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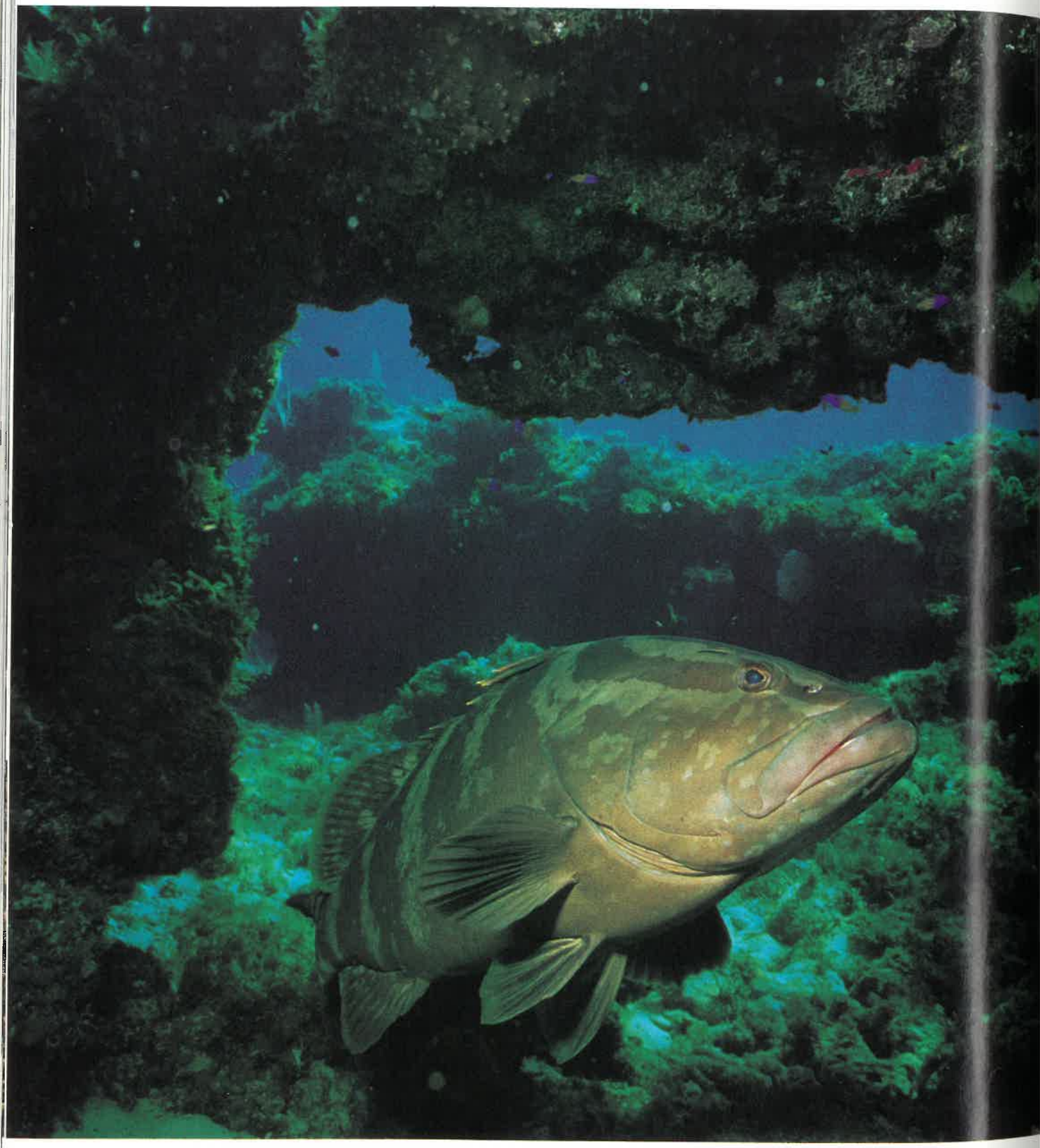


MULTITUDES

Al Huelga

A bottom-dwelling carnivore, the Nassau grouper frequents the many caves and crevices that dot the barrier reef along the coast of Belize. Normally patterned in brown and black stripes, the fish changes color to blend with its background.

Under midwinter moonglow thousands of fish crowd into a Caribbean reef for their annual ritual

BY H. JACQUE CARTER

RENOWNED ECOLOGIST G. Evelyn Hutchison eloquently referred to living organisms as actors performing a great evolutionary play in a theater of ecology. In this vein, surely one of the greatest shows on Earth occurs annually off the steamy tropical coast of Belize, Central America. By the light of the silvery full moon, Nassau groupers gather to spawn in the crystal clear waters of the barrier reef.

The barrier reef of Belize (formerly British Honduras) and its three atolls are unmatched in the Western Hemisphere for size and the luxuriance of corals. The nearly continuous ribbon of reef extends from Mexico's Yucatán peninsula southward about 180 miles to the Gulf of Honduras. More than 35 species of reef-building corals thrive in the warm, sun-drenched waters, providing sustenance and shelter to a mind-boggling variety of marine organisms.

