



## Baltic Marine Environment Protection Commission

Continuation of the project on Baltic-wide assessment of coastal fish communities in support of an ecosystem-based management

FISH-PRO II 5-2018

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### Background

The HELCOM Baltic Sea Environment Fact Sheet '[Abundance and distribution of round goby](#)' is about to be updated by national experts during spring 2018. Attached is the current draft including recent comments and edits provided by national experts from Denmark, Estonia, Finland, Germany, Latvia and Poland.

### Action requested

The Meeting is invited to provide possible additional information (e.g. sightings/occurrence) to the draft fact sheet.

## Abundance and distribution of round goby (*Neogobius melanostomus*)

*HELCOM Baltic Sea Environment Fact Sheet 2018*

**Authors:** Riikka Puntila – Finnish Environment Institute; Solvita Strake – Latvian Institute of Aquatic Ecology; Ann-Britt Florin – Swedish University of Agricultural Sciences, Department of Aquatic Resources; Maiju Lehtiniemi – Finnish Environment Institute; Jane W. Behrens – National Institute of Aquatic Resources, Technical University of Denmark; Jonne Kotta – Estonian Marine Institute, University of Tartu, Daniel Oesterwind – Thünen Institute of Baltic Sea Fisheries, Ivars Putnis – Institute of Food Safety, Animal Health and Environment (BIOR), Szymon Smolinski and Adam Wozniczka – National Marine Fisheries Institute (NMFRI), Henn Ojaveer – Estonian Marine Institute, University of Tartu.

