Alien species

A significant portion of mariculture in the OSPAR area is reliant on non-native species (for example, Pacific oyster *Crassostrea gigas*). Concern is increasing about the impacts of introduced species on marine ecosystems. If allowed to escape, these species may establish breeding populations and dislodge native species from established niches. Non-reproducing alien species may also interact with native species and affect predation and competition for food. Mixing of exotic genes through hybridisation, habitat modification and the introduction of diseases and parasites are other areas of concern. There has been little research to date on the ability of natural populations to recover from introgression of farmed genes (CBD, 2004).

It is likely that new alien species will continue to be introduced to supply the needs of the growing aquatic food market. It is therefore important to have procedures in place to assess the risks and benefits associated with the introduction of alien species into an ecosystem and, if appropriate, to develop and implement a plan for their introduction and responsible use (FAO, 2005). Several programmes have recently been introduced to manage the threat of invasive species, including the European Strategy on Invasive Alien Species as established under the Berne Convention (2003) in accordance with the Guiding Principles for Invasive Alien Species under the Convention on Biological Diversity (see Section 3.1 for further detail).

Several non-native marine organisms have become established after being accidentally introduced with imports of bivalve mussel seed (Kaiser *et al*., 1998). These include the American slipper limpet (*Crepidula fornicata*) which competes with native bivalves, and diseases such as Bonamia which infect oysters and was introduced from the USA.

The introduction of some non-native bivalve species for cultivation in some OSPAR regions was carried out in the belief that the temperature would be too low for larval production and recruitment to occur. Species such as the Pacific oyster (*Crassostrea gigas*) (see case study below) and the Manila clam (*Ruditapes philippinarum*) are important mariculture species which have become established in the wild. It was initially assumed that natural spatfall of *C.gigas* would not occur in higher latitudes (such as the United Kingdom, Ireland, Netherlands and Germany) as the water would be too cold for reproduction. However this was not the case and successful populations are now widespread as far north as the Wadden Sea (Wehrmann *et al*. 2000) and Limfjord in the north of Denmark (Christensen and Elmedal, 2007). It has been estimated that up to 32 alien species have been imported into the OSPAR region as a result of the movement of this species (Reise *et al*., 2002).

The Manila clam was introduced for culture in southern England in the late 1980s. This species has naturalised in Poole Harbour in Dorset (Jensen *et al*., 2004) and, in a previously unknown predator-prey interaction, is being exploited by the Eurasian oystercatcher (*Haematopus ostralegus*). It has continued to spread around European coastal waters, a process likely to be facilitated by increased temperatures due to climate change. The establishment of clam populations could have benefits for many shellfish-eating shorebird populations (Caldow *et al*., 2007) but the extent of the impact of this species depends on the density of established populations.

Increasing sea temperatures due to climate change may mean that it will become possible to farm warmer water species further north. In addition to the northerly range extension of Pacific oysters and Manila clams, the ranges of turbot, sea bass and scallops may also extend northwards. While this may be of benefit to mariculture in Northern countries, the northward shift of southerly species ranges may have a negative effect on southern and central European countries such as Spain and France where mass mortalities of Pacific Oyster have occurred in recent years. Summer mass mortalities can be caused by the cumulative effects of spawning (the energy expenditure of which reduces thermal tolerance) and heat shock – conditions which may become more frequent due to climate change (Li *et al*., 2007).

➥*Go to full QSR assessment report on the impacts of mariculture (publication number 442/2009)*