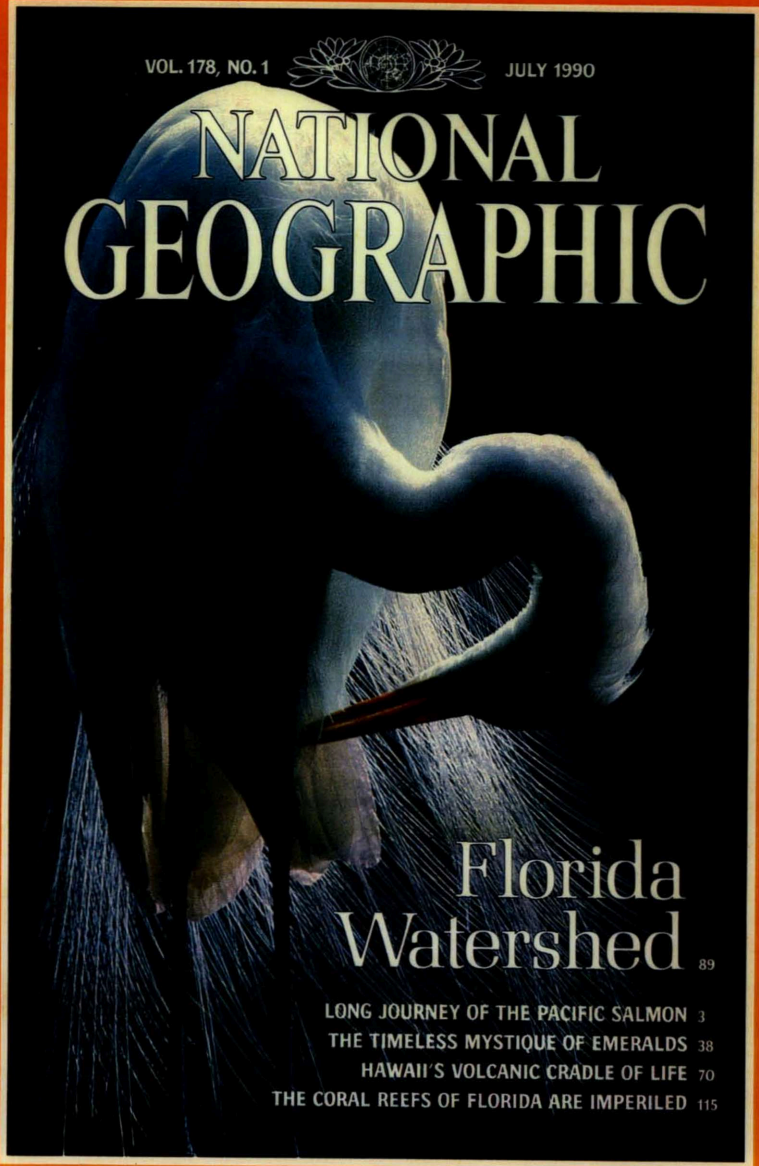
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# NATIONAL GEOGRAPHIC



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# FLORIDA'S Coral Reefs Are Imperiled

By FRED WARD
BLACK STAR

Photographs by
JERRY GREENBERG and FRED WARD

WHEN FLORIDA established John Pennekamp Coral Reef State Park off Key Largo in 1960, there was general rejoicing that this great American treasure would be preserved for future generations to enjoy. Less than a generation later many of the state's reefs are dying, not just in the park but throughout the keys. Some experts say the causes are part of a natural cycle, and widespread death is inevitable. Others say the causes are unknown, but the result is still inevitable. And others warn that we are actually killing our reefs.

I first dived the Florida Keys while I was a University of Florida student in the 1950s. Through 35 subsequent years of regular scuba trips and documentation (along with the amazing photographic coverage of the reefs by my lifelong diving buddy, Jerry Greenberg), I have watched their steady deterioration. Corals are living organisms that have created the very structure of the reefs over thousands of years. Seeing them suffer is like living with a terminally ill family member whose doctors argue over symptoms while the patient silently slips away.



