RIT FISKIDEILDAR VOL. II. — NR. 10

Icelandic Driftnet Herring Tagging Experiments

(Síldarmerkingar úr reknetum)

By

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CONTENTS

1. INTRODUCTION

Until 1953 the Norwegian-Icelandic tagging experiments — although very successful — had been confined to the purse seine and land seine fishing areas in Norwegian and Icelandic waters (Friðriksson and Aasen, 1950, 1952).

There remained, however, a herring fishing area of considerable importance where no tagging had taken place. This was the rich driftnet fishing area off the South-west coast of Iceland.

This driftnet fishery had not only become a very important factor of the Icelandic herring fishing but the influence of the "South Coast"-herring of Iceland on the North coast fishery and even on the Norwegian fishery has been one of the most debated questions in the herring investigations in the North Atlantic. The importance of tagging this debatable stock is thus clear.

The tagging technique developed for tagging the purse seine and land seine caught herring could obviously not be applied at the South-west coast since driftnets were the only fishing gear in use. On the other hand it would appear that the technique developed by scientists of the Marine Laboratory, Aberdeen, might prove suitable for the conditions off the South-west coast (Wood, Parrish and McPherson, 1955).

The author was fortunate enough to have the opportunity of joining one of the Aberdeen workers on a commercial drifter in June 1953.

Then it became clear that the Scottish technique of tagging herring on board commercial vessels was not applicable in Iceland. Icelandic fishermen always use a mechanical roller when hauling their nets. The nets pass the roller in a bulk, and a considerable pressure and damage is usually done to the fish from the tagging point of view. The Scottish fishermen on the other hand, have the nets spread out on the gunnel and they haul their nets by hand. Further, the method of shaking the nets is such that the Icelandic fishermen drag the nets along the deck before they are shaken. Scottish fishermen do not do this.

It is thus obvious that most of the commercially caught herring in Iceland is dead before it has been disentangled.

Driftnet tagging in Icelandic waters must therefore be carried out on board a special tagging vessel.

Consequently a very small drifter, the "Auðbjörg" of 45 ft. has been used for the purpose of tagging herring from both purse seines and driftnets.

II. METHODS AND TECHNIQUE

1. Method of fishing.

The first driftnet tagging experiments in Icelandic waters took place during the second half of August 1953. At first the nets were shot in the usual Scandinavian manner keeping the rope above the nets at a depth of 4 fms. with the nets at a depth of 8—16 fms.

It proved impossible to haul the nets from this depth without using the mechanical roller so after the first shot the rope was kept underneath the nets which were then at a depth of only 2—10 fms. This is the usual method of Scottish and Russian fishermen.

The nets could now be hauled without using the mechanical roller and it is of some interest that when fishing alongside commercial vessels which kept their nets 6 fms. deeper than we did, our catches were seldom smaller and often much better than the commercial ones.

Generally the nets were hauled after 3 hours drifting or less depending on the catch in the first net which was frequently inspected.

2. Method of disentangling the herring.

Instead of shaking the nets and then selecting the liveliest herring from the deck as the Scottish workers did, a new technique of disentangling the fish was evolved. Each herring intended for tagging is by this method disentangled invididually on or outside the gunnel.

The actual technique depends on how the herring is entangled in the mesh. The sides of the mesh may be underneath one or both of the opercula or the herring may have gone further into the mesh in which case the sides of the mesh form a girdle around the body. If one or both of the opercula are entangled the fish is pushed gently forward and then it is twisted slightly as it is pulled back, so that the opercula do not become reentangled. If the mesh is already behind the opercula the forward push is omitted but otherwise these fish are disentangled as already described. When the life fish in one net have been selected and tagged, the tagging work ceases while that net is shaken in the usual manner and thus cleared of any herring.

3. Method of tagging.

As soon as a live herring has been disentangled, it is handed over to the tagging man who grips the fish and holds it by the cup of his left hand, with the head pointing away from him.

If internal tags are used the ventral side is turned upwards and vise versa if external tags are used. Then the herring is tagged quickly in air by the appro-

priate tag and dropped overboard. The actual tagging is thus carried out by the "one man" method although two of the crew are engaged in disentangling live herring and thus securing adequate supply.

4. Rate of tagging.

The rate of tagging varies greatly from experiment to experiment depending on a number of more or less controllable parameters such as the supply of live herring, the type of tags in use, the weather conditions and the skill of the crew.

The rate of internal tagging has always been found to be much higher than that of external tagging using e.g. Scottish toggles. This may partly be due to lack of experience in use of external tags since relatively few (about 1800) have been used.

TABLE 1.

