

## PRESENT SITUATION OF THE VISTULA SEA TROUT

*Ryszard Bartel*

The Stanisław Sakowicz Inland Fisheries Institute

**Abstract.** The aim of the paper was to show the present status of Vistula sea trout. Pollution of water in the Vistula River has reduced population of Vistula sea trout. When the Vistula River was dammed in 1968, Vistula sea trout population dropped drastically. In 1972-1992 from 32 000 to 314 000 smolts and from none to 1 446 100 alevins were released into the Vistula River yearly. In this period the sea trout catches in the Vistula River varied from 30.9 to 129.1 t. Effectiveness of stocking based on sea trout catches in the Vistula estuary and the Vistula River was 295.5 kg/1000 smolts on the average.

**Key words:** SEA TROUT, VISTULA RIVER, STOCKING, CATCH

### 1. INTRODUCTION

Vistula River, the biggest Polish river, had in the past and still has the biggest population of sea trout. A steady process of the environment degradation, and in consequence worsening of water quality in the Vistula's main stream channel as well as in the tributary rivers, resulted in a gradual decrease of fish catches, also of the migrating ones, and then in closing down of the fisheries cooperatives operating in the upper and middle Vistula waters. The following fisheries cooperatives were closed down: in Kraków in 1958, in Wyszogród in 1968, in Tarnobrzeg in 1971 and in Puławy in 1976 (Wiśniewolski 1978, Fig. 1).

The other evident proof of worsening of the ecological situation in the Vistula River is a decreasing number of sea trout spawners on the spawning grounds in the Vistula's upper tributary rivers. The very last sea trouts were caught in Soła in 1956, in Raba in 1957, in Dunajec in 1968 (Bieniarz, Łysak 1975, Fig. 1). The fact of catching the last sea trouts in Dunajec River coincided with the construction of a dam in the Vistula River, in Włocławek. Though this dam has a fish pass but it does not fully comply with the requirements since only limited number of individuals of sea trout pass it, and only single individuals are caught in the vicinity of Nowy Dwór and Puławy (Bartel, Zieliński 1991).

Recent observations on sea trout migration, by means of sonic tagging (unpublished materials of Institute of the Russian Academy of Sciences at Borok and of the Inland Fisheries Institute) proved that sea trout had difficulties in finding the entrance to the fish pass positioned in the Włocławek dam.

