This Report not to be cited without prior reference to the Council*

International Council for the
Exploration of the Sea

C.M.1979/M:4
Anadromous & Catadromous Fish Committee

THE 25th MEETING OF THE BALTIC SALMON WORKING GROUP

Älvkarleby, Sweden, 2-3 April 1979

This Report has not yet been approved by the International Council for the Exploration of the Sea; it has therefore at present the status of an internal document and does not represent advice given on behalf of the Council. The proviso that it shall not be cited without the consent of the Council should be strictly observed.

*) General Secretary,
ICES,
Charlottenlund Slot,
2920 Charlottenlund,
DENMARK.

Contents

THE 25th MEETING OF THE BALTIC SALMON WORKING GROUP

1. PARTICIPATION

1.1. The following participated in the 25th Meeting of the Baltic Salmon Working Group held in Älvkarleby, Sweden, 2-3 April 1979:

H. Auvinen	Finland	
Z. Chełkowski	Poland	*
F. Chrzan	Poland	*
O. Christensen	Denmark	*
E. Ikonen	Finland	
N. Johansson	Sweden	*
P.-O. Larsson	Sweden	*
H. Lassen (Rapporteur)	Denmark	*
G. Naevdal	Norway	**
J. Pickova	Sweden	****
N. Ryman	Sweden	****
N. Steffner	Sweden	****
K.M. Svensson	Sweden	****
R. Sych (Chairman)	Poland	*
J. Toivonen	Finland	*

*) Members of the Working Group
**) Substituting D. Möller (Norway)
****) Only present on 3 April

1.2. Membership

The membership was checked according to information submitted via the ICES General Secretary.

1.3. Opening of the Meeting

The Chairman, Dr R. Sych, opened the meeting and welcomed the participants to the 25th Working Group meeting. The Chairman thanked the Swedish Institute for housing the meeting.

1.4. Terms of Reference

The Group met under the following terms of reference (C.Res.1978/2:36):

> "a meeting of the Baltic Salmon Working Group with Dr R. Sych as Chairman should be held for up to three days in March 1979 in Sweden to develop a population model for Baltic salmon and to review factors affecting the management of mixed stocks."

and (C.Res.1978/5:8):

> "a sea-trout tagging experiment should be conducted in Sweden and Poland to compare different methods and techniques, since returns from Carlin-type tags on sea-trout smolts have been poor."

2. AGENDA

2.1. The following agenda was adopted:

1. Opening of the meeting
2. Adoption of the agenda
3. The Chairman's address
4. Reporting on the "Review on Baltic Salmon Research"
5. Report on the first part of sea-trout tagging experiments conducted in Poland, March 1979
6. Considerations on some particulars of the tagging experiment being in progress
7. Country information and discussion on a present state of Baltic salmon stocks with a special regard to:
   - 7.1. relative changes in offshore, inshore, and river fishery
   - 7.2. influences of diseases and injuries on the stocks
   - 7.3. factors limiting a survival of the young up to post-smolt stage
   - 7.4. other pieces of information which might serve our better knowledge of the stock state and/or possibilities of its improvement
8. Current affairs of building the models of exploited salmon stocks
9. A discussion on an outline of our future cooperative studies on the genetic diversity of salmon and sea trout stocks in the Baltic region
10. Further collection and presentation of Baltic salmon catch statistics
11. Some matters of formal procedures referring to the Council requirements
12. Final formulation of the meeting recommendations
13. Any other business
14. Closure of the meeting

3. THE CHAIRMAN'S SUMMARY

3.1. The Chairman expressed his thanks for the confidence the Group had shown him when appointing him Chairman.

3.2. The Chairman congratulated the previous Chairman, Mr O. Christensen, for his successful chairmanship.

3.3. The Chairman summarized the four main points on which future activity would be centered:

a) comparing and standardizing methods in experimental and field work like the present sea trout (Salmo trutta L.) tagging experiment

b) developing models of exploited fish stocks of salmon (Salmo salar L.) and sea trout

c) investigations on genetic diversity of salmon stocks

d) continued collecting of information concerning the status of the salmon and sea trout stocks of the Baltic.

4. REVIEW ON BALTIC SALMON RESEARCH

4.1. The ICES Secretariat received the final manuscript of the synopsis shortly before Christmas 1978. The synopsis is expected to be published in the Cooperative Research Report Series in accordance with the recommendation C.Res.1978/1:8. Mr O. Christensen informed the Group that publication is expected in June 1979. Mr O. Christensen also expressed his hearty thanks to all contributors and special thanks to Dr Lindroth (Sweden) and Dr Pyefinch (Scotland) who acted as advisors to the editors.

5. ICES BALTIC SEA TROUT (SALMO TRUTLA L.) TAGGING EXPERIMENT - POLISH PART OF THE PROGRAMME

5.1. The programme of the experiment is given in the report from the 24th meeting of the Baltic Salmon Working Group.

5.2. 8 000 Vistula sea trout smolts were tagged, 2 000 of each tag type. On 1-2 March 1979, the smolts were sorted into 3 cm length groups in four basins. Each basin, one for each tag type, had the identical length distribution of smolts. On 6-8 March 1979, the smolts were tagged and stored in the basins until the temperature in the hatchery reached 8°C. Probably in the middle of April the smolts will be released in the lower Vistula River near Svibno, about 2 km from the river mouth. Dr Sych has reported that so far only three specimens have died.

The tagging took place in the hatchery Podkomorzyce and the taggers were:

Finland:	Jorma Toivonen
	Erkki Ikonen
	Alpo Tuikkala
	Jarmo Louhimo
Sweden:	Elisabeth Elfrendahl
	Per-Olov Larsson
	Nils Steffner
	Bjarne Ragnarsson
Poland:	Ryszard Bartel
	Zygmunth Zieliński
	Józef Rozek
	Roman Sych

The Chairman expressed his thanks to the taggers as well as to the hatchery chief, Mr Jerzy Zelazny, for a most professional job.

6. ICES BALTIC SEA TROUT (SALMO TRUTTA L.) TAGGING EXPERIMENT

6.1. The Swedish programme has been postponed due to a gill disease which makes the fish unable to handle. The experiment (tagging and releasing) is planned for May 1979 when the temperature in the River Dalälven has increased to about 5°C.

6.2. Due to the low number of released fish in the Swedish experiment, separately coded nose tags for each of the four types of external tags will not be used, consequently only a total loss of tags independent of tag type can be estimated.

6.3. The programme of sea trout tagging was enlarged by Danish and Finnish contributions.

6.3.1. The Danish laboratory will make a comparative tagging experiment in 1979 using the following tag types:

1. modified Carlin tags (Canadian type)
2. original Carlin tags
3. Floy-anchortags

or 3. Polish single wire attachment tags (type 4 in the original plans)

or 3. Finnish streamer tags.

The experiment will be conducted in April and July 1979 in the River Skjern Å. This river is running to the North Sea.

6.3.2. The Finnish laboratory will contribute with experiments in May 1979 according to plans later to be circulated to the Working Group.

6.4. Mr Erkki Ikonen submitted a paper on Finnish experience with the original and modified Carlin tags (see Annex 1).

6.5. The effect of tag colours was discussed and more information is necessary before any conclusion can be made (see Recommendation 6-5).

6.6. The reporting of the sea trout tagging experiment will be centralised at the Finnish Institute which has undertaken to establish a data bank (see Recommendations 6-3 and 6-4). Before the end of May 1979, the Finnish Institute is expected to circulate among the Working Group members standard forms and instructions (code lists and maps, etc.) for reporting releases and returns.

6.6.1. The release information should show each fish separately and contain:

type of tag
legend and number of tag
place of release
date of release
total length at tagging (see Recommendation 6-1).

