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Fish biology

AN INVENTORY OF SALMON (*SALMO SALAR* L.) SPAWNING GROUNDS
IN THE DRAINAGE BASIN OF THE DRAWA,
A 4-TH ORDER TRIBUTARY OF THE ODRA

INWENTARYZACJA TARLISK ŁOSOSIA *SALMO SALAR* L.
W ZLEWNI DRAWY IV-RZĘDOWYM DOPLÝWIE ODRY

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Salmon spawning grounds were counted in the rivers Drawa and Płociczna within 1977–1983. From 0 to 44 and from 3 to 22 spawning grounds per year were recorded in the Drawa and Płociczna, respectively.

INTRODUCTION

The salmon, *Salmo salar* L., is a valuable species, both from the generally biological and economic points of view, both for the marine and inland fisheries. In Polish waters, the species occurs only in the river Odra drainage basin; the population – as shown by long-term observations – is clearly on the decline (Chełkowska and Chełkowski, 1974; Chełkowski, 1982). The salmon spawn in the lower reaches of the Drawa, a 4-th order tributary of the Odra, and also in the Płociczna, Drawa's downstream left-bank tributary (Fig. 1).

After the World War II (1947–1976), salmon spawners were being captured in the Drawa to reproduce the population in stocking centres. Basically, the efforts failed to

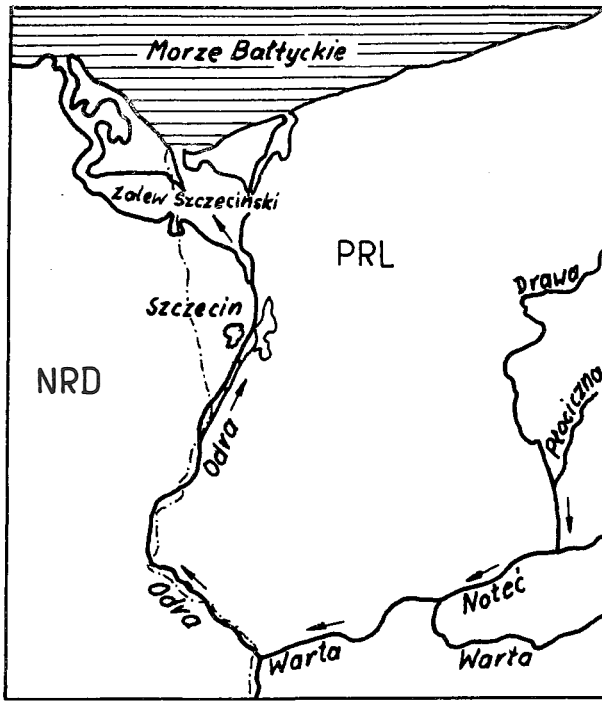


Fig. 1. Route of inland migration of salmon (*Salmo salar* L.) in the Drawa catchment

supply the assumed amount of juveniles to be stocked in the Drawa drainage, proving occasionally totally futile (Chełkowska and Chełkowski, 1974). The cause of failures was an extremely high mortality of developing eggs and presmolt juveniles. In view of this, capturing of spawners in the Drawa in order to obtain reproductive products was terminated as of the autumn 1977 (Chełkowski and Chełkowska, 1978, 1979, 1980, 1981, 1983, 1984). Instead, all the effort was directed to protect the spawners in the Drawa and Płociczna during spawning*. Natural spawning is very important for the population reproduction and may play a key role in preserving or increasing the size of the population, compared with the stocking efforts mentioned.

Spawning grounds used by the salmon may be surveyed. It is the inventory of spawning grounds in the Drawa and Płociczna in consecutive spawning seasons that is dealt with in the present work. The number of spawning grounds is an indirect evidence of the size of spawning population. To conserve, and if possible, to increase the salmon spawning population in the Drawa and Płociczna is the basic goal pursued by the Polish Anglers' Union. Gorzów Branch, the managing body of the lower Drawa drainage.

* Fish Protection Guards employed by the Polish Anglers' Union, Gorzów Branch were in charge of the protection of spawners in the Drawa and Płociczna in 1977–1983.

MATERIALS AND METHODS

Long-term observations show the salmon to appear in the Drawa and Płociczna spawning grounds in late October, the spawning taking place in November and December. Most fishes spawn in the second and third decades of November (Chrzan, 1969; Chełkowska, 1982). During the spawning, a spawning ground is formed, appearing on a gravel bottom of a river as a light-coloured patch. Spawners disturb a certain area of the bottom, the area taking on a characteristic shape. The number of spawning grounds can be determined by counting the patches.

