

Alien freshwater polychaetes *Hypania invalida* (Grube 1860) and *Laonome calida* Capa 2007 in the Upper Odra River (Baltic Sea catchment area)

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Abstract – Two polychaete species, *Hypania invalida* and *Laonome calida*, were found in the Upper Odra River in 2016. Both species were recorded close to a natural river bank down to 1 m depths. They inhabited sandy-gravelly and sandy-muddy sediments. *H. invalida* is an alien invasive Ponto-Caspian species, previously known in Poland from the Odra River estuary only. Our results may indicate a further rapid dispersal of *H. invalida* upstream the Odra River or an accidental introduction. This study is the first record of *L. calida* in the Baltic Sea catchment. This Australian species has been recently introduced into Europe. Prior to this study, it had been reported from Dutch rivers only. The present data suggest accidental introduction of the species to European rivers; however, our findings show an urgent need for a close monitoring of the polychaete in Europe.

Keywords: polychaeta / invasive species / Ponto-Caspian region / Central Europe

Résumé – Les polychètes d'eau douce exogènes *Hypania invalida* (Grube 1860) et *Laonome calida* (Capa 2007) dans la Haute-Oder (bassin versant de la mer Baltique). Deux espèces de polychète, *Hypania invalida* et *Laonome calida*, ont été trouvées dans la Haute-Oder en 2016. Les deux espèces ont été trouvées près d'une rive naturelle jusqu'à 1 m de profondeur. Elles occupent des sédiments sablo-gravelleux et sableux. *H. invalida* est une espèce invasive Ponto-Caspienne, connue jusqu'alors en Pologne dans l'estuaire de la rivière Oder seulement. Nos résultats peuvent indiquer une nouvelle dispersion rapide de *H. invalida* en amont de la rivière Oder ou une introduction accidentelle. Cette étude est le premier enregistrement de *L. calida* dans le bassin de la mer Baltique. Cette espèce australienne a récemment été introduite en Europe. Avant cette étude, elle avait été signalée uniquement dans les rivières hollandaises. Les données actuelles suggèrent l'introduction accidentelle des espèces dans les rivières européennes. Cependant, nos résultats montrent un besoin urgent d'un suivi étroit du polychète en Europe.

Mots-clés : polychète / espèce envahissante / région Ponto-Caspienne / Europe centrale

Freshwater ecosystems support as few as about 2% (<200 species) of currently known polychaetes (Glasby and Timm, 2008). Although some of them have been recently introduced into various new areas, invasive polychaetes make up a very small proportion of the total number of species (Cinar, 2013). *Hypania invalida* is such an invasive species of the Ponto Caspian origin which, until now, has been the only polychaete inhabiting inland waters of Central Europe (Norf *et al.*, 2010). Over the last 35 years, it spread widely and rapidly in Europe through the Volga, Dnieper, and Danube catchments

(Woźniczka *et al.*, 2011 and references therein). The species has been recently recorded in Great Britain (Gallardo and Aldrige, 2015). *Laonome calida* is a freshwater Australian sabellid described only 10 years ago (Capa, 2007). It has been recently recorded in the Netherlands, at numerous freshwater and brackish sites located in the delta region of the rivers Rhine, Scheldt and Meuse (Capa *et al.*, 2014). The currently known distribution of the species in Europe has been restricted to this single area in the Netherlands.

Our study was carried out in the upper course of the Odra River (southern Poland), one of major European waterways and the second largest river in Poland. Qualitative samples were collected in July 2016 (Dobrzeń Mały: 50°44.60'N;

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17°51.59'E) and September 2016 (Zdzieszowice: 50°24.708'N; 18°06.435'E and Bierawa: 50°41.177'N; 18°10.723'E) with a net set on a square (25 cm × 25 cm) frame, from depths of up to 1 m; 10 replicate samples were retrieved at each site. The sediment material collected was sieved on an 0.5 mm mesh sieve. The water parameters were measured in situ with a Hanna Instruments portable meters or were determined in the laboratory according to standard methods (Hermanowicz *et al.*, 1999).