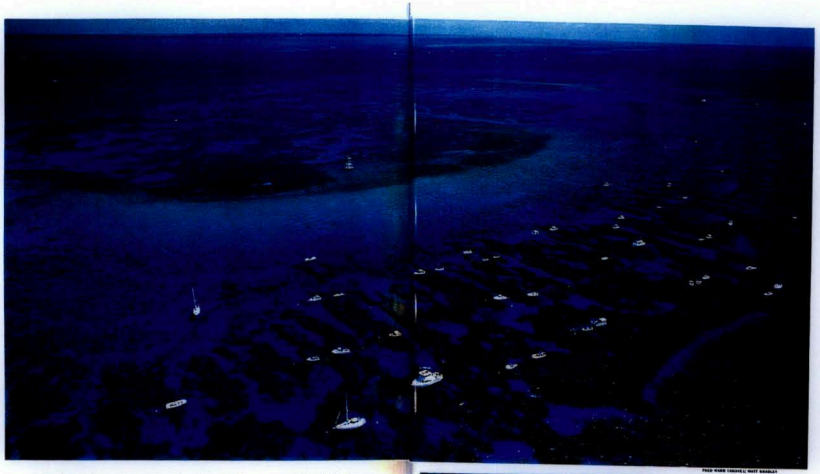
*In a troubled underwater world off Key Largo, a school of diving students swarms around the "Christ of the Deep" statue. Fouled waters and thoughtless visitors are destroying growths of coral (above), some of which took centuries to form. Designed to protect an extensive reef system, John Pennekamp Coral Reef State Park and the adjacent Key Largo National Marine Sanctuary are being ruined by too much pollution and too many people.*

There is magic in coral. In secret watery gardens, nature plays out her diverse drama for the snorkeling alien to behold: birth and death, beauty and beast, competition and cooperation. What appears to be a large boulder that resembles a human brain is actually a colony of millions of creatures. Each tiny, seemingly independent polyp, taking in water and nutrients and exuding calcium carbonate (limestone), participates in forming a design specific to each species of coral.

Pennekamp is part of a reef ribbon, made possible by the warm flow of the passing Gulf Stream, that reaches from southwest of Key West almost to Miami.

Although most refer to the area along Key Largo as "Pennekamp," little-noted jurisdictional changes in 1974-75 dramatically altered the reefs' future. At that time the federal government took control of all U. S. underwater areas beyond three miles to a depth of 300 feet. These actions diminished Pennekamp Park (administered by the Florida Department of Natural Resources) to the three





miles closest to shore and transferred the major reefs to the Key Largo National Marine Sanctuary (operated by the U. S. Department of Commerce).

ROCK HARD in appearance, coral reefs are in truth exquisitely fragile, living within a very narrow range of conditions. Water temperature should remain above 70°F; Pennekamp is at the cool edge of reef growth, and its waters dip into the sixties in winter. And the water must have few nutrients and even fewer toxins—Pennekamp has too many of both. In short, since the increase of development and tourism in the keys the odds are against Pennekamp's sensitive ecosystem.

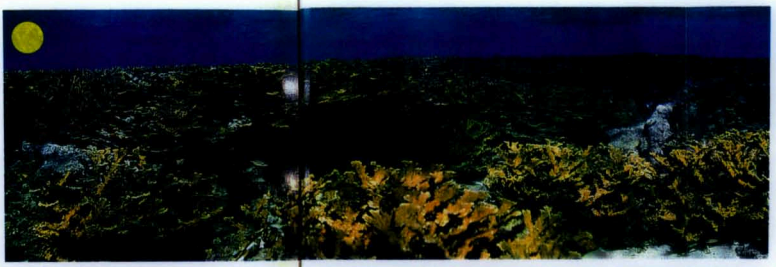
In the derring-do days of 1950s sport diving we felt like pioneers, exploring a private wonderland. After Jacques-Yves Cousteau co-invented the Aqua-Lung, the young and the daring suited up in relatively untested scuba outfits and raced toward this underwater frontier. No laws limited spearfishing or coral and shell collecting. Heedless divers speared tons of the most desirable game fish.

