Currie, Boden & Kampa 1969)

BLL Benthic long lines.
St: 6368 Date: 25/VII/67
(Merrett & Marshall 1981)

BN 330 Near bottom plankton net in a rigid frame. The mouth area could be altered between 1.25 and 1.75m² by moving the bottom bar. Originally the mesh size was 0.33mm and length of net 6m (20').
St: 6547 Date: 24/I/68
(NIO Cruise Rep. No. 21)

BN 5 BN 330 frame rerigged as a benthic sledge. The net had a mouth area of 1.75m², length of 3.66m (12') and was made of 5mm mesh.
St: 6703 Date: 16/III/68
(NIO Cruise Rep. No. 21)

BN2.4 A further modification using the basic design of the BN330 sledge frame. The skids were widened and the net attached to the back of the frame. The net had a mouth area of 2.4m², a length of 6m (20') and mesh size 4.5mm, decreasing to 1mm at the cod-end. Towed at 1.5 knots.
St: 7422 Date: 23/X/70
(Merrett & Marshall 1981)

BN1.5 Developed from the BN2.4. The frame is lower, but the skids are the same distance apart (2.15m), giving a mouth area of 1.5m². Net of 4.5mm mesh decreasing to 1mm at the cod-end.
St: 8519#7 Date: 23/VI/74
(Aldred, Thurston, Rice & Morley 1976)

BN1.5/5C As above, but with camera attached.
St: 9115 Date: 4/XI/76
(Rice, Aldred, Billett & Thurston 1979)

BN1.5 /3M The single benthic net is replaced by three smaller ones, the centre net of 1mm mesh size, with a net on either side of 4.5mm mesh size.
St: 9753 Date: 8/IV/78
(IOS Cruise Rep. 70)

Now the benthic sampling part of the sledge is as above but the frame is heightened for a 0.6m² mouth area, 0.33mm mesh suprabenthic plankton net. This net is opened and closed by pivoting the mouth through 90° using a mechanical linkage from the opening/closing mechanism of the lower nets. The abbreviations BN1.5/3MSB and SBNO.5 have been used for this net.
(Rice, Aldred, Darlington & Wild 1982)

BNR Russell's bottom tow net. An N100 plankton net was attached to a frame 1.5m (4'10") long and 38cm (15") wide, with skids to keep the net mouth 15cm(6") above the bottom.
St: 406 Date: 5/VI/30
(Russell 1928)

Bottom trap See under traps. Also recorded as BTS.

BT Bathythermograph.
St: WS 964 Date: 4/III/50
(LaFond & Couper 1972)

BTS Small beam trawl. Beam length 2.4m (8'). Mesh size at the cod end was 12.7mm (½").
St: 55 Date: 16/V/26
(Kemp, Hardy & Mackintosh 1929; Holme 1971)

Bucket Also recorded as LB. Leather bucket.
St: WS 821 Date: 18/I/32

C14 Measurement of organic production of radioactive carbon.
St: 3141 Date: VII/54
(Steeman-Nielsen 1952)

Cast Net Experimental net, used only on one cruise. No other information.
St: 5448 Date: 18/VI/64

CDB Catch dividing bucket (mechanical). Designed for use with the IKMT and N113 nets.
St: 4670 Date: 21/VIII/61
(Foxton 1963)

CDBA Catch dividing bucket (acoustic).
St: 5828 Date: 29/XI/65
(Foxton 1969)

CDBE Catch dividing bucket (electrical).
St: 5480 Date: 9/VII/64
(Foxton 1969)

Corbin Net Experimental net from the Marine Biological Association, Plymouth. Large mid-water trawl, about 29m (95') in length, and with a circular mouth 9m (30') in diameter. Also recorded as 30' Pelagic net.
St: 3049 Date: 25/VIII/52
(Corbin 1951; A. de C. Baker's unpublished notes on handling gear)

CPR Continuous plankton recorder. The plankton is rolled up between gauze of about 60 meshes to the inch.
Towed during the 1925-27 cruise on Discovery
(Hardy 1936)

CTD Conductivity, temperature, depth probe. Commercial.
St: 8545 Date: 21/VII/74
(Brown & Morrison 1978)

CWS Water samples centrifuged for phytoplankton. Also recorded as CS.
St: 359 Date: 24/II/30
(Grann 1932)

DGA Depth gauge, Admiralty pattern.
St: 32 Date: 17/III/26
(Kemp et al. 1929)

DGB Depth gauge, Budenberg pattern.
St: 3 Date: 3/XII/25
(Kemp et al. 1929)

DGE Electrical depth gauge. Commercial. Bell Howell strain gauge transducer.
Date: Indian Ocean Exp. 1963.