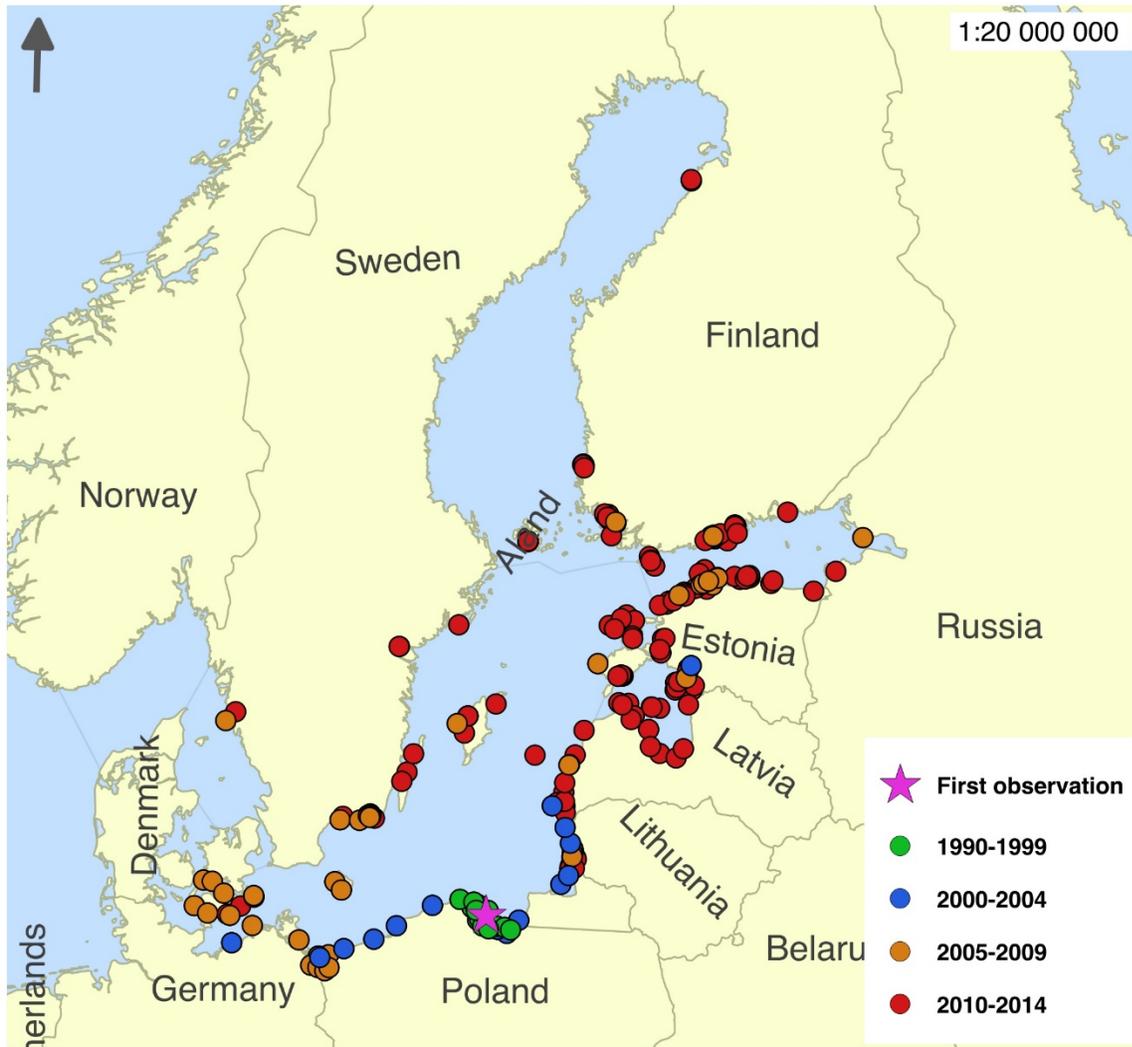
### Key message

Round goby has established in all Baltic Sea sub-basins and is continuously increasing its range and abundance in recently colonized habitats. The species has become the predominant fish species in many coastal areas and poses strong predatory pressure essentially on epibenthic mollusks. It has also become an important prey species in areas where it is numerous, with signs of individual-level benefits of some piscivorous fish.

### Results and assessment

#### Current status in the Baltic Sea

Round goby is an invasive species of Ponto-Caspian origin, likely transported to the Baltic Sea via ballast water (Sapota 2006). It was first observed in the Baltic Sea in Gulf of Gdansk in 1990 (Skóra and Stolarski 1993). The round goby is currently considered as one of the top invasive species in the Baltic Sea (Kornis et al. 2012, Ojaveer and Kotta 2015). It has been established in all Baltic Sea sub-basins (Figure 1).



**Figure 1.** Round goby finding locations in the Baltic Sea expressed as presences. Source: Kotta et al. 2015.

### Population densities

In the Gulf of Gdansk, being the site of first observation of the round goby in the Baltic Sea and most likely source of secondary spread, densities up to 350 fish/100 m<sup>2</sup> have been observed (Sapota and Skora 2005). The densities are usually lower in deeper or open waters.

Round goby density along the Latvian open Baltic Sea coast is 1-3 fish per m<sup>2</sup>. The observations in different coastal zone depths shows that the highest number of round goby was observed at a depth of 10-15 m, where also the maximum concentration of mussels along the Latvian coast can be found. Moreover, observations in offshore areas shows that round goby successfully colonizing shoal regions in the deepest parts of the Baltic Sea, Latvian EEZ (LIAE 2017). Comparable high densities are seen in some Danish waters with 1.9 fish per m<sup>2</sup>, and the invasion front continues to expand here with approximately 30 km per year (Azour et al. 2015).

In Estonia round goby is spreading and expanding its range to new areas. In coastal habitats, its density remains between 1 and 9 individuals per m<sup>2</sup> but occasionally densities above 20 fish per m<sup>2</sup> have been estimated (EMI 2017). In Muuga Bay (Gulf of Finland), the fish has made over 80% of catch biomass in gillnets of mesh size 36-44mm in the 2010s (ICES 2017).

One of the highest round goby commercial landings in the Baltic Sea are observed currently in Latvian coastal waters. The fishery logbook data evidence a sharp increase in catches from less than 1 ton in 2011 to over 500 tons in 2016 (BIOR 2017).

In Finland, no population density estimates exist, but the round goby appears to be more common every year. Based on angling on the coast of Helsinki, the catch per hour has increased either linearly (Eteläsatama) from 3.4 to 12.0 fish/hour or exponentially (Katajanokka) from 1.6 to 22.8 fish/hour in 2009 - 2013 (Lehtiniemi et al. 2014). The round goby has been detected almost throughout the Finnish coast indicating wide spread distribution (Kotta et al. 2015; current status available at vieraslajit.fi).

