



Masked Angelfish (*Genicanthus personatus*) male.



Japanese Pygmy Angelfish (*Centropyge interruptus*).

EXPEDITION TO MIDWAY

□ Eleven hundred miles northwest of Honolulu, Hawaii -- halfway between America and Asia -- lie two tiny islands known simply as Midway. Most people remember Midway as the site of a great World War II sea battle; marine aquarists know it also as home to one of the rarest and most beautiful Hawaiian fishes -- the masked angelfish, *Genicanthus personatus*. Not discovered until 1972 and almost never seen or collected around the main Hawaiian Islands, "Midway angelfishes," when they can be obtained, command over \$1000.00 apiece in the aquarium trade. Several articles on this species have appeared in FAMA over the years.

At 28° north latitude, Midway is the second most northerly coral atoll

in the world (its neighbor, Kure, about 50 miles to the west, is the first). Thus, as well as being halfway between East and West, these islands also lie midway between North and

By John Hoover

South, between the tropics and the temperate zone. Because of their latitude, Midway, Kure, and the other Northwestern Hawaiian Islands are home to a number of unusual fishes rarely seen elsewhere.

As a resident of Hawaii, I often wondered what it would be like to dive these waters. My chance came when a last-minute diver and

photographer was needed for a small expedition sponsored by Honolulu's Bishop Museum. The primary goal was research -- the compiling of a list of fishes for Midway Atoll -- but the expedition had a secondary purpose: to capture live specimens of *Genicanthus personatus* for the Waikiki Aquarium.

Fish collecting at Midway is not easy to arrange. The Northwestern Hawaiian Islands, a 1000 mile arc of reefs, shoals, and coral islands (including Midway), are a vast wildlife refuge administered by the U.S. Fish and Wildlife Service; Midway itself is a U.S. Naval Air Station. A daunting number of permits are thus required to visit, dive, and collect specimens.

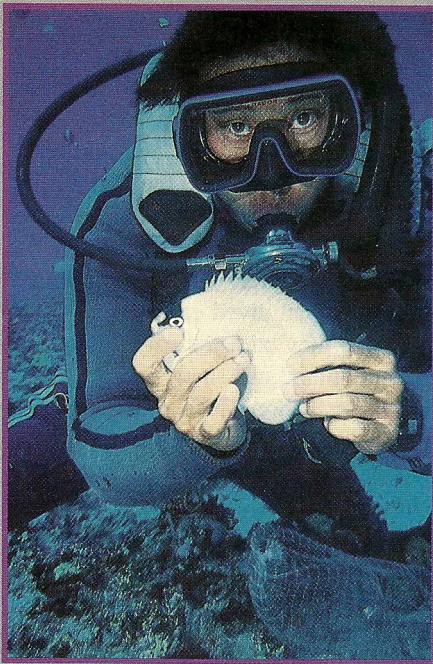
Luckily, the Bishop Museum took



Hawaiian Anthias (*Pseudanthias thompsoni*) male.



Dragon Moray (*Enchelycore pardalis*).



Marj Awai holding Masked Angelfish.

care of the paperwork; I had only to apply for a security clearance and turn up at the airport.

On the morning of May 28, 1992, four of us met at Honolulu's Hickam Air Force Base for the weekly flight to Midway: researchers John Earle and Therese Hayes from the Bishop Museum, aquarist Marj Awai from the Waikiki Aquarium, and myself as "dive buddy at large" with camera. We brought with us scuba tanks, weights, and miscellaneous equipment including an oxygen bottle, bang sticks, and large plastic garbage cans in which to keep the angelfishes. These we somehow bundled into the regulation two pieces of baggage per person, each weighing less than 70 lbs. The flight (on a nearly empty C-41 cargo plane)



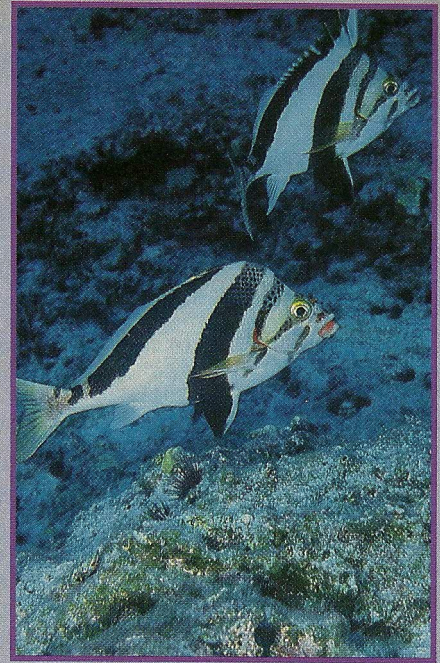
Whiskered Boarfish (*Evistias acutirostris*).

lasted a little over two hours.

