THREE NEW RECORDS OF FISHES AND THEIR PARASITE FAUNA FROM POMERANIAN BAY, BALTIC SEA

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Abstract. This paper reports the occurrence of three new fish species, extremely rare in the Baltic Sea, and provides new data on their parasite fauna. The fish collected were Barbus barbus (Linnaeus, 1758), Salvelinus fontinalis (Mitchill, 1814), and Scophthalmus rhombus (Linnaeus, 1758). Their taxonomic identity was confirmed through genetic analyses using DNA extracted from fin clips. The stomach contents were examined, and age was determined by otolith or scale readings. Parasitological examinations focused on the skin, vitreous humour, eye lenses, mouth and nasal cavities, gills, gonads, viscera, and muscles. Furthermore, the changes of fish species composition over 20 years in Pomeranian Bay were analysed. The sequence comparisons against GenBank records revealed that sequences obtained for B. barbus and S. rhombus from Pomeranian Bay represent new rhodopsin barcodes. Record of the juvenile B. barbus in this study is the first in the Baltic Sea. Scophthalmus rhombus is a new host for the ciliate Trichodina jadranica, while Neogobius melanostomus (Pallas, 1814) is a new food item in the diet of S. rhombus in the Baltic Sea. Acanthocephalan Pomphorhynchus laevis found in the adult specimen of B. barbus and myxozoan Myxobolus musculi, noted in the juvenile specimen, have not been recorded previously in this fish species in Polish waters. Species collected as bycatch can potentially be used for monitoring potential changes in the overall fish community structure and biodiversity.

Keywords: Neogobius melanostomus, Salvelinus fontinalis, Barbus barbus, Scophthalmus rhombus, ichthyofauna, Pomeranian Bay, parasite fauna

INTRODUCTION

Since the mid-1990s, the Baltic Marine Biologists (BMB) has encouraged research on non-commercial coastal fishes with regard to the occurrence, distribution, and the overall ecological status (Winkler et al. 2000, Więcaszek et al. 2015).

Pomeranian Bay (Bornholm Basin; ICES division IIId, subdivision SD 24), a highly dynamic environment, is a large, shallow basin off the Polish and German coasts, with the depth not exceeding 30 m. The salinity at the bottom layers ranges from 7.2‰ to 7.6‰ (mean 7.4‰), while at the surface layers it is 3.9‰–7.3‰ (mean 6.2‰). The water temperature at the bottom layers ranges from 7.0 to 22.3°C (mean 16.0°C), while at the surface layers it is 7.8–23.4°C (mean 16.4°C) (Abbas et al. 2015). Pomeranian Bay is a water-mixing region with two important factors: riverine water input and water exchange with adjacent open seawaters that influence the hydrological conditions of the area (Beszczyńska-Möller 1999). Data on the fish species composition of Pomeranian Bay quite recent, but the monitoring surveys in 2007–2008 and 2011–2015 conducted by Dudko et al. (2015) focused on commercial species, mainly Clupea harengus Linnaeus, 1758, Sprattus sprattus (Linnaeus, 1758), Gadus morhua Linnaeus, 1758, Platichthys flesus (Linnaeus, 1758), Sander lucioperca (Linnaeus, 1758), and Perca fluviatilis Linnaeus, 1758. However, since surveys usually collect many other species as bycatch, they can potentially be used to monitor changes in the overall fish community structure and biodiversity (Ojaveer et al. 2010). Generally, the information concerning fish species that are caught sporadically or are commercially insignificant is not available (Psuty-Lipska...
and Garbacik-Wesołowska 1998). In recent years, only Kesza and Raczyński (2002), Czerniejewski et al. 2008, Więcaszek et al. (2011, 2015), and Panicz and Kesza (2016) have presented results of studies on endangered, non-commercial, new, or visiting fish species recorded as bycatch during monitoring surveys in Pomeranian Bay. Next to nothing is known about the relations between the age and length, the diet, and the parasite fauna of the bycatch fishes from Pomeranian Bay.

The main objectives of the presently reported study were to

- Report on the occurrence of three new fish species captured as bycatch during monitoring surveys in 2014 and 2015.
- Provide the relevant biological data, especially concerning their parasite fauna.
- Present a checklist of the fish species recorded in Pomeranian Bay, thus contributing to the knowledge on the Pomeranian Bay biodiversity.

