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SHORT COMMUNICATION

New data on benthic Naididae (Annelida, Clitellata) in Polish brackish waters

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Summary This paper presents new findings on oligochaete species inhabiting Polish brackish waters. Identification of 455 specimens collected in September 2013 and July 2014 during the macrozoobenthos survey in the Port of Gdynia (the Gulf of Gdańsk, the southern Baltic Sea, Poland) showed the presence of six species belonging to two subfamilies Naidinae and Tubificinae.

1. Introduction

Oligochaetous clitellates (subclass Oligochaeta) are a diverse, widely distributed group in both marine and freshwater ecosystems all over the world in which they play various roles. Despite their importance, and the fact that oligochaetes are an abundant group within soft-bottom communities in the Baltic Sea, they are often identified only to the subclass level (Boström and Bonsdorff, 1997; Gic-Grusza et al., 2009; Masłowski, 2010), what can give a different result when considering, for example, species richness or number or non-indigenous species (NIS), considered these days a major threat to coastal ecosystems' biodiversity (Bax et al., 2003; Ojaveer et al., 2014). Because of intense international vessel traffic and favorable environmental conditions, the Baltic Sea is particularly susceptible to NIS introductions (Leppäkoski et al., 2002). Moreover, ballast water and ballast tank sediment are the most probable vectors of introduction of annelids (Gollasch et al., 2002), hence it is likely that a new species from this phylum will be recorded in port areas in the future (Kotta et al., 2015; Leppäkoski et al., 2002; Paavola et al., 2005).

In this paper, we present new data on oligochaete worms, native and introduced, from shallow waters of southern part of the Baltic Sea (Poland), based on the example of the Port of Gdynia. In 2013 and 2014, during testing the protocol for comprehensive sampling of alien species in ports recommended by HELCOM (2013), we analyzed the taxonomic composition of benthic macrofauna, including the identification of oligochaetes to the species level.

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2. Material and methods

Samples of benthic infauna were taken in September 2013 and July 2014 in the Port of Gdynia (Gulf of Gdańsk, Poland) from three sampling sites at the depth of 8.7—13.6 m. Bottom temperature during sampling varied from 18.5 to 18.9°C in 2013 and from 16.1 to 19.5°C in 2014, salinity was between 6.7 and 6.8 PSU in 2013 and 7.0 PSU in 2014, water oxygenation at the bottom ranged from 65.7 to 76.7% in 2013 and from 62.1 to 89.9% in 2014. Samples were collected with a Van Veen grab of 0.1 m^2 sampling area. Sediment was sieved through a 0.5 mm sieve; the residue was placed in 1000 dm^3 bottles and preserved with 4% formaldehyde. In a laboratory, Oligochaeta specimens were selected from samples, placed in Amman's lactophenol to display chitinous structure of chaetae and penial sheaths and then they were identified to the species level based on features given by Kasprzak (1981) and Timm (2009).

3. Results

Altogether, 455 individuals belonging to the family Naididae were collected. Among them one species from the subfamily Naidinae and five from the subfamily Tubificinae were identified, moreover, 136 immature specimens were classified as Tubificinae gen. spp. juv.

Each year of the study, five species were recorded. In September 2013, *Tubificoides heterochaetus* (Michaelsen, 1926) was the most abundant taxon ($n = 135$) followed by mature specimens of *Limnodrilus hoffmeisteri* Claparède, 1862 ($n = 61$). *Tubifex blanchardi* Vejdovský, 1891 was distinctly less numerous ($n = 4$), whereas both *Baltidrilus costatus* (Claparède, 1863) and *Paranais litoralis* (Müller, 1780) were represented by only one specimen (Fig. 1A). Juvenile Tubificinae, not determined to the species level, were not numerous ($n = 7$) in 2013, while they were the most abundant group ($n = 129$) in July 2014. In 2014, the number of mature specimens of *L. hoffmeisteri* ($n = 63$) was similar to the number determined in 2013, while the number of mature *T. blanchardi* was higher ($n = 22$). *T. heterochaetus* was represented by 22 individuals, whereas *B. costatus* — by 8 individuals. Moreover, the presence of *Limnodrilus profundicola* (Verrill, 1873) ($n = 2$) was determined (Fig. 1B). The density of the subclass Oligochaeta reached 697.67 $\pm$ 872 ind. m^{-2} in 2013 and 820 $\pm$ 771 ind. m^{-2} in 2014.

