CRUISE REPORT OF F.R.V. "SCOTIA" - JUNE, 1949.

The "Scotia" left Aberdeen on 30th May at 5 p.m. and proceeded directly to stations west of Orkney and thereafter continued the scheduled programme. The weather was moderate for the first part of the trip and excellent for the latter part. Calls for stores were made at Castlebay, Stornoway and Oban and coal was also taken at Oban. The "Scotia" paid a visit to the Marine Station at Millport on the 21st June and terminated the cruise on the 22nd June at Port Glasgow, where she was due for dry dock at Lamont's Yard.

Hydrography.

Temperatures off the north coast varied between 9.28 and 10.55°C. at the surface and little difference (¼ - ½°) occurred between the surface and deeper temperatures. Off the west coast surface temperatures were slightly higher, 10-11°, but temperatures at depths greater than 1,000m. were about 6°C. A reading of 3.6° was noted in about 2,000m. in UU12a. Temperatures in the Minch were about 10°C; between Barra Head and Malin Head surface temperatures were about 11.5°C. at the northern end and 12.5° at the southern end. In the Clyde, surface temperatures were about 13-14½° owing to the sunny weather, though bottom temperatures were only about 8½-9°. Salinity samples were taken and drift bottles released at the required stations. The hydrographic station at XX10c was moved to 55°35'N. 6°42'W. to clear a minefield.

The reversing thermometer 1906 gave aberrent readings in UU14c and UU12a, the cause being unknown. The outer glass case of P.N. thermometer No.29653 was broken and it was replaced by thermometer 1442. The breakage is believed to have been caused by a sudden jet of hot water and steam from the drain cock of one of the winch cylinders. One thermometer in the unprotected thermometer No.U.13089 was illegible in stations WW.17d and WW.17c., the mercury column being apparently quite empty though at later stations the thermometer worked normally. A pair of messengers was lost at UU12a owing to the accidental release of the reversing bottle catch before the messengers were coupled to the wire.

Samples of water from west of Orkney and from the inshore lochs were taken for estimation of phosphate and oxygen. These were fixed on board; the oxygen samples were brought back to Aberdeen and the phosphate samples were sent direct to Dr. Black of the Institute of Seaweed Research at Musselburgh. Details of the oxygen contents in ccs. per litre have now been worked out for forwarding to Dr. Black, who has already sent the results of the phosphate analysis to Aberdeen (Ref.S.A./6).

Plankton.

Plankon samples were taken according to the schedule given in the programme, but these have not yet been worked up in detail. Rich collections of bathypelagic copepods, Sagitta, Eukrohnia, medusae etc. were taken in the oblique hauls from deep water off the west coast, though macro-plankton collections generally were only of moderate volume except for the dominant species Aglantha digitalis. Of the larval fish present Onos, Gadus poutassou and mackerel stand out most in their abundance and young haddock and whiting were rare. Deep sea fish larvae (Myctophum, Argyropelecus, Stomias, Nansenia, Cyclothone etc.) were present in deep water collections. The new type of brass clamp which allows free rotation of the warp within a shackle has proved very successful in the operation of tow-nets. Only one clamp per net is required, and tow-nets were sent down to an estimated depth of 1500 metres using 1200 fms of warp without difficulty. Ctenophores (particularly Beroe) were present locally and little else was found where these were abundant. Doliolids were present in small numbers but no salps were seen on a casual examination of the jars. Calanus was moderately abundant west of Orkney and off the west Scottis

coast generally, and was very abundant to the west and east of Barra Head and again some 30 miles north of Malin Head. Dense phytoplankton - mostly a mixture of the smaller species of Chaetoceros - occurred, west of Orkney and near St. Kilda. Chaetoceros decipiens was very dense north of Malin Head. In the Clyde area Cyanea was abundant and some very large specimens of Aurelia were seen. Donse quantities of Calanus in some areas and Temora in others were found at the actual surface in brilliant noonday sun when sub-surface collections were almost entirely free of copepods. Plankton in the inshore lochs was rather poor except for shoals of mysids (P.fluxuosus) at the edges of the incoming tide and swarms of small and medium-sized Aurelia in Loch Feochan, Kyle Scotnish, and Sailean More.