YEAR	NUMBER OF SHOTS	TOTAL NUMBER OF TAGGED (LIBERATED) HERRING	AVERAGE NUMBER OF TAGGED (LIBERATED) HERRING PER SHOT
1953	11	5092 (5092)	463 (463)
1954	10	5133 (4979)	513 (498)
1955	6	2841 (2822)	474 (470)
1056	15	8140 (7554)	543 (504)
1957	10	4688 (4688)	469 (469)
1958	3	846 (846)	283 (283)
1959	17	6210 (6210)	365 (365)
1960	8	5114 (5114)	639 (639)
Total	80	38064 (37305)	476 (466)

While more than 1000 herring have been tagged on several occasions during the course of a driftnet haul of 12—15 nets the figures in table 1 show that the average number tagged during the course of such a haul is a little under 500. These figures are based on all shots in which herring were caught. In some of the shots only a few herring were caught, in others there was adequate supply of herring, or more than 1 cran per net. Shots in which no herring at all were caught are not included.

In the majority of the experiments only one man carried out the actual tagging although two tagging guns were used simultaneously on a few occasions.

This rate of 476 herring per shot corresponds roughly to the rate of one Scottish operator per 3—4 shots, on board a commercial vessel (Wood, et al., 1955, p. 37).

5. Method of liberating the herring.

During darkness the herring were dropped overboard one by one. Many of them then swam actively away but for others it seemed to take considerable time to recover from capture and the tagging operation. (See also Wood et al.,

1955). During daylight this method of liberating the herring has not proved applicable because of large number of gannets which then assemble and catch the tagged herring no matter how actively they swim away. The herring has therefore either been dropped into a purse net and then liberated in a small shoal at the end of the experiment or else liberated individually into a bottomless pursenet which then provides a kind of an escape tunnel for the herring. Never have any severe panic reactions been observed as compared to those noted at the North coast (FRIÐRIKSSON & AASEN, 1950) when the herring were liberated individually.

III. VIABILITY OF DRIFTNET CAUGHT HERRING

1. Immediate mortality rate of driftnet caught herring.

In order to investigate the rate of mortality of driftnet caught herring during the period immediately after tagging eleven experiments were carried out by the following method: A net-purse 4×4×4 meters and of the type described by FRIÐRIKSSON & AASEN (1950), was placed on the starboard side of the "Auðbjörg" — the nets being hauled at the portside —. Then a known number of tagged herring was gradually liberated into the purse-net and the time of liberation for each completed hundred noted. All the experiments were carried out in unsheltered waters so it did not prove possible to keep the herring in the purse for a long time. Thus the experiments usually only lasted until all the nets had been hauled. The cork of the purse-net was then submerged at one place in order to allow the live herring to swim away, leaving the "non swimmers" lying on the bottom of the purse. These were taken on board and dissected in order to recover the tags. It was then possible to estimate the approximate time during which each "non swimmer" had been kept in the purse.

TABLE 2.

YEAR DATE EXP.	DURATION OF EXP. IN HOURS	NO. OF TAGGED HERR. IN PURSE	NO. OF "NON SWIMMERS" IN PURSE	% OF "NON SWIMMERS" IN PURSE
1954 15/8 I	2	236	19	8.1
1954 23/8 II	4½	893	111	12.4
1954 25/8 III	3	395	24	6.1
1955 17/8 IV	4	300	19	6.3
1956 31/7 V	5½	600	85	14.0
„ 6/8 VI	7¼	798	74	9.3
„ 18/8 VII	6½	1199	207	17.3
„ 20/8 VIII	1½	200	20	10.0
„ 25/8 IX	4½	547	70	12.8
„ 28/8 X	2	249	30	12.0
„ 29/8 XI	5	769	100	13.0
Total or mean %	.	6186	759	12.27

The results of these experiments are shown in Table 2 and Fig. 1.

The table shows that of the 6186 herring 759 or 12.27% were unable to swim out of the purse when liberated at the end of each experiment. The table also shows that the percentage of "non swimmers" ranged from 6.1 to 17.3.

