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DIFFERENCES IN MIGRATION PATTERN AND GROWTH OF POLISH AND FINNISH SEA TROUT (*SALMO TRUTTA* L.) RELEASED IN THE SAME AREAS

Ryszard Bartel, Erkki Ikonen**, Heikki Auvinen****

*Inland Fisheries Institute, River Fisheries Laboratory Gdańsk, Poland
** Finnish Game and Fisheries Research Institute Helsinki, Finland
***Finnish Game and Fisheries Research Institute, Salmon Fisheries Research and Aquaculture, Enonkoski, Finland.

ABSTRACT. Tagged sea trout (*Salmo trutta*) from the Vistula (Poland) and Isojoki (Finland) rivers were released into the Vistula River mouth and into the Gulf of Finland outside of the city of Helsinki. Vistula sea trout released into the Vistula River mouth were less frequently caught (75%) in and nearby the place of their release than were Isojoki sea trout released in the same place (92.3%). Finnish sea trout seldom migrated to the southern Baltic Proper. Of the Isojoki sea trout released into the Gulf of Finland, 74.1% were caught in the Gulf of Finland. The behavior of the two stocks released into the Gulf of Finland could not be compared due to the low tag returns of the Vistula stock. Isojoki sea trout released into the Vistula River mouth attained a total length of 49 cm and a body weight of 1.7 kg by the end of the first year after release, and 63 cm and 2.8 kg by end of the second year; while those released into the Gulf of Finland attained 39 cm and 654 g by the end of the first year, and 52 cm and 1.6 kg by the end of the second. The results of stocking was low; between 0.2 and 160.3 kg per 1000 smolts, and depended on the method of fish tagging, smolt quality, and stocking site.

Key words: SEA TROUT, SMOLT, TAGGING, VISTULA RIVER, ISOJOKI RIVER, DISTRIBUTION, GROWTH

INTRODUCTION

The results of previous tagging experiments carried out in Finland and Poland have revealed some differences as to the migrations and distribution of sea trout (*Salmo trutta* L.) in these countries. The Finnish stationary sea trout tend to migrate along the coast of the Gulf of Finland, and only single specimens migrate southward to the Baltic Proper (Toivonen and Tuhkunen 1975, Ikonen and Auvinen 1982, 1984, Bartel et al. 1987). Sea trout from Polish rivers tend to migrate towards the open sea, reaching the Gulf of Finland and the Gulf of Bothnia (Żarnecki et al. 1962, Backiel and Bartel 1967, Skrochowska 1969, Palka and Bieniarz 1983, Bartel 1987, 1988). The latter are classified as a widely migrating type.

Fig. 1. Tagging (X) and release (an arrow) sites of sea trout smolt in Finland and Poland.

The objective of the experiments was to assess the suitability of these sea trout strains for stocking, and to determine whether the environment might affect sea trout migrations and growth.

MATERIAL AND METHODS

A total of 7 962, two-year-old sea trout smolts were tagged as follows:

- 3 969 Vistula smolts produced in the Podkomorzyce Hatchery (Poland) (Fig. 1) were tagged from 24 to 27 March 1980;
- 3 993 Isojoki smolts produced in the Finnish Hanka Taimen Hatchery (Fig. 1) were tagged on 11 and 12 April 1980.

In each hatchery the fishes were divided into four groups. Two of the groups were tagged by a Finnish team with light-green tags attached with a polythene monofilament (polythene). The other two were tagged by a Polish team with yellow celluloid tags attached with a single monel metal wire.

The fishes were anesthetized with MS-222 before tagging. Half of the Polish sea trout tagged with the two different tags were released into the Vistula River mouth, and the rest were transported by ferry boat to Finland and released into coastal waters near Helsinki. The Isojoki sea trout were treated similarly; half where released near Helsinki and the rest were transported by ferry boat to Poland and released into the Vistula River mouth (Fig. 1, Table 1).

Fishes tagged in Finland were kept for 13 days in fiberglass basins or for 26 days in an earthen pond before being transported to Poland or Finnish coastal waters (Table 1).

The Isojoki sea trout were transported by truck on a ferry boat to Poland in two basins with oxygenated water. The duration of the transportation was 39 h. Isojoki sea trout released into coastal waters near Helsinki were transported by truck in a basin with oxygenated water. Their transportation duration was 7 h.

Polish sea trout were kept in concrete basins for three and 41 days before being transported to the Vistula River mouth and to Finland (Table 1), respectively. The car-ferry transport of the fishes from Poland to Finland lasted 40 h. A total of 37 fishes died during transport, and 3 lost their tags (Anon 1980). Transporting the fishes from the Podkomorzyce Hatchery to the Vistula River mouth by truck lasted 2 h.

The total length (TL) of the sea trout at the time of tagging varied from 15.5 to 28.4 cm. The average length of the fishes tagged in the Hanka Taimen Hatchery varied from 20.7 cm to 21.3 cm (Table 1). The average length of the fishes tagged in the Podkomorzyce Hatchery ranged between 19.1 and 19.9 cm (Table 1).

The growth of the fish was characterized using the average length and average weight of each of the three mentioned groups of fish above for the November to March period in the successive years following release. The following parameters were compared using two-factor analysis of variance (Fisher-Snedecor test) and non-ortogonal data:

- average length and average weight of sea trout in the November-March period in successive years following release;
- trout growth in four-month periods in the second and third year following release.

