VOL. 121, NO. 1 JANUARY, 1962

NATIONAL GEOGRAPHIC

Hong Kong Has Many Faces — JOHN SCOFIELD — 1

Ghost From the Depths: the Warship *Vasa* — ANDERS FRANZÉN — 42

Key Largo Reef: America's First Undersea Park — CHARLES M. BROOKFIELD — 58

Florida's Coral City Beneath the Sea — JERRY GREENBERG — 70

Easter Island and Its Mysterious Monuments — HOWARD LA FAY, THOMAS J. ABERCROMBIE — 90

Brazil's Big-lipped Indians — HARALD SCHULTZ — 118

Strange Courtship of the Cock-of-the-Rock — E. THOMAS GILLIARD — 134



$8.00 A YEAR $1.00 A COPY

THE JOURNAL OF THE NATIONAL GEOGRAPHIC SOCIETY WASHINGTON, D. C.

VOL. 121, NO. 1 JANUARY, 1962

NATIONAL GEOGRAPHIC

Hong Kong Has Many Faces — JOHN SCOFIELD — 1

Ghost From the Depths: the Warship *Vasa* — ANDERS FRANZÉN — 42

Key Largo Reef: America's First Undersea Park — CHARLES M. BROOKFIELD — 58

Florida's Coral City Beneath the Sea — JERRY GREENBERG — 70

Easter Island and Its Mysterious Monuments — HOWARD LA FAY, THOMAS J. ABERCROMBIE — 90

Brazil's Big-lipped Indians — HARALD SCHULTZ — 118

Strange Courtship of the Cock-of-the-Rock — E. THOMAS GILLIARD — 134



$8.00 A YEAR $1.00 A COPY

THE JOURNAL OF THE NATIONAL GEOGRAPHIC SOCIETY WASHINGTON, D. C.

KEY LARGO CORAL REEF

America's First Undersea Park

By CHARLES M. BROOKFIELD

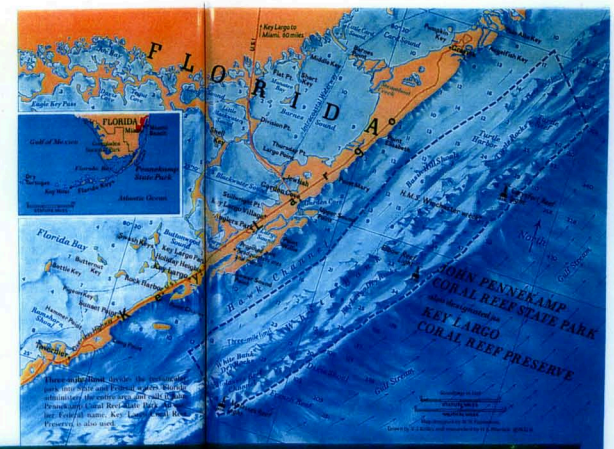
Photographs by JERRY GREENBERG

ALMOST within sight of the oceanside palaces of Miami Beach, a pencil-thin chain of islands begins its 221-mile sweep southwest to the Dry Tortugas.

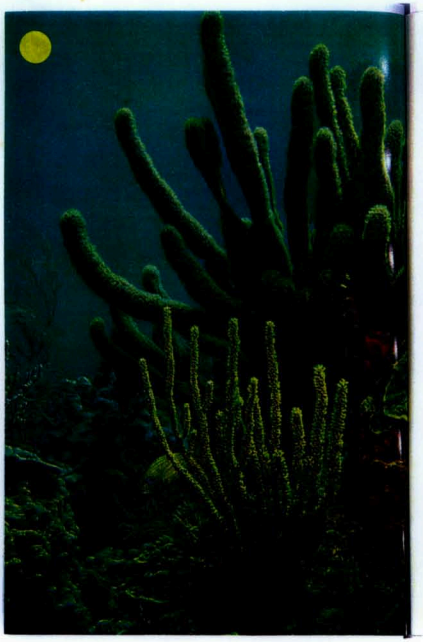
Just offshore, paralleling the scimitar curve of these Florida Keys, lies an undersea rampart of exquisite beauty—a living coral reef, the only one of its kind in United States continental waters. Brilliant tropical fish dart about its multicolored coral gardens. Part of the magnificent reef, a segment roughly 21 nautical miles long by 4 wide, off Key Largo, has been dedicated as America's first undersea park.

I know this reef intimately. For more than 30 years I have sailed its warm, clear waters and probed its shifting sands and bizarre formations in quest of sunken ships and their treasure of artifacts.

Snorkel diver (opposite, right) glides above brain coral into a fantastic undersea-scape of elkhorn and staghorn in the new preserve off Key Largo, Florida.







