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## Checklist of Gastrotricha of the Polish Baltic Sea with the first reports of *Heterolepidoderma joermungandri* K anneby, 2011, and *Turbanella hyalina* Schultzze, 1853

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### Abstract

Gastrotricha is a cosmopolitan phylum of aquatic and semi-terrestrial invertebrates comprising more than 800 described species. Up to now, only five taxonomic and faunistic papers have been published on the gastrotrichs of the Polish Baltic Sea and 27 taxa have been found (including three freshwater, which were found in estuaries). This article presents a complete list of brackish and estuarine Gastrotricha from the Polish Baltic Sea accompanied by localities and the first observations of gastrotrich species inhabiting the underwater macrophytes. Although the group has been studied for more than 150 years, the gastrotrich community of marine macrophytes has not been studied in any great detail. Here we provide data on gastrotrich communities living on macrophytes and also in sandy sediments. In total, nine species were found (seven from sandy sediments, two species from macrophytes). Seven of the species belong to Chaetonotida: *Halichaetonotus balticus* Kisielewski, 1975, *H. lamellatus* Kisielewski, 1975, *H. schromi* Kisielewski, 1975, *Heterolepidoderma joermungandri* K anneby, 2011, *Lepidodermella squamata* (Dujardin, 1841), *Xenotrichula intermedia* Remane, 1934, and *X. velox* Remane, 1927(c). Two of species belong to Macrodasyida: *Turbanella cornuta* Remane, 1925, and *T. hyalina* Schultzze, 1853. *H. joermungandri* and *T. hyalina* are new for Polish fauna. Both species correspond with the original descriptions but differ by some morphometric characters. Taxonomic, morphometric, and biogeographic remarks are provided for the new records together with differential interference contrast (DIC) microphotographs.

**Key words:** Baltic Sea, Chaetonotida, Gastrotricha biodiversity, Macrodasyida, phytophilous species, Puck Bay, taxonomy, underwater meadows

### Introduction

Gastrotricha is a taxon comprising monophyletic, microscopic, acoelomate metazoans ranging in size from 50 µm to 3500 µm (Hochberg & Litvaitis 2000; Kisielewski 1997; Todaro *et al.* 2006). They inhabit both aquatic (marine and freshwater) and semi-terrestrial ecosystems (peatbogs, alder woods, riparian forests, *etc.*) and can be found in natural as well as artificial habitats (Kisielewski 1997; Balsamo *et al.* 2008; Kolicka *et al.* 2013). Gastrotrichs constitute a significant component of the benthic, psammic, and epiphytic ecosystems (Nesteruk 1996; Balsamo & Todaro 2002; Balsamo *et al.* 2008; Kolicka *et al.* 2013). Despite their abundance in various habitats, they are often neglected in faunistic studies, or mentioned only as a group, without identification to species level (*e.g.*, Fonseca *et al.* 2011; Kotwicki *et al.* 2014).

Gastrotricha is divided into two orders comprising approximately 800 nominal species (Todaro 2014). The order Chaetonotida Remane, 1925, contains approximately 460 nominal species, of which *ca.* 130 are marine or brackish (Balsamo *et al.* 2013; Todaro *et al.* 2009; Todaro 2014). Chaetonotidans have a total body length of 50–780 µm and are usually tenpin-shaped. They are characterized by the furcated caudal end. The furca bear only one pair, or very rarely two pairs, of distal adhesive tubes. Certain semi-planktonic families, viz. Dasydytidae and

optimum range between 25 PSU and 34 PSU. They also demonstrated that the species can resist temperatures ranging between  $-3.7^{\circ}\text{C}$  and  $34.3^{\circ}\text{C}$  with a thermal optimum between  $14.5^{\circ}\text{C}$  and  $15.7^{\circ}\text{C}$ . However, mortality increased at temperatures above  $25^{\circ}\text{C}$  (Boaden & Erwin 1971). By comparison, conditions in the study area range between 6–17 PSU and 2– $18^{\circ}\text{C}$  in the open sea and between 6–9 PSU and 0– $20^{\circ}\text{C}$  in Gdańsk Bay (Axe 2010; Siegel & Gerth 2013).

### Dispersal routes of newly recorded species

The record of the freshwater species *H. joermungandri* allows us to surmise that the species may also inhabit the freshwater inland waters of Poland or its neighbouring countries, even though it has not yet been found. Furthermore, that it was introduced into Puck Bay, where it found suitable living conditions (as indicated by the recording of juvenile and adult specimens as well as specimens with developing eggs). The dispersal transport for *H. joermungandri* can be surface runoff from bodies of water located close to the sea and from swamps, being carried together with flowing waters, seeds, and fragments of macrophytes, as well as being carried with sediment transported on the legs of water birds and marsh birds (Norkko *et al.* 2000; Rachalewski *et al.* 2013). Such a secondary transition of the representative of the *Heterolepidoderma* from freshwater to saline water would be consistent with a hypothesis supported by the molecular data presented by Kånneby *et al.* (2013). On the other hand, equally plausible is the opposite dispersion direction of *H. joermungandri*. As a species reported in a freshwater habitat located in Skarvesäter, a small island in Skagerrak, it could have been introduced by means of the brackish waters of the Baltic Sea. It was possible for the *H. joermungandri* to disperse in both directions due to ability to produce opiblastic eggs by Chaetonotida that are resistant to unfavourable environmental conditions (drought, high temperature, *etc.*) and subsequently, eggs are able to develop (Balsamo 1992). Species capable of parthenogenesis, such as gastrotrichs from the Chaetonotida, can potentially create a stable population in a new habitat from a single specimen or from a small number of specimens that were introduced to the area by chance. The high abundance of *T. hyalina* can be explained by a considerable capability for rapid development and increasing their population (Strayer *et al.* 2010), as well as ability for inhabiting new environments (da Fonsēca-Genovois *et al.* 2006; Hummon 1972; Mirto & Danovano 2004). For *T. hyalina*, potential means of transport comprise the species migrating on its own, being carried for great distances together with seawater and material (sediment, sand, and algal mats, *e.g.*, *Fucus* spp. from Sweden) transported during storms, and being carried with waters and sediments in ships' ballast tanks (Norkko *et al.* 2000; Radziejewska *et al.* 2006).

### Conclusion

- In total, 29 species, including three freshwater taxa from estuaries, were recorded in the Polish Baltic Sea area; 16 belong to the Chaetonotida and 13 belong to the Macrodasyida.
- Two taxa (*H. joermungandri* and *T. hyalina*) are new to the Polish fauna.
- Macrophytes of underwater meadows are a newly recorded habitat for brackish/marine gastrotrich assemblages.

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