

Field Notes

Bahamas Undersea Photography, 1961

Behavior Studies of Reef Animals

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June 13

Arrived Nassau on the Bahama Star at mid-morning after an extremely quiet passage. Weather beautiful and hot -- as expected. Off the boat by ten or so, but the car, no. The poor little VW station wagon came as deck cargo, and must be hoisted to the dock. We stood on the balcony of the customs house waiting for our baggage to be checked, and watched the operation. Much shouting and pushing and giving of directions by ten or twelve black people. The rope sling was a pretty tattered affair which Tom insisted must be a bundle of seaweed. But it did the business; the car went up into the air, held by that mass of tatters and fuzz and came gently down on the dock -- with my camera trained on it all the while to record any sudden plunge.

Then the routine. First to clear the car and wheedle Mr. McKinney, Director of Customs, into letting it onto the island without assessing the new one-third-of-value deposit; then back to the dock to get the car. "No, you must first go to the Curry Co. for release of the shipping papers;" so to the Curry Co. up the street beyond the Prince George and into the ground floor office; "This is the air division; the shipping division is upstairs;" so upstairs to the Curry Co., and then back to the dock with the papers. Big hassle at the dock between two inspectors as to who would inspect the car. The one who lost was so disgruntled that he barely looked at the tons of gear in the back of it -- much to my relief. Ah, step number one completed! People and luggage loaded into the car, and

remembering to drive on the left, we wheeled off the dock onto Bay Street and up the narrow lane past the Post Office to the Police Station for inspection and licenses. But: "We don't inspect cars here any more; that is done at the station on the west side of town near Fort Charlotte." Much backing and filling to get back onto Bay Street again. Off we go, everybody peering for the Traffic Department. No signs, of course. At last we are at Fort Charlotte and there is nothing left as a possibility but an open field on the left with a small weathered shanty on one corner at the back of it. We have a try at it. Sure enough, inside the shack are some policemen and a couple of desks. We sign the papers, show our drivers licenses, are given a sticker for the windshield saying we promise to leave the island by the first of September. Now, license plates. "Those are issued at the License Department. It is up the hill." We go up the hill towards the fort itself. Could the License Department be in one of the dungeons? No signs, no markers, no buildings. We decide against looking in one of the dungeons and turn back. The first alternative way lands us in the courtyard of somebody's home. We do not ask for license plates there -- though we would not have been surprised to find them there. Farther down the hill another road turns off. No signs, no markers, but suddenly another little shanty -- the License Department. For two pounds we are issued a set of black-and-white plates. We are in!

June 27

Two weeks have gone. We have become used to the new look of Lyford

Cay, so changed in the last two years -- the golf links, the pink club house, the big white gate with a man always on duty (he always salutes with a wide grin); the sprinkling of new houses along the beach. But the sea is the same -- the curve of white sand and the magnificent color of the water; the white roofs of Bali H'ai on the rocky spine of Lyford, the fuzz of palms far out on the tip of the land, Goulding Cay, squat and brown as a turtle with rows of waves moving towards it across the reefs like white boats. And Mactaggart's dock down the beach is the same (though a board or two is missing from the top of it) and their little thatched house shuttered and empty looks as though no time had passed since we saw it last. When I went up to it a rat scurried out of the grass and raced into the palm thatching. I waited for him to come out again, but there was only a rustling and then quiet -- likely he was peeking at me through the dead fronds.

I have established a workshop on the porch, with polyethylene over the screen to keep out the rain; we have an eighteen-foot workboat with an eighteen horse motor (the boys are agitating for a thirty, which we can have for the same money.) My crew, Tom, Chris, and Jimmy Dean, who came along to be Chris's unpaid assistant, have been assembling our under-sea enclosures while I put my time in on camera equipment and related gear. It would have taken too much time to build the enclosures after our arrival, so we spent several weeks back in Texas designing and building them, marking the pieces for re-assembly. The system has worked beautifully,

and has saved a great many hours.

All of the enclosures have skeletons of angle and channel iron, treated and painted and bolted together. We have one cage 3'x3'x4' which is to be used for keeping specimens until we need them. It is covered with galvanized hardware cloth and has full-size sliding doors at each end. Then there is the main shooting enclosure, of the same basic construction, but five-sided and considerably larger. It has three walls 3'x3' also of hardware cloth to allow free water movement through the structure when the glass is on. The top is small-mesh netting fastened with removable wooden strips so that adjustments can be made inside without removing a glass or one of the screens. The permanent screen panels in this main cage actually are sliding doors for introducing specimens at the proper time. An auxiliary cage 3'x3'x4' can be attached to either end of the shooting enclosure, and has doors that match its openings. This cage has removable screens that can be replaced with windows for use in locations where a large enclosure is not necessary. I have found such enclosures to be necessary when one is trying to learn and record behavior. Reef animals placed in them are puzzled for a short while at being able to see their old haunts and not to be able to get to them through the glass. Then they settle down and carry on as though they were out in the open. Only a few of the wanderers -- baracudas, squids, jacks, and the like, are not happy in such places.

Today we are reinforcing the edges of our undersea windows with aluminum channels, the holding pen is out where we worked in 1958 with a small remora

and a three-foot nurse shark in it. Three days ago Tom and I shot up a roll of tests on the new Ektachrome 16mm commercial film and sent them off yesterday asking for a quick report. We used five filter combinations, beginning with 40R; dropping to 30R; then 30R, 10M; then 20R, 20M; and finally 30M, 10R. With a variation of exposures from F:3 to F:5.6 we should come up with an answer. We shot these tests at our old reeflet where we took many pictures in years past, but we will not work out there. Something unhappy has overtaken the once charming spot. Perhaps the extra sediment in the water from dredging during the building of the canals at Lyford Cay is to blame. At any event, the sponges all have vanished; the gorgonian skeletons stand on the tops of coral mounds, bleak and dead; most of the fish have gone, and I saw no anemones, and of course, no cleaner shrimps. Oddly enough our shooting pens of 1958 are almost as we left them. The metal appears to be in near perfect condition, but the wooden parts are worm-riddled and crumbling. I wonder in what other part of the ocean it would be possible to leave frail structures like that on the bottom and find them in place three years later. It is very dismal, though -- these skeletons of angle-iron enclosures with bits of algae-encrusted screen swaying to the current, and in the background the dying coral heads and the tattered gorgonians. I know how Rip Van Winkle must have felt.

With some foreboding I sent Tom out to learn whether all of the reeflets in Lyford Bay had gone the way of our particular little coral formation. When I returned from town Monday (I had gone on a bootless errand to see

Mr. Ott of the Outboard Marine in the hope of getting another boat -- he would let us use one if I would promise to show it and the engine in the movies, which I would not) Tom reported that the reefs farther out are still in fine shape, and was sure he had located a good one for the site of our season's activities.

This morning we went out to have a look at it, and I am sure it will do very nicely. It will be necessary to move a few of our cement anchor blocks from the old shooting site, but other than that there should be little difficulty. There are mounds of star coral, huge clusters of gorgonians, fans and plumes, and a great many fish -- both the blue-striped grunts and the little golden ones. And Tom has seen a hawksbill turtle out there twice and was allowed to come within three feet of it if he moved slowly. Today we took along some lettuce, but the turtle failed to show up. We fed the remora in the cage at our old shooting site and the nurse shark. They both appeared to be in good condition, but the shark wouldn't eat. Perhaps he is unhappy. The boys put him in the cage only yesterday.

The remora -- Remo, we call him -- already has an interesting history. We have had him almost a week. He came up to Chris and Jim while they were swimming near shore. Jim was unprepared for a fish that would come up and hook on for a ride, and was having fits trying to get rid of him when Chris saw what was going on. Between the two of them they tangled him in the minnow net and then dumped him into a tub with the net on top of it. Tom

and I were finishing a floating net, so we hustled to complete it and put it out by the end of the dock. And we popped the fish into it. He is about eight inches long, with a black stripe and a friendly nature. For many years I have wanted to study a remora, but of the several we have managed to pick up each one has slipped through our fingers, one way or another.

A few days later Chris came in to report that when he went down to feed the remora (he had been eating a broken-up minnow or so each day) he found the net inside-out and the fish gone. So. We all felt very bad. Another one of those chronic bits of misfortune. The boys swam up and down the beach, but no Remo. And then Chris rushed in to report that he had found him after all. He was in a little glass-and-wire cage at the outer end of the dock pilings. Chris had put the cage on the bottom for some reason or other and then had forgotten about it. Remo was in it with the door closed. To date we have no notion how he got from the net to the cage. Nobody in the area will admit to having had a hand in it. But I doubt that he could have done it by himself.

