

Recent Changes in the Spawning Habits of Sea Trout in the Upper Vistula

By

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Introduction

The winter population of salmon and sea trout spawn in the Upper Vistula. The salmon, however, only enter the two uppermost tributaries, the rivers Sola and Skawa. The sea trout enter the lower tributaries, the rivers Wisloka, Dunajec, and Raba but also the rivers Sola and Skawa. The position of these rivers are shown in Figure 1.

Since time immemorial it has been recognized that the majority of the sea trout population spawn mainly in the largest of the rivers mentioned above, namely the Dunajec; this river system occupies an area of 6,823 km². However, during recent years very interesting changes in the spawning migrations of the sea trout have been observed. The river Dunajec is no longer the predominant spawning area, and the main concentrations of spawners occur in the much smaller river Raba (1,518 km², see Fig. 2). The number of spawners caught in different rivers for stripping purposes is listed in Table 1.

The problem now to be solved is, which are the factors responsible for these changes?

Two factors may be distinguished:—

- (i) factors inhibiting the entrance of spawners into the river Dunajec, and
- (ii) factors initiating migration into the river Raba.

Inhibitive Factors

As inhibitive factors the following can be established:—

1. Low water level obstructing the passage of fish into the mouth of the river Dunajec. Investigations have, however, ruled out this supposition.
2. Dams built on the river Dunajec about 70 km upstream from the mouth blocking migration of the fish.

At Czchów we find the first dam, about 10 m high, and at Roznów there is another one, 32 m high. Both dams are supplied with suitable pool passes for salmon. The position of the dams is shown on the map in Figure 2.

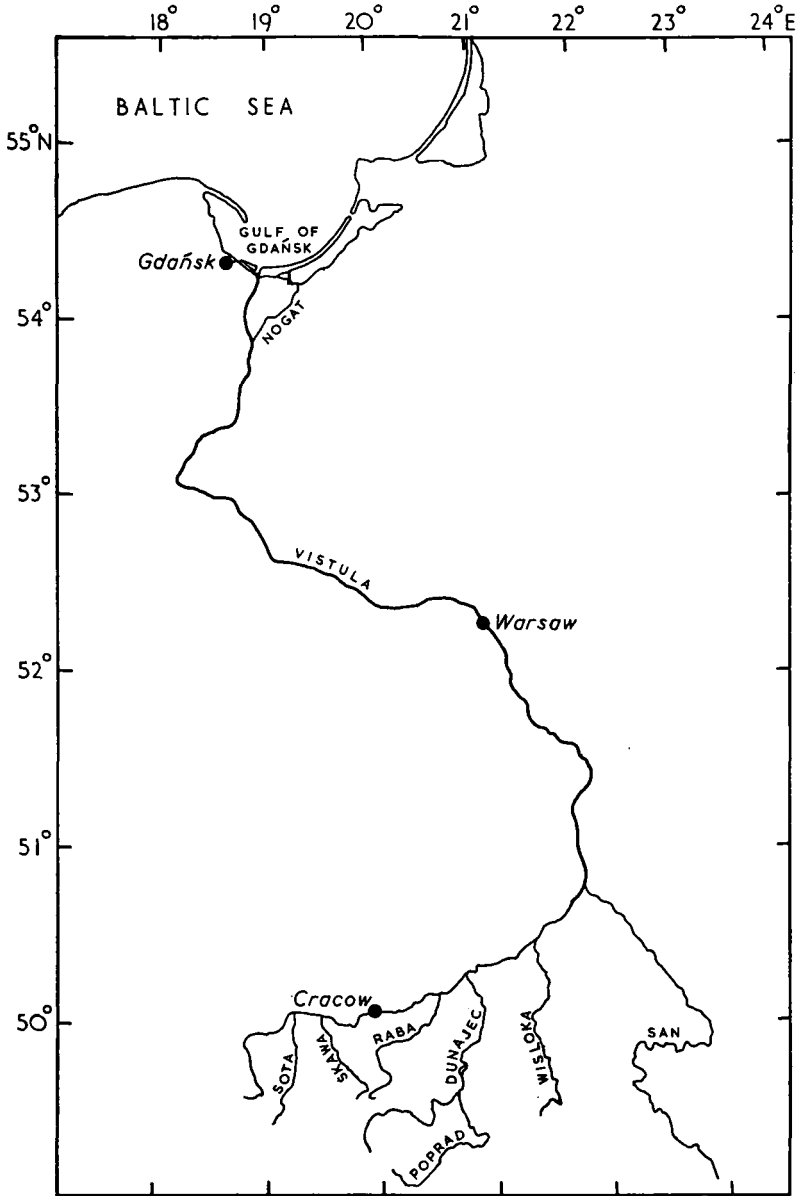


Figure 1. Map to show the tributaries of the Upper Vistula.

