Bestand.

International Council for
the Exploration of the Sea.

C M 1957.

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H E R R I N G T A G G I N G E X P E R I M E N T S

B L Ö D E N G R O U N D

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P A R T I

b y

Olav Aasen
David Cushing
K. Popp Madsen

.....

I. Introduction.

The socalled "Industrial Fishery" for immature herring on the "Blöden Ground" began in July 1950 [1] when a Danish cutter accidentally found dense concentrations of young herring 60-100 m.m. west of Esbjerg. (Jensen, 1951). Since that time this fishery has developed into important industries in Denmark and in the German Federal Republic. (Fig. 1).

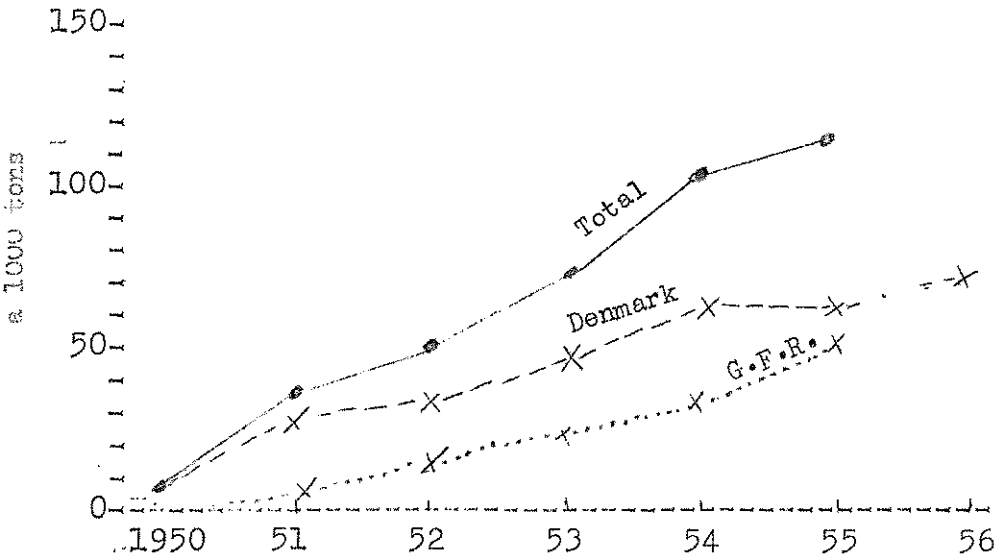


Fig. 1. The Danish and German (G.F.R.) landings of young herring for industrial purposes.

The herring is caught by trawls and pair trawls and is utilized almost exclusively for processing in reduction plants. Typically, there are two fishing seasons: The spring fishery (January - beginning of May) and the autumn fishery (July - Oct.) Of these the autumn fishery is the more important. The fish belong mainly to the I and II group herring with average lengths about 17 [2] and 20 cm. in spring, while for the autumn the corresponding figures are 19 and 22 cm. (Bertelsen & Popp Madsen, 1952). Occasionally also 0 - group and III - group herring are caught. Usually the catches include a small amount of whiting. As a general rule, according to the same authors (Bertelsen & Popp Madsen, 1953), the herring tend to aggregate in the autumn on the border between water masses of different temperatures, and thus the area of the Blöden

1) A Danish fishery for 0-group herring in Graa Deep had been in progress since 1948.

2) The 1952 samples were biased for length, the average is usually 15 cm.

fishery at this time of the year may be roughly defined as the ground covered by bottom water of a temperature less than 10°C.

This rapidly expanding fishery for small herring did not fail to attract attention of the fisheries' authorities and the herring biologists in the various countries participating in the herring fisheries of the North Sea. The crucial question was:

To what extent did the Blöden fishery for small herring affect the North Sea herring fisheries as a whole ?

When the East Anglian herring fisheries changed character in the 1951 season (Hodgson, 1954), one school of thought maintained that one of the prime causes for the failure was the new industrial fishery for immature herring. The material at hand, however, failed to yield any conclusive evidence and the opinions of the scientist differed widely. It was evident that additional data of a different nature would be needed for solving the riddle.

II. Preparatory Work.

In 1953 Erik Bertelsen voiced the opinion that a tagging programme ought to be started on the Blöden Ground herring, designed to establish the fishing mortality of this stock. Preceding experiments with commercial trawl in the area had indicated that herring caught in this manner were only to a very limited extent fit for tagging, and in view of the results obtained by the Norwegian fat herring taggings (Aasen, 1952, 53) the purse seine was considered to be an ideal gear for securing live material if it could be employed at the Blöden ground. This question was examined in collaboration with Olav Aasen, but, unfortunately, the expenditure was considered to be outside the limits of the ordinary fishery research budget for Denmark and these plans were shelved.

In the summer of 1956, David Cushing, in preparation for the speoial scientific meeting on the herring of the Southern North Sea (Rapp. et Proc. - Verb., Vol. 143, part I), visited the various fisheries research institutions in the countries bordering the North Sea, presenting the English view on the disturbing changes in the East Anglian herring fishery. (Cushing & Burd, 1956). During the discussions in Bergen between Cushing and Aasen, the latter raised the question whether it could be possible to obtain support from the various interested countries for launching a large scale herring

tagging scheme in the North Sea in order to secure additional and more direct observational data. It was agreed that Cushing should ventilate this question with the various experts he was to contact on his round trip.