TABLE 1

Results of the tagging of Polish sea trout transferred to Finnish waters and Finnish sea trout transferred to Polish waters

Group No.	Fish Tagging			Origin of fish	Mean length (TL) cm	Released			Recaptured		
	Hatchery	Date (1980)	Tag type			Place	Date (1980)	No. of fish	No. of fish	%	Yield kg/1000 smolts
1.	Podkomorzyce	26 March	Monel	Vistula River	19.1	Vistula River mouth	29 March	998	19	1.9	19
2.	Podkomorzyce	26 March	Polythene	Vistula River	19.7	Vistula River mouth	29 March	983	62	6.3	116
3.	Hanka Taimen	11-12 April	Monel	Isojoki River	20.7	Vistula River mouth	25 April	999	81	8.1	98
4.	Hanka Taimen	11-12 April	Polythene	Isojoki River	21.3	Vistula River mouth	25 April	997	93	9.3	119
5.	Podkomorzyce	27 March	Monel	Vistula River	19.9	City of Helsinki-Gulf of Finland	07 May	1000	2	0.2	2
6.	Podkomorzyce	27 March	Polythene	Vistula River	19.3	City of Helsinki-Gulf of Finland	07 May	988	5	0.5	19
7.	Hanka Taimen	11-12 April	Monel	Isojoki River	20.7	City of Helsinki-Gulf of Finland	08 May	998	13	1.3	15
8.	Hanka Taimen	11-12 April	Polythene	Isojoki River	21.2	City of Helsinki-Gulf of Finland	08 May	999	69	6.9	161
				Total				7972	344	4.3	

RESULTS

TAG RETURNS

Of 7 972 tagged fishes, 344 tags were returned, i.e. 4.3%. The tagging method used noticeably affected the returns. The rate of returns of polythene tags was almost twice as high (5.8%) as that of the monel tags (2.9%). Returns of polythene tags were higher in all variants of the experiment (Table 1).

From the fishes produced by the Podkomorzyce Hatchery, an average of 2.2% of the tags were returned. The rate of return of the tags from the fishes of the Hanka Taimen Hatchery was higher at 6.4% on average.

Of all the fishes released into the Vistula River mouth (originating from the two hatcheries and tagged with the two methods), 255 tags were returned (6.4%). The rate of return was higher for fishes originating from the Hanka Taimen hatchery at 8.1 and 9.3%, compared to the Podkomorzyce hatchery at 1.9 and 6.3% for monel and polythene tags, respectively (Table 1).

Of the 3 985 fishes released into Finnish coastal waters, 2.2% of the tags were returned. The results differed considerably depending on fish origin and the type of tag used. The returns were much worse for fishes originating from the Podkomorzyce Hatchery (Table 1). Tagged fishes were caught for five years. From the fishes released into the Vistula River mouth, many were caught during the first three months following release, accounting for as much as 57% of all returns (Table 2). These fishes were mostly caught with herring gillnets.

TABLE 2

Distribution of tag returns in different years

Place of release	Origin of fish	Tag returns %						Total number of tag returns
		Year of release		2nd year	3rd year	4th year	5th year	
		First 3 months	Latter 9 months					
Vistula mouth	Vistula River	34.5	4.9	24.7	23.5	11.1	1.2	81
Vistula mouth	Isojoki River	57.0	4.6	19.8	9.9	8.7	-	174
Helsinki Gulf of Finland	Isojoki River	7.3	6.1	29.3	35.3	17.1	4.9	82

DISTRIBUTION OF THE TAGGED ISOJOKI SEA TROUT RELEASED INTO THE COASTAL WATERS OF THE GULF OF FINLAND

Of the Isojoki sea trout released near Helsinki, 71.4% were caught in the Gulf of Finland. Most frequently (44.3%), the returns were caught in or near the release site. Single specimens migrated to the southern Baltic Proper and the Bothnian Bay (Fig. 2, Table 3).

TABLE 3

Percentage of tag recoveries by ICES sub-division of tagged Vistula and Isojoki sea trout released into the Vistula River mouth and the Gulf of Finland near Helsinki

ICES sub-division	Release site			
	Vistula River mouth		Helsinki	
	Origin		Origin	
	Vistula River	Isojoki River	Vistula River	Isojoki River
Baltic Proper 24	7.9	1.2		1.2
Baltic Proper 25	4.0	-		-
Baltic Proper 26	64.5	79.2		1.2
Baltic Proper 27	2.6	1.2		7.5
Baltic Proper 28	4.0	2.4	16.7	3.8
Baltic Proper 29	1.3	1.2	33.3	7.5
Bothnian Sea 30	2.6	1.2	16.7	6.2
Bothnian Bay 31	-	-	-	1.2
Gulf of Finland 32	2.6	0.6	33.3	71.4
Vistula River	10.5	13.1		-
No. of recoveries	76	174	6	80

DISTRIBUTION OF THE TAGGED VISTULA SEA TROUT RELEASED INTO COASTAL WATERS OF THE GULF OF FINLAND

Of the 1 988 Vistula sea trout released near Helsinki, only seven tags were returned; data regarding the catch site was recorded for six of them. Consequently, it was difficult to determine the distribution of the fishes and to compare it with the Isojoki sea trout released in the same place (Fig. 3, Table 3).