Here is a graveyard of countless brave sailing ships. Spanish galleons. English men-o'-war. pirate vessels, and privateers foundered on the reef's hidden fangs. In the 19th century alone, several hundred vessels met death here, and the wrecking masters of Key West gleaned close to ten million dollars from salvage operations.

In today's salt-water preserve the boundaries are marked by buoys, and visitors eventually will ride glass-bottomed boats above the lovely coral gardens. Even now the more active visitors fasten on mask and snorkel and bob face-down in gentle swells for a closer look at gaudy reef fish. The most adventurous strap on breathing units and descend to the beautiful coral world that underwater photographer Jerry Greenberg describes vividly on pages 70 to 89.

Author Found Wreck of the *Winchester*

Heavy seas break directly on the outer coral barrier, where the seaward edge of the reef comes up abruptly from the deeper waters of the Gulf Stream. Here, 23 years ago, I found the scattered remains of H.M.S. *Winchester*, which went down off Carysfort Reef, five miles east of Key Largo, in 1695.*

A British ship of the line with 60 guns and a crew of 350, the square-rigged *Winchester* fought with the West India Squadron in the war with France, harrying ports of the French islands. Mission accomplished, she refreshed at Jamaica, then set sail for England and home. But scurvy—that age-old plague of the sea—began to lay her crew low. I did not uncover this interesting fact until two years ago, when I learned that the *Winchester's* log had been saved. Writing to the Public Record Office in London, I obtained photostatic copies of the last few pages.

On September 14, 1695, the unhappy captain recorded that: "... we had not above 7 men Well our Shipp increasing upon us by the water She made in the holds & we Left Distitute of all ability to pump it out our people being all dead and Sick. ..."

Ten days later a vicious gale struck the ship off the Florida Keys. With the crew helpless, only a few men able to stand, the *Winchester* broke her back on the reef.

Key Largo, the nearest land, was inhabited only by fierce Calusa Indians, notorious for practicing human sacrifice and keeping slaves. There was no thought of seeking refuge there. An accompanying vessel rescued eight men—the only survivors.

For 244 years *Winchester's* guns, some weighing more than two tons, lay five fathoms deep, while shipworms made a sieve of her rotten hull. By 1939, when we located the wreck and raised the cannon, the ship had disintegrated.

Eighteen months ago I paid a return visit to *Winchester's* grave. With an air lift and free-diving gear, I hoped to recover objects overlooked by previous expeditions. Fortune favored us. We raised coral-encrusted cannon-

*For a description of *Winchester's* last voyage and the discovery of its wreck, see "Florida Cannon Solve Mystery of Sunken Ship," by Charles M. Brookfield, in the December, 1941, NATIONAL GEOGRAPHIC.

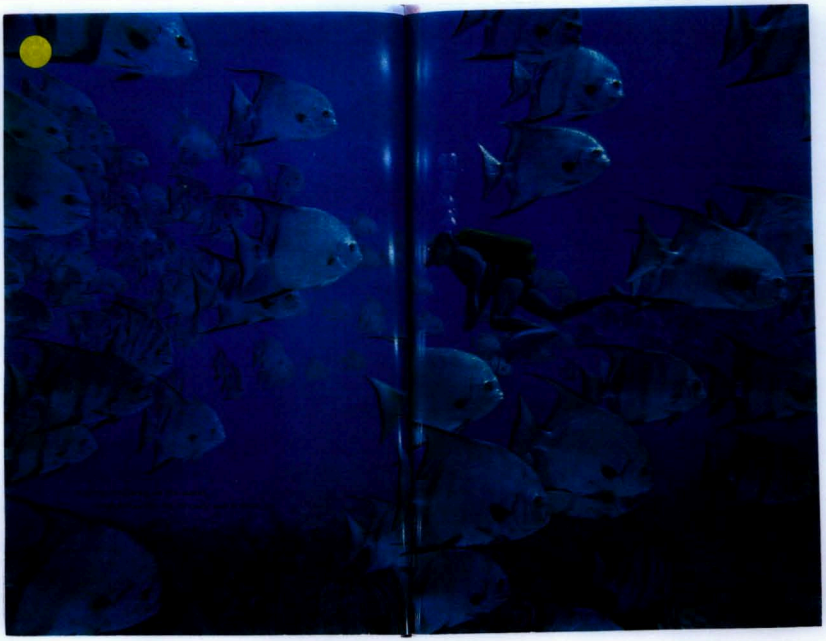
Giant sea whips, or gorgonians, reach for the sun like saguaros in a cactus forest. Blue-striped grunt (*Haemulon sciurus*) peers past the smaller branches below.