The beforementioned scientific meeting on the present state of the herring stock in the Southern North Sea agreed in a resolution " ...., to urge all interested countries to participate in a co-ordinated programme ... - including ....an intensive tagging programme." The Herring Committee considered this proposal and appointed an ad hoc committee to draft a general programme of research. This committee, consisting of Aasen, Bertelsen, and Cushing, submitted the following draft which was agreed upon:

1. The ad hoc committee considers that international co-operation can best be started by an intensive tagging programme on the Blöden Ground which is a vital area. The programme is directed at this nursery ground to find out the fishing mortality there and to determine the pattern of recruitment from this area to the adult fisheries.

2. The two problems, that of mortality and recruitment, can be elucidated by internal and external tagging experiments, respectively. To get the fish in good condition and to obtain quantitative results, the committee considers it necessary to use a purse seine as this is the best gear for the purpose.

3. The programme should be started in August 1957. The internal tagging experiments for mortality rates should follow the methods used by the Norwegians in their fat herring fishery. The external tagging experiments for recruitment and migration should follow the methods used in the Swedish herring investigations.

4. If the internal tagging experiments are to be successfull it it is essential that member countries take an inventory of their herring meal factories and see they are fitted with magnets under controlled conditions and tested for efficiency.

5. During the period of the experiment the statistics of catch and effort in small unit areas on the nursery ground must be recorded in detail; it goes without saying that catch and effort statistics are required all over the North Sea in small unit areas to elucidate the problem of migration.

6. It is proposed that a working group of experts be set up, one member from each interested country, to plan, carry out, and work up the results of the experiments.

7. Finance. As the research ships available in the North Sea cannot work purse seines, it will be necessary to charter a suitable ship for one month, in the first instance, in 1957. A rough estimate of the expenditure for the charter of ship

and cost of tagging material and rewards., comes to 150.000 kr. (D.). This sum should be borne equally by participating countries who should obtain approval in principle for the scheme as soon as possible so that the working group can meet by December 1st, 1956.

The Herring Committee proposed furhter that three experts should meet as soon as possible in order to prepare a detailed programme of work. ICES agreed to this and recommended:

"Following the Recommendation of the Herring Committee, it was agreed that three experts nominated by this Committe should meet in Copenhagen as soon as possible and at all events before the end of 1956 in order to prepare detailed plans for a large-scale tagging experiment in the southern North Sea. It is expected that such a plan will involve participation and financial contributions by the interested Governments and that, as soon as possible, these Governments will be invited to send representatives to a special meeting convened by the Secretary General, at which the question of participation will be discussed."

On 8. and 9. of November 1956 the nominated experts (Aasen Bertelsen, Cushing) met under the chairmanship of Mr. Aasen, and made the following plan:-

I. Work at Sea.

(a) A purse seiner will be used to catch the herring in the best condition for tagging. The ship will be 80' long, will be shot from the vessel itself with the assistance of one dory. Esbjerg will be used as a base.

The purse seine will be 15 fms. deep and so will fish right to the bottom over all the Blöden Ground, much of which is smooth; Norwegian fishing skippers have examined Blöden echo-records (Atlas echo-sounder) and are confident that they can catch the fish.

(b) Tagging will be carried out on the Blöden Ground area from the end of July to the end of August 1957 in the best part of the fishing season, when the weather is normally good. Up to 20.000 internally tagged fish will be liberated in order to estimate fishing mortality; up to 5.000 externally tagged fish will be released to study the movement of Blöden fish into adult fisheries.

(c) Three tagging teams will do the work under the supervision of a naturalist-in-charge. The naturalist-in-charge will also be responsible for deciding where to tag and how intensively to tag.

(d) It would be most welcome if national research programmes covered additional work in the area; such programmes should be reported to the working group metioned below.

II. The Making of Records.

(a) The tagging records at sea are the responsibility of the naturalist-in-charge and he will hand them over to the Secretary General at the end of the experiment.

(b) Rewards paid for tags will be refunded from the ICES (the separate account (III c)). The Governments are asked to provide information services which facilitate the recovery of tags.

(c) In addition to the statistics of catch and effort already collected from the whole of the North Sea, it will be necessary to collect detailed statistics of catch and effort from the Blöden Ground itself. It will be also necessary to keep detailed records of the quantities of fish processed in each factory. Magnets in the principal factories should be tested for efficiency in recovery.

III. Administration.

(a) Each country should appoint an expert to deal with the tagging experiment and these experts should form a working group reporting back to the Herring Committee. This working group will appoint four experts to carry out the work at sea, one of whom will be appointed naturalist-in-charge.

(b) An equal share of the expenditure is borne by the participating Governments.

(c) The funds provided by the interested Governments are to be paid into a separate account from which all expenses in connexion with the experiments are covered.