6.6.2. The information on returns should contain:

legend and number of tag
nationality of the reporting fisherman
place of recapture (ICES statistical rectangle)
date of recapture
total length at recapture (see Recommendation 6-1)
weight (whether gutted/round fresh/unknown)
sex
gear
predator.

If the tag is found in the stomach of any other fish, in a gear or otherwise, this should be recorded under this heading.

6.7. The returns should be reported to the Finnish Institute as part of the current exchange of recaptures among laboratories.

6.8. The Finnish Institute is kindly asked to circulate among the Working Group members on a three monthly basis a list of returns showing each recaptured sea trout separately. The Finnish Institute will also kindly report annually to the Anadromous and Catadromous Fish Committee summarising the outcome of the experiment.

6.9. The national institutes and laboratories are responsible for informing the fishermen about the current sea trout tagging experiment.

6.10. The objective of the sea trout tagging experiment is to compare the return rates of different tag types (see ICES C.Res.1978/5:8).

6.10.1. The analysis of the tagging experiment was discussed and the polynominal model approach was proposed as an adequate model (see Seber (1973) and Jones in Gulland (1977)).

7. PRESENT STATE OF BALTIC SALMON STOCKS

7.1.1. Mr P.-O. Larsson reported on returns of salmon (see Annex 2).

7.1.2. Mr O. Christensen supplied tables and commented on the trends in catches and catch per unit effort in the offshore salmon fisheries (see Annex 3).

7.1.3. Mr J. Toivonen reported on the Finnish catches in recent years.

7.1.4. Dr R. Sych reported on the Polish sea trout catches (see Annex 4).

7.1.5. The conclusions from the contributions and discussions were as follows:

1. Salmon is in danger of reproduction failure due to decreasing numbers of homing spawners.

2. The decrease in the salmon stock is not apparent in the data from the offshore fisheries. Catch per unit effort seems to be at a constant level over a 25-year span, although a decline in total effort has been experienced since the sixties.

3. The widely migrating sea trout from Polish rivers do not appear to show any sign of danger of reproduction failures.

7.2. Dr N. Johansson reported on UDN diseases in Swedish rivers. After an epidemic outbreak in 1975, the number of known cases in 1978 is small. This disease places an additional stress on the salmon stock, especially as the mortality on females is higher than on males. Therefore, as female spawners are already scarce the danger of recruitment failure is increased.

7.2.1. Dr Johansson further stressed the importance of testing smolts under stress as fish with diseases may show vastly increased mortalities as compared with healthy fish (see Johansson (1977)).

7.2.2. Dr Johansson reported on dorsal fin rot in hatchery reared salmon (see Annex 5).

7.2.3. Mr Toivonen reported that at present in Finland there were no known cases of the UDN disease.

7.2.4. Mr Flondro submitted a report on salmonid diseases in Poland presented by Dr Sych (see Annex 6).

7.3. Dr Johansson reported on a disease in female spawners which causes defects in the eggs and also defects in later development of the parr stage. The agent of the disease is unknown at present.

7.3.1. Mr P.-O. Larsson reported on the influence of water temperature at release of smolts on the return rates in tagging experiments (see Annex 7).

7.3.2. Mr Jutila prepared a report for this item on the survival of salmon parr, which was presented by Mr Toivonen (see Annex 8).

7.3.3. Mr Toivonen showed graphs relating smolt migration to the water level in the river and to water temperature in the river as well as in the sea.

7.3.4. Dr Sych informed about the decrease in sea trout recaptures after damming the Vistula River which may be a result of an increase in the pike (Esox lucius L.) population in the dam reservoir.

7.4. Professor Chrzan presented estimates of the food basis for salmon and sea trout in the Baltic Sea. Herring and sprat are supposed to be the most important food items. The total biomass of herring and sprat is 3-4 million tonnes, and the food supply necessary for salmon and sea trout in the Baltic only amounts to about 0.4% of this biomass. It is therefore not likely that a shortage of food would limit the salmon and sea trout stocks at present and that increased stocks may change this situation.

8. MODELS OF EXPLOITED SALMON STOCKS

8.1. Dr Sych informed that the data obtained on the Finnish salmon tagging experiments will be applied for the Polish assessment model.

8.2. The next step towards assessment calculations on the Baltic salmon stock will be to simulate series of catches which can be compared with observed situations. Thereby it can be established if the models are isomorphic with the real situations (see Recommendation 8-1).

9. TRANSPLANTATION EXPERIMENTS

9.1. Two projects on transferring sea trout from Poland to Finland and Sweden and vice versa were discussed.

The objectives of the Finnish-Polish and Swedish-Polish exchange programmes are twofold:

to search for strains efficient for stocking;

to test the influence of the environment on migratory behaviour and the growth of the single specimen.

9.1.1. The Finnish-Polish project will transfer Polish, widely migrating sea trout smolts to Finnish inshore waters and Finnish (local, more stationary) sea trout smolts to Polish inshore waters.

9.1.2. The Swedish-Polish project will compare the Vistula sea trout introduced in Sweden 20 years ago, with the same population living in the Vistula River now. About 30 000 eggs of Vistula sea trout will be transferred next year, and in 1982 two-year-old smolts will be tagged and released in Sweden together with smolts of the population introduced in Sweden 20 years ago.

9.1.3. Simultaneously, smolts from the same sample of eggs as those sent to Sweden will be reared, tagged and released in Poland. A sample of tagged smolts from the Vistula population introduced 20 years before in Sweden will be transferred to Polish inshore waters also in 1982.

9.1.4. Mr Steffner summarised the results from tagging of the previously transferred widely migrating sea trout (see Annex 9).

9.1.5. Both projects were discussed and it was recommended to initiate these projects (see Recommendation 9-1).

9.2. Dr Johansson reported on a Swedish project on mapping genetic diversity in the salmon stocks (see Recommendation 9-2).

9.2.1. The objective of this project is to obtain a basic knowledge necessary for the eventual future establishment of gene pools and future management steps towards conservation of the genetic diversity in the salmon stocks.

9.3. Dr Ryman gave a lecture on mapping the genetic characteristics using electrophoreses (see Allendorf et al (1977)).

9.4. The ability to distinguish between stocks using other methods than the genetic mapping was stressed as important. Attention was drawn to the differences in scale structures as a possible method of discrimination between stocks (see Recommendation 9-3).

10. CATCH STATISTICS

10.1. Several members submitted catch statistics of Baltic salmon fisheries for 1977-78.

10.2. The complete set of catch statistics for 1978 should reach the Chairman not later than June 1979. Concerning the reporting, see Recommendation 10-1.

11. FORMAL PROCEDURES

11.1. The Chairman informed that Professor Thurow (Federal Republic of Germany) will no longer be a member of this Working Group and the Chairman expressed the Group's gratitude to Professor Thurow for his many years of hard work in the Baltic Salmon Working Group.

11.2. The absence of the member from USSR was specially noted with regret and the delegation to ICES of the USSR should be approached.

The importance of obtaining catch statistics from the USSR was reiterated from previous meetings.

12. RECOMMENDATIONS

General Recommendation G-1: A short meeting should be held during the 1979 Statutory Meeting to:

a) report on the progress of the ICES Baltic Sea trout tagging experiment;

b) define the Finnish-Swedish-Polish experiment of transfer of sea trout.

ICES Baltic Sea Trout Tagging Experiment

Recommendation 6-1: All length measurements be presented as total length.

Recommendation 6-2: The Finnish, Swedish and Danish Institutes' laboratories submit to Dr Sych short reports which contain the place and time of release, the number and the length distribution of the released fish together with other relevant data. Dr Sych will prepare a short report to be presented to the meeting of the Anadromous and Catadromous Fish Committee in October 1979.