The Drawa and Płociczna fish faunas include trout (*Salmo trutta* L.) and brook trout (*Salmo trutta morpha fario* L.). The two species spawn at the same time and places as do the salmon. Their spawning grounds, however, are much less extensive. Therefore, during the inventory, the spawning grounds were classified as large and small, the former about 1 m long, undoubtedly belonging to the salmon, the latter about 0.5 m long or smaller, belonging to the trout or brook trout. The inventory was carried out in the well-known area of the salmon spawning ground occurrence in the Drawa and Płociczna. The Drawa spawning grounds were counted along a 3.75 km long section of the river immediately

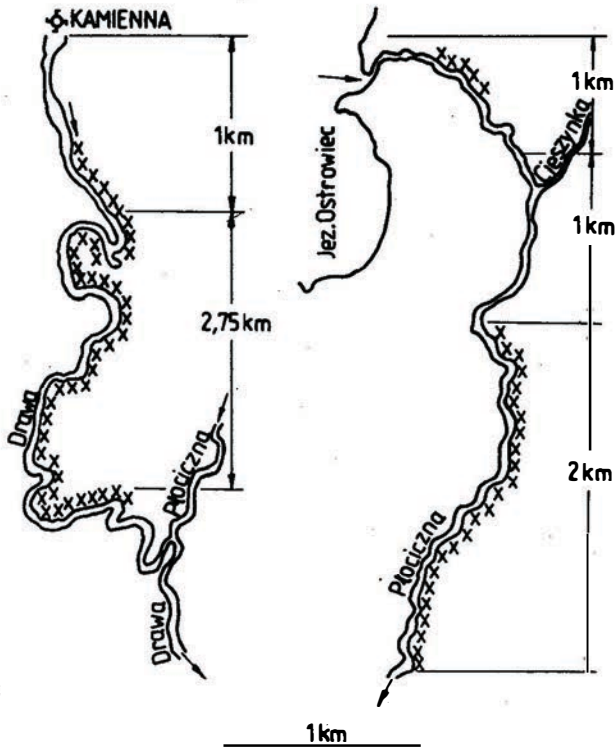


Fig. 2. Location of salmon spawning grounds in the Drawa and Płociczna

downstream of a power station weir at Kamienna, the weir terminating the preliminary migration of the salmon. The Płociczna spawning grounds were counted along a 4 km long section of the river downstream of the Lake Ostrowiec (Fig. 2).

The spawning grounds were counted either during a walk along the Płociczna bank (the river is 9 m wide) or from a boat rowed down the Drawa (the river is 21 m wide). The spawning grounds were counted after the spawning had terminated. The inventory was carried out within 1977–1983, i.e., when no spawners were caught for stocking. Additionally, data concerning attempts to determine the number of spawning grounds in 1969 and 1976 were collected. However, in those years the salmon spawners were caught just from the studied section of the Drawa.

The spawning grounds were easy to spot and count in shallow water, i.e., along the whole lower reaches of the Płociczna. It was more difficult to count the Drawa spawning grounds, but they were possible to locate upstream the Kamienna weir. In the remaining 27 km long section of the lower Drawa, spawning grounds are more difficult to locate owing to larger depth, particularly near the mouth. There are, however, reasons to believe that the salmon spawn there, too (Chełkowska and Chełkowski, 1974).

One can also suppose that the salmon can spawn in the remaining part of the Płociczna drainage, the species having had an access to the area for a few years now (Chełkowski and Chełkowska, 1980). However, no data have been gathered so far. An inventory of salmon spawning grounds in the mouth section of the Drawa and in the Płociczna drainage area deserves to be undertaken.

INVENTORY OF SPAWNING GROUNDS

Results of the salmon spawning grounds inventory in the Drawa drainage are summarised in Table 1. As seen from the data, salmon spawning grounds were located in

Table 1
Number of salmon spawning grounds in the Drawa and Płociczna

year of study	river	Drawa			Płociczna			Grand total
		large	small	total	large	small	total	
1969						12	12	
1976				27			27	
1977				35		11	46	
1978		13	3	16	3	1	4	20
1979		28	2	30	13	10	23	53
1980		44	4	48	22	9	31	79
1981		18	2	20	16	12	28	48
1982		0	0	0	15	12	27	27
1983		0	0	0	17	8	25	25

the Drawa within 1977–1981; they were absent from the river in the years 1982 and 1983, which was probably caused by a thick layer of silt covering the bottom, the silt being discharged from the Kamienna reservoir during its clean-up (Chełkowski and Chełkowska, 1984). On the other hand, the spawning grounds occurred in the Płociczna throughout the period of study (1978–1983).

A total of 20 to 79 spawning grounds per year were recorded both in the Drawa and Płociczna, most of them being large, i.e., formed by the salmon. The Drawa contained from 0 to 44 large spawning grounds per year; the Płociczna contained from 3 to 22 large spawning grounds per year. The ratio between large and small spawning grounds in the Drawa and Płociczna within 1978–1983 was 3:1. Thus the number of salmon spawning grounds exceeded those of the trout and brook trout. It is particularly evident in the Drawa with its ratio of 9:1, the Płociczna ratio being 1.7:1.

