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International Council for the  
Exploration of the Sea

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Pelagic Fish (Northern) Committee

REPORT OF THE WORKING GROUP ON THE BLØDEN TAGGING EXPERIMENT

January 20th-22nd 1969

- (i) The Working Group considers as its terms of reference the following paragraph from the Memorandum on the Bløden Tagging Experiment, dated 8th July 1968:-

"In relation to the assessment of the causes of the decline in the southern North Sea herring fishery and the possible effect of the Bløden fishery on juvenile herring on it, the Liaison Committee of ICES proposed in its 1967 Report to NEAFC that a further international tagging experiment should be carried out on Bløden herring on a larger scale than those previously conducted in 1957 and 1958. It was considered now that the composition of the stocks fished in the Bløden area, and the nature of the fishery there have changed substantially from that time, and that, therefore, new, up-to-date estimates of the mortality rate generated by the fishery are required. It was considered further that the experiment should cover the spring as well as the autumn fishery in the Bløden area, between which it is known that there are changes in the composition of the exploited herring stock".

- (ii) The objectives of the experiment are according to the same Memorandum:-

"a) As in the 1957/58 Bløden tagging experiments, the main objective of the new experiment will be to obtain a minimum estimate of the proportion of the juvenile herring stock in the Bløden area taken by the fishery there. This estimate is required to assess the effect of the Bløden fishery on recruitment to the total adult herring population in the North Sea. Further, provided adequate sampling for racial analysis is conducted, it is hoped also to provide estimates of its effect on recruitment to each of the main spawning stocks separately.

b) In addition, it should provide valuable information on the distribution and migration pattern of the juvenile herring within and away from the Bløden area".

In view of the recent developments in the juvenile fisheries, the Working Group found it desirable to extend the area defined in the said Memorandum up to 58°N, and also into the Skagerrak, and has based its planning upon this extension (see Map 1)<sup>x</sup>).

In order to cover the main period of the fisheries it is proposed to advance the time of the commencement of the experiment to July 15th 1969 ending on March 15th 1970.

x) Map p.31, Rapp.P-V. Réun.Cons.perm.int. Explor.Mer, 152, with sub-areas inserted.

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(iii) The Experiment

a) Ship. The Working Group was informed by its Norwegian member that it was possible to hire a suitable Norwegian purse-seiner with its gear and crew for a period of 8 months within the costs proposed in the budget. If a new vessel were to be hired the cost would most likely be of the order of D.Kr. 930,000, including all running costs (crew, suitable gear, insurance, fuel, food, etc.). The Working Group requested the Norwegian member, with the assistance of the General Secretary of ICES, to negotiate, if possible, the hire of a somewhat smaller and older vessel well within the total cost of D.Kr. 900,000. The costs have to be made on the basis of a full 8 months charter. The period of hire should run from 15th July 1969 until 15th March 1970.

The operation of the vessel will be under the instructions of the supervisor, unless safety of ship or crew is involved. The supervisor will decide on the handling and disposal of all catches.

b) Personnel. At the request of the Working Group the Norwegian representative had investigated the possibility of hiring special personnel for conducting the tagging. The Group considered it desirable that the 'supervisor' and 'gunners' should be Norwegians. The Institute of Marine Research in Bergen has kindly agreed to release a tagging expert, Mr. Sangolt, for 8 months to act as leader of the team ('supervisor'). The hiring of the two 'gunners' for the duration of the exercise was not considered to offer much difficulty. If necessary, a third 'gunner' might be available from the Bergen Laboratory.

The contracts will be drawn up on the basis of a continuous sea-going availability.

The Group was informed that the supervisor's salary in the Norwegian service for an equivalent tagging exercise would have been approximately D.Kr. 40,000, including sea-subsistence, health-insurance, social security payments, etc. In view of the high level of responsibility for the success of the operation and the condition of service on a commercial vessel for 8 months, it was considered that an additional emolument of D.Kr. 10,000 should be made, bringing the total sum to D.Kr. 50,000.

The proposed salary for the 'gunners' is based on the payment of junior technicians in the Norwegian service, which would amount to approximately D.Kr. 30,000, including sea-subsistence, health-service, social security payments, etc.

Any approved travel expenses of the hired personnel would be according to ICES rates.

c) Tagging. The type of tags to be used in the experiment will be the small "sprat" type tag. Although the ultimate aim is the release of 100,000 tagged fish, a preliminary order of 50,000 tags was considered adequate to start the experiment. The total cost of 100,000 tags would

be D.Kr. 25,000. The necessity of purchasing three tagging guns, at the cost of D.Kr. 4,800, will be left to the discretion of the supervisor, in consultation with the Chairman of the Working Group.