The Nassau grouper, *Epinephelus striatus*, is one of the more common reef inhabitants. A member of the sea bass family, which includes more than 400 species of tropical and subtropical fishes, the Nassau grouper is a bottom-dwelling carnivore that often seeks shelter in the abundant reef crevices and caves. Cryptically colored to conceal itself from unsuspecting prey, it is nonetheless easily distinguished from other coral-reef fishes by five irregular dark brown bars that circle the body, a broad black saddlelike patch near the base of the tail fin, and a prominent dark streak running from the snout through the eye.

In Belizean waters, these fish usually grow to a length of two feet and a weight of 15 pounds. Easily tamed, Nassau groupers often approach delighted scuba divers and snorkelers for tidbits at fish-feeding stations. The species is prized by sport and commercial fishermen and accounts for a major portion of the annual catch of coral-reef fishes.

Throughout most of the year, Nassau groupers of all ages establish well-defined territories amid lush coral forests, where they lead solitary lives. In late November their behavior abruptly changes; the fish abandon their territories and begin to mill restlessly in small groups. By early December, as strong north winds cool the surface water, large schools of Nassau groupers move in waves along the precipitous edge of the outer reef. Coinciding with the full moon in late December—the so-called grouper moon—thousands of these fish, bellies swollen with eggs and sperm, arrive at their ancient spawning grounds. Stacked like cords of wood, they wait instinctively among craggy outcrops of coral for nature's enigmatic signal to spawn.

Scientists have known about the annual gathering of groupers for many years, yet no one had thoroughly studied the phenomenon. The factors responsible for this behavior are buried in the Nassau grouper's evolutionary past.

Feeding sometimes became so frenzied that the groupers would swallow hooks baited only with strips of cloth.

IN MAY 1984, at the request of Wildlife Conservation International (a division of the New York Zoological Society), I went to Belize to implement a combined research and education program aimed at conserving the spectacular barrier reef ecosystem. While there, I heard ominous reports from government officials and local fishermen that Nassau grouper catches had seriously declined in recent years on traditionally productive fishing banks. Indeed, in other regions of the Caribbean, grouper populations had either diminished or disappeared. Nassau groupers depend on coral reefs, utilizing different habitats at different stages of their development. If I could unravel some of the mysteries of this natural history, I could focus public attention on the reef ecosystem and its importance to *all* marine life.

That fall, I gathered a hardy crew—including local fishermen Miguel Rivero and Ivan Staines, Peace Corps volunteers Susan Younkin and Mame Marron, a couple of field assistants, and several scientific colleagues—for a trip to Caye Glory. Once an island of sand and coral shingle, Caye Glory was destroyed in 1961 by Hurricane Hattie. Now only shoals remain. Nassau groupers have been congregating in that region since at least the 1920s, when the bank was discovered, and probably for centuries before.

In early December, with gear and equipment stowed snugly below deck, we hoisted the mainsail of our 30-foot mahogany fishing smack and left the village of San Pedro, on Ambergris Caye. For the next 10 hours we slipped through a maze of lush mangrove swamps and small islands thick with coconut palms. As we cruised the blue-green Caribbean, I thought about the groupers that were making a similar journey in the watery depths below.

After sailing nearly 70 miles, we dropped anchor at Caye Glory Shoals, behind the windswept reef crest. Nearby, some local fishermen were building and refurbishing small temporary huts of mangrove thatched with palm fronds; they would occupy these for the next few weeks, the grouper season. Other fishermen would stay on their sailboats. In the surrounding shallows, men were constructing fish corrals and three-tiered fish-drying racks of chicken wire and mangrove branches, called *tendedores*. The cluster of huts and boats gave the appearance of a floating fishing village. That evening, a gentle breeze stirred as the bloodred sun dipped between cracks in the distant Maya Mountains.

The next morning came early, announced by a flock of clamoring gulls. The fishermen jumped into their dugouts and paddled through narrow cuts in the reef crest. Our party followed a short distance behind in a small skiff loaded with underwater cameras, video equipment, and dive gear. We soon arrived at the grouper bank a quarter mile off shore.

Our first task was to set up an underwater video camera on the ocean floor, which would enable the surface team to monitor fish activity on the bank. Ever watchful to avoid fishing line entanglements, we slowly descended 80 feet to the rocky bottom. Swift currents made movement difficult, and we labored under bulky equipment, consuming our air supply at an alarming rate. We had to work fast. Communicating by hand signals, we secured the video camera in a sandy depression between two jagged pillars of coral.

This task accomplished, we had just enough air left to make a quick count of the groupers. Pivoting slowly, we scanned the bank. Thousands of fish (probably 20,000, I later estimated) were concentrated among the coral formations. Not a crack or crevice remained unoccupied; groupers were squeezed into every available space, moving nervously like expectant parents.