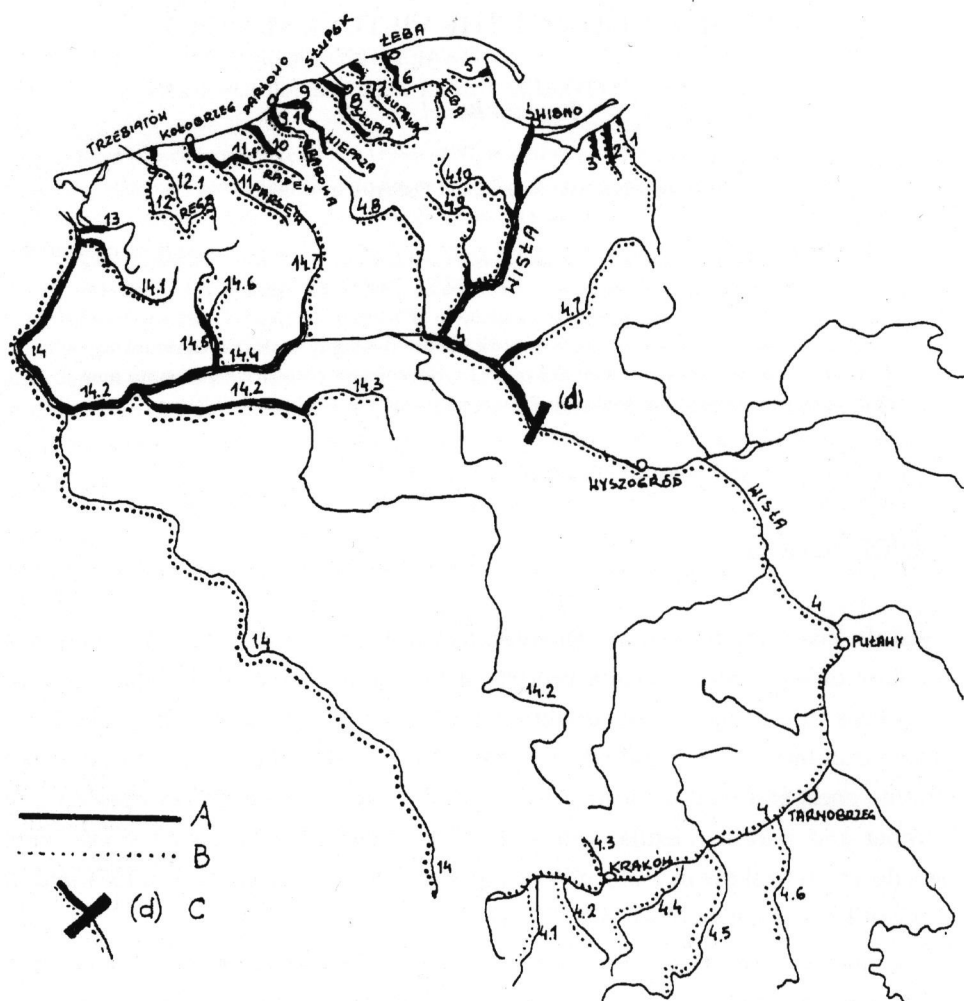


Fig. 1. Sea trout rivers in Poland, possibilities to reach spawning grounds (Christensen, Johansson 1975 modified). A - at present, B - in the past, C - a dam in Włocławek built in 1968, 1 - Pasłęka River, 2 - Bauda R., 3 - Narusa R., 4 - Vistula R., 4.1 - Soła R., 4.2 - Skawa R., 4.3 - Rudawa R., 4.4 - Raba R., 4.5 - Dunajec R., 4.6 - Wiśłoka R., 4.7 - Drwęca R., 4.8 - Brda R., 4.9 - Wda R., 4.10 - Wierzyca R., 5 - Reda R., 6 - Łeba R., 7 - Łupawa R., 8 - Słupia R., 9 - Wieprza R., 9.1 - Grabowa R., 10 - Unieście R., 11 - Parsęta R., 11.1 - Radew R., 12 - Rega R., 12.1 - Mołstowa R., 13 - Gowienica R., 14 - Odra R., 14.1 - Ina R., 14.2 - Warta R., 14.3 - Wełna R., 14.4 - Noteć R., 14.5 - Drawa R., 14.6 - Płociczna R., 14.7 - Gwda R.

Ecological degradation as well as the influence of the barriers constructed in river's streams, hindering or making it even impossible for the spawners to reach the spawning grounds, have been observed in the Vistula River and some other Polish rivers (Fig. 1). Positioning of the Włocławek dam in the Vistula River resulted in

considerable decrease in the number of smolts migrating from the Vistula catchment area down to the Baltic Sea. Number of these smolts, estimated in the 50's and at beginning of the 60's, i.e. prior to the other effects, namely state of the environment and dam construction, was on the level of 500 thousand to 1 million (Backiel, Bartel 1967), while at present it is not higher than about 30 thousand. After the dam construction across the Vistula River in Włocławek, the River Drwęca remained the single bigger tributary having the conditions for natural spawning of the sea trout. Though its potential possibilities decreased due to pollution and construction of artificial barriers across Drwęca's tributary rivers, the role of this river, with respect to population of the Vistula River sea trout is essential, as it favours an increase of the genetic variability of Vistula sea trout population due to the fact that the fish spawn in natural conditions. Besides, sea trouts representing winter population spawn in Drwęca (Borzęcka, personal communication). The importance of spawning of winter sea trout in Drwęca River should be emphasized because smolts of this particular sea trout are not reared at present.

The aim of this work is to present the Vistula sea trout management in the recent years.