MATERIALS AND METHODS

The study material was collected in May 2014 and in May 2015 as bycatch during monitoring surveys focusing on commercial fish species. The survey was carried out in Pomeranian Bay from the research vessel SNB-AR-1 (depicted on the back inner cover of this journal) with trawls (mesh size of 10–20 mm), at the depth of 9.8–14.6 m, over the sandy bottom (Table 1).

The fish collected were one juvenile and one adult specimen each of common barbel, Barbus barbus (Linnaeus, 1758) (Cyprinidae), one specimen of brook trout, Salvelinus fontinalis (Mitchill, 1814) (Salmonidae), and two specimens of brill, Scophthalmus rhombus (Linnaeus, 1758) (Scophthalmidae). All fish specimens collected were measured and weighed. The basic metric measurements and meristic counts of taxonomical keys (Nielsen 1986, Kottelat and Freyhof 2007). The taxonomic identity of the specimens collected were prepared for species determination by examining specimens in fresh mounts or after immersion in glycerin under transient light.

RESULTS

The meristic and metric characters of the taxonomic significance were taken of each fish specimen and were used to identify the specimens to the species level according to the standard length, SL = total length, TL = total length, A = 54°00′–54°01′N, 014°30′–014°35′E, B = 54°00′–54°08′N, 014°20′–014°35′E, S = scale reading, O = otolith reading.

Table 1

| Species                  | CS | Depth [m] | Date      | SL [cm] | TL [cm] | Weight [g] | Age  |
|--------------------------|----|-----------|-----------|---------|---------|------------|------|
| Barbus barbus            | A  | 9.8–11.9  | 6 May 2014| 7.23    | 7.31    | 0+ S       |
| Barbus barbus            | B  | 9.8–14.6  | 18 May 2015| 23.3    | 29.0    | 4+ S       |
| Salvelinus fontinalis    | B  | 9.8–14.6  | 18 May 2015| 34.6    | 38.0    | 4+ S       |
| Scophthalmus rhombus     | A  | 9.8–11.9  | 6 May 2014 | 17.0    | 69.6    | 4+ O       |
| Scophthalmus rhombus     | A  | 9.8–11.9  | 6 May 2014 | 21.5    | 90.6    | 5+ O       |

Provide the relevant biological data, especially concerning their parasite fauna. The stomach contents were examined following commonly accepted methods, and age was determined by otolith or scale readings. Parasitological examinations focused on the skin, vitreous humour of the eye, eye lenses, mouth and nasal cavities, gills, gonads, gastrointestinal tract, kidneys, swim bladder, urinary bladder, gall bladder, peritoneum, and muscles. The parasites found were prepared for species determination by examining specimens in fresh mounts or after immersion in glycerin under transient light.

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The smaller specimen of Barbus barbus was a juvenile (aged 0+) measuring 7.23 cm SL (the caudal fin was destroyed), while the second specimen was a female (aged 4+) measuring 23.3 cm SL and 29.0 cm TL. Figure 1 shows the characteristic structure of the last dorsal fin (spinous, serrated along the entire posterior edge), which distinguished this common barbel from other Barbus species in Europe.

Only undetermined ingested remains were found in the barbel stomachs. Parasitological studies of the muscles of the juvenile specimen indicated the presence of spores of the myxozoan, Myxobolus musculi. In the anterior intestine of the adult barbel 17 specimens of Pomphorhynchus laevis were found. Additionally, there were four specimens of the nematode Rhabdochona hellichi in the mucus from the middle part of the intestine (Table 2).

The collected specimen of Salvelinus fontinalis was a female (4+) measuring 34.6 cm SL and 38.0 cm TL. The
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Table 2

Meristic and metric characters of taxonomical significance of *Barbus barbus*, *Salvelinus fontinalis*, and *Scophthalmus rhombus* specimens, collected as bycatch in 2014 and 2015 from Pomeranian Bay