Recommendation 6-3: Release and return information be circulated among the Working Group members on a three monthly basis by the Finnish Institute. The circulation of information should be done on standard forms giving each fish separately both for release and return.

Recommendation 6-4: The Finnish Institute is kindly asked to establish a data bank on computer and to present to the coming annual meetings summary tables showing the progress of the experiment.

Recommendation 6-5: Mr P.-O. Larsson and Mr O. Christensen are kindly asked to submit information on the effects on return rates using different colours of the tags.

Recommendation 6-6: The report on the effects of tagging on fish prepared by Dr Porter be circulated among the Baltic Salmon Working Group members. The Swedish laboratory is kindly asked to undertake the task of circulation.

Recommendation 8-1: Mr O. Christensen, Mr H. Lassen and Dr R. Sych are kindly asked to submit to the Working Group the results of comparisons of theoretical simulations with an observed exploitation pattern of Baltic salmon. This reporting is expected in May 1980.

Recommendation 9-1: The Finnish-Polish and Swedish-Polish experiments with transferring sea trout from Poland to Sweden and Finland and vice versa are commenced and that the results of these experiments be reported to the Anadromous and Catadromous Fish Committee.

Recommendation 9-2: The Swedish genetic mapping programme be carried out and reported to the Anadromous and Catadromous Fish Committee in 1980.

Recommendation 9-3: Other methods applicable for stock separation in salmon and sea trout be investigated.

Recommendation 10-1: Attention is drawn to C.Res.1976/4:10 whereby catch statistical rectangles, also inshore and river catches should be shown separately.

Recommendation 10-2: Mr O. Christensen will undertake to compile catch statistics for reporting to the Working Group and to the Anadromous and Catadromous Fish Committee.

Recommendation 10-3: Data be sent to Dr Sych, Poland, who will convey the data to Mr O. Christensen.

13. Any other business

No topic was discussed under this heading.

14. Closure of the meeting

The Chairman closed the meeting and expressed his thanks to the participants for the contributions presented and for the discussion. The Chairman expressed special thanks to the Swedish Laxforskningsinstitutet for housing the meeting.

References

ALLENDORF F.W., MITCHELL N., RYMAN N., and STÅHL, G., 1977. Hereditas 86, 190-197.

GULLAND, J., 1977. Fish population dynamics. Wiley.

JOHANSSON, N., 1977. Studies on diseases in hatchery-reared Atlantic salmon. Acta Universitatis Upsaliensis.

SEBER, G.A.F., 1973. Estimation of animal abundance and related parameters. Griffith.

ANNEX 1

TAGGING EXPERIMENTS OF TROUT WITH CARLIN TAGS AND MODIFIED CARLIN TAGS IN FINLAND

by

Erkki Ikonen

In the tagging of sea trout and brown trout, Carlin tags are usually used in Finland. This method has, however, created some problems. There has often been quite intensive gillnet fishing near the areas where the tagged fish are released. The mesh size used is usually 27-40 mm. Sea trout and brown trout in smolt size are too small to be caught by these gillnets, but when smolts are tagged with Carlin tags, they are caught by these gillnets because of the steel wire of the tags.

In order to avoid these difficulties, better tags have been tried in Finland.

Schlumpberger (1964) has used a hydrostatic tag which is attached to the fish with green thread made of dederon. This tag and tagging method is shown in Figure 1. This idea has been modified in Finland since then. The thread first used was made of polyfil nylon (the same material as used in the preparation of gillnets) which was drawn through the back of the fish by a needle. Instead of a hydrostatic cylinder, a flag of Carlin tag was used. With this modified tag, 500 brown trout smolts were tagged in Lake Konnevesi in the central part of Finland in 1970. Five hundred brown trout smolts tagged with Carlin tags were also released in the same place and at the same time.

The results of the taggings were as follows: Only two individuals with a modified tag were recaptured during the year of tagging. After this there were no recaptures. The rate of return (kg/1000 released) was only 0.4% and 1 kg/1000 released. Recoveries of the brown trouts with Carlin tags were made during five calendar years. The number was 61 individuals. The rate of return was 12.2% and 67 kg/1000 released.

The reason for the weak result with this modified tag was thought to be caused by tag losses. Tags were attached by one hole through the back of the fish but the material used for the thread was not suitable for this purpose.

A new modification of this tag was made in 1976. The flag was the same as earlier (the flag of the Carlin tag), but the thread was made of polyeten, which is also used in human surgery. In this tagging, the thread was drawn twice through the back of the fish by a small hook or open-eyed needle (Figure 2). During tagging, there were some difficulties because it was not easy to draw the hook or open-eyed needle through the back of the fish. By this method, 2 000 sea trout smolts were tagged in four different areas on the coast of Finland. At the same time and in the same areas, 2 000 sea trout smolts were also tagged with Carlin tags (Table 1).

It is not easy to say which result of these taggings is best, because they do not differ significantly.

The latest taggings with this tag type have been carried out with a needle which can be opened from the back end so that it is very easy to put the loop of the tag into the eye of this needle. These needles were originally made for blind people who find it difficult to use an ordinary needle. With these needles, it is very easy to draw the loop of the tag twice through the back of the fish

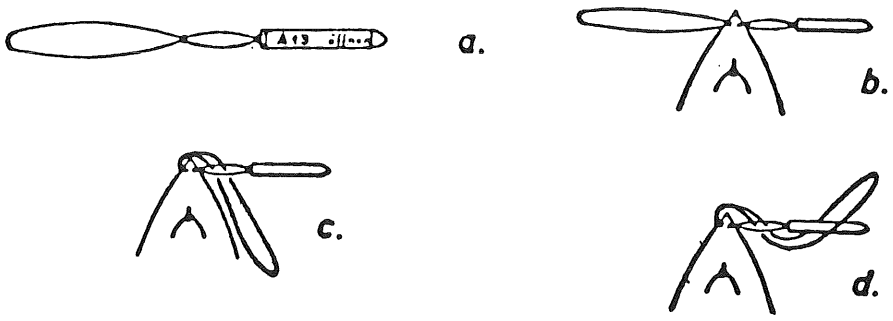
and the wounds made by the needle are very small. However, there are no results yet of taggings made by this tag and needle.