## 2. MATERIALS AND METHODS

Materials from the „Information Service on Salmon Management” initiated in 1972 and issued in the form of mimeo by the Inland Fisheries Institute, supplemented with materials from „Gospodarka Rybna” (Bartel 1976, 1989, Bartel, Zieliński 1977, 1978, 1979, 1981, 1982, 1984, 1985 a, b, 1986 a, b, 1987a, b, 1989, 1991) and with the unpublished materials collected for the „Information Service ...” but not published and Wiśniewolski's paper (1987) were used in this paper.

## 3. RESULTS AND DISCUSSION

Construction of Vistula dam in Włocławek caused changes in fishery relations in the Vistula River. These changes were reflected in the catches of migratory species such as vimba and sea trout. Catches of the latter species increased below the dam, while dropped nearly to zero above it (Fig. 2, Sych, Bartel 1979).

Decreasing number of smolts in the Vistula River has been observed much earlier and, therefore, attempts were made to replace unsatisfactory Vistula sea trout spawning by stocking with parr reared in the hatcheries. As the number of eggs obtained from the Vistula sea trout was not sufficient, it was decided that the Vistula catchment

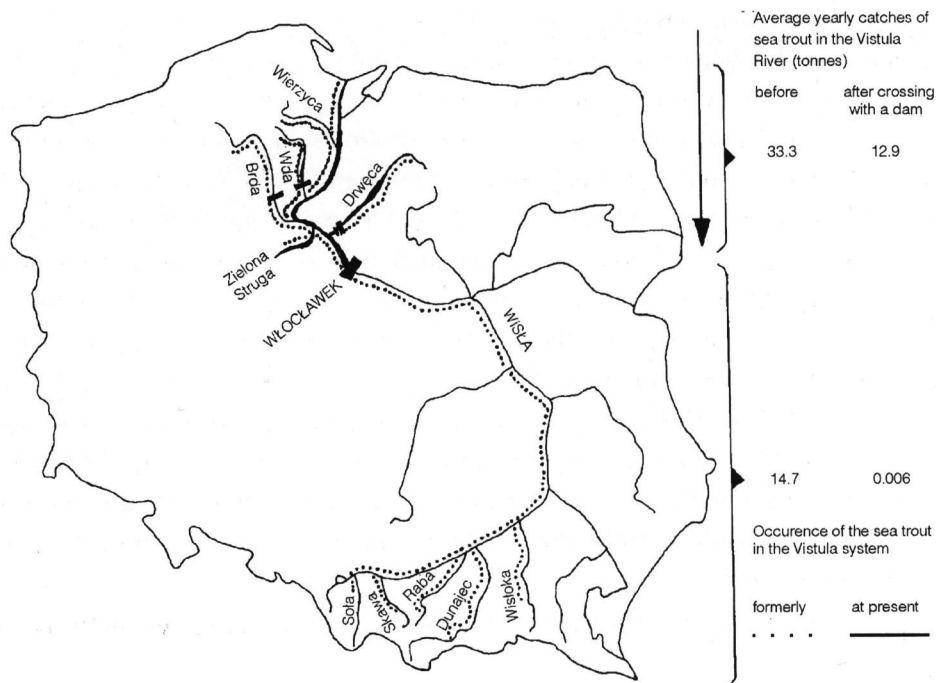


Fig. 2. Occurrence of sea trout in the Vistula system and catches of sea trout in the Vistula below and above the dam in Włocławek (Sych, Bartel 1979).

area would be stocked with the material reared from eggs originating from the sea trout of Pomeranian rivers.

Though the number of reared individuals released into the Vistula catchment area increased constantly, this was not reflected in the sea trout catches. On the contrary, since the late 70's, a steady decrease has been observed of the catches of sea trout in the Vistula River and its estuary (Fig. 3). Lack of the effects of stocking was due to the fact that stocking with parr and presmolts was preferred.