| Character                  | *Barbus barbus*  | *Barbus barbus*  | *Salvelinus fontinalis* | *Scophthalmus rhombus* |
|---------------------------|------------------|------------------|-------------------------|------------------------|
|                           | 6 May 2014       | 18 May 2015      | 18 May 2015             | 6 May 2014             |
| Dorsal rays               | IV, 8            | III, 9           | 3/10                    | 78                     |
| Anal rays                 | III, 5           | III, 6           | 3/10                    | 57                     |
| Pectoral rays             | I, 17            | I, 17            | 1/12                    | 12                     |
| Ventral rays              | II, 8            | II, 8            | 1/7                     | 6                      |
| Caudal rays               | —                | —                | —                       | 16                     |
| LL                        | 56               | 56               | —                       | —                      |
| Gill rakers               | —                | —                | 18                      | —                      |
| Pharyngeal teeth          | 5.3.1–1.3.5      | 5.3.1–1.3.5      | —                       | —                      |
| **Metric characters expressed as % of SL** |                   |                   |                         |                        |
| TL                        | —                | —                | —                       | 123.19                 |
| HL                        | 29.74            | 24.02            | 28.36                   | 32.61                  |
| Maximum body depth        | 21.16            | 21.50            | 26.92                   | —                      |
| Minimum body depth        | 10.10            | 9.86             | 11.00                   | —                      |
| Head height               | —                | —                | 19.90                   | —                      |
| Body width                | 13.86            | 12.70            | —                       | —                      |
| **Metric characters expressed as % of HL** |                   |                   |                         |                        |
| Length of lower jaw       | 29.77            | 29.80            | 74.99                   | 16.67                  |
| Length of upper jaw       | —                | —                | 69.48                   | —                      |
| Eye diameter              | 17.67            | 15.30            | 15.61                   | —                      |
| Interocular distance      | 25.58            | 30.27            | —                       | —                      |
| Head height               | 56.74            | 60.91            | 67.35                   | 27.54                  |
| Head width                | 43.26            | 49.26            | —                       | —                      |

LL = number of lateral line scales, TL = total length, HL = head length, SL = standard length.
**DISCUSSION**

Three species described in this paper, *Barbus barbus*, *Salvelinus fontinalis*, and *Scophthalmus rhombus*, were noted for the first time in Pomeranian Bay. Values of the morphological characters of the specimens were consistent with the ranges provided by Nielsen (1986) and Kottelat and Freyhof (2007).

We prepared a checklist with 56 fish and two lamprey species reported from Pomeranian Bay, and among these 58 species, 35 species are marine, 13 are freshwater, and 10 are diadromous. Dudko et al. (2015) reported the occurrence of 41 fish and one lamprey species in Pomeranian Bay, with *Sprattus sprattus*, *Osmerus eperlanus* (Linnaeus, 1758), and *Platichthys flesus* dominating the catches (jointly 66% in terms of numbers). Psuty-Lipska and Garbachik-Wesołowska (1998) and Dudko et al. (2015) reported different fish species composition in Pomeranian Bay, which probably depended on the season and the distance from land. The checklist of fish and lamprey species in Pomeranian Bay, is presented in Table 3. Dudko et al. (2015) listed two species of the Gobiidae as permanent residents of Pomeranian Bay: *Pomatoschistus minutus* (Pallas, 1770) and *Neogobius melanostomus*. The abundance of the latter species has increased markedly since 2007–2008. First catches of this species were recorded in the area in 2003 (Winkler 2006), confirmed by our own study in 2006 (authors’ unpublished data). In this study *Neogobius melanostomus* was found as a new food item in the diet of *Scophthalmus rhombus*, thus becoming a new and important link in the trophic structure of Pomeranian Bay. It was previously reported as a new prey for predatory fish like *Gadus morhua*, *Perca fluviatilis*, *Sander lucioperca* in Pomeranian Bay (Dąbrowski et al. 2017).

Two of the three new species, *Barbus barbus* and *Salvelinus fontinalis*, are freshwater fishes. The natural habitat of *B. barbus* are the upper and middle sections of fast flowing streams. This fish occurs in some Pomeranian rivers and lakes that are linked to the Baltic Sea. There is no evidence that barbel reproduces in the Baltic Sea. It only occurs intermittently in estuaries and brackish waters, e.g., in the Curonian Lagoon (Adjers et al. 2006) or in the Gulf of Gdańsk (Skóra 1996). According to Thiel et al. (2013), adult *B. barbus* are encountered occasionally in the Baltic Sea coastal zone, but they do not occur in the coastal zones of the North Sea. *Barbus barbus* is considered a typical stenohaline freshwater species (Calin Sandu and Oprea 2013). This can be explained by a strong, permanent input of riverine waters to the coastal waters of Pomeranian Bay (Beszczyńska-Möller 1999).

