

Aquaculture

Fishing Methods Fact Card

What is aquaculture?

Aquaculture is farming of aquatic animals and plants. It is comparable in many ways to agriculture on land, with the big difference of being conducted underwater where you generally can't see as well what is happening, and the impacts on the surrounding environment can be more immediate. These create some limitations to its effectiveness and sustainability, but it is generally recognized that the increasing global demand for seafood can only be met by aquaculture, not fisheries alone.

Some aquaculture, like the growing of carp in earthen ponds in China, has been carried out for thousands of years. Locally, First Nations also did a form of clam culture for thousands of years, in a lost art of “clam gardens”.

However, most aquaculture is relatively new. It requires knowledge of how an animal or plant grows and reproduces, ideally throughout its life-cycle.

How does aquaculture work?

Often development of fish or shellfish culture proceeds through a couple of stages:

- 1) Young or juvenile animals or plants are captured from the wild and grown up in some kind of aquaculture system.
- 2) Research on the reproduction of the animal or plant leads to reproduction in captivity.
- 3) Research leads to the capability to grow the larval and juvenile stages.
- 4) “Closed cycle” aquaculture becomes independent of wild resources except for the occasional renewal of parents (“broodstock”).
- 5) Development of special breeds of a species that perform best in aquaculture.

Aquaculture can be carried out in the open ocean, lake or river or in more contained systems built on land:

- open systems are generally large net enclosures “cages” that are floating in the water (for fish), suspended baskets, ropes, poles or special beach areas for shellfish (clams, oysters, or scallops), or poles, nets, or ropes for algae (plants). New systems are being developed that roll around on the ocean floor.
- systems on land can be earthen or concrete ponds or reservoirs, OR concrete, plastic, or fiberglass tanks or raceways. These can be either flow-through (water from and outside source flows in and a similar amount flows out), recirculating (the water goes through a treatment and is re-used), or a combination of the two. Some new systems are being developed that float in the water, but have controlled water intake and outlet. These closed systems are generally used for fish and shrimp.

The difference between the two approaches is to some extent determined by the species being farmed, but also is an economic decision. The cheapest approach – called “extensive” aquaculture, is to have relatively few fish growing in ponds or reservoirs with very little water flow that may be fertilized by something like cow manure, but otherwise depend only on natural production of food for the fish (zooplankton, insects, other small fish). The next step in “intensification” is to feed these fish with something extra –like food scraps or prepared fish food – this allows the system to grow more fish per area. Fish that are grown in cages generally need to be fed, as access to natural food sources is low – this is an intermediate step in intensification. The final step in this intensification is to have organisms growing in a concentrated fashion

in enclosed tanks, depending entirely on external food and water treatment. Trout and tilapia are frequently grown in this fashion, but not many other organisms.

What is grown?

Lots of aquatic organisms are now being grown all over the world, including many species of fish, shellfish (shrimp, clams, oysters, scallops, etc.) and even some species of algae and aquatic plants. The largest volume of aquaculture species produced is carp, while the biggest value is salmon and shrimp. China is by far the largest aquaculture producer in the world, with a variety of other Asian countries in second place. In Canada, salmon, clams, oysters, scallops and trout are the main organisms grown, but there are many others being developed or grown in smaller quantities. In the USA, there are many growers of catfish. In Mozambique, the main aquaculture is extensive culture of tilapia in small freshwater ponds, though shrimp culture is also being developed.

Not all species are good for aquaculture, just as not all animals or plants are good for agriculture on land. Unfortunately, this means that aquaculture is responsible for the introduction of many of the new species that show up in local aquatic ecosystems and may or may not cause damage. For example, all of the clams, oysters, mussels, and scallops grown in BC are species from elsewhere in the world, but it is unclear what the impact of these new species is having on our local ecosystems. Most of the salmon grown in BC are the Atlantic salmon species. Tilapia are grown all over the world, but generally only special breeds – not the local varieties.

Always there is effort also spent on culturing “local” species that have established fisheries markets and address the criticism of introducing new species. However, there is usually some level of selection for fish that do better in the culture systems. This makes them somewhat different genetically. If these get out into the wild, they can interbreed with the wild stocks and possibly damage the genetic composition that makes the species more resistant to natural conditions and challenges, such as climate change.

What are the issues?

The main issues with aquaculture are the impacts of escaped individuals on local ecosystems, and pollution, diseases, and parasites that may leak out into the surrounding water. The visual impact of aquaculture systems is also a major factor in some regions, as is competition for markets with the fishing industry.

The salmon aquaculture debate, centered on the BC coast, is one of the most publicized, followed by the debate about mangrove destruction by the construction of shrimp culture ponds. These debates have certainly moved the whole aquaculture industry to more responsible practices, but the debate can have negative repercussions on aquaculture efforts that are unrelated. This is a good debate to exercise “reading between the lines”. ** Try this with the “seafood watch” aquaculture fact cards that talk about raceways, recirculating systems, ponds, open net pens & cages, and shellfish culture. These can be found at: http://www.mbayaq.org/cr/cr_seafoodwatch/sfw_gear.asp .