

## **sustainable fishing**

For the complete encyclopedic entry with media resources, visit:

<http://education.nationalgeographic.com/education/encyclopedia/sustainable-fishing/>

Sustainable fishing guarantees there will be populations of ocean and freshwater wildlife for the future. Aquatic environments are home to countless species of fish and invertebrates, most of which are consumed as food. (Others are harvested for economic reasons, such as oysters that produce pearls used in jewelry.) Seafood is respected all over the world, in many diverse cultures, as an important source of protein and healthy fats. For thousands of years, people have fished to feed families and local communities.

Demand for seafood and advances in technology have led to fishing practices that are depleting fish and shellfish populations around the world. Fishers remove more than 77 billion kilograms (170 billion pounds) of wildlife from the sea each year. Scientists fear that continuing to fish at this rate may soon result in a collapse of the world's fisheries. In order to continue relying on the ocean as an important food source, economists and conservationists say we will need to employ sustainable fishing practices.

Consider the example of the bluefin tuna. This fish is one of the largest and fastest on Earth. It is known for its delicious meat, which is often enjoyed raw, as sushi. Demand for this particular fish has resulted in very high prices at markets and has threatened its population. Today's spawning population of bluefin tuna is estimated at 21 to 29 percent of its population in 1970.

Since about that time, commercial fishers have caught bluefin tuna using purse seining and longlining. Purse seine fishing uses a net to herd fish together and then envelop them by pulling the net's drawstring. The net can scoop up many fish at a time, and is typically used to catch schooling fish or those that come together to spawn. Longlining is a type of fishing in which a very long line—up to 100 kilometers (62 miles)—is set and dragged behind a boat. These lines have thousands of baited hooks attached to smaller lines stretching downward.

Both purse seining and longlining are efficient fishing methods. These techniques can catch hundreds or thousands of fish at a time.

### **Overfishing**

Catching so many fish at a time can result in an immediate payoff for fishers. Fishing this way consistently, however, leaves few fish of a species left in the ocean. If a fish population is small, it cannot easily replenish itself through reproduction.

Taking wildlife from the sea faster than populations can reproduce is known as overfishing. Purse seining, longlining, and many other types of fishing can also result in a lot of bycatch, the capture of unintended species. Longlines intended to catch bluefin tuna, for instance, can ensnare birds, sea turtles, and other fish such as swordfish.

Another fish species that has been overfished is Chilean seabass, sometimes called Patagonian toothfish. In the

1990s, this fish became extremely popular in restaurants across the United States and other countries, causing an increase in demand. The fish is native to the South Pacific and South Atlantic Oceans, typically caught by longline in international waters. Fishing in this area is regulated by international agreements, which are very difficult to enforce. Illegal fishing—in this case catching fish in numbers high above internationally established limits—became widespread. The number of fish caught and the average size of the fish decreased, leading to even higher prices and greater incentive for illegal fishing. Chilean seabass is a long-lived (up to 50 years), slow-growing fish. Smaller seabass are likely younger, and may not have spawned yet. As fishers caught smaller seabass, healthy replenishment of the population became unlikely.

By the early 2000s, hundreds of American chefs joined a campaign to “Take a Pass on Chilean Sea Bass,” with the hope of giving the fishery time to recover. Today, import of Chilean seabass into the United States is highly regulated by the National Marine Fisheries Service, but illegal fishing continues.

Overfishing also occurs in freshwater ecosystems. The Caspian Sea, for instance, is home to the beluga sturgeon, a large, slow-growing fish. Beluga sturgeon can grow up to 4.5 meters (15 feet) and 1,115 kilograms (2,500 pounds). They take about 20 years to reach maturity, at which point females release their eggs (called roe), although they only do so every three to four years. Beluga sturgeon are best known for roe—also known as caviar. In fact, Caspian Sea sturgeon are the source of about 90 percent of the world’s caviar. The fish are slow-moving and easy prey for fishers. When its eggs are harvested, the fish cannot maintain their populations.

Rules regulate the caviar harvest and imports in countries worldwide, but illegal fishing and international demand are huge threats. The fish’s population continues to decline.

### **Sustainable Fishing Practices**

There are ways to fish sustainably, allowing us to enjoy seafood while ensuring that populations remain for the future. In many indigenous cultures, people have fished sustainably for thousands of years. Today’s sustainable fishing practices reflect some lessons learned from these cultures.

In the Philippines, the Tagbanua people have traditionally employed fishing practices that simultaneously harvest and maintain fish populations. They continue to follow these practices today. Tagbanuas fish for specific species only during certain times of the year, determined by tides and the moon, allowing fish stocks to replenish themselves. They set aside certain areas, such as coral reefs, as protected spots in which fishing is prohibited. When they do fish, these traditional fishers primarily use hook-and-line methods, catching only what they need to feed themselves and their communities. A 2007 study lauded traditional Tagbanua practices as a way to prevent injury and death to local Irrawaddy dolphins, which become entangled in more modern fishing gear like nets and traps.

