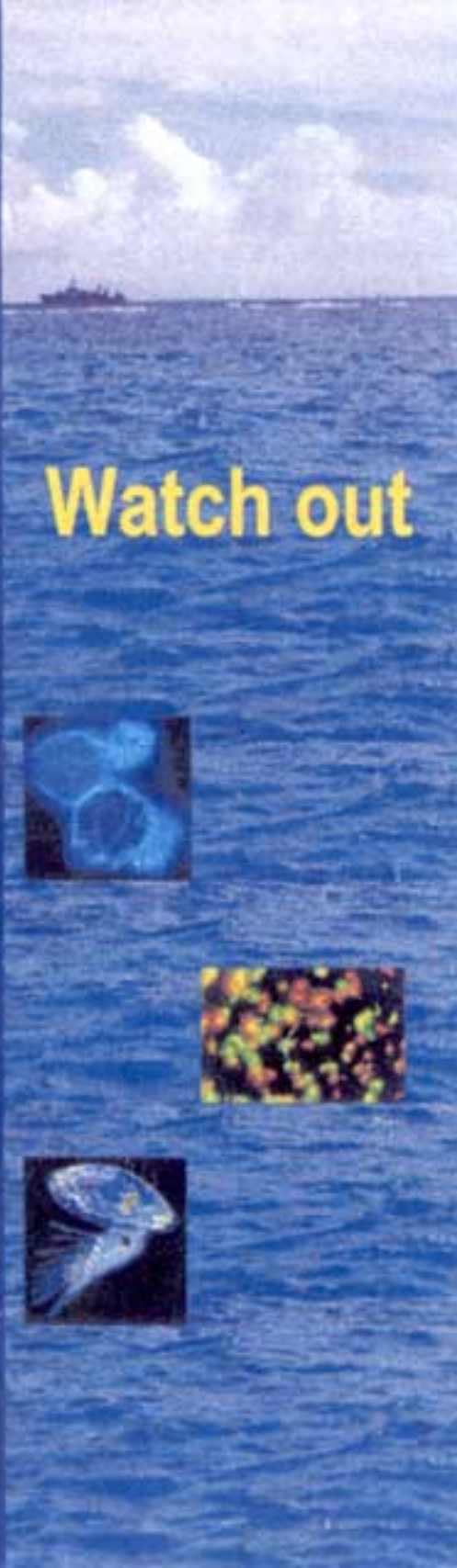


# Marine Bioinvasion

Watch out



## What is marine bioinvasion?

Bioinvasion occurs when an alien organism is introduced into an environment and the ecosystem therein is disturbed. The invading organisms live in semblance with their predators and are controlled by ecosystem interaction in their natural environment. However, in the alien environment they can turn out to be pests.

## What facilitates marine bioinvasion?

Intentional introduction for aquaculture gain and unintentional introduction through shipping are the major pathways of marine bioinvasion. The pathways related to shipping include introduction through ballast water discharge and fouling of ship hulls. Advances in ship building have resulted in larger and faster vessels. This in turn has increased the chances of successful introduction of marine organisms to alien environments manifold. The United Nations Development Programme through its Global Environment Facility (UNDP/GEF) has identified marine bioinvasion through ballast water as one of the prominent threats to the health of the oceans.

## What is ballast water?

Ballast is any material used to weigh down and/or balance an object. Ships have carried solid ballast in the form of rocks and/or metal for thousands of years. Ships of modern times use seawater as ballast. Ballasting helps in submergence of propeller and rudder for steering. When a ship empties its cargo, it takes in ballast water to maintain its stability, balance and structural integrity. Conversely, when it loads cargo, the ballast water is discharged. Shipping moves over 80% of the world commodities and transfers about 10 billion tons of ballast water throughout the globe each year (Ref. Global Ballast Water Management Programme, IMO London.)

## What is the threat?

Seawater that is taken up as ballast by ships contain a gamut of organisms and their propagules. In the wild their sustenance is controlled by natural events. However, once in the dark ballast chambers, their ambient environment is altered. This leads to alteration of population structure in the seawater.



