



MIT SEA GRANT

MARINE BIOINVASIONS FACT SHEETS:

AQUACULTURE

WHAT IS AQUACULTURE?

A simple definition of aquaculture is farming in water. This fact sheet will focus on marine aquaculture, but fresh water organisms may also be cultivated in a similar manner. Aquatic plants, shellfish, and fish are grown in aquaculture systems around the world.

Aquaculture helps to reduce over-fishing by growing the organisms that would usually be caught in the wild.

Salmon, shrimp, oysters, quahogs, mussels, and algae are examples of marine aquaculture species. Unfortunately, many species adaptable to aquaculture are not native to the area where they are cultured. These species occasionally escape and compete with native species, or carry diseases and parasites that infect local populations.

A number of different types of aquaculture exist. The simplest is the releasing young organisms into the wild to increase the natural population size. This is especially useful for farming salmon because the fish return to the place they hatched when they are ready to spawn. This makes their harvest especially simple. The next level of aquaculture contains the organisms in a pen or cage open to water and nutrients, but that restrains them from leaving the site. The most complex aquaculture type is a closed system. In this situation, there is no exchange between the aquaculture facility and the environment.

IMPACTS OF ESCAPED SPECIES

Most aquaculturists are careful not to release exotics, however, releases, accidental or otherwise, do occur. Some introductions have resulted from the release of organisms being studied in labs. In the Northwest, Atlantic salmon have escaped through holes in net pens, and have been captured by commercial fishermen. There is concern that they may compete for food or nesting sites with native Pacific salmon.

In Massachusetts, introductions of American oysters, *Crassostrea virginica*, from the Mid-Atlantic region, carried a protozoan parasite, *Perkinsis marinus*, also known "dermo." The parasite infects the digestive system, gills and mantle, and eventually kills the oysters. Other oyster diseases, including MSX, caused by *Haplosporidium nelsoni*, and juvenile oyster disease have caused widespread economic damage to both wild

fisheries the aquaculture industry, and are easily spread by moving infected seed between growing areas. For these reasons oysters may not be relayed from infected areas, and hatchery stock for planting in Massachusetts is limited to certified Northeastern hatcheries. Policies and regulations may be different in other states.

Other non-native oyster species have been introduced into the U.S. with variable results. The Japanese oyster, *Crassostrea gigas*, has out-competed and displaced native oysters in the Pacific Northwest, and the European oyster, *Ostrea edulis*, has gained a foothold in the Northeast, although occupying a different niche than the native oyster population. Other ecological interactions, however, may be less obvious, and yet to be determined.

The home aquarium trade and increased interest in garden ponds have greatly increased the importation and culture of exotic ornamental species. Intentional and accidental releases have caused serious problems, specially in southern areas, where tropical species can survive and reproduce.

WHAT IS BEING DONE?

Many states regulate the importation of living marine organisms. Permits or licenses are required that allow a review of the proposed activity, site and species for adverse affects and unwanted releases. In many cases, the organisms are grown in "closed" systems, where waste waters are re-circulated and/or treated before released to the environment. In most cases, exotic species are not allowed to be grown or maintained where escapes are possible or local populations may be infected. Genetically altered organisms which are sterile may also help to reduce risks, but not eliminate them completely. Policies and regulations need to be updated as new information is discovered.

To find out about New England states' programs see policies and regulations. Individuals can also help by never releasing any plants or animals to the environment. Ask your aquarium dealer about the species you purchase, and share your concern about preventing unwanted introductions. Insist on using only local plants (fresh or marine) in your aquarium. Do not release organisms purchased from pet and aquarium stores to the wild.

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- + Indicates a large sized document which MIT Sea Grant will send on loan for a short period of time.