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SHORT COMMUNICATION

A handy trap for capturing of the adult river lamprey in streams

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Abstract. In the Baltic Sea Basin, the river lamprey, *Lampetra fluviatilis* (L.), is still important to commercial fishing; however, the species is on the decline, especially in the southern part of the catchment area. At present, the river lamprey is protected by European law that requires monitoring its stocks. This article describes a convenient trap for catching adult river lamprey in streams. The gear is a small fish-pot or hoop-net with two chambers. Operating the trap is very simple, and tests indicated its usefulness for monitoring ascending river lamprey. Thus, this trap design is recommended as a standard tool for use in the future, especially since there is a lack of commercial fishery data.

Keywords: *Lampetra fluviatilis*, migration, monitoring, protected species, spawning streams

The river lamprey, *Lampetra fluviatilis* (L.), is one of the two predatory, anadromous species of the family Petromyzontidae inhabiting the Baltic Sea Basin. In contrast to the sea lamprey, *Petromyzon marinus* L., it is much more abundant. In many Scandinavian rivers (Sweden) and in tributaries of the eastern Baltic Sea (Finland, Estonia, Latvia), the river lamprey periodically occurs in large amount and plays a significant role in commercial fisheries (Sjöberg 2011). Nowadays, the species occurs less frequently in tributaries of the southern Baltic, but in the mid twentieth century catches of it were considerable in the lower Vistula River (Jokiel 1983, Thiel et al. 2009). River lamprey ascend from the sea to rivers in two distinct peaks in autumn and in spring. The species exhibits nocturnal activity (Aronsuu et al. 2015). Lamprey spawn in streams with rapid current flows directly into the sea or in tributaries of large rivers from March to May at water temperatures of 8.5 to 12.0°C (Hardisty and Potter 1971). They bury their eggs in gravel nests at water depths of 20–150 cm in areas where surface water velocity is 0.5–0.8 m s^{-1} (Maitland 2003, Jang and Lucas 2005). Adult individuals die after spawning, while offspring remain in the river environment for 3–5 years (Hardisty and Potter 1971). After this period larvae undergo a metamorphosis and swim downstream. In the sea, the river lamprey leads a parasitic lifestyle by feeding on fish. The mean length of adult individuals entering Baltic rivers ranges from 27.9 to 42.9 cm (Bartel et al. 2010). Commercial lamprey fishing is conducted mainly during the migration of this species in rivers and streams using traditional traps that are characteristic of given areas (Sjöberg 2011, 2013, Abersons and Birzaks 2014). Typically, these traps are various modifications of fish-pots, fyke-nets, or chests set up in river currents for the night. In the lower Vistula, which is a large river, lamprey was

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originally fished with sets of about ten willow baskets attached on long wooden poles and deployed in the main river current near the bank (Jokiel 1983).

River lamprey habitats are currently protected in European Union countries (European Commission 1992). In some countries, including Poland, because of significant decreases in their numbers, lamprey is protected by national laws that prohibit fishing it. The Habitats Directive imposes on EU countries the obligation to monitor protected species and their habitats. In the case of the migratory river lamprey, the adult individuals of which occur in rivers for short period, it is difficult to apply appropriate methods for precisely determining the state of their stocks. Nevertheless, commercial catches in rivers and streams can be an indicator of the states of populations; however, in the absence of such data, other methods are necessary.

The basic method for determining population parameters for assessments of the protection status of river lamprey is based on estimating the abundance of larvae in spawning grounds with electrofishing surveys, which, however, have methodological drawbacks (Harvey and Cowx 2003). In particular, the problem is there is no possibility of distinguishing larvae of anadromous river lamprey from that of brook lamprey, *Lampetra planeri* (Bloch), which spend the entire life cycle in rivers (Potter 1980, Gardiner 2003, Staponkus and Kesminas 2014). It is also difficult to obtain precise information on the occurrence and size of individual stocks migrating to a given river or stream for spawning when using different collection methods (Moser et al. 2007). The solution to these problems could be to use standard trap tools for adult lamprey during migration in the streams that are their spawning grounds. This work proposes a simply constructed trap for catching ascending lamprey along with a brief description of the possibilities of its practical application in environmental monitoring.