All seemed well with Remo, and we hoped he would hold out in the floating net until we were ready to put down the big holding pen at our shooting location. He was eating a daily ration of minnows. Then three or four nights ago I went down on the dock, and there was Remo half in and half out of the net. I pulled it carefully up onto the dock. He had tried to escape and had gilled himself. But he was still alive. I worked him out

of the hole, tied it shut so that he couldn't do it again, and put him back into the net. Then the next day he was taken out and installed in the holding pen. That was on Sunday morning. On Monday the boys put in the nurse shark. They reported that he brightened up and immediately hooked onto the shark. But the shark wasn't going anywhere and finally settled down on the bottom of the pen for a nap, with Remo trying to prod him into action.

Today Tom and I took a few small mullet to the two of them on our way out to the other reef. When we arrived Remo was slithering back and forth over the shark's hide as though he were working at something. Could he be cleaning? When Tom put parts of the minnows into the cage Remo ate some at once, though the shark paid no attention. He was either asleep or sulking, but when we left Remo was very busy pecking at him and working over him, the shark completely oblivious. In a couple of days we will have the shooting pen ready and dressed up at the new location. The main pen is about eight feet long, with an auxiliary pen four feet long. Should be big enough for the two of them -- and for visitors. I hope Remo doesn't pull any more tricks.

Chris has been out this afternoon looking for mantis shrimps. He came in about four to report that he had seen no Mantises but had noticed a jawfish with a ball of eggs in its mouth. He was astounded when I got excited about his find because I had told him I was no longer interested in jawfish. I had assumed that the egg-laying time had long passed, or I would

have asked him to be on the lookout for such a thing. I sent him back, and he and Jim spent a couple of hours in a vain hunt for the jawfish with the eggs. Damn! He will try again tomorrow. We all will try.

At last we are ready to begin putting pictures on film. It takes a long time to get under water, but finally there comes a day. The trips to town and the searching for supplies from store to store and from market to market are about over. I find it difficult to become used to trying to buy supplies in Nassau..."Yes, we usually have five gallon cans, but this is the only one we have left, and there is no lid for it."..."No, we do not carry bolts; you can buy bolts at Kelly's." "Galvanized pipe? You'd have to buy that at the plumber. He is not open at this time of day."..."Yes, we have the fittings, but no pipe. Try the Iron Monger's for plastic screen"..."You'll not find hose smaller than half-inch anywhere in Nassau."..."Brass bolts we have in three-eighths and five-eighths, but not in half-inch."..."Spears for spear guns? We have an ample stock. But I'm sorry, we have no spear points. We have spears, yes, but no points for them. A shipment will be coming from England next month. There are none in town, I'm afraid."...And so it goes. It is fine to have that phase of the undertaking behind us.

June 28.

Dull day, with no sun. Sent Chris and Jimmy out after breakfast to look for the jawfish with the mouthful of eggs. Within an hour they were back and reported that they had found him and had marked the spot. Tom and

I broke off working on the small wire cage we had been completing and went to investigate. And we located the fish with no trouble. It appeared to be a maxilosus, and his mouth was crammed solidly with eggs, slightly bluish in color, and peppered all over with tiny iridescent blue spots. When I began moving my camera on tripod closer the fish slowly backed down into his hole and a moment later reappeared with no eggs. Apparently he had stashed them in a safe place in order to give me and my operations his undivided attention. After I was set up and had made no move to give him trouble he slid out of sight and reappeared once more with the ball of eggs. The mass was very large, and he never at any time shut his mouth completely over it. From time to time it would appear that he was about to disgorge it, but after popping it half out of his mouth in a jerky motion of his jaws he would settle calmly down again to his routine of staring about at the passing scene. At one time I put my finger within a half-inch of his nose. His only reaction was gradually to back down into his den.

After making some photographs I asked Tom to sprinkle a few shreds of minnow in the water where the fish could see them. When he saw the particles of food floating down he got a gleam in his eyes and backed out of sight into his burrow. In a moment he was back eggless and ready for business. He was not at all afraid, and dashed almost into my camera lens after bits of minnow. When he had satisfied himself that there was no more food in the area he disappeared and in a moment or two reappeared with his egg cargo. We repeated this piece of business several times to make sure

that he was perfectly willing to set his eggs down in a safe place when there was an opportunity to get something to eat.

On one occasion when he had his head out of his hole and no eggs in his mouth I put my finger close to the end of his nose. He took it in his mouth and shook it vigorously three or four times. He appeared to be neither annoyed nor on the defensive; it was simply his way of indicating his feelings towards all things un-jawfish. The jawfish I photographed over an extended period three years ago responded in the same fashion. I had thought at the time that it was his method of greeting a fellow underwater creature, and set a great deal of store by it. Now I feel quite let down. We will keep this jawfish under close observation to find out how he handles the young when they appear. Will he treat them as food potential or as children? I am hoping that our jawfish will have a family feeling for them.

In the afternoon -- it took until about one o'clock to finish off the jawfish -- Tom and I ferried our pens out to the new shooting location and dumped them overboard. We also installed a Nassau grouper in our holding pen with the nurse shark and Remo. These two were very buddy-buddy, and Remo wouldn't leave his friend even long enough to take some minnow we put in the pen. The shark wasn't moving about in a very active way, but Remo seemed to feel that everything was as it should be, and spent all of his time with him, moving all over his hide, and pecking at him when he stopped swimming. Neither one of them paid any attention to the grouper. Chris

had caught him in our fish trap, and since the sea had been too rough to check it yesterday, he probably had been in it for a day or more, and was roughed up a little from trying to get out. His condition should give a cleaner shrimp something to work at when we start shooting in earnest.

June 29.

Ran over first thing this morning to check on the jawfish. Still sitting in his hole with his mouth full of eggs. Deciding that he was safe, at least for the timebeing, we went off to the reef location to begin adjusting the pens and getting them in shape for the summer's shooting. Found a level spot on the south side of the reef where the sun would help us out most of the time and put the shooting pen and the auxiliary there. Did not take time to dress them up with coral and local scenery, however. But we did hook onto the holding pen containing the grouper and the shark and Remo and pull it to the shooting location without mishap. The grouper still looks sad, but Remo is in fine fettle. I am anxious to find out what happens when the two of them have more room for roaming about.

Made a few test shots with the Rollei, some with flash, and some without, using a 40R, and on the basis of the shots I had made the previous day (which were shot at F:5.6 and were overexposed about a stop) I shot most of these at F:8. Years ago we used to have to expose Ektachrome at F:3.5 at a thrity-fifth. These were shot at a sixtieth. On our way home we swung by the jawfish and I finished up the roll on him, using the red filter and F:8. Yesterday's magenta cut out too much yellow.

Developed the films in the evening. Much better. Exposure and balance appeared to be about right. Could easily see the yolks of the jawfish eggs. The eggs appear very mature.

June 30.

Something is happening at the home of the jawfish. This morning his eggs were no longer in his mouth. We hung around quite a spell thinking that perhaps he had just dumped them and soon would come up with them again. But no. He sat stolidly at the opening of his burrow -- and nary an egg. But all around his den in a circle perhaps six feet in diameter there were small fish hanging in the water. These were little sand dwellers like the razor fish that pop into the sand anywhere, are striped in black, and about two inches in length. There were perhaps a hundred of them altogether. Were they waiting for something, or does the home of the jawfish just happen to be in the center of a colony? There were a few of these fish in evidence yesterday, but not nearly as many as today. They never approached nearer than eight or ten inches of the jawfish -- probably his effective striking range, and they appeared to pay no attention to him at all. But if the eggs are hatching at the bottom of his hole, could they be waiting for the babies to come out?

We gave the jawfish close attention all day long, but saw neither eggs nor babies. The jawfish keeps his gill covers distended today, however, and appears to be breathing harder than usual, as though he might be forcing water down the hole from his gills. We tried him on some minnow, and he

left his hole without hesitation. However, he will not bite my finger, and allows me to peck him on the head and will retreat only an inch or two into his burrow.

We have a flying gurnard! Jimmy spied it while swimming near the jawfish house, and Tom caught it in the hand net. It was walking along the bottom on its ventrals, he said, hoisted a couple of inches off the bottom. It is a little fellow, six or seven inches long, but with beautiful dark blue wings, and on its body tiny light blue dots. When its wings are folded it keeps reminding me of a tiger moth.