(d) While the salaries of these experts remain the responsibilities of the respective Governments, the travel expenses and per diem in connexion with the experiments are covered from the funds provided by the interested Governments.

(e) It is suggested that the special meeting of representatives should take place in the last ten days of January 1957.

(f) Accounting of expenses is carried out by the Secretariate.

(g) An estimate of the costs is given in detail as follows. The total expenditure amounts to Danish kroner 140.000.-.

Estimated Expenses.

I. Purse Seiner:

Ship	kr. 20.000.00		
Crew (1 Skipper, 10 Fishermen) ..	" 20.000.00		
Food and Water	" 5.000.00		
Oil and lubricants	" 15.000.00		
Gear	" 15.000.00	kr. 75.000.00	kr. 75.000.00

II. Tagging Equipment:

a) Internal Tagging.

2 tagging guns	kr. 1.552.00		
160 magasines	" 1.040.00		
4 boxes (stainless) ..	" 552.00		
20.000 tags (numbered)	" 3.600.00	kr. 6.744.00	
b) External Tagging.			
5.000 Lea hydrostatic tags	kr. 7.500.00	kr. 7.500.00	
c) Accessories.			
3 live nets	kr. 2.000.00		
6 dip nets	" 360.00		
1 tagging sluice	" 1.500.00	kr. 3.860.00	
d) Miscellaneous.			
Ropes, buckets, tubs, recording forms etc.	kr. 1.896.00	kr. 1.896.00	kr. 20.000.00
III. Rewards:			
3000 recaptures á kr. 10.00		kr. 30.000.00	kr. 30.000.00
IV. Administrative Expenses.			
Travel per diem, extra office expenses, working up of results etc.		kr. 15.000.00	kr. 15.000.00
		Grand Total:	kr.140.000.00

Addendum (to Estimated Expenses):

Surplus fish from the catches should be allowed to be landed and sold at market prices in any participating country. Any income thus obtained should be paid into the account mentioned in III c. The percentage for the fishermen will be 30 %. If fishing goes well, the cost of the experiment will be substantially reduced, and the participating Governments would be reimbursed.

It is sincerely to be hoped that the interested Governments will regard favourably the importance and urgency of the matter. The proposed plan represents a quick and reliable way of collecting vital information necessary for a sound evaluation of the state of affairs. The situation may well arise that the effect of fishing will be disastrous before sufficient statistics can be obtained by the methods heretofore employed. The time is therefore ripe to employ immediate radical and energetic measures to close the gaps in knowledge indispensable to any intelligent management of the fish stock in question.

At this stage, when the frame-work of the first phase of the co-ordinated international research programme were laid down, the General Secretary of the ICES, Dr. Arni Fridriksson, approached the various interested Governments and a number of countries (7) agreed to participate. A meeting convened by the Secretary General was held on February 18th and 19th 1957 at Copenhagen to discuss the tagging of herring in the Southern North Sea. The following countries were represented:- Denmark (Dr. Å. Vedel Tåning and Dr. E. Bertelsen), Germany (Dr. G. Krefft), Netherlands (Mr. G.J.Lienesch), Poland (Mr. J.Popiel), Sweden (Dr. H.Höglund), and United Kingdom (Dr. D.H. Cushing). The USSR was unfortunately not in a position to send a representative. The Chairman of the Herring Committee, Mr. Olav Aasen, was invited to take part.

The Secretary General was unanimously elected Chairman.

The report of the committee which met in November 1956 was considered and it was agreed that the naturalist-in-charge should be elected by the meeting as he would be responsible to the Council for the carrying out of the whole plan.

It was agreed to ask the Central Office to administer the finances.

Mr. G.J.Lienesch (Netherlands) recommended that the plan designed for 1957 should be continued in the future, but within the financial contributions for the countries which participate in 1957.

The meeting welcomes the presence of a number of research vessels on the Blöden Ground area. It is highly desirable that the national programmes of these vessels reach the naturalist-in-charge before the work begins.

It is assumed that intense sampling for age and length of fish landed from the area in question will be carried out.

The meeting unanimously elected the Chairman of the Herring Committee, Mr. Olav Aasen, as naturalist-in-charge. His duties were defined as follows:-

1. to charter a purse seiner with its skipper and crew.
2. to provide gear and equipment.

3. to write a guide on testing the efficiency of magnets in factories, to be distributed to the members of the working group and to provide them with unnumbered tags for that purpose.

4. to design a poster giving information on the experiment: this would be translated in each participating country and copies distributed to factories and other centres.

5. He will be responsible to the ICES for executing the plan.

The delegates present at the meeting appointed a working group as follows:-

Dr. E. Bertelsen, Denmark,
Dr. G. Krefft, Germany,
Dr. J.J.Zijlstra, Netherlands,
Dr. H.Höglund, Sweden,
Dr. D.H.Cushing, United Kingdom,
Mr. J.Popiel, Poland.

The member for USSR will be appointed later by correspondence. 1)

The duties of the working group are:-

1. to take care of the efficiency of magnets in the factories.

2. the collection of tags and their transmission to ICES.

3. to ensure that adequate statistics are collected.