The trap is a 1.5-m-long fish-pot (hoop-net) with five hoops made of stainless steel (Fig. 1). The first hoop in the trap is comprised of a semi-circle that is 60 cm wide and 35 cm high. The remaining hoops that constitute the main part of the trap have diameters of 30 to 20 cm, respectively. The rims are trimmed with a twine netting with a mesh size of 6 mm. Two funnels are sewn into the interior of the trap that form two chambers with 5 x 5 cm inlets. The trap ends in a knot that can be untied to remove the lamprey caught from the last chamber. This flexible trap construction makes it easy to fold and transport. The trap should be deployed at selected, relatively shallow sites with fast currents. The knot with the cable must be attached at the start with a metal rod driven into the river bottom (upper water). Next the entrance of the trap should be set with one or two rods with the river current (lower water), which must be deployed in the opposite direction of lamprey migration. The trap should be stretched so that the funnels are fully opened. Convenient locations for trap deployment include shallow rapids near banks that are a potential migration area just downstream from or directly in spawning grounds. The gear should be deployed for the night and checked in the morning. The deployment period depends on river thermal conditions. During spring spawning migrations, the best moment for fishing is when water temperatures increase to approximately 8–10°C, which usually occurs in northern Poland in mid-April.

Current field tests were conducted in the second half of April 2016 at two sites located in the Wierzyca River (a tributary of the lower Vistula, southern Baltic Basin). To date, there has been only scant historical information about the presence of lamprey in the Wierzyca River. Site 1 was located under a road bridge near the city of Gniew, while site 2 was situated in rapids downstream from the village Brodzkie Młyny. Catches were conducted twice at an interval of nine days. Three traps were set in the evening at about 20:00 and were collected the next morning at about 08:00 (CPUE). The traps were deployed in the same locations for both of the tests. The width of the river ranged from 12 to 15 m, while the depth of the fishing sites was between 60 and 70 cm. During trap deployment, the water temperature and the oxygen content were recorded. After counting and measuring, the captured individuals were released back into the river.

Figure 1. A trap model.

At the first trial, the water temperature was 8.0°C, and the oxygen level was 11.0-11.8 mg l^{-1}, while at the second trial, these values were 9.8°C and 12.7-14.0 mg l^{-1}, respectively. In total, 99 river lamprey specimens were collected in the two trials, and the results per trap varied depending on site and time (Table 1). The highest catch (28 individuals per trap) was recorded in the second trial at site 1 (Fig. 2). The length of individuals ranged from 28 to 41 cm. During the first trial at site 2 (Brodzkie Młyny), the lamprey were observed spawning near the traps.

The different catch results in the traps confirm the importance of selecting the appropriate location for traps with regard to the character of the microhabitats, i.e., water current, depth, etc. At shallow water depths, trap operation is very simple, but it leaves the traps clearly visible, which means unauthorized persons could access them. In places where this is a possibility, the solution is to either watch the traps or deploy them in places that are hidden or inaccessible. In the case of larger, deeper rivers, the traps can be fixed to the bottom with an anchor, but

Table 1

Results of river lamprey (*L. fluviatilis*) catches (CPUE, individuals) in two sites in the River Wierzyca (ranges of lamprey numbers captured per trap are in parentheses)

	CPUE			
	Trial 1	Trial 2	Mean per trap ± SD	Length of specimens (cm)
Site 1	31 (5 – 21)	44 (8 – 28)	12.5 ± 9.6	28 – 41
Site 2	10 (3 – 4)	14 (1 – 9)	4.0 ± 2.7	28 – 34

Figure 2. Catch of river lamprey (*L. fluviatilis*) in the River Wierzyca, site 1.

this makes them difficult to deploy. Nevertheless, considering the experience we gained, the trap model described can be recommended for monitoring river lamprey in streams or shallow rivers as a standard for future use, especially in the absence of other fishing opportunities. Additionally, the trials conducted confirmed that river lamprey undertake spawning migrations in Wierzyca River.

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