We brought it carefully up to the dock, dumping out my plastic film box to give it a place to swim while it was in the boat, and put it in a small hardware cloth box, settled it on the bottom near the dock and put a stone on the top so that there would be no mischance of the tide turning the box over and letting the little tyke go. In twelve years this is the first gurnard we have managed safely to put in an enclosure of any sort. The last one, three years ago, was placed in a pen the back door of which happened to be open without anyone's knowing. That was a sad day. This little pen has no back door, and the door on top is latched and has a stone on it besides. It will be fascinating to have a chance to study this little character.

On the way back from the dock we met two of the little boys who live in the house down the beach, and whom we suspect of having had a hand in dumping the remora out of our floating net. I told them that I had a

little fish in a box beside one of the dock posts, and please not to touch it. They promised to leave it alone. But I will feel better when we have it out at our shooting location.

July 1.

Our second boat is ready. We have been limping along with one boat, but finally got the promise of one in our price range. It is old and had to have some patching on the bottom to make it seaworthy. But we are to have it today at ten o'clock. Mr. Brown of Brown's Boat Basin is too busy to bring it out, and besides we are to exchange our present boat motor for a stronger one, so it will be necessary to run in to town with this boat and pick up the second one and bring it back. There goes a half-day.

Before leaving we checked the jawfish. No change. No babies in evidence, nor anything unusual. What the devil has happened to those eggs? We have found another jawfish with eggs, much less advanced, and are putting him under observation also. The gurnard was still in his little box, looking more like a tiger moth than ever.

Ran to town without incident, save for a squall on the way, but Tom and I had our ponchos, and each put on a diving face plate to see through the raindrops. No trouble. Chris and Jim had come to town to help in taking the other boat back. I elected to return in the older boat with the small motor. Chris and I took it and shoved off before the other motor was ready. Tom and Jim caught us just as we came into Lyford Bay, their boat having a thirty horse motor against our ten.

First thing I checked when we pulled up at the dock was the gurnard. The cage was empty! Rock still on top of it, but no fish. Jimmy jumped into the water to make sure. Somebody had let the fish out and then had put the stone back on the top of the box. There were small-size barefoot tracks on the beach. Hell's fire! There are enough hazards and difficulties in trying to make these studies without having to add human beings to the list. Well, another potential subject gone. I wonder how long it will be before we can pick up another one. We all felt pretty low.

Scraped together some lunch, put the diving gear into the boat and went out to the reef to begin dressing up the pens. Worked at it until nearly six, and have them coming along. Very pretty setting. Will keep the auxiliary pen bare, for mantis shrimps, and the main enclosure will be made to look more like a section of reef. We can use both of them in combination for a great number of things. The sliding door between the pens will have to be re-done. It is too wide, and sticks. It must run free, because we are apt to use it often.

Came to the surface and found Chris and Jim in their boat fifty yards away with a dead motor. They had run out of gas, refilled the tank, and hadn't got a pop out of their motor since. We towed them to shore. Checked the gas line and noticed a few drops of water. Ran the tank pump and got nothing but water. Pumped out a quart or so and then quit. Took the motor and gasoline cans up to the house. Must have been at least a gallon of water in it; salt water, at that. Some days never seem to amount to much.

July 2.

Sunday. Slept until seven. Worked on the pressure plate and the front extension for the new camera box until nearly noon. Had Tom check the jawfish. Nothing new. He reported that the fish is cleaning up his house. I'll be damned! The other fish still has his mouth stuffed with eggs. Maybe we can learn something from him. Went out to Goulding for a picnic in the afternoon. Beautiful day.

July 3.

Spent the morning working on the pens, fitting screens, placing coral, carrying sand, generally getting things ready for serious work. Chris came down in mid-morning with a message inside his face plate. The film had been returned from Calvin (one week for the round-trip -- pretty good) and also a report letter and a cable. An airmail letter gets to Nassau as fast as a cable. Basic exposure in sun of F:4 with a 40R filter appears to be the best. Our gray scale appears to have been to no purpose. I viewed the entire roll of film in the evening and found that at a distance of five feet the gray scale was blue, no matter what filter or exposure we used. However, the flesh tones on Tom's arm holding the gray scale appeared to be very good. Must have been some sort of sky reflection affecting the gray scale. We had the scale mounted water-tight between two sheets of plastic.

July 4.

We have another gurnard! Such good luck is almost too much. The boys caught it this morning when they went over to have a look at the jaw-fish. They had no bucket or net in their boat, so Chris hung in the water watching the fish while Jim headed back for the necessary equipment. Through the glasses I saw Jim coming full speed for home alone, and knew that something was up. After some scanning we could see Chris's head far back in the distance occasionally popping to the surface. Jim's motor conked out on the way, so Tom rushed out to give him a hand, and they piled back with the workboat to where Chris was floating. We could see much frenzied activity, throwing swim fins, tossing nets and pieces of nets, a good deal of bobbing and threshing about. Finally everybody jumped back into the boat and headed full speed toward our shooting area. We knew that they had been successful in catching whatever they had been after when we saw them stop and go under with it. They came steaming up a few minutes later to report the good news. The fish (about eight inches long) was safe in our holding pen. The boys had found him walking about on the bottom digging in the sand with his pectorals looking for something to eat. And they caught him with their hand net.

Went out to the shooting location as soon as possible, half expecting to find that the gurnard had vanished during the boys' absence. But he was there, sailing up and down inside the holding pen with his nose against the wire looking very sad. In short order Tom and I finished dressing the

shooting pen, tried the glasses for size and found that all of them fitted -- though some a bit snugly -- and carefully put the little gurnard inside. We watched him for a long time before trying to take any pictures. He was still too excited and feeling too strange for pictures to be of much value. He keeps his pectorals furled most of the time, and looks like a small swept-wing airplane. When he is ready to take off he spreads his wings and sails up like a glider going into a steady wind. He appears not to move his wings at all, but holds them stiffly spread, and does not turn like an ordinary fish, but banks like a plane, and when he nears the ground he comes in on a long gentle glide and rests on his extended ventrals an inch or so off the ground. He was too fussed to carry on with any of his routine activities, but I did shoot some film of his taking-off and landing. By tomorrow he should be in better condition for pictures. He is a beautiful little creature, with big eyes that he turns in his head, and he has a sad, timid look about him.

After finishing with the 16mm film I decided to shoot some closeup stills with the Rollei, and was about to move the boat to a better location when I noticed a pile of sand in the grass -- new sand beside a neat round hole the size of a quarter. Suddenly something emerged from the hole -- a large mantis. He had an armload of sand, and leaning far out of his hole, tossed it onto the pile and disappeared again into the hole. He was the largest one I had ever seen, and has black -- or dark brown -- bars across his back. I watched him for some time digging. He watched me, too, moving

his stalked eyes this way and that for a better view. He does not know it, but he is in for some busy days. We can drop a cage over him right where he is.

July 5.

Up at six as usual, repaired rip in diving suit, worked half an hour on the new camera box making plastic snoot to accommodate the big 100mm lenses, changed film in both 16mm boxes, checked focus on the number one camera (and found it okay, except for the parallax a bit off) had Tom get gasoline and oil and change oil in the compressor motor, wrote up notes for the past two days, had breakfast, got out to the reef at 10:00. Typical morning.

The gurnard still is jumpy, and looks longingly out of the front side of the enclosure. Not happy. We put the glass on, but the little fish was not yet a fit subject. He did yawn once in awhile, though, and seemed much less frightened of us than he was yesterday. And from time to time he pawed the sand and picked up something from the bottom. His pectoral fins are parted at about five rays from the leading edge into little hands, and he uses these a great deal. Sometimes he leans against the glass or the wire, using one of them for support. He also digs in the sand with them, using a sidewise sweeping motion, whirling away the top layer of sand, or possibly for the purpose of frightening something from a temporary hiding place. All I saw him pick up, however, were little shells which he immediately spat out again. Perhaps he is looking for little hermits.

With this in mind I killed a small hermit and put pieces in front of the gurnard. He ignored them, and a little grunt that happened to be in the pen when we closed it rushed up and snatched away the morsels. Broke open an urchin also and sprinkled the crumbs in the sand. Ignored again -- except by the grunt. I had placed the urchin on top of the cage, and while I was watching the gurnard the trigger that lives on the reef rushed up and snatched it and ran off, feeling that she had done a great thing. All the other fish in the vicinity joined her in a huddle and they bickered over it a good while -- the trigger, of course, taking first rights.

