



Aliens and their Impacts in European Coastal Waters Final Update

Executive Summary

Shipping carries > 80% of the world trade and 3000-4000 Mton of untreated ballast water is released from ships every year; this figure is significantly lower than previous reported estimates (10-12 000 Mton). Up to 10 000 species are estimated to be in transit around the world at any given moment – new species have been establishing in some US, New Zealand and Australian ports once every 32 to 85 weeks. The registered merchant fleet consists of > 45 000 vessels; larger vessels are being developed (9200 TEU container ships are on the drawing board and 12 500 TEU vessels are planned).

The European coastal ecosystems are under growing environmental pressures, one of them being NIS introduced by various vectors. This contribution is aimed to be a review of this problem – it consists of the transport, intentional or most often unintentional, of non-native aquatic organisms from one coast or sea to another and their role as biopollutants. In some isolated areas, particularly on oceanic islands, the current rates of invasion may be more than 1 million times their natural levels. This trend also applies to the semi-enclosed and enclosed seas of for example Europe, even if no comparable estimates are available.

The consequences of species introductions, such as their interactions with native species and the threats they pose to the marine biodiversity, are poorly understood in many parts of Europe. Research is needed to make it possible to assess the effect of biological invasions on biodiversity and on what level these effects are expressed (are the effects on genetic, population, species or ecosystem level).

NIS are abundant and even dominant throughout the shallow benthic and fouling communities of many coastal waters of Europe: at present, practically no shallow-water habitat is entirely free of human-mediated invaders in e.g. estuaries, harbour areas and, more generally, in the semi-enclosed European seas. Bioinvasions have both local and basin wide impacts on both structural and functional biodiversity of the sea. Thus the theoretical framework of aquatic invasion biology shall focus on the threats to biological integrity, defined as the capability of supporting and maintaining a balanced, integrated, adaptive biological system having a full range of (i) elements (genes, species, assemblages), and (ii) processes (biotic interactions, nutrient and energy dynamics, metapopulation processes), expected in a natural habitat of a region.

Further species are likely to arrive in the coastal Europe; and some of these may have ecological and economic consequences. Successful inoculations may have been relatively rare events in the past but are likely to increase with:

- higher frequency of ship visits, rapid turn-around times in port and changes in trading patterns as new opportunities arise that may not have been present before (with a consequent increased volume of ballast water discharges)
- new trading links resulting in imports from new port regions. New trade patterns within the EU may result in transport routings of live marine organisms with their associated organisms and diseases into other areas
- more berths available in ports where there are marine conditions and construction of new ports (providing more suitable targets for primary inoculations to become established and enhancing opportunities for secondary spread)
- better management of water quality in port regions leading to better conditions for imported organisms in ballast water to become established and increase the opportunities of exporting larger numbers of organisms elsewhere

- the expansion of exotic species ranges elsewhere
- the widespread interest in gardening and aquarium species
- with the development of new aquaculture products further species will be used in culture for biotechnology or food production
- predictions of mean annual temperature increases will provide important changes that may enable further species to become established either because reproductive opportunities enable the maintenance of populations or because of reduced winter mortalities.
- the planned banning of some toxic ships antifoulants or for the recruitment from spawning fouling organisms.
- environmental pollution and habitat destruction provide new conditions in which non-native species can thrive and global climate change may further favour the spread and establishment of invasive species

Data on European aquatic invasions is still scarce and it is not possible to draw conclusions on the current status of these nor to make predictions for the future. It is however known, from data collected in other areas such as the zebra mussel (*Dreissena polymorpha*) in the Great Lakes in the USA, that there can be great economic as well as environmental problems involved in the introduction of just one new species.

It has also been pointed out by different experts that just because an area has not been much affected by invasions up to current date, there is no guarantee that it will remain unaffected in the future - only with sufficient research will it be possible to establish some sort of pattern and to find ways of preventing further introductions.

There is an exponential increase in the availability of information online. The search engine www.yahoo.de delivered 22 600 records for the search terms “database” and “exotic species”, mainly referring to terrestrial habitats. When the search term “aquatic” was included, the result was 9970 hits. An addition of the search term “Europe” resulted in 898 records. A year ago the same searches gave the results 8820, 3030 and 1140 records. With the search engine www.google.fi the results for the exact same searches were 29 900, 14 300 and 3160 records. However, these search results include many Internet sites that focus on terrestrial habitats and provide details on legal aspects or do not contain information at a species level.

One of the problems faced by the global scientific, administrative and shipping communities has been the lack of internationally agreed standards for the quality of ballast water in terms of number of viable organisms allowed to be discharged in receiving waters.

International Convention for the Control and Management of Ships’ Ballast Water and Sediments was adopted at a Diplomatic Conference at IMO in February 2004. Implementing of the Convention, based on e.g. regional action plans within the EU, will increase the need of scientific knowledge of alien species and their ecological and economic impacts.