DISTRIBUTION OF TAGGED VISTULA SEA TROUT RELEASED INTO THE VISTULA RIVER MOUTH

Among the 1 981 tagged Vistula sea trout smolts released into the Vistula River mouth, 76 tags were returned with precise information as to where the fish had been

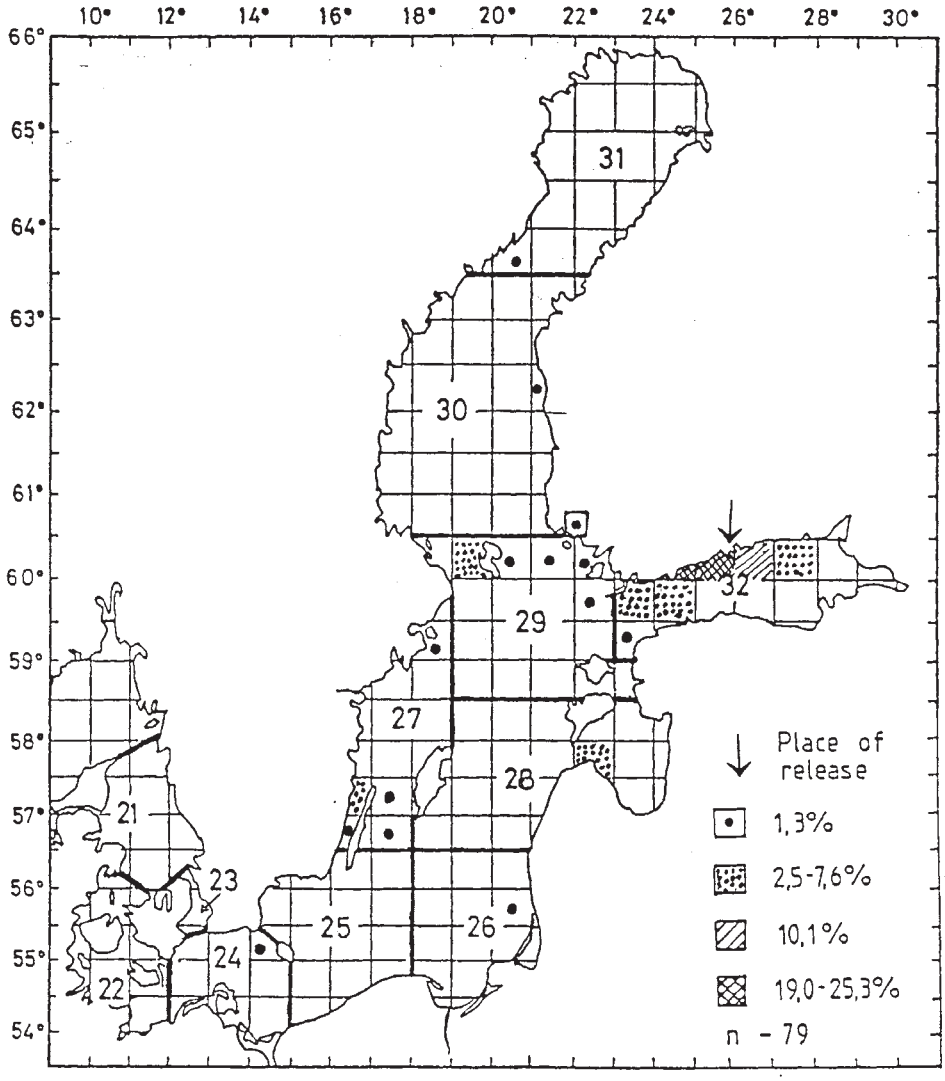

Fig. 2. Tag recoveries from Isojoki sea trout released in the Gulf of Finland near Helsinki. Rectangles show the percentage of recoveries.

caught. Most of these fishes were caught in the Gulf of Gdańsk (64.5% of all tags returned, Table 3) close to the river mouth. Catches were more frequent in the western (57.5%) than in the eastern part of the river mouth (5.5%). Of the tagged fishes, 10.5% were caught in the lower Vistula River and the river mouth. The remaining 25% of the returned tags were from the Baltic Proper and the Gulf of Bothnia (Fig. 4, Table 3).