Elimination of the stocking material originating from Pomeranian rivers decreased the possibility of stocking with reared smolts, and damming of the Vistula River in Włocławek almost entirely excluded natural spawning in the upper Vistula tributaries. Consequently, there was a danger of drastic decrease in the sea trout population in Vistula. Some hope for improvement of the situation appeared when in 1967 some basins provided for keeping of the sea trout spawners were open for exploitation at Świbno, in Vistula estuary (Kossakowski 1969). This enabled obtaining the eggs of Vistula trout for smolt rearing. The importance of this object increased significantly when the Fishery Cooperative „Certa”, fishing below the dam in Włocławek, ceased obtaining the eggs in 1985. In 1972-1984 this cooperative obtained

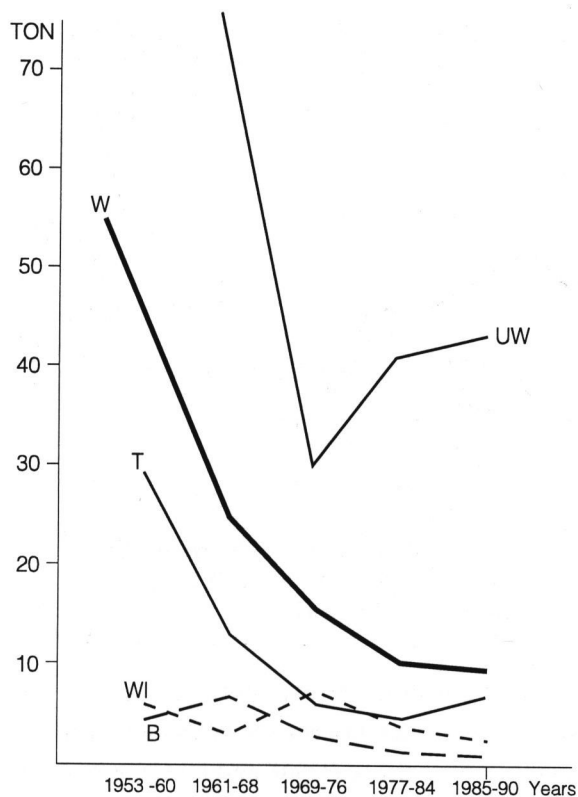


Fig. 3. Catches of sea trout in 1953-1990, UW - Vistula estuary. W - Vistula (whole), T - Vistula, Tczew, WI - Vistula Włocławek, B - Vistula, Bydgoszcz (Wiśniewolski 1987, Bartel 1976, 1989, Bartel, Zieliński 1977, 1978, 1979, 1981, 1982, 1984, 1985a, b, 1986 a, b, 1987 a, b, 1989, 1991 and Bartel - unpublished materials).

4.270.000 eggs from spawners kept in earth ponds in Nieszawa (Bartel 1976, 1989, Bartel, Zieliński 1977, 1978, 1979, 1981, 1982, 1984, 1985 a, b, 1986 a, b, 1987 a). It can be said that the present state of Vistula sea trout population results from two facts: presence of the basins at Świbno and stocking with smolts reared from eggs originating from the spawners caught in the Vistula estuary.

Number of eggs procured by the Fishery Cooperative in Świbno in the recent 20 years ranged from 181 000 in 1979 to nearly 1 900 000 in 1992, while number of smolts released at the same time to Vistula catchment area ranged from 32 000 in 1985 to 314 300 in 1990. Number of released smolts to Drwęca in 1972-1992 fluctuated from zero in 1973 and 1974 to 128 000 in 1990, and number of fish released in Vistula estuary varied from zero in 1975 to 186 300 smolts in 1990 (Fig. 4). Besides, certain numbers of sea trout alevins were released into the Vistula River.

Numbers of released smolts were affected not only by the number of obtained eggs, but also by the breeders' competence in rearing and their willingness to produce the stocking material. The breeders' skills have been improving continuously, while their inclination to rear the smolts was connected with the financial abilities of the Commission for Stocking and Salmon Management, the latter strictly depending on