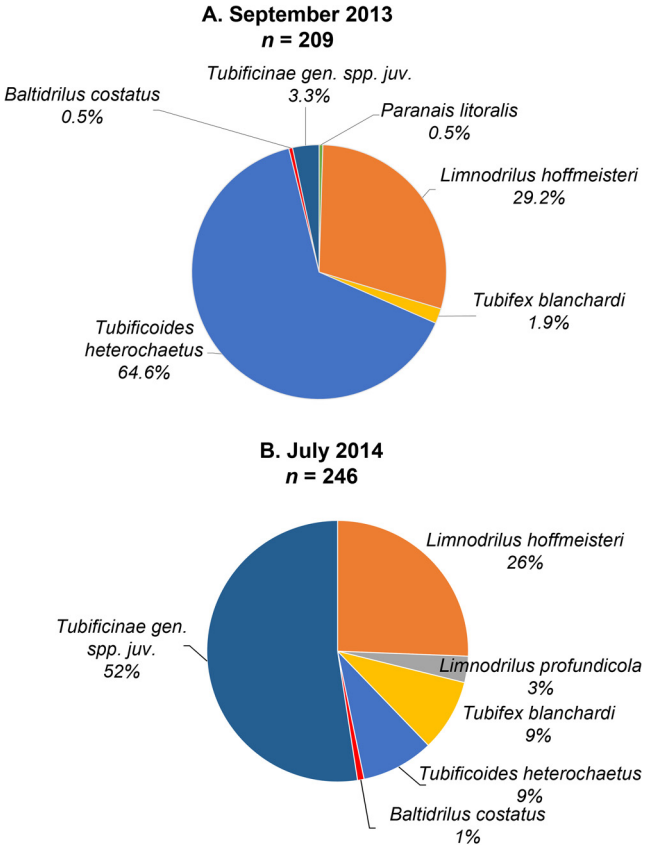

Figure 1 Abundance of Oligochaeta species in three sample replicates collected form the Port of Gdynia in 2013 (A) and 2014 (B).

4. Discussion

Only a few authors analyzed the subclass Oligochaeta (e.g. Gogina et al., 2010; Jabłońska-Barna et al., 2013; Legeżyński, 1979) in the Southern Baltic. As evidenced by the research conducted by Włodarska-Kowalczuk et al. (2015) in the Vistula River prodelta, oligochaete individuals can represent from less than 1% up to 82% of the total number of benthic macrofauna and, based on the literature (Zettler and Daunys, 2007), it might be assumed that they could be one of the most diverse groups within the macrobenthic community. Of the six species identified in the Port of Gdynia, four are typical marine or brackish water inhabitants (*T. heterochaetus*, *P. litoralis*, *B. costatus*, and *T. blanchardi*), previously found in Polish coastal waters. *T. heterochaetus*, *P. litoralis*, and *B. costatus* were noted by Legeżyński (1979) in the Gulf of Gdańsk, whilst Żmudziński (1990) mentioned only *T. heterochaetus* and *P. litoralis* and described them generally as Baltic Sea inhabitants. So far, euryhaline species *T. blanchardi* and *L. hoffmeisteri* were found in the Vistula Lagoon only by Dumnicka et al. (2014). Our study reports for the first time the occurrence of *L. profundicola* in Polish coastal waters but this species was previously recorded in brackish water. Pfannkuche (1981) found it in the Elbe estuary, Verdonschot et al. (1982) — in brackish inland waters of the southwestern part of The Netherlands, and Seys et al. (1999) — in the Scheldt estuary. Generally, *L. profundicola* was present, except for freshwater ecosystems, in localities where the salinity was usually low (about 2 PSU) and did not exceed 7 PSU (Verdonschot et al., 1982). According to Weigel et al. (2015) and Warzocha (pers. comm.), the most abundant species in the western Baltic Sea and the Polish Exclusive Economic Zone were *B. costatus* and *Tubificoides benedii* (Udekem, 1855). Surprisingly, only few specimens of the former were found during our work. Our study revealed that both the species composition and the abundance may vary seasonally and annually, but in this case this kind of variation could be explained by patchy distribution of oligochaetes and perhaps collection of more samples would have given a better, overall picture of their abundance and taxonomic composition.

Almost all specimens collected in the Port of Gdynia in 2013 and 2014 belong to the subfamily Tubificinae, typical inhabitants of muddy sediments at depths ranging from a few centimeters to several dozen meters. The depth on sampling sites and type of sediment could be the reason for almost complete absence of Naidinae species, despite that some species from this subfamily (*Nais elinguis* Müller, 1774, *Amphichaeta sannio* Kallstenius, 1892) tolerate salinity up to 15 PSU (Pfannkuche, 1980).

As an effect of marine traffic, new species can be introduced into the Port of Gdynia and possibly further expand their range. Therefore, the origin of some Clitellata species is not certain, for instance *T. heterochaetus* with unknown status (Timm and Erséus, 2015) was listed by Gherardi et al. (2009) as an alien species in Europe. The origin of cosmopolitan *P. litoralis* (Timm, 2009) is also unknown — probably speciation of this genus took place in the Ponto-Caspian region and *P. litoralis* colonized other continents before oligochaetological studies; two other species from this genus were listed by Gherardi et al. (2009) as non-indigenous to Europe. Moreover, *T. blanchardi* described from North Africa (Vejdovský, 1891) and found in some countries of Southern Europe (Giani, 2013) could also be an introduced species in Poland.

Our study shows that even in a relatively small area with quite severe conditions for living organisms, fairly high species diversity can be noted, even when analyzing only one taxonomic group. Without a doubt these are valuable information, especially in the context of the EU Marine Strategy Framework Directive, where non-indigenous species, listed as one of the descriptors of "Good Environmental Status" of an aquatic ecosystem, constantly challenge marine biodiversity.

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