*Salvelinus fontinalis* is an indigenous species of the north-eastern United States and Canada. It has also been released (intentionally or not) into different bodies of water (including brackish water) worldwide, where it is usually regarded as an invasive species. Some individuals commonly referred to as salters, move to the sea in the spring as stream temperatures rise, and they inhabit areas close to river mouths (Beitinger and Bennett 2000). In Europe, only non-anadromous populations are recorded (Kottelat and Freyhoff 2007), however, the non-migratory forms, when introduced directly into seawater, well adapt to salinity changes (Besner and Pelletier 1991). It is classified as a non-native species that was intentionally introduced for fishing and angling in the late nineteenth century in Baltic Sea drainage basin countries (Leppäkoski and Olenin 2000). Since then, escapes from hatcheries and aquaculture facilities located along the coast of the Baltic have been reported (Welcomme 1992).

*Scophthalmus rhombus* is a marine species, distributed from Norway to the Black Sea. According to Nielsen (1986) and Anonymous (2014), in the Baltic Sea, *S. rhombus* is distributed primarily in the western part, however, Heessen et al. (2015) noted its regular occurrence off Cape Arkona and around Bornholm. The eastern limit of its range has yet to be clearly defined. Skóra (1996) reported its presence in the Gulf of Gdańsk, but he categorized it as an extremely rare species. Grygiel (2009) described a...
Table 3

A checklist of fishes and lampreys recorded in Pomeranian Bay

| Family             | Species                              | Reference                      |
|--------------------|--------------------------------------|--------------------------------|
| Petromyzontidae    | Lampetra fluviatilis (Linnaeus, 1758) | Dudko et al. 2015              |
|                    | Petromyzon marinus Linnaeus, 1758     | Więczaśek et al. 2015          |
|                    | Eptatretus spinax (Linnaeus, 1758)    | Więczaśek et al. 2018          |
| Acipenseridae      | Acipenser gueldenstaedtii Brandt et Ratzeburg, 1833 | Keszka and Heese 2003         |
| Anguillidae         | Anguilla anguilla (Linnaeus, 1758)    | Dudko et al. 2015              |
| Engraulidae         | Engraulis encracicolus (Linnaeus, 1758) | Dudko et al. 2015              |
| Clupeidae           | Alosa fallax Linnaeus, 1758           | Krzykawski et at. 2001         |
|                    | Clupea harengus Linnaeus, 1758        | Dudko et al. 2015              |
|                    | Sprattus sprattus (Linnaeus, 1758)    | Dudko et al. 2015              |
| Cyprinidae          | Abramis brama Linnaeus, 1758          | Dukdo et al. 2015              |
|                    | Alburnus alburnus (Linnaeus, 1758)    | Dukdo et al. 2015              |
|                    | Ballerus ballerus (Linnaeus, 1758)    | Dukdo et al. 2015              |
|                    | Barbus barbus (Linnaeus, 1758)        | This study                     |
|                    | Blicca bjoerka (Linnaeus, 1758)       | Dukdo et al. 2015              |
|                    | Rutulus rutulus (Linnaeus, 1758)      | Dukdo et al. 2015              |
|                    | Scardinius erythrophthalmus (Linnaeus, 1758) | Dukdo et al. 2015 |
|                    | Vimba vimba (Linnaeus, 1758)          | Dukdo et al. 2015              |
|                    | Osmerus eperlanus (Linnaeus, 1758)    | Dukdo et al. 2015              |
| Salmonidae          | Coregonus maraena (Bloch, 1779)       | Dukdo et al. 2015              |
|                    | Salmo trutta (Linnaeus, 1758)         | Dukdo et al. 2015              |
|                    | Salvelinus fontinalis (Mitchell, 1814) | This study                     |
| Esocidae            | Esox lucius Linnaeus, 1758            | Dukdo et al. 2015              |
| Gadidae             | Gadus morhua Linnaeus, 1758           | Dukdo et al. 2015              |
|                    | Merlangius merlangus (Linnaeus, 1758) | Dukdo et al. 2015              |
|                    | Pollachius virens (Linnaeus, 1758)    | Krzykawski et at. 2001         |
| Lotidae             | Enchelyopus cimbrius (Linnaeus, 1766) | Więczaśek et al. 2015          |
|                    | Lota lota (Linnaeus, 1758)            | Dukdo et al. 2015              |
| Mugilidae           | Chelon labrosus (Risso, 1827)         | Czerniejewski et al. 2008      |
|                    | Chelon ramados (=Liza ramada) (Risso, 1827) | Więczaśek et al. 2011 |
| Belonidae           | Belone belone (Linnaeus, 1760)        | Dukdo et al. 2015              |
| Gasterostidae       | Gasterosteus aculeatus Linnaeus, 1758 | Dukdo et al. 2015              |
|                    | Spinachia spinachia (Linnaeus, 1758)  | Więczaśek et al. 2015          |
| Syngnathidae        | Nerophis ophidion (Linnaeus, 1758)    | Więczaśek et al. 2015          |
|                    | Syngnathus typhle Linnaeus, 1758      | Więczaśek et al. 2015          |
| Triglidae           | Chelidonichthys lucerna (Linnaeus, 1758) | Krzykawski et at. 2001 |
|                    |                                       | Więczaśek et al. 2011          |
| Cotididae           | Myxoxocephalus scorpius (Linnaeus, 1758) | Dukdo et al. 2015 |
| Agonidae            | Agonus cataphractus (Linnaeus, 1758)  | Więczaśek et al. 2015          |
| Cyclopteridae       | Cyclopterus lumpus Linnaeus, 1758      | Dukdo et al. 2015              |
| Moronidae           | Dicentrarchus labrax (Linnaeus, 1758)  | Krzykawski et at. 2001         |
| Percidae            | Gymnocephalus cernua (Linnaeus, 1758) | Dukdo et al. 2015              |
|                    | Perca fluviatilis Linnaeus, 1758      | Dukdo et al. 2015              |
|                    | Sander lucioperca (Linnaeus, 1758)    | Dukdo et al. 2015              |
| Carangidae          | Trachurus trachurus (Linnaeus, 1758)   | Więczaśek et al. 2011          |
| Mullidae            | Mullus surmuletus Linnaeus, 1758       | Więczaśek et al. 2011          |
| Labridae            | Labrus bergylta Ascanius, 1767        | Keszka and Raczyński 2002     |
| Zoarcidae           | Zoarces viviparus (Linnaeus, 1758)    | Dukdo et al. 2015              |
| Pholidae            | Pholis gunnellus (Linnaeus, 1758)     | Więczaśek et al. 2015          |
| Ammodytidae         | Ammodytes tobianus Linnaeus, 1758     | Dukdo et al. 2015              |
|                    | Hyperoplus lanceolatus (Le Sauvage, 1824) | Dukdo et al. 2015 |