The additional possibility of external tagging was considered, but the Group decided against it in view of the disappointing results with this type of tag from the 1957/1958 experiments.

Rewards. The Group felt that the usual national reward for herring tag returns should be paid, which is of the order of D.Kr. 10 per return. The costs involved to pay the rewards were difficult to estimate, as they depend on the number of tags used and the fishing rate, the determination of which is the object of the experiment. The Group has, therefore, limited the sum available in the budget for rewards to D.Kr. 70,000, payable up to 1st January 1971. This would for example cover a 10% return of an effective release of 70,000 tags, compared with a 6% return in the previous experiment. Any rewards to be paid in excess of D.Kr. 70,000 or after 1st January 1971 will have to be paid by national governments of the country, where the tag is recovered, in accordance with established international practice.

d) Boats and ancillary equipment. During the tagging operation boats have to be used, and the Group recommends the use of two rubber boats, costing approximately D.Kr. 5,000 each. In addition it will be necessary to have keep-nets and dip-nets made at an approximate cost of D.Kr. 10,000.

e) Tagging Mortality. In view of the deficiencies of the 1957/1958 taggings in respect of the determination of tagging mortality, the Group paid considerable attention to this subject. Apart from indirect estimates of tagging mortality, such as were made previously, some attempts to obtain direct estimates are desirable. The following methods were proposed:-

1. The use of free-floating keep-nets in the open sea with tagged and untagged herring, supplied by the purse-seiner and attended by research vessels.
2. Holding live, tagged and untagged, herring, supplied by the purse-seiner, in suitable containers on research vessels.
3. Experiments in keep-nets in sheltered coastal waters and tanks in laboratories with locally caught juvenile herring.

It is expected that attending research vessels will assist in carrying out Method 1. Dependent upon suitability of the research vessel and its facilities, it is hoped that some experiments by Method 2 would be made. Neither of the experiments mentioned under points 1. or 2. should be extended more than five days. Realising the probably excellent facilities for executing Method 3 in several of the participating countries (Waddensea, Kieler Förde, Ringkøbing, Limfjorden, Norwegian fjords, Swedish west coast and Scottish coastal area), the Working Group strongly recommends that every effort should be made to obtain information especially on the influence of temperature and condition of the fish on tagging mortality.

f) Distribution of Tags in Time and Space. It is necessary that the tags should be distributed over a wide area throughout the course of the experiment in order to get tags into as many components as possible of the juvenile stocks of the North Sea herring.

It is realised that the tagging positions will be determined in the first place by the availability of suitable fish shoals. The distribution of fishing over recent years led the Group to establish four general tagging areas (see Map 1). It is the intention that tags would be liberated within each of the areas within each month, depending upon the availability of fish as reported from the commercial fishery and research-vessel searching. In view of the location of some of the fishing grounds close to the Danish coast, permission has to be obtained for the vessels to fish within the Danish exclusive fishing limits.

It is estimated that an efficient tagging team can work at a rate of 200 tagged fish per hour. In order to minimise the effects of increased tagging mortality with time it was decided that tagging on a catch should be limited to about 5 hours from the start of the tagging. In this manner a batch liberation of 2.000 tagged fish would be the maximum, using two tagging teams as intended. At this rate 100.000 tags could be liberated in a minimum of 50 successful shots. In view of the dependence of tagging on suitable weather, windforce 3 being most likely the limit, a number of 50 successful shots were considered to be a reasonable expectation of the experimental period, which includes the winter. An average of 9 to 12 working days per month could be expected according to meteorological observations.

g) Research Vessels. It was considered necessary that during the whole experiment the purse-seiner should be supported by at least one research vessel at the time. The work of the research vessel would be:

- (i) to assist the purse-seiner in locating suitable herring concentrations,
- (ii) to carry out experiments to obtain estimates of tagging mortality (keep-nets, tanks on board), and
- (iii) to make hydrographic surveys to supplement observations made on the purse-seiner.

The following time-table for research vessel assistance was prepared in October 1968, and the Working Group now expects that this plan can be carried out, perhaps with one reservation:-

1969

August	-	Poland
September	-	Denmark
October	-	Poland
November	-	Netherlands
December	-	Norway

1970

January	-	Germany
February	-	International Young Herring Cruises, including ships of different countries.
March	-	France.

Unfortunately it was reported that the Danish research vessel may have to be withdrawn from its commitment. The Working Group stresses the need for adequate research-vessel support during this month and has requested the Danish member to look into the possibilities of making alternative arrangements.

With the change in the proposed date of commencement, some adjustments would be necessary in the research-vessel time-schedule. The French member will investigate the possibility of covering the month of July 1969 instead of March 1970.