The mantis has not tipped his hand yet as to what interests him. We tried putting a partially disabled hermit next to his hole, but he merely pushed it away. Next we used a live swollen egg shell. No sale. I smashed it and allowed the smoke from it to drift down his hole. Still no interest. He must eat something. Possibly a fish. But we had no fish.

Clouds came in at noon -- and stayed in. We sat around awhile, and then picked up the gear and went over to the jawfish. The one that had had the eggs is friendly, and hangs half out of his hole. But no sign of little fish. The small striped fish hang above the sandy bottom as before. Probably simply a colony of them, though they appear more scattered than they were at the time of the disappearance of the eggs. The other jawfish has his eggs still. But they are of a color different from those carried by the first jawfish, being solid yellow-green with no visible spots, and there are not nearly as many as the glob the first jawfish managed. This

jawfish is able to close his mouth completely over his load -- though it gives him the look of having a mouthful of mush. From time to time he also pops them in and out of his mouth, to give them a change of water circulation, I suppose.

July 6.

Good day. Sun most of the time, with brisk breeze. First thing I did at location today was to take a small fish to the home of the mantis. He was in his burrow with his eyes up. He has a high mound of sand all around his house -- must have a very deep hole. I dropped the fish three times before it landed at a reasonable eight inches from his doorway. He appeared gathering himself for action. When he moved he was out of the hole in a flash and back into it again with the minnow. I should be surprised if the action took a tenth of a second. And that was that. Now, at least, we know that he likes fish. We must see what he will do with a live one.

The little gurnard was still preoccupied with sliding up and down the screen of the shooting pen. When we put on the glass she slid up and down that. Very unhappy. Tom and I gathered several handfuls of small shells and bits of others and sprinkled them over the fresh new sand of the pen to give it some character. Looked better to us, but it appeared to matter not at all to the fish. Up and down the pen glass.

Remo and his lazy shark pal have been in the auxiliary pen for several days now. Since he is quicker on the trigger than the shark we lured him

into the shooting pen with a bit of fish before the shark got wise. For some reason his coming pepped up the gurnard a good deal -- she left off running up and down the windows and spent her time following the remora. Tagged him all over the pen. Once in a while he would slap her in the face with his tail, but she only ducked and kept on tagging. But I was able to shoot a few swimming scenes of both of them.

By afternoon Remo was lonesome for his shark pal and was spending his time at the screen partition between the two cages. So was the gurnard. We let Remo back into his old digs, and he immediately hopped onto the shark and was content. His leaving appeared to calm down the gurnard and she settled to the bottom and began walking around on her ventrals, from time to time turning over a shell or a small stone -- for all the world as though she had hands on her pectorals.

If it was stones and shells she was pining for, Tom and I would be glad to oblige. We lumbered off around the reeflet and brought back a hatful of miscellaneous trash and thoroughly sprinkled the shooting pen floor. For the gurnard the place was beginning to look like home. Not one time after that did she head for the glass, but quietly stalked about stone-turning. Sometimes she turned a shell or stone with each hand at the same time, or sometimes with only one. She wasn't satisfied with big shells until she had turned them completely upside down. By this time the light was too far gone for good pictures.

While this was going on Tom pointed at something and began to laugh. It was a big trunkfish waddling along with a remora riding on it! Never have I seen this before, and few things could be more preposterous. Both of them appeared to be perfectly happy. Tom picked up the hand net and clapped it over both of them. But the meshes were too big for the remora (he was about six inches long) and he was out in a second. We tried to catch him in our hands, but he was too quick for us. And then we tried to shoo him into the cage -- without letting the gurnard out. That didn't work either. He banged into the plate glass and into the pen sides, and in the scramble the trunk fish bumped out of the net and fled across the reef. The little remora took this sort of treatment for a couple of minutes and then, apparently concluding that we played too rough, headed straight out to sea, swimming fast and straight. Tom tried to head him off, but it was no use, and he vanished into the haze -- bewildered, no doubt at the treatment he had received when all he had been doing was to hitch a ride on a passing truck. He'll probably stick to sharks after this.

Before calling it a day I checked the mantis den -- there was no hole. Same mound of newly-dug sand, but no hole at all. Probably he had plugged up his doorway while he finished eating the prize I had handed him in the morning. Looks as though we'll have to be careful how we feed this fellow.

July 7.

Checked the mantis hole first thing this morning. No hole. Still

down there living it up, I guess. Hope he hasn't moved on to greener pastures.

We had thought that the gurnard was happy, but no. This morning she spent almost all of her time running up and down the glass -- either that or she took up a station two or three inches from the glass frame, where I could not take her picture. I dropped rubble all along the forbidden area, but this caused her to spend all of her time running up and down the glass again. Made a few shots of stone-turning, but her heart wasn't in it, I'm afraid.

Finally banished her to the holding pen and let in the shark and the remora. The remora is the only fish I ever have seen that is quite happy swimming belly-up. We found that often as not when he had been lying upside down on the shark's back he would leave and swim for a good while in that position, with his ventral fins on top. In this position his belly remains almost black -- the color it turns when he is lying in an inverted position on the shark. However, when he flips over and swims in the normal position his stomach becomes white almost at once.

We gave the shark pieces of minnow, and it was interesting to see the reaction of Remo. He would pick up some pieces as they came out of the shark's gills, or he would station himself under the shark's chin where he could occasionally snatch a piece that the shark missed. Once he actually took a bit out of the shark's mouth. He always was in a great state of

excitement whenever the shark was eating, flipping about so fast that I scarcely could follow him with the camera.

Later in the day Chris brought down a six-inch frog fish, and we installed him in the pen. He is a past master at the business of walking. Uses both his ventrals and his pectorals, and waddles like a bear. From the rear his pectorals look like out-size paws. He looks like an interesting fellow.

July 8.

Saturday. Ear feeling a bit sore from diving -- the left one. Since the other one doesn't operate any more at all, it appeared prudent to stay out of the water and not take a chance on having them both out of commission. Worked all day on the new camera box. Chris and Jim went out, however, and caught a small octopus which they installed in a screen box inside the holding pen. They came in twice for more wire and string to tie down the lid of the box to be sure that the octo couldn't get out. They are aware that these characters can dribble out through a pretty small hole.

July 9.

Sunday. Checked the octo. He is fine in his cage-within-a-cage.

July 10.

Quite heavy wave action today. Water looked yellowish and full of floating particles. Took a small crab down to the octopus. The boys had

him wired shut to the point where it was almost impossible to reach him at all. Before I could make an opening large enough to insert the crab he ran two or three of his arms out through the wire and laid hold of my arm. Very friendly. I never have known a freshly-caught octopus to do such a thing. Usually octos are timid for a week or so. Very good sign, this. He took the crab the instant it was within range and sank to the bottom of his box with it under his mantle. Later on in the day I saw pieces of it scattered around his cage. I would guess that he will be a good subject. Shot some general scenes of gorgonias and sponges, etc. In the middle of the roll my focussing cable broke on the number one camera box carrying the 42mm lenses.

The hawksbill turtle visited us most of the day, sailing back and forth among the coral heads and the grassy areas, sometimes paddling down for a mouthful of grass or to chomp on algae growing on the rocks. We did not bother him, of course. He is about eighteen inches long, I should say, with his shell very clean and varnished and giving the impression altogether of just having been carefully scrubbed. He paddles along slowly and without apparent effort, peering from side to side as though he were merely an interested passenger in some sort of underwater vehicle. He surfaces only at long intervals for a breath of air. Had no watch with which to time him. I hope no native happens by when he has his head out of the water.

In the evening I replaced the focussing cable on the number one box. A very tricky job that took until near midnight. Found that the camera had

been running slow, and that the filters were stuck together, creating a fine set of Newton rings. Great day.

July 11.

Another day with a lot of wind, and consequently heavy swells. This combined with a low tide, made life undersea not too pleasant. Re-shot some of the gurnard material and some of the nurse shark and remora. Switch on the number one camera box went bad -- and the footage counter on the camera stuck, causing me to lose fifty feet of film. Gremlins.

Spent some time looking for mantis shrimps, and found a couple of small ones. The hole of the big one out in the grass remains plugged. Must have killed him with kindness. The boys report that the last jawfish with eggs has vanished -- been gone from his home for two days now, eggs and all. So that is that. One bright spot: our octo is still on deck, and today ate another crab. About time to get a moray eel and domesticate him.

July 12.

