



Creating the Nation's first BioPark

National Zoological Park · Smithsonian Institution · Washington, D.C. 20008-2598

Letter from the Desk of David Challinor  
April 1995

Each culture has its own food tastes, which determine what is and is not edible. Such food biases are sometimes so strong that people have been known to starve rather than consume food unacceptable in their culture. Such strong feelings are often alleviated by improving education.

There is little logic to account for food preferences. For example, few North Americans enjoy eating snails, most of which are grazing herbivores consisting mostly of high protein muscle tissue. Yet curiously many of us relish crabs and lobsters, scavengers which help clean the sea bottoms of dead fish and other animals. Many edible species are the vultures of the sea. An ocean delicacy popular in the Orient is trepang, the smoked or dried flesh of the sea cucumber. This animal derives its name from its cucumber-like shape and size. It is also known as *bêche* (spade) *de-mer* (in French) or *pepina* (cucumber) *de mar* (in Spanish). The group is generally lumped together as holothurians, consisting of three different families with about a dozen genera.

Holothurians are a spectacularly evolved animal that fills a niche on the sea floors of the globe, not unlike that of the earthworm on land. They are found in all oceans and even at the bottom of the deepest trenches. A soft, slimy creature, it does not enjoy the same appeal or interest to us as big-eyed, furry mammals do, but creepy crawly ones are just as remarkable, if degraded in our eyes.

Holothurians vary in size, from 2m to a few cm in length; in shape, from a long, thick worm to a chunky bun; and in color as well. Cold water species are muted browns, greys or yellows, but on coral reefs they are bright red, sky-blue or dark green. They have no skeleton, but many have imbedded in their skin small bony plates or spikes, which require them to be skinned before eating.

Other than humans, holothurians have few predators. Gulls occasionally feed on them as do a few species of fish and crabs. Many species have evolved effective defense mechanisms; they can contain toxins which are lethal to fish but become harmless to man if the creature is boiled as part of its conversion to trepang. Some species exude long, white, sticky threads when threatened, entangling and thus immobilizing a predator. Other species protect themselves by ejecting their viscera to confuse predators, later regenerating new organs. In the most extreme



protective stage, one group of sea cucumbers can actually constrict their bodies and break themselves into pieces. These body particles die or are eaten by the attacker. However, if the extreme front end piece, where the mouth is, survives, in time it will regenerate a whole new body.

These details are probably more than any of you want to know about sea cucumbers, so I will not dwell on the strange commensals and parasites that live in their body cavities, among which are certain highly adapted fish and crabs. Holothurians are a remarkable and very useful group of invertebrates because like earthworms, they feed by ingesting the bacteria and algae that grow on the particles of sea floor sediments. Enormous quantities of sand pass through their gut, aiding in the nitrification and oxygenation of the ocean bottom. The benefits they contribute to the health of our planet are seldom considered because the global demand for them as food exceeds the current, easily accessible supply. The strong market for these remarkable animals actually resulted in the closing of the Charles Darwin Research Station in the Galapagos for about a week last December; thereby hangs an interesting tale.

First some background on the trepang industry: Sea cucumbers are harvested from the ocean floor by divers generally in water less than 10m deep. Most species are easy to harvest and merely require picking them up and placing them in a mesh bag. On board the fishing boat or on shore, the animals are cut open, skinned, cleaned and boiled to remove or at least lower their salt content. After cooking they are dried in the sun or they may be smoked, depending on available facilities and market demand.

According to Grzimek's Animal Life Encyclopedia (vol. 3, p. 322), trepang is often used as a soup base, and when the dried pieces of trepang are cooked in the soup, they swell and develop a clear, shiny consistency. A popular dish throughout the Orient, it is eaten raw in Samoa and generally roasted in the Philippines. It is a high quality food with a protein content of 50% to 60%.

As demand grew in that part of the world, fueled by prosperity and population increase, the price of trepang soared and it was not long before the sea cucumbers were fished out of many local waters, including Japan's. However, another species of the same genus as the Japanese one was common in the nutrient-rich sea floor of the Galapagos. Soon hundreds of pepineros, as the local sea cucumber fishermen are called, congregated in the islands to harvest this rich resource.

Ecuador's government policy is to limit the exploitation of all Galapagos marine resources because about 95% of the islands are a designated national park. The Ministry of Fisheries forbade all sea cucumber harvesting in Galapagos waters on 15 December 1994. Tension rose and on 3 January the angry pepineros seized control of the road to the Charles Darwin Resource Station and its neighbor, the headquarters of the National Park Service. The staff of both organizations were held hostage for three days to enforce demands that the fishery be reopened. The protesters even threatened the life of Lonesome George, the last surviving member of the giant tortoise subspecies from Pinta Island and a major attraction for tourist visitors to the Research Station.

The representatives of the Fisheries Ministry met with the pepineros but resolutely maintained the fisheries ban. The crisis subsided by 6 January and a short time later the Army arrived to help maintain order. Conditions are relatively peaceful now, but even in the best of times, enforcement of harvest limits is tenuous.

Soon, however, all accessible sea cucumbers may be harvested in the Galapagos. Restocking could take a long time even for those kinds of sea cucumbers that can migrate up from lower depths or that have pelagic larvae capable of traveling for thousands of miles on ocean currents. The very absence of adequate numbers of holothurians on the ocean floor may alter conditions so that new arrivals coming to repopulate these vacant spaces will fail to gain a foothold. According to Smithsonian scientist Dave Pawson, a specialist in marine invertebrates, there is evidence that overfished holothurian stocks may never fully recover to pre-exploitation densities even after 100 years.

The bounty of the sea is not inexhaustible. Overharvesting and the large by-catches must be curbed. It is conservatively estimated that 20% of the animals caught in ocean trawls are considered not worth processing for sale and are thus discarded at sea as by-catch.

The future demise of some resources is hard to predict, but today we have glaring examples. Whaling, market hunting for ducks and shore birds, and oystering in the Chesapeake are relatively recent examples of prosperous industries that have disappeared when the supply ran out. Energy supplies may be the next resource to test mankind's resilience as we face what are bound to be supply/demand crises of the forthcoming new millennia.

David Challinor  
(202) 673-4705