Reference

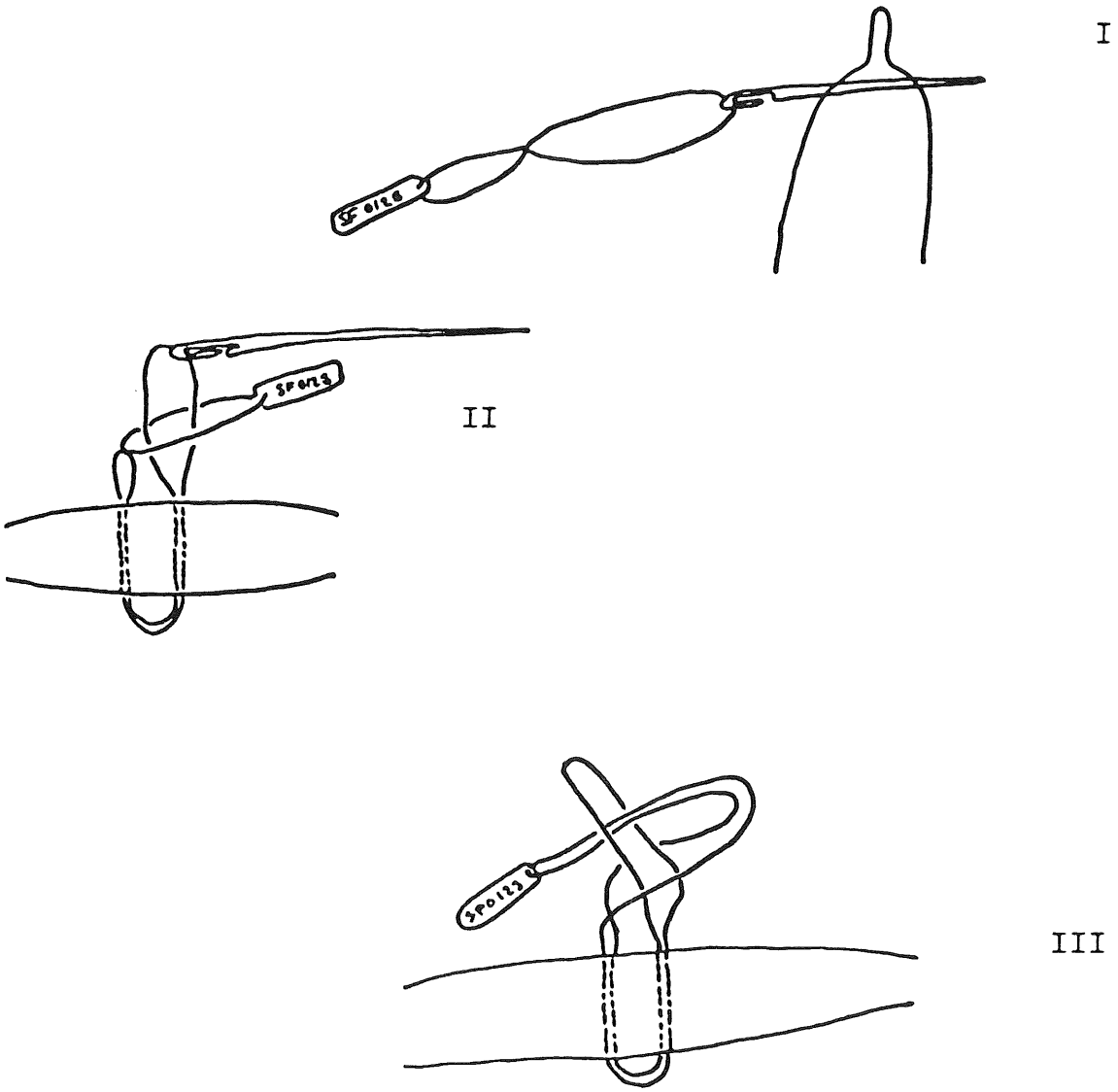
Schlumpberger, W., 1964. Fischmarkierungen zur Lösung von Bewirtschaftungsfragen in inneren Küstengewässern. Deutsche Fischerei Zeitung 11, 177-182.

Table 1. Return rates for some Finnish sea trout tagging experiments tagged with Carlin tags and modified Carlin tags (polyeten thread).

River stock	Length in release mm	Place of release	Date of release	Tag type	Number released	Return rate %	Return rate/kg 1 000 released	Mean weight kg
		Bothnian Bay						
Oulujoki	189	Hailuoto, Marjaniemi	19.5.1976	Carlin	250	13.2	46	0.4
Oulujoki	192	Hailuoto, Marjaniemi	31.5.1976	Carlin with polyeten thread	483	10.8	45	0.5
Oulujoki	192	On the coast near River Siikajoki mouth	21.5.1976	Carlin	250	11.6	40	0.4
Oulujoki	191	On the coast near River Siikajoki mouth	20.5.1976	Carlin with polyeten thread	490	13.7	64	0.5
		Archipelago Sea						
Isojoki	177	Nauvo, Gullkrona	1.6.1976	Carlin with polyeten thread	485	0.8	12	1.5
Isojoki	175	Nauvo, Gullkrona	1.6.1976	Carlin	500	0.8	13	1.6
		Gulf of Finland						
Isojoki	192	Kotka, Mussalo	31.8.1976	Carlin	489	9.0	93	1.0
Isojoki	192	Kotka, Mussalo	31.8.1976	Carlin	500	8.4	93	1.1
Isojoki	192	Kotka, Mussalo	31.8.1976	Carlin with polyeten thread	496	7.3	75	1.1



Annex 1 Figure 1. Schlumpberger's tag and the method of tagging.



Annex 1 Figure 2. The modification of Schlumpberger's and Carlin's tag. The flag is the same as in the Carlin tag and the thread is made of polyeten. The tag is attached by an open-eyed needle.