DGP Depth pressure gauge, modification of the Budenberg pattern.
St: 413 Date: 21/VIII/30
(Ardley & Mackintosh 1936)

DGT Depth gauge, reversing thermometer type.
St: 81 Date: 18/VI/26
(Kemp et al. 1929)

DN Dinoflagellate net. Fine mesh triangular microplankton net fished between the closing bridles of the RMT 1. Mouth area 0.01m² and mesh size 0.061mm.
St: 8609 Date: 22/VIII/74
(H. Roe, unpublished)

DNI Depth of net indicator, an acoustic depth telemeter.
St: 4668 Date: 17/VIII/61
(Bowers & Tucker 1962)

DTP Depth telemetering pinger.
St: 6354 Date: 18/VII/67
(Tucker, Bowers, Pierce & Barrow 1963)

Dredges i) Allen dredge. Mentioned in biological log only, no details given, but Dr. J.A. Allen from Dove Marine Laboratory was a visitor on this cruise. This was probably a version of the Sanders epibenthic sledge developed at Woods Hole Oceanographic Institution.
St: 6581 Date: 28/I/68

ii) Anchor dredge. The mouth has an inclined plate to take a single bite of the sea bed. The ship is stopped and the dredge is shot and hauled like a ship's anchor.
St: 4828 Date: 28/III/62
(Holme 1964; Holme & McIntyre 1971)

iii) DC Conical dredge. Mouth 45.7cm (18") or 40.6cm (16") in diameter with a canvas bag.
St: 29 Date: 16/III/26
(Kemp et al. 1929; Borley 1923)

iv) DL Large dredge, of the double-sworded type, light pattern. It is 1.2m (4') in length, 0.304m (1') in breadth, with arms 1.4m (4'6") long.
St: 4 Date: 30/I/26
(Kemp et al. 1929)

v) DLH Large heavy dredge, similar to the DL but of heavier construction.
St: 30 Date: 16/III/26
(Kemp et al. 1929)

vi) DRL Large rectangular dredge.
St: 934 Date 17/VIII/32
(Holme & McIntyre 1971)

vii) DRR Rectangular dredge bag on a Russell frame with skids.
St: 1652 Date: 23/I/36
(Russell 1928)

viii) DRS Small rectangular dredge.
St: 1941 Date: 29/XII/36
(Holme & McIntyre 1971)

ix) DS Small dredge, unspecified, no other information.
St: 179 Date: 10/III/27

EMT Engel's mid-water trawl. The mouth opening is 20m high and 35m wide. Mesh graded from 200mm down to 32mm at the cod-end. Length of net 70m, and it is fished with 5m² otter boards. Head line 35.3m.
St: 5819 Date: 16/VI/65
(Scharfe 1966; Harrison 1967)

ERG Electro-retinograms.
St: 5789 Date: 8/X/65
(Currie et al. 1969)

Falling trap See under traps.

Fish trap See under traps.

FGTN Fibre glass tow net. Experimental on one cruise only and no catch recorded. No other information.
St: 4842 Date: 7/IV/62

FL Fluorometer, commercial. 5 models have been used to measure levels of chlorophyll 'a'.
St: 8507#34 Date: 5/IV/74
(Yentsch & Menzel 1963)

Free-fall corer 34mm internal diameter liner tube.
Date: Indian Ocean Exp. 1963
(Burt 1979)

Free-fall net Experimental net used only on one cruise and no catch recorded. No other information.
St: 5005 Date: 19/VI/63

FRN Free rise net. Sank to 1000m, released the chain sinker and then rose. The mesh size was 1mm. (See also pop-up net). There were 2 types:-

FRN30 Mouth diameter 30' (9.144m)
St: 6137 Date: 26/X/66
(NIO Cruise Rep. 15)

FRN15 Mouth diameter 15' (4.572m)
St: 6708#1 Date:18/III/68
(NIO Cruise Rep. 21)

Grabs i) Grab B Probably a Shipek grab.
St: 7816#3 Date: 4/III/72

ii) GSM 1/10 or SM grab Smith-McIntyre grab, with a sampling area 0.1m². The grab has hinged buckets mounted within a frame-work, with powerful springs to ensure closure. There are 2 trigger-plates controlling release.
St: 4927 Date: 3/VI/62
(Smith & McIntyre 1954)

iii) Petersen grab Smaller version of a commercial grab. There are two hinged buckets, sample area usually 0.1m², but there is a 0.2m² model of heavier construction.
St: 4672 Date: 23/VIII/61
(Petersen 1928)

iv) Shipek grab Shipek sediment sampler. It has a semi-circular scoop, which rotates through 180° taking a sample approx. 20.5mm x 20mm.
St: 6561 Date: 26/I/68
(Holme & McIntyre 1971)

v) Smith grab Presumably the GSM grab.
St: 4919 Date: 30/V/62

vi) Van Veen grab or GVV 1/10 Two hinged buckets with long lever arms attached. Samples either $0.1m^2$ or $0.2m^2$ depending on the model.
St: 4725 Date: 10/IX/61
(Holme & McIntyre 1971)