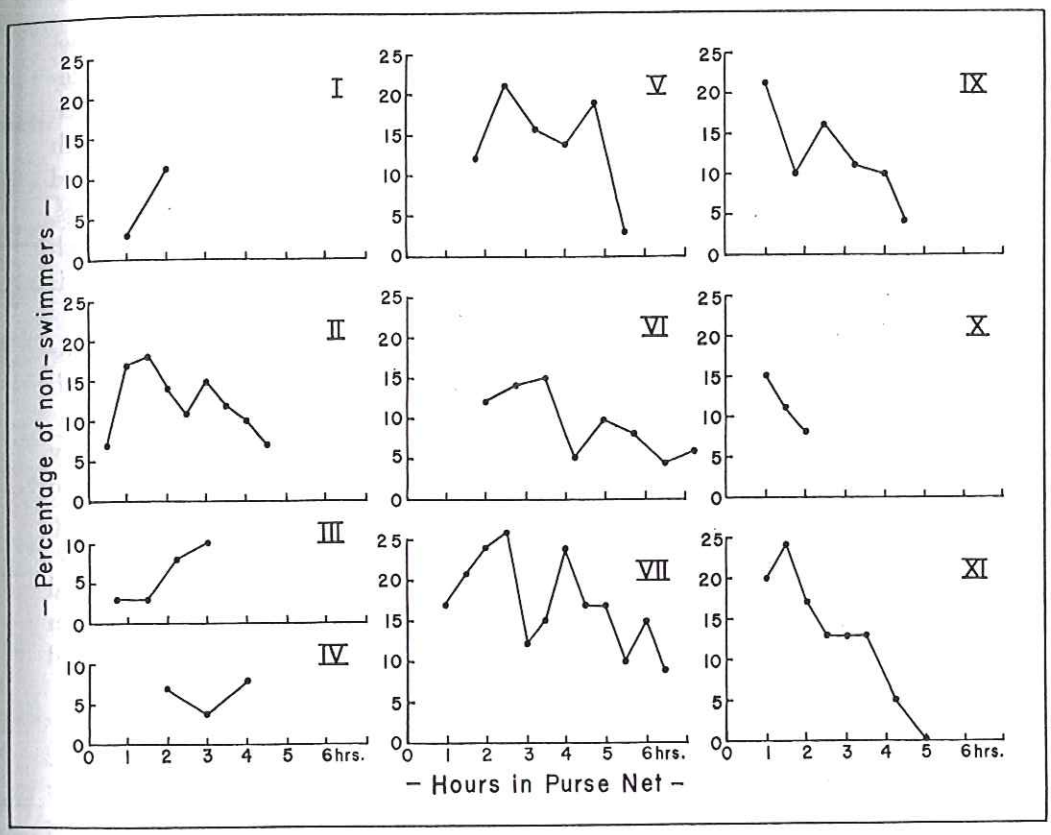

FIG. 1. *Graphic representation of results of experiments on the immediate death rate of driftnet tagged herring. Each experiment has been given a roman numerial (see table 2 and the text).*

Fig. 1 shows that in many of the experiments especially those which lasted for more than three hours the tendency for the number of "non swimmers" to decrease is quite evident.

This may either be the result of more frequent mistakes by the selectors when selecting the live herring during the second half of the experiment and hence higher mortality for those herring which are kept in the purse for less than half the experiment time — or some recovery may take place in the purse 2—5 hours after the tagging.

External conditions (wind, waves, water currents) were extremely variable. In experiments II and V the external circumstances were extremely bad and the number of "non swimmers" were correspondingly high (Table 2). The damag-

ing effects of these external factors do not, however, outweigh the presumed process of recovery in these experiments as clearly shown in Fig. 1. Although the wave action and currents in the purse may not have a great effect on the immediate death rate of the herring these factors cause considerable loss of scales and therefore will affect long term viability.

On examination, the causes of death could sometimes be ascertained. Generally the most frequent ones were coelomic haemorrage and apparent suffocation. Notable exceptions were however noted, especially in experiment VII. The stomachs of the herring in this experiment were so tightly packed with Euphausiids (mainly *Meg. norv.*) that the stomach walls were greatly extended and had become very thin and easily pierced even by the rounded ends of the tags.

The main cause of death was thus found to be the piercing of the stomach wall in experiment VII and this accounts for the high mortality rate in this experiment.

In experiments VIII to XI the quantity of Euphausiids in the stomachs gradually decreased and the piercing of the stomach walls became correspondingly infrequent.

Successful selection of the live herring from driftnets is always a very difficult task, which may be affected by several factors such as experience and skill of the selectors, the type of net and the general condition of the herring.

It was frequently observed that the herring were very much alive at the beginning of the haul and again at the end of the haul when newly entangled herring were often encountered in considerable quantities. There is thus an indication that the herring will mainly become entangled just after sunset and before sunrise.

2. Returns.

The returns of driftnet caught herring are shown in Table 3 and Fig. 2. The significance of these returns in respect to herring migrations lies outside the scope of this paper. The number of returns will therefore only be discussed as regards viability of driftnet caught herring.

Before 1956 only 2 internal tags were returned from the driftnet caught herring. Both these tags were returned within a month of the tagging and in the tagging area. In 1956 most of the magnets in the reduction plants were tested and a very low efficiency was found in many of those at the South-west coast. After some readjustments, improved (up to 100%) efficiency was experienced.