Still plenty of wind, but not enough to cause the big swells of yesterday. Ran off some footage of the frog fish the boys brought out two or three days ago. He looks very much like a big sargassum fish. Anyway, he walks, swimming only when it is absolutely necessary. Has spotty sort of stripes on his dorsal, and pinkish-white bait that wriggles when he uses it. Two times he unlimbered his rod and flapped his bait at a passing fish. No

luck. I dropped a half-dead mojara inside the pen, but it appears he wants to fight for his meals, or at least to get them in a sporting way, because he ignored the mojara altogether. We will have to provide for him something that will respond to his lure.

Turtle returned to a nearby reeflet -- Tom saw it while swimming about -- and I made some footage on it while it was feeding among the rocks. It appeared to be eating the slick spongy growth on the rocks that looks like a cross between algae and a sponge. He paddled off before I had a chance to do much.

The hose on Tom's reserve let go and as we had nothing to repair it with, he had to spend the afternoon up in the boat. I tried to mend the hose with the tape from cans of film. Didn't work. Watched a cleaner shrimp (*p.pedersoni*) for a long while. No customers. I wonder if scale cleaning has gone out of fashion. I haven't seen a cleaner busy all summer. Mantis shrimp's hole is still plugged.

July 13.

Fed some mojaras to an anemone today for the record. It is difficult to make a minnow get itself caught by an anemone. Yesterday I set up a small glass-sided tank snuggled down in the coral with a *gigantea* in it. By this morning the anemone was feeling at home and hungry. Chris and Jim brought out a dozen or so small mojaras and we put a few of them in with the anemone. All the fish in the area began pestering the poor things through the glass, and since they were out of their depth anyway they had a pretty

tough time of it. Now and again one of them would touch the anemone. If he were strong he got away, but if not the long arms began to bind him up until finally he would disappear altogether, and there would be only a little spasm of shuddering down in the anemone where the little fish was still trying to struggle free. Too bad. It bothers me to kill things.

When we had emptied both cameras we went up for lunch, planning to finish up the business in the afternoon. But when we went below again all of our mojaras had given up and were lying at the bottom of their wire cage. Only one little pompano minnow remained, perky as could be. Because he had come through the ordeal unscathed and still battling, we released him. He headed for the surface, and we could see him up there laying out a course for the nearest shore. A needlefish fell in behind him in a moment or two, but he was too big for the needle, and the last we saw of him he was heading straight for shore. Hope he made it.

We let our gurnard go this afternoon, too. We should have enough footage on him, and the poor little thing has been standing on his head in the wire-bottomed holding pen trying to part the wires with his little hands to move the sand and stones that he can see a half-inch below. We opened the entire end of the cage, but he wouldn't leave it. Finally Tom had to crawl in and shoo him out with his hands. He sailed out with his wings open finally, and settled in the grass as though he never had been away. I watched him moving the grass blades aside with his hands and fanning the sand. From time to time he picked up something, but of such

small size that I couldn't see what it was. He was not at all frightened now, and allowed me within a few inches. The last I saw of him he was still sniffing about, happy as could be, and almost invisible in the grass.

We decided we had had enough shark, too. So we opened his cage after putting Remo in another one, and Tom took him by the middle and carried him into the open, being careful not to give him room enough to take a nip at him. The shark sailed off as though this sort of thing happened every day. Later we found him fast asleep with his head under a coral lump, probably having forgotten that he ever had been in a cage at all.

July 14.

Another go-round with the anemone this morning. Chris and Jim brought out some little mojaras, and we set to work. Ran one roll on the wide-angle camera. The pictures were okay, but not as good as those we took yesterday. The mojaras would dive into the anemone and then after a half-second come bursting out again. Turned out that the anemone had had so much to eat that it wasn't interested too much in having any more fresh food. For some reason I had not expected this, but I suppose even an anemone has a capacity that can be filled.

Have a new visitor to the reef. Tom pointed him out to me -- a Nassau grouper of about five or six pounds. We gave him some minnows, and he soon came to the conclusion that we were okay, and would eat out of our hands -- this took maybe ten minutes. Now he doubtless will stay around for a daily hand-out -- if nobody happens onto him with a spear.

Clouds began forming while we were up for lunch. A few sprinkles of rain followed. From nowhere the clouds gathered, until suddenly we were in a downpour. Tom put on his flippers and went down for the cameras. He reported that the grouper was on the bottom directly under the boat waiting for us to come down again. When I threw Tom the equipment hook line for hoisting the gear he said the queen trigger saw the knot in it and grabbed the whole thing and started off with it. These fish soon will know more about taking pictures than we do.

July 15.

Turned out that the grouper didn't stay around after all. He was not in evidence when we came out to the reef today, and although we kept our eyes out he failed to show up. Possibly he has met with foul play somewhere.

We broke an urchin in the shooting pen for the angler's benefit. When a flock of wrasses had come in for the pickings we shut the doors again so they couldn't get out. We waited for a long time hoping that the angler would unlimber his rod and go to work, but he sat hunched beside a piece of coral and wouldn't budge.

Then we took off the auxiliary pen and set it up over the small piece of coral occupied by a cleaner and its anemone. Next time out to location we will install some fish in it so that the cleaner will have some captive customers. So far the cleaners have been in no mood to do any cleaning. I have spent a good deal of time watching them, and all I have seen so far

is one cleaning job, and that not a very enthusiastic one. A gray snapper sidled up to the anemone, and keeping close to it allowed the cleaner to work on his one unexposed side. Perhaps if we put some fish in the pen who have nothing to keep them busy they will have more time for primping.

Found a spotted shrimp in one of the anemones that closes when food touches it. The shrimp looked like a Yucatanicus. I watched it for an hour or more, and although many fish hung next to it as though they expected to be cleaned the shrimp gave them no mind at all. He was almost invisible inside the anemone -- which did not close when he walked around on the inside of it. I found, however, that he was careful to stay on the outside whenever it did close. This gave me an opportunity for some clear pictures -- I hope.

While I was putting small scraps of fish down for the anemone I noticed an eel's head a few inches away -- watching the whole proceeding with great interest. I dropped a larger piece in his direction. Several squirrel fish dove for it. And suddenly the eel had one of them across the middle, so quickly that it was almost impossible to follow his move. The fish was there, then it was crosswise in his mouth with his teeth going into it. And then it and the eel had vanished into the reef. One second, possibly less. Tragedies come quickly.

July 17.

Cloudy day. An easterly wave in from Trinidad way, and the air murky

and dull. No chance for pictures. We have been unsuccessful in getting our octopus to accept a house for himself, and a house is essential. If he will adopt a house of some sort we can move him about without his becoming upset. We tried him first on one of our former octo houses, a largish glass jar encased in cement. No sale. Then we put two empty conchs in his cage, and I am sure he is small enough to get into either one of them. He sits on the outside of the shells and looks about. When I pat him lightly with my finger he should crawl inside, but he merely flattens out and remains where he is. Today Chris and I made a special house for him, using a short length of asphalt pipe perhaps five inches in diameter that we had found on the bottom. We tacked a solid piece of plywood on one end of it and on the other a similar piece with a hole in the middle. To give it the look of a rock I covered it with fiberglass resin and sprinkled it with sand. It looked very pretty when we had finished, and our eight-legged friend should be happy with it. When I put it into his cage and took out the conch shells he paid no attention to it, but just hung on the side of the wire. During the night he may change his mind.

Our big grouper is back again. And very friendly. I fed him some minnows and then wheedled him into our big shooting pen. We want to see if Remo will try to ride on him now that his shark is gone. He made no fuss about it when he realized he was in jail; just hung in the water next to the wire wall and looked at me accusingly.

We put our queen trigger and some yellow tails into the pen that encloses the annulata and the cleaning shrimp. The yellow tails went wild, but the trigger turned the strange mottled color triggers assume when they are frightened, and just settled in the middle of the cage -- unfortunately not near the cleaner. By tomorrow maybe the picture will have changed. Watched the Yucatanicus again. Still no sign of his doing any cleaning, although many fish -- mostly conies and squirrels -- moved up to him and apparently waited for a job. Developed film again in the evening.

July 18.

Late to the reef for having spent time trying to latch onto a large spotted moray. The ones the boys have been able to pick up in the shallow bay area are too small to have any self-confidence with our octopus, I'm afraid. Chris and Jim located a large one at our shooting location of last year and I went down to try to wheedle the beast out into the open where I could get a net on him. I offered fish as an inducement. He would take a chunk -- in fact he took many chunks -- but would stay well back in his hole. Much too wise for his years. After an hour of this I gave up. He was only vaguely interested in food -- or had eaten a big meal prior to my coming -- and he was living in a tunnelled rock too extensive to give me a chance to poke him out.