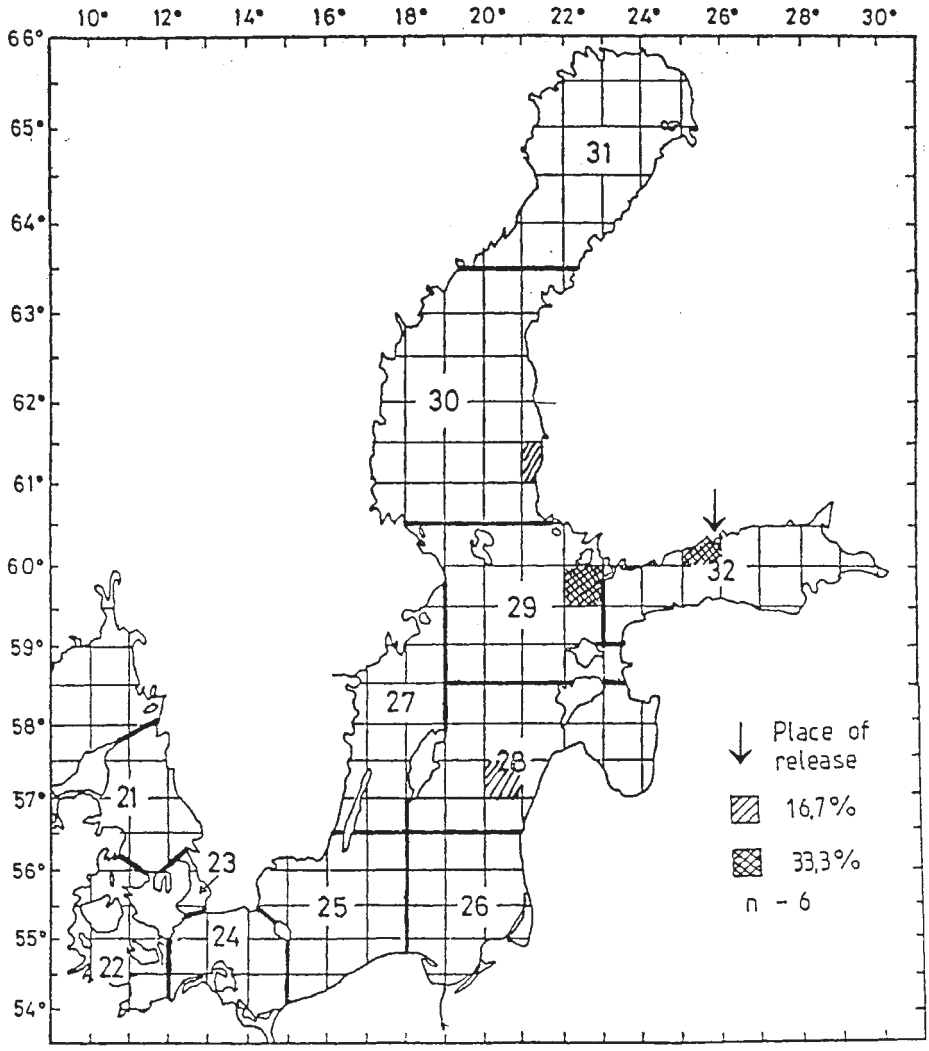

Fig. 3. Tag recoveries from Vistula sea trout released in the Gulf of Finland near Helsinki. Rectangles show the percentage of recoveries.

DISTRIBUTION OF THE ISOJOKI SEA TROUT RELEASED INTO THE VISTULA RIVER MOUTH

A total of 1 996 tagged Isojoki sea trout were released into the Vistula River mouth. The tag return rate averaged 8.7% (Table 1). Most fishes were caught in the southern Baltic Proper (the Gulf of Gdańsk) and accounted for over 79% of all returns.

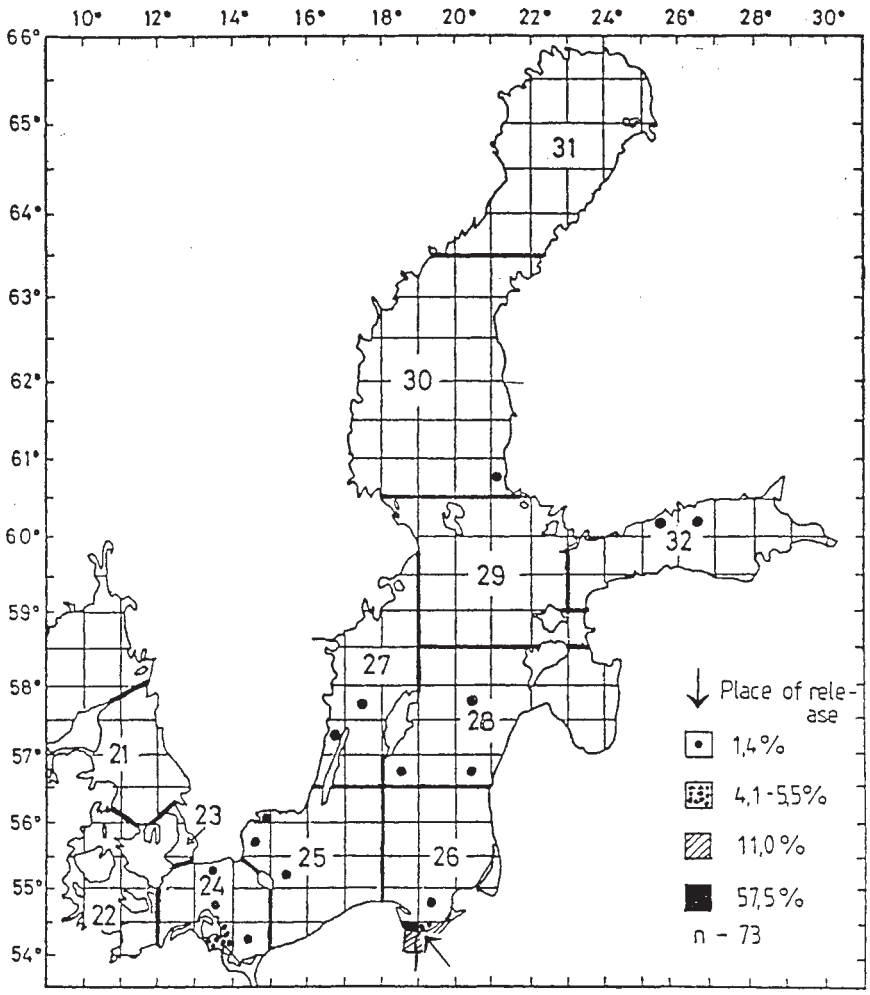

Fig. 4. Tag recoveries from Vistula sea trout released in the Vistula River mouth. Rectangles show the percentage of recoveries.

They were usually caught close to the river mouth, the west bank (63.0% of all returns), and less frequently on the east bank (14.2% of the returns). Moreover, a number of sea trout were caught in the lower Vistula River and in the river mouth itself (13.1%, Fig. 5, Table 3). A total of 92.3% of the tag returns were from the southern Baltic Proper (the Gulf of Gdańsk) and the Vistula River mouth; 7.7% of the tags were returned from the more northern Baltic Proper and the Bothian Sea and the Gulf of Finland (Table 3, Fig. 5).