Observations in 1948 and 1949 showed the occasional presence in the pools of a great number of sea trout, sometimes over a hundred at a time. Further observations in 1950 and 1951 (ZARNECKI and KOLDER, 1955), revealed however, a remarkable decrease in the number of sea-trout spawners present in the fish passes, although other species of fish were found there in relatively great quantities. This seems also to indicate a decrease in the number of fish present

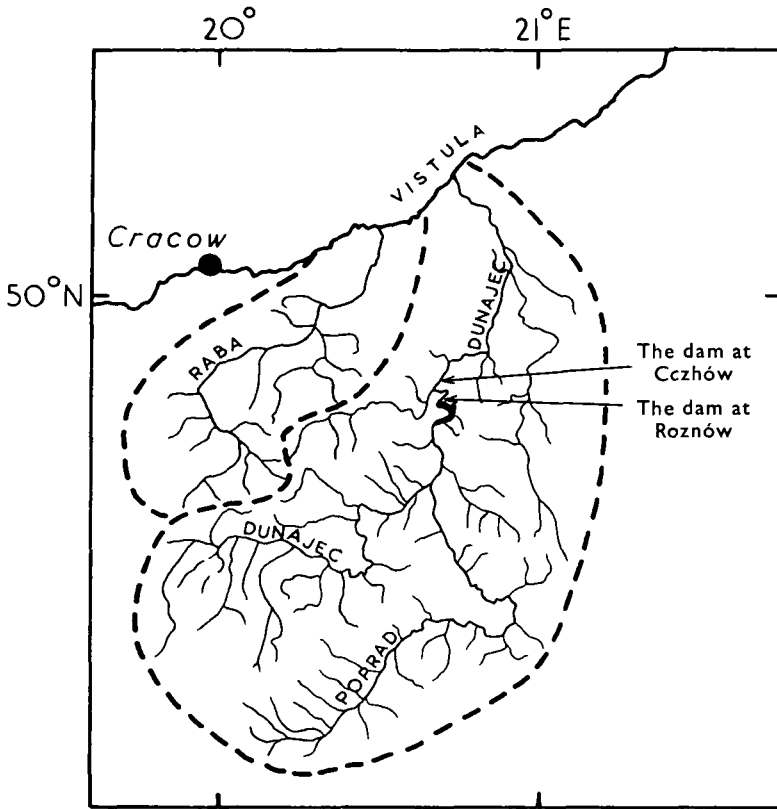


Figure 2. Map to show the location of the two dams on the river Dunajec. The dashed line delimits the catchment areas of the rivers Raba (1,518 km²) and Dunajec (6,823 km²).

in the river below the dams. Upon examination of the fish passes it was observed that the upper apertures, placed at different levels, were often open simultaneously and the current was too rapid to be overcome by the sea trout. During early autumn the fish passes are closed for the purpose of catching spawners for artificial stripping.

The question arises if it is possible that these are the obstacles which stop the upstream migration of sea trout, thus causing part of the migrating fish to return downstream in search of other affluents. No facts, however, truly confirming the "escape" of fish from the river Dunajec were established.

3. To date, no significant changes have been observed in the water components (natural pollution), brought about by the passage of the river through the reservoirs situated above the dams.

4. Artificial pollution may be possible, especially in connexion with the chemical industrial plants situated about 30 km above the mouth of the river. Although the character of the river is still oligotrophic, the possibility of changes in the odour of the water, which HASLER and WISBY's (1951) work

Table 1
Number of sea trout spawners caught for stripping purposes

Year	River Dunajec	River Raba	River Rudawa	River Vistula near the Raba estuary
1952.....	229	—	250	—
1953.....	397	469	120	—
1954.....	660	463	—	—
1955.....	337	359	—	—
1956.....	99	349	—	—
1957.....	—	274	—	67
1958.....	51	1,883	—	132
Total.....	1,773	3,797	370	199

suggest might be important, cannot be excluded. Obviously this is only a hypothesis; no facts seem to confirm it.

None of these inhibitive factors seem to provide an adequate reason for the decrease in the spawning migrations of sea trout into the river Dunajec.