Went on out to the shooting area, telling Chris and Jim to stick with the moray situation until we had something. Our hawkbill was on the reef,

as friendly as could be, and I tagged him around for awhile watching while he chomped grass and from time to time drifted to the surface for a sniff of air. A very neat, well-behaved little character, and I am delighted to have become acquainted with him. Tom tried to feed him some grass, but he would have none of it. Preferred getting it himself.

Checked Yucatanicus again. Still in the same place, and still with potential customers who receive no attention. The fish in the cage with the pedersoni are still flighty. The little shrimp was constantly signalling to them, but they paid no attention. The queen trigger was not jumpy, but she ignored the cleaner altogether. I think we will have to change the potential customers. I have a notion that the groupers, the coney, or some goats would be better material. Actually I do not recall ever having seen a trigger at a cleaning station.

The big Nassau eats food as though he hadn't had anything for a week, and appears not the slightest concerned at being in a cage. I think he trusts me to have no evil intent, and is just rocking along to see what will happen. And the octopus has gone into his new house. All I could see were some of his sucker discs in the doorway. The remainder of him was out of sight. Thank goodness! Now we can begin moving him around for pictures.

Had finished for the day and was taking off my lead belt when Chris came puffing up, having swum all the way from our old shooting location of other years, pulling the hand net. In it was a very big -- and very angry -- spotted moray. I took him down to the holding pen and turned him loose.

He began climbing the sides of the cage in all directions looking for a way out. Remo, who was in the same cage, looked tempted by all this activity to hook on for a ride, but his caution got the better of him, and he ended by keeping his distance. This moray is fairly short -- under three feet -- but very chunky. He should be a good subject.

While I was watching the new moray in his efforts to get free of the cage a Nassau grouper about ten inches long rushed over with his cheeks puffed out, his gills extended and his dorsal stiffly erect and marched back and forth in front of the screen making faces at the eel. He appeared to derive a great deal of satisfaction from it. Generally speaking the reef fish do not care for eels.

July 19.

Today the large Nassau grouper was still placidly in his cage, as trusting as ever when we arrived in the morning. I had a coffee can full of mackerel, and fed him bits of it which he took from my fingers with great gusto. When I turned around to pick out some more mackerel the can was empty, and a couple of feet away was the little grouper with his face so puffed he couldn't get his mouth closed. I don't know how he got the lid off the can, but he had managed it and had cleaned it out. Tom picked up the hand net and made a pass at the little thief, and he was so overloaded that he couldn't get away. As soon as he was fast in the net he spat the fish pieces back out again. But we put him into the cage with the cleaner

shrimp, and he settled down behind a rock looking very sad and contrite. I offered him a couple of fish bits to make up for the handful he had coughed up, but he would have none of it. And he wouldn't come near the cleaner.

In order to drum up some new customers for the cleaner I set up the fish trap and in five minutes it was teeming with small grunts and squirrels. Apparently they were smaller than I had thought because when I picked up the fish pot to carry it over to the cleaner enclosure they all popped out through the meshes save for one squirrel who could get only part way, and hung with his head fast in the wire. I put the trap down and after a little careful maneuvering to keep away from his barbs managed to back him up into the trap again. Whereupon he rushed with great enthusiasm to the other side of the enclosure and got his head stuck in those wires. After his second release he was beginning to look frayed and was a little more cautious. He waited for the back door of the trap to be opened, and then swam thoughtfully into the cleaner pen. It will be interesting to see if the cleaner works especially on the squirrel's sore spots.

We glassed up the main shooting pen and let Remo into it to find out if he would try to ride the big grouper. Nothing happened. But suddenly, and for no reason that I could see, the grouper went completely berserk. He charged about as though he had lost control of his senses, banging into the glass in a frenzy, and generally upsetting the furniture. I thought the remora had set him off, but Tom told me later that he had picked up the speargun spear and was about to use it to touch the grouper in order to

move him into the open when he went to pieces. Perhaps he has had experience with a spear someplace else.

In any event, since Remo was not interested and the grouper was in a twit we let him out of the pen. He swam over to the reef rocks and propped himself between two of them looking very wild. I took him a bit of fish to calm him down, but he ignored it; just lay there looking glassy-eyed. Suddenly he came to life again and flew about the reef as though he were possessed, dashing in and out of the holes in the rocks, scattering fish in every direction. But he wasn't trying to catch anything. In a couple of minutes he settled down and was as placid and friendly as before, taking food and allowing us to pat him and tickle his scales. In some ways fish are as strange as people.

In the afternoon I checked the cleaner shrimp with the squirrel and the small grouper. Nothing going on. The big grouper was friendly still, so I opened the pen door a crack and led him in with a piece of fish. When I closed the door again he hung there in the water completely complacent behind the wire, eyeing me as though he wondered what the devil I was up to now, but not being too concerned. Within five minutes he settled down by the cleaner shrimp and got himself a good cleaning. The shrimp did not go into his mouth, but worked around his eyeballs, poked its arms into his nostrils, and gave him very careful attention. Tom and I moved the cement diffuser anchor blocks and had the diffuser in position and were about to

put glass on the pen for shooting this action when the air ceased coming down the hoses. Tom went up to have a look at the engine while I remained below on the emergency tank. Soon my hose jerked and I knew something was wrong that couldn't be righted. It was. The engine had no compression. Carbon under one of the valves, probably -- an overhaul job. Oh me!

Spent the evening pulling the engine apart, cleaning it and putting it back together again. A bit of carbon holding a valve open.

July 20.

Arrived at the reef with repaired compressor working okay. Our hurried departure yesterday had made it necessary to leave the shooting pen with the glass on. Wave action had loosened the clamp screws and one of the glasses was on the ground when we arrived; not broken because it had landed on a sponge. But Remo was nowhere to be seen. Doubtless he has gone looking for a new buddy and we will know him no more.

The angler was on hand, though, and I ran some footage of him stomping around and from time to time trying to angle a fish. The swells were high and he had a good deal of trouble holding his footing. And he didn't catch any fish although we put in an urchin as an assist in bringing in something for him to work on.

No action with the cleaner in the morning. Checked the Yucatanicus. Still no cleaning. Found another of the same species on an annulata. It did no cleaning either while I was looking. Glassed up the cleaner shrimp

pen after lunch, having added to its population several white grunts and a French angel. Found it necessary to remove the big Nassau because he constantly was bothering the other fish, not allowing them to be near the cleaner for some reason.

After that things settled down, and several of the grunts came to the cleaner with their mouths open, and the shrimp went inside. The fish seemed to be interested only in their mouths, and the cleaner worked on no other part of them. The French angel had the side of her cheek cleaned, but very discreetly, on the side away from the camera. She is still immature -- still carries her white stripes -- although she is more than six inches long, and must retain some of her earlier cleaning habits, for twice I have seen her move up to the small Nassau grouper and peck at something on his side. This grouper -- about ten inches -- spent his time near an overhanging rock. It wasn't until he had been there for some time that I realized he was being cleaned by two boxers. Sometimes they moved about over his scales, but usually they reached out and worked at him while clinging to the rock. Never did they work on any part of the fish exposed to direct sunlight.

July 21.

Spent the morning with the angler. He appeared to be hungry, and would shake his bait at anything in sight. The boys caught some mojaras and we

put them in the cage for him. Mojaras are bottom feeders and should have gone to the bottom, but they remained at the top of the pen, several feet from the angler. In the course of an hour or so they had descended a foot or so, but still were much out of his range. By one o'clock the situation remained unchanged and we were too hungry to wait any longer. So we climbed up the line to the boat and had lunch. There were five mojara minnows, all hale and hearty and perverse. When we came down again after lunch they were only four. And the angler was no longer angling. The minnows practically flapped their tails in his face, and he paid not the slightest attention. So.

A big fuzzy cloud in the west sapped the strength out of our sunlight early in the afternoon. Obviously the angler would eat nothing more. We carefully removed the minnows -- keep his cupboard bare until tomorrow. The cleaner shrimp had been inactive all morning. And in the afternoon there wasn't enough light to make his picture. We folded for the day, having shot less than a hundred feet of film.

July 22.

Put in some more mojaras for the angler this morning, and he appeared ready to follow them about for a good close angling job, creeping cautiously and ponderously after them on his pectoral-feet. But the minnows were uninterested in his bait and remained about a half-inch too far away for his lunge to catch them, and they lived. By early afternoon the clouds

gathered in long avenues running east and west, and covering the sun as successfully as though there had been clouds over all of the sky. The cleaner did no cleaning on any of the fish in his pen during the day. He appears to confine his cleaning activities to afternoons, and even then he is most choosy.