DIFFERENCES IN THE DISTRIBUTION OF VISTULA AND ISOJOKI SEA TROUT

Tag returns varied widely from 0.2 to 9.3% (Table 1). The low tag returns from particular experiments allowed for only limited comparisons as to the distribution of the Vistula and Isojoki sea trout released into the Vistula River mouth. No comparisons could be made for the fishes released into the Gulf of Finland because there were practically no returns for Polish Vistula fishes.

Vistula sea trout released into the Vistula River mouth were less frequently caught (75%) in and near their release site (the Gulf of Gdańsk and the Vistula River mouth) than were the Isojoki sea trout released in the same place (92.3%). The Vistula sea trout released into the Vistula mouth showed wider distribution than the Isojoki sea trout released at the same site. Tagged fish of both of these stocks reached ICES Sub-division 27 and 28 and the Gulf of Finland. The Isojoki sea trout rarely migrated to the southwestern Baltic proper, and only the Vistula sea trout migrated to ICES Sub-division 24 and 25 (Figs. 4 and 5, Table 3). The results were compared using the chi-square test. The distribution of tagged fish from these two groups differed significantly ($\chi^2 = 10.94$, 1 df).

GROWTH OF TAGGED SEA TROUT

The data on the growth of sea trout released at the two sites suggest that there were some differences between the fish groups. Generally, the growth of Vistula and Isojoki sea trout released into the Vistula River mouth was similar, with the smolts attaining lengths of 47.5 and 49.2 cm, respectively, in the first year (during the November - March period) and 63.0 and 62.2 cm in the second year (Fig. 6). The average weight of the fishes was 1 025 and 1 680 g, respectively, after the first year, and 2 880 and 2 786 g after the second year. The data on fish weight are also presented in Figure 7 according to weight increases calculated for four-month periods. The calculated fish length (for the same periods) suggests that the Vistula sea trout might have been characterized by slightly more rapid growth compared to the Isojoki sea trout (Fig. 8).

Isojoki sea trout released into the Gulf of Finland attained an average length of 38.9 cm and weight of 654 g after the first year, 52.2 cm and 1 600 g after the second, and 65.7 cm and 3 282 g after the third. The growth of these fishes does not seem to be as good as that of fishes from the same group released into the Vistula River mouth,

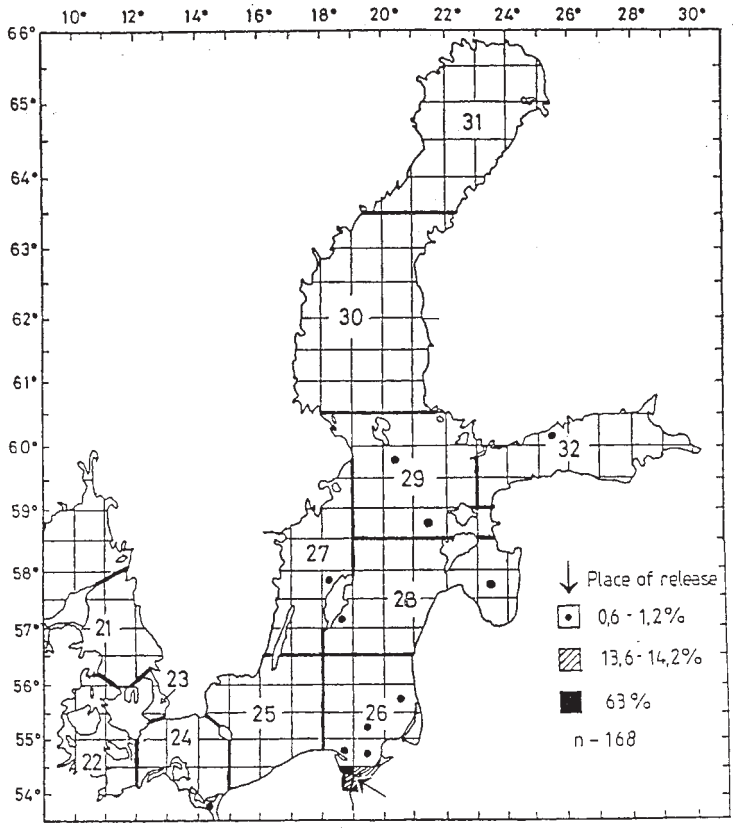

Fig. 5. Tag recoveries from Isojoki sea trout released in the Vistula River mouth. Rectangles show the percentage of recoveries.

notwithstanding the fact that the average length of the fishes in the two groups was similar after the third year (Fig. 6). This indication of poor growth seems to be confirmed by the data on the calculated average fish length, and the weights for four-month periods (Figs. 7 and 8). Taking into account the above considerations, it can be stated that the growth of sea trout was influenced by environmental conditions. This was reflected in the better growth of Isojoki sea trout released into the Vistula River mouth than of fish from the same stock released into the Gulf of Finland (Fig. 7).

YIELD OF STOCKING

The effectiveness of stocking was expressed as kg of sea trout caught per 1 000 released smolts. It was rather low and did not exceed 161 kg (Table 1).

