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Fish biology

**SURVIVAL RATE OF SEA TROUT, *SALMO TRUTTA* L.
FROM HATCH RELEASE TO SMOLTING IN THE STREAM OSÓWKA****WIELKOŚĆ PRZEŻYCIA TROCI *SALMO TRUTTA* L.
OD WSIEDLENIA WYLĘGU DO SMOLTYZACJI W POTOKU OSÓWKA**

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In spring 1984, 5402 sea trout hatchlings were released into the upper section of the Osówka stream. In three subsequent years after release smolts were caught with a trap located downstream the release site. The number of smolts caught allowed to determine the survival rate over the period from hatch release to smolting.

INTRODUCTION

The survival rate of fish released to rivers is generally an important economic problem. Such problem is presented also by the survival rate of the sea trout (*Salmo trutta* L.) hatch released into Pomeranian rivers on the assumption that the hatch will grow, under natural conditions, into smolts which, after descending to the sea, will increase the resources available to fisheries in the Baltic. Doubtless, the survival rate depends, i.a., on the method of stocking. Chełkowski, Chełkowska (1981) who had released into the Pomeranian river Mołstowa drainage 16000–25400 individuals of 6-wk-old trout hatch to comply with the planned value of stocking density of 1.8 ind/m², arrived at the survival rate (until smolting) of 1%. What would be the survival rate of sea trout hatchlings grown until smolting, should the hatch be released in the upper section of the stream Osówka and disperse along the selected section of the stream? The planned stocking density of the hatch in both the Mołstowa and the Osówka was within the limits recommended by Sakowicz (1955) of 1–2 individuals per 1 m² of stockable stream bottom.

MATERIALS AND METHODS

The Osówka originates in the Warszawskie Hills reaching the altitude of 131 above the sea level. This 13-km long stream drains into the lower Odra as its left bank tributary.

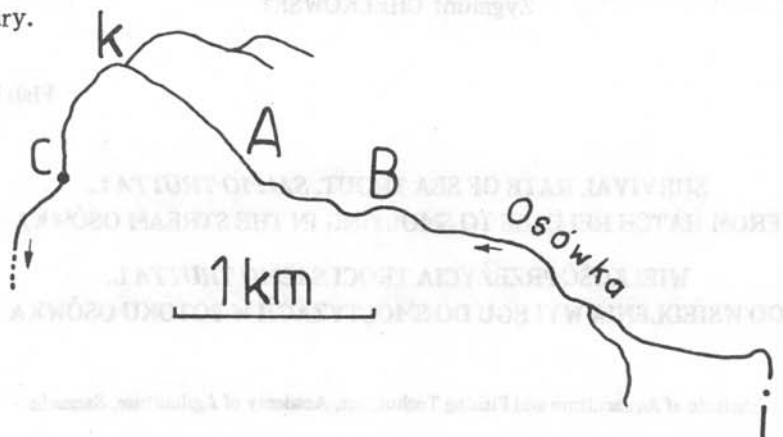


Fig. 1. Map of upper Osówka (the section stocked with trout hatch, A-B; smolt catchment site, C)

The experiment was carried out in a 4-km long upper section of the stream, from "k" to "i" (Fig. 1), the surface area and mean grade amounting to 5430 m² and 19%, respectively. The downstream section of the Osówka bottom is covered with concrete to the Lake Goplana, the remaining part being included into the City of Szczecin sewage system. The upstream section used to be regulated as shown by the banks being strengthened by fascine, considerably damaged at present. The stream has generally steep banks; the water table width and stream depth range within 0.5–2.5 m and 0.1–0.2 m, respectively. The flow varies between 0.3 and 1 m/s. The bottom is sandy. Aquatic vegetation is poor and covers the banks only, *Veronica beccabunga* L. being the commonest plant. The stream drainage area is covered in 80% by mixed deciduous-coniferous forests, meadows making up the remaining part. The stream water stands up to the salmonid standards. The native fish fauna of the Osówka lacks both the sea trout and the brook trout (*Salmo trutta m. fario* L.) (Chełkowski, 1990). The downstream section of the Osówka is inaccessible for trout migrations, both ascending and descending; conditions prevailing there make natural spawning impossible, which also holds for the brook trout.

For stocking with trout hatchlings, an 800-m long and 1.2-m wide section of the stream (960 m² area) was selected, denoted A-B in Fig. 1. The day before stocking, a "clean-up" fishing operation was carried out using electrofishing. Several individuals of *Pungitius pungitius* L. were obtained only. On 19 April 1984, trout hatchlings at the terminal stage of yolk sac resorption were released into the stream section selected.

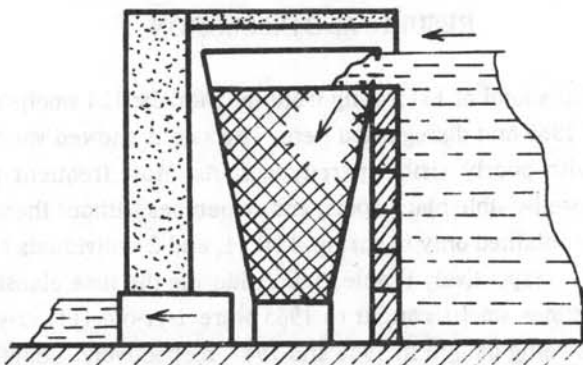


Fig. 2. Smolt trap (smolt catchment gear before mounting in the lock, a; lock cross-section with smolt trap in place, b)

The larvae, from parents inhabiting the Pomeranian river Rega, were obtained from the Goleniów hatchery. The larvae were transported in two 50-l containers with water of a temperature by 0.3°C higher than that of the Osówka during stocking. A total of 5402 larvae were released into the Osówka in small batches (3–6 individuals). Thus

the stocking density was, as anticipated from preliminary calculations, 1 ind./m² with respect to the whole stockable area of the Osówka (the area of the upstream section suitable for juvenile trout growth to smolt was estimated at 5430 m²).