Massive publicity, not the least of which was a major

*(Continued on page 123)*



*Buoys can be lifesavers for coral by discouraging anchoring directly on the reefs, once the cause of massive destruction. Some boats double up at Molasses Reef in the federal sanctuary (above), where 15 new buoys a year are planned. In 1984 the freighter Wellwood (left) plowed up several acres of coral and went aground. Part of the six-million-dollar fine helped finance habitat restoration.*

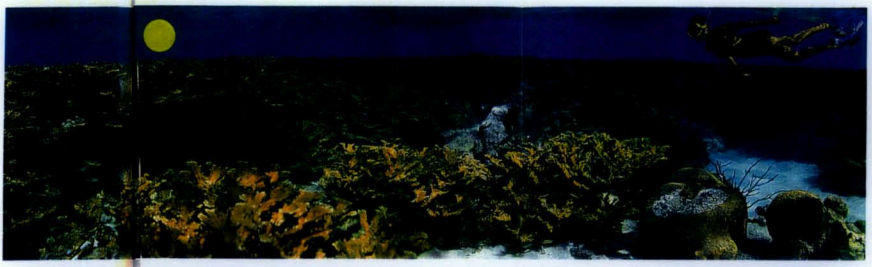


1960

1989











*A wondrous realm unfolds in a panorama taken by Jerry Greenberg at Carysfort Reef in 1960 (top). Golden branches of elkhorn coral stand beside brain coral, at lower right. In the same region 29 years later, coral was reduced to a mass of stumps. To compare such areas, author Fred Ward (above) uses laminated old photographs.*

*Earth's largest formations made by living organisms, coral reefs are the handiwork of small marine animals called polyps, which reproduce asexually. After a polyp dies, it leaves behind deposits of calcium carbonate upon which live polyps build. When nutrient levels soar from such sources as human sewage and fertilizers washed from farmland, algae can overwhelm and smother the polyps.*



1983



1989



and the economy probably could not survive a substantial loss of fishing revenues. Yet in the absence of constraints, there may be no game fish in the future.

Hook-and-line saltwater fishing is still allowed in the 120 square miles of Pennekamp Park and the national marine sanctuary. The fish that are taken are often the scarcest, the biggest, and the best.

I asked Mike White, manager of the Key Largo National Marine Sanctuary, how the sanctuary and park justify letting people catch the very fish that two million visitors hope to see. He answered, "Our program is responsible for resource protection while encouraging multiple compatible uses. These requirements often conflict. I have another year to make a report on water use and to advise whether all the keys should become part of the federal sanctuary system." Mike believes Florida would condone such an act but has watched the protest movement grow as treasure salvors, commercial lobstermen and fishermen, and tropical fish collectors organize to defeat any further attempt to federalize the reef tract.

Events, however, have overtaken Mike's study. After three freighters ran aground within 17 days last fall, Congressman Dante Fascell introduced legislation to designate all the reefs from Biscayne National Park to Dry Tortugas as the Florida Keys National Marine Sanctuary. "It doesn't take a congressman to see that the reefs are dying," Fascell told me. Florida's Senator Bob Graham has also introduced legislation.

Lobsters, tender to eat and difficult to protect, raise tensions to the breaking point. It is almost impossible to find a mature lobster at Pennekamp only a couple of weeks after the season opens. I was on the reefs





*Divers' rest stop that appears to be bare rock (below) is actually an overturned stand of coral. Boaters who run aground (left) were fined according to a formula that considers coral density, damage, recovery potential, and degree of negligence. Ignoring rules against touching the coral, divers paw through a dying stand of elkhorn in search of lobsters. In 1989 three persons caught with 399 lobsters were fined more than $4,000 apiece for violating size and bag limits.*

daily for six weeks and saw no more than half a dozen lobsters.

"Any person with a license can take 6 lobsters a day or 24 per boat during the August 6 through March 31 season," says Mike White. "So one man with a boat can take 24 lobsters a day. And that's not the worst of it. Commercial lobster licenses are cheap in Florida, and there's no limit on the number of traps or lobsters taken."

During the summer two-day non-commercial "mini-season," locals say so many amateur lobstermen show up you can walk from boat to boat six miles out to the reefs without getting your feet wet.

A few days after the mini-season, Jerry Greenberg returned to finish photographing a particularly attractive stand of coral at Carysfort, near the sanctuary's northern border. Only a pile of paint-scarred coral fragments remained, silent testimony to careless boating.