HH Hand harpoon.
St: 616 Date: 14/II/31
(Kemp et al. 1929)

IKMT$_2$ Isaac's Kidd mid-water trawl. Mouth is pentagonal shape, area about $7.8m^2$ with the top 2.4m (7'10"), the sides 2.8m (9'2") each, and the bottom sections 1.5m (4'9½"). Net approx. 30.5m (100') in length and of mesh size 5mm. Fished with one triangular depressor plate 3m (10') wide.
St: 3471 Date: 15/IX/56
(Devereaux & Winsett 1953)

IKMT CDBE As above but modified at the cod-end to carry the catch dividing bucket.
St: 5487 Date: 12/VII/64
(Foxton 1969)

IKMT (SIO) An IKMT net designed at Scripps Institution of Oceanography, U.S.A. Made of black knotless netting of smaller mesh size than the usual IKMT.
St: 5796 Date: 16/X/65
(NIO Cruise 8 - Cruise Report)

IOSN Indian Ocean Standard net. A vertical net 6.7m (22') long, mouth diameter 1.13m and area $1m^2$. The net is constructed of netting of 12.5mm mesh size at the top and a lower section of 0.33mm mesh size, tapering to a sail-cloth cod-end. It was later also rigged as an oblique closing net using Leavitt release gear.
St: 4826 Date: 23/III/62
(Currie 1963b)

KT Kelvin sounding tube.
St: 43 Date: 3/IV/26
(Kemp et al. 1929; McConnell 1981)

LB See bucket.

LH Hand fishing lines.
St: 4 Date: 31/I/26

LHS Longhurst Hardy sampler. Longhurst's modification of the Hardy continuous plankton recorder. It gives records of depth, temperature and flow in conjunction

with the plankton. Mounted on a $1m^2$ net of 0.33mm mesh.
St: 7089#46 Date: 20/XI/69
(Longhurst, Reith, Bower & Seibert 1966)

LHS IMER A benthos version from Institute for Marine Environmental Research, (IMER), on 0.5m diameter ring net using netting of 0.20mm mesh size.
St: 7783#2 Date: 11/II/72
(NIO Cruise Rep. 50)

LL Baited lines, weighted at either end and attached to a buoy.
St: WS 1004 Date: 2/V/50
(Unpublished Note and Sketch WS80 and biological log)

LLB Oblique long lines, towed with lures attached. No catch recorded.
St: 3057 Date: 28/VIII/52
(A. de C. Baker's unpublished notes on handling gear)

LLH Horizontal long lines, specifically designed to catch espada. No catch recorded.
St: 4736 Date: 1/IX/61

LLP Light meter on net monitor.
St: 9541#2 Date: 15/IV/77
(Roe & Harris 1980)

LLV Vertical long lines, paternosters on wire.
St: 3066 Date: 2/IX/52
(Harrison 1967; A. de C. Baker's unpublished notes on handling gear)

LMD Photo-diode light meter.
St: 8508 Date: 16/IV/74
(Kahn, Pugh, Fasham & Harris 1975)

LMM Photo-multiplier light meter.
St: 8509#45 Date: 1/V/74
(IOS Cruise Rep. No. 10)

LNHS/18 Lowestoft net, high speed. 180mm in diameter, netting of 54 or 60 meshes to the sq. inch. Towed at 8 or 8.5 knots. See also Plankton samplers.
St: 9498 Date: 26/III/77
(Gehringer 1952)

LS Experimental line used in strong currents. Rigged with traces and hooks and kept fast to the ship.
St: WS 1010 Date: 9/V/50

Lucas Sounding machine.
Date: Cruise 1925-27
(Kemp et al. 1929; McConnell 1981)

Marra Trawl A mid-water net developed at Aberdeen used on only one cruise. No other information, mentioned only in biological log.
St: 5091 Date: 14/VIII/63

MS Multiple water sampler. General Oceanics Rosette Multisampler.
St: 8251 Date: 22/II/73

N50 50cm diameter ring net with a mouth area 0.196m² of uniform mesh, 200 meshes to the linear inch. Designed especially for sampling diatoms. Length of net 2.3m (7'7") including canvas.
St:41C Date: 28/III/26
(Kemp et al. 1929)