4. to advertise the experiment on national information services, including radio.

The following four scientists were unanimously elected as a tagging team to join the naturalist-in-charge for the field work:-

Dr. E. Bertelsen, Denmark,
Dr. G. Krefft, Germany,
Dr. H. Höglund, Sweden,
Dr. D.H.Cushing, United Kingdom.

It was agreed to leave the question of the working up of the material to the Herring Committee.

All participating countries should have facilities to send trainees for observation. It was decided to provide for the headquarters of the experiment to be in Esbjerg, Denmark.

It was recommended that:-

1. Additional tagging be carried out by different methods, that echo surveys and hydrographical surveys be made and that stock samples be taken.

2. That detailed statistics of catch and effort be collected from the Blöden Ground during the tagging experiment, especially statistics of the daily input of each factory was stressed.

1) USSR member J. J. Marty.

Of the naturalist in-sharge's duties, as laid down in the preceding, the first 4 points fall in the category "Preparatory work", and will be delt with here:

1. During the spring of this year (1957) an account of the planned experiments were presented to the press, and through advertising a suitable purse seiner (M/S "RYGRUNN" of Bremnes, Norway) was secured. The contract was drawn up 27. April 1957. (Appendix 1). It will be noticed that the ship is somewhat more expensive than provided for in the estimate, but on the other hand the seiner was bigger and with larger crew. Moreover, the ship with its gear and equipment was new.

2. Although Norway did not enter the international scheme of the tagging work, the Norwegian fisheries authorities agreed to aid the work with technical assistance. In consequence of this, outfit for the internal tagging was lent by the Intitute of Marine Research in Bergen. The Norwegians provided:

   4 tagging guns
   25000 internal tags
   4 live nets 1
   8 dip nets
   1 tagging sluice
   Accessories and miscellaneous equipment.
   (ropes, buckets, tubs, recording forms etc.).
   1000 alcathem tags for external tagging.
   (none of these were used).

   Unfortunately it proved impossible to secure in time the Lea tags (hydrostatic external tags). Moreover, Dr. Höglund, who was supposed to organize the external tagging work, was unable to participate in the field work. Dr. Höglund, however, provided 1000 Lea tags from his own stock with cradles and other equipment for fixing the tags. The Fisheries Laboratories in Lowestoft and Charlottenlund provided, respectively, further 2000 Lea tags and 2000 Danish tags of similar construction.

3. A "Guide on testing the efficiency of the magnet installations in the reduction plants" was worked out and distributed to the Working Group through ICES. (Appendix II). Unnumbered tags for the tests were dispatched to the various interested countries according to a requirement list provided by the members of the Working Group. (Appendix III).

4. A poster, to beput up in the reduction plants, was designed and distributed through ICES (Appendix IV). In addition were circulated "Notes on Collecting, Recording, Transmitting, and Payment of recovered internal Herring Tags in Reduction Plants" (Appendix V).

In order to deal with specific problems and details in organizing the work a comprehensive correspondence has been necessary.

The first 3 points of the Working Group members' duties are in the nature of field work and will be dealt with in part II of this report. Concerning point 4, the advertising of the experiment through information services, the Working Group members have submitted the following accounts:

U.S.S.R. (J.J. Marty):
no account

Poland (J. Popiel):

" We have endeavoured to popularize the experiments by publishing some articles in our professional fishery press which is read by broad circles of Polish fishermen, explaining the aim of the tagging and requesting that all recovered external tags be sent to out laboratory.

Besides, we have published a poster, hung in all work-shops and ports. The poster reproduces various types of tags, promising a reward for each returned tag."

Sweden: (H. Höglund):
no account

Denmark (E. Bertelsen):

The experiment has been advertised in several interviews and articles in Danish papers and periodicals, at meetings of fishermen and representatives of the fishmeal industry and in the Danish T. V. Partly as a result of this nearly all involved - administration, factories, and fishermen - are most interested and co-operative.

In some of the few cases where magnets were lacking or ineffective our approach to close these gaps were successful. Through co-operation with the foremen the best possible informations on position of catch of the tagged herring were secured.

Cards for returned tags and informations and posters (App. 6) were distributed to all factories.

The co-operation with the factories is extremely good, and detailed informations on time and place of catch have been obtained for a very large percentage of the returned tags.

(The only complaint we have had came from one of the formen who was troubled by the fact that the workers spent most of their time at the magnets waiting for tags!)

The liberations of externally tagged herring in the Blöden Ground area has been advertised in the Danish fishing-periodical and local newspapers of Esbjerg and other fishing towns.