Fishes aren't the only inhabitants of Midway. Ask anyone who has been there what they remember most and they'll instantly answer "birds." I soon saw why. Numbers of large white sea birds and their fuzzy turkey size chicks covered a grassy slope abutting the runway. So was the field beyond, acres in extent. The two islands of Midway, Sand and Eastern, are the world's largest nesting sites for the Laysan albatross (*Diomedea immutabilis*). For nine months out of twelve these "gooney birds" and their chicks occupy every available piece of open ground. In some places driving is impossible without someone preceding the vehicle on foot to shoo them away.

Gooney birds probably got their name when sailors watched their strange courtship "dance." Pairs of adults face each other whinnying like horses and bobbing their heads vigorously up and down. After several minutes of this, they tuck their heads under their wings, then emerge clacking their beaks rapidly like castanets. Finally, stretching on tiptoes, they point their beaks straight up and honk. The image of gooney birds "sky-honking" has become the very symbol of Midway, emblazoned on everything from fuel tanks to T-shirts.

Before I get to the fish collecting I must mention something else: Midway is a ghost town of sorts -- a place of memories. Commercial flights ended in 1950 and the Navy pulled out in force years ago. This once bustling community of thousands, including families, is now



Hawaiian Morwong (*Cheilodactylus vittatus*).

reduced to about a dozen Navy personnel augmented by a few hundred contract workers, almost all from Sri Lanka, Thailand, Korea, and the Philippines.

I took a walk late one afternoon down Nimitz Avenue, toward an area marked simply on the map, "Historic Housing." After a hundred yards the asphalt disappeared under a cover of casuarina pine needles, fallen branches and birds. I found a school, playground, barracks, officers' and nurses' quarters, an NCO club -- all left to the birds and creeping vegetation, and slowly falling apart. If you like nostalgia, you'll love Midway.

You will also love it if you're a naturalist. Green turtles nest here, as well as sea birds, and endangered



Laysan Albatross (*Diomedea immutabilis*) "sky-honking."

Hawaiian monk seals haul up on the beaches, even the boat ramps. Most important for us, of course, were the fishes. I was looking forward to seeing for the first time some of the unusual species found only at the outer fringes of the tropics, strange fishes such as morwongs (*Cheilodactylus vittatus*) and whiskered boarfish (*Eviostias acutirostris*). And, of course, the masked angelfish.

We made our first dive in the lagoon off the cargo pier. The visibility was poor, as expected, but the temperature surprised us: at 68°, it was cold by Hawaii standards and our light wet suits were barely adequate. Under the pilings, though, we soon forgot our discomfort. Schools of large thick-lipped jacks (*Pseudocaranx dentex*), almost never seen around the main Hawaiian Islands, milled excitedly about us and strangely striped morwongs perched on the bottom between the great concrete pillars. Completely new to me were two species of striking, North Pacific fishes called knifejaws (genus *Oplegnathus*) -- one marked with bars, the other with spots. One of our most significant discoveries occurred on this dive. My buddy Marj spotted them first: blue-stripe snappers (*Lutjanus kasmira*), a species introduced to the main Hawaiian Islands in 1958 for

commercial purposes. They have since spread up the Hawaiian chain, taking (we now know) exactly 34 years to reach Midway. At the end of the dive John Earle saw and photographed a white tip reef shark -- another new record. Interesting as it was, however, the pier was the wrong habitat for masked angelfish; members of the genus *Genicanthus* are plankton eaters that prefer ledges and drop-offs in deep clear water.