Gold watch raised from H.M.S. *Winchester*, which went down off Carysfort Reef in 1695, shows the hours in Roman numerals and the minutes in Arabic. Here a lump of rock bears the imprint of the dial's face in black iron oxide. For 264 years the watch lay on the bottom, sandwiched between an iron fitting and rock ballast.

When he discovered the *Winchester's* grave in 1939, the author salvaged cannon, cannonballs, wrought-iron fittings, and a brass sundial, as recounted in the December, 1941, NATIONAL GEOGRAPHIC. On a return visit 20 years later, this remarkable watch and a universal ring sundial were recovered.

2 EACH



hails, hinges, spikes, and fittings wrought by 17th-century craftsmen.

One day young Charles H. Baker III popped to the surface with an object wreathed in lumps of the ship's ballast. A hammer blow revealed a gold watch within the black mass. The watch's crystal was broken and its works were filled with grit and sand, but, miraculously, one of the brass wheels still turned on the pivots.

It seemed fitting that young Baker made the discovery. His father was with me when we raised *Winchester's* cannon, and the Baker sloop, *Mata Hari*, served as the mother ship of the latest expedition.

A second treasure raised from *Winchester's* remains was a universal ring sundial, used by mariners in the 17th century.

Museum Will Exhibit Relics

Both watch and sundial will be exhibited in a museum which will be constructed in park headquarters on Largo Sound.

Generous citizens have donated 74 acres for exhibit buildings, docks, and launching ramp, and the Florida Legislature has appropriated $150,000 for the center's development. From the marina, glass-bottomed boats will cruise out to the reef.

Here soft-bodied coral polyps—tiny anemonelike creatures that build protective cups of lime—flourish in the warm waters of the Gulf Stream. Billions of their limestone skeletons form the foundations of the reef; vast colonies of the living coral animals grow on the dead, fashioning a fantasyland of strange forms.

Tourists who buy coral at roadside curio shops see only the bleached white skeletons of the once-living colony. But a visitor to the reef may feast his eye on living colors—the green, brown, and gold of stony corals; the blue, purple, and yellow of coral fans and plumes that sway with the current; the pastel tints of towering sea feathers and graceful coral whips (page 60). Altogether, they form one of nature's grandest shows, a submerged landscape of awesome beauty.

A preserve to safeguard this unique underwater world was discussed at a meeting of Florida conservationists in 1957. Dr. Gilbert L. Voss, of the University of Miami's Institute of Marine Science, warned that the gorgeous Florida reef might soon become a watery desert if steps were not taken to protect it.

His statement raised many an eyebrow. What could destroy a reef? he was asked.

"Man," Dr. Voss replied.

Coral From Reef Sold to Motorists

Curio vendors were tearing the reef apart, using dynamite and crowbars. Bargeloads of corals, sponges, and the imposing queen conch shell were piled along the roadsides for sale to motorists. Fish collectors raided the waters, and spearfishermen stabbed everything that swam or crawled.

Despoliation of the reef would have other consequences, Dr. Voss predicted. The coral gardens served as a haven for small tropical fish and a nursery ground for game fish. Without small fish to feed upon, the game fish

The Author: Florida representative of the National Audubon Society, Charles M. Brookfield also heads the State Park Board's Advisory Council on Florida Key Sites. A veteran explorer of Key Largo's reef, he found the remains of H.M.S. *Winchester* there in 1959 (page 61). During World War II he saw action in several theaters as an LST skipper.





Water-living Morays, members of a Miami diving club, leap into the Atlantic's gentle swells above Molasses Reef to explore the sea floor with snorkels, masks, and fins.

Head in Air, Body in the Water, a Diver Prepares for an Inspection Tour of Coral Gardens

Charles H. Baker III clears face mask and breathing tube near Carysfort Light. Refraction of light by water magnifies his body about 25 percent. In this unusual photograph, the camera sees simultaneously in air and water, like the four-eyed fish of Central America which has bifocal vision.



PHOTOGRAPHED BY JERRY GREENBERG, © NATIONAL GEOGRAPHIC SOCIETY

Bold white grunt (*Haemulon plumieri*) inspects a slice of sea urchin held by Judy Meade above a huge brain coral. Tiny blue-head wrasses (*Thalassoma bifasciatum*) hover near for leftovers. Many reef fish show little fear of humans.

Mountains and Valleys Corrugate Brain Coral

Neon goby (*Elacatinus oceanops*) darts over the maze, approximately three-quarter-life-size, at center right. Using fused ventral fins shaped like a suction cup, this tiny fish perches on coral heads. Neon gobies pluck parasites from the mouths and bodies of groupers and other predatory fish.

would go elsewhere. In Florida, where one out of four visitors comes for salt-water angling, such a shift could be of grave concern.