The descending smolts were captured with a trap placed upstream the Lake Gopłana, directly past a small (0.2 ha) flow-through pond (Fig. 1). The trap was made of a 10 mm mesh size net bag stretched on a metal frame located in the draining canal of the pond (Fig. 2) such that the pond water had to flow through the trap. The trap was inspected twice a day, at 7.00 and 19.00 hours. Smolt descent in the Pomeranian rivers, according to Chełkowski (1966, 1978) and Chełkowski, Chełkowska (1981a) occurs within April – June. Therefore sequentially in three years after stocking (1985, 1986, 1987) the trap was operated from 21 March until mid-July. The operation ended in 1987 because, as shown by many studies (Chełkowski, 1966, 1967, 1969, 1974, 1978; Chełkowski, Chełkowska 1982; Chrzan, 1959), the age of smolts in Pomeranian rivers is 1–3 years. Having entered the trap, smolts fell with the water from the height of 1.2 m, were retained in the net and died there. The retained smolts were examined; examinations included species identification, development stage determination (parr of smolt), and length (caudal) measurement (mm). The smallest trout trapped was a 96-mm long parr. All the fishes longer than that were retained. It should be mentioned that, as stated by Chełkowski, Chełkowska (1982), the smallest smolts grown under natural conditions of Pomeranian rivers were 93 mm long, while the smallest Osówka smolt was 111 mm long. Thus all the smolts descending from the Osówka were trapped.

RESULTS AND DISCUSSION

The trap provided a total of 131 young trout individuals: 124 smolts and 7 parr, the latter occurring in 1985 and disregarded here. The smolts showed varying coloration. Few were silver with poorly visible parr-type spots. Most frequent were silver-coloured smolts with well-visible black spots, and sometimes without them.

The smolts were obtained only in spring, 111, 11, and 2 individuals being caught in 1985, 1986 and 1987, respectively (Table 1). Considering the time elapsing from stocking until capture, those smolts caught in 1985 were 1-yr-old (1+), 2-yr-old (2+) and 3-yr-old (3+) smolts being caught in 1986 and 1987, respectively. Length of the smolts varied from 111 to 260 mm ($M \pm = 155.2 \pm 2.1$ mm).

As 5402 hatchlings were initially released to the Osówka and 124 individuals were caught, the survival rate was calculated at 2.3%, that is higher than in a corresponding stocking experiment in the river Mołstowa (Chełkowski, Chełkowska, 1982) where the survival rate was 1%.

The occurrence of 7 parr individuals measuring 96–125 mm in the 1985 catches points to descent of some young trout a year after release. The remaining individuals

Table 1

Periods of catches and number of smolts caught in Osówka

Year	Period of catches	n
1985	Apr 6 – 11 Jun	111
1986	Apr 7 – 7 Jun	11
1987	Apr 12 – 8 May	2
Total	Apr 6 – 11 Jun	124

descended as smolts in two subsequent years. Should the trap be located farther downstream, the number of descending trout could have been increased by those individuals. It ought to be mentioned that in autumn 1984, 88 parr individuals measuring 71–146 mm were captured by electrofishing in several upstream Osówka sections to analyse gut content, described elsewhere. By assuming that the parr individuals descending and captured for other studies could have grown to the smolt stage, the survival rate of young sea trout in the Osówka from stocking until smolting may reach 4.1%. The survival rate, however, is most likely to reach a value between 2.3 and 4.1%.

The data presented allow to calculate the Osówka area available to 1 smolt. The area, as calculated using all the individuals caught ($n = 219$) is 24.8 m^2 , a corresponding area in the Mołstowa drainage (Chełkowski, Chełkowska, 1981) being 62 m^2 , i.e., 2.5 times larger.

CONCLUSIONS

The experiment reported shows that:

- the survival rate of young sea trout in the upper section of the Osówka, from release of hatchlings to smolting, attains a value between 2.3 and 4.1%;
- the stream area available to 1 smolt was not smaller than 25 m^2 .

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WIELKOŚĆ PRZEŻYCIA TROCI *SALMO TRUTTA* L., OD WSIEDLENIA WYŁĘGU
DO SMOLTYZACJI W POTOKU OSÓWKA

STRESZCZENIE

Osówka stanowi 13 km długi, lewobrzeżny dopływ dolnej Odry. W eksperymencie wykorzystano jej górny, 4 km długi, bieg charakteryzujący się średnim wyrównanym spadkiem dna wynoszącym 19%. W składzie autochtonicznej ichtiofauny potoku ryby łososiowate nie występują. W środkową część tego odcinka potoku, o powierzchni 960 m², wsiedlono wiosną 1984 r. 5402 sztuki (tj. 5,6 szt./m²) wylęgu troci. W trzech kolejnych latach łowiono na samołówkę, usytuowaną w dolnym biegu tej części potoku, spływające smolty troci. Pozyskano wiosną: 1985 r. – 111 sztuk, 1986 – 11 sztuk oraz 1987 r. – 2 sztuki. Z przeprowadzonego eksperymentu wynika, że przeżycie młodzieży troci w górnym biegu Osówki, od wsiedlenia wylęgu do smoltyzacji, mieści się w granicach 2,3–4,1%. Średnia długość (*l. caudalis*) pozyskanych smoltów wyniosła $M \pm m 155,2 \pm 2,1$ mm.

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