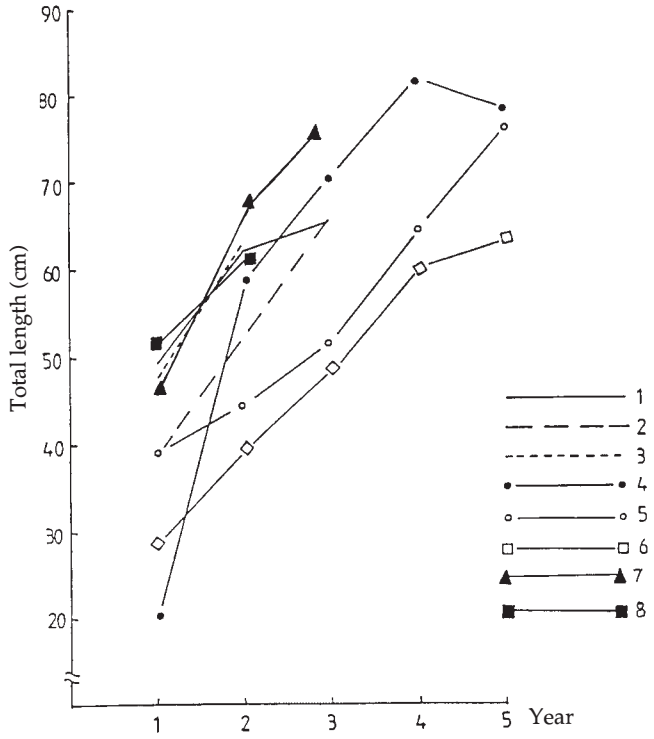

Fig. 6. Growth of sea trout in different areas, and growth of salmon stocked in ICES Sub-division 31. 1 - Isojoki sea trout released into the Vistula River mouth (N = 10), 2 - Isojoki sea trout released into the Gulf of Finland (N = 27), 3 - Vistula sea trout released into the Vistula River mouth (N = 8), 4 - salmon stocked in ICES Sub-division 31 (Ikonen and Auvinen 1982), 5 - sea trout released in ICES Sub-division 32 (Ikonen and Auvinen 1984), 6 - sea trout released in ICES Sub-division 31 (Ikonen and Auvinen 1982), 7 - Vistula sea trout released in the Vistula mouth (Bartel 1988), 8 - sea trout released into the Wieprza River (Bartel 1987).

Considerable differences were observed in relation to tag type; they were up to 10-fold for groups 7 and 8 (see Table 1). Among the other groups, the differences were not as large, but in each case better results were obtained with fishes tagged with polythene tags (Table 1).

The effectiveness of stocking was related to tag type, fish release site, origin of the stocking material, and transportation (Table 1).

DISCUSSION

The combined differences between tag type, release, site, origin of fish, and transportation, affected the tag returns which varied from 0.2 to 9.3%. These are some of

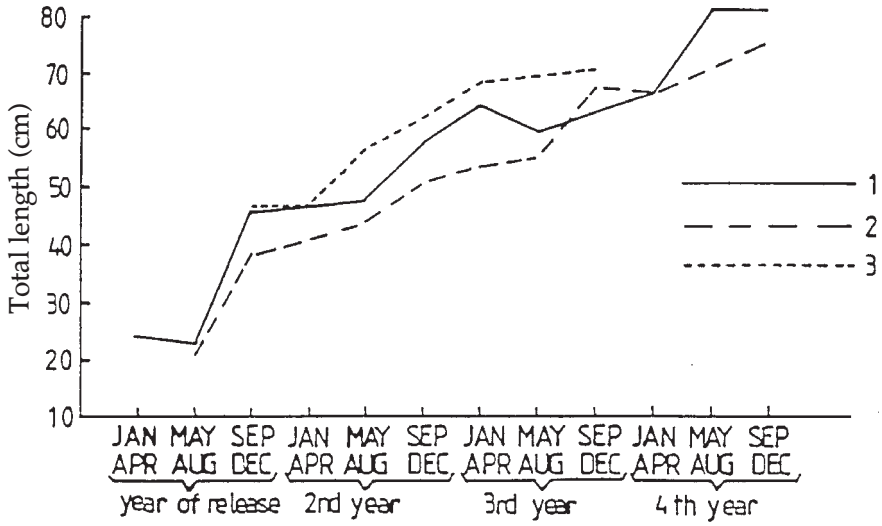

Fig. 7. Mean length of sea trout by four-month periods on the basis of tag recovery data. 1 - Isojoki sea trout released into the Vistula River mouth (N = 39), 2 - Isojoki sea trout released into the Gulf of Finland near Helsinki (N = 70), 3 - Vistula sea trout released into the Vistula River mouth (N = 34).

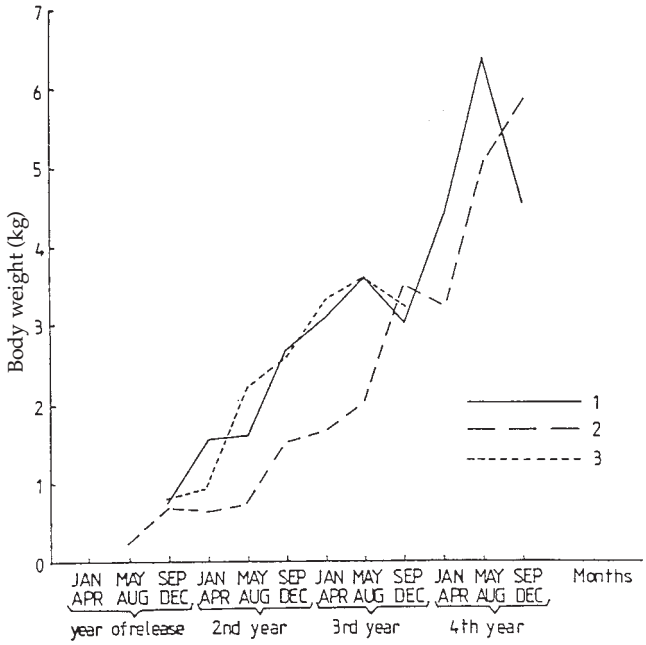

Fig. 8. Mean body weight of sea trout four-month periods on the basis of tag recovery data. 1 - Isojoki sea trout released into the Vistula River mouth (N = 34), 2 - Isojoki sea trout released into the Gulf of Finland near Helsinki (N = 77), 3 - Vistula sea trout released into the Vistula River mouth (N = 31).