Dr. Voss's plea spurred conservationists into action. The Florida Board of Parks and Historic Memorials approved a 75-square-mile section – 10 percent of the entire reef – as a permanent preserve. The National Audubon Society's staff in Miami encouraged Floridians to write to the governor and the United States Secretary of the Interior.

Because the park's suggested boundaries straddled the three-mile line that divides State and Federal waters, approval by both governments was needed.

Complications delayed the park's birth for three years, but in March, 1960, President Eisenhower proclaimed the Key Largo Coral Reef Preserve. At dedication ceremonies the following December, Gov. Leroy Collins gave the preserve the name of John D. Pennekamp, associate editor of the *Miami Herald* and an ardent conservationist. Thus the protected area is known by two names, one chosen by the Federal Government, the other by Florida.

"His pen has struck down the despoiler and exalted those who would conserve," Governor Collins said of the editor who, in the press and in person, has fought more than 20 years to preserve Florida's natural beauty.

Today the 21-mile stretch of sea in the preserve is dotted with chartered fishing boats trolling the surface and smaller craft of free divers floating at anchor. Fleets of flat-bottomed clouds sail the horizon. Now and again one breaks away from the armada and scurries across the sky, darkening the sea with its shadow.

Fish-hunting cormorants ride the waves, and porpoises play leapfrog with whitecaps. A flying fish skims the sea, and a loggerhead turtle pops up for air. Floats bobbing on the surface mark the lobster traps of commercial fishermen seeking the spiny lobster.

Park rules prohibit spearfishing, but sanction rod-and-reel fishing and lobstering, provided the ocean floor suffers no damage.

Reef a Center for Marine Research

Marine biologists from all parts of the world work above and below the reef's waters. Dr. Voss and his associates at the University of Miami's Institute of Marine Science are carrying on a three-year research project to determine how fast corals grow and the maximum life a reef can sustain. Aided for the past 11 years by the National Geographic Society, through its Committee for Research and Exploration, they are also studying the food-chain relationship between living plants and animals, and the movements of fish populations.

Other scientists are shedding new light on one of nature's most remarkable associations – the relationship between the coral polyps and hordes of tiny plantlike cells that live within them.

Some of these microscopic cells contain chlorophyll, which tints the soft tissues of the





coral green.* Others lend a golden-brown color to their hosts. These cells benefit from the carbon dioxide and other wastes given off by coral tissues; in turn, they supply the polyps with oxygen. Symbiosis, as their mutually beneficial relationship is known, stems from a Greek word meaning "living together."

Close relatives of the true corals, millepores, or stinging corals, also flourish on the reef. Their stinging cells, touching human flesh, cause a burning sensation. Many of their colonies have distinctive shapes: branch-like, flat, or bladelike (page 86).

Altogether, more than 30 different species of coral have been found in this unique underwater preserve.

Other reservations in the West Indies and Florida include undersea areas, but the new preserve off Key Largo lies totally under water. Lighthouses and tide-exposed rocks alone break the surface. The three lighthouses studding the seaward side of the reef – Carysfort (page 64), Elbow, and Molasses – all perch on iron piles.

Carysfort, only habitable structure within the preserve, is manned by United States Coast Guard men. When I first visited it 35 years ago, the Lighthouse Service was in charge. Keepers then spent two months on the light for every 29 days on "honeymoon," their term for shore leave.

I shall never forget my first night on Carysfort. I had gone out with two friends in my cabin cruiser, *Manatee*, with meat and vegetables for the keeper and his two assistants.

Captain Johnson's Ghost Groans

At bedtime my companions and I settled on the lower deck of the light's dwelling, but I could not sleep. As I lay restless, a groan echoed through the lower deck.

"Did you hear that?" I asked.

My friends snored blissfully. I had just about convinced myself that my imagination was playing tricks when the moan was repeated, as if from a soul in torment.

Jumping up, I climbed the steps to the upper deck and circled the dark stairs to the tower, where Harry Baldwin, one of the assistants, was standing watch at the lantern.

"Harry," I panted, "have you ever heard any funny noises down below?"

"Oh, sure," he said, "but we don't pay attention to 'em any more. It's only Captain Johnson, and he just comes around to see if all's well. He died out here on the light, you know. Must have been a great sinner, he groans so. Sometimes he rattles his chains."

Thus reassured – I use the word loosely – I went below and slept, groans or no groans.