The only patch of floating weed (Ascophyllum) seen in the outer oceanic waters was picked up near St.Kilda, but as it had numbers of small Lepas pectinata and a covering of Bichmophera on it and was associated with a community of harpactids, it would appear unlikely that the weed originated from St.Kilda and an origin near the west Irish Coast is suggested. A sample was sent to Dr. Black at Musselburgh in accordance with his request.

The station at UU.15d was moved out to 58°11'N. 9°24'W. to get the desired extra depth. Two of the outer deep water stations south of St. Kilda were omitted as the previous stations were deep enough for the purpose of the investigations, and the weather was rapidly worsening. This turned out to be a wise decision as the trawl station at WW13c was successfully worked in excellent visibility, but three hours later it would have been impossible to locate it.

Trawling.

Catches along the north line of stations were moderate and contained a few megrims, lemon sole, haddock, cod and dogfish, the best catch being in ZZ17c where 116 haddock were taken, ranging from 28-43 cm., the largest numbers being between 31-35 cm. The hauls in the neighbourhood of St.Kilda were very poor, partly due to torn nets but it is also thought that these grounds were sparsely inhabited. The trawl ground at WW13c was located by echosounder and traversed in two directions at right angles, the records showing one small snag in the form of a small ridge towards one edge of the flat ground. There was still sufficient ground to work on and the dahn was placed in the approximate centre and the trawl towed round it for an hour. No tears of any kind were made and the haul was one of the most successful of the trip, except for the Clyde area. A good sample of megrim from 22-46 cm. was taken here, with haddock up to 43 cm. and four species of skate were found. It is suggested that this position should be called **The Scurrival** Ground, named after the nearest point on the Island of Barra. The true bearings are Barra Head 148½°; Ben Haeval 110° and the 603 ft. top of Eriskay 88°.

Trawls in the Minch contained only moderate numbers of fish and the grounds near Rhum, Iona and Colonsay very few indeed, although there were large catches of Funiculina, Pennatula and cidarids. The suggested position at XX12c was abandoned after a traverse of the area with the echosounder. Fishing was also poor on the line from Barra Head to Malin Head and the trawl WW11c was moved south to a smoother position at 56°03'N. 7°46'W.

Five trawls were made in the Firth of Clyde and these contained the heaviest catches of the trip. The dominant species was usually Squalus, and 715 of these were taken off Ailsa Craig. Good samples of cod and hake were also taken and the only herring of the trip (5 in number) were taken in the Clyde. A Dutch trawler working off Ailsa Craig took six boxes of hake, three baskets of cod and twelve of mackerel in a three-hour trawl but had only dogfish the previous day.

No halibut were taken during the cruise.

Inshore Lochs.

A separate report dealing with the possibilities of using Lochs Aline, Feochan, Chorie and Lowlandman Bay for fertilisation experiments has been prepared. In addition, investigations were carried out in Kyle Scotnish and Sailean More (Loch Sween). No commercial fish were taken by shore seine at Kyle Scotnish though some fish were seen at the head of the loch which might have been sea trout or mullet. Invertebrates were numerous, particularly the tectibranch Philina aptera, with crangon, Psammechinus miliaris, Asterias etc. In Sailean More a single plaice and saithe, both of 4 cm. were taken together with a shoal of some 1250 sand-eels of 4-11 cm. Invertebrates were numerous, the dominant species Ophiocoma nigra which could be seen on the sandy bottom with a density of about one per square foot near the head of the loch. Both lochs were heavily populated with Aurelia. Visits were made to Loch Craiglin but as it was not possible to take the boat to the loch no investigations were made. Numerous large eels and Carcinus were seen in the entrance to the channel.

A good sample of crustaceous plankton (mostly Calanus) was obtained for vitamin investigation by Dr. Carpenter of the Rowett Institute. The sample dried in the engine room and the dried plankton and the oil which exuded during the drying process have now been delivered at the Rowett.

Some of the more valuable and fragile equipment was left at Millport in care of the Marine Biological Station and should be collected after the work at Lamont's Yard has been completed. Included are the Nansen-Pettersen bottles, reversing bottles, thermometers, microscope, binoculars and the library books. Water samples, shore seine, fish stomachs, scales etc. and some of the plankton samples were brought back to Aberdeen by road, but the tow-net collections stored in jars liable to be damaged during road transport were stowed away on board to be landed at Aberdeen in due course.

