This report contains information based on the HELCOM List of non-indigenous and cryptogenic species in the Baltic Sea, which has been circulated among HELCOM Contracting Parties several times, for example, in HELCOM MARITIME and HABITAT and in the HELCOM HOLAS and CORESET projects. The list is a living document which will be updated all the time with new or corrected information.

Observed non-indigenous and cryptogenic species in the Baltic Sea

Compiled by the HELCOM Secretariat based on the HELCOM list of non-indigenous and cryptogenic species in the Baltic Sea and the chapter "Alien species" (Leppäkoski et al. 2009) in the HELCOM Thematic Assessment of Biodiversity.

Key messages

All areas of the Baltic Sea are invaded by non-indigenous species.

The number of new species has increased in recent decades

Policy relevance

Alien species are defined as "*species or lower taxa occurring outside of their natural range (past or present) and dispersal potential...*" (IUCN 2002). Some alien species have become invasive, i.e., an alien whose population undergoes an exponential growth stage and rapidly extends its range (Occhipinti-Ambrogi & Galil 2004). Recent establishment of a number of alien species populations can be considered as biocontamination (Arbačiauskas et al. 2008) of the indigenous Baltic ecosystem because the invaders have caused alterations in the taxonomic structure of the invaded communities.

One of the management objectives of the maritime segment of the Baltic Sea Action Plan (BSAP) is "No introductions of alien species from ships". In addition, the biodiversity segment of the BSAP includes the specific target: "To prevent adverse alterations of the ecosystem by minimising, to the extent possible, new introductions of non-indigenous species".

The 2004 International Convention for Control and Management of Ships' Ballast Water and Sediments (BWM Convention) under IMO will be the global instrument to regulate the management, treatment and release of ballast water once it enters into force. The HELCOM countries have agreed to ratify the BWM Convention at the latest by 2013 and a HELCOM Ballast Water Road Map was adopted by the HELCOM Ministerial Meeting 2007 in Krakow to facilitate the ratification of the BWM Convention in the region. By May 2012 Sweden and Russia have ratified the Convention.

The EU Marine Strategy Framework Directive (MSFD) introduced a qualitative descriptor "Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems" and requires an assessment by three indicators:

- Trends in abundance, temporal occurrence and spatial distribution in the wild of non-indigenous species, particularly invasive non indigenous species, notably in risk areas, in relation to the main vectors and pathways of spreading of such species.

- Ratio between invasive non-indigenous species and native species in some well studied taxonomic groups (e.g. fish, macroalgae, molluscs) that may provide a measure of change in species composition (e.g. further to the displacement of native species)
- Impacts of non-indigenous invasive species at the level of species, habitats and ecosystem, where feasible.

Number of non-indigenous species in the Baltic Sea

There are 118 non-indigenous species (NIS) observed and approximately 90 established in the Baltic Sea. The HELCOM list of NIS gives the detailed information of the species, areas, time span, vectors and areas of origin. See *Methods* to read how the list has been compiled.

The number of NIS is highest in the Gulf of Gdansk and Gulf of Finland, both areas receiving new species from large harbours and long inland canals reaching to other sea regions.

The lowest number of NIS has been observed in Bothnian Bay.

New higher taxonomic groups in the Baltic

More than half of established alien species included in the Baltic Sea Alien Species Database (Olenin et al. 2008) belong to genera that are not represented among the native flora and fauna of the Baltic Sea. In the inner Baltic, some newcomers contribute to taxonomic diversity at higher levels: the alien barnacle *Balanus improvisus* is the only representative of its order Thoracica. Similarly, the only species belonging to gambarid decapod crayfsh (*Orconectes limosus* and *O. virilis*) and to mud crabs (Decapoda, Xanthidae (*Rhithropanopeus harrisii*)) as well as the Chinese mitten crab *Eriocheir sinensis* (family Grapsidae) are invaders in the Baltic. Only one native comb jelly species (*Pleurobrachia pileus*) represents the phylum Ctenophora; in addition, an introduced species (*Mnemiopsis leidyi*) has become established since 2006. Furthermore, only one native cumacean crustacean (*Diastylis rathkei*) was present prior to the introduction of *Stenocuma graciloides*, first found in 2004.

