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Short communications

A SIMPLE TRAP FOR THE CAPTURE NEW-EMERGENT SALMONID FRY IN STREAMS

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ABSTRACT. A simple trap was built for capturing salmonid fry emerging from natural spawning redds in streams. The trap is shaped like a cap with a vertical PVC tube. Since the trap is not attached permanently to the substrate, settled debris can be cleaned out regularly, and the trap can be deployed in streams with large amounts of drifting organic material. Its simple construction means that it is easy to use. Based on the comparison of the effectiveness of two types of traps on artificial redds, the catch efficiency of the newly constructed trap was determined to be 37%.

Key words: SALMONIDS, FRY EMERGENCE, FRY TRAPS

Relatively little is known regarding various aspects of salmonid (*Salmonidae*) fry emergence from natural redds. This is mainly due to methodological difficulties with deploying appropriate traps. The basic problem is constructing traps that do not disturb water flow through redd substrates thus allowing fry to emerge from the redds freely.

The simplest method for capturing emerging fry is to deploy drift traps (Garcia de Leaniz et al. 1993), but they can only be used in streams in which small quantities of organic material drift on the water current. Earlier experiments conducted in the drainage area of the upper Wda River indicated that large quantities of drifting plant debris make the use of such traps very problematic (Radtke 2005).

Good results were obtained in streams using a net trap that encircles the entire redd and forms a type of cap with the edges buried into the surrounding gravel (Philips and Koski 1969, Porter 1973, Field-Dodgson 1983, Fraley et al. 1986). Unfortunately, this type of trap deployed permanently in the stream bottom can only be used success-

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fully when there are small quantities of mobile sediments (McMichael et al. 2005), and when the net is not subjected to large quantities of drifting organic debris or if it does not become overgrown with algae. Blocked mesh openings require that the trap is cleaned regularly, but its permanent deployment on the stream bottom limits trap manipulation possibilities. Additionally, there is also the danger that sand and mud will accumulate on the net that is buried under the gravel at the edges of the redd, which can increase mortality among the eggs and fry (Reiser et al. 1998).

The large quantities of floating organic debris encountered during earlier experiments in the Wda and Trzebiocha rivers as well as the substantial amount of sand on the bottom required building a trap that encompasses the entire redd just like the cap trap. However, its lower edge was not be buried permanently in the gravel, but was attached to a metal hoop surrounding the redd. Depending on the trap size, from one to three arch handles made of thick wire were mounted on the hoop. The construction was covered with a cap of polyester twine netting with a mesh bar length of 2 mm (Photo 1, Fig. 1). The second part of the trap was a vertical tube made of PVC 10 cm in diameter that was attached to the end of the netting with a PVC t-joint that was closed off from the bottom. The back

Photo 1. Medium cap trap with a vertical tube (metal hoop circumference – 75 cm).

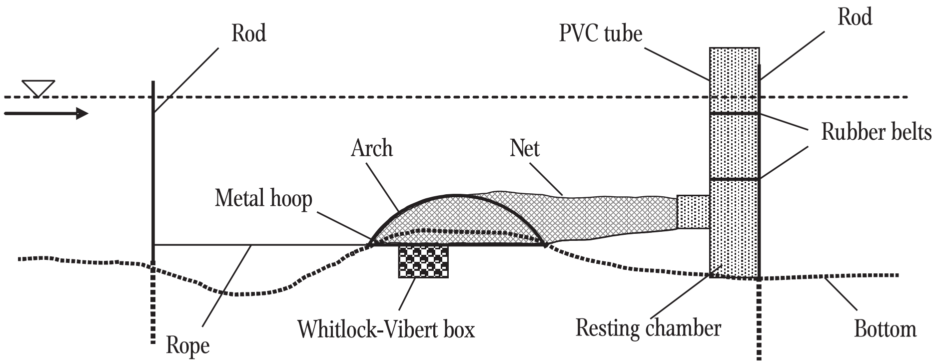

Fig. 1. Deployment and construction of the cap trap and vertical tube on an artificial redd.

wall of the t-joint was perforated. This created a resting chamber for the fry in the lower part of the tube, and also provided the fry free contact with the water surface for swim bladder inflation. The hoop was attached by rope to metal rods that were driven into the stream bottom. The vertical PVC tube was attached to a second vertical metal rod with two rubber belts (Fig. 1). This construction permitted easy monitoring access, for example, to empty it of its contents, and the lack of permanent contact with the substrate made it easy to clean the net of accumulated sediment. While servicing the trap, however, care must be taken to not disturb the structure of the redd.

In spring 2007 an attempt was made to determine the catchability of the new trap construction on artificial redds. Unfortunately, not all the specimens placed as eggs or fry in artificial redds emerge, which is why the number of individuals placed in the redd compared to the fry caught in the trap does not accurately reflect trap catchability. For this reason, the best way of evaluating the catchability of the tested trap is to compare the number of fry it catches to the number of fry caught in traps that catch all emergent fry under the same environmental conditions. In order to do this, six artificial redds that were shaped similarly to natural ones were constructed in the Trzebiocha (approximately 20 m downstream from the weir at Grzybowski Młyn). These redds had similar parameters, which means they were of the same size (redd tail diameter of approximately 0.5 m), and the same substrate (gravel diameter range of 16-32 mm). The depth of the stream was about 0.25 m, and the water current was within the 0.6-0.7 ms^{-1} range. A Whitlock-Vibert box containing 100 fry of lake trout, *Salmo trutta* m. *lacustris* L. from Lake Wdzydze with approximately 75% yolk sac resorption was placed in each redd. The fry came from the hatchery at Grzybowski Młyn, and they were released through rubber hoses into the W-V boxes after it had been placed on the redd.