J.B.FRASER
5th July, 1949.

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Report on inshore lochs investigated from F.R.V. "SCOTIA" in June 1949 with a view to determining their possibilities as sites for fertilization experiments.

1. LOCH ALINE.

Investigations from the "SCOTIA'S" motor boat were made in Loch Aline on June 11th. The loch has a fairly narrow and shallow entrance from the sea and thereafter broadens into the loch itself which has depths up to 120 feet just over the sill. The bottom is clayey sand at the south west and clean sand at the north east end, but the sides are somewhat stony with clumps of Ascophyllum on each stone making shore seining difficult, especially from a motor boat. The "KATHLEEN" could work both trawl and seine net in most of the loch in almost any direction of wind (provided it was not too severe) as most of the bottom appears to be clear of obstructions.

Two shore seine net hauls were made in different parts of the shore and two others off the sandy beach at the north east end. Natural fish populations are by no means absent though there is not sufficient fish present to make it worth while to fish it for a living. Shoals of herring and mackerel appear from time to time and there are saithe, lythe and flounders to be had. Larval fish were abundant in the seine net particularly larvae of Gobius spp. (mostly G. ruthensparri) and Centronotus gunnellus, and there were numbers of post-larval saithe, lythe, plaice and sandeels with some Syngnathus acus and Cottus. One flounder, 46 cms. in length, was taken by hand and others were seen of similar size.

Shore investigations revealed a rich fauna of marine invertebrates suitable for fish food, including Gammarus spp., Idothea balthica, Nereis, Arenicola and other polychaetes, Crangon, Carcinus, Philine, Cardium, Mya, Mytilus, Littorina and Ascidians. At the edge of the incoming tide it was almost soup-like with mysids (P. flexuosus). Fucus and Pelvetia zones were well marked on the stony edges and there was a thriving Zostera flora at the north east beach.

A band of fluorescein was liberated across the loch near the narrows but revealed nothing in particular during the short time for which it was visible. Surface samples for oxygen and phosphate were taken in the centre of the loch. It was not practicable to take the "SCOTIA" through the narrow entrance with the charts available so that it was not possible to operate the Pettersen-Nansen bottle. There is a strong tide-flow through the narrows but this should not drain off an excessive proportion of the loch at each tide.

The loch, about 1½ miles long and ⅓ - ½ mile broad, may be considered a little too big for initial experiments, but further investigation seems desirable as it might prove suitable for later large scale experiments should these eventually be required. The presence of so many marine (as distinct from brackish) invertebrates goes a long way towards showing that the loch is suitable for marine fish, and the deep water near the sill would tend to discourage migration of bottom fish of the loch to the Sound of Mull, whilst the sill itself should tend to limit water exchange.

Salmon and sea trout are present and if further work was to be done in Loch Aline it would be courteous to inform the owner at Ardtornish of the Department's project and to tell him that no interference with salmon or sea trout rights was intended.

2. LOCH FEOCHAN.

Investigations in Loch Feochan were made on 12th June. There is a narrow entrance which is shallow and awkward to navigate for boats larger than a small motor boat as there is a very narrow channel with only 1½ fms. depth at low water and which has a strong tide run. The shallow entrance opens into the main

main loch, itself fairly narrow (¼ - ½ mile wide), but is 3 miles long and has depths up to 16 fms. in places, though the average depth is perhaps 3 or 4 fms.

Herring and mackerel shoals occasionally come into the loch but otherwise local fishing is very poor. There are some small flounders present but these do not appear to be numerous, and an occasional saithe or skate has been caught. No local people fish the loch except for salmon and sea trout at the entrance to the streams and from a small stony groyne.

The shores of the loch are stony almost throughout, and there are many beaches of small stones suitable for seine netting. The bottom appears to be clayey mud and stones.

Shore fauna investigations revealed little but Gammarus and Carcinus, and no Arenicola, Nereis, Cardium, etc. were seen. A few Crangon, one Asterias and one Pecten were taken in the shore seine net which also caught some small Gobies (G. ruthensparri), a few G. esmarkii, Cottus, 15 - spined sticklebacks and many Aurelia, indeed the whole loch was teeming with Aurelia.

Surface samples for oxygen and phosphate were taken about the middle of the loch.