Next morning I solved the mystery of the moans, I believe. Under the hot sun, the tower's iron walls expand; in the cool of darkness, they contract. Shrinking, they make sounds startlingly human. My theory may not be true, but I have clung to it ever since.

Seminoles Ambush Lightship Crew

Oldest of the reef lighthouses, Carysfort was first lighted in 1852. But for more than a quarter of a century before that, a lightship had been stationed within the reef. Since the main source of supply for the crew was Key West, about 100 miles away, they cultivated vegetables in a little harbor they called Garden Cove, on near-by Key Largo.

One fine day in 1837, Capt. John Whalton and three of his crew lowered boats and headed for Key Largo to gather firewood. The Seminole Indians had been on the warpath in southern Florida for some time, but there had been no recent attacks on the Keys. It seemed safe enough to go ashore for a few hours.

But dark, hostile eyes watched from ambush as the boats beached. Without warning the Indians attacked, and the captain and one of his crew were killed. The two other men escaped with the boats.

In that earlier tragedy, when the warship *Winchester's* keel struck Key Largo's coral barrier, the crew thought only of cruel rocks and surging seas. Crushing timbers were falling all about them, and the sea was rushing in through gaping holes in the ship's bottom. Soon the swirling waters brought merciful death.

No man aboard the ill-fated vessel could have dreamed that the treacherous reef possessed a rare beauty which man would one day deem worthy of preservation.

Mixed Battalions of Porkfish and Grunts Maneuver in Close-order Drill

Distinguished by its yellow stripes and black bars, the porkfish (*Anisotremus virginicus*) often travels with its relative, the white grunt. Like many reef fish, both species feed by night. This school will disband when the members go foraging for food.

PHOTOGRAPHED © NATIONAL GEOGRAPHIC SOCIETY

*See "How the Sun Gives Life to the Sea," by Paul A. Zahl, NATIONAL GEOGRAPHIC, February, 1961.

Florida's Coral City

Beneath the Sea

Article and photographs
by JERRY GREENBERG

Exploring the wonders of the reef, a diver finds another world and photographs its denizens in color

"BUT THE SHARKS... aren't you afraid of the sharks?" This is a familiar question. My answer is "No," with some reservations.

When working under water, I regard sharks as the man in the jungle does the tiger, or the midtown pedestrian does the reckless driver. I know they are there; sometimes I see them. But I go out of my way to avoid them.

For more than 10 years I have been diving for pictures of fish and coral reefs off the Florida Keys. I have spent thousands of hours in the depths, and I have seen countless sharks—hammerhead, blacktip, lemon, nurse, bull, tiger—but not one of them has ever attacked or even threatened me. I photographed the lemon shark below from a distance of only seven feet.

A shark is cautious; usually it steers clear of a diver if he doesn't bother it. But a shark is unpredictable; no one can say what it will do on any given encounter. "Don't provoke the animals." The admonition to zoo visitors also applies to an underwater reef.

Recently I spent two months roaming beneath the waters of the new John Pennekamp Coral Reef State Park (see preceding article). Here some fifty thousand acres—about 75 square miles—make up America's first park totally under water. This unique preserve

Lemon shark, 10 feet of malevolence, seizes a snapper in razor teeth. Hitchhiking remoras loosen suction disks and rush for scraps



AN EXTRACHROME © NATIONAL GEOGRAPHIC SOCIETY



Silhouetted against blazing sun, a diver glides to the floor of the coral reef preserve.

Sprawled Filefish With Puckered Mouth Seems Asking for a Kiss

Actually, *Alutera scripta* is making a grunting sound as he swims. Other brilliant reef fish share John Pennekamp Coral Reef State Park with artist-diver Judy Meade. Wide-eyed French grunt *(Haemulon flavolineatum)* inspects her fingers; gaudy sergeant major *(Abudefduf saxatilis)* darts between her flippered feet. Bluehead wrasses and yellowtail snappers *(Ocyurus chrysurus)* swim past leisurely. Stinging coral at upper right resembles a basket of flowers. Lobed star coral decorates the reef at lower right.

Working off my 20-foot runabout, I dived four or five days a week. Many days I stayed submerged six hours, ascending only to switch air tanks and reload the cameras.

Often we made underwater photos at dusk. Sometimes we dived under a full moon, and the visibility was good enough to see 30 feet in any direction.

To photograph the reef's eerie beauty, I used four Rolleiflex cameras in Rolleimarin housings, four Leicas in special Seahawk housings, three electronic flashes in underwater casings, and assorted flash guns. To facilitate the changing of cameras, I suspended all gear on lines dropped over the boat's side. We worked mostly in depths of 15 to 30 feet,

where a tank of air can last an experienced diver about an hour and a half.

