

Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Distinguished Professor of Earth and Planetary Sciences, UC Santa Cruz.

**#262 May 13, 2018
Harvesting the Sea**

The potential for mining the seafloor that seemed so glowing in the 1960s has still not materialized a half century later. Continuing population growth combined with the expanding need for mineral resources for an increasingly industrialized society, including high-tech industries, has not led to any significant offshore mineral recovery.

Even though the oceans cover 71% of the planet's surface, many of the needed minerals are more abundant on land. In addition, technological difficulties and greater costs of recovery from the deep-sea have discouraged ocean mining.

Have our other dreams from the last century for looking to the sea to solve our resource needs and limitations been realized? Another big opportunity on the horizon 50 years ago was the potential to feed the world's growing population from the sea.

Without question, we do take a lot of fish from the world's oceans, about 90 to 100 million tons every year. Over 1.5 billion people, mostly in Asia, depend upon fish for about 20 percent of their annual protein intake.

While there is a lot of ocean out there, coastal waters are by far the most biologically productive. About 99% of the worldwide commercial fish harvest

comes from waters within about 220 miles of a shoreline, literally our ocean backyard. Somewhere in the neighborhood of 1,500 different types of fish are commercially taken from the ocean today, with different species or stocks being exploited to varying degrees.

The global fish harvest grew through much of the 20th century with an increasing appetite for seafood, the development of larger and greater numbers of vessels, bigger nets, and high tech equipment to determine where the fish were hanging out. But the total yearly catch peaked around 1990. There were simply too many boats chasing too few fish. With the massive nets and huge trawls, combined with large factory ships, we were essentially clear-cutting the oceans and not leaving enough fish for the populations to recover.

Perhaps not surprisingly, with the number of people on the planet growing at about 75 million every year (or 200,000/day), the pressure on fish populations has continued to increase. The trend is clear, and the news isn't good. The most recent United Nations Report on the state of global fisheries concluded global wild fish production is approaching its sustainable limit, with about 90% of the world's stocks now fully or overfished.

Yet a 17% increase in production is forecast by 2025. Where are these fish are going to come from? Many of the fish we have depended upon for so long (the Atlantic cod, for example), were fished down to a level that wasn't sustainable. While wild caught fish are unquestionably an important source of protein for hundreds of millions of people, we have reached a limit and the annual catch is not going to increase and feed many more people for much longer.

What has begun to fill the gap is fish farming or aquaculture, which now produces over 80 million tons per year and is expected to overtake the amount of wild-caught fish by 2021, just 3 years away. Subsistence fish farming has been practiced for hundreds of years, from carp ponds in early China to coastal fishponds in the Hawaiian Islands.

As wild fish stocks were gradually depleted and fishing boats had to go further offshore to return a full catch, fish farming has emerged and grown as a major industry. As the global wild fish catch began to level off in the mid-1980s, aquaculture rapidly expanded.

Between 2000 and 2010, the global aquaculture harvest doubled. By 2010, the production (including fish, shellfish and crustaceans, raised in both salt and freshwater) had expanded to about 75 million tons per year, with almost all of this in Asia. Fish made up 50% of the total aquaculture harvest, followed by aquatic plants with 24%, shellfish with 18% and crustaceans with 8% of the total.

There are now over 200 species of marine animals and plants that are farmed; the major fish species include salmon, catfish, carp, Arctic char, trout, tilapia and tuna. The shellfish are primarily mussels and oysters, while the crustaceans cultured or farmed include crabs, shrimp and crayfish. Aquaculture can help feed the world's people but there are also some significant environmental impacts to consider.