Keeping a close eye on our air supply, I finished my survey and gave the signal to surface. Halfway up, we ran into trouble: One of the divers had exhausted her airtank. Breathless and unable to fight the current, she signaled her buddy for help. Fortunately he was able to assist her.

While the other divers extricated themselves from scuba gear and camera equipment, I watched incredulously as fishermen hauled in one grouper after another. They lowered linen handlines bearing several baited hooks to the bottom; then giving a strong jerk on the line, they rapidly hauled the fish to the surface, "winded" them, and placed them on stringers fastened to the stern. Fishermen wind a grouper by piercing the swim bladder with the point of a hollow metal tube to relieve the pressure that results from surfacing too quickly. That way the fish can swim normally while on the stringer and not flop helplessly on the surface. At midday we hauled anchor, the fishermen pulled in their rigs, and we all returned to camp.

Later that afternoon we carried our measuring boards, scales, and notebooks to the fish corrals, where the men were cleaning the day's catch. We scribbled down the weights and lengths of hundreds of fish destined for market. From the ones that were to be filleted, we took reproductive tissues and examined them to determine sex and state of sexual maturity. We also removed scales and small bones from their braincases for microscopic examination in the laboratory. Like the rings in a cross section of a tree, marks on these samples would reveal age and growth rates.

OVER THE NEXT SEVERAL DAYS we logged many hours under water, recording the activities of these curious creatures. During the day, the fish swam about in small groups of six to 10. I surmise that they spent much of this time looking for food on the crowded bank, particularly because so many ended up on fishermen's hooks. The men usually used small grunts and sardines as bait, but feeding sometimes became so frenzied that the groupers would swallow hooks baited only with strips of cloth.

As spawning time drew near, the groupers began to cluster and circle about one another. Several times a day, the males flashed a bicolored pattern—jet black above, brilliant white below the midline, and a white bar running from the snout to the forehead. The females turned pale gray or white with no conspicuous markings. Then, just as rapidly, both sexes would assume their normal black-and-brown body pattern.

Spawning seemed to begin on the third day after the full

Belize fishermen (left) release the day's catch of Nassau groupers (one in black-stripe color phase below) into holding pens.

Doug Perrine; Howard Phipps III (inset)

PERSPECTIVE: The Mysteries of Group(er) Sex

TRUTH IS OFTEN much stranger than fiction, especially when you consider the processes by which animals and plants reproduce. The Nassau grouper is a case in point. In the normal course of events, animals mature as one sex or the other and stay that way for life. Not the Nassau grouper. Fish of this species mature first as females, then later some of them become males. This transformation is irreversible and may occur when the animal reaches anywhere from 10 to 34 inches.

The grouper's sex organs lie in pairs below and slightly behind the swim bladder. During the sex change —a process lasting several weeks to a few months—the female sex tissues degenerate, the male reproductive tissues enlarge dramatically, and sperm production begins. We don't yet know the underlying physiological mechanism of sex inversion or the factors that control this amazing process in Nassau groupers.

Changing sex is widespread among coral-reef fishes. In some species, females become males (protogyny), and in others, males become females (protandry). In still other fishes, individuals can be both sexes at the same time (hermaphroditism). But what advantages do these tactics provide for the survival of the species? Why should natural selection favor this development?

H. Jacque Carter

As spawning time nears, the groupers begin to cluster. Males flash black above the midline, white below; females sporadically turn pale gray.

A number of scientists have proposed a size-advantage theory, which explains some but not all cases of sex change. For example, fishes that switch sex from female to male often live in social units in which larger males monopolize spawning females. In such communities, small males may not spawn at all, but small females have little difficulty finding mates. Natural selection favors protogyny in this case because an individual that functions as a female when small and as a male after attaining a large size would produce more offspring than one that didn't change sex.

Conversely, fishes that change from male to female take advantage of an increase in the females' egg-producing capacity with increasing size. Males usually produce millions of sperm, and small males are physically capable of fertilizing females of all sizes. In fishes where mating is by random pairing (rather than within the harem social structure), the small-male–large-female combination maximizes reproduction potential.

Sex change among Nassau grou-

moon. At that time, the fishermen started catching Nassau groupers that were freely releasing eggs. It is the condition of the *female* of the species that triggers the commencement of spawning. Both sexes congregate at the bank for weeks prior to breeding. The males arrive "running ripe," which means they are capable of releasing sperm at any time. Females, on the other hand, appear to carry their eggs in a state of near-readiness until they receive nature's signal to release them.

Late on the afternoon of that third day, the fishermen reported a huge school of groupers along the edge of a steep drop-off. Between 5,000 and 10,000 fish had formed a cone-shaped aggregation that stretched from the 100-foot-deep ocean bottom to within 50 feet of the surface. The fish were no longer interested in taking bait. Scientists have suggested that Nassau groupers enter what they call spawning stupor, a state that ensures continued breeding despite threats from predatory sharks.