Traditional Polynesian cultures of the South Pacific have also always relied on the ocean’s resources. Their most common historical fishing practices were hook and line, spearfishing, and cast nets. Hooks constructed of bone, shell, or stone were designed to catch specific species. Fishers would also craft 2-meter (6-foot) spears. They would dive underwater or spear fish from above, again targeting specific animals. Cast nets were used by fishers working individually or in groups. The nets could be cast from shore or canoes, catching groups of fish. All of these methods targeted fish needed for fishers’ families and local communities.

Some of these sustainable fishing practices are still used today. Native Hawaiians practice cast-net fishing and spearfishing. Modern spearfishing is practiced all over the world, including in South America, Africa, Australia, and Asia. In many cases, spearguns are now used to propel the spear underwater. Spearfishing is a popular recreational activity in some areas of the United States, including Florida and Hawaii. This fishing method is considered sustainable because it targets one fish at a time and results in very little bycatch.

If you have ever gone fishing, chances are you used a rod and reel. Rod-and-reel fishing is a modern version of

traditional hook-and-line. Rods and reels come in different shapes and sizes, allowing recreational and commercial fishers to target a wide variety of fish species in both freshwater and saltwater. The different types of rods and reels, coupled with different locations and bait, mean fishers can catch pelagic fish like sailfish, bottom-dwellers like flounder, and freshwater species such as catfish and trout. Rod-and-reel fishing results in less bycatch because non-targeted species can be released immediately. Additionally, only one fish is caught at a time, preventing overfishing. For commercial fishers, rod-and-reel-fishing is a more sustainable alternative to longlining.

Another way to prevent overfishing and bycatch is to simply abstain from eating fish and other seafood. Dr. Sylvia Earle, renowned marine scientist and National Geographic Explorer-in-Residence, suggests people need to take a break from eating seafood until we learn better how to maintain healthy fish and wildlife populations.

"I personally have stopped eating seafood," she explained to *National Geographic*. "I know too much. I know that every fish counts at this point. Some more than others, but I can no longer bear the thought of eating tuna knowing in what dire straits they currently are. If we value the ocean and the ocean's health at all, we have to understand that fish are critical to maintaining the integrity of ocean systems, which in turn make the planet work."

### **Fisheries Management**

Many individuals, communities, and nations continue to rely on fish and other aquatic life as a source of food and raw materials. To maintain fish stocks, we need to reduce overfishing and bycatch through fisheries management. Managing fish populations is no easy task. It requires cooperation at all levels of government, from local communities to nations across the globe.

Nations are responsible for regulating fishing in their coastal waters. In the United States, NOAA Fisheries is responsible for fisheries management in waters 5-321 kilometers (3-200 miles) from land. Local municipalities manage the ocean closer to shore.

Of course, different stakeholders have different perspectives on fishing regulations. Fishers themselves are interested in both maintaining their livelihoods and ensuring that fish populations remain for years to come. Conservationists work to protect marine and freshwater environments, often seeking to prevent fishing and other activities that remove wildlife from their habitats. Regular citizens want to continue to purchase the seafood they love to eat. Scientists focus on ensuring the health of fresh and saltwater ecosystems.

A nation's territorial waters do not encompass much of the huge ocean. The majority of Earth's waters are the "high seas"—international areas that do not belong to one particular nation. Regulating fishing in international waters is tricky; it requires nations with competing agendas and economic needs to agree on management approaches.

There are many international agreements in place, however. There are 17 Regional Fisheries Management Organizations (RFMOs), composed of nations that share economic interests in a particular area. When member nations agree to RFMO regulations, they are bound by these rules, which may include catch limits and specifications on the types of gear used. Evidence suggests these regulations have led to decreased bycatch (such as dolphins in tuna nets), but maintaining healthy fish stocks has remained a challenge. Enforcing fishing regulations on the high seas is extremely difficult, but member nations have worked to address the problem of illegal fishing and prevent illegally caught seafood from being imported.

One organization that has demonstrated enforcement success is the North Pacific Anadromous Fish Commission (NPAFC), which exists primarily to preserve salmon stocks. Member nations are Canada, Japan, South Korea, Russia, and the United States. The commission prohibits catching salmon on the high seas, which is primarily accomplished using drift nets. Drift nets float freely in ocean currents, usually near the sea's surface. They are used to catch schooling fish like salmon and sardines. Unfortunately, these nets result in a lot of bycatch, ensnaring seabirds, marine mammals, and other non-targeted species.

The goal of fisheries management is to develop regulations based on scientific data. These regulations may be based on knowledge of species' life histories, migration patterns, or other information.

Fishing for bluefin tuna, for instance, is highly regulated in the United States. Fishers may only catch this species with a rod and reel or hand-thrown harpoon. This regulation ensures they may only catch one fish at a time. To be taken from the ocean, a fish must measure at least 185 centimeters (73 inches). The goal of this rule is to give fish a chance to spawn before being caught. In addition, only a certain tonnage of fish may be caught each year. Once that quota is reached, the fishery is closed for the season. Rules like these take into consideration a fish species' biology and natural history in order to maintain populations for the future.

### **Consumers**

As consumers, we can choose seafood from well-managed, sustainable fisheries. To do so, we should educate ourselves about where our fish comes from and how it is caught. Resources such as the Seafood Decision Guide can help us make the best choices for our ocean's future.

The remaining struggle is that policymakers must consider the needs of consumers, the livelihoods of fishers, and the data of scientists as they look ahead.