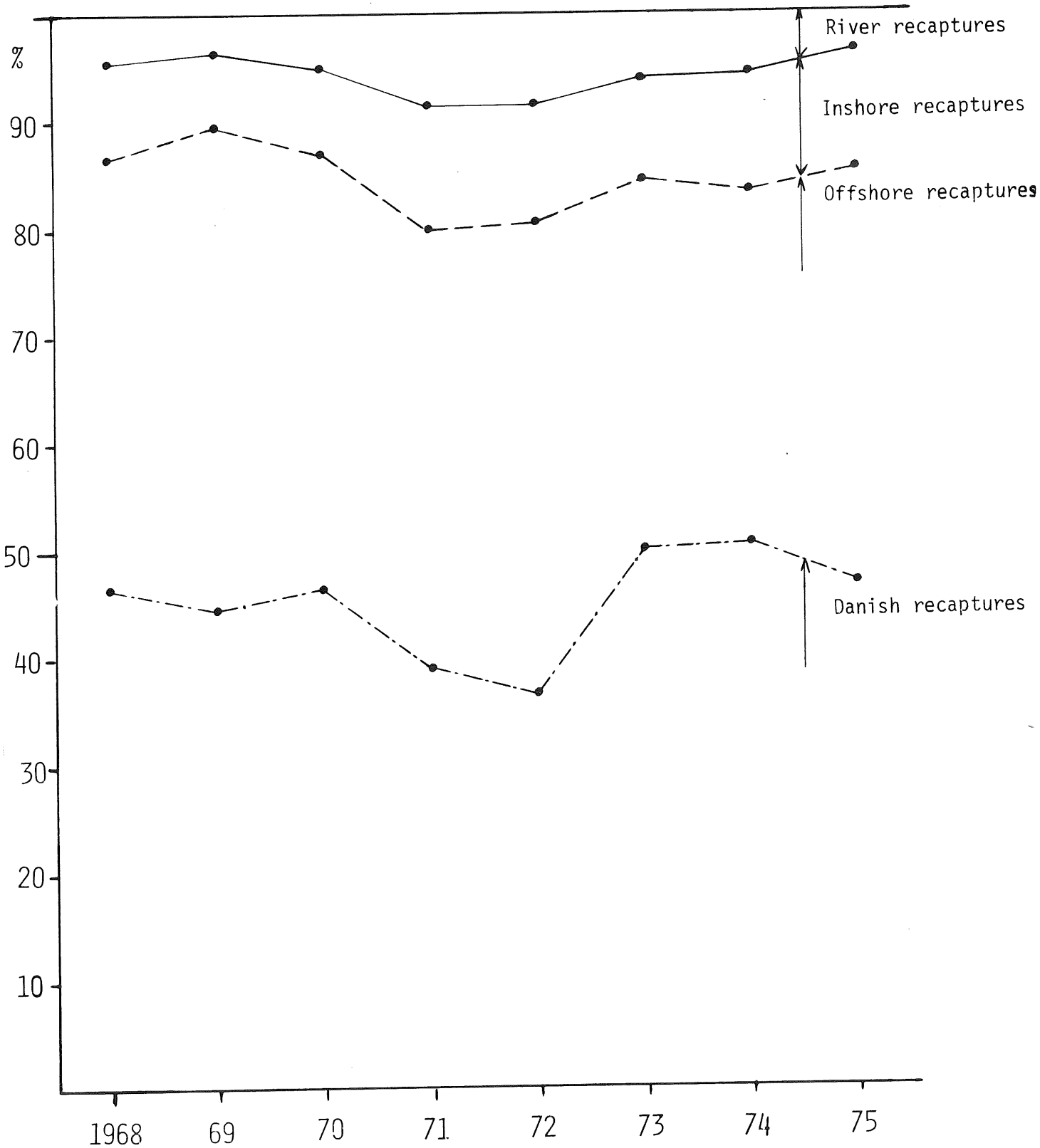
ANNEX 2

RELATIVE CHANGES IN OFFSHORE, INSHORE AND RIVER FISHERY

by

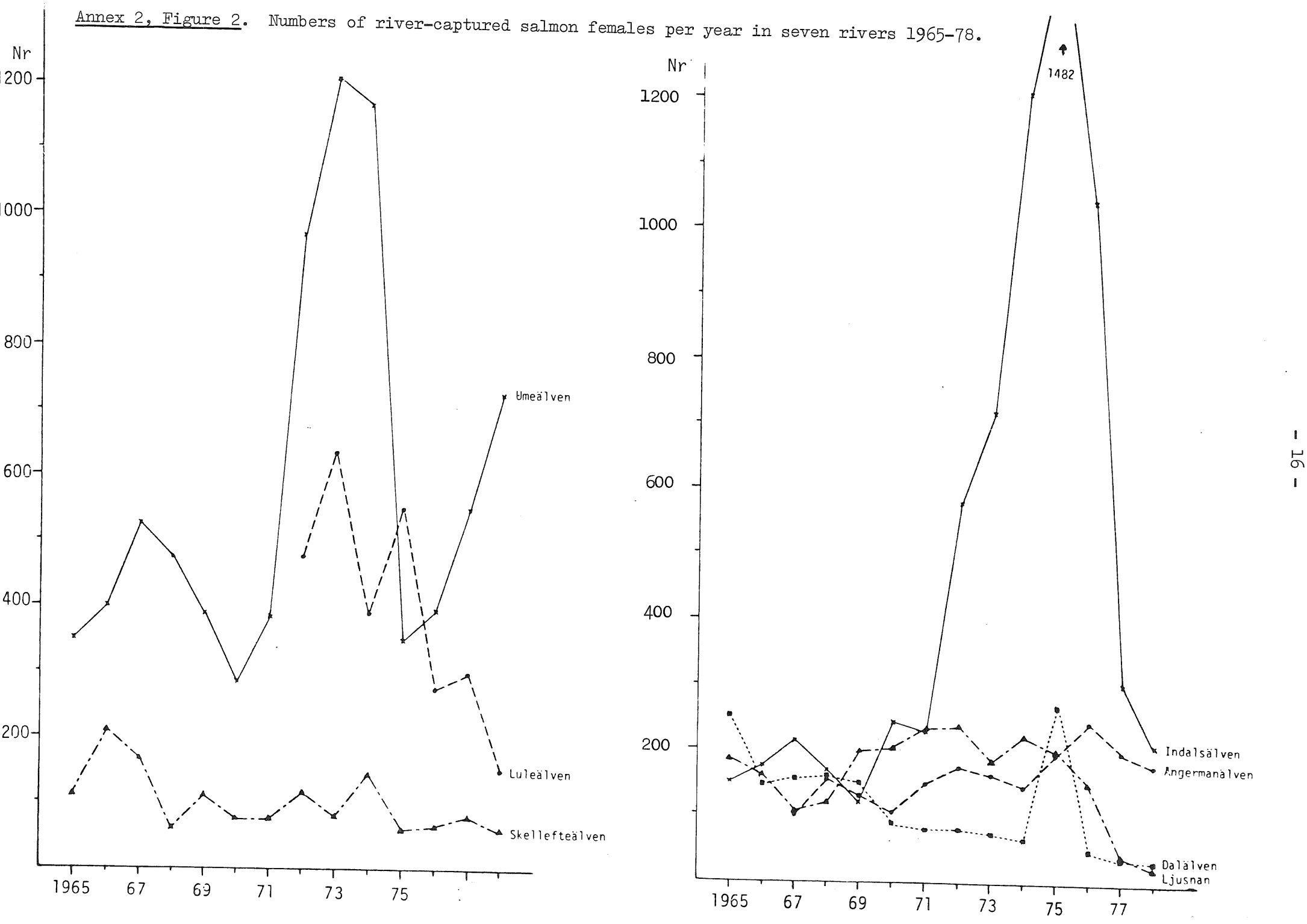
Per-Olov Larsson

The percentage distribution of tag returns on offshore, inshore and river fishery is shown in Figure 1 for the smolt year classes 1968-1975. The decrease in intensity of the Danish fishery (entirely offshore) during 1971-73 is clearly reflected in the material of tag returns (Figure 1). That decline resulted in an increase in inshore and river catches of spawning migrators. The higher abundance of spawning migrators induced an increase in fishing effort inshore. When the offshore fishery was again intensified and the inshore fishing efforts remained at a high level, the river fishery was strongly affected as can be seen in Figure 2, showing the number of females caught for breeding purposes in the major Swedish salmon rivers from 1965-1978. This fishery is carried out with different kinds of traps working with the same efficiency from year to year and the catch thus very well reflecting the abundance of fish.



Annex 2, Figure 1. Distribution of tag returns on offshore, inshore and river fishery together with Danish part of recaptures.

Annex 2, Figure 2. Numbers of river-captured salmon females per year in seven rivers 1965-78.



ANNEX 3

by

O. Christensen

Annex 3, Table 1. Nominal catches in metric tons of Baltic salmon in 1955-1977.

Annual mean	Baltic Main Basin Drifting gear Offshore	Gulf of Bothnia Drifting and fixed gear Offshore and coastal	Gulf of Finland Drifting gear Offshore	Rivers Fixed gear
1955-59	1621	4oo	3o	319
196o-64	2olo	474	99	283
1965-69	2353	299	113	245
197o-74	1782	347	129	2o7
1975	1821	661	158	321
1976	1950	715	81	-
1977 x)	1464	-	-	-

Based on Review of Baltic Salmon Research (unpublished) and ICES C.M.1978/M:9

x) Preliminary catches in the Main Basin by Denmark, Fed. Rep. Germany, Finland and Sweden.

Annex 3, Table 2. Catch, effort and catch per unit effort of salmon in the Baltic Main Basin in the seasons 1955/56 - 1977/78.

Season and mean	Number of salmon caught [a]	Number of salmon caught per 100 nets [b]	per 1000 hooks [c]	Number of hooks used (all catches converted to hook-catches)
1955/56-1959/60	365 000	8.3	15.7	2.32×10^7
1960/61-1964/65	466 000	7.2	15.3	3.05×10^7
1965/66-1969/70	641 000	8.0	20.1	3.19×10^7
1970/71-1974/75	455 000	8.3	21.9	2.08×10^7
1975/76	424 000	7.8	22.1	1.92×10^7
1976/77	484 000	8.7	22.6	2.14×10^7
1977/78	370 000	6.8	18.4	2.01×10^7

a) Metric tons converted to number by means of seasonal average weight per salmon in the Danish fishery.

b) 1955/56-1960/61 and 1961/62-1977/78 seasonal means of the fishery by The Federal Republik Germany and by Denmark respectively. (Reference Report on Baltic Salmon).

c) 1955/56-1956/57 and 1957/58-1977/78 seasonal means of the fishing by The Federal Republik Germany and by Denmark respectively. (Reference Report on Baltic Salmon).

d) Preliminary catches by Denmark, Fed. Rep. Germany, Finland and Sweden.

