Continuous Plankton Recorder

Preliminary notes on sampling between St. John's, Newfoundland, and Boston, Mass.
by R.S. Glover
Scottish Marine Biological Association, Oceanographic Laboratory, Edinburgh.

During the last two years the Continuous Plankton Recorder survey has been progressively extended across the Atlantic to North America. In 1961 this extension was assisted further by the award of a contract (62558-2834, NR 104-601) from the United States Office of Naval Research.

In July 1961, as part of the contract programme, two new routes were started from R.M.S. NEWFOUNDLAND (by permission of Messrs Furness Withy and Co. Ltd.) The Recorders are towed at the depth of 10 m which has always been the standard throughout the survey; the methods of analysis of the material are the same as those used since 1948 during the survey of the eastern North Atlantic and the North Sea. The new routes are:

Ea - from St. John's, Newfoundland, to Halifax, Nova Scotia.
Eb - from Halifax to Boston, Mass.

The mileage sampled so far is as follows:

<table>
<thead>
<tr>
<th></th>
<th>Ea</th>
<th>Eb</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>361</td>
<td>451</td>
</tr>
<tr>
<td>Aug.</td>
<td>449</td>
<td>358</td>
</tr>
<tr>
<td>Sept.</td>
<td>0</td>
<td>356</td>
</tr>
<tr>
<td>Oct.</td>
<td>440</td>
<td>344</td>
</tr>
<tr>
<td>Nov.</td>
<td>331</td>
<td>347</td>
</tr>
<tr>
<td>Dec.</td>
<td>260</td>
<td>339</td>
</tr>
<tr>
<td>1962</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Feb.</td>
<td>463</td>
<td>342</td>
</tr>
<tr>
<td>Totals</td>
<td>2,304</td>
<td>2,544</td>
</tr>
<tr>
<td>Grand total</td>
<td>4,848 miles</td>
<td></td>
</tr>
</tbody>
</table>

One of the major objectives of the Plankton Recorder survey is the study of fluctuations in the abundance, distribution and composition of the plankton. Results from the European part of the survey, since 1948, have shown the danger of attempting this kind of analysis from material collected over a short period of time. In general, three years sampling appears to be the barest minimum required and after five years the value of the results begins to increase in a striking way.

It would be most unwise, therefore, to attempt to generalize about the plankton on the new routes, Ea and Eb, on the basis of 6 months' sampling. These preliminary notes are offered here so that members of ICNAF may be aware of the kind of material which is being collected and analysed.
Figure 1 shows the positions of the Recorder routes during the last six months of 1961. Each route is divided into 10 mile "samples" which are numbered, consecutively, from the eastern ends of the routes. Alternative, odd-numbered, samples are subjected to a form of routine analysis, the remaining samples being used for specialist purposes only (e.g. for fish larvae and eggs). Two Records were treated as "qualitative" as a result of malfunctioning of the Recorder mechanism; in November because there was an escape of plankton; in December because the positions of the 10-mile samples are rough estimates.

Figures 2 - 5 show the distributions of a few selected organisms. It should be remembered that the Recorder samples at a depth of 10 metres. The broken line in the charts shows the position of the 100-fathom depth contour.

In Figure 2, the green colour of the filtering silks provides a rough measure of total phytoplankton which was most abundant off the southern tip of Nova Scotia (in July, August, October and December) and off southern Newfoundland (in October and November). Young fish and eggs were found mostly in July and August. We were specially interested in the specimens of young redfish (Sebastes) which were the first collected by the Recorder with the caudal pigment spots said by some workers to characterize the mentella type. All the Sebastes collected in the open Atlantic during the last seven years have been without this pigment and have been identified as the marinus type.