Jacques Cousteau, in a popular television film, *The Fish That Swallowed Jonah*, documented a similar aggregation of groupers off Caye Glory in 1970, apparently during spawning. In the film, the females slowly rose in the water while shedding perhaps a million eggs apiece. The males circled attentively, releasing milt as they nudged the females' bellies. Individuals in the aggregation we observed displayed similar behavior.

Spawning continued intermittently over the next several days. By the new moon, the fish had dispersed so we left camp and returned to San Pedro.

A few weeks later, we sailed to Caye Glory to observe grouper activity on the bank at the next full moon. Local fishermen believe that a different school of Nassau groupers arrives to spawn then. Catch records indicate that, until recently, the fish did indeed bite well during January's full moon. Unfortunately, there is no way of knowing from this information if the fish were new arrivals or holdovers from

pers, however, is difficult to explain using this theory. The behaviors common to nearly all protogynous coral-reef fishes—frequent social interaction, frequent spawning by large monopolizing males, and dense populations living in separate colonies—are not seen in this species. Male and female Nassau groupers are solitary and widely dispersed along the reef. They gather only to spawn, which brings up another mystery of grouper sex. How do the fishes manage to congregate at the same few sites each year?

In Belize, spawning appears to be related to water temperature and lunar cycle, commencing when surface temperatures cool during late December and early January. Scientists have suggested that peculiarities in currents or other physical conditions may attract groupers. Some hypothesize that fish move to the edge of the reef and follow the drop-off until they meet other groupers and begin to stack up. Older fish, many of which have bred at the banks before, may return to the same spots, leading younger fish there. Intriguing explanations, but they leave many questions unanswered.

Perhaps the key to understanding Nassau grouper spawning behavior lies in the dispersal of eggs and the return of larvae to shallow water. Migrations to specific spawning grounds may be adaptive because they result in eggs and sperm being shed in regions where water conditions (temperature, salinity, oxygen levels, currents) facilitate offshore transport, thereby minimizing larva predation. Grouper aggregations occur during the full moon, possibly taking advantage of peak tidal flow.

Our study of five widely scattered spawning sites off the coast of Belize supports this theory. Two of the grouper banks lie along the barrier reef, about eight to 20 miles off shore. Farther out, the spawning aggregations take place off three picturesque coral atolls. All of these spawning banks are located on northeast promontories on the seaward slope of the outer reef, and all have strong eddy zones, upwellings, and very strong surface and subsurface currents. The fish concentrate in two or three channels of spur-and-groove coral formations at depths of 80 to 100 feet. They seek shelter on a bottom that is scattered with outcrops of hard boulder coral surrounded by sea fans, sponges, and bushy soft corals. Just a few yards seaward of the grouper banks, the floor drops off sharply, forming precipitous canyon walls bounded by deep blue water.

Choosing these sites may increase the likelihood that eggs and larvae will be quickly carried away from predaceous filter-feeding corals and such reef-dwelling, plankton-eating fishes as blue chromis and wrasses. Upwellings of nutrient-rich water may provide grouper larvae with abundant food. And finally, prevailing currents and eddies improve the chances that the larvae ultimately will be returned to the reef.

Like rockets projected into space, larval Nassau groupers are launched from the spawning banks into the vastness of the open ocean. Millions of buoyant, translucent, spherical eggs—each no more than 1mm (1/25 of an inch) in diameter—form billowing clouds that are carried out to sea by strong wind-driven currents. Twenty-four hours later, tiny larvae emerge from the egg capsules, with large yolk sacs, no fins, and unpigmented eyes. After five days of drifting, they have absorbed their yolk sacs and must find food. During the next month, the larvae forage heartily on floating microscopic plants and animals.

Soon their pelagic life-style draws to a close, as the prevailing currents return the youngsters to the protection of the coral reef. Upon arrival, they metamorphose and assume the adult form. Like snowflakes, they settle in the sheltering cracks and crevices of the reef. Five years later, only a small fraction of the fish have survived. Before long, they will feel the irresistible pull of the lunar tide and begin their first trip to the spawning bank . . . as females, of course.

H. J. Carter

the previous spawnings. The January 1985 aggregation was much smaller than the one we had witnessed at the earlier full moon, and we saw neither a cone-shaped school nor any evidence of group spawning. The fish that were caught were ripe with eggs and sperm, but groupers are capable of reabsorbing them if they don't spawn.