THE REEFS' chief defenders are an unusual coalition of environmentalists and a few of the businessmen whose lives depend on having something alive on the reefs for people to see. One such is Captain Spencer Slate, gregarious owner of Atlantis Dive Center, who





has been roundly criticized for continuing to hand-feed barracuda and moray eels even after a number of people have been bitten while imitating him. Slate has recently come down on the side of a fishing prohibition, saying, "Let's protect everything, lobsters and all. I want my guests to experience a living, beautiful reef."

But divers and fishermen alone do not threaten the reefs' survival. After 1960 Florida Keys development even outdistanced neighboring mainland counties, which themselves had some of the highest growth rates in the country. Key Largo, the nearest island to the reefs, once a rustic collection of trailer parks and weekend fishing shacks, has burgeoned into a development of homes, condos, and shopping centers straddling U. S. 1 and crowding the land between ocean and bay.

Carl Nielsen says, "Onshore development is a continuing problem. Monroe County has no storm-water treatment facilities and no tertiary (or fully processed) sewage plants, which means that street runoff washes right into the water and unprocessed sewage is dumped into the ground. Key West has the only city sewage-treatment plant in all the keys, and it opened just last year."

The rest of the keys use septic tanks, injection, and small, local sewage plants operated by schools, apartment buildings, and shopping centers. The underlying limestone is as porous as a sieve. Anything dumped on the ground soon filters into the water table.

"A coral reef is only as healthy as the water around it," explains Florida regional biologist Renate Skinner, who keeps some of the scarce hard data on Pennekamp's water quality. A tiny woman who works in a cramped trailer, she appears even smaller among her crush of books and papers.

Poring over her computer





*The ruddy glow of its branches reflects the health of a sea fan (right), which grows best in warm, clean water with a low nutrient level. A dying coral of the same species haunts the deep like a specter (facing page), perhaps the victim of parasites or polluted water.*

*Lifeless white limestone discolors a branch of elkhorn coral after the spread of white band disease (bottom left), whose cause remains a mystery. Produced by bacteria, black band disease, here infecting a star coral (center right), can kill a 200-year-old formation in two months. Experiments to stop the disease and treat infected coral so far have failed.*

*Known as golf ball coral, Favia fragum (bottom right) is smothered by algae, which then use the remains as a base for further growth.*

*Life on a reef is typically balanced, with a variety of corals coexisting with coral-eating parrotfish, algae, sea urchins, and damselfish. Normally corals have the ability to cleanse and heal themselves of disease and impact wounds. At Pennekamp the reefs may no longer be able to withstand the stresses of their environment.*

"There are almost no butterflies left where the county sprays. The number of birds has declined because their food is killed in the process of killing mosquitoes."

Carl Nielsen notes the county is supposed to cut off the spray as planes fly over the park or over water, but, he says, "We pick up those pesticides in our water samples. Anything that lands on Key Largo ends up in the park."

Once water quality deteriorates, corals may not have the strength to recover from the stresses of people, boats, storms, silt, chemicals. Anything can push them over the edge.

That fatal "anything" can come from almost anywhere. Richard Curry, resource management coordinator for Biscayne National Park, reports, "We pick up paper plants' residues from the Midwest brought down by the country's sewer, the Mississippi River, mixed in the Gulf of Mexico, and carried here by the Gulf Stream. Every product that people make is found around our reefs—including far too many nutrients."

Agricultural runoff, garbage, sewage, and thousands of products that humans discard have seriously raised the level of nutrients in the water around the keys.

"Nutrient loading could make the Florida Keys reef tract the first in the world to be killed by humans," says Brian Lapointe, water-quality expert with the Florida Keys Land & Sea Trust. Calling the keys an "ecosystem dysfunction," he notes, "Coral reefs thrive only in a low-nutrient environment. Pollution is pushing Florida's reefs beyond their ability to survive. They may not recover."

Algae, which flourish in high-nutrient water, are the key problem. Relentless competitors, they can blanket an entire reef and smother living polyps. Lapointe has studied Caribbean reefs that turned algal in only weeks, the way a swimming pool greens overnight with algal "bloom."