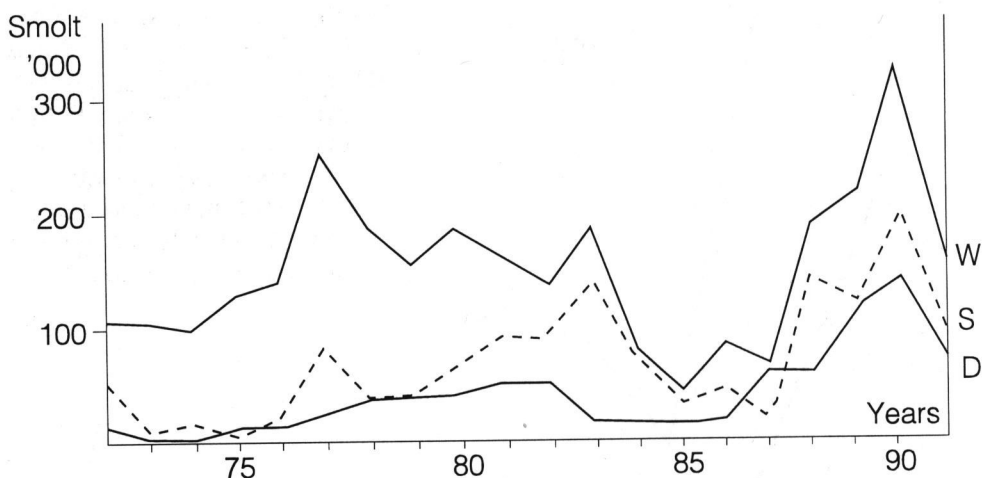


Fig. 4. Stocking of the Vistula and the Drwęca rivers with sea trout smolts in 1972-1991. W - Vistula - whole, S - Vistula - estuary, D - Drwęca (Bartel 1976, 1989, Bartel, Zieliński 1977, 1978, 1979, 1981, 1982, 1984, 1985 a, b, 1986 a, b, 1987 a, b, 1989, 1991 and Bartel unpublished data).

the finances allocated by the Ministry of Agriculture, Ministry of Transportation and Maritime Economy, and the Ministry of Environment Protection. Some insignificant funds were provided by the fishermen catching the sea trout, and by some Provincial Councils.

In the considered period 1972-1991, the sea trout catches in the Vistula River, between its estuary and Włocławek, ranged from 30.9 tonnes in 1984 to 129.1 tonnes in 1990 (Fig. 5). At the same time the number of smolts migrating to the sea fluctuated from 74.000 in 1985 to 348.000 in 1990 (Fig. 5). The number of smolts showed in Fig. 5 represents the following components: number of smolts reared in the hatcheries, number of released alevins recalculated per number of smolts (assuming 1% survival), and number of smolts from natural spawning. The very last component was assumed to be a stable value, equal to 30.000 each year. Fig. 5 shows a considerable dependence of trout catches in the Vistula River upon stocking.

Effectiveness of Vistula stocking, expressed by the size of sea trout catch (in kg of 1000 smolts) was equal to 295.5 kg, at the total catch amounting to 1 000 344.5 kg in 1973-1991, and the number of smolts equal to 3 385 400 in 1972-1990.

It is essential to know the size of catches in particular sectors of the Vistula River in order to serve the investigating institutions and for the purposes of fishery cooperatives catching the sea trout between Świbno and Włocławek.

Sea trout catches in the Vistula River and its estuary ranged from 30 931 kg in 1983 to 129 070 kg in 1990 (Fig. 6), with the yearly mean 50 639 kg. The biggest total amount