And what wonders we saw!

Let me show you this world beneath the waves that I find so intriguing and that claims so much of my life. Slip a mask over your face, clench the Aqua-Lung's rubber mouthpiece between your teeth, and drop down with me into the sea.

Awed Diver Feels Like Trespasser

As you sink slowly, you experience an exhilarating sense of buoyancy. The air tank felt heavy above the surface; now you are scarcely aware of it on your back. Freed from the demands of gravity, you move like a bird, free to dive or soar with no other power but your arms and flippered feet.

Just below the surface, jellyfish pump past as you submerge. Living parachutes, they range in size from a dime to a dinner plate. At 20 feet you touch down on the reef. What had seemed a blurred tapestry of color at the surface now assumes dimensions and patterns.

Deep, winding gullies carpeted with sand slice plateaus of coral seemingly so soft, so untouchable you fear they may fade away before your eyes. Such primitive beauty and solitude make a man feel he is trespassing on forbidden ground.

The silence is awesome. Only the sound of breathing through the mouthpiece and

ANSCOCHROME (BELOW) AND AN EXTRACHROME BY JERRY GREENBERG © NATIONAL GEOGRAPHIC SOCIETY



welcomes the free diver, the rod-and-reel fisherman, and the fish watcher. But to the spearfisherman, it is forbidden territory.

While exploring this magnificent marine realm, I encountered only three or four sharks. They did not molest me or any member of my diving party, and we interrupted their privacy only long enough to capture their portraits (pages 71 and 80).

My crew members, who doubled as models, included Judy Meade, a commercial artist; Carl Gage, Paul Dammann, and young Van Cadenhead. Van learned to use an Aqua-Lung three years ago, when he was 10 years old. Now he swims and dives with the best.



As a Diver Plants a Warning Flag, His Boat Appears to Float on Air

"Watch out for free divers," the red-and-white banner tells boatmen sailing the waters around Molasses Reef, America's first underwater park, the preserve welcomes divers and rod-and-reel anglers to its fifty thousand acres, but prohibits spearfishing. From a marina to be constructed on Largo Sound (map, page 58), visitors will ride glass-bottomed boats above the coral gardens. Sunlight filtering through the iridescent water glitters against coral of thirty or more varieties and tropical fish of two or three hundred different species. In this kaleidoscopic world, swimmers stare at the fish, and the fish goggle back.

Species pictured opposite are queen angelfish (*Holacanthus ciliaris*), barracuda (*Sphyraena barracuda*), hawkfish (*Amblycirrhitus pinos*), and moray (*Gymnothorax*).



Spotted moray lurks in coral ambush



Queen angelfish glides past elkhorn coral



Razor-toothed barracuda awaits prey



Hawkfish rests on pectoral fins



Diver and dog snapper play follow-the-leader among stands of elkhorn coral. Dog snapper (*Lutjanus jocu*), a popular sport fish, attains 50 pounds.

Sea Fan and Butter Hamlet Blend Their Beauty as in a Japanese Print

Members of the grouper family, butter hamlets (*Hypoplectrus*) wear coats of various colors: blue, pink, yellow, and orange. This six-inch specimen floats above a boulder-like colony of star coral and branching fingers of pink coral (bottom left). Filigree sea fan at upper right contrasts with skeletal branches of gorgonians at left.



exhaled air bubbling up from the regulator break the quiet. Later, when you have become more acclimated, you may hear the snapping of shrimp, the crunching of the parrotfish as he feeds, and the grunting noises that many fish make.

Reef Fish Escort Divers on Tour

You sense an air of subdued expectancy. The reef waits in hushed judgment until you make clear your intentions, and it is certain that friends have come to call.

Graceful gorgonians raise arched branches like uplifted arms. These dense stands of horny coral sometimes grow as tall as a man. Pastel-hued sea fans spread their lace to the eddying currents (opposite).

Forests of staghorn coral, amazingly like antlers, crown the crest of the reef. Boulder-shaped brain coral exhibits patterns of twisted grooves that bear remarkable resemblance to the surface of the human brain. Star coral, cactus coral, and leaf coral suggest decorations in a potentate's palace. At least 40 species of coral and 25 kinds of gorgonians adorn the reef (pages 58, 60, and 82).

Three queen angelfish in blue and gold lose their sense of caution, emerge from hiding, and swim toward you. A silvery school of spadefish shimmers into view and floats lazily above, below, and beside you, as though providing a path for your swimming pleasure (page 62).