Germany (G. Kreffts):

Um die Mitarbeit der Fischer wie der Fischmehlfabriken zu erlangen wurden

1. Auf einer am 31.5.1957 in Hamburg stattgefundenen Sitzung unter Vorsitz von Heern Professor Dr. Bückmann Absprachen zur Mitarbeit mit dem "Verband Deutscher Fischmehl- und Fischölfabriken e.V.", mit dem "Deutschen Fischereiverband e.V." und den Direktören bzw. Vertretern der Fischereiforschungsinstitute in Bremerhaven, Cuxhaven und Kiel getroffen.
2. Den beiden Verbänden wurden Denkschriften und Anweisungen zur Mitarbeit für ihre Mitglieder zugesandt.
3. Den einzelnen Kuttergenossenschaften wurden durch den "Deutschen Fischereiverband e.V." Fangmeldebögen zur Aushändigung an die Kutterfischer mit einem Aufruf zur Mitarbeit ausgehändigt.
4. In den Fischmehlfabriken fanden Besprechungen der örtlichen Wissenschaftler mit den Fabrikdirekturen und Vorarbeitern bzw. Betriebsleitern über das geplante Experiment statt. Werbeplakate nach Muster des norwegischen Plakates wurden in den Fabriken ausgehängt.
5. Das Bundesministerium für Ernährung, Landwirtschaft und Forsten unterstützte das Experiment durch ein Schreiben vom 21.6.57 an die genannten Verbände.
6. In Presse und Rundfunk wurde wiederholt auf das Markierungsexperiment hingewiesen und die Öffentlichkeit um ihre Mitarbeit ersucht.

Alle Verbände sagten weitgehend ihre Unterstützung zu.

Netherlands (J. Zijlstra):
no account.

U.K. (D. H. Cushing):

Posters have been prepared and circulated to the factories Mr. Parrish and Mr. Bolster visited all factories and interviewed foremen, workmen and managers and stimulated their interest. No widespread effort on press and radio was made because the number of tags expected was small.

Literature

1) Aasen, 1952: "Tagging Experiments"

Ann. Biol., Vol. IX., pp. 172-173
Copenhagen, 1953.

2) " 1953: "Tagging Experiments"

Ann. Biol., Vol. X., p. 149
Copenhagen 1954

3) Bertelsen & Popp Madsen, 1952: "Young Herring from the Blöden Ground Area"

Ann. Biol., Vol. X., p. 179
Copenhagen 1953

" 1953: "Young Herring from the Blöden Ground Area"

Ann. Biol., Vol. X., p. 156
Copenhagen, 1954.

4) Cushing & Burd 1956: "On the Herring of the Southern North Sea".

Ministry of Agriculture, Fisheries and Food Fishery Investigations Series II, Vol. XX, No. 11
London 1957.

5) Hodgson, 1954: "East Anglian Herring Fishery in 1954".

Ann. Biol., Vol. XI,, p. 139
Copenhagen, 1956.

6) Jensen, 1951: "Young Herring at the "Blöden Ground - Clay Deep"

Ann. Biol., Vol. VIII,, p. 142,
Copenhagen 1952.

Chartering Contract

between owner - Mr. Karl MÅland - and charterer - The International Council for Exploration of the Sea (ICES) - for hiring of the purse seiner M/S "RYGRUNN" to tag herring on the Blöden Ground.

A. M/S "RYGRUNN"s specifications.

1. Technical Data.

Length 108', breadth 23', depth 12'.
Tonnage: Gross 177 t, net 60 t.
Engine: 30 HK Wickmann, cruising speed 10 n.m.

2. Gear & Equipment.

2 seining dories, 2 fat herring seines, pilot boat, radio telephone, direction finder, 1 echosounder (mother ship), 1 echosounder (pilot boat).

3. Manning.

Captain, Engineer, Steward, master fisherman, 5 man for each dory, total 14 man.

4. Cabins.

3 single, 3 double, 3 four persons, berths in all for 21 man.

B. Plan of Work:

1. Departure Monday 22. July 1957 from home port (Bremnes, Norway), to Bergen for taking in stores and equipment, arrival in Esbjerg (Denmark) Wednesday 24. July 1957.

   Work Blöden Ground:
   25. July - 17. August 1957.

Departure Esbjerg Sunday 18. August 1957, to Bergen for unloading equipment, arrival home port 20. August 1957.

2. In case the charterer finds it necessary ICES shall have option to prolong the contract, though not for more than a fortnight, - 14 days -, if the owner does not agree.

3. The naturalist-in-charge decides in all questions concerned with the work.

4. During the tagging, the crew will be placed to the disposal of the naturalist-in-charge after conference with the captain.

5. Surplus from the catches is to be delivered for sale in the nearest port according to decision by the naturalist-in-charge.

C. Chartering Conditions.

1. The owner - Mr. Karl Mäland - places to the disposal of the charterer - ICES - the purse seiner M/S "RYGRUNN" (see specifications) for the time and on the conditions mentioned in B. "Plan of Work".

2. The charterer - ICES - pays in lease 80.000 N.kr. - eighty-thousandnorwegiankroners oo/oo - per month (30 days) for the ship with crew and equipment as mentioned in A. "Specifications". The money is to be paid with an advance of 20.000 N.kr. - twentythousandnorwegiankroners oo/oo - per 15. July and the rest at the end of the cruise (30 days).

3. The lease lasts from departure home port to arrival home port, both days inclusive, as mentioned in B. "Plan of Work".

