

## ***Aquaculture: A Cornucopia?***

**Lesson Time :** 60 minutes

**Grade Level :** 8-12

**Vocabulary:** aquaculture, panacea, recirculating systems, mariculture

### **Summary**

Compare aquaculture production statistics for the U.S. and Canada to evaluate the demand for fisheries products.

### **Objectives**

- Define aquaculture and identify various examples of aquaculture practices.
- Formulate and compare aquaculture production values over time for the U.S. and Canada.
- Discuss the impacts of aquaculture and the global demand for fisheries products.

### **Introduction**

From abalone to oysters, pearls to seaweed, food fish to baitfish, aquaculture provides us with a bounty of goods. Some people are turning to aquaculture with hope as natural stocks decline, and although it may not be the panacea, it is the fastest growing sector of U.S. agriculture. Aquaculture now supplies about 10% of the seafood that Americans consume, with 60% coming from imports and 30% coming from wild catch. A decline in wild catch and pressure to reduce seafood imports are helping to stimulate growth in U.S. aquaculture production.

Aquaculture is defined as the farming of aquatic organisms, which include plants and animals, freshwater and marine. Like other methods of farming, it is labor-intensive and occasionally subject to Mother Nature's whims. We have acquired much knowledge of nutritional requirements, controlling reproduction, managing water quality, system design, and factors influencing growth (e.g. water temperature, stocking densities, pond size, diseases). However, knowledge should not be mistaken for complete control. We can't control the weather, and we can't possibly keep our systems at optimal operating conditions constantly. There are also quite a few challenges for the aquaculture industry to overcome to mitigate its impact on the environment. Coastal habitat destruction, waste discharge, and the escape of farm-raised animals are all concerns which need to be addressed.

The practice of pond culture existed centuries ago in almost every ancient culture; the Egyptians raised fish, the Greeks and Romans raised eels, the Chinese grew carp, the Japanese cultured pearls, and the Europeans farmed oysters. Today, pond culture is still practiced, and evolving

technologies have allowed for the creation of some high-tech culture systems, such as indoor, recirculating systems.

The farming of marine organisms is called mariculture. Shellfish culture takes place along coastlines, and fish can be raised in cages or net pens in enclosed bodies of water like bays. Some are experimenting with extremely large open ocean cages, engineered to withstand extreme conditions. Mariculture has lagged behind freshwater aquaculture because the successful spawning and larval rearing of marine fish are more complex. It is more difficult to satisfy the food requirements of larval marine fish; live foods such as zooplankton must be offered instead of pelleted foods. Advances are being made, however, with many marine species, such as cod, halibut, turbot, sea bass, tuna, mahi-mahi, and flounder. Shellfish have a readily available food source in the wild since they are filter feeders, and many shellfish are successfully cultured, including oysters, clams, scallops, and mussels. Techniques to produce marine shrimp are also well established, as are those for salmon, an anadromous fish which spends most of its life in the ocean.

### **Data Activity**

The Canadian Ministry of Fisheries and Oceans provides aquaculture production statistics for the years 1986-2024. Open the site and scroll down to access Aquaculture production quantities and values by year (we'll just look at data from **2013 and 2023**). Graph total production (given in the far right column) for each of the following species: salmon, trout, steelhead, clams, oysters, mussels, and scallops.

For which species do you see steadily increasing production? (Before looking at your graphs, make a guess based on the farmed product you see most often in the grocery store and that you think is the most popular among consumers.)

Do the same exercise using data representing private aquaculture production in the United States for the years 2013 and 2023 for the following species: salmon, trout, steelhead, clams, oysters, mussels, and scallops.

For which species do you see steadily increasing production?

**Notes:** You will want to convert the Canadian and U.S. figures to a common unit of measure for comparison (1 metric ton = 2205 pounds).

### **Looking at the Data**

Which is the only species whose production has increased steadily in both Canada and the U.S.? Compare quantities produced. (In fact, *world* production of this species has increased steadily. The U.S. imports it, and Canada is one of its main suppliers.)

*For more data-based lessons, visit: [bridgeoceaneducation.org/data-series](https://bridgeoceaneducation.org/data-series).*

The global demand for fisheries products will continue to increase as the world population continues to expand. Many wild stocks are either approaching their biological limits or are already overfished, so aquaculture will have to play an increasingly important role in the future.

### **More Information**

If you are interested in setting up your own aquaculture project in your classroom, visit the web site of the [National Council for Agricultural Education](#). You will find information on instructional materials, how-to manuals and teacher training, a discussion list, and links to schools with aquaculture programs. You can also get ideas from the [Aquaculture in Action](#) web site. To get your students even more excited, you may want to consider entering a [Secondary School Aquaculture Competition](#).

*This lesson was written by staff educators at the Bridge Ocean Education Resource Center in collaboration with Virginia Sea Grant. If reusing, presenting, or adapting this lesson please credit the Bridge Ocean Education Resource Center and include the URL below.*

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