Table continues on next page.
A single specimen of *S. rhombus* from the mid-Polish coast, caught in 2008. Plikšs and Aleksejevs (1998) reported single occurrences of *S. rhombus* in Latvian waters in the 1960s. There have been only scarce published records on length–weight relations, age, and the reproductive biology of *S. rhombus* carried out in the Atlantic Ocean and the Adriatic Sea (Turan et al. 2016).

*Scophthalmus rhombus* is a commercially exploited species, but not in the Baltic Sea where it usually appears as bycatch, and its stocks are currently not regulated by the Total Allowable Catch (TAC) quotas. In 2012–2015 the landings in SD 24–32 were null while in 2016 they amounted to 1 t. Swedish and Danish landings for the period of 2012–2016 were null in SD 24–32, while German landings in SD 22 (Kiel Bight and Mecklenburg Bay) amounted to 2 t (no data for SD 24) (Anonymous 2017). It is unclear whether more than one stock of *S. rhombus* exists in the Baltic Sea, or if the Baltic population of *S. rhombus* is a part of a larger stock complex (Anonymous 2013). According to Blanquer et al. (1992), the weak geographic structure of *brill* seems to result from rapid re-colonization following the last ice age.

The growth rates of *S. rhombus* are slower in the northern parts of its distribution, and maturation is attained at shorter lengths; however, no precise data are available in the literature. In this study, the male specimens were aged 4+ and 5+ (17 and 21.5 cm TL), while in the Adriatic Sea males aged 4+ and 5+ attained from 38 to 40 cm TL (Arneri et al. 2001). ICES categorizes the brill stock as 'data limited' (Anonymous 2017). The parasites recovered from this fish species in Poland, where *Myxobolus pfeifferi*, *M. cordis*, and *Eimeria carpeni* are known from cultured fish (Malanowski 1951). *Rhabdochon hellichi* presently found in the adult *B. barbus* specimen that was reported from Polish waters in two host species, *Barbus barbus* and *Barbus peloponnesius* Valenciennes, 1842. Described by Janiszewska (1955) as *Rhabdochonoides barbi*, it was detected in rivers of southern Poland and since then it has probably not been observed. This is a stenoxenic nematode that requires an obligatory intermediate host such as the caddisfly larvae of the genus *Hydropsyche* (see Okulewicz et al. 2008) that inhabits only rivers and streams. Specimens of the acanthocephalan *P. laevis* penetrated the intestinal wall of the adult *barbel*. This parasite has not been recorded previously in this fish species in Poland, however, it is a common parasite of flounder in the brackish waters of the Baltic Sea (Chibani and Rokicki 2004).