4. In case the contract be prolonged, the payment will be proportionally to the monthly sum.

5. Expenses for oil & lubricants, food & water etc. is paid by the owner.

6. Harbour expenses outside Norway is paid by ICES.

7. Radio communications with the shore is to be paid by ICES insofar they concern the cruise work.

8. Insurance of ship with equipment is not a concern of ICES. Insurance of tagging equipment and personal belonging of the participating scientists does not concern the owner.

9. Six berths are to be placed to the disposal for the participating scientists. These will pay their food on the same basis as the crew.

10. In case of sale of surplus fish, 30 % of the sale sum is to belong to the crew of M/S "RYGRUNN" for distribution according to established rules.

11. Wrecking of ship, engine and equipment belonging to owner is not a concern of ICES. By wrecking causing that the ship can no longer be used in the experiments, the lease is rendered not valid.

This contract is issued in 2 copies.

For owner: For charterer:

Karl Mäland (s.) Olav Aasen (s.)

Bergen, den 27-4, 1957

GUIDE

on

Installing and Testing the Efficiency of Magnet Separators in Herring Reduction Plants

by

OLAV AASEN

C o n t e n t s:

I. Introduction

In this short pamphlet will be set forth some considerations on installing and testing magnetseparators in the herring reduction plants with a short description on the reduction process. The planned large scale international herring taggings on the Blöden Ground immature fish, renders it necessary for the scientists to work in close cooperation with the herring reduction industry since the main stress will be laid on internal tagging.

In many factories, unfortunately not in all, magnetseparators are put in for extracting iron pieces, such as nails etc., which have accidentally entered the raw material. These magnets will be the basic equipment for recovering the internal tags, and the success of an internal tagging scheme is dependent on high efficiency of the magnetseparators. Before such a scheme is launched, it is therefore imperative to ensure that at least a number of the important reduction plants (preferably all) have magnets installed, and to measure the efficiency of the separators while production is going on.

II. The Reduction Process

In a herring reduction plant operating according to the usual methods, the line of production will be:

1. From the storage bins the herring is taken by a conveyor to a cooker where the herring is thoroughly boiled to disintegration.

2. From the cooker the boiled fish mass is taken to a screw-press which squeeze out the "press-liquid" and produce the "press cake".

3. The "press-cake" is conveyed to a hammer type grinder which tears it to small pieces.

4. This rough, damp meal is fed into huge, revolving driers, where the moisture content is reduced to the desired level, and discharged at the far end.

5. From here the meal is sucked or conveyed by other means to another grinder (mill) from which it emerges as the final product ready for packing and storage.

6. The "press liquid", a mixture of oil and stick-water, from the screw-press is passed over a vibrator strainer and thereafter enters a centrifuge which separates the oil from the stick-water.

7. The stick-water is either led to waste or is pumped to evaporators where it is concentrated approximately ten times. This "Condensed Fish Solubles" is (in Norway) usually mixed with the press cake and dried to meal.

III. Where to install the Magnets.

In the production process there are many links of machinery through which the tag will have to pass, as will be evident from the brief description of the processing given above. In this machinery there are many corners and crevices which may trap the tag and prevent it from being detected. In principle, the earlier in the line the magnet is placed, the more of such traps will be avoided. On the other hand, one cannot expect the magnet to separate the tag before it is completely liberated from the herring. It is therefore useless to install the magnet before the meal is discharged from the drier. Further, experience shows that the final grinder very frequently severs the tags and renders them unreadable. The best point to fit in a magnet will therefore be somewhere bdtween the drier and the final grinder. There are many types of magnets in common use. The type is dependent on local conditions in the factory, hardly two factories are the same except for the basic principles and pieces of machinery. A very successful type now used extensively in Norway is the chute type separator with permanent magnets (see attached brochure).

IV. How to install the Magnets

The main principles when installing a magnetic separator are firstly that the meal should run freely over the magnet so as not to hamper production. Secondly, the speed of the meal must not be too high or else the magnet will not be able to retain the iron pieces. Thirdly, efficiency will increase if the meal is evenly spread over the whole of the working surface of the separators. Typically, when the rough meal is discharged from the drying oven, it is conveyed to a pit, very often by an endless screw. This is the most convenient place for a chute type magnetic separator.

It may sometimes be necessary to shorten the screw in order to give the chute the correct slope, or, if the difference in level is not sufficient, to deepen the pit. The revolving type of magnetic separator (electro magnets or permanent magnets) requires larger space and is usually placed just before the final grinder. It is not possible to give exact instructions on where and how to install magnets in the herring reduction plants. Factories very widely in their layouts, and the best solution in each case will have to be decided upon on the spot.