N70 70cm diameter ring net with mouth area 0.38m². Mesh graded from 40 to 74 meshes to the linear inch at the cod end. Length of net 3.1m (10'2"). Later nets were made of uniform 0.23mm mesh.
St: 4 Date: 30/I/26
(Kemp et al. 1929)

N70V² N70 double net. Used for only three hauls due to great strain on wire.
St: 3178 Date: 25/IX/54

N100 1m diameter ring net, with mouth area 0.78m² of mesh graded from 4mm down to 15 or 16 meshes to the linear inch at the cod-end. In 1927 the mesh was changed to stramin of 11-12 meshes to the linear inch. Length of net 4.7m (15'6") including canvas.
St: 4 Date: 31/I/26
(Kemp et al. 1929)

N100BS Special modification of the N100 net constructed on suggestions by Dr. K. Sheard, in which the cod-end of the net is turned in and drawn up part way inside the net, supported here on bridles from the net ring, and the catch collected in the annular bag of net.
St: 2698 Date: 20/VIII/50

N200 2m diameter ring net, mouth area 3.1m² and of mesh size graded from 7mm down to 4mm at the cod-end. Length of net 8.8m (29').
St: 3 Date: 3/XII/25
(Kemp et al. 1929)

N450 4.5m diameter ring net, mouth area 15.9m² with mesh size graded from 12.7mm to 7mm at the cod-end. Length of net 19.5m (64').
St: 9 Date: 11/II/26
(Kemp et al. 1929; Marr 1938)

N25/600 )
NP (600))
600 mesh)
A fine phytoplankton net with 600 meshes to the inch. Mouth 25cm diameter. No other information.
St: 4714 Date: 5/IX/61

N113 This net is a modified version of the IOSN, a vertical net with 1m² mouth area, mesh size 0.32mm or 0.33mm. Later fished obliquely and also used with the CDB.
St: 5766 Date: 12/IX/65
(Foxton 1969)

NC50 An N50 net but with netting of 25 meshes to the linear inch.
St: MS1 Date: 11/II/25

NCSD Coarse silk tow-net, 16 meshes to the linear inch, attached to a dredge.
St: 84 Date: 22/VI/26
(Kemp et al. 1929)

NCSN Coarse silk net as above but attached to another net.
St: 91 Date: 8/IX/26
(Kemp et al. 1929)

NCST Coarse silk net as above but attached to an otter trawl (OTC).
St: 45 Date: 6/IV/26
(Kemp et al. 1929)

ND Dip net. Consists of a circular frame, 2m in diameter with a shallow bag of coarse netting. Used with bait on the bottom in shallow water.
St: 398 Date: 17/V/30

NF50V An N50 net fitted with depth-flowmeter.
St: 3666 Date: 18/III/58

NF70V An N70 net fitted with depth-flowmeter.
St: 3214 Date: 3/IV/55
(Currie & Foxton 1957)

NF113 An N113 net fitted with depth-flowmeter.
St: 5766 Date: 12/IX/65
(Currie & Foxton 1957)

NH Hand net.
St: 45 Date: 6/IV/26

NHP Modification of Harvey's phytoplankton net. A metal funnel of 305mm aperture leads to a recording mechanism and silk net of 200 meshes to the linear inch.
St: 1189 Date: 19/XI/33
(Harvey 1934)

NHS High speed tow-net with a mouth of 76.2mm (3") diameter and netting of 74 meshes to the linear inch.
St: MS 36B Date: 14/X/25

Niskin Sampler A presterilized plastic bacteriological sampler.
St: 5033 Date: 5/VII/63
(Niskin 1962)

NN Neuston net, designed to sample the top 10cm. The net is mounted in a metal frame 30cm x 15cm (area 0.045$m^2$) and of mesh size 0.32mm or 0.33mm. It is usually fished at 5 knots for 12 minutes.
St: 4994 Date: 5/XI/63
(David 1965)

NN3 Triple neuston net sampling 3 layers at the same time. Fished at 2 knots. Top net:- 30cm wide, 15cm deep, area 0.045$m^2$. Other 2 nets:- 30cm wide, 10cm deep, area 0.030$m^2$.
St: 5360 Date: 29/IV/63

NNL An NN net but with mouth 50cm wide, area 0.075m$^2$.
St: 5273 Date: 17/III/64

NNP Plastic neuston net. Frame constructed of plastic, and the net larger and coarser than the ordinary NN. Fished at 2 knots.
St: 6112 Date: 16/X/66
Since the NN was first fished a variety of mesh sizes has been used, but at present the ordinary NN is of mesh size 0.33mm.