Table 3 shows that since 1956 a total of 134 returns have been received or only 0.37%. When this small percentage is considered, it must be born in mind that on the South-west coast only a very small proportion (10—20%) of the total catch was processed in reduction plants during the period 1956—1960. Thus only 168120 hectolitres have been processed during this five year period in the South-west coast reduction plants which have tested magnets. Further, a

TABLE 3.

Returns of Driftnet Herring. (Endurheimtur reknetasíldar).

Year of tagging	53	54	55	55	56	57	57	58	59	60	Total
Category	SW	SW	EF	SW	SW	SW	NH	SW	SW	SW	
No. of tagged Herring	5092	4979	2491	331	7554	4577	111	846	6214	5114	37309

Recaptured at North and East Coast. (Veitt við Norður- og Austurland).

Year of tagging		55	54	55	55	56	57	57	58	59	60	Total
Year of recapture	56	1	.	2	.	.	.	.	.	.	.	3
	57	8	8	6	.	1	.	.	.	.	.	23
	58	4	.	.	1	.	1	1	.	.	.	7
	59	4	2	3	.	6	3	.	.	11	.	29
	60	.	1	.	.	6	2	.	.	1	5	15
	Total	17	11	11	1	13	6	1	.	12	5	77

Recaptured in Norway. (Veitt við Noreg).

Year of tagging		55	54	55	55	56	57	57	58	59	60	Total
Year of recapture	56	1	.	.	.	.	.	.	.	.	.	1
	57	.	.	3	.	.	.	.	.	.	.	3
	58	1	.	1	.	.	2	.	.	.	.	4
	59	.	.	1	.	.	.	.	.	.	.	1
	60	.	.	.	.	.	.	.	.	.	.	.
	Total	2	.	5	.	.	2	.	.	.	.	9

Recaptured at SW-coast. (Veitt við Suðvesturland).

Year of tagging		55	54	55	55	56	57	57	58	59	60	Total
Year of recapture	56	.	.	.	.	15	.	.	.	.	.	15
	57	.	.	.	.	.	10	.	.	.	.	10
	58	.	1	.	.	.	1	.	1	.	.	3
	59	.	.	.	.	.	.	.	1	16	.	17
	60	.	.	.	.	.	1	.	1	2	2	6
	Total	.	.	.	.	15	12	.	3	18	2	51

SW = South West Coast herring, EF = Mixed East Coast Inshore herring, NH = North Coast herring.

considerable part of these 168120 hl were immature herring, but no driftnet tagging of that part of the herring population has taken place. A total of 51 tag (Table 3) have been returned from these South-west coast plants, of which