The loch was disappointing for the possibility of using it for fertilisation experiments. It is too big, not rich enough in ordinary marine fauna, and has only a poor natural fish population.

3. UPPER LOCH CRERAN.

As the "SCOTIA" could not enter the lower loch without risk, working Upper Loch Creran from the motor boat would have meant some 10 miles 'steam' and consequently too long an absence from the parent ship. It was decided, therefore, to leave the initial investigations in Creran to the "KATHLEEN" and to work in Loch a' Choire instead.

4. LOCH a' CHOIRE.

This loch would appear to be worth further investigation. It is a convenient loch to work from several respects, not the least being its easy approach and the good anchorages within, so that the "SCOTIA" could lie at anchor in the loch itself while the motor boat was used for shore investigations. This meant that the Pettersen-Nansen bottle could be used to take temperature readings and water samples. These were taken at 0, 10 and 20 metres and samples retained for salinity, oxygen and phosphate. (Phosphate samples were sent to Musselburgh). Temperatures recorded were 9.76; 9.50; and 9.30°C. at these depths.

The loch has a rather broad entrance from Loch Linnhe (about ¼ mile wide) and the loch itself is about 1½ miles long and ½ mile broad with a depth in the centre of about 16 fathoms. The bottom is muddy or muddy sand over most of the area and could be worked by the "KATHLEEN". The edges of the loch are somewhat stony generally but there were several places where the shore seine could be operated, though care is needed, because of staking to discourage salmon poachers. Hauls with the shore seine gave disappointing results and no 'edible' marine fish were taken, though post-larvae of cod, saithe, lythe were common, and shore fishes such as Gobius ruthensparri, Centronotus gunnellus, Cottus, and 15-spined stickleback were also common. Two small ballan wrasse and 1 sea trout (which was released) were caught.

According to local information, herring and mackerel visit the loch in shoals and there are plenty of flounders near the staked entrances to the rivers. Skate and saithe are frequently taken and there are seals present which can be seen to take quite large fish.

The large stones on the shore have zones of Pelvetia, Fucus, Ascophyllum and Hymenthalia. Shore fauna is abundant with Crangon, Idothea, Gammarus,

Carcinus, mysids, Littorina, Gibbula cinereria and Eolis; polychaetes are not uncommon near the stones.

A band of fluorescein was made across the entrance to the loch 1½ hours after high water at that place, and this showed that at that time the tide still flowed into the loch slightly in the centre and out of the loch on the north side.

There is a sandy bay at Camas na Croise, just north of Loch a' Choire, that might be a suitable place to obtain plaice for transplanting, though a shore seine haul there was not very successful and only two small plaice were taken (3 ozs. each).

The keeper, Mr. Macdougal, was most helpful with advice about local conditions, stakes, etc., and gave willing help in working the shore seine. He would be an extremely valuable person to contact if further investigations were made, and he offered to remove the stakes for such time as we wished to work on beaches at present staked. A courtesy letter to the owner of the salmon rights should be sent if future work is proposed:- Arthur Strutt, Esq., Kingairloch House, Ardgour, Argyllshire.

5. LOWLANDMAN BAY, JURA.

In many ways, this is the most ecologically suitable loch of those investigated and conditions in it are as near open sea conditions as is likely to be found in a bay so nearly closed. Furthermore there is a suitable anchorage in the loch which the "SCOTIA" could use. It is barely a mile long and ½ mile broad with an entrance direct from the Sound of Jura only ¼ mile wide.

Unfortunately its good points end there, and it was found impracticable to work the shore seine. There is only one sandy beach, at the head of the loch, and although it would be possible to shoot the net there a band of rocks at about low water level prevented hauling a shore seine. There are a few small sandy patches in the loch and it might be possible to investigate these from the "KATHLEEN", but most of the bottom and the shores are very rocky, with severe boulders and a rich flora of Laminaria at, and below low water level.

It would appear impracticable to use this bay for fertilisation experiments as it would not be possible to estimate fish populations satisfactorily from the one or two small sandy patches.

It is suggested that consideration might be given to investigating its possibility for use in lobster experiments.

GENERAL.

These preliminary investigations suggest that if, at any time, it should be proposed that fertilisation experiments should be conducted further, then Loch Aline and Loch a' Choire might possibly be suitable places for such operations. It would be advisable, however, to conduct a more detailed investigation if other cruises can be arranged.

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