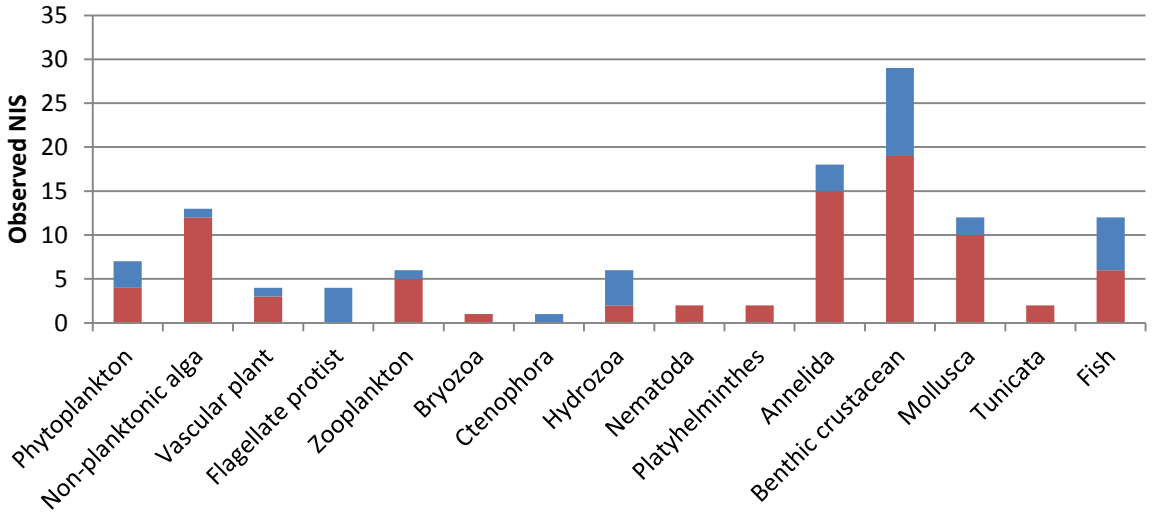

Figure 1. Number of NIS in different taxonomic groups. Red bars represent the number of established species. See HELCOM list of NIS for details.

Ratio of NIS and native species

The ratio of NIS and native species gives an overview of the potential influence of NIS on the Baltic ecosystem (**Table 1**).

Table 1. Ratio of NIS and native species according to the HELCOM Checklist of macrospecies in the Baltic Sea. Note that all planktonic, mesobenthic and protist species are not included.

	NIS list	Checklist of all species	Ratio
Mammals	0	5	0
Birds	0	57	0
Fish and lampreys	13	239	0.054
Macrophytes	17	531	0.032
Invertebrates	69	1898	0.036

According to Reise et al. (2006) the ratio of non-native to native species in brackish waters, may be as high as 1:5 (in estuaries or lagoons) compared with 1:20 at open coasts and 1:40 in European marine waters. The ratio presented here corresponds to the ratio suggested for open coasts or European waters, but was not calculated to smaller areas, e.g. areas of particularly high number of NIS, which might have resulted in higher ratios.

Vectors bringing the NIS to the Baltic

The greatest contributor to the number of NIS in the Baltic Sea is shipping (**Figure 2**). Half of all the currently found NIS was introduced by shipping and a quarter by stocking and aquaculture purposes.

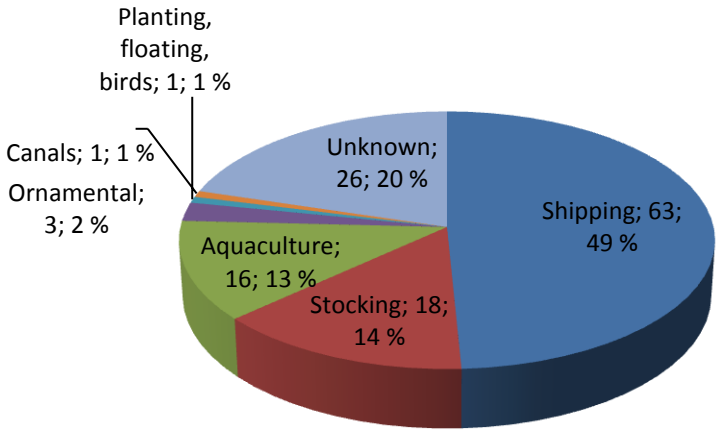

Figure 2. Vectors bringing NIS to the Baltic Sea.

Shipping. In the Baltic and elsewhere, the high invasion rate by shipping can be related to several factors: (i) increased number and size of ships, (ii) increased speed of ships, resulting in better survival of organisms during the voyage, (iii) use of separate tanks instead of cargo tanks for ballast water (less polluted ballast water) and (iv) opening of new trade routes.

Stocking and aquaculture. Humans have intentionally introduced NIS to the sea for fishing purposes or to aquaculture to be farmed as food. For example, in the former Soviet Union, tens of Ponto-Caspian crustacean species were transplanted into the Baltic catchment area as potential prey items to stimulate fish production in lakes and water reservoirs in the 1950s to 1970s. Some of these species have expanded their range along rivers to coastal waters (Ojaveer et al. 2002).

Areas of origin

The origin of the NIS may be sometimes difficult to determine and for some particularly invasive species the route of invasions may be complex. The HELCOM list of NIS includes information of both the native area of a species and the area where the species has been assumed or known to invade the Baltic. In **Figure 3** the latest area of origin has been highlighted, because that helps to develop the management measures against further invasions.

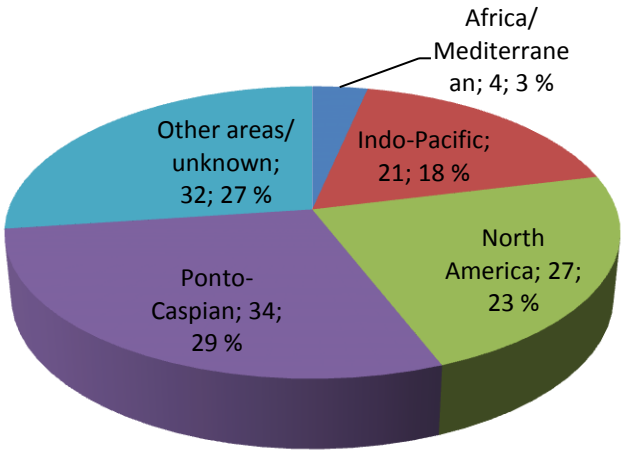

Figure 3. Areas of origin of the NIS observed in the Baltic Sea.

Methods

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.

The presence and absence of NIS in the assessment units is confirmed by experts and non-confirmed presence or absence is also shown. The list contains references to justify the information, but quite often the justification is made by expert judgement.

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