CONCLUSIONS

The results obtained allow to draw the following conclusions:

1. The salmon did spawn in the Drawa drainage area within 1977–1983.
2. An annual mean of 27 spawning grounds was recorded in the Drawa drainage, from 0 to 44 and from 3 to 22 spawning grounds being located annually in the Drawa and Płociczna, respectively.
3. The lower reaches of the Drawa, between its opening to the Noteć and the Kamienna weir, as well as the lower reaches of the Płociczna between its opening to the Drawa and Lake Ostrowiec, should be entirely protected the year round. In particular, the spawners in spawning grounds should be protected in October-December and the juveniles through the year.
4. Protection of the salmon population should have a top priority in fisheries management in the Drawa drainage.
5. It is purposeful to continue the inventory of salmon fishing grounds as their presence is a good evidence of spawning.

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INWENTARYZACJA TARLISK ŁOSOSIA *SALMO SALAR* L.
W ZLEWNI DRAWA IV-RZĘDOWYM DOPŁYWIE ODRY

STRESZCZENIE

Łosoś w rzekach Polski odbywa tarło tylko w IV-to rzędowym dopływie Odry – Drawie i jej lewobrzeżnym dopływie Płocicznej. W trakcie tarła powstają w rzece tarliska które można policzyć. Właśnie określenie liczby tarlisk występujących w Drawie na 3,75 km długim odcinku rzeki położonym bezpośrednio poniżej jazu w Kamiennej, oraz w dolnej Płocicznej poniżej jeziora Ostrowiec w latach 1976–1983 stanowi przedmiot pracy. Jak z opracowanych materiałów wynika, w latach 1976–1981 w Drawie występowały tarliska łososia, natomiast w 1982 i 1983 ich nie stwierdzono. Brak ich występowania w dwóch ostatnich latach spowodowany był niewątpliwie pokryciem dna rzeki, a w tym i tarlisk, grubą warstwą namulów zrzucanych ze zbiornika retencyjnego w Kamiennej w dół rzeki w trakcie jego czyszczenia. W Płocicznej natomiast we wszystkich latach badań tarliska występowały. Ogółem w toku inwentaryzacji tak w Drawie jak i Płocicznej stwierdzono obecność od 20 do 79 tarlisk, w tym decydująca ilość przypadała na tarliska duże, a więc niewątpliwie łososia. W Drawie występowało rocznie tarlisk dużych od 0 do 44 a w Płocicznej od 3 do 22 sztuk. Stosunek tarlisk dużych do małych w latach badań 1978–1983 w Drawie i Płocicznej kształtował się jak 3:1. Zatem liczba tarlisk łososia przeważała nad liczbą tarlisk troci i pstrąga. Szczególnie odnosi się to do Drawy w której stosunek tarlisk dużych do małych osiągnął wartość 9:1 a w Płocicznej 1,7:1.

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ИНВЕНТАРИЗАЦИЯ НЕРЕСТИЛИЩ ЛОСОСЯ SALMO SALAR L.
В БАССЕЙНЕ Р. ДРАВЫ, ЧЕТВЁРТСТЕПЕННЫМ
ПРИТОКЕ Р. ОДРЫ

Р е з ю м е

Лосось в реках Польши нереститься только в четвёртостепенном притоке Одры р. Драве и её левобережном притоке р. Плотичной. Во время нереста образуются нерестилища, которые можно посчитать. Определение числа нерестилищ, находящихся на р. Драве на 3,75 км отрезке реки, находящимся непосредственно ниже плотины в Каменной, а также в нижней части р. Плотичной, ниже озера Островец, в 1976-1983 г.г. являлось предметом данной работы.

Из обработанных данных вытекает, что в 1976-1981 г.г. в р. Драве находились нерестилища лосося, а в 1982-1983 г.г. их не обнаружено. Отсутствие нерестилищ в течение двух последних лет было вызвано, несомненно, загрязнением дна реки в том числе и нерестилищ, толстым слоем наносных илов, сбрасываемых из запруды в Каменной во время её очистки, в нижнюю часть реки. В р. Плотичной нерестилища находились в течение всего исследуемого периода. В общем, в течение инвентаризации, как в р. Драве так и в р. Плотичной, обнаружено присутствие от 20 до 79 нерестилищ. Большую часть составляли крупные нерестилища,

т.е. без сомнения, нерестилища лосося. В р. Драве наблюдались крупные нерестилища от 0 до 44, а в р. Плотичной от 3 до 22. Отношение крупных нерестилищ к малым в исследуемые годы 1978-1983 в р. Драве и р. Плотичной, составляло 3:1. Значит количество нерестилищ лосося превышало количество нерестилищ кумжи и форели. Особенно это относится к р. Драве, в которой отношение крупных нерестилищ к малым составляло 9:1, а в р. Плотичной - 1,7:1.

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