Figure 3 shows the numbers of "total copepods" and of Calanus finmarchicus. These charts show a feature which is seen also in Figures 4 and 5; a scarcity of plankton over the deep channel of the Cabot Strait connecting the Gulf of St. Lawrence with the Atlantic Ocean. In many of the charts the region of scarcity is flanked by a zone of abundant plankton over the shallow waters of the shelf on both sides of the channel; see, for example, the distribution of "total copepods" in August, or Ceratium fusus in October. Of the organisms plotted in the charts, only C. fusus in August was more abundant over the deep channel than over the continental shelf. This kind of sharp contrast at the edge of the continental shelf has been a constant feature of Plankton Recorder sampling in European waters.

Figure 4 shows the scarcity of Temora longicornis in the Gulf of Maine, compared with its relative abundance between Halifax and Newfoundland. In the European part of the Recorder survey this species is abundant in the North Sea but relatively rare over the Atlantic shelf and restricted to the colder northern waters of the oceanic Atlantic (Colebrook, John and Brown, 1961). Another copepod, Centropages typicus (fig. 5), was more abundant in the Gulf of Maine than elsewhere on the 'E' routes although it extended eastwards along the Nova Scotian shelf in October. In the European survey this species is common in the oceanic waters of the Atlantic but it is widespread in the North Sea where it is sometimes regarded as an indicator of the inflow of mixed oceanic and coastal water. Frost (1938) associated Ceratium fusus with mixed or Atlantic water (but not with Arctic water) off the Newfoundland coast. In the Recorder material (Fig. 5), it was found in October and November over the north-eastern part of the Nova Scotian Shelf and off the southern coast of Newfoundland. In the European part of the survey it is common throughout the North Sea and in the oceanic waters of the Atlantic (Robinson, 1961).

One of the advantages of sampling across the Atlantic using a standard technique is that it provides special opportunities for comparative studies of the plankton in European and American shelf waters and over the deep ocean. In general the plankton of the American shelf is similar to that of European waters but the present limited sampling suggests that there may be large differences in the seasonal cycles of production on the two sides of the Atlantic. The full ocean...
survey has been in operation for a very short time but it has confirmed
that the plankton over the shelves is quite distinct from that over the
deep ocean with a rich standing crop and few species in the cold northern
water and a lower crop and a great variety of species in the warmer
water between Newfoundland and the United Kingdom.

PLANS FOR THE FUTURE

With the continued assistance of H.M. Treasury and the U.S. Office
of Naval Research, it is hoped that the Plankton Recorder survey of
the North Sea and the eastern North Atlantic will be continued, as
previously, together with the cross-ocean routes introduced during the
past two years. The new sampling over the North American Shelf ('Ea'
and 'Eb' routes) will be continued and it may be possible to add other
routes in the western North Atlantic.

In March 1962, a new route (G) was introduced between Scotland and
Greenland from M.V. UMANAK (with the permission of the Royal Greenland
Department of Trade). This route will be financed partly from British
funds and partly from the O.N.R. contract.

Figure 6 shows the routes which will be sampled, at monthly inter­
vals where possible, during 1962. Requests for information concerning
these routes should be addressed to the Officer-in-Charge, Oceano­
graphic Laboratory, Craighall Road, Edinburgh 6, Scotland.

This survey of the North Atlantic would not be possible without
the assistance of colleagues in other laboratories who supervise the
equipment and arrange for the return of the collecting silks to the
Edinburgh laboratory. We are particularly grateful to Mr. David
Miller of the Woods Hole Laboratory of the U.S. Bureau of Commercial
Fisheries and to Mr. Ingvar Hallgrimsson of the Reykjavik Fisheries
Laboratory.

REFERENCES.

towards a plankton atlas of the north-eastern Atlantic
Ecol., 5: 90-97

Frost, Nancy. 1938. The genus Ceratium and its use as an indicator
of hydrographic conditions in Newfoundland waters.

Robinson, G.A. 1961. Contribution towards a plankton atlas of the
north-eastern Atlantic and the North Sea. Part I:

Fig. 6. Edinburgh
Plankton Recorder
Survey in March 1962.
Capital letters
indicate the position
of Ocean Weather
Stations.
Fig. 4