### **Invasion history**

The first record of the round goby in Polish waters is from the tip of Hel Peninsula (Gulf of Gdansk) in 1990 (Skóra and Stolarski 1993). The species abundance has since increased, especially in the western part of the Gulf of Gdańsk, Puck Bay, where it settled into habitats previously occupied by native *Gobius niger* (Jazdzewski and Konopacka 2002). In 1994 the fish was reported to be present in almost the whole of the Polish part of the Gulf of Gdańsk, whilst already in the next year the first individuals were found outside the Gulf (Kuczyński 1995).

In 1999, the species was found for the first time in the Polish part of the Vistula Lagoon (ICES 2004) and German Rügen area (Sapota 2006). In 2002, the species was found in the Gulf of Riga, in 2003 along the entire German coast, and in 2005 from the Gulf of Finland and Archipelago Sea (reviewed in Sapota 2006, Ojaveer 2006). Between 2006 – 2009 the species settled successfully the Szczecin Lagoon and the whole River Odra estuary (Czugala and Wozniczka 2010).

In 2008, the first observation was made in coastal waters of Bornholm and southern Sweden, Hanö bight and in 2009 in the coast of Helsinki, and in Smålandsfarvandet south of Zealand, Denmark (Azour et al 2015). In 2010, it had invaded the Belt Sea and was detected in the main harbor on Gotland Island in the central Baltic Sea as well as in Gothenburg in Kattegat and in 2011 the round goby was detected from Åland islands (Mariehamn) and the Bothnian Sea (Raahe).

In 2013 and 2014 round goby has continued its spread along the Swedish coast of the central Baltic Sea. Distribution is also expanding especially on the southern and western coasts of Finland (Kotta et al. 2015). The biological and ecological features of the species, such as extremely aggressive behavior at individual level and ability to sustain variable biotic and abiotic conditions, indicate further range expansion and the round goby is currently considered as one of the top invasive species in the Baltic Sea (Kornis et al. 2012, Kotta et al 2015, Ojaveer and Kotta 2015). For example, although physiological performance may be reduced to some extent under oceanic conditions, the increasing salinity towards the Skagerrak/North Sea will likely not hinder further northward spread (Behrens et al. 2016). Spread of the fish in the Baltic Sea follows dual pattern: long-distance spread by means of shipping, followed by

natural spread at short distances locally (Kotta et al. 2015).

Round goby has also been entered the freshwater environment, with findings in small rivers in Sweden (Gotland 2016 and nearby Kalmar 2017; Ann-Britt Florin, unpublished) and rivers situated at the northern coast of Estonia (Verliin et al. 2017).

According to Björklund and Almqvist 2010, local sub-populations of the species are genetically differentiating in the southern Baltic Sea, indicating fast divergence. Further studies are needed to investigate the genetic structure of the species sub-populations in the Baltic Sea wide scale.

### Role in the food web

The ecology and reproductive biology of the species is reviewed by Charlebois et al. 2001, Kornis et al. 2012 and Sapota (2006). The round goby are aggressive, territorial and voracious benthivorous fish (Charlebois et al. 1997) observed to have profound impacts on the ecosystems especially where numerous (*e.g.* Laurentian Great Lakes (Balshine et al. 2005) and Gulf of Gdansk, Poland (Almqvist et al. 2010)). Round gobies are generalist predators reported to feed primarily on bivalves when available (Järv et al. 2011, Kornis et al. 2012, Skabeikis and Lesutiene 2015), but their diets are highly variable and consist of a variety of benthic prey organisms (French and Jude 2001, Kornis et al. 2012, Nurkse et al. 2016). In the Gulf of Gdansk, native European flounder, utilizing similar prey, have slightly shifted their foraging to deeper waters as a result of increased round goby densities (Karlson et al. 2007). There is also indications of competition with juvenile flatfish in nursery areas in Latvia (Ustups et al. 2016). Furthermore, the round goby appears to be able to sustain successful populations also in locations where bivalve prey is not available or very scarce (for example in Raahe, Bothnian Bay and in the coast of Helsinki, Riikka Puntila, unpublished).