Two types of traps were used. Three redds were fitted with cap traps with a vertical tube (described above) in three different circumferences (small – 0.5 m, medium – 0.75 m, large – 1 m). For comparison, the three other redds were fitted with three boxes of perforated metal that caught all the fish emerging from the redd (Photo 2, Fig. 2). The dimensions of the boxes were as follows: height – 0.30 m, length – 0.6 m, width – 0.23 m. The size of the perforations was 2 mm. With this type of trap, the W-V box with the fry was placed in plastic baskets with 2 mm perforations and gravel. The main part of the box was fitted with an opening in the bottom along the edge of the plastic basket so that all of the emerging fry could reach the trap. The rear section of the box trap had

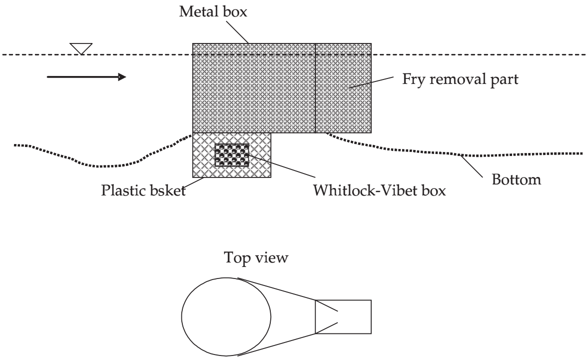

Fig. 2. Deployment and construction of the metal box trap on an artificial redd.

Photo 2. Metal box trap with a removable resting chamber for the fry.

a separate, removable module that provided a resting chamber for the fry (Photo 2, Fig. 2).

Two experiments were conducted in May 2007 on the three cap traps and the three box traps described above. The mean catch from six attempts with the metal boxes was 49.8 fry individuals while with the cap traps it was 18.5 fry individuals (Table 1).

TABLE 1

Number of fry deployed and caught in traps on artificial redds (SD – standard deviation)

Trap type	Number of traps	Number of fry released per 1 trap	Number of fry caught (mean ± SD)
Cap trap	6	100	$18.5^{a} \pm 16.2$
Metal box trap	6	100	$49.8^{b} \pm 20.2$

Values with a different letter index in the same column differ significantly statistically (test t, P< 0.05)

Assuming that the metal box catches all the emergent fry, the measure of catchability of the cap trap was taken as the ratio of the number of fry caught in it to the number of fry caught in the metal box. This proportion was 0.37 (SD = 0.24). The difference in the mean number of fry caught in these two trap types was statistically significant (Student's t – test, P < 0.05). In practical terms it seems that the number determined can be taken to be the approximate catchability of the cap trap.

The lower catchability of the cap trap recorded during the experiment can be explained by the migration of the emerging fry outside of the substrate area covered by the trap. The phenomenon of horizontal migration in redd substrates was observed in

Atlantic salmon (Garcia de Leaniz et al. 1993). In practice, one way of preventing trap aversion by emerging fry is to use an additional perforated hoop pushed into the gravel bottom to encircle the eggs or fry. However, this carries with it the risk of sediment accumulation and reduced water flow through the center of the redd.

Although the model cap trap described above does not encircle the entire redd and does not catch all the fry emerging from it, it can be deployed successfully in natural salmonid spawning grounds where there are large quantities of floating organic debris.

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STRESZCZENIE

PROSTA PUŁAPKA DO POŁOWU WYCHODZĄCEGO Z GNIAZD WYLĘGU RYB ŁOSOSIOWATYCH W POTOKACH

Celem badań było określenie łowności pułapki do połowu wylęgu ryb łososiowatych wychodzącego z naturalnych gniazd tarłowych. Pułapka własnej konstrukcji tworzy formę czapki zakończonej pionową rurą PVC (fot. 1, rys. 1). Uzyskane wyniki porównano z rezultatami osiągniętymi z zastosowaniem pułapki z perforowanej blachy, w której umieszczono aparat z wylęgiem (fot. 2, rys. 2). Brak stałego umocowania pułapki w podłożu umożliwia jej regularne czyszczenie z naniesionego osadu, dzięki czemu można ją stosować w rzekach z dużą ilością dryfującej materii organicznej. Prosta konstrukcja umożliwia łatwą

obsługę pułapki. Na podstawie porównania efektywności dwóch rodzajów pułapek na sztucznych gniazdach określono łowność nowo skonstruowanej pułapki na 37%. Średnia ilość larw troci jeziorowej, *Salmo trutta* m. *lacustris* L. złowionych w porównywane typy pułapek różniła się istotnie statystycznie (test t, $P < 0,05$; tab. 1).