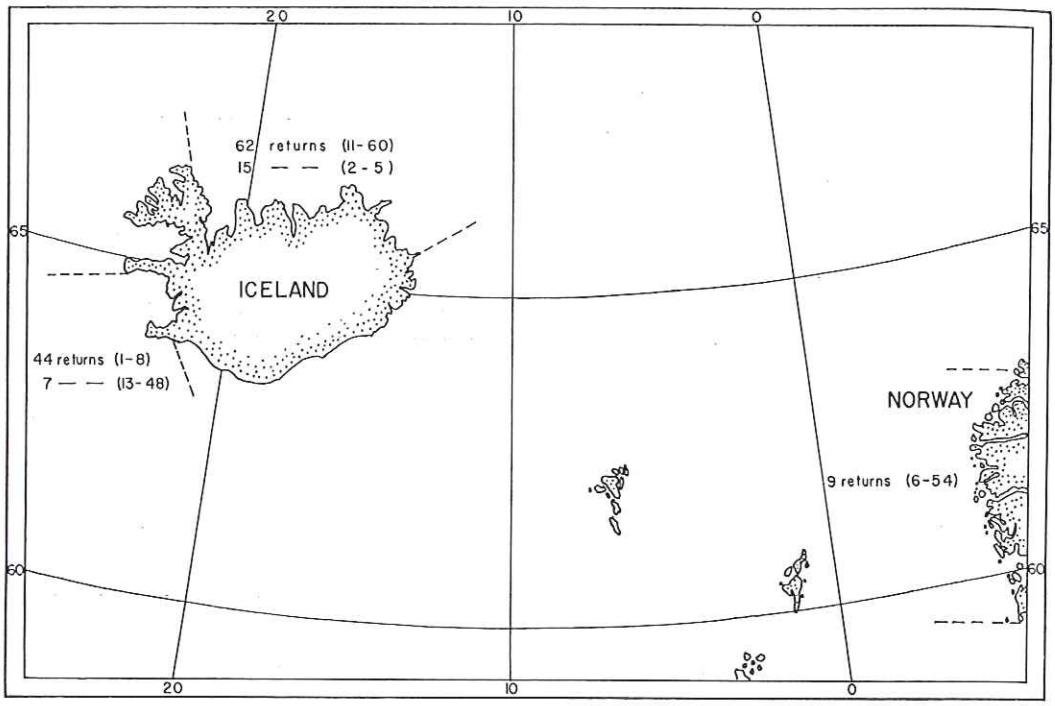

FIG. 2. *A map showing the areas and numbers of returns of driftnet tagged herring. The number of months at liberty are shown in brackets.*

44 were returned within a year of the tagging after 1—8 months at liberty. The remaining seven tags were returned 1—4 years (Table 3) after the tagging took place. During the same period, 1956—1960, 30 returns from the North and East coast purse seine tagging experiments, of which 20 were mixed (mature & immature) East coast herring, have been received. Table 3 shows that 77 herring have been recaptured at the North and East coast during the summer purse seine seasons. Of these tags 16 were returned from catches landed in Norway but the remaining 61 were returned from 3.671.075 hectoliters processed in North coast reduction plants. As Table 3 and Fig. 2 show, 9 driftnet tags have been returned from Norwegian fishing grounds after 6—54 months at liberty. It should be noted that of these five were tagged as Mixed East Coast Inshore herring.

Since a total of 37309 driftnet caught herring have been liberated (allowing for 12% immediate death rate) the ‰ returns per million hectoliters of the driftnet caught herring at the North coast during the five year period were 0.5, or of the same order as returns of purse seine tagging experiments in Norway (DRAGESUND, 1958) and of a similar order as returns of mature North and East coast herring at the South-west coast. The number of driftnet tagged herring recaptured at the North coast is, however, too low to draw any definite conclusions on viability of driftnet caugt herring.

Further indication of the comparable viability of the driftnet herring can be obtained by comparing returns of Norwegian purse seine tags and the driftnet tags during the North coast herring season. Since the North coast catches are a varying mixture of Icelandic and Norwegian herring, this comparison only has a meaning if the quantity of each stock is taken into account. The best estimate available of the composition of the catches is obtained by analyses of the types of scales. These show that during the 5 year period 1956—1960 the ratio between Norwegian and the Icelandic types of scales was: 1:2.6 (Fridriksson, 1958—60, and unpublished data). Considering also that the ratio between the tagged number of Norwegian purse seine herring and the driftnet herring during the 5 year period 1956—1960 is approximately 1:0.2, the ratio between ‰ returns of the Norwegian and the driftnet herring is 1:1.4. Although this comparison may not give direct indications of the relative viability of purse seine and driftnet herring, it certainly shows whether the relative viability of the Norwegian purse seine herring is of similar order as that of the South-west coast driftnet herring. While the ‰ returns per million hectoliters of driftnet (and Norwegian herring) generally are below 1, the corresponding returns of North coast purse seine herring either in Norway or in Iceland are above 2, and often reaching 5—10, thus indicating a much higher viability of this category.

In 1959, during the period 24th April to 9th May, 5238 driftnet herring were tagged off Reykjanes (South-west coast), and on May 10th and 11th 2635 purse seine herring were tagged in the same locality.

During the following North coast summer season 10 driftnet herring and 42 purse seine herring were recaptured, or 0.2 (allowing for 12—13% immediate death rate of the driftnet herring) and 1.6% respectively, thus the driftnet returns were only an eighth of the purse seine net ones. In 1960 six herring from the 1959 experiment were recaptured during the North coast summer season, of which only one was a driftnet tagged herring which further emphasizes the higher returns of the purse seine herring. Considerable variation of recapture of the driftnet herring from the different batches of liberations was encountered. It should be noted that by far the highest returns (4 tags) were received from 376 herring liberated on the 10th of May i.e. the day prior to the beginning of the purse seine experiments. Analyses of four samples taken from the tagging catches show that in the driftnet catches summer spawners were predominant (73%) whereas in the purse seine catches spring spawners predominated (65%). The north coast summer season takes place during June–August, when the catches consist almost entirely of spring spawners, and e.g. in 1959 the ratio was approximately 7:1 (Fridriksson, unpublished data). Lower returns from the 1959 driftnet experiment than the purse seine experiment are therefore to be expected at the North coast.