Algae-eating sea urchins, which might have helped save the reefs, suffered a Caribbean-wide die-off in 1983, possibly from a viral disease. The timing was unfortunate. The keys lost an estimated 98 percent of their reef-grooming sea urchins, just when they were needed most.

**Is death inevitable?**

Maybe not, but we need immediate and drastic actions. Man-made threats may well be the end of the reefs unless we change our ways. The area needs a master plan for dealing with water quality, fishing, boating, and visitors.

The reefs are credited with bringing in more than 50 million dollars a year to the upper keys. Restaurants, hotels, boat charters, and dive shops all depend on that money. Logically, the owners of those businesses should be largely responsible for preserving the reefs. Instead, all too often, they bury their heads.

Rather than taking action, many plead that nothing negative be said to deter tourists, who continue coming in record numbers to enjoy the remaining beauty of live areas. Ultimately, healthy reefs and healthy tourism are interdependent.

Saving the reefs means stopping the pollution. Lapointe says, "Cleaning up Key Largo and the other Florida Keys and putting them all onto sewage systems would be a major step in the right direction." Agricultural, boating, and industrial pollutants should be kept away from the reefs. Finally, fishing and lobstering should be banned in Pennekamp Park and the sanctuary.

As I photographed one morning from the top of a park concession snorkel boat, its young captain, Kevin Puch, glanced below at nearly a hundred snorkelers leaping onto one small patch of reef. We exchanged concerned looks.

"I make my living driving this boat, and I love it," said Kevin. "But the only way this place will recover, if it even can, is to treat it like a real park . . . restrict activity in the fragile areas, and let it try to heal."

Kevin is probably right that some parts should be closed. But cleaning up the water is the first priority. We will kill the coral reefs if we're not careful, by ignoring their silent plight and loving them to death. □





JERRY GREENBERG (TOP LEFT); FRED WARD



FRED WARD (BELOW); JERRY GREENBERG



*Small but feisty, a damselfish guards its turf (below). By picking at polyps, the fish kill patches to create algal lawns (left). In defense, a "chimney" of new growth appears (above). If habitat is destroyed, the fish swarm to nearby reefs, where coral destruction is intensified.*



## On Assignment

NATIONAL GEOGRAPHIC MAGAZINE

Adventurous descents took Fred Ward to the bottom of the two subjects he wrote about and photographed for this issue. Delving into the world of emeralds, Fred rode a cable winched down a narrow 300-foot shaft to reach a Brazilian mine face (below) that shook with blasts from neighboring operations. "It was chaos," he says. "The only way these guys communicated was with dynamite."

It was worse in Colombia, where more than a dozen people Fred interviewed were later murdered, victims of emerald-related violence. An artifact of that mayhem came in handy when Fred lost the shutter button of his camera in the mud near a mine where gun battles often erupt among treasure hunters. He jury-rigged one of numerous spent .32-caliber cartridges (right) as a shutter button so he could keep shooting.



JERRY GREENBERG (BELOW); LIGHTSTREAM © 1990



FRED WARD (BELOW); MARK JONES



Fred's emeralds story is the latest in his series of Geographic articles on gemstones and precious metals. He capped the assignment by completing what is normally a three-year course in only three months to earn a Graduate Gemologist diploma from the Gemological Institute of America. Over the years, he developed a friendship with ardent collector Elizabeth Taylor (top), here bedecked in emeralds.

Fred's other descent took him scuba diving off Key Largo to Florida's ailing coral reefs. There danger threatened above the surface when a violent squall sent Fred under cover (center); he was nervous sitting in an open boat as lightning danced nearby. He and photographer Jerry Greenberg were comparing sites in the Pennekamp park and adjacent marine sanctuary today with photographs Greenberg had made seven to thirty years ago. "It's depressing," says Fred, who grew up in Florida and first dived on Pennekamp as a teenager in the late 1950s. "I remember when it was bright and alive, pink and green and lovely."



Fred's diving adventures are legendary. While covering Cuba in 1976, he explored a reef with Fidel Castro's former photographer. "The only gear we could get was Russian regulators and tanks," he recalls. "I hopped into the water and tried to take a breath—what a regulator! It was like trying to siphon a 20-gallon gas tank! Five stories below."

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