July 23.

Sunday.

July 24.

Mounted my new camera lenses -- 102mm -- this morning and checked them for focus and parallax. Found out something that had not occurred to me before; although the lenses are a quarter of an inch apart, at three feet their fields scarcely overlap at all, making it impossible to use my present system of correction. Bent the lens plate to cause the lenses to toe in. Still left me out of frame about a half-inch at three feet, and the field of view is only three inches.

Took the wide-angle camera out to the shooting area to shoot some material with the aqua lung. The lung had a rupture in the regulator diaphragm. When we started up the boat to take the thing to shore to repair it we overlooked the boarding ladder on the side of the boat and broke off the top of it. Great day!

By afternoon we had the ladder repaired, the aqua lung repaired, and were back in business. Oddly enough the sun cooperated, and Tom and I ran

off a couple of rolls of general background material in jig time. (It was only later I found that the camera had lost a loop and spoiled both rolls.)

July 25.

The angler again. Got the pen ready, diffuser in place, glass sides on, camera set on tripod. I opened the back door and ran in the minnows. Before I could reach the camera one of the little fish dashed straight at the angler -- and vanished into his mouth. He chomped a couple of times while I was focussing the camera, and that was that. One never knows about these things.

But the angler appeared still to be hungry, and in the course of a couple of hours of fits and starts and false moves on the part of the angler and the anglees a little jack answered the lure of the bait and the angler gulped him in full view of the camera. The scene ran for perhaps a second.

In the afternoon I ran some more footage on the small cleaner shrimp and kept a weather eye on the boxers. It appears that the boxers often are used by the grouper, and from time to time by the angel. At one time the boxer went under the grouper's gills while a little oceanops was cleaning the inside of his mouth. No film left, of course, to photograph this action. Nor light either, for that matter.

July 26.

We have put the moray eel into the shooting pen so that it will be

home to him and he can have a fair play with the octopus when the time is ripe. So far he has been most inactive and uncooperative. Eats little or nothing, spends the days with his entire body coiled out of sight behind the rocks. I have not a single frame of film on him so far. Tom reported that he had been able to get him to take a piece of fish this morning. Perhaps he is coming around. The octopus appears to be content with his house and should be ready for business at any time.

Spent the morning trying to get a record of the boxers on the Nassau grouper. Managed, I think, both stills and movies. Too bad my other camera is still out of business. I have been working on it, of course, and it appears the problems were not as great as I had thought at first. It is coming around, but it will be a few days yet.

A large barracuda came for a visit in the afternoon with a school of small jacks flipping about him. He lay a foot or so off the bottom, watching us with his big calculating eyes. His flanks became blotched and mottled so that he was all but invisible against the gently moving sea plumes. I came to the conclusion that he was waiting for one of the reef fish to forget that he was there, and set the camera on him for a half hour hoping to see him strike. But he only hung there, his eyes unblinking and glittering, and at last slowly tilted upward like a Zeppelin leaving a mooring, and drifted away, his entourage of jacks skittering around him, and vanished into the water haze.

July 27.

We have had the moray eel in the shooting pen for several days now, and he is beginning to feel at home. Today he came out from the rocks he has picked out as a home, and took minnows that Tom put in for him. Quite anxious for them, in fact. In view of this we herded him back into the holding pen, chinked up all the holes in the rocks and made a place for the octopus house. Put the octo in, house and all, and went up to lunch to give him time to look around.

When we returned he still was in his house, but I could see one eye at the top of his door peering out. Tom put a crab into the enclosure, and after he had herded it around for awhile we could see the octopus getting interested. After a bit he rushed out and took the crab and carried it back to his house. The door was too small for him to carry the crab inside, but he did the best he could and backed in as far as he could go. This exposed the crab to the point that almost the entire carapace and the big claws were free. Perhaps not more than two or three minutes had elapsed since the octopus had caught the crab, but the claws hung limp, and the crab apparently was dead. The octopus most certainly must have bitten it to put it out of commission that quickly. There was no exterior evidence of damage, however.

When the octo had settled down to enjoy his crab we raised the back door and allowed the moray to return. I had the camera on him rather than on the octo (a mistake) and expected to see the octopus come into view when

I had swung the camera far enough in following the progress of the eel toward him. But when the area appeared there was nothing in it but a cloud of smoke. Tom, who had had his eye on the octo, told me that the instant the moray came into sight the octo had dropped the crab, shot out a cloud of ink, and shot for the ceiling. He apparently was so rattled that he had not thought of retreating into his house, and was huddled in a corner of the pen top in as small a ball as possible. We plucked him down and put him back into his cage. I am positive that the moray hadn't even seen him.

July 28.

Glassed up the pens this morning and immediately put in the octo in his house. We allowed him to get used to the place while we worked with a scorpion and with the angler. Nothing much on either of those two. I believe the scorpion did take two mojaras. His reactions are interesting. When there are possible victims about he freezes wherever he happens to be, even if it is out in the open. He spreads his pectorals wide and braces them against the bottom or preferably a rock, and then waits, ready as a cocked gun. His pink eyes follow the movements of the minnows, and as one approaches he leans towards it ever so slightly, as though it were some sort of magnet. You can see the pressure mount in him as the prey comes closer. And when he jumps -- not over three inches -- the minnow vanishes. The movement is much too fast for the eye. He opens and closes his big trap-door of a mouth two or three times afterwards as though smacking his lips, and that is all. He is ready for another little fish to come too close.

After lunch we paraded a crab back and forth in front of the octo's house expecting him to come out and latch onto it. We could see his eyeball in the door of his house, but that was all. Once he put a tentative tentacle outside and then pulled it back in again. Finally we had to give up. Perhaps he remembers the moray; we'll try again when he is hungrier.

July 31.

Spent Saturday working on the new camera box. Also Sunday. Today for the record I photographed Tom setting up the pens, putting on the glass, etc. We were half through when the clouds came. Had ten minutes of sun altogether, probably. Stood poised with the rolled-up diffuser in our hands for twenty minutes as the clouds got darker and darker, and finally gave up and tied the diffuser again to its concrete blocks and went up for lunch.

Before starting the day's business we had put the octopus into the shooting pen so that he could limber up and be ready when we were. He was very active, and hadn't been in the pen five minutes before he was out of his house and exploring. Hungry, no doubt. We had a crab for him in a screen box, but did not want to feed him until there was sun to use and a chance to turn in the moray. There was no sun. So he had to go hungry -- and in turn escaped a good scare, or maybe worse -- because we kept the moray in his part of the pen.

The avenue of clouds formed thicker and thicker, and by three o'clock things looked completely hopeless, so we descended again, chased the octo

back into his house, returned him to his little pen for safe keeping, and folded for the day.

In the evening I came at last to the end of the work on the new camera case. It is now ready for business. I think it will be interesting to see how the 100mm lens works under water.

August 1.

Another go at the octo-moray business today. The octopus came out of his house and took the crab almost as soon as it was presented to him. When he had settled down to his meal in front of his house we opened the door for the moray.

This time I held the camera on the octopus. And this time nothing happened. The octo wrinkled his brows and looked a bit worried, backed as far towards the entrance of his house as he could, and that was all. The moray swam in, headed for the octopus after he had looked around a bit. The octo did not panic, but merely held the crab up towards the moray, keeping his tentacles well out of the way. The moray nudged him a couple of times with his nose and then swam off. And that was that. The octopus finished his meal in a leisurely fashion, retired to his house, and we picked him up and put him back in his box. No hits, no runs.

August 2.

This day we put the octopus in his house in the shooting pen while the

moray was present. After a bit the octo appeared to be ready for food. We put in a crab, and in short order the octopus piled out after it and carried it back to his den -- though he could not get inside with it. In order to get at the crab in the first place it had been necessary for the octopus to pass the moray's hangout, but apparently the moray wasn't looking. Anyhow, nothing happened. We sprinkled fish crumbs in the water to attract the moray, and he came out to see what was up. The octo retreated as far as he could with his crab, but hung onto it, and whenever the moray came close he would all but disappear behind the crab, having put most of himself into his house, in case there was trouble.

Later the octopus became very nonchalant and sat on his doorstep in full view of the moray and casually finished eating the crab. Then my wide-angle camera jammed. When I had cleared the trouble and came down again from the boat the octo had finished the crab and was back in his house. And so I put him back into his cage. Sometimes things just don't work out.