The following day, therefore, we planned to take a boat outside the lagoon to a site at about 80' that on previous collecting trips had yielded masked angelfishes. Marj and Therese wanted to catch at least half-a-dozen early on to allow ample time for them to decompress and empty their stomachs. (Fishes transported with food in their systems soon foul their own shipping water.) The plan was to attach a float-line to the bottom, then tie the angelfishes off at about 40' to decompress overnight. The next morning we would move them up to about 15', and in the afternoon bring them to the surface.

That evening Marj and Therese ingeniously fashioned holding cages by wiring pairs of plastic laundry baskets together at the open ends. They needed one cage per fish, as masked angelfishes placed together will fight. The cages' excellent

circulation, however, would allow the plankton eating angelfishes to feed while suspended on the line. To empty their stomachs after decompression it would be necessary to move the fishes into the lagoon where plankton was less abundant. Marj and Therese decided to hang them off the rarely used cargo pier where we had dived earlier.

While they built the cages, John Earle outlined our shark policy. During a Bishop Museum trip a year earlier several dives outside the lagoon had been aborted because of Galapagos sharks (*Carcharhinus galapagensis*), a species known for boldness and curiosity. John had taken part in that trip: according to him there was no doubt about their intentions: they were not merely curious, they wanted to eat you. Although solitary sharks were not usually bothersome, in groups they gained courage. Our rule, therefore, would be to abort a dive when three or more sharks appeared. Dives requiring decompression stops were out -- no one, said John, should have to make the awful choice between mutilation by sharks and the bends. For added protection, each dive team was to carry a bang stick. Although of little value against a group of Galapagos sharks, one of these shells might disable a hungry tiger shark, should one turn up. Next to great whites, tigers (*Galeocerdo cuvier*) are probably the most dangerous sharks in the sea. They are common at Midway, especially during the late summer when they gorge on albatross chicks that fall in the water while learning to fly. The abundance of tiger sharks is probably one reason that the Navy ordinarily prohibits surfing and diving outside the reef.

Our dive site the next morning was a ledge well offshore that paralleled the south side of the atoll at a depth of about 80'. Several communications' cables traversing the ledge served as location references and, incidentally, made good tie points for our float lines. (During the war, undersea cables, perhaps these very ones, enabled Midway and Navy headquarters on Oahu to communicate without fear of radio interception by the Japanese.) John and I made a reconnaissance

dive to find the greatest concentration of masked angelfishes. Limited by logistics to two dives per day, we wanted to give Marj and Therese their best chance of success. We looked for juveniles or subadults; large adults adjust poorly to captivity, and with their longer spines are more apt to pierce the plastic shipping bags.

Incidentally, small masked angelfishes are always female. This species lives in groups of three or four females to a male. The only way to become male is to come up through the ranks -- mature as a female, then change sex. Biologists believe that only the largest, most dominant female in a group undergoes this transformation. Fishes with this socio/sexual life history (and there are many) are known as "harem protogynous hermaphrodites."

The ledges near the cables were home to quite a few masked angelfishes of various sizes, including some juveniles. Females appeared snow white, with a black mask. Males were bluish gray with a yellow mask, saffron dorsal and anal fins, and long tail streamers. We also saw Japanese pygmy angelfishes (*Centropyge interruptus*), a splendid orange and magenta species known only from Japan and the Northwest Hawaiian Islands, their larvae probably transported here by the Kuroshio Current. There were other surprises: impressive crosshatch triggerfishes (*Xanthichthys mento*), straw colored with blue stripes on the chin and tails rimmed in red, swarmed about and actually seemed attracted to us. These beauties, typically found in remote subtropical locations such as Pitcairn and Easter Islands, are seldom seen by sport divers and have probably never graced the inside of an aquarium. Also present off the ledge were numerous Hawaiian anthias (*Pseudanthias thompsoni*). Males, with their lavender overtones and long tail filaments, were especially attractive. Although endemic to Hawaii, this species is uncommon around the main islands (except in quite deep water) and seldom enters the aquarium trade.

There were plenty of large fish,

too: four-foot amberjacks (*Seriola dumerilii*) cruised by within a few feet and big, green, spectacled parrotfishes (*Scarus perspicillatus*) crunched serenely on the substrate, oblivious to our presence. Many of the fishes were noticeably curious, actually swimming over and surrounding us if we stayed still for more than a few minutes. The water was clear and we saw no sharks; diving here was going to be a real treat. The only conceivable problem might be the pesky, overly-friendly

Midway fishes that kept swimming between me and my photographic subjects.