IV. DISCUSSION

In order to get as complete a picture as possible of the migrations of the driftnet herring stocks and tribes as well as information on their size, it may be necessary to carry out large scale tagging experiments in fishing areas, where it is very difficult to obtain purse seine or land seine caught herring. It is in such circumstances that the Icelandic driftnet tagging has developed since 1953. Although based on Scottish working methods of tagging from driftnets, the methods used have evolved according to the particular characteristics of the Icelandic fisheries and environment.

As shown in Table 1, the average rate of tagging during these five years is 476 herring per shot of 10—15 nets, the amount of fish caught being the limiting factor. Given good catch more than 1000 herring have been tagged on several occasions during one haul.

The results of 11 experiments on the immediate death rate of driftnet caught herring are shown in Table 2 and Fig. 1. The mean percentage of non swimmers proved to be 12.27 there being a large range between experiments. As shown in Table 2, and particularly in Fig. 1, there is some evidence that during those experiments which lasted for more than 3 hours some recovery of the herring may have taken place, persuming that the selection of live herring has been of the same standard throughout the experiments. External factors such as swell and sudden changes of current in the purse net, used for the experiments, did not affect this process of recovery to any great extent, but are thought to have affected the long term mortality rate to a large extend, because they seemed to cause considerable loss of scales. The cause of death could sometimes be ascertained. Generally internal haemorrage and suffocation were thought to be the main cause of death, but notable exceptions were encountered. In a few experiments piercing of the stomach walls by the tags was the most frequent cause of death. This was due to the fact that the stomachs were so tightly packed with food (Euphausiids) that they filled the body cavity completely.

The returns are shown in Table 3 and Fig. 2. Owing to a small quantity of herring processed in reduction plants in the driftnet area, relatively few returns are from the tagging area itself. More than half of the returns are from the North coast of Iceland and 9 returns are from Norway. It is noticeable that there seems to be an interval of 2—3 years from the time of tagging at the South coast to the time of returns at the North coast and Norway. Notable exceptions are two returns which were found in Norway only six months after having been tagged at the South-west coast of Iceland. Contrary to this pattern of returns there is a very sharp fall of the number of tags returned at the South-west coast after the first year thus indicating the absence of old herring in the South-west coast herring that is in good agreement with age analyses of samples (e.g. Einarsson, 1955, and unpublished data, Fridriksson, 1958).

Calculation of ‰ returns per million hectoliters processed in the North coast reduction plants are based on too small numbers to draw any firm conclusions about the viability of the driftnet caught herring, but these calculations clearly indicate that although the ‰ returns of driftnet herring lie considerably below that of the North coast purse seine herring, it is well above the lower limits of the ‰ returns of Norwegian purse seine herring either in Norway (Dragesund, 1958) or in Iceland (Dragesund & Jakobsson, in print). Returns from driftnet and purse seine herring tagged in the same area in 1959 were most unfortunately not quite comparable because of changes in the composition of the herring catches which took place during the experimentation time. The returns so far from this experiment point, however, to the greater rate of mortality of the driftnet herring.

Although stock analyses cannot be based on driftnet tagging the results of the Icelandic driftnet tagging experiments have already given very valuable information on seasonal, as well as annual migrations of the Icelandic herring stocks, thus proving the validity of the methods applied.

V. ÁGRIP

Hinar sameiginlegu síldarmerkingar Íslendinga og Norðmanna hófust eins og kunnugt er árið 1948. Þeir dr. Árni Friðriksson, frumkvöðull merkinganna, og Olav Aasen birtu skýrslur sínar um merkingaraðferðir og árangur þeirra 1950 og 1952. Mikil vitneskja fékkst þegar á fyrstu árum þessara velheppnuðu merkingatilrauna um síldargöngur milli Norðurlands og Noregs. Hins vegar var sá ljóður á, að fram til ársins 1953 hafði engin síld verið merkt við suðvesturströnd Íslands. Síldveiðarnar við Suðvesturland urðu mikilvægari með hverju árinu sem leið, og var augljóst, að mikil eyða yrði ávallt í þekkingu manna á síldargöngum við Ísland, unz vel heppnaðar merkingatilraunir hefðu verið gerðar víðar en við Norðurland, ekki sízt vegna þess, að göngur íslenzku síldarstofnanna á Norðurlandsmið fyrr og síðar hafa löngum verið eitt umdeildasta atriði, er síldarrannsóknir Íslendinga hafa fjallað um.

Merkingaraðferðir þær, er beitt var við Norðurland og Noreg, voru algerlega háðar því, að unnt var að fá lifandi síld úr herpinótum síldveiðiskipanna. Um slíkt var ekki að ræða syðra, þar eð engar herpinótaveiðar voru hafnar þar þá, og síldin svo dreifð á þáverandi aðalveiðitíma, ágúst—október, að nær óhugsandi var að nota herpinót til veiðanna. Reknet voru því eingöngu notuð við þessar veiðar.