ANNEX 4

A DISTRIBUTION OF WIDELY-MIGRATING SEA TROUT CATCHES IN RELATION TO THE STOCK REPRODUCTION

by

R. Sych and R. Bartel,
Inland Fisheries Institute,
Poland

1. Relative figures and conclusions

As the annual catch statistics in metric tons are submitted to the Working Group, some relative figures have been considered in an attempt to analyse the catches in relation to the needs of stock reproduction. The basic information for these computations was taken from Polish reference reports on salmon and sea trout management which were prepared yearly at the River Fishery Laboratory of I.F.I. in Gdansk-Oliva.

The high seas catches have been approximated by supplementing the Polish statistics with fish caught by foreign vessels as shown from tagging, and a certain by-catch of salmon in Polish catches was not excluded (less than 10% with a permanent decrease).

The figures in Table 1 represent a relative distribution of Polish sea trout catches divided into the high seas, coastal and river. It is shown that 31% of fish caught come from high seas (with annual ranges from 27% to 37%), 50% from Polish coastal waters (with ranges from 44% to 56%), and 19% from rivers (with ranges from 17% to 27%). It is also important that changes in this distribution of catches are neither significant from year to year nor correlated with total catch fluctuations expressed in the last column of Table 1.

Table 2 explains an average utilising the river catches. About 50% are commercial and sport fish excluded from reproduction, about 15% are the migrators released over the dams for natural spawning, and 35% are spawners stripped of eggs for hatchery rearing.

Annual effects of fish stripping in 1972-75 ranged between 11.4 and 13.2 million eggs. Regarding the capacity of hatcheries, since 1976 the number of annually collected eggs has been limited to about 8 million (Table 3).

As is shown in Table 4, a great part of obtained eggs then serve to stock the streams with alevins, but now a strong tendency of an increase of stocking with smolts takes place.

Hence, in the case of Polish widely-migrating sea trout, a number of migrants entering the rivers, and a number of spawners, can be easily controlled as more than 60% of fish are taken in coastal and fresh waters and only 50% of fish captured in rivers now serve for reproduction. The stock reproduction is, on the other hand, mainly dependent on the capacity of hatcheries and on the hatchery-rearing results which are in general poor (scarcity of water, low survival).

2. Supplementary notes

The problem was presented in a general way (see Section 1) since only a distribution of total catches could be taken into account. It is known from tagging experiments that the Gulf of Gdansk is an area where sea trout originate from various Polish rivers, and similarly the Vistula sea trout can be found in the Pomeranian inshore grounds. These facts also seem to be proved by comparing the monthly catch distribution in the rivers and adjacent coastal waters (Figure 1). May-November is a period of time when the fish schooled in coastal waters could be roughly subordinated to the river stocks. However, winter-spring is the season when a mixed stock approaches the inshore grounds for feeding. Thus, some regular studies on the catch levels in relation to the needs of fish reproduction should be supported by the methods of discrimination of the unit stocks.

Annex 4 Table 1. Distribution of sea trout catches in relative figures.

Year	High seas	Coastal	River	Total	Relative changes of total catches
1972	37%	45%	18%	100%	83%
1973	35%	47%	18%	100%	101%
1974	32%	51%	17%	100%	129%
1975	29%	44%	27%	100%	98%
1976	28%	54%	18%	100%	107%
1977	27%	56%	17%	100%	82%
Average 1972-77	31%	50%	19%	100%	100%

Annex 4, Table 2. Average distribution of river catches in relation to reproduction.

100%	Total river catch
40%	Commercial catches
10%	Sport catches
15%	Migrators released for natural spawning
35%	Spawners used for stripping

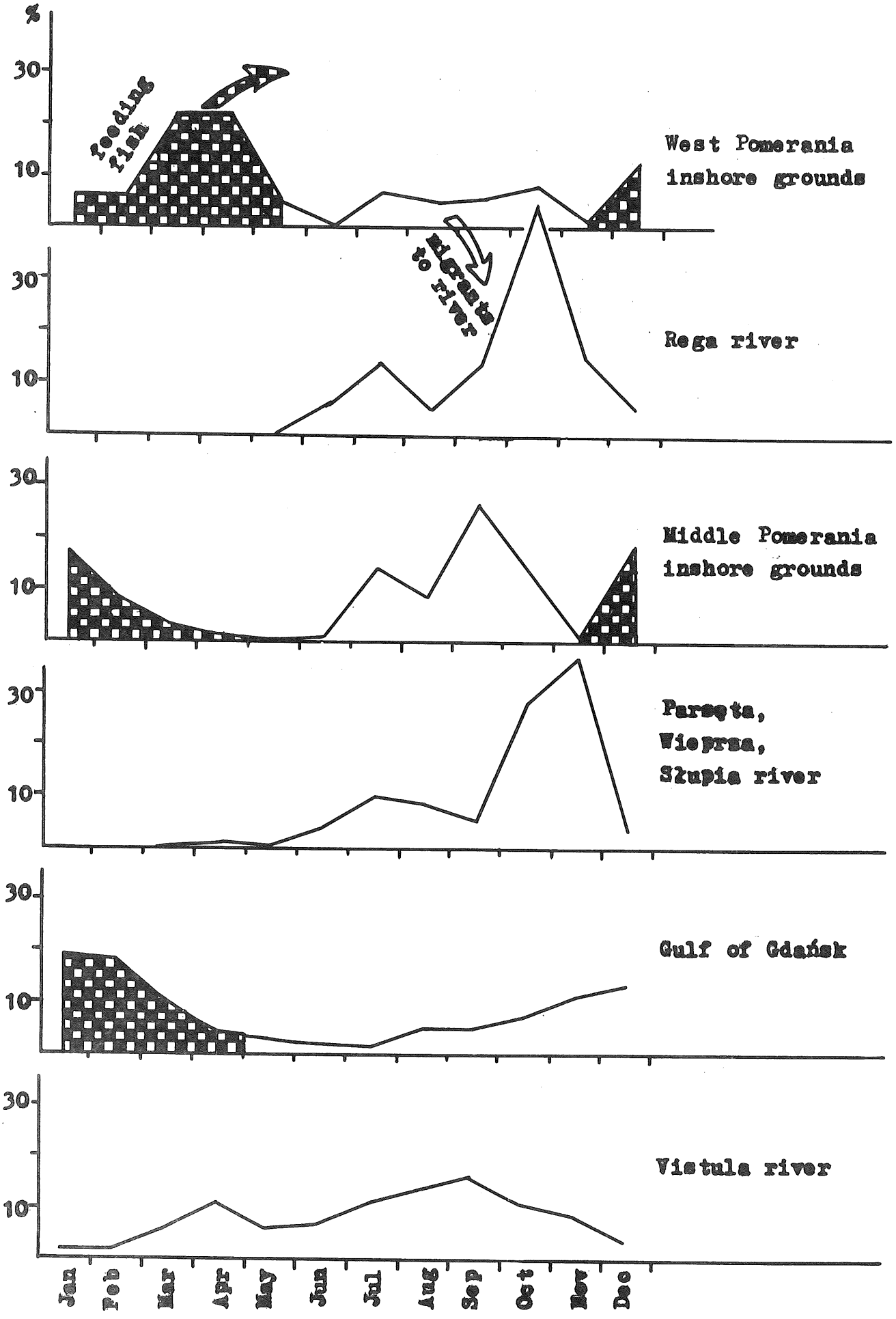
Annex 4, Table 3. Number of obtained eggs.

Year	No. of eggs
1972	12 570 300
1973	12 489 600
1974	13 215 600
1975	11 354 200
1976	8 830 300
1977	7 918 000
Average 1972-77	11 063 000

Annex 4, Table 4. Average distribution of obtained eggs in relation to stocking.