NNT Neuston net with a temperature probe on the leading cross strut.
Date: Ind. Ocean Exp. 1963

NR Unspecified rectangular net but probably with a frame 0.9m x 0.3m (3' x 1') and a bag of 4mm (0.16") mesh.
St: WS 748 Date: 16/IX/31
(Kemp et al. 1929)

NRL Large rectangular net. Long bag of netting (12.7mm (½") mesh) in a rectangular frame, 2.45m x 0.7m (8' x 2'3"), towed by 4 bridles.
St: 91 Date: 8/IX/26
(Kemp et al. 1929)

NRM Medium rectangular net. Frame 1.22m x 0.38m (4' x 1'3") with a bag of 7mm mesh. (Also given as ½" mesh.)
St: 1 Date: 16/XI/25
(Kemp et al. 1929)

NS or SN Also probably recorded as Seine Net. Length 50m (180') with graded mesh down to cod-end of 38.1mm (1½") mesh.
St: 271 Date: 30/VII/27

NS50 Experimental high speed tow net, primarily for krill.
St: 2277 Date: 7/III/38

NS200 Mentioned in Biological logs only with no details given. No catch recorded.
St: 2303 Date: 28/III/38

N-T Net (mesh unspecified) attached to back of otter trawl (OTC).
St: WS 790 Date: 14/XII/31
(Kemp et al. 1929)

N4-T)
N7-T) Nets of 4mm and 7mm mesh size respectively attached to back of otter trawl (OTC).
St: 39 Date: 25/III/26
(Kemp et al. 1929)

$O_2$ Oxygen probe.
St: 5784 Date: 30/IX/65

OTC Commercial otter trawl. Headline 24.5m (80') long and fished with otter boards 3.048m (10') long and 1.321m (4'4") high. Mesh at cod-end 76.2mm (3") graded to 127mm and 152.4mm (5" and 6") mesh size. (Also recorded with mesh size at the cod-end of 38.1mm (1½").)
St: WS 71 Date: 23/II/27
(Kemp et al. 1929)

OTL Large otter trawl. Headline 12.2m (40') long and otter boards 1.524m (5') long and 0.889m (2'11") high, fitted with chains. Mesh graded from 63.5mm (2½") at the cod-end to 114.3mm (4½"). (Also recorded with mesh size of 31.75mm (1¼") at the cod-end.)
St: 39 Date: 25/III/26
(Kemp et al. 1929)

OTM Medium otter trawl. Headline 9.14m (30') used with otter boards. Mesh size recorded as 31.75mm (1¼") at the cod-end.
St: 195 Date: 30/III/27
(Kemp et al. 1929)

OTSB14 Otter trawl semi-balloon, with head rope about 14m (46'), of varied mesh. The main body is of 44.45mm (1¾") stretch mesh, tapering to 38.1mm (1½") at the cod-end, with a 12.7mm (½") stretch mesh liner. It is fished with 2 pairs of 'V' trawl doors 1.5m x 1.02m (5' x 3'4"), of mild steel. Mouth opening 8.84m (29').
St: 8929#1 Date: 29/X/75
(Merrett & Marshall 1981)

Oxfam This is a standard N113 net, fished for live material at the surface during trawling.
St: 7709#63 Date: 1/V/71

PDL Pelagic drop line. Vertical line, weighted at the bottom and attached to a buoy, with paternosters and hooks.
St: 7429 Date: 25/V/70
(Forster, Badcock, Longbottom, Merrett & Thompson 1970)

Petersen grab See under grabs.

PES Precision echo sounder.
Date: 1966

Plankton counter Various models. 'Jet-Net' and ½ scale model of this.
Date: Sond Cruise 1965
(Clarke, W.D. 1964; Clarke, M.R. 1977)

Plankton sampler Model Gulf III, Lowestoft pattern. Uniform metal mesh (0.23mm) high speed sampler.
Date: Ind. Ocean Exp. 1963
(Gehringer 1952)

Pop-up net Fished from a pre-set depth up to the surface. The release mechanism was a hydrostatic shear pin system. Mouth diameter 2.4m (8') with 10 or 20 floats. There were 2 types:- one with 7mm mesh and canvas bucket, the other was a standard 2m TYF net.
St: 5814 Date: 11/XI/65
(NIO Cruise 8 - Cruise Report)

Pump Submersible pump with 0.32mm mesh over the outflow.
St: 8507#34 Date: 5/IV/74
(Fasham & Pugh 1976)

RM Mussel rake.
St: 53 Date 12/V/26
(Kemp et al. 1929)