the worst results ever obtained in the Gulf of Finland (Ikonen and Auvinen 1982) or in the Vistula River mouth (Bartel 1977). It seems that fish origin was most significant. In each experiment, fishes from the Podkomorzyce Hatchery gave poorer results. The worst result was obtained with fishes from the Podkomorzyce Hatchery which were released into Finnish coastal waters. Most probably, these smolts were of low quality (Goryczko and Kania 1983) and had low resistance to the manipulation stress experienced during the tagging procedure. It is also possible that fish tagging induced infection which caused high mortality in low quality material. Similar conclusions were formulated in a study in which poor results were obtained in tagging experiments with six types of tags carried out on Danish and Vistula sea trout in 1979 (Bartel et al. 1987). It may be assumed that low smolt quality affected tag returns, particularly in the case of these fishes subjected to considerable stress during the tagging procedure, i.e. a 41-day storage period in the basins and 40-hours of transport to Finland. The Isojoki smolts seemed to be of better quality, and the tag returns were also better.

The method of tagging also affected the returns. In all the experiments monel tags gave poorer results, a finding which corresponds with the results of a cooperative sea trout tagging experiment conducted in 1979 (Bartel et al. 1987).

Tag recoveries were affected by tag loss either by the fish or fishermen, or by the latter's aversion to reporting tag recoveries. Discussions with fishermen have confirmed that some of them are not interested in collecting tags and sending them to an institute.

The fish release site also affected the rate of tag return. In Poland, the releases were carried out in the river, and in Finland in reasonably open water off the sea coast. Intensive herring fishing takes place in spring in the Gulf of Gdańsk close to the Vistula River mouth. Moreover, part of the fishes released into the Vistula River mouth were not smolt, and these tended to migrate upstream. Consequently, more tag returns were obtained immediately after release in the Vistula River mouth than in Finnish coastal waters. The above factors affected the results of stocking, which were very low, especially for Vistula sea trout released into Finnish coastal waters. In view of the considerable differences related to the tagging method, it is very difficult to determine results (Groups 1, 2, 7 and 8, Table 1). Fishes originating from one source and of the same length gave quite different results regarding kg of catch per 1 000 released smolt (Table 1). The results obtained for Isojoki sea trout released into the Gulf of Finland were similar to those obtained in previous experiments (1971-1982) (Ikonen and Auvinen 1982) as well as to those obtained in the Kymijoki and

Kokemäenjoki rivers, and slightly better than in the case of stocking carried out in the Kemijoki, Iijoki, Oulujoki and Tornionjoki rivers (Ikonen and Auvinen 1984). On the other hand, the results of this study for Isojoki smolts were worse than the results obtained with Isojoki sea trout smolts tagged with Carlin and polythene tags by a Finnish team in 1979 in a study done to compare various tags (Bartel et al. 1987).

The Isojoki sea trout released into the Vistula River mouth were caught at a higher rate in the Gulf of Gdańsk and the Vistula mouth than were the Vistula sea trout. Moreover, the Vistula sea trout more frequently migrated westward into ICES Sub-divisions 24 and 25 (Figs. 4 and 5). The distribution of this sea trout was similar to that obtained in earlier experiments (Backiel and Bartel 1967, Skrochowska 1969, Palka and Bieniarz 1983). The Isojoki sea trout released into the Vistula River mouth seldom migrated out of the Gulf of Gdańsk. This confirms the classification of this form as a stationary type (Toivonen and Tuhkunen 1975, Ikonen and Auvinen 1982, 1984). However, it was not possible to definitely state whether the differences between Finnish and Polish sea trout were of genetic origin or resulted from environmental factors. This was due to insufficient material, and especially to the lack of tag returns for the Vistula sea trout released into Finnish coastal waters.

Over 71% of the Isojoki sea trout released into the coastal waters near Helsinki were caught in the Gulf of Finland, and over 16% were caught in the Baltic Proper and the Gulf of Bothnia. The percentage of fishes caught in the Gulf of Finland was lower than in earlier experiments (Ikonen and Auvinen 1984), but the differences might have been due to the fact that these fishes were released into the River Kymijoki. Fishes released directly into the sea had greater possibilities to migrate. Similar trends were observed in a study in which sea trout and rainbow trout, *Oncorhynchus mykiss* (Walbaum) were released into the Vistula River mouth and the Gulf of Gdańsk (Bartel 1977, 1985).