While the research vessels are in attendance of the purse-seiner the Group requests that the vessels take advice from the Supervisor on the purse-seiner concerning the areas to be searched and the experiments on tagging mortality to be carried out.

h) Purse-seiner reporting procedure. It will be necessary for the Supervisor to report on his activities at frequent intervals. These reports will be sent to ICES headquarters, which will be responsible for copying and distributing them immediately to members of this Group. Any communication arising from these reports should be sent to the Chairman of the Group and copied to ICES. The Chairman, or his delegate, will be the only member of the Group authorized to issue instructions to the Supervisor, such instructions normally being transmitted through ICES headquarters.

It is considered that a small group of 3 or 4 people, together with an ICES officer, should brief the tagging team on the commencement of the experiment, in Esbjerg. Additional meetings of members of the Group with the tagging unit or its Supervisor may be needed.

A letter of instructions for the Supervisor will be prepared, giving a more detailed description of the programme.

Arrangements will be made to keep the purse-seiner informed of the positions of the Danish fleet.

i) Tag-recovery. The success of the whole experiment is heavily dependent on a high efficiency of detection of the tags in all the major plants handling the herring catches from the North Sea and Skagerrak. It is the considered opinion of the Group that it will not be worthwhile to carry out the experiment unless adequate facilities for tag-recovery are available.

The countries which are expected to yield about 90% of the tag returns are Norway and Denmark. Some recoveries may be obtained in Germany and Sweden, and perhaps also Scotland.

It is understood that in Norway most of the plants are fitted with efficient magnets. Denmark reports efficient magnets in the major plant in Esbjerg, but other plants have either low efficiencies or were reported not to be equipped with magnets. Considering the predominant position of the Danish fishery in the total catch of juvenile herring, for which a major part of the tag returns are to be expected, the Group strongly presses for adequate facilities for tag-recovery in all the major plants in each port of that country.

The Memorandum of the experiment sent to the participating countries stated that tag-recovery and magnet efficiency in a country's industry belonged to that country's responsibility. In view of the urgency of arranging for adequate facilities for tag-recovery, it is proposed that a recoverable sum of about D.Kr. 10,000 is reserved in the budget to meet any temporary financial difficulty on the immediate installation of suitable equipment.

Tag losses in the fish hulls and in handling before reaching the magnets might be an important factor in recovery rates in some months and it was stressed that countries concerned should take measures to assess these losses.

The advertisement of the tagging experiment is considered a national responsibility and countries are urged to prepare posters for fish-meal plants.

In addition the Group will prepare a short account of the proposed experiment for publication in national fish-trade papers.

(iv) Statistics

The actual tagging is only a part of the experiment in question. No results can be obtained without detailed statistics on catch and effort broken down by areas, which preferably should be even smaller than the international statistical rectangle.

At present (January 1969), the collection of detailed national statistics on juvenile fisheries in the North Sea and Skagerrak is as shown below:

Denmark: Satisfactory coverage of the Esbjerg fishery broken down by 15 x 15 naut.m. squares. The fishing from Thyborøn, being about 20% of the Bløden fishing is not sampled.

There is no information about the industrial fishing in Skagerrak except for Danish and Swedish landings of adult herring in Hirtshals.

Sweden: No information at all.

Norway: No information on effort available to the Group. Catch-statistics are only broken down by fishing grounds.

Germany: No information.

It is evident, that at the present level of statistical information no result can be obtained by the tagging experiment as envisaged. It is essential that at least 50% of the Skagerrak catches and 50% of the North Sea catches are covered in this respect, and it is the considered opinion of this Working Group, that unless this demand for catch and effort data from landings is fulfilled, the entire experiment will be a waste of money and manpower.

Concerning the adult fishery there is also need of statistical data. At the present time the following countries have given data as shown below:-

Country	Total landings in the North Sea, Skagerrak and Kattegat	Total landings with reference to area	Effort data	Gear
Denmark	X	X (partly)	X (partly)	X (partly)
England	X	X	X	X
France	X	X	X	X
Germany	X	X	X	X
Netherlands	X	X	X	X
Norway	X	X	-	X
Poland	X	X	X	X
Scotland	X	X	X	X
Sweden	X	-	-	-
U.S.S.R.	X	?	?	?

The following data are considered to be wanted for national collecting of statistical data, both for adult and juvenile fisheries.

1. Type of boat (gross tonnage, power)
2. Number of days at sea
3. Number of days fishing
4. Type of gear (seine, pelagic trawl, pair-trawl, bottom-trawl and drift-net)
5. Quantity (of herring and eventually of by-catches) caught in each statistical area.
6. Indication of fishing effort per statistical area (e.g. seiners, number of shots; trawlers, number and duration of hauls).

