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Effect of hydrodynamic conditions on habitat preferences of lamprey larvae (Lampetra spp.)

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Although hydrodynamic conditions play an important role in the creation of niches for aquatic vertebrates, their role in the spatial distribution of lamprey larvae of *Lampetra* spp**.** remains poorly recognized. In spite of conservation status of all lamprey species, radical decline in lamprey population has been recorded over the last century as a result of water pollution, sediment excavation, and river engineering. Also water abstraction and land drainage create unstable habitats for lamprey through varying water levels or flows. The unstable conditions may be detrimental to lamprey larvae (ammocoetes) which live for 3 – 5 years burrowed in the sand or mud until metamorphosing. A single niche may be taken up by larvae of both river lamprey *L. fluviatilis or* brook lamprey *L. planeri,* which are similar in appearance. They filter organic matter from the water for nourishment until their sexual maturity is approaching, and soonafter they stop feeding entirely. Unlike river lamprey, brook lamprey does not migrate out to sea, but spends the whole life-cycle in fresh water (it is not anadromous). A few weeks after spawning the adults die. This unique feature of lamprey's life-cycle requires a detailed survey of habitat preferences of its larvae to undertake the effective restitution programmes. To do so, we analysed and compared hydrodynamic conditions at 9 sites abundant in river and brook lamprey larvae in the Grabowa River (southern Baltic Sea basin, N Poland) and a flow-through sediment tank system discharging river water to the trout ponds. We measured water head, discharges and velocity distribution in the channel crossections with the use of AquaProfiler^{TM}(HydroVision). Simultaneously to larvae sampling, water quality measurements were performed with the use of multiparameter sonde YSI 6600R2. In substrate samples collected from the lamprey burrowing sites, the contents of C, P, N, and heavy metals were determined. Grain size fractionation occurred helpful in predicting the initial homogeneity or heterogeneity of sediment material and its influence on the larvae distribution (multivariate ordinations).

Our result showed that lampreys larval nursery beds were located at the edges of the river or tank channels with relatively slow water velocities (0.007-0.010 ms^{-1}) over *Lampetra spp.* burrows. The water velocities over ammocoete beds were remarkably constant, with values ca. 0.35 m s^{-1} at the water surface. In substrate taken from the sediment tank, apart from 2 adult representatives, we found tens of medium-size and several small larvae *Lampetra* spp. $<$ 7 cm of body length. Our study indicated that the lamprey larvae avoid bed substrate consisted soleyly of mineral matter or organic particles, e.g. wooden parts as sticks or alder cones. They prefer sites with a significant share of organic matter in bed substrate and well oxygenated water.The results presented above indicate the need of environmental surveys supporting lamprey restoration programmes. There is a significant potential of sediment tanks to be used for restitution of declining populations of river or brook lampreys. The project was supported by National Science Center in Poland within a grant No. DEC-2013/09/B/NZ9/03130.