The growth of the Isojoki sea trout released into the Gulf of Finland was better than that seen in earlier studies of sea trout from the River Kymijoki and from five rivers flowing into the Gulf of Bothnia: the Tornionjoki, Kemijoki, Iijoki, Oulujoki and Kokemäenjoki (Fig. 6, Ikonen and Auvinen 1984); but was not as good as that seen in fishes from the same stock released into the Vistula River mouth (Figs. 6, 7 and 8). However, the latter still grew slower than Vistula sea trout, both during this and earlier experiments in which sea trout were released into the Vistula and Wieprza Rivers (Figs. 6 and 7, Ikonen and Auvinen 1984, Bartel 1987, 1988). It seems that the Isojoki sea trout grew better in Polish waters due to the better environmental conditions

there compared to those in the Gulf of Finland. This would suggest that the growth of sea trout was related more to environmental than genetic factors, although the latter cannot be excluded.

CONCLUSIONS

1. The Isojoki sea trout released into the Vistula River mouth migrated less than the Vistula sea trout released into the same place. This might suggest that the stationary character of Finnish sea trout is determined genetically.
2. The Isojoki sea trout released into the Vistula River mouth were characterized by better growth than those in the Gulf of Finland, but their growth was still not as good as that of the Vistula sea trout from the Vistula River. This suggests that the growth of the fishes was affected by environmental conditions, although genetic factors cannot be excluded.

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STRESZCZENIE

RÓŻNICE W ROZSIEDLENIU I WZROŚCIE POLSKICH I FIŃSKICH TROCI (*SALMO TRUTTA* L.).

Celem pracy była próba określenia, czy warunki środowiska mogą wpływać na wędrówki i wzrost troci. W 1980 r. w Gospodarstwie Podkomorzyce zespoły z Polski i Finlandii poznakowały 3969 dwurocznych smoltów troci wiślanej, z których 1981 wypuszczono do ujścia Wisły i 1988 do Zatoki Fińskiej koło Helsinek. W Gospodarstwie Hanka Taimen oba zespoły poznakowały 3993 dwuroczne smolty troci z rzeki Isojoki, które wypuszczono w te same miejsca co trocie wiślane. Smolty znakowano znaczkami plastykowymi umieszczanymi pod przednią częścią płetwy grzbietowej, mocowano je na pojedynczym drucie monelowym (zespół polski) bądź na podwójnej nici polietylenowej (zespół fiński).

Ryby przewożono w wodzie natlenianej, z Polski do Finlandii i z Finlandii do Polski, samochodem i promem (tab. 1, rys. 1). Średnie długości ciała znakowanych smoltów z Hanka Taimen wahały się od 20,7 do 21,3 cm a w Podkomorzycach od 19,1 do 19,9 cm (tab. 1). Wzrost troci określano licząc średnie długości i średnie masy znakowanych troci poławianych w okresie listopad - marzec w kolejnych latach po wypuszczeniu smoltów oraz określano średni wzrost troci w czteromiesięcznych okresach w drugim i trzecim roku po zarybieniu.

Otrzymano 344 zwroty znaczków (4.3%). Z poszczególnych eksperymentów procenty zwracanych znaczków wahały się od 0,2 do 9,3% (tab. 1). Znakowane ryby były poławiane przez 5 lat. Najwięcej troci (57%) złowiono w czasie pierwszych 3 miesięcy po zarybieniu (tab. 2). Trocie z Isojoki wypuszczone do Zatoki Fińskiej były głównie poławiane (71.4%) w Zatoce Fińskiej (rys. 2, tab. 3). Z troci wiślanych wypuszczonych do Zatoki Fińskiej uzyskano jedynie 7 zwrotów, co nie pozwoliło na określenie ich rozsiedlenia (rys. 3, tab. 3). Z troci wiślanych wypuszczonych do ujścia Wisły, najwięcej ryb złowiono w Zatoce Gdańskiej (64,5%). W Głównym Basenie Bałtyku i Zatoce Botnickiej złowiono 25% troci z tego eksperymentu (rys. 4, tab. 3). Trocie Isojoki wypuszczone do ujścia Wisły najczęściej były poławiane w południowej części głównego basenu Bałtyku (79%) a włączając połowy rzeczne procent tych troci złowionych w niewielkiej odległości od miejsca wypuszczenia sięgał 92,3% zwrotów. Jedynie 7,7% zwrotów pochodziło z północnej części głównego basenu i Zatok Botnickiej i Fińskiej (rys. 5, tab. 3). Troć wiślana częściej i dalej wędrowała

niż troć z Isojoki wypuszczone w te same miejsca.

Wzrost troci wiślanych i z Isojoki, wypuszczonych w ujście Wisły był podobny. Osiągały one po pierwszym roku pobytu w morzu odpowiednio średnią długość 47,5 i 49,2 cm i średnią masę 1025 i 1670 g, po drugim roku osiągają średnią długość 63,0 i 62,2 cm i średnią masę ciała 2880 i 2786 g (rys. 6 i 7). Obliczając średnie długości dla tych samych okresów można sugerować, że troć wiślana rośnie nieco lepiej niż troć z Isojoki (rys. 8). Trocie z Isojoki wypuszczone do Zatoki Fińskiej rosły wolniej niż te wypuszczone do ujścia Wisły (rys. 7 i 8). Można sądzić, że na wzrost troci i ich wędrówki wpływały warunki środowiska i kształt wybrzeża polskiego i fińskiego.

CORRESPONDING AUTHOR:

Prof. dr hab. Ryszard Bartel
Instytut Rybactwa Śródlądowego,
Zakład Rybactwa Rzecznego,
ul. Reduta Żbik 5
80-761 Gdańsk
Tel./Fax: + 48 58 3057011; e-mail: rbartel@polbox.com