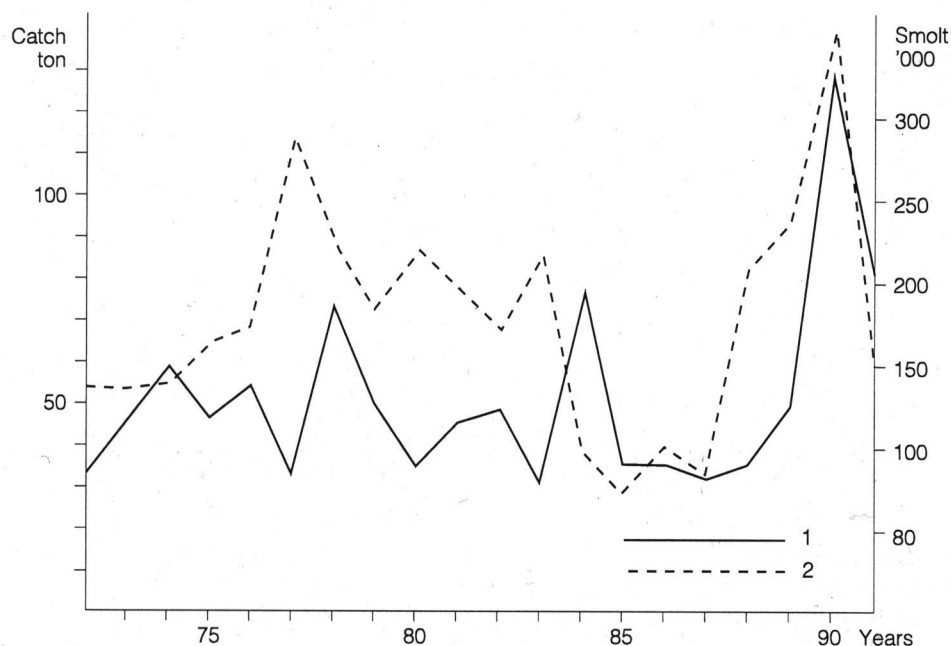


Fig. 5. Catches of sea trout and stocking with the smolts (reared, from natural spawning and smolts from released alevins in 1972-1991. 1 - sea trout catches, 2 - stocking with smolts (Bartel 1976, 1989, Bartel, Zieliński 1977, 1978, 1979, 1981, 1982, 1984, 1985a, b, 1986 a, b, 1987 a, b, 1989, 1991 and Bartel unpublished data, Wiśniewolski 1987).

of fish was caught by the Cooperative in Świbno; the average being 40 561 kg and the extremes - 18 628 kg in 1972 and 107 700 kg in 1990 (Fig. 6). Share of the remaining Cooperatives was considerably lower, and within this group the leading one was the cooperative in Tczew. Its average was 5 211 kg, with fluctuations from 1356.5 kg in 1980 to 15 200 kg in 1990 (Fig. 6). The fishermen operating below the dam in Włocławek caught on the average 3989 kg, with the extremes 600 kg in 1987 and 13 105 kg in 1975. The fishermen from the vicinity of Bydgoszcz had as low as 3 kg catch in 1977 and 4957 kg in 1974, with the average being on the level of 1439 kg (Fig. 6). Share of particular Vistula regions in the catches of sea trout is better illustrated by the catches expressed in per cents. In 1972-1991 Świbno obtained 80.1% of total trout biomass. The lowest share in total sea trout biomass was noted in 1972 - 59.9% and the highest, reaching 90.9%, was observed in 1980 (Fig. 7).

Considerably lower share, only 10.3%, had the fisherman from Tczew. Their share in sea trout catches in particular years ranged from 3.8% in 1980 to 24.1% in 1972 (Fig. 7). The fishermen from Włocławek and Bydgoszcz caught on the average 7.9% and 2.8%, respectively.

