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## Oceans

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By Don Walsh

### The Farming of the Sea

Fishing is one of mankind's oldest organized activities. From the time our earliest ancestors first sorted through tidal pools to the present day, we have been fishermen, and fishermen are essentially hunters. Today, that hunting has become increasingly difficult. High-tech, super-efficient methods have led to drastic overfishing of the most valuable stocks. In addition, loss of fish habitat, pollution, and acidification of the oceans have combined to naturally reduce those fisheries that are still viable. It is known what measures should be taken to develop global sustainable fisheries, but few governments have the discipline to enforce the necessary restrictions.

The World Ocean covers 71 percent of our planet's surface and has a volume of 350,000,000 cubic miles. But the idea that it contains a vast store of harvestable protein for humankind is fiction. The fact is, fish in the oceans can never be a primary source of animal protein for a growing world population now at 7 billion people. The present world fish catch is about 85 million tons a year. It has remained at that level for nearly two decades. Furthermore, 80 percent of the fish stocks now taken for human consumption are at or have exceeded their exploitable limits. The hunter roaming the oceans is rapidly losing his prey.

Aquaculture is the controlled farming of fish and seaweed primarily for human consumption. There are both saltwater (mariculture) and freshwater components to this activity. And it is not a new idea. There is evidence that a type of aquaculture was being employed 6,000 years ago in Australia. It is known that China was doing it more than 2,000 years ago, and the Romans, too, practiced a form of fish-farming. There are many other examples of aquaculture being developed by early societies because they had no means to go out on the ocean to hunt for fish there.

Today, 50 percent of world seafood production is from aquaculture. It has been said that this is the fastest growing food-production system in the world. Experts say that within two decades, mankind will get two thirds of its seafood from aquaculture.

Prominent species of farmed seafood include salmon, trout, catfish, tilapia, shrimp, prawns, oysters, abalone, and mussels. While the major products of fish-farming are for human consumption, aquaculture also produces several other products: sportfish (stocked, for-fee fishing ponds), ornamental fish (for aquaria), baitfish (to catch other fish)

and fish eggs (i.e., caviar). In addition, there is the farmed production of sea vegetables and algae (seaweeds, particularly important in Japan).

The United States is a major importer of seafood, with 86 percent of domestic consumption coming from other countries. And half of this comes from aquaculture valued at about \$10.4 billion annually. In terms of the national trade deficit in natural resources, it is second only to oil imports.

Worldwide, this is a \$100 billion-per-year industry, with China accounting for two thirds of the production. The United States ranks 13th, just behind Burma. Here, domestic aquaculture accounts for only 5 percent of consumption of farmed seafood and is valued at about \$1 billion per year.

In the U.S. government, aquaculture is divided between the Department of Agriculture (USDA) and National Marine Fisheries Service in the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). The demarcation of activities between these two departments seems somewhat blurred. The USDA is the "food ministry," and freshwater fish-farming is just that, where ponds and lakes are often part of larger farming operations. In 2005 more than 365,000 acres were used for freshwater fish-farming.

For sea-harvesters, NOAA's oceanographic research generates many useful products, such as marine navigational charts, maritime weather forecasting, and data support for marine fisheries. Therefore, it is logical that NOAA's National Marine Fisheries would have an Office of Aquaculture primarily concerned with saltwater fish-farming off our shores.

But in U.S. coastal waters, it may be difficult to significantly expand the saltwater component that today only represents 20 percent of our aquaculture. It tends to be so site-exclusive that other activities cannot easily share those spaces. With more than 50 percent of the U.S. population living within 50 miles of the coastline, competing uses of coastal lands make it difficult to site fish-farming activities there. In addition, questions of water pollution can affect the fish stocks. There are ways around such problems, but they can be costly, rendering our domestic saltwater aquaculture economically uncompetitive with imported products. The real and sustained growth will be in freshwater aquaculture, with more ponds being built on agricultural lands where there are good sources of clean water.

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