Tying a line to the cable, we surfaced, reporting that Marj and Therese would find what they were looking for below. While they gathered nets and cages and headed down, John and I stripped off our wet suits and warmed gratefully in the sun. Why, I asked, are masked angelfishes common at Midway but rare around the main Hawaiian

continued on page 208

Islands? The full explanation, said John, involves plate tectonics, geology, climatology, and biology. The short answer is simply that the water is cooler. This theory is supported by the observation (from a paper recently published by J.E. Randall, John, Therese, and others) that many species abundant in shallow water at Midway are found around the main Hawaiian Islands only at depths of several hundred feet, where the water is similarly cool.

In half an hour the women were back, chattering with cold but radiating success. Each had caught angelfishes of both species and had tied them off at 40 feet as planned.

We dived the same area that afternoon. Marj and Therese checked on their angelfishes and caught a few more, then John and I scouted for new records. I was impressed by the abundance of fishes we consider strange and rare in Hawaii. Under

ledges and in caves I was pleased to find whiskered boarfishes and more morwongs. Although both are frequently on display at the Waikiki Aquarium, I had never encountered them in the wild.

Another prized reef animal common at Midway was the dragon moray (*Enchelychore pardalis*). Rare in the main Hawaiian Islands, this eel has vicious hooked jaws, nasal "horns," and livid spots that never fail to impress.

Many of the most abundant species were endemics -- fishes found only in the Hawaiian archipelago. But again, even among the endemics, the theme repeated itself: those rare on the main islands were common at Midway. Two Hawaiian endemics, for example, that I had never encountered in Hawaii, despite extensive diving -- the lined coris (*Coris ballieui*) and the yellowbar parrotfish (*Calotomus zonarchus*) -- were everywhere at Midway. Why?

Endemism -- the emergence of unique plants and animals -- is an interesting biological phenomenon

especially associated with remote islands. The Galapagos Islands were made famous in this regard by Charles Darwin, but the Hawaiian Islands are an even more dramatic example, with an estimated endemism rate of about 90% for terrestrial plants and animals, 30% for fishes; however, the proportion of endemic fishes at Midway was obviously higher. Of the 10 or 15 most common fish species, easily half were unique to the Hawaiian chain.

Could it be that many Hawaiian endemics thrive best in this cool northern water? These northern atolls, I reason, are geologically older than the main islands, and the fishes presumably evolved here. But was the water cooler? According to theory of plate tectonics, islands such as Midway originally formed in the warmer south then drifted northwest with the Pacific Plate. At any rate (and for whatever reason), these northwestern reefs and islands are indeed, as John puts it, the heartland of Hawaiian endemism. There is probably no other marine environment in the world where half of the most common species occur nowhere else. I was glad that the whole area is protected, sad that so few other divers could experience it.

For the next several days Marj and Therese looked for more small angelfishes, moving the captured ones up the line and then over to the lagoon. In the lagoon, they hung the cages off the normally unused cargo pier. Here it would be easy to check on them and retrieve them for the flight home. During this time we tried diving some different spots. The most memorable was an extensive area from about 40'-60' where the bottom consisted of a great jumbled mass of boulders and limestone formations. Around these caves, arches, and trenches I saw my first Hawaiian black grouper (*Epinephelus quernus*). Never encountered by divers around the main islands, at Midway they swim right up and gaze at you in the eye. We also saw our first Galapagos sharks, small ones that looked us over briefly then swam away. It seemed that sharks were not going to be a problem on

this trip. One day, however, while waiting in the boat for the first round of divers to come up, I saw two huge dorsal fins approaching in parallel. Sharks, I thought. Big ones. Tigers! But they were only the wing tip of a monstrous manta and I was overboard with my camera in a flash. Actually, no flash was needed in the bright sunlight as I snapped away. Forty feet below, I could see Marj, John, and Therese poking stupidly about some boulders. At one point the huge ray actually got caught on John's float line. **Look up**, I shouted through my snorkel. It was useless. Later they claimed they saw it, but I don't believe it for a minute.