V. How to test the Magnets

The object of testing the efficiency of the magnets is to obtain conversion factors so that it will be possible to convert the number of recovered tags to the actual number of tagged fish recaught. It is practical to express such factors as percentages i e. how many per cent of the tags going through a factory are retained by the magnets. This may be achieved simply by placing a known number of tagged herring on the conveyor belts from the storage bins to the factory and counting the number of recoveries. For this purpose unnumbered tags are used. It is convenient to use 100 tags for each test, then the percentage follows directly. The test should be run twice during a season, one in the beginning and another towards the end. The tests are so simple that they can easily be run by the staff in the factories although it is to be recommended that for the first time a staff member from a research institute ought to instruct on the procedure and supervise that the instructions are carried out conscientiously. The herring is tagged by making an incision in the belly of the herring (approximately at the distal end of one of the ventral fins) and inserting the tag well into the body cavity. The herring is thereupon placed on the conveyor belt. The magnet is then inspected after 1, 2, 4, 8, 16, 24, 48 and 72 hours and the number of retained tags noted. Later recoveries are also noted and included in the total. If the tests are left to the factory staff, it will be wise policy to pay the man in charge an amount sufficient to make his efforts worth while. In Norway he is paid kr. 25.- for two tests. Special forms to be filled out have been printed in order to make the tests uniform. (See appended photostat copy of actual tests run by one of the factories). The recovered blank tags should be collected and forwarded with the test forms filled up to the proper authorities for checking purposes.

Skjema 4

Fabrikk: MOKSHEIM SILDOLJEFABRIKK
John K. Kyvik

År: 1957

Distrikt: I/57
Haugesund.

Prøve av gjenfangsteffektivitet på magnetanlegget.

100 merkete sild lag på transportbåndet fra kummene til fabrikken.

Dato: 18/2		Dato: 12/3	
Gjenfangster:		Gjenfangster:	
Etter 1 time	65 stk.	Etter 1 time	0 stk.
" 2 timer	19 "	" 2 timer	29 "
" 4 "	8 "	" 4 "	13 "
" 8 "	2 "	" 8 "	16 "
" 16 "	1 "	" 16 "	"
" 1 døgn	"	" 1 døgn	32 "
" 2 "	2 "	" 2 "	"
" 3 "	"	" 3 "	3 "
Senere	"	Senere	"
Total	97 "	Total	93 "

Prøvene av magnetanlegget bes utført under overoppsyn av formannen. - De tilsendte 200 merker benyttes. Der skjæres et lite hull i bukveggen på silden, omtrent ved bakkant av bukfinnene, og merket stikkes godt inn i bukhulen. Silden legges deretter på transportbåndet, og magneten kontrolleres deretter som antydet ovenfor. - Prøven tas 2 ganger - 1 i begynnelsen og 1 i slutten av sesongen -, og kortet sendes inn til Havforskningsintituttet ved sesongens slutt sammen med de gjenfunne merker. Honorar kr. 25.-.

Appendix III

Distribution list for test tags.

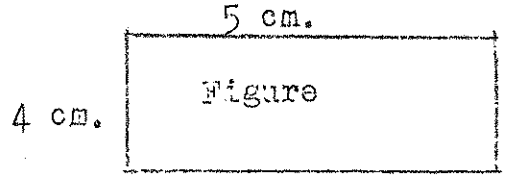
1.	Dr. D. H. Cushing	England	1200 tags
2.	Dr. J. J. Zijlstra	Netherland	800 tags
3.	Professor Gilis	Belgium	800 tags
4.	Dr. E. Bertelsen	Danmark	3600 tags
5.	Dr. J. Ancellin	France	500 tags
6.	Dr. D. Krefft	Deutschland	3200 tags
7.	Dr. B. B. Parrish	Scotland	1200 tags
8.	Dr. H. Höglund	Sverige	800 tags
		Total	12100 tags

Appendix IV

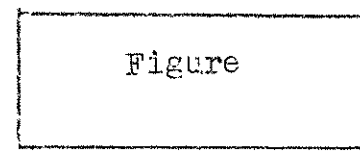
Internal

HERRING TAGGING.

" A numbered steel plate (the tag, for example, C 15389) is shot into the body cavity of the fish with a "Tagging gun". The herring is then set free."



Tagging of herring



The tagging gun

When a tagged herring enters a reduction plant, the tag will be retained by the magnet separator. By studying the pattern of a sufficient number of such recaptures information will be obtained on the migration of the herring, the fishing and natural mortalities, and the stock level. The tagging is thus a vital link in the investigations which aim at elucidating the natural basis for the herring fisheries and consequently also for the industries based on them. Therefore:

Look out for herring tags on the magnetic separator!

When a tag appears on the magnet:

Notify the foreman immediately!

In many instances it will then be possible to establish when and where the herring batch under production was caught. When this information and the tag are forwarded to _ _ _ _ _ the finder will be paid a reward:

Ten shillings per tag!

Thank you for co-operating.

Good hunting!

NOTES

on

Collecting, Recording, Transmitting, and Payment of recovered internal Herring Tags in Reduction Plants

by

OLAV AASEN

C o n t e n t s

I. Introduction

In the following pages are set forth some considerations which may aid the members of the working group when organising the set up for the recovery of the internal herring tags to be liberated during the international herring tagging experiments on the Blöden Ground.

II. The Management. - Goodwill, Consent, and Support.

The bulk of the recaptured internal herring tags must be expected to come in from those herring reduction plants which are equipped with magnetic separators. It is therefore vitally important that as many as possible of the reduction plants are fitted with such devices, and that these are in good working order. Tags going through factories without tested magnets are, even if recovered, a loss to the tagging scheme. The owners and managements should therefore be approached well in advance of the launching if the scheme in order to ensure that the experiments get the best obtainable support from the industry. Personal contacts are to be preferred and members of the working group, or their deputies, should be given opportunities to visit the factories, furnished with letters of introduction from high level authorities.