100%	Total No. of eggs	
~ 40%	For stocking with alevins	
~ 35%	For stocking with parr	a)
~ 25%	For stocking with smolts	

a) Since 1976, this part has been reduced for a tendency to rearing smolts.



Annex 4, Figure 1. Monthly distribution of sea trout catches in some main Polish regions (compiled from Chełkowski, Bartel and Zieliński for 1960-75).

ANNEX 5

DORSAL FIN ROT

by

N. Johansson

Considering the fairly high frequency of dorsal fin rot in hatchery-reared salmon and its chronic character, it is logical to suggest that the disease has some influence on the vitality of the smolts and consequently on the survival to the adult stage. The influence of dorsal fin rot on the quality of hatchery-reared smolts at the time of release was studied by tagging experiments (Carlin, 1968). The material included a total of 97 625 salmon smolts, reared in three different stations and released as two-year-old fish in three different rivers. Table 1 shows the magnitude of dorsal fin lesions and the recapture quotients between fish with fin rot at the time of tagging and healthy fish. The quotient ranged from 0.8014 to 1.1774 and the mean value was 0.9573 ($P < 0.001$). Consequently, the dorsal fin rot seems to decrease the quality of hatchery-reared smolts by about 4%. The relationship between recaptures of fish with dorsal fin rot and the total recaptures in the material investigated is given in Figure 5.

Annex 5, Table 1. DFR+ or DFR- = individuals positive or negative for dorsal fin rot at the time of tagging,

$$Q = \frac{\text{Recapture of DFR+ fish \%}}{\text{Recapture of DFR- fish \%}}$$

River	Number of experiments	Number of test groups	Released fish			Q
			Total	With fin rot		
			Number	Number	%	
Luleälven	8	31	33 089	15 506	46.9	0.9385
Ångermanälven	4	22	19 589	11 605	59.2	1.0105
Indalsälven	15	46	44 947	22 696	50.5	0.9531
Total	27	99	97 625	49 807	51.5	0.9573

Annex 5, Table 2. Percentage mortality due to UDN in salmon and sea trout kept for stripping in two different rivers 1975-78.

	River Indal				River Lule			
	1975	1976	1977	1978	1975	1976	1977	1978
Salmon ♀	58.8	30.0	21.8	6.3	60.8	28.1	4.6	2.6
Salmon ♂	22.9	17.4	4.8	12.1	30.9	15.2	2.1	2.7
Sea trout ♀	52.3	29.6	59.9	42.6	52.7	28.6	1.9	3.5
Sea trout ♂	47.2	14.1	9.3	9.1				

ANNEX 6

A SHORT REPORT ON THE STATUS OF SALMONID FISH HEALTH IN POLAND

by

Feliks Flondro
Research Laboratory for Salmonid Fish Pathology,
Bytowska 5, Gdansk-Oliva, Poland.

The most important salmonid fish diseases noticed in Poland in 1976-78, especially in sea trout, can be described briefly as follows:

Furunculosis salmonum caused by Aeromonas is prevalent in four hatcheries: Porabka, Zawada, Roznów, Hańczowa. Terramycin and other antibiotics, furazolidone, sulfa drugs have been used in treating furunculosis among sea trout.

Ulcer disease caused by Hemophilus piscium is less frequent in sea trout hatcheries than furunculosis. As efficacious remedies, chloramphenicol and terramycin are applied in food.

Bacteriosis pinnarum - Fin rot occurs in sea trout hatchery Czatkowice. Most parr and pre-smolts are susceptible to this disease. Dipping infected fish in a solution of copper sulfate is effective in controlling the bacterial form of the disease. A diet rich in folic acid and vitamin A is recommended too.

Necrosis ulcerosa cutis - Ulcerative dermal necrosis (UDN) has not been revealed.

Costiosis caused by Ichthyobodo pyriformis is prevalent in sea trout parr in hatcheries Porabka, Olszówka and Roznów. A one-hour bath in a 1:5 000 formaldehyde solution is effective as treatment.

Ichthyophthiriosis caused by Ichthyophthirius multifiliis is found in almost all stages of young sea trout, and resulted in serious losses. The fish are treated with a 1:4 000 formaldehyde solution for one hour, or by a combined wash of 25 ppm formaldehyde and 0.1 ppm malachite green.

Other common factors of sea trout diseases in our hatcheries are irrationality in fish nutrition, and an excess of waste products including metabolites connected with water deficit.

At the present time there are 20 laboratories for fish pathology in Poland, which belong to the Veterinary Hygiene Stations. However, the diseases mentioned above are still a great problem as they can result in heavy losses of fish in some years, limiting the effects of hatchery rearing. This is a reason why our annual sea trout smolt production fluctuates between about 200 000 and 500 000 smolts from the same total area of hatcheries.

ANNEX 7

IMPACT OF WATER TEMPERATURE AT RELEASE OF HATCHERY-REARED SALMON SMOLTS ON THEIR SURVIVAL

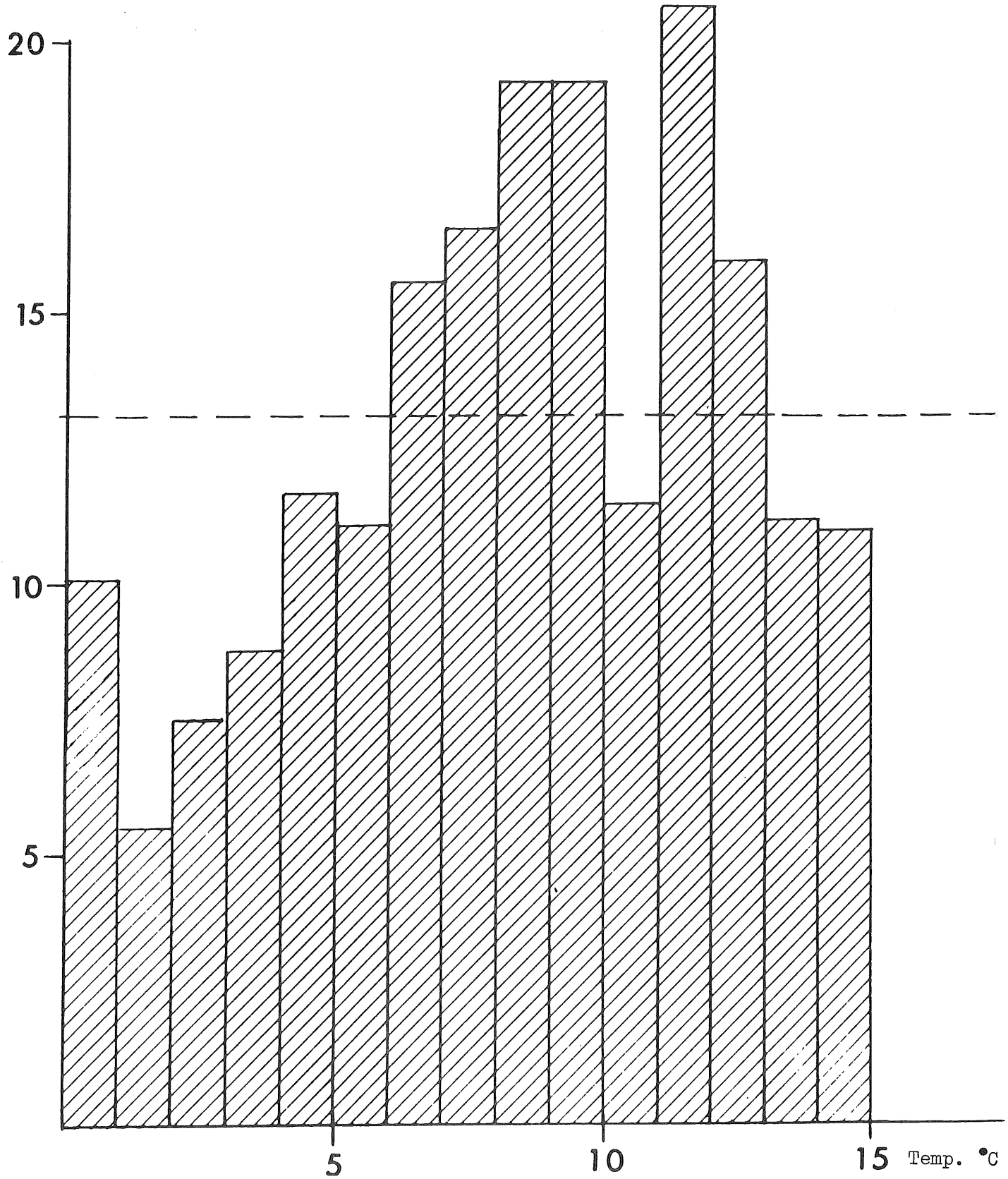
by

Per-Olov Larsson

The results of all Swedish tagging experiments with salmon smolts have been related to the water temperature at release.