In contrast to this, share of Drwęca was insignificant and the maximum catch

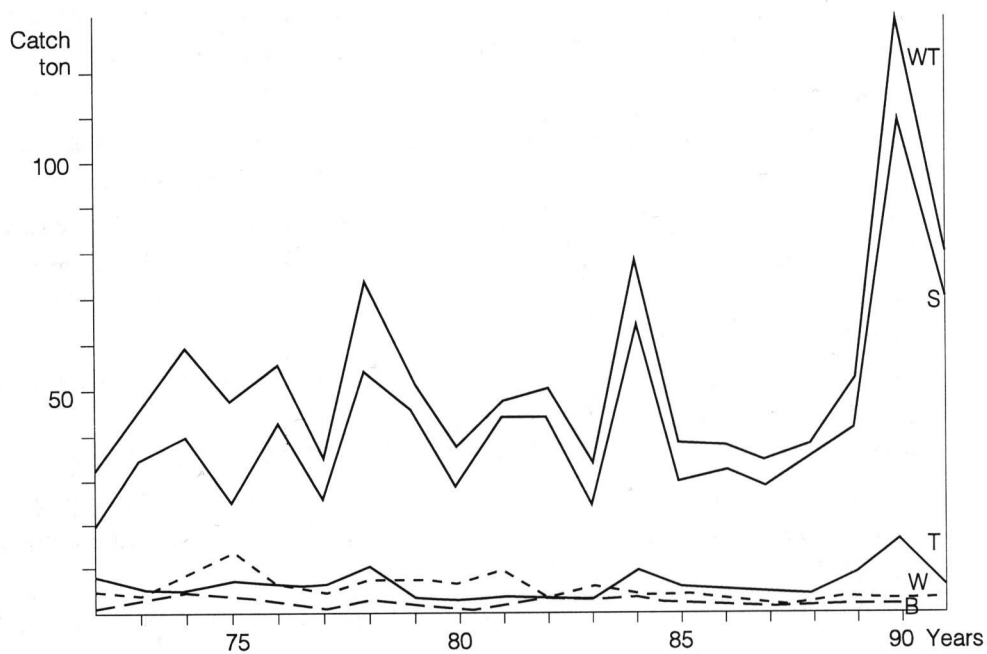


Fig. 6. Catches of sea trout in the Vistula River in 1972-1991. WT - Vistula, the whole river and the estuary, S - Vistula estuary, T - Tczew, W - Włocławek, B - Bydgoszcz (Bartel 1976, 1989, Bartel, Zieliński 1977, 1978, 1979, 1981, 1982, 1984, 1985 a, b, 1986 a, b, 1987 a, b, 1989, 1991 and Bartel unpublished data, Wiśniewolski 1987).

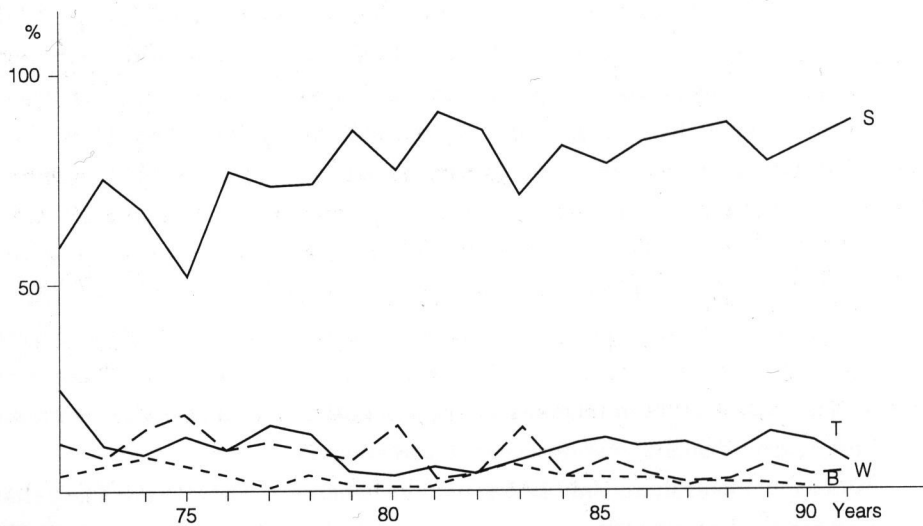


Fig. 7. Percentage share of sea trout catches in the Vistula in 1972-1992; based on fishermen catches in different regions of the Vistula River, S - Świdno, T - Tczew, W - Włocławek, B - Bydgoszcz. (References as in Fig. 6).



reached 1400 kg, while minimum was zero. In some cases there were no information. These catches include fishing with rods, professional catches and catches of spawners.

To sum up the following conclusions can be drawn:

1. Stocking with sea trout smolts in the Vistula River estuary and in the Drwęca River should be carried out in order to maintain trout population at a proper level.
2. In order to ensure adequate amount of sea trout eggs for smolt rearing the Base for Spawners in Świbno must remain operating and should provide 2 million eggs every year. At the same time from 0.5 to 1 million eggs a year should be obtained from fish in Drwęca River.
3. Introduction of Pomeranian sea trout to the Vistula catchment area should be avoided.
4. Attention should be paid to the fact that while stocking with alevin of brown trout, a hybrid of sea trout and brown trout originating from the hatcheries having stocks of brown trout spawners built up on a base of admixture of sea trout, should not be introduced.
5. Protective regulations should be respected to enable migrating sea trout to reach the spawning grounds.