III. The Foreman. - A Key Man to Success.

When promise of co-operation has been obtained on management level, the foreman in the factory should be contacted. He is a very important person in the scheme. In a well organised reduction plant, the foreman will know, more or less exactly, where the different landings are stored and also when and where the fish were caught. He will also know when they are being processed and in many instances it will accordingly be possible to establish time and location of recaptures. Such data are obviously of great importance if they can be relied upon, and members of the working group should make a point of getting personally acquainted with the foreman of the reduction plants within their respective countries and endeavour to enthuse them on the subject. Also approximate data may be of value and even guesswork should be encouraged, provided, of course, that the necessary reservations are entered too.

IV. The Workers. - The necessary Scouts.

If the foreman's interest is succesfully roused and they are thoroughly briefed on the background for the experiment and how it is being executed, they should be induced to convey their knowledge and interest to the workman. The best approach will probably differ from place to place; but the foreman will know his workmen and he will also have his ideas how to go about it. The main points is to get the people interested as this will inevitably sharpen the search for tags. No major effort should be necessary. Unobtrusive discussions on the scheme and answering of questions as they arise in the daily work may well suffice. As constant reminders there should be placed posters in the factories where they would catch the eyes of the workers, making them conscious of the tagging scheme being developped and of its importance. The human element should by no means be overlocked. The alertness of the workers attending the machinery (and the magnetic separators) is as basic to the success of the scheme as are the magnet themselves. The offered reward, 10 shillings a tag, will of course stimulate the interest further. Sometimes there might even be made attempts to cash in on faked tags. Such tags are, as a rule, easy to distinguish from the genuine tags. Needless to say, such enterprises should be vigorously discouraged.

V. Collecting, Recording, Transmitting, and Payment.

When a tag appears on the megnet, the foreman should be notified immediately. He will stick the tag on a card (form no.1) using Sellotape. Such cards and tape should be issued in advance to the factories. The foreman enters his notes on time and place and means of recapture.

..../....

The finder will then, on presenting this card in the office of the plant, get his reward. The office personnel, briefed by the foreman, forwards the card to ICES after having entered some of its data on another card (form no.3)[1]. On the back of the cards are entered the daily processed quantities (24 hours). Such cards are also issued in advance to the factories. At the end of the season, the cards (form no.3) are sent in to the central research institute in the respective countries. This institute collects all cards from the factories and forward them to ICES with a claim of reimbursement, covering rewards, postage and other expenses, making of course notes on how much is due to each factory. The ICES will pay the total amount by cheque to the research institute which will refund the factories.

The procedure outlined here may easily be adapted to fit in anywhere. No doubt it will greatly facilitate the administrative work involved, especially it will ease the burdens of the limited staff of the ICES's secretariat.

1) Form nr.2 is used for recordings at sea.

Returned Herring Tag.
Des marques de hareng trouvées.
Gefundene Marken.

Form no.1

Tag to be fixed here. Use Sellotape. Montez la marque ici. Employez Sellotape. Marke hier aufkleben. Sellotape anwenden.

x Liberation .....

Tag No. .....
No. de la marque .....
Nummer der Marke .....

x Number liberated .....

xTagged		Returned Trouvées Gefundene		Caught Pêchés Gefangen		
Date Datum	Place Lieu Stelle	Date Datum	Place Lieu Stelle	Date Datum	Place Lieu Stelle	x Number of Days at Liberty
Size of Catch Quantité pêchée Grösse der Fanges				Gear Engin de pêche Gerät		
Annotations Remarques Bemerkungen						

x To be filled in at the Central Office.
x A remplir au Bureau Central.
x In Copenhagen ausfüllen.

Use Block-Capitals, please.

Ecrivez avec lettres moulées, s.v.p.

Bitte Druck Buchstaben benutzen.

Please send to:
Envoyer s.v.p.à:
Senden Sie bitte nach:

ICES,
Charlottenlund Slot,
Charlottenlund,
Denmark.

FACTORY:.. YEAR:..............

No. of production lines:	No. of magnets:	Type:
Efficiency of magnets, see Form 4)	Test no.1: %	Test no.2: %

PROCESSED QUANTITY:

Date	Tons	Date	Tons	Date	Tons	Date	Tons	Date	Tons	Date	Tons
Total											

Grand total:.................... Tons

Average efficiency:........... %

Corrected
Grand total:.................... Tons

No. of recovered
Tags: ....
No. of recovered
tags per unit of
catch:....................

Form no.3.

FACTORY:..

YEAR: ....

COUNTRY and DISTRICT:..

RECOVERIES:

Tag no.	Date	Recaptured	Tag no.	Date	Recaptured

Card to be filled up under the supervision of the foreman. By the end of the season it is to be forwarded to ____________. The tags (Form no.1) are to be forwarded to ICEC as they appear on the magnet and the data are entered on this card.