In Figure 1, the results of 272 experiments from 1955-1974 in the six major salmon rivers are summerised per C°. It is clear that the empirically-grounded rule to release salmon smolts at 8-10° water temperature also gives good results. The optimal temperature is slightly different between the rivers, but in all of them releases at 10-11° give poorer results than both lower and higher temperatures. This odd fact is hard to explain, but might have something to do with the results being better if the fish are released when the water temperature is rising than when it is decreasing, which often happens even in the spring.

Anyhow, it is important to release hatchery-reared fish at the optimal temperature in the river in question to obtain maximum survival.



Annex 7, Figure 1. Results of tagging experiments with salmon smolts related to water temperature at release in six main Swedish salmon rivers 1955-74.

ANNEX 8

FACTORS AFFECTING THE SURVIVAL OF THE SALMON PARR TO POST-SMOLT STAGE IN THE SIMOJOKI RIVER

by

Eero Jutila

The influence affecting the survival of the salmon parr to post-smolt stage in the Simojoki River

The sex ratio and the ratio of precocious males of salmon parrs and smolts have been studied in the Simojoki River in 1976-78. The salmon parrs have been collected by electrical fishing in August 1976 and 1978. Migrating salmon smolts have been sampled in the mouth of the river by smolt traps in connection with tagging experiments in May-June, 1972-78.

The sex of the age group 0+ was not determined. The ratio of males and females was equal in the 1+ group. Within group 2+, the percentage of males increased (Table 1). Among the oldest parrs, males dominated considerably. On average, 10.5% of the males in their second year of river life and 70.7% in their third year were precocious males, and all were precocious among the oldest age group.

Females were more numerous than males in all the age groups of smolts. The percentage of females was highest among smolts of three years. The ratio of females in all the salmon smolts averaged 69.8%. On average, 2.2% of the male smolts at two years of age appeared to have matured the autumn before. Among older smolts, the percentage was higher, 38.8% in three-year-old smolts and 75% in four-year-old smolts.

The majority of males in older parrs is caused by more numerous smoltification of females in young ages as compared with males, as observed in many rivers, e.g., in Salatsa and Daugava in Latvia by Mitans (1972). It may also be due in part to the active migration of precocious males to spawning areas easy to electrical fishing. The predominance of females among smolts indicates considerable mortality of male parrs, especially precocious ones before smolt migration. The increased mortality of precocious males as compared with other parrs may be due to exhaustion by sexual maturation and greater activity during autumn and winter. In part, it may be caused by the altered behaviour of the precocious males during the spawning season affecting their higher mortality by predators.

In Latvian rivers, Mitans (1972) has demonstrated that the survival rate of precocious males was 56% of that of the juvenile parrs. In these rivers, the predominance of females (58%) established on the smolt stage remained unchanged in the spawning stock of adult salmon. The percentage of females (69.8%) among the smolts of the Simojoki River is equal to the predominance of females (68.4% on average) in adult salmon caught ascending to spawn for the first time in the Gulf of Bothnia area in 1921-35, studied by Järvi (1938). It is reasonable to suppose that the more numerous smoltification of females in younger ages, as compared with males, and the increased mortality among precocious males, are the main factors influencing the predominance of females among wild salmon smolts and adults. On the other hand, salmon stocking has been reported to increase the proportion of grilse in the salmon rivers of Sweden (e.g., Berg, 1976). This phenomenon may be partly due to the greater proportion of males in hatchery-reared smolts as compared with wild smolts.

REFERENCES

Berg, S.E., 1976. Laxens medelviktminskning. Laxforskningsinstitutet. Meddelande 3: 1-7.

Järvi, T.H., 1938. Fluctuations in the Baltic stock of salmon (1921-35). ICES, Rapp. et Proc.-Verb., Vol. 106.

Mitans, A.R., 1972. The precocious males in the populations of salmon parrs and smolts in the Latvian rivers. ICES, C.M.1972/M:8.

Annex 8, Table 1. Sex ratio of salmon parrs and smolts of the River Simojoki in 1976-78 (parrs only 1976 and 1978).

Groups of young salmon	Age groups	Sex ratio, %			Ratio of males, %			
		Indet.	♀	♂	Indet.	Precocious	Juv.	N
Parrs	0+	100.0	-	-	100.0	-	-	83
	1+	0	52.0	48.0	0	10.5	89.5	136
	2+	0	37.3	62.7	0	70.7	29.3	32
	3+	0	3.6	96.4	0	100.0	0	15
Smolts	2	2.2	61.6	36.2	0	2.2	97.8	210
	3	0.7	69.8	29.5	0	38.8	61.2	305
	4	0	52.8	47.2	0	75.0	25.0	11

ANNEX 9

RECAPTURES OF VISTULA WIDELY-MIGRATING SEA TROUT RELEASED IN SWEDEN 1962-1978

by

N. Steffner

Year	Place of release	Released number	Returns			
			Kg/1 000	Number	Kg	%
1962	Verkeån nedom fasta fisket	821	64.9	27	53 260	3.0
	Indalsälven Kävsta	200	93.2	9	18 645	4.5
	Indalsälven Bergeforsen	755	161.4	67	121 873	9.0
	Malgomaj	750	28.5	60	21 429	8.0
1968	Vättern Baskarp	127	19.6	2	2 500	1.5
1969	Indalsälven Bergeforsen	1 000	139.9	47	139 865	4.7
1970	Lule älv Heden	400	196.4	39	78 570	9.7
	Vättern Hästholmen	400	25.5	15	10 210	3.7
	Nordre älv Kungälv	306	3.5	2	1 060	0.6
1971	Helgeån Helgeåns mynn.	500	236.2	36	118 091	7.2
1973	Dalälven Bremen, Skutskär	500	176.6	34	88 302	6.8
	Bråviken Färjeläget, Skenäs	500	397.7	57	198 882	11.4
1974	Brantevik från båt	500	154.3	19	77 130	3.8
	Hovenäset Smögen	500	4.5	3	2 270	0.6
1975	Dalälven Skutskär	500	82.9	17	41 440	3.4
1977	Bråviken Skenäs	498	5.7	4	2 850	0.8

/Continued

Continued

Year	Place of release	Released number	Returns			
			Kg/1 000	Number	Kg	%
1978	Bråviken Skenäs färja	500	-	3	-	0.6
	Mälaren Stockholms ström	496	1.3	4	0 669	0.8
	Östersjön Gotland	499	-	-	-	-
	Dalälven, Kungsådran Laxöfisket	498	-	1	-	0.2
	Dalälven, Kungsådran Laxöfisket	472	28.5	1	0 095	0.2