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On the study of cod in the Baltic Sea
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by

Gunnar Otterlind
Institute of Marine Research, Lysekil



In an earlier paper (Otterlind, 1966), problems of cod in the Baltic Sea were discussed. The need for international collaboration in the study of the occurrence of cod in relation to current hydrographic situations in the course of a year was stressed on the background of known migratory habits and the fact that two, genetically distinct, main populations exist here. A more comprehensive project has been postponed, however, until the necessary hydrographic investigations could be organized.

At the Sixth Conference of the Baltic Oceanographers at Sopot, in June 1968, plans were drawn up for an intensified hydrographic activity of the kind essential for the study of the above-mentioned biological problems. The planned hydrographical investigations are to cover all the months during the period January 1969 - April 1970, in principle with one expedition a month. The distribution among the participating countries can be seen in the preliminary program appended here (Appendix 1). The expeditions should comprise at least two, if possible three, weeks each. The first week should be devoted to studies of temperatures and chemical parameters at as many stations as possible, from the Gulf of Finland to the Arcona Basin. The second week should be reserved for continuous measurements mainly of the parameters mentioned from an anchoring station in the Gotland Deep. While the activities during these two weeks are uniform throughout the whole period, a third week may be used to supplement studies which, owing to weather conditions and the like, could not be completed, or for special investigations of interest to participants in the international program.

Thus conditions exist for a careful study of the hydrographic background during the period in question. It is necessary, however, that tagging cod, and related biological work will be performed mainly by special expeditions more or less parallel with the hydrographic activities. The project is therefore requiring a relatively large contribution of research vessels from the countries concerned. Although it may not be possible to organize tagging experiments every month, it is obvious that tagging should

be repeated as often as possible in the most important areas, in order to register, by short-time recaptures, the course of migration in relation to hydrographical factors.

It would be a great advantage if representatives of the countries around the Baltic could meet during the ICES conference in Copenhagen in October 1968 for a discussion of and a decision on common fishery-biological action in 1969-70. Not only tagging of cod is of interest, but also the collection of fish eggs and larvae within the areas in which hydrographic investigations are to be made, i.e. practically the whole of the Baltic proper.

When the tagging of cod is being planned for 1969-70, the technical requirements for a successful activity should be borne in mind. Generally speaking, cod caught in trawls during the high summer and in early autumn are usually less suitable for tagging. Owing to the great variations in the water temperature of different layers at that time, such ^{fish} must be returned to the bottom in a container to counteract the excessive pressure in the swim-bladder or body cavity. In rather shallow water (ca. 15-40 m), however, cod can be caught by hand-line, and released successfully at the surface during these seasons after being tagged quickly. In the winter months sometimes severe cold may make effective tagging impossible. - The intensity of cod fishing during various parts of the year must also be taken into account. It is high in winter—spring and much lower in summer—autumn. To obtain a sufficiently great number of recoveries from the latter period demands proportionally higher tagging activities during late spring and summer.

Tagging should be performed on both young and old cod, and these two categories should be separated when the recoveries are studied. Tagged very young cod (ca. 20 cm and smaller), caught in trawls, should preferably be returned to the bottom in a container, for young fish are always more sensitive to variations in pressure and temperature.

One of the most important items in common planning is a suitable chronological dispersion of the individual tagging experiments. In general, the experiments should be distributed among the most important fishing grounds, which are, to a great extent, common to the Baltic countries, e.g. several areas in the southern Baltic. In more peripheral waters and near the coasts, the work should, of course, be performed mainly by the countries nearest.

For analysing the recoveries and comparing the results, it is important that parallel tagging experiments have been made simultaneously in some fishing areas for comparisons of the effectivity of the various types of

tag and the methods used. The Bornholm Basin seems most convenient for these efforts.

If a large, common project is organized the fishermen must be given good information on types of tag, and instructions on how recoveries are to be reported, as well as information on the purpose of the tagging experiments. Repeated information in the form of circular letters to fishermen's organizations and publications would undoubtedly considerably improve the outcome of the work.

In Sweden we intend in any case to utilize the possibilities created by the hydrographic activities in 1969-70. We are planning, therefore, to tag 8,000-10,000 cod. This will be done mainly in the Arcona Basin, the Bornholm Basin, the Slupsk Furrow, east of Gotland, at northern Öland, off Landsort and in the Sea of Åland. Most of the Swedish taggings are to take place in December 1968, March-April, August and October 1969, and January-February 1970. In summer, tagging will be performed i.a. at the Midsea Banks, Hoburgs Bank and Klints Bank. - Blue and yellow Lea-tags will be used.

The outlined program with frequent expeditions for tagging cod (possibly to some extent the hydrographic cruises, too) would create facilities for necessary and urgent studies of the distribution and dispersal of cod eggs and larvae. The relations of these stages to hydrographic factors in the Baltic Sea, and also to the inflow of water from the Danish sounds requires elucidation. Light may be thrown on the recruitment to the cod population in various areas by this activity. Of particular interest in this respect is the mechanism of genetical isolation between the eastern and western cod populations (cf. Sick, 1965). The genetically conditioned biochemical characteristics of these populations should also be studied further, within various age phases, for example. Investigations of haemoglobin types indicate a varying cod recruitment even from the South-West to central Baltic, off the east coast of Gotland and south of this island (Jamieson & Otterlind, unpublished).

In the Swedish cod studies we will intensify sampling for fish eggs and larvae, preliminarily by using 1-metre nets with meshes of 280 μ (nylon gauze No. 4, or shrunk silk gauze No. 3). The overall length of the net is 280 cm of which 200 cm is gauze. It might be of advantage to take up such investigations and their methods for discussion and common planning.

It is, however, not only important to discuss plans for the near future, but also to present existing and future results of cod studies. The material of Swedish cod investigations, mainly tagging experiments from the

1950ies and onwards, is being worked up and will be published in 1969-70.- Since the Baltic is a very wide, well-defined brackish water area I think a small special meeting or symposium devoted to Baltic cod should be discussed and planned for one of the coming years. In addition to the migrations biochemical characteristics of the different cod populations and the recruitment of the latter are very important items, as are the growth and the methods of age-determination (cf. Berner 1968) and further, but not least, measures for the effective utilization of the cod stock by fishing. In my opinion a small cod symposium should be followed later on by a meeting on Baltic herring. I think such small meetings are necessary especially now when the Demersal and Pelagic (Northern) Committees have grown so large.

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Preliminary scheme for hydrographical cruises during the Baltic Year 1969-70.

	1969												1970			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
1	Sweden	USSR	DDR	Sweden	USSR	Finland	Poland	BRD	Poland ?	USSR	Sweden	?	Sweden	USSR	DDR	BRD
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