RMT Rectangular mid-water trawl, a modification of the Tucker mid-water trawl. With acoustic monitoring and release system for opening and closing and measuring environmental parameters and net behaviour.
(Clarke 1969)

RMT1 Mouth area 1m² of mesh size 0.32mm. The net tapers down to a cod-end 203.2mm (8") in diameter with a conical terylene canvas bucket and a liner of the same mesh size as the net. First fished as the TMT1.
St: 6450 Date: 21/VIII/67

RMT8 Mouth area 8m². The first net was of mesh size 1.5mm and first fished as the TMT8.
St: 6353 Date: 17/VII/67

The net tapers to a conical bucket as in the RMT1 and a liner of mesh size 0.75mm. The mesh size of the net was changed to 4.5mm and was then termed the TMT8/5.
St: 6541 Date: 20/I/68

With further modifications the 2 nets were used in combination with the same electronic gear and were called RMT1+8. They are fished at 2 knots.
St: 7034 Date: 20/X/69
(Baker, Clarke & Harris 1973; Roe, Baker, Carson, Wild & Shale 1980)

Special RMT1 Rectangular mid-water trawl, mouth area 1m² but of mesh size 0.23mm.
St: 7477#1 Date: 6/XI/70

RMTM Multiple RMT1+8. Combination of 3 RMT1's and 3 RMT8's fished sequentially in the same framework.
St: 9791#2 Date: 6/V/78
(Roe & Shale 1979; Roe et al. 1980)

RMT8/BN Rectangular mid-water trawl of mouth area 8m² with a beam trawl directly below it, using the lower bar of the RMT8 as the spreader bar for the bottom trawl.
St: 7460 Date: 31/X/70
(NIO Cruise Rep. 36)

RMT8/25 HS Rectangular mid-water trawl, mouth area 8m² of mesh size 25mm. High speed.
St: 8508#40 Date: 17/IV/74
(IOS Cruise Rep. 17)

RMT8/150 Rectangular high speed open mid-water trawl, mouth area 8m², but with mesh graded from 150mm to 4.5mm and towed at 5 knots.
St: 7104 Date: 28/XI/69
(NIO Cruise Rep. 30)

RMT25 Rectangular opening/closing mid-water trawl, mouth area 25m². The first net was of mesh size 10mm and the second 20mm. The diameter of the cod-end is 305mm and the liner made of mesh size 0.75mm (also recorded as RMT25/20).
1st Net:- St: 7407 Date: 13/X/70

2nd Net:- St: 7803 Date: 22/II/72
(Baker et al. 1973)

RMT90 Rectangular mid-water trawl, mouth area 90m². Towed at 1.5 or 2 knots. Three nets of varying mesh size have been used, all with a cod-end of 305mm diameter and liners of mesh size 0.75mm.
1st Net:- Old BCMT netting of graded mesh size 32mm to 4.5mm trawled at 2 knots. (Recorded as TMT90).
St: 6354 Date: 18/VII/67

2nd Net:- Net of uniform 10mm mesh size, trawled at 1.5 knots.
St: 6648 Date: 7/II/68

3rd Net:- Net of stepped mesh 102mm to 13mm, trawled at 2 knots on one warp. (Recorded as RMT90)
St: 7055 Date: 24/X/69
(Baker et al. 1973)

SBN 0.5 Suprabenthic net, mounted above the benthic sledge. See under BN1.5/3M
St: 10106#1 Date: 4/IX/79

SD See under TD.

Sea Soar See under Batfish.

Sh. coll. Shore collections.
St: 2 Date: 17/XI/25

Shipek grab See under grabs.

SL Sondeur leger.
Date: Cruise 1925-27
(Richard 1910)

Smith grab See under grabs.

SN See under NS.

Squid trap See under traps.

STB Baillie sounding rod.
Date: Cruise 1925-27
(Kemp et al. 1929)

Steele sampler Water bottle, Aberdeen pattern. No other information.
Date: Ind. Ocean Exp. 1963

STN Sounding rod, Nansen-Ekman type.
Date: Cruise 1925-27
(Kemp et al. 1929)

SSL Lumby surface water sampler.
St: WS 994 Date: 4/III/50
(Lumby 1928)

TB See under traps.

TD Transparency or Secchi disc.
St: 93 Date: 23/IX/26
(Kemp et al. 1929)

TDL Tuna drop lines. Vertical baited lines with weights and suspended from a buoy.
St: 7075 Date: 31/X/69
(NIO Cruise Rep. 30)

TDM A recording device fitted to the CDB to show the time and depth of operation of the flap.
St: 6350 Date: 16/VII/67
(Foxton 1969)

TMT Tucker mid-water trawl. See under RMT.