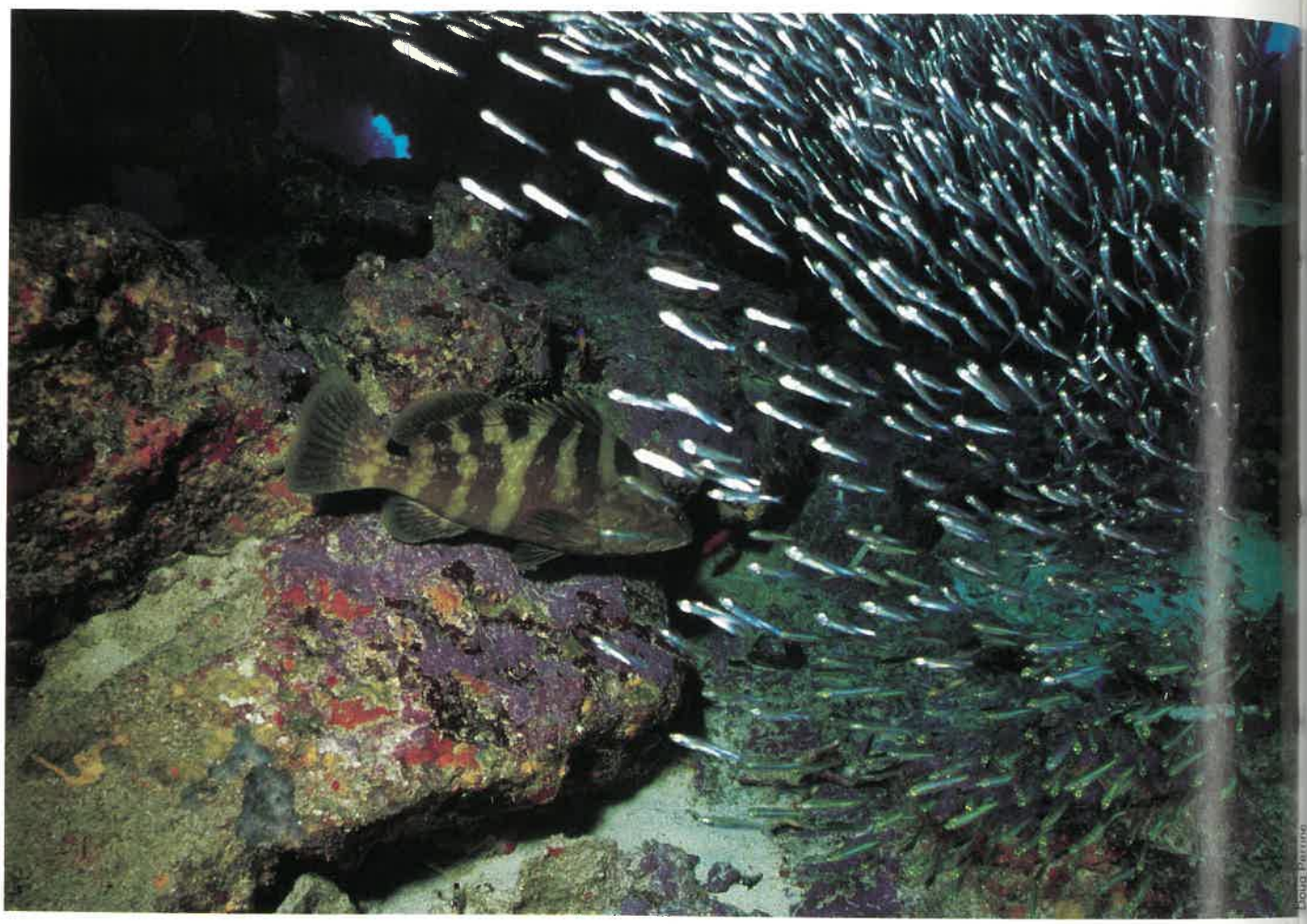
AFTER THEY SPAWN, Nassau groupers scatter throughout the barrier reef and resume their solitary life-styles. In an effort to learn more about the species' behavior year-round, we are using two tagging procedures, enabling us to chart grouper home ranges, movements during feeding forays, and social interactions with other fish.

In the first procedure, chevron-shaped wire traps are baited with small fishes or lobsters and set on the ocean floor in approximately 60 feet of water. Groupers caught in the traps are measured, weighed, and tagged with dime-sized plastic disks bearing my name and address and an identification number. Attaching the tag to the dorsal fin does not harm the fish. People who catch the tagged fish report their locations and numbers to me.

I have also begun high-tech fish tracking—following a few selected individuals outfitted with ultrasonic transmitters. A paraffin-coated cigar-shaped transmitter is inserted through a small incision in the fish's abdomen. I then suture the cut, administer antibiotics, and release the animal. The transmitter has a battery life of 14 months and generates beeps that I can locate with a hydrophone.

Our fieldwork indicates that the majority of groupers inhabiting the shallow lagoon waters are either juveniles or mature females; males prefer the deeper water of the outer reef. Andarín (Spanish for wanderer) is one of our sound-tagged subjects. A mature male, he frequently hovers near the bases of massive coral pillars framing the steep canyons and drop-offs of the outer reef. As a rule, Andarín is territorial and does not venture far from cover.

Some fishes swim constantly in search of food, but groupers often wait, camouflaged against the coral reef, for unsuspecting prey.