Líklegt þótti, að merkingaraðferðir þær, sem Skotar beittu við merkingu síldar úr reknetum, gætu hér komið að haldi, og var höfundur því fenginn til

að kynna sér skozku aðferðirnar. Sumarið 1953 var svo gerð hin fyrsta tilraun til að merkja síld úr reknetum. Var notaður til þess 15 lesta bátur, v/b Auðbjörg NK 66. Tekin var upp hin skozk-rússneska veiðiaðferð, sem er í því fólgin að hafa reknetakaðalinn (kapalinn) undir netunum. Þá var netunum aðeins sökkt 3 faðma í stað 8 faðma sem venja er hér. Af þessu hvoru tveggja lyftust netin svo vel upp, þegar kaðallinn var dreginn, að unnt reyndist að draga netin á handafli einu saman. Lífvænlegustu síldarnar voru þannig losaðar úr netunum, þegar er þær komu að borðstokknum, og merktar. Einnig var reynt að hafa kaðalinn yfir netunum, eins og tíðkast hérlendis og á Norðurlöndum, en þá var ekki unnt að draga netin á handafli og drapst síldin þá, er hún fór yfir reknetavinduna (rúlluna).

Þegar látið var reka í hópi íslenzkra reknetabáta, kom í ljós, að við veiddum tiltölulega betur en þeir, ef veður var stillt og gott, enda var síldin þá oft mjög nærri yfirborði. Til þess að fá síldina sem fyrst eftir að hún var gengin í netin, var fyrsta netið athugað með stuttu millibili og farið að draga, þegar er einhver veiði var komin í það.

Við merkinguna voru oftast notuð svokölluð innri merki, en þau eru gerð úr stálplötum með ástimpluðu númeri, og eru merkin 2 cm löng og 0.4 cm breið og vega um 1 g. Þegar er lífvænleg síld hafði verið losuð úr netunum, var hún tekin og henni haldið í vinstri hendi og kviðnum snúið upp á meðan merkinu var komið fyrir inni í kviðarholi síldarinnar með svokallaðri merkingabyssu, er höfð var í hægri hendi. Að merkingu lokinni var síldinni sleppt í sjóinn. Þannig gat einn maður framkvæmt merkinguna sjálfa, en a. m. k. tvo menn þurfti til að velja og losa lifandi síld úr netunum.

Merkingahraðinn var fyrst og fremst háður því, hve vel gekk að velja lifandi síld úr netunum. Væri gnótt lifandi síldar, voru merktar á annað þúsund síldir úr 10—15 netum, en tafla 1., bls. 5 sýnir, að meðaltalið er 476 stk. í lögn.

Þegar dimmt var af nóttu, var síldinni sleppt, strax og hún hafði verið merkt. Margar síldanna syntu þá þegar burtu og hurfu í djúpið, en aðrar virtust vera lengur að jafna sig eftir meðferðina. Á daginn reyndist hins vegar ekki unnt að sleppa síldinni strax, vegna þess að mikill fjöldi súlna safnaðist þá að bátnum og hirti hverja síld, er sleppt var. Síldin var því annað hvort látin í ferningslaga pokanót og þá sleppt í smárri torfu að merkingu lokinni eða sleppt einni og einni í botnlausa pokanót, sem beindi síldinni á djúpt vatn, áður en súlan fékk færi á að stinga sér eftir henni.

Nauðsynlegt þótti að gera athugun á dauðahlutfalli merktrar reknetasíldar fyrst eftir merkinguna. Alls voru gerðar ellefu tilraunir til að fá úr þessu atriði skorið. Þekktum fjölda merktrar síldar var smám saman sleppt í pokanót og síldin geymd í nótinni eins lengi og kostur var. Þegar korkateini nótarinnar var ýtt í kaf, synti lifandi síldin út, en eftir lágu hinar dauðu, er voru taldar og krufnar, til þess að ná merkjunum og kanna dauðaorsök. Tafla 2, bls. 6 sýnir dauðahlutfallið og 1. mynd, bls. 7 sýnir, hvernig dauðahlutfallið breytist eftir því, hve lengi síldin hefur verið í nótinni. Tilraunir þessar benda þannig

til þess, að a. m. k. 85% af merktu síldinni lifi af fyrstu klukkustundirnar eftir merkingu. Tilraunirnar segja hins vegar ekkert um, hvernig merktri reknetasíld farnast síðar.