There have been only few studies on parasitic fauna of *Scophthalmus rhombus*. The parasites recovered from this fish include a myxozoan intestinal parasite *Enteromyxum scophthalmi* (see Losada et al. 2014), tapeworms *Bothriocerplus scorpii* (see Renaud et al. 1984), and *B. andresi*, the trypanorhynch mesenteric cestode *Nybelinia linguis*, the digenean *Derogenes varicus*, the acanthocephalan *Acanthocephaloides propinquus* (see Eiras 2016), and two species of copepods, *Lepeopeltius hippoglissi* (see Hayward and Ryland 2003) and *L. europensis* (see Dawson et al. 2000). However, data from the Baltic Sea are lacking. The ciliate *Trichodina jadranica* noted in this study has not yet been recorded nor in this host neither in other fishes from the Pomeranian Bay area. This parasite is typical for *Platichthys flesus* recorded in the Kiel Bight (Dobberstein and Palm 2000), in the Gulf of Riga (Kirjušina and Vismanis 2007), and also in Danish eel farms on *Anguilla anguilla* (see Madsen et al. 2000). The diameter of the adhesive discs differs slightly among specimens from *P. flesus* and *A. anguilla*, and they also differ among individuals, but the differences are recognized as intraspecific variations. In Pomeranian Bay another species of *Trichodina* was found, namely

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### Table 1 cont.

| Family               | Species                                      | Reference                  |
|----------------------|----------------------------------------------|----------------------------|
| Trachinidae          | *Trachinus draco* Linnaeus, 1758             | Krzykawski et al. 2001     |
| Gobiidae             | *Neogobius melanostomus* (Pallas, 1814)       | Dudko et al. 2015          |
| Pomatoschistus minute | (Pallas, 1770)                               | Dudko et al. 2015          |
| Scombridae           | *Scimpanther scumbi* Linnaeus, 1758           | Dudko et al. 2015          |
| Xiphidiidae          | *Xiphias gladius* Linnaeus, 1758             | Krzykawski et al. 2001     |
| Scophthalmidae       | *Scophthalmus maximus* (Linnaeus, 1758)       | Dudko et al. 2015          |
|                      | *Scophthalmus rhombus* (Linnaeus, 1758)       | This study                 |
| Pleuronectidae       | *Platichthys flesus* (Linnaeus, 1758)         | Dudko et al. 2015          |
|                      | *Pleuronectes platessa* Linnaeus, 1758        | Dudko et al. 2015          |
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T. borealis in P. flesus (see Korłatowicz and Piasecki 2001), similarly like in the Gulf of Gdańsk (Chibani and Rokicki 2004). No ectoparasites were noted in this study, but they could have died because of their sensitivity to environmental changes from fresh to marine water.

The occurrence of Barbus barbus in Pomeranian Bay might have resulted from restocking activities and may represent the Oder River population. In recent years the density and the biomass of many rheophilous cyprinids have decreased considerably in many component river subsystems of the Oder River basin (Witkowski et al. 2007). In order to support the barbel population for over the past 15 years, a stocking program has been carried out by the Polish Angling Association in the West Pomeranian area. In turn, the specimen of Salvelinus fontinalis, collected in this study, might have escaped from an aquaculture facility in Pomerania (Inter-boundary region of Poland and Germany). This could have happened, for example, when ponds were damaged during a severe thunderstorm, such as that reported in August 2017, when dozens of brook trout and sturgeon escaped into the Baltic Sea through the Pomeranian Grabowa River. Similarly, Keszka and Heese (2003) described two specimens of Acipenser gueldenstaedtii Brandt et Ratzeburg, 1833 in Pomeranian Bay that were likely escapes from fish farming facilities.

The occurrence of Scophthalmus rhombus specimens in Pomeranian Bay might be a result of its active migration from the Arkona or Bornholm areas or a passive translocation with inflows of higher-salinity waters from the western Baltic. A weak Major Baltic Inflow from the North Sea occurred in March 2014. Previously, two smaller inflow events in November 2013 and February 2014 affected the Bornholm Basin (Naumann et al. 2018). The presently reported occurrence of the fish specimens recorded for the first time in Pomeranian Bay can be related to stocking (B. barbel), aquaculture activities (S. fontinalis), the migratory behaviour of species, or inflows of higher-salinity waters from the western Baltic (S. rhombus).

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