It is suggested that the high densities of round goby in the Lithuanian coast have locally depleted dense blue mussel banks (Darius Daynus, pers. comm., Stupelytė 2014). A similar finding was made by in the Latvian open coast inside the Nida-Perkone marine protected area (Solvita Strake, unpublished).

In regions where round gobies have become abundant, they have themselves become important prey items to both avian and fish predators (Jakubas 2004, Dietrich et al. 2006, Almqvist et al. 2010): the round goby is the main food item for cod and perch in the Gulf of Gdansk (Almqvist et al. 2010) and increasingly important prey for perch in Estonia (Liversage et al. 2017) and is also an important prey item for Great cormorant and Grey heron, contributing locally up to 60-95% to their diets (Bzoma 1998, Bzoma and Stępniewicz 2001, Jakubas 2004, Oesterwind et al. 2017). In addition, the round goby can also consume small individuals of the native flounder *Platichthys flesus* (Schrandt et al. 2016). Certain piscivorous and commercially valued fish can actually benefit from the round goby, evidenced by better individual-level performance – higher length-at-age values after the invasion (Hempel et al. 2016).

Round goby is target species for fishermen in its native range. It is considered tasty and it may gain popularity as a catch also in the invasive range (Ojaveer et al. 2015). To be able to more effectively utilize the abundant source, there have been implemented round goby management activities in Latvia including a definition of a new fishing gear and terms of its use to minimize the bycatch of non-target species (BIOR 2017).

### Policy relevance

This fact sheet adds supplementary information to the assessment of Good environmental status regarding the HELCOM Baltic Sea Action Plan (BSAP, HELCOM 2007) and the qualitative descriptor 2 'Non-indigenous species' of the EU Marine Strategy Framework Directive (Anon. 2008, 2010, 2017). This fact sheet also supports the Baltic Sea assessment carried out using HELCOM core indicators for [Trends in arrival of new Non-indigenous species](#).

The Baltic Sea Action Plan does not directly have an ecological objective for the distribution and abundance of non-indigenous species. The management objective 'No new introductions of non-indigenous species' addresses the new introductions and the ecological objective 'Thriving communities of plants and animals' addresses the whole community. Nonetheless, this fact sheet gives essential background information for the other HELCOM indicators and supports risk assessments of NIS in the region.

### Data

For more information on *Neogobius melanostomus* see [AquaNIS](#) and [NOBANIS](#).

### Metadata

**Data source:** In the HELCOM Ballast Water Road Map, HELCOM HABITAT and MONAS were requested to compile a list of non-indigenous, cryptogenic and harmful native species in the Baltic Sea by the end of 2008. The list is a living document which has been edited in various HELCOM subsidiary bodies, expert workshops and projects. Since 2008 the list has been modified by HELCOM HABITAT (11/2009 and 12/2010), HELCOM MONAS (12/2009), the HELCOM HOLAS project and, most recently, by the HELCOM CORESET project.

All observations of the presences of the round goby are confirmed by experts.

### Geographical coverage

The information has been gathered for the entire Baltic Sea from various sources of information, from research studies and national monitoring (see Kotta et al. 2015 and references therein).

Experts of the HELCOM CORESET project have recommended to regularly monitor ports and areas of intensive ship traffic in order to follow the effectiveness of the IMO Ballast Water Convention. However, as only one country in the Baltic Sea has marine alien species monitoring program in place (ICES, 2012), the knowledge of the current distribution range of the round goby is scattered, incomplete and presented as presence only.

### Temporal coverage

The abundance information may contain old records of non-established populations. The HELCOM List of non-indigenous species contain presence-absence information from historical sources and current situation.

### Quality of information

Data is variable in time and space, sometimes anecdotal, but even without full coverage of information

the quality of information received from research studies is reliable. The list of presence from the expert group is not totally substantiated with references, and need to be complemented with that.

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