Closer to shore, Bocón (big mouth), an immature female, resides in one of the many limestone sinkholes that honeycomb the lagoon. These underwater apartments are interconnected by tunnels and provide shelter for countless creatures on the crowded reef. Bocón shares her abode with two triggerfish, an octopus, and a moray eel. Very young Nassau groupers (one and a half to three inches long) make their homes in piles of abandoned conch shells, mounds of coral rubble, and occasionally, discarded rum bottles.

Like all Nassau groupers, Andarín and Bocón are quick-change artists, adept at assuming the colors of the habitat, particularly when moving from one site to another and when startled. One afternoon, I had a little difficulty finding Bocón. She was nearly indistinguishable against the gray coral rubble of the sea bottom. Surprised by my appearance, she swam away into a thick stand of turtle grass. Almost immediately her color changed to match the swaying blades of green grass dappled with sunlight. Many top-level predators on the reef use cryptic coloration to conceal themselves from prey.

Some fishes swim constantly in search of food, but Nassau groupers often wait for food to swim to them. Andarín and Bocón usually linger in the openings of caves and reef crevices. When small fishes, crustaceans, and other marine animals venture too near, the groupers rapidly expand their cavernous mouths, drawing water in over their gills and engulfing the prey in the powerful suction. By examining stomach contents of groupers, we have discovered that large adults rely heavily on other fishes and younger ones eat a more mixed diet.

We've also learned that Andarín is most active at dawn and dusk, when light levels are low. It would seem to make more sense to obtain food during late morning and early afternoon, when ample sunlight filters through the water. The cones and rods of the Nassau grouper's eye, however, are arranged so the fish can easily make out shapes and objects in dim light. Twilight and dawn are changeover periods in the coral-reef community: When diurnal residents seek shelter, the nocturnal ones become active; positions are reversed at dawn. Thus, as day breaks and as daylight fades, Nassau groupers take advantage of the ensuing confusion.

When small fishes venture too close, groupers open their cavernous mouths and engulf the prey in a powerful suction.

IT MAY SURPRISE YOU to learn that all Nassau groupers mature as females and that a number of individuals later become males. This reproductive behavior is called protogyny [see "The Mysteries of Group(er) Sex," page 66]. We don't know what triggers the switch or why certain animals remain females; those are questions I hope to be able to answer as my study progresses.

The change in sex among Nassau groupers may not occur until individuals are well into their teens. This presents a problem for biologists and others concerned with the species' management and conservation. Because male groupers grow larger than females, a fishing industry that consistently selects big specimens will create an imbalanced sex ratio, and some females may be unable to produce their maximum number of offspring because mates will be scarce. Unrestricted harvesting of Nassau groupers—primarily by spear gun and to a lesser extent by hook-and-line and trap fishing—could seriously endanger their populations in Belize. Meanwhile, the number of spearfishermen in Belize is growing.

Every year since the early 1920s, Mestizo, Creole, and Carib fishermen have set up their camps to catch groupers at Caye Glory. In the 1950s, the industry flourished; more than 600 local fishermen landed catches well in excess of 100,000 pounds annually. In striking contrast, only a few dozen fishermen gambled on the Caye Glory bank in 1986, landing less than 30,000 pounds. At the same time, the demand for fresh fish continues to increase. In the early years, supply exceeded demand, and nearly all the fish caught were salt cured and sold to neighboring inland communities. Now the majority of the fish are frozen whole and sent by air to markets overseas. If the trend of diminishing supply and growing demand continues unchecked, the fishing industry could fail, resulting in a serious loss of income for people of the region.

Besides the substantial economic loss, there are considerable ecological consequences of overfishing coral-reef communities. Some fishery biologists think a minimum population size may be necessary to ensure formation of the grouper spawning aggregation and to stimulate group spawning behavior. If populations fall below that threshold, these aggregations may cease to exist. Furthermore, the removal of large adult Nassau groupers from the reef may upset the organization of the fish community. In the crowded and diverse coral-reef ecosystem, the size of a fish, not necessarily the type, may determine a species' role. Loss of large individuals may not confer any advantage on younger, smaller ones; for example, big groupers may be replaced by similar-sized fish of a different species.

Traditional methods for protecting and conserving marine resources undoubtedly were devised and practiced long before Western civilizations recognized the need for such controls. At the height of the Maya civilization—from A.D. 300 to 900—it is believed that more than a million people lived in Belize and on the associated islands, compared with the 150,000 inhabitants today. The great quantities of manatee and fish bones, shell fragments, and fishing gear found at island sites in Belize have revealed that those native Americans actively fished the reef waters and may well have exported their products to Mayan centers on the mainland. Archeologists have discovered that early peoples of the western Pacific islands developed conservation measures such as closing sections of overfished reefs at certain times of the year. Probably native Americans of the Caribbean did likewise.