You accept the welcome and begin the tour of a coral metropolis where every square inch teems with life. A red squirrelfish (page 78),





Feather-duster worms, their frilly gill plumes expanded, feed on microscopic plankton. Their coloring closely matches that of the red boring sponges to which they cling. These sponges secrete an acid that etches rock and shells.

Fins bristling, a squirrelfish darts toward a crevice in the rocks. When disturbed, the creature makes a chattering noise. Light-colored star coral appears at upper and lower left. Purple sponges grow above lettuce coral behind the fish.

its dorsal fin spread like a fan, peers at you from its rock crevice. Black groupers rest in shadows at the base of an elkhorn coral.

In the dark recesses of a coral cavern, a massive jewfish lurks to grab the next passing neighbor. Dwellers in this underwater housing development convert every hole, crack, and crevice into a home.

Now before your eyes parade all the beautiful and graceful tropical fish that you have seen hitherto only in aquarium or pet shop tank: sergeant majors in yellow with black bands; queen triggers, gray with two prominent blue stripes on the face; parrotfish arrayed in green, blue, purple, and even polka dots; blue tangs and other surgeon fish ranging from yellow to purple; spadefish in silver with black stripes; unicorn filefish – studies in olive brown with black-and-white markings; horned cowfish; and others whose vivid colors combine all the hues of rainbow and sunset.

All look larger than anticipated, an illusion caused by magnification. Refraction of light by the water magnifies all objects and makes them appear about 25 to 30 percent larger.

Flickering shadows darken the reef as a huge school of porkfish glides by, yellow tails glinting like ornaments of gold (page 68). Slowly the cloud passes as the fish swim elegantly on, follow the turns





Hammerhead shark (top), a remora riding its flank, travels with a convoy of yellowtails. Eyes and nostrils of this shark (*Sphyrna*) lie at the tips of the hammer.

Popeyed squid, common on the reef, moves by jet propulsion. As *Sepioteuthis sepioidea* swims, its 10 sucker-bearing arms press together in the shape of a beak.

White grunts hold a meeting beneath a ledge; one club member seems to voice his opinion. "Grits and grunts" fed the Conchs, pioneer settlers on the Keys.

of a coral canyon, and disappear in the distant gloaming.

A pancake-thin sting ray flaps batlike wings, waves a buggy-whip tail, and skims the sand. An evil-looking barracuda bares razor teeth and swims past arrow-straight (page 75). You have heard that barracudas seldom attack man, but you heave a sigh of relief when he is gone. A vicious moray eel keeps vigil in a rock cave. Any unwary fish that swims too close will find quick death in the moray's curved teeth (page 75). He is no menace to you, however, unless you try to dislodge him from his lair.

Now a bright green-and-yellow fish attracts your attention. Swimming closer, you watch a parrotfish hovering like a blimp above a brain coral. With parrotlike beak and small sharp teeth, it nibbles on the living coral.

You approach a sea whip, or gorgonian, and one of the

many thin "branches" appears to fall off, slither away, and wriggle into a narrow opening. The branch is a trumpetfish – an elongated species that finds perfect camouflage for itself among the gorgonians, whose branches it so deceptively resembles.

You wave your fins gently and glide along the bottom. Beneath you a small pale-blue fish disappears into the sand. At the spot where it vanished, you spy a patch of coral with a hole at the top. Close examination reveals a mound of fragments built up around the entrance of the burrow in which the fish is hiding. The yellowhead jawfish has excavated this retreat, then built up the entrance by picking up coral fragments in its mouth and piling one on another. The crater on top of the mound serves as a door into which the fish backs, tail first, to escape pursuit.

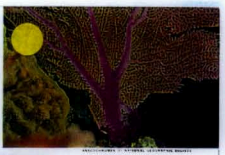
Survival of the fittest is the rule of the underwater jungle; size and might determine the hierarchy. The shark devours the grouper, which feeds on the snapper, which preys on the sardine, which eats the plankton.

Suddenly a flicker of gray cuts through

(Continued on page 88)







Flash and Camera Capture Subtle Colors of Reef Life

For undersea close-ups, the photographer uses a ring-shaped flash reflector around the lens to eliminate harsh shadows. Here wrasses devour bits of sea urchin above a huge brain coral.

Lavender branches of a sea fan (above) divide in a golden network. Gorgonian polyps at left extend petal-like tentacles to feed. These arms retract at a touch. Gray lettuce coral (below) circles the dark hiding place of a worm. Gaping tube sponges and a red sponge (bottom) feed on microscopic plankton.





Star coral owes its delicate green beauty to the algae that live within the polyps and help them extract lime from the ocean. The coral that forms living reefs needs some sunlight for survival. Flourishing within 90 feet of the surface, it usually does not grow below 150 feet, where light is too weak.