TP Pelagic traps. See under traps.

Traps i) BTS Bottom traps 2.4m x 1.2m x 1.2m (8' x 4' x 4'). Used singly or in pairs, with or without lights.
St: 3041 Date: 16/VIII/52
(A. de C. Baker's unpubl. notes on handling gear)

ii) Falling trap Experimental, no catch recorded.
St: 3166 Date: 16/IX/54
(A. de C. Baker's unpubl. notes on handling gear)

iii) Fish trap No information.
St: 4844 Date: 10/IV/62
St: 8978 Date: 6/VIII/76
and St: 9752#2 Date: 7/IV/78
(See bio. log.)

iv) Pelagic trap A large wire netting trap for use in mid-water, 3.048m (10') long, 3.048m (10') in diameter. Experimental, no catch recorded.
St: 3069 Date: 4/IX/52
(A. de C. Baker's unpubl. notes on handling gear)

v) Squid trap There were 4 types:- Clam, Spear, Jaw and Purse. They were experimental. The largest was about 2.4m² (8 sq. ft).
Date: July Cruise 1954
(A. de C. Baker's unpubl. notes on handling gear)

vi) TB Bottom traps, attached to bottom long lines. Small experimental trap, with side entrance holes.
St: 7713 Date: 3/VI/71

vii) TGL Large, gauze fish trap. Cylindrical shape, 0.9m x 0.3m (3' x 1') covered with brass 3.175mm ($\frac{1}{8}$") gauze.
St: 90 Date: 10/VII/26
(Kemp et al. 1929)

viii) TGM Medium, gauze fish trap. Cylindrical shape, 457.2mm x 152.4mm (1'6"x6") with 1.587mm ($\frac{1}{16}$") mesh. No catch recorded.
Date: Cruise 1925-27
(Kemp et al. 1929)

ix) TGS Small, gauze fish trap. Cylindrical shape, 228.6mm x 76.2mm (9" x 3"), covered with brass gauze of 34 meshes to the linear inch.
St: 174 Date: 28/II/27
(Kemp et al. 1929)

x) TN Fish trap. Rectangular shape covered with 12.5mm ($\frac{1}{2}$") wire netting.
St: 616 Date: 16/II/31

xi) TNL (1) Large fish trap. Rectangular shape, 1.2m x 1.2m x 0.75m (4' x 4' X 2'6"), with netting or wire 12.7mm ($\frac{1}{2}$") mesh.

St: 165 Date: 18/II/27
(Kemp et al. 1929)

xii) TNL (2) Large fish trap. Rectangular, 3.66m x 1.83m x 1.83m (12' x 6' x 6'), covered with wire of 25.4mm (1") mesh with 2 funnel-shaped entrances and 2 lamps.
St: WS 1006 Date: 6/V/50
(unpubl. Note and Sketch WS80)

xiii) Trap B Bottom trap, 2 types. One is pyramidal shape (1) and originally with 1.651m (65") base and 1.219m (48") slant height covered with 25.4mm (1") wire mesh. Later on the measurements given for Trap B pyramidal shape are 1.7m base and 1.5m slant height with three entrances to the trap. It was covered with galvanised wire netting of 2.5cm mesh size. The other type (2) was rectangular, 0.610m x 0.406m x 0.406m(24" x 16" x 16") covered with 6.35mm ($\frac{1}{4}$") netting.
1) St: 7814#1 Date: 28/II/72
2) St: 7815#2 Date: 3/III/72
(NIO Cruise Rep. 50; Merrett & Marshall 1981)

Also recorded as Trap B:- Prototype free fall fish trap. An acoustically operated 'pop-up' fish trap.
St: 9629#1 Date: 27/X/77

TS No information.
St: 4259 Date: 27/IX/59

TSD Temperature, salinity, depth probe.
St: 5779 Date: 25/IX/65
(Brown 1964)

TTN Tin tow-net. High speed, experimental. See also under Plankton Samplers.
St: 4839 Date: 4/IV/62

TYF Petersen's young fish trawl. Mouth rectangular, 1.8m x 1.2m (6' x 4') and made of stramin of 11-12 meshes to the linear inch. At first it was fished as a pelagic trawl with poles and otter boards, but after July 1926 it was

attached to a circular N200 frame and used as an ordinary tow-net.
St: 71 Date: 30/V/26
(Clarke 1920; Kemp et al. 1929)

TYFS Petersen's young fish trawl as above, but with the net lined for 2.4m (8') above the bucket with silk netting (number 60).
St: 1162 Date: 21/III/33
(Disc. Rep. Vol XXI)

TYF70 As above but with the net lined for 0.914m or 1.219m of its length (3' or 4') with silk netting (number 70).