By the time the Spanish arrived, in the early 1500s, maritime trade flourished along the coasts of the Yucatán peninsula and Belize. Since then, several centuries of contact with European colonizers have eliminated many of the traditional conservation practices. Although local fishermen possess invaluable natural history knowledge—such as the locations of grouper spawning banks and turtle nesting beaches—they are unable to conserve their natural resources in the face of increasing development and exploitation. The Belize barrier reef ecosystem will surely experience a conservation crisis unless modern management methods are implemented.

The most effective means of conserving Belize's renewable marine resources is a holistic approach. A protected area established on the basis of esthetic qualities or species diversity and other scientific criteria, but without regard for traditional human usage, stands little chance of success. With this concept in mind, the New York Zoological Society, in cooperation with the government of Belize, is working to establish reserves throughout the reef ecosystem, incorporating human customs and practices into the management plans.

The Belize government set aside a small portion of the reef in 1982. Half Moon Caye Natural Monument protects an area of offshore reefs, islands, mangrove keys, and sandbars in Lighthouse Reef, about 65 miles southeast of Belize City. HMC Natural Monument, Belize's first national park, is one of few marine reserves in Central America. Another one has been proposed to conserve the reef in Hol Chan Channel, near San Pedro.

To date, however, the government of Belize has not established a federal agency to develop and administer its national parks system. Protected areas are supported by nongovernmental organizations—among them Belize Audubon Society, World Wildlife Fund, and NYZS—and managed in cooperation with the government. I hope to see a Belize barrier reef authority created, modeled after the agency that oversees similar marine reserves in Australia. Until then, HMC Natural Monument and the proposed Hol Chan reef park, along with future small parks, should be regarded as individual gems along the barrier reef that will eventually be strung together in a necklace of protected marine habitats. □

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How to Explore the Barrier Reef of Belize

WARM TROPICAL BREEZES, lush forests of coral, aquamarine waters teeming with beautiful fishes, palm-covered keys, romantic sunsets, tales of swashbuckling pirates and buried treasure. These are just a few of the things that lure sailors and landlubbers alike to Belize.

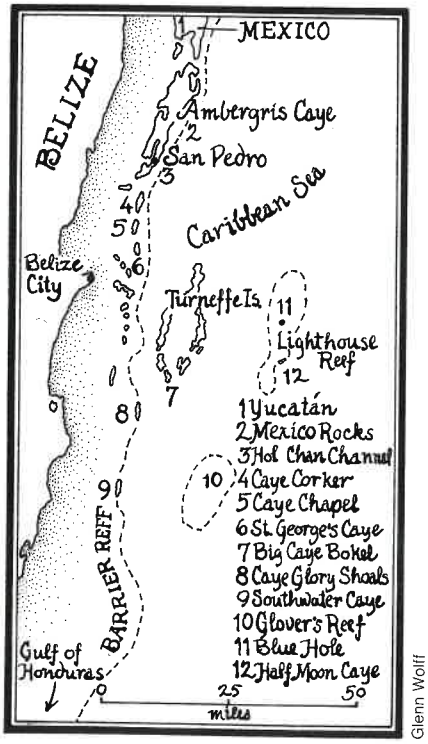
Sitting on the western shore of the Caribbean Sea, Belize is bordered by Mexico on the north and Guatemala to the west and south. Mountainous Honduras looms on the southeastern horizon across the deep waters of the Gulf of Honduras. Although geographically part of Central America, the country has strong ties to the Caribbean, especially the former British colonies. After 130 years of British rule, Belize achieved independence in September 1981. Sparsely populated and lacking the great disparities of wealth that have led to unrest elsewhere in the region, Belize has emerged a beacon of peace and political stability.

Just offshore of this small, friendly country lies the greatest barrier reef in the Western Hemisphere, stretching from the southern tip of the Yucatan peninsula to the Gulf of Honduras. Immediately seaward of the reef lie three lovely atolls, one of which—Glover's Reef—was chosen by a team of leading marine scientists as the best site for coral-reef study during the 1970s. The quiet lagoon waters that extend 8 to 25 miles from the barrier reef to the mainland are filled with patch reefs, vast sea-grass meadows, and mangrove swamps.

The barrier reef and its three atolls may be the country's most spectacular natural features. An effective barrier against the power of the sea, the coral reef protects island shores and the mainland coast from erosion by dissipating the energy of battering waves. The reef appears to be lifeless rock but it is alive, expertly constructed by colonies of minute organisms called polyps. As each polyp grows, it forms a compartment of calcium carbonate that remains even after the animal dies. Over the years the immense structure of coral-built rock reaches the surface; the outer portion is the living part of the reef.

Inhabiting the tissues of the polyps are thousands of single-celled plants called zooxanthellae. In what is known as a symbiotic relationship, the tiny plants derive nutrients from the polyps' waste products and the coral uses by-products of zooxanthellae photosynthesis. In daytime, the coral organisms withdraw their anemonelike bodies into their stony compartments, but at night they extend fully to capture microscopic animals and plants that float in the water.