(Translated by Mrs. M.Pastuszek)

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## STRESZCZENIE

### OBECNA SYTUACJA TROCI WIŚLANEJ

Pogorszenie się sytuacji środowiska w Wiśle doprowadziło do zmniejszenia się ciągu tarłowego troci wiślanej - najbardziej interesującej formy troci w zlewisku Morza Bałtyckiego. Zmniejszenie się populacji troci wiślanej doprowadziło do likwidacji rybołówstwa trociowego w górnym i środkowym biegu Wisły (rys. 1). Wybudowanie przegrody we Włocławku ze źle działającą przepławką doprowadziło praktycznie do całkowitego wyeliminowania tarła troci w górnych dopływach Wisły. Spowodowało to znaczne zmniejszenie liczby smoltów spływających z dorzecza Wisły z pierwotnych 0,5-1 mln do około 30 000 smoltów. W tej sytuacji szczególnego znaczenia nabiera Drwęca jako miejsce naturalnego tarła troci.

Celem pracy było przedstawienie obecnego stanu gospodarki trociowej w Wiśle.

W pracy wykorzystano materiały zbierane do serwisu gospodarki łososiowej w Polsce, częściowo publikowane w Gospodarce Rybnej oraz z pracy Wiśniewolskiego (1987).

Wybudowanie przegrody na Wiśle we Włocławku spowodowało zwiększenie połowów troci poniżej zapory a ich spadek niemal do zera powyżej zapory (rys. 2). Niedostateczną liczbę spływających smoltów uzupełniano przez zarybienie materiałem wychowanym w gospodarstwach. Zabiegi te nie dawały efektów i połowy troci w Wiśle i jej ujściu zmniejszały się do końca lat siedemdziesiątych (rys. 3). Przyczyną było preferowanie w zarybieniach narybku jesiennego i presmoltów. Mała liczba tarlaków troci wiślanej nie zapewniała dostatecznej liczby ikry, której brak uzupełniano ikłą troci pomorskiej. Eliminowanie

z zarybień Wisły materiału z innych rzek groziło drastycznym spadkiem liczby wypuszczanych smoltów troci. Dla zwiększenia możliwości pozyskania ikry troci wiślanej w ujściu Wisły wybudowano baseny do przetrzymywania tarlaków troci łowionych w ujściu Wisły. Zapewniło to zwiększenie liczby wychowanych smoltów troci wiślanej. Liczby smoltów wypuszczanych do Wisły wahały się od 32 000 do 314 300 (rys. 4). Połowy troci w Wiśle w latach 1972-1991 wynosiły od 30,9 t do 129,1 t. Liczbę spływających z Wisły smoltów z tarła naturalnego oszacowano na 30 000, a liczby smoltów z zarybiania wylęgiem i z chowu w stawach wahały się od 74 000 do 348 000. Połowy troci w Wiśle i jej ujściu w sposób istotny zależały od zarybiania wychowanymi smoltami (rys. 5).

Efektywność zarybiania Wisły w latach 1973-1991 wynosiła 295,5 kg/1000 szt. smoltów.

Połowy troci w Wiśle w latach 1972-1991 średnio wynosiły 50,6 t przy wahaniami od 30,9 t do 129,1 t. Największą masę troci pozyskała Spółdzielnia w Świbnie od 18 628 kg w 1972 do 107 700 kg w 1990 r., średnio rocznie 40 561 kg (rys. 6), co stanowiło od 59,9 do 90,9% średnio 59,9% całości połowów w Wiśle (rys. 7).

Adres Autora:

Prof. dr hab. Ryszard Bartel  
Instytut Rybactwa Śródlądowego  
Pracownia Rybactwa Rzecznego  
Reduta Żbik 5  
80-761 Gdańsk