The Dobrzeń Mały samples yielded a total of four specimens of *H. invalida* (6.5% of the benthic fauna), four individuals being found in Zdzieszowice (0.4% of the benthic fauna). The latter locality yielded also five specimens of *L. calida* which made up 0.5% of the entire macroinvertebrate fauna. In Dobrzeń Mały, *H. invalida* was collected from sandy-gravelly substrate, the Zdzieszowice specimens being isolated from sandy-muddy sediment. The water at the sampling sites was brackish (conductivity range of 1581–2350 $\mu\text{S cm}^{-1}$) and nutrient-rich (nitrate, nitrite, ammonium, and phosphate concentration ranges of 4.43–11.95 mg dm^{-3} , 0.12–0.13 mg dm^{-3} , 0.02–0.40 mg dm^{-3} , and 0.22–0.43 mg dm^{-3} , respectively) as a result of coal mine water discharge from mines located in the upstream part of the Odra River catchment (in the Upper Silesian Coal Basin). The benthic fauna at all three sites was dominated primarily by bivalves, gastropods, amphipods, and dipteran larvae.

The first record of *H. invalida* in Poland dates back to 2010 when the species was found in the Odra River mouth area. The small ampharetid occurred at very high densities (up to 11 000 ind./m²) at several sites in the Szczecin Lagoon and the Róztoka Odrzanska. The polychaete had most likely dispersed via the Spree-Oder Canal (Woźniczka *et al.*, 2011), a main invasion route into the Odra River for many other Ponto-Caspian macroinvertebrates (Gruszka, 1999). Until present, there has been no new data on the polychaete's distribution along the Odra and any other river in Poland. Our recording of *H. invalida* in the upper reaches of the Odra River, more than 600 km upstream from the estuary, may evidence a further rapid dispersal of the species. *H. invalida* is known for its ability to spread upstream rivers. The larval stages travel with ballast waters of small vessels (Norf *et al.*, 2010). On the other hand, the Odra has been intensively sampled in recent years by a number of Polish researchers without any record of *H. invalida* and *L. calida* between the river mouth and Zdzieszowice (Bącela, personal communication; Krodkiwska, unpublished results). Therefore it is conceivable that our findings might have resulted from accidental introductions. As polychaetes are often used as fish bait and as food in aquaculture and aquariums, an accidental release into the Upper Odra cannot be ruled out. Woźniczka *et al.* (2011) considered a possibility of *H. invalida* spreading along the central migration corridor, as the species was at that time already known in Belarus. This dispersion route seems to be doubtful, however, as there are still no published or unpublished records of *H. invalida* from the Vistula River. On the other hand, it is probably only a matter of time when the species will spread from the Odra to the Vistula as a result of passive drifting during floods occurring in the upper reaches of both rivers (Czaja *et al.*, 2014). Currently, *H. invalida* and *L. calida* were present at the sampling sites at low abundances (although our data are not quantitative), which might support

the accidental introduction scenario. Water at the sampling sites was brackish due to saline water discharges from active and abandoned coal mines in the Odra River basin (Lach *et al.*, 2006). Increased salinity might have locally created conditions suitable for the species' establishment following a small scale accidental introduction, particularly in the case of *L. calida*.

The true migration and/or introduction routes of the two species should be revealed by molecular studies, and there is an urgent need for this type of research. It is also important to monitor the possible further spread of the alien polychaetes as well as changes in their abundance at both Zdzieszowice and other neighbouring, but currently non-invaded sites. The *L. calida* specimens collected in the Odra, with their 8 thoracic segments, 40–45 abdominal ones, a radiolar crown with transverse pigmented lines, and a ventral anal depression in the last 10–15 chaetigers match the description provided by Capa (2007) and Capa *et al.* (2014). Previous comparisons with the Australian material (Capa *et al.*, 2014) demonstrated morphological similarity with the European specimens, although the Dutch population was found in areas with very low winter temperatures, which might suggest the presence of cryptic species characterized by different environmental requirements; hence the need for molecular analyses. Nevertheless, it is rather unlikely that the species invaded the Odra River directly from Western Europe. In Dutch rivers, *L. calida* also appeared rapidly post-2009 at numerous sampling sites, most probably as a result of unintentional introductions. Another, currently still undescribed, non-indigenous species of *Laonome* has been recently found at the Estonian coast of the Baltic Sea (Kotta *et al.*, 2015).

Further studies should address the problem of possible effects of the two species on native biodiversity and ecosystem functioning. At present, however, we cannot speculate about a potential impact of the polychaetes on benthic communities in Central European rivers.

Acknowledgements. The study was supported by the University of Silesia's internal funds. We wish to thank Teresa Radziejewska for polishing the language of the manuscript and two anonymous reviewer for the comments.

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Cite this article as: Pabis K, Krodkiewska M, Cebulska K. 2017. Alien freshwater polychaetes *Hypania invalida* (Grube 1860) and *Laonome calida* Capa 2007 in the Upper Odra River (Baltic Sea catchment area). *Knowl. Manag. Aquat. Ecosyst.*, 418, 46.