There are several ways to see Belize's barrier reef. Chartered sailboats and professional dive boats make daily excursions from some of the more than 200 offshore keys. One of the more popular keys for diving, snorkeling, bird-watching, and sportfishing is the largest island—and my home for the past two years—Ambergris Caye. It is serviced several times daily by short commuter flights from Belize City. The main town of San Pedro (population 1,500), near the southern tip of this 25-mile-long island, exudes Caribbean charm—sun-faded pastel houses, thatch-roofed cabanas, sociable bars, mahogany fishing smacks anchored in the lagoon, and friendly people. Bare feet are the rule, whether you are crossing a sandy street or exploring a ridge on the windward shore. San Pedro has about 20 hotels and lodges and offers sportfishing and water sports such as windsurfing, jet-skiing, and glass-bottom-boat rides over the barrier reef, only a few hundred yards from shore. Most fishing and diving is done from 20- to 24-foot wooden skiffs powered by twin outboards; a few larger vessels are available upon request.



Glenn Wolff

In the tidal flats, scrappy bonefish, permit, and tarpon abound. Closer to the reef, snapper, grouper, hogfish, and toothy barracuda stalk their prey. Farther out, king and Spanish mackerel, bonito, wahoo, sailfish, white and blue marlin, and swordfish cruise the deep blue water.

Inside the reef, at Mexico Rocks and the proposed Hol Chan underwater park, all one needs to see numerous fishes and colorful corals are a mask and a pair of fins. Underwater photographers can hone their skills at capturing the herds of grazing parrotfish and surgeonfish, browsing angelfish, electric blue neon gobies and rainbow wrasses, pugnacious damselfish, graceful butterflyfish, and darting schools of grunts and snappers. I recommend diving on calm moonlit nights at the Hol Chan cut, a natural break in the reef. At dusk there is a changing of the guard on the reef as dark red squirrelfish, soldierfish, cardinalfish, and copper sweepers emerge from coral caves, cracks, and crevices. If you are lucky, you may see an octopus scrambling about or a train of lobsters walking gingerly on the bottom.

Experienced divers and snorkelers can find excitement in the deeper reefs beyond the crest and atoll rims, where the seafloor gradually deepens

to the edge of a 100-foot drop-off—a great place to photograph turtles, eagle rays, and giant groupers. From the 100-foot mark the bottom seems to disappear into deep blue. Vertical walls plunge to a depth of several thousand feet. Giant barrel and azure vase sponges as well as bright yellow tube sponges adorn the walls and provide a colorful backdrop for clouds of plankton-feeding fishes such as Creole wrasses and brilliant blue chromis. The corals alter their positions to capture the waning rays of sunlight, often forming great plate-like structures along the wall.

Other keys also offer diving and fishing, with resorts ranging from rustic to chic. Caye Corker, Caye Chapel, St. George's Caye, and Southwater Caye are adjacent to the barrier reef. Big Caye Bokel, in the Turneffe Island chain, also provides facilities for divers and sportfishermen, and there is a rustic divers' lodge at Glover's Reef. Lighthouse Reef, a large atoll about 65 miles southeast of Belize City, is the home of the famous Blue Hole. This 400-foot underwater shaft was filmed by Jacques Cousteau in 1970. Half Moon Caye, which lies at the southeast corner of Lighthouse Reef, has been designated a natural monument by the government of Belize, giving needed protection to colonies of red-footed boobies, herons, roseate spoonbills, and many other native birds.

Belize is directly accessible from Miami and Houston on a daily basis and from New Orleans, Washington, D.C., New York, and Los Angeles at least twice a week. For more information, see "Destination: Belize," *AK*, September/October 1986, or your travel agent.

Diving and fishing gear and underwater cameras may be brought in for personal use. Scuba tanks and weights are available locally at dive shops. Both the U.S. and Belizean (BZ) dollars are acceptable in most places; the exchange rate is U.S. $1 = BZ $2. The rainy season runs from May through October; the rest of the year is relatively dry, with especially delightful weather during the winter holiday season. The best diving is in late spring, when the water is clearest and visibility often exceeds 100 feet. Water temperature ranges from a winter low of 73°F to a summer high in the mid-80s. The air temperature is balmy year-round, with evening sea breezes on the islands.

photos by Stephen Frink/WaterHouse © 1986

Belize's barrier reef is a divers' and snorkelers' delight: Angelfishes (top) swim among brain and other corals; a cleaner shrimp (above) seeks shelter in a sea anemone.

Belizeans take great pride in their barrier reef and are quick to stress the need to ensure its future. The country is strongly oriented toward conservation. Ten reserves and bird sanctuaries have been established by the Belize government to protect native wildlife. Recently, Belize gazetted the world's first and only jaguar reserve in the Cockscomb forest basin. In the near future, we look forward to the establishment of the Hol Chan marine reserve and national underwater park.

It is with great pleasure that I invite you to discover this gracious country and its coral reefs. You won't Belize your eyes!

H. J. Carter