(v) Sampling

It will be necessary to sample the purse-seiner catches, the commercial landings and the research-vessel catches.

a) Purse-seiner catches

(i) Tagged fish. The Group considered it important that the personnel of each team should, as far as possible, remain unchanged throughout the whole experiment. The teams will alternate in making length measurements of the fish, which they tag. During tagging records should be kept of the serial numbers of the tags used by each team in half hourly periods.

(ii) Untagged fish. A random sample of 100 fish will be taken from the remainder of the catch for length, age and weight determination.

b) Commercial landings

Random samples of at least 100 fish should be taken daily in all major ports in which juvenile herring is landed (Denmark, Norway, Germany), for length and weight measurements. 2 samples per week should be treated for age and other determinations. The position of the catching of these samples should be known.

c) Research vessels

In so far as research vessels during their scouting activities make trawl-hauls, these should be sampled in a similar manner to that used on the purse-seiner.

d) Sampling for stock analysis

In order to assess the effects of the juvenile fishery on the recruitment to the different components of the autumn-spawning North Sea herring (Downs, Bank and Buchan), special samples for separate analysis will be needed. As at present it is uncertain whether adequate methods of stock analysis will be available for the young herring, it is proposed that additional samples should be deep-frozen, both on the purse-seiner and in the ports. The samples should be replicates of those used for age analysis. Working up and analysing this material should be carried out at national cost. The costs of deep-freezing these samples from the purse-seiner have been estimated at D.Kr. 2,000.



It cannot be expected, that any results of this analysis will be available before 1975 at the earliest, to allow for the time to recruitment of the tagged year-classes and the time-consuming analysis.

e) Additional observations

At each tagging position surface and bottom temperature need to be recorded. It is proposed to use a bathythermograph and it is hoped that this can be done without cost to the project.

(vi) The analysis and final report

An account of the conduct of the experiment will be made as soon after the termination of tagging in March 1970.

An analysis of the data, available up to January 1971, will be made during spring 1971. At that time the necessary commercial statistics of the 1970 fishery ~~should~~ be available. It is expected that a meeting of the full Group, necessary for analysing the data and preparing a report, will at least require 10 days. Preliminary data summarization will be carried out by the Secretary of the Liaison Committee on a continuous basis throughout the experiment and up to January 1971, in preparation for the meeting. He will keep the members of the Working Group informed about this preliminary analysis. It is hoped that this will provide a basis for informing the NEAFC at its meeting in May 1971. The full report will not be available before 1972.

Tags are expected to be returned for some time after January 1971. An eventual **analysis** of these data, coming from the adult fish, will have to be considered at a later date.

(vii) Management of the experiment

The Group felt, that the preparation of the experiment and the day to day management should be executed from the ICES-headquarters. It is understood that the individual members of the Group will assist ICES officers in these tasks. ICES will be responsible for contracting ship and personnel, purchasing the necessary equipment, maintaining the reporting system of the operation and assisting in the statistical analysis of the data.

(viii) Costs

<u>ICES Account No.</u>	<u>Item</u>	<u>D.Kr.</u>	
B.2	<u>Ship hire</u>	930,000	(900,000)
B.3	<u>Personnel:</u>		
	Supervisor, basic salary	40,000	
	Supervisor, increment	10,000	
	2 'gunners' à 30,000	<u>60,000</u>	110,000 (126,000)
B.4	<u>Miscellaneous:</u>		
	100,000 tags	25,000	
	3 guns for tagging	5,000	
	rewards	70,000	
	keep-nets, dip-nets etc.	10,000	
	2 rubber boats	10,000	
	deep-freezer	2,500	
	renting of deep-freezing comp. (Esbjerg)	2,500	
	telegrams, echo-sounder paper, pilot charges etc.	10,000	
	meetings	40,000	
	inspection and travel	10,000	
	suspense accounts (magnets)	<u>10,000</u>	195,000 (140,000)
B.5	<u>Contingencies (unforeseen)</u>	<u>15,000</u>	( 84,000)
		1.250,000	(1.250,000)

Figures in parentheses are from the preliminary cost estimate.

Charlottenlund, 20th-22nd January 1969

J.J. Zijlstra (Chairman)  
H. Ackefors,  
A.C. Burd,  
S. Haraldsvik,<sup>1)</sup>  
Cl. Nédélec,  
J.A. Pope,  
K. Popp Madsen,  
G. Wagner,  
The General Secretary.

<sup>1)</sup> took part in the meeting on the 20th only.