We saw little living coral on these dives. Midway's water is too cold for most reef-building corals. Nevertheless, this atoll, like others, was formed by deposits of limestone secreted over underlying volcanic rock. The organisms responsible are plants, not animals. Coralline algae, like coral polyps, have the ability to extract and deposit calcium carbonate from seawater. They do not build skeletons.

The day after Marj and Therese had hung their precious angelfishes in cages off the cargo pier we returned from our dive to a disturbing sight -- a great, gray, greasy destroyer tied closely alongside. A stream of rusty looking effluent poured from a hole in its side approximately over the spot where the delicate, snow white angelfishes lay suspended in their cages. Inquiries revealed that the normal fueling pier was out of order, and the South Korean destroyer (on maneuvers nearby) had been directed here. Officials waved us away; the cargo pier was now off limits.

Marj and Therese were distraught, but there was nothing to be done. By morning the fishes would be dead or near so, and it was too late in the trip to catch, decompress, and empty the stomachs of more specimens. Glumness prevailed at dinner. An early morning check, however, found the destroyer gone and the angelfishes (to everyone's surprise) no worse for the experience.

On our last diving day we decided to make a shallow dive in the blue

green lagoon, which harbors numerous patch reefs of finger coral (*Porites compressa*). The fauna of these reefs had been extensively investigated by previous scientists and we anticipated no new fishes for our list. Nevertheless, for the sake of completeness we wanted to see the reefs. The dive proceeded without incident, with Marj and Therese returning to the boat about 20 minutes before John and myself.

Surfacing by the boat, I saw Therese looking intently down at me. "Interesting, if not exciting," I started to say, handing her my camera. "Just get in the boat" she said cutting me off in an even, controlled tone. "What?" I said, although I had understood her perfectly well. "Just get in the boat," she repeated. I didn't catch on, but obediently heaved myself in. The two women, who had been looking tense, relaxed. Then they told me: five minutes earlier a blunt-snouted, brownish shark with faint stripes on its back had swam right up to the boat. A big one. A tiger. Knowing that John Earle and I were due back at any minute, Marj had reached for the bang stick. It wasn't there -- we had been careless preparing for this dive, only five minutes from the boat ramp. What to do? Luckily, shortly before I

surfaced the shark had lost interest and wandered away. When John Earle returned, we sped back to the boat house to warm up in the hot shower and wash our gear for the last time.

It had been a great trip. Marj and Therese had captured eight small masked angels and two Japanese pygmies. Tomorrow morning, early, they would retrieve them from the lagoon, pack them in oxygenated double plastic bags separated with layers of insulating newspaper, and place them in sturdy cartons for the trip home.

The mood was festive the next morning as everyone who was anyone, from the base commander to the smiling Sri Lankan police chief, turned out for the event of the week -- the arrival of the plane from Honolulu. As the big C-41 pulled up, I wondered if there would be reporters on board.

Today was June 4, 1992, the anniversary of the famous battle, the day on which, 50 years ago, many young Midway-based pilots gave their lives for their country. This American victory, six months after Pearl Harbor, had turned the tide of the Pacific conflict decisively against Japan; I expected a ceremony, a speech, perhaps a gun salute -- but there were no reporters and nothing

had been planned. Mail was handed out as usual, a few crates of vegetables were unloaded, and soon boarding was announced. We walked slowly out over the concrete. The gooney birds and their ugly chicks next to the runway didn't even look up as we climbed aboard the nearly empty cargo plane for the two-hour flight home.

As I write this, a year later, Marj and a new crew are back catching more angelfishes (which the aquarium will trade for rare species from other institutions). They had

hoped also to catch a few small Galapagos sharks for their new shark tank, but have been unable to secure permits. Other specialists hope to find and classify new nudibranchs from the area. It could be everyone's last chance; military budget cuts will likely cause the closing of the Midway Naval Air Station within a year. Luckily, the Fish and Wildlife Service will maintain a presence and has a continuing need for volunteers. Anyone interested in birds, turtles, and seals who would like to spend time in the Northwestern Hawaiian Islands should write to the U.S. Fish and Wildlife Service, P.O. Box 50167, Honolulu, Hawaii 96850, (808) 541-1201. Who knows, they might even let you dive.

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