Spiral-shaped feather duster worm, living in a star coral, filters plankton swept past by the current.

Riding a snippet of stinging coral, a bristleworm reaches the end of the line.

Among the amazing variety of living creatures that inhabit the reef are many equipped with stinging cells or irritating spines. Divers should not touch bristleworms, which are also called fireworms. Stiff, fine bristles on the worm's sides penetrate the skin on contact, producing inflammation and pain. Living under rocks or dead coral heads, the bristleworm comes out at night to feed.

Stinging corals frequently grow on the horny skeletons of dead sea fans and sea whips. Divers avoid them too, for their minute hypodermics irritate flesh and cause a long-lasting rash.







Fierce moray eel at lower right lurks almost invisible in a crevice in plaster-like millepore, a stinging coral. Tiny wrasse close by barely escapes in a blur of speed. Yellow-and black rock beauty flits past the wavy weft of millepore and the shrublike gorgonian beyond.

the distant blue haze: A 12-foot tiger shark is rocketing in. You stand motionless, frightened and fascinated as the streamlined giant sweeps through the water, caudal fin swishing. On and on comes the monster. When only 10 feet separate you, he turns away. But relief is short-lived as he shoots upward and traces two fast circles above your head. He leaves as abruptly as he arrived.

Breathing becomes more difficult; your compressed air is running low. You pull the air reserve rod on the breathing unit and earn a brief reprieve before you start a reluctant return to the surface.

As you rise toward the roof of the liquid world, you try to recall the bewildering variety of life on the reef. How jumbled the impressions are in your memory! Many more tours will be required before the mind's eye sorts out all the reef's fleeting beauties.

Tips on Safety for Beginners

For visitors planning to explore the Key Largo preserve, I offer a few simple but vital tips. First, and most important, the beginner who wants to use self-contained diving apparatus should take lessons from a qualified instructor. Before each dive he should make a thorough check of his equipment.

Never dive alone or stray far from the boat on a low tank of air. Always stay upcurrent of your boat; in case of emergency, the current will carry you toward it. If you spend more than two hours in water cooler than 78°, wear a rubber suit. After you've been down for awhile, the water begins to feel chilly at 30 feet.

Coral is sharp; watch your step. Be careful, too, where you place your hand. Beware of treading on long-spined sea urchins or brushing against stinging coral.

First Dive an Incomparable Thrill

I remind the amateur photographer that he needs no special magic. If he can take reasonably decent surface photographs, he should be able to get good underwater shots. Obey the basic rules of surface photography, and you will see the quality improve as you practice and experiment under the sea.

Underwater lighting conditions, of course, will vary with the water, the depth, and the time of day. But if you can see your subject you can photograph it – provided your film gets the proper exposure.

Despite my thousands of dives on the reef, I envy the man who is going below for the first time. It is an incomparable thrill.

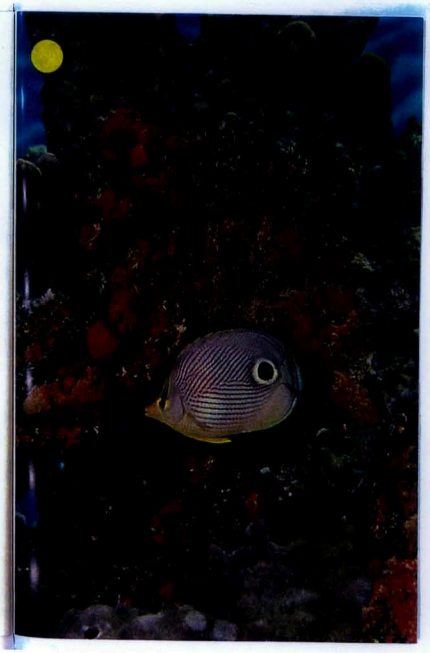
James Aldridge, an Australian writer and veteran diver, has expressed it well:

"You are in another world – absolutely – the moment you put your head under the water. This thought will occur again and again, and you will never become tired of saying this trite thing to yourself. *It's another world, it's another world.*"



Author-photographer Jerry Greenberg has spent more than three thousand hours roaming the ocean floor off Florida's east coast. He himself designed the Seahawk housing for his cameras and flashes. His formula for underwater pictures: patience, practice, and proper equipment.

Adjusting his electronic flash unit, Mr. Greenberg stands on the ladder of his 20-foot, twin-engine runabout.



False Eyes and Look-alike Ends Save Butterfly Fish From Hunters

Deluded by a stripe that partly obscures the true eye, attackers often lunge for the big dot near the tail. With a burst of speed, the little butterfly *Chaetodon capistratus* escapes.