U/C Underwater camera, used in mid-water.
Date: 1956
(Baker 1957)

U/C/C Underwater ciné camera.
Date: 1958

Also underwater television.
Date: 1952
(A. d C. Baker's unpubl. notes on handling gear)

UFL Submersible fluorometer. See under FL.
St: 9043 Date: 26/VIII/76

Van Veen See under grabs.

WB and WS Water bottles and water samplers.
(Kemp et al. 1929; Barnes 1959)

Zobell sampler A presterilized glass bacteriological sampler.
Date: Ind. Ocean Exp. 1963
(Zobell 1941)

Also used on board RRS Challenger.

(1) Amphipod Trap 'Pop-up' system with baited bottle traps.
St: 50909 Date: 10/XI/80

(2) B snap Gear designed to photograph an area of sea bed over a period of days, also carrying a current meter, sediment sampler and compass.
St: 50908 Date: 10/XI/80

Appendix II Groups and shelf allocations in the Discovery Collections (not including recent benthic material)

| | |
|---|---|
| Amphioxus | J6 |
| Amphipoda | F59 |
| Annelid | J37 |
| Appendicularia | J12 |
| Ascidian | J34 |
| Bivalve | J126 |
| Branchiopoda | J55 |
| Bryozoa | D52 |
| Cephalodiscus | J34 |
| Cephalopoda | F79 |
| Chaetognatha | F5 |
| Cirripedia | J46 |
| Cladocera | J56 |
| Coelenterata (unspecified) | G33 |
| Copepoda | F49 |
| Crinoids | D51 |
| Ctenophora | G49 |
| Cumacea | J48 |
| Decapoda | G57 - G100 and HI |
| Diatoms | J4 |
| Doliolum | J10 |
| Echinoderm | D57 and E1 |
| Eggs | J15 |
| Enigmatic | J7 and J16 |
| Eryoneicus | J59 |
| Euphausiid | Basement 7/A/1 |
| Faunistic Association | D53 |
| Fish | Basement 3/D/1 |
| Fish RMT 1 | H51 |
| Foraminifera | J5 |
| Gastropoda | J125 |
| Glaucus | J124 |
| Halobates | J43 |
| Heteropoda | J128 |
| Holothurian | E4 |
| Hydroid | E3 |
| Ianthina | J126 |
| Insecta | J43 |
| Isopoda | J50 |

| | |
|---|---|
| Lucifer | J58 |
| Medusae | G1 |
| Megalopa | See file |
| Mollusca (unspecified) | J124 |
| Mysid | D1 |
| Nauplii | J15 |
| Nebaliopsis | J57 |
| Nemertina | J132 |
| Notostraca | J55 |
| Nudibranch | J127 |
| Oligochaeta | J37 |
| Ophiuroid | D48 |
| Ostracoda | Basement 8/G/1 |
| Phyllosoma | J63 |
| Physalia | G39 |
| Platyhelminth | J37 |
| Polychaeta | J38 |
| Polyzoa | D52 |
| Porifera | D56 |
| Porpita | G38 |
| Protochordata | See file |
| Pteropoda | J116 |
| Pycnogonid | J72 |
| Pyrosoma | J81 |
| Radiolaria | J5 |
| Salpa | J19 |
| Sea-weed | J6 |
| Siphonophora | Basement 5/E/1 |
| Stomatopoda/Squilla | J140 |
| Tanaeid | E3 |
| Tunicata (unspecified) | J14 |
| Velella | G36 |
| Vermes | E3 |
| BCMT | C44 |
| Corbin net | C59 |
| DN | C61 - |
| EMT | C45 - C46 |
| FRN | C46 |
| IKMT | C26 - C32 |
| IOSN | C58 |
| LHS | C51 |
| LNHS | C63 - |
| Marra Trawl | C59 |
| N50 | Bay A |
| N70 | Bays A, B and C |

| | |
|---|---|
| N100 | Basement 1/A/1 - 3/B/3 |
| N100V | C57 |
| N200 | C58 |
| N450 | C47 and C57 |
| 600 mesh | C61 |
| N113 | C33 - C43 |
| NHP | C61 |
| NN | E17 - |
| NS50 | C58 |
| Odd nets/lines | C59 - C60 |
| Oxfam | C66 - |
| Pop-up net | C44 |
| Pump/filters | C52 - |
| RMT 1 | Basement 9/A/1 - |
| RMT 8 | Basement 9/E/1 - |
| RMT 25 | C49 - |
| RMT 90 | C48 |