An illustration of the four possibilities of changes in the composition of the population is shown above. It indicates that three of the four possibilities (✓) can lead to an introduction. However, all that is introduced may not successfully establish. In an alien environment, the capability of introduced organisms to establish and its speed is geographically variable and controlled by the ecology of the locality.

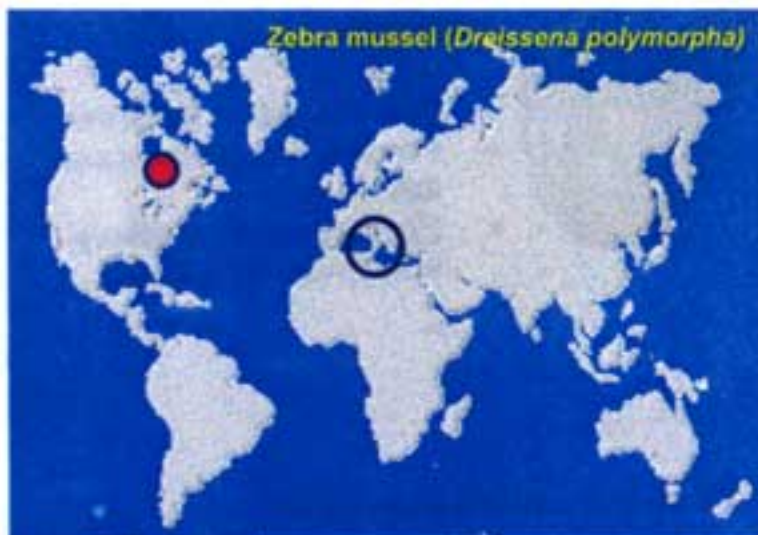
## What are the implications?

Marine bioinvasion of a wide spectrum of marine organisms including plants and animals have been reported. The impacts include changes in biodiversity and restructuring of the food web. The

introduction of new species can have a direct impact on the society and human health by virtue of affecting the fisheries and causing health hazards. The health hazards are generally caused by build up of toxins facilitated by blooming organisms in wild harvested fish and shell fish.

## What are the examples?

Many causes of marine bioinvasion have been reported and their harmful effects on the ecosystem and human health have been documented. Examples of invasion of zebra mussel and comb jelly are illustrated.



○ native      ● introduced

### Implication

- Biofouling of water intake pipes
- Established in rivers
- Millions of dollars spent fighting zebra mussel

### Comb jelly (*Mnemiopsis leidyi*)



○ native

● introduced

#### Implication

- 95% biomass in black sea
- Feeds on zooplankton and fish larvae
- Reduced anchovy fishery worth millions of dollars



### What is the Indian scenario?

Black striped mussel *Mytilopsis sallei* has been reported from Mumbai and Visakhapatnam. This species is a native of tropical and sub tropical Atlantic waters and is reported to have invaded the Indian waters sometime during 1960's. It has also spread to Hong Kong and threatened Australia. Green crab - *Carcinus maenas* a native of Europe is also reported from the Indian Ocean (Sri Lanka). The molluscs and crustacean population on which this crab preys upon can be affected. There could be many more such examples and their elucidation is needed.

## What is at stake for India?

India is endowed with a coastline of 7500 kilometers, dotted with 11 major ports and a number of minor ports. These serve as gateways for marine bioinvasion. In addition to introduction of alien species in these marinas, the threat of its dispersal to neighboring environments and the coral reefs of Andaman, Nicobar and Lakshadweep islands is also a possibility. In light of this it is essential to monitor all the ports simultaneously and adopt suitable ballast water management protocols.

## What is being done?

UNDP/GEF is implementing a global ballast water management programme through the International maritime Organization (IMO). Brazil, China, India, Iran, South Africa and Ukraine are participating in this programme. This programme aims to raise awareness among stakeholders and to remove barriers for effective ballast water management.

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