Þar eð merkingatilraunirnar við Suðvesturland hafa allar farið fram á opnu hafi, hefur ekki reynzt unnt að geyma merktu reknetasíldina í nót nema nokkrar klukkustundir, eins og að framan er greint frá. Engar beinar tilraunir á dauðahlutfalli merktrar reknetasíldar hafa því verið framkvæmdar eftir að fyrstu 5—8 klukkustundunum lýkur. Vorið 1959 voru merktar 5238 síldir úr reknetum við Reykjanes á tímabilinu 24. apríl til 9. maí, og 2635 síldir úr herpinót dagana 10. og 11. maí. Sumarið 1959 endurheimtust alls 52 merki úr þessum tilraunum við Norðurland, þar af 10 síldir, er merktar höfðu verið úr reknetum og 42 úr herpinót, eða ca. 0.2% (ef gert er ráð fyrir 12—13% dauða reknetasíldarinnar við merkingu) og 1.6%. Endurheimtur þessar benda þannig til þess, að reknetasíldin endurheimtist 8 sinnum verr en herpinótasíldin. Þess ber þó að gæta, að ⅔ hlutar reknetasíldarinnar voru merktir um tveim vikum fyrr en merking herpinótasíldarinnar fór fram. Hinn 9. maí, eða daginn áður en merking herpinótasíldarinnar hófst, voru merktar 349 reknetasíldir. Úr þessari merkingu voru endurheimt 3 merki við Norðurland sumarið 1959, eða um 1% (ef gert er ráð fyrir 12—13% dauða við merkingu). Sumarið 1960 voru aðeins 6 merki endurheimt úr tilraun þessari, þar af var aðeins ein síld merkt úr reknetum, en 5 úr herpinót. Sýnishorn, er tekin voru úr rekneta- og herpinótaaflanum, er merkt var úr, sýna, að í reknetasíldinni var sumargotssíld í meirihluta (73%), en vorgotssíld í herpinótasíldinni (65%). Sé tekið tillit til þess, að 1959 var hlutfallið milli vor- og sumargotssíldar í sýnishornum norðanlands 7:1 er ljóst, að ekki er unnt að búast við sambærilegum endurheimtum reknetaog herpinótamerkja við Norðurland.

Alls hafa 77 merki úr reknetamerkingunum endurheimzt við bræðslu Norðurlandssíldar á árunum 1956—1960 (tafla 3). Sextán þessara merkja fundust í norskum síldarverksmiðjum við bræðslu Íslandssíldar, en hin 61 fundust hér á landi og komu úr 3.671.075 hektólítrum bræðslusíldar. Ef tekið er tillit til þess, að alls hafa verið merktar 37309 reknetasíldir (tafla 1), þá hafa ‰ endurheimtur þeirra tilrauna á hverja milljón bræddra hektólítra orðið um 0.5, og eru það svipaðar endurheimtur og fást í Noregi af herpinótasíld (Dragesund, 1958) og við Suðvesturland af Norðurlandssíld. Mun hærri endurheimtur (‰) fást hins vegar af Norðurlandssíldinni við Norður- og Austurland.

Samkvæmt athugunum á hreisturssýnishornum Norðurlandssíldar hefur hlutfallið á milli síldar af norskum og íslenzkum uppruna á árunum 1956—1959 verið 1:2.6 (Friðriksson 1956—58 og óprentuð gögn). Á sama tímabili hafa alls endurheimzt 84 norsk merki við Norður- og Austurland, en 77 reknetamerki. Ef tekið er tillit til þess, að merktar hafa verið í Noregi nærri 5 sinnum fleiri síldir úr herpi- eða landnót en merktar hafa verið úr reknetum suðvestanlands, verður hlutfallið á milli ‰ endurheimta norsku og íslenzku reknetasíldarinnar 1:1.4 og virðast þessar endurheimtur ekki gefa tilefni til að álíta dauða-

hlutfall reknetasíldarinnar mjög frábrugðið dauðahlutfalli herpinótasíldarinnar norsku.

Enda þótt reknetamerkingar veiti ekki nákvæma vitneskju um stofnstærð og áhrif veiða á síldarstofnana, sýnir árangur sá, sem fengizt hefur af íslenzkum síldarmerkingatilraunum á reknetasíld, að unnt er að fá víðtæka vitneskju um göngur síldarstofna með slíkum merkingum úr reknetum.

ACKNOWLEDGEMENTS

The author wishes to express his sincere thanks to Dr. Árni Friðriksson for his instigation of the driftnet herring tagging and for making various unpublished data available. My thanks are also due to Mr. B. B. Parrish of the Marine Laboratory Aberdeen for reading through the text of the first manuscript. His criticism and suggestions proved most valuable. My thanks are further due to Hermann Einarsson, Dr. Phil., for making unpublished data available.

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