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A Delicate Pacific Seaweed Is Now a Monster of the Deep

By MARLISE SIMONS

NICE, France— No one remembers quite what happened in the tropical aquarium of a German zoo two decades ago, but its experiments with an exotic Pacific seaweed, biologists say, have unleashed a monster that is threatening marine life in the western Mediterranean.

The biological alien looks rather delicate. It is made up of elegant bright green fronds and it has spawned luxuriant-looking meadows along the sea floor. What makes *Caulerpa taxifolia* a menace is that it appears toxic to many Mediterranean creatures and has been suffocating everything in its path.

A gift from the German zoo to other institutions, it is thought to have gotten into the Mediterranean some 15 years ago, when the aquarium of the Oceanographic Museum in Monaco emptied its tanks. Since then, the invader has proliferated wildly along the French Riviera, around the Spanish island of Majorca and off the coast of Italy, and has shown up as far away as Croatia.

By many estimates, it already occupies more than 8,000 acres. Researchers say that in the past three years, it has been more than tripling annually.

In the consternation over the seaweed, some scientists have described the plant as an aggressive mutant of a far more discreet tropical cousin. Wherever the newcomer has established itself, it has crowded out most other plants and animals, and, most worrying to biologists, it has smothered the beds of native sea grass that serve as the nurseries for many species of the Mediterranean.

"It's like a tumor that can't be stopped and that chokes everything around it," said Alexandre Meinesz, a professor of biology at the University of Nice-Sophia Antipolis, and part of a team researching the problem.

A professor of marine biology at the University of Marseilles, Jean-Francois Boudouresque, said, "The worst is that it produces a monoculture that threatens the whole Mediterranean ecosystem."

Marine scientists disagree on how to deal with the colonizer. Amateur divers and professionals from the French and Spanish navies have tried destroying the smaller patches by hand or by using suction pumps, only to see the stands bounce back and spread again soon after. Some scientists propose bringing in a predator; some say the plant cannot be fought at all.

The rampant seaweed fits into a form of globalization that worries biologists, that is, the inadvertent spread of plants and animals to distant places where nature did not intend them to be and where they manage to overpower native species.

These creatures may hitch rides on the ever-growing flow of human traffic. Alien snakes have crossed the ocean in the landing gear of airplanes. The zebra mussel, a native of southern Russia, entered the Great Lakes by ship and spread to the Hudson River, clogging up American and Canadian municipal water systems. A small ribbed jellyfish from the American Atlantic coast traveled in ballast water to the Black Sea. Unfettered by a predator, it boomed and ate so much plankton, fish eggs and larvae that, in the early 1990's, many fisheries had to close.

The case of the warm-water weed running amok in the cool Mediterranean continues to puzzle scientists.

"It adapts to anything -- rocks, sand, mud," said Mr. Meinesz. "It thrives equally well in agitated currents and quiet inlets and in polluted and pristine waters."

The seaweed's arrival has been traced to the Wilhelmina Zoo, in Stuttgart, Germany, which in the 1970's imported tropical seaweed for its tropical aquarium.

Zoo officials said their *Caulerpa taxifolia* came from the Pacific but they could not reconstruct exactly what happened next, except that the seaweed was subjected to ultraviolet light, aquarium chemicals and human selection.

French and Italian biologists are convinced that the German zoo, perhaps inadvertently, created a powerful hybrid.

"What we have here is a sort of monster," said Mr. Meinesz.

Most astonishing, he said, the plant now grows up to six times the size of the tropical one, spreads faster and quickly dominates its surroundings, whereas in the tropics it forms only small, discreet clusters. And it can survive at lower water temperatures, down to 50 degrees rather than the 70 degrees of its tropical habitat.

After breeding it for several years, the Wilhelmina Zoo gave portions of the pretty seaweed to other aquariums, including one in Paris and one in Nancy. Nancy sent some to the Oceanographic Museum of Monaco. Most researchers believe that it was the Monaco institution that let the plant out into the Mediterranean when cleaning out its tanks. It was here, beneath the seaside Oceanographic Museum, that marine biologists spotted the Mediterranean's first *taxifolia* plants in 1984.

Now there appears to be no stopping it.

On the Spanish island of Majorca, Antoni Grau, the head of marine resources, regularly dispatches teams of divers to the inlets where the weed has settled, possibly carried on the anchors of pleasure boats.

"I've never seen anything like this," he said in his office in Palma.

Divers use suction pumps, but the weed returns.

"Where this seaweed grows, everything else disappears," Mr. Grau went on. "There are no more sea anemones, starfish, crabs, shrimps and very few fishes. The whole ecosystem changes."

In Port Saint-Cyprien, in France, just north of the Spanish border, divers have had little more success. After uprooting all the stands in 1991, they found the blanket was almost 20 times bigger in 1993. Last summer, the town tried another method. It poured 10 tons of salt on a particularly dense stretch. But only a fourth of the treated plants died.

So far, the seaweed has also defeated the French Navy. It sent down its divers several times to destroy large meadows off the city of Hyeres, only to find that, perversely, the disturbed fields grew back even faster.

Although not toxic to people, the plant's toxin appears strong enough to deter most Mediterranean creatures. In one experiment, Prof. Boudouresque of the University of Marseilles found that sea urchins ate their own waste and resorted to pieces of plastic, rather than touch the seaweed.

With European Union funds, researchers are now mapping the plant's journey and testing ways to destroy it. An information campaign is under way, with 60,000 pamphlets in six languages asking fishermen, divers and yachtsmen to report the plant and, when they catch it in nets and anchors, not to throw it back.

In a laboratory here in Nice, biologists have bred thousands of snails, a species brought from the Caribbean, where it devours the local variety of the seaweed. The team is waiting for permission from the French Government to unleash the snail army. But critics fear that the remedy may introduce new bio-troubles.

Mr. Meinesz, an advocate of the operation, insists it is safe. "We have proof that the snail only attacks this seaweed," he said, adding confidently, "We'll put it in the sea in the spring and it will die from cold in December."

In Paris, the Ministry of Environment is not yet convinced.

Photos: Divers have tried to destroy a mutant seaweed, but it bounces back and spreads more quickly. (Alexandre Meinesz); A marine invader called *Caulerpa taxifolia* is now a common sight off the south coast of France and has even shown up as far away as Croatia. The mutant seaweed has so far defied any attempts to stamp it out. (Alexandre Meinesz)(pg. 4) Map of the Mediterranean Sea showing areas of Pacific seaweed detection, for '84-'91, '92-'93 and '94-'95. (pg. 5)