Factors Initiating Spawning Runs into the River Raba

Together with the decreasing spawning migrations into the river Dunajec and the increasing migrations into the Raba, observed during recent years (see Table 1), parallel changes in the distribution of the released fry and one year-old parr of sea trout can be noted in both rivers. They are listed in Table 2.

During the last eleven years about twice as many fry have been liberated into the river Raba as into the Dunajec, and also a greater number of one year-old parr.

A comparison between the changes in intensity of spawning runs and the distribution of liberated fry gives evidence for believing that there may be a relation between the two phenomena. It looks as if anadromous salmonids return not only to their native *main* river but also to the tributaries in which they were hatched or released. It is not easy to find a biological mechanism initiating this behaviour. On the other hand, the interpretation mentioned above cannot be rejected.

Other rivers as the San, Wisloka, and Rudawa show similar phenomena which might be interpreted in the same way. For instance, in the river San, another tributary of the Vistula, sea trout were previously rarely observed and then only single specimens. It is an interesting fact that this river was stocked with sea trout fry (see Table 3) during the period 1949 to 1953. In the Wisloka basin similar phenomena were observed. After having intensified the liberation of fry into this river a pronounced increase in the number of sea trout present was observed four or five years later.

Finally, in the years 1952 and 1953, 250 and 120 spawners respectively were caught in the very small river Rudawa (a western tributary of the Vistula, above Cracow). It was subsequently discovered that four and five years previously a great number of young sea trout had been released into this river. During the years previous to 1953, a run of sea trout had never been observed in the Rudawa.

Table 2
Number of fry and one-year-old parr of sea trout
released in the tributaries of Upper Vistula, viz. in the rivers Raba and
Dunajec in the period 1949 to 1958

(a) Stocking by the Polish Angling Association (1955-1958)

Year	Fry		One-year-old parr	
	Raba	Dunajec	Raba	Dunajec
1949.....	1,825,000	1,155,000	66,455	26,450
1950.....	658,500	508,848	67,100	2,042
1951.....	345,407	481,715	13,300	9,750
1952.....	1,022,000	371,300	31,946	-
1953.....	711,800	347,200	32,500	-
1954.....	1,332,000	109,000	37,150	-
1955.....	1,207,637	452,000	53,500	519
1956.....	1,089,000	200,000	66,360	81,563
1957.....	-	3,020	95,850	105,060
1958.....	-	-	60,000	221,500
Total.....	8,191,344	3,628,083	524,161	446,884

(b) Stocking by the States Fisheries Management

Year	Fry		One-year-old parr	
	Raba	Dunajec	Raba	Dunajec
1955.....	732,200	637,400	155,000	-
1956.....	1,158,700	-	132,000	-
1957.....	392,500	70,000	168,000	-
1958.....	760,000	585,000	95,800	-
1959.....	1,093,000	204,000	-	-
Total.....	4,136,400	1,496,400	550,800	-

Table 3
Number of fry and one-year-old parr of sea trout
released in the tributaries of Upper Vistula, viz. in the rivers San, Wistloka,
and Rudawa in the period 1949 to 1954

Year	River San		River Wistloka		River Rudawa	
	Fry	Parr	Fry	Parr	Fry	Parr
1949.....	150,000	-	180,000	-	375,000	35,910
1950.....	-	-	-	-	-	27,000
1951.....	160,000	-	135,000	2,100	93,000	43,120
1952.....	180,000	-	-	-	-	105,000
1953.....	73,519	-	8,000	-	300,000	80,500
1954.....	-	-	108,906	-	322,000	48,000
Total.....	563,519	-	431,906	2,100	1,090,000	339,530

Summary

1. The main spawning grounds of the big race of Vistula sea trout were located in the largest tributary of Upper Vistula, namely the river Dunajec, the system of which occupies an area of 6,823 km². In recent years, however, the Dunajec has lost its predominance as a spawning area and the chief concentrations of spawners are now observed in the much smaller river Raba (1,518 km²),

and in other tributaries of the Vistula in some of which sea trout have never before been observed (the rivers San and Rudawa).

2. Investigations have failed to reveal any inhibitive factors responsible for the decrease in the spawning runs in the river Dunajec.

3. A comparison between the number of spawners caught in the different tributaries and that of the fry and one-year-old parr liberated in them leads to the supposition that there must be a connexion between the distribution of spawning runs and the number of fry and parr liberated.

4. On the basis of these phenomena the problem arises as to whether anadromous sea trout return not only to their main native river (the Vistula) but also to the tributaries in which they were hatched and liberated.

References

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