We have lost our angler. He was not in the pen this morning, and the big scorpion looked suspiciously fat. I think this is a case of the angler being angled. Too bad. I should have known.

In the afternoon I made some footage with the 100mm lens on the cleaner and the snappers and grunts in the cage, and then tried to turn them loose. Took the glass off one side of the pen, but they all crowded to the back. So I took off the back glass also, leaving them two three-by-four-foot

openings to go out of. They wouldn't go. When I crawled into the pen to chase them out they would circle wildly to escape, but never venture past the place where the glass had been. It took ten minutes to convince them that they were free. Finally they broke through the invisible barrier and swam away. They had been in the pen about ten days.

August 3.

This day we set out on a new project. Dr. Chace had sent in a request for one of the fish (fierasfer) that inhabit the cucumber, and we spent the morning gathering holothurians. They are relatively scarce here, and for the most part are well hidden under the edges of the rocks that surround the coral heads. In the course of two hours we gathered ten or a dozen and brought them up and deposited them in a tub of water in the shade of a tree, hoping that when the water had gone stale the little fish would come out to look for something better. This turned out to be the case, but it happened sooner than we had expected.

Dr. Schmitt went outside to check our tubful after lunch and found several fierasfers lying on the grass near the tub. They had left their hosts and leaped the rim. All but one were dead. We rushed about and put them into fresh seawater, and happened upon one that had just left his cucumber. He hopped forthwith out onto the ground, but we scooped him up and put him into the bucket. Dr. Schmitt brought out bottles of ice to cool the water, and we gave the little fish our best attention to try to keep it alive. He was about six inches long by an eighth of an inch at

front, tapering to a needle point. He was all but transparent, the only color being a red-brown lateral line with several series of cross bars spaced along it.

We took him at once to the shooting area, placed an auxiliary pen on the grass and gave it a sand bottom, put on the side glasses, and placed the fish in the pen. He was completely lost and out of control of the situation, and spent his time head-down, wriggling up and down one of the glass sides of the pen. Unfortunately he insisted on staying on the shadow side of the enclosure and we could not budge him back to the sunny side. Finally I moved over and photographed him against the light with flash. Once in his slitherings about he slid out of one of the small gaps in the pen and was in the open water, but Tom opened the big main door and shoed him back inside before any of the local reef fish got wise. He was not a good subject. From time to time he coughed up small pieces of white material. I don't think he was feeling too well.

After making several stills we set up the long-nosed movie camera and I ran some footage on his swimming movements. We put in the cucumber we had brought along, hoping that he would go into it, but there was so much surge that the cucumber rolled about the bottom with every passing wave. The little fish appeared to be completely lost. He passed over the cucumber once or twice, but made no move to try to enter it. Then suddenly he slid along the glass, the current caught him just right to waft him through a crack, a passing yellowtail made a quick lunge, and the little fish had

vanished. And that was that.

The light had not gone completely bad, so I took one of the little red pistol shrimps I had filched from an anemone earlier in the day and put him down near a similar anemone (annulata) to find out what would happen. He dove in among the tentacles as though he were a prodigal returning home -- and in about two seconds came tumbling back out again with one of the resident pistol shrimps hot on his heels letting off a volley of shots. He huddled at the very outer fringe of the anemone's tentacles, and each passing fish would make a pass at him. He edged back into the sheltering arms and disappeared -- only to reappear after more gunfire on the other edge of the anemone with a pistol shrimp in pursuit.

At this point I ran out of film and went twenty feet for my other camera. When I returned all was quiet. I waited twenty minutes, and not a sign of commotion appeared in the tentacles of the anemone. I have no idea how the battle had ended.

On the way home we stopped at a neighboring reeflet and found a half-dozen more cucumbers for another try at photographing a fierasfer.

August 4.

Dr. Schmitt put our supply of cucumbers in a tub of water in the sun and stood watch over them for an hour or so this morning, and before Tom and I were ready for the day's work he had two of the little fish out in the open and ready for business.

I had built a small glass-sided box with an interior not more than a quarter of an inch deep so that we could hold one of the fish in position underwater for his picture. When we arrived at the shooting location we realized that the trick was going to be to transfer the fish from his bucket to the glass cage. The opening into which we must insert him was a quarter-inch by two inches. These fish are exceedingly slippery. I tried scooping our subject up in a piece of cheesecloth, but suddenly he was gone, onto the boat seat and into the bottom, with everybody after him. Jim -- who had come out for the day -- caught him and did a juggling act, losing and recapturing him three or four times. In the end we cupped our hands at the right time and in the right place and the fish went into his cage. He could scarcely move in it at all, and lay there gasping in his narrow prison.

Tom and I carried him to the bottom and after some little difficulty in keeping him centered in the glass area I made some exposures on the still camera -- those of yesterday were only passable. Then we took him to the large pen and turned him loose, making sure that all of the inquisitive reef fish were kept at a distance. It took the fierasfer only a short time to find the cucumber on this occasion, but unfortunately for him he came to the wrong end of it first. He peered at it from all angles, trying to understand why there was no opening for him to get into. Two or three times he gave up and slid up and down the glass walls of the pen. Then he would make up his mind to have another go at it -- and again come to the wrong

end. Finally some drift of the current -- or the spark of an idea -- carried him in the proper direction. He peered closely at the opening, flattening himself out on the sand to get the proper angle. When he had convinced himself that this was indeed the place, he flipped ends, inserted his slender tail, and began to back into his refuge. Then he waited for a moment, lying quietly on the bottom, and when the opening was large enough backed in quickly out of sight.

Since we had a second fish and only one cucumber we decided to find out if a second fish would go into a cucumber already occupied. This second fellow came to the proper end of the cucumber on the first try, peered at it closely to make sure he was correct, flipped ends and quickly slid into it. We waited for some time, but there was no commotion, and both fish remained out of sight. We kept the cucumber in the pen and checked it from time to time during the day, but so far as we could tell both fish remained in it.

Tried the octopus-moray again. The octopus was very hungry, but the moray was hungry too, and went slithering about the coral lumps in sight of the octo. Consequently the octopus had second thoughts about tackling the crab we offered. He began to come out several times, and once or twice lashed a tentacle at the crab, trying to catch him as he went by, but he would not venture out. Finally we gave up, put the moray in the holding pen where he could not get in the way again, gave the crab to the new octopus -- who paid no attention to it -- and returned our timid octopus to his house. Tomorrow we will try this business just one more time.

August 5.

Chris and Dr. Schmitt went crabbing last night and picked up five or six of them and put them in the floating net at the end of the dock. This morning Tom and I went out to the shooting location ready to do business and had all of the equipment on the bottom before we remembered that we had brought no crabs. So back for the crabs -- and it turned out that the little devils all had escaped from the net. So we had nothing with which to entice the octopus out into the open.

I spent the morning photographing the grouper being cleaned by an oceanops, and a trigger beating a small urchin to pieces. Then we moved over to a coral head half a block away where there are round anemones, and I made some footage of a Yucatanicus moving about among them. Tried to induce them to close by dropping a small brittle star on them. They weren't interested. Same was true with a couple of very small crabs. At this point Tom showed me a big-eye being cleaned by a Yucatanicus. It was on the side of the fish, and was actively cleaning. This is the first time I ever have seen one in action.

August 6.

Sunday.

August 7.

Cloudy all day. Dr. Schmitt and I went out to the shooting location and I showed him around the area, this being his first time down with a

Desco. The cleaner shrimps refused to clean for him, so he did not have an opportunity to see any of them in action. After he had gone back up to the boat I spent an hour or so scouring the bottom in a vain effort to pick up another mantis hole with a mantis in it like the one that dug his burrow and then vanished after my having fed him a fish. Nothing to be found. The place where his house was located is now only a smudge in the sand, and there is nothing similar to it anywhere in the area. Very strange.

August 8.

Our first day to be rained out -- and thoroughly. The day began fine, with a few floating clouds. We were out at the location early. By the time we had glassed up the shooting pen rain was falling. It must be a small shower, we thought. Tom and I divided up a can of minnows and went searching for mantis dens. Our reef fish were a bothersome lot, constantly rushing in and grabbing any bits of fish we put at the mouths of likely holes. In fact I had had to crawl into one of our cages with my head in a corner to divide up the minnows in the first place. Mine were in a glass jar, and our big Nassau grouper was constantly biting at it. The only way we could work without trouble was to go far out away from the reef rocks where the fish didn't care to follow. We found only one small light green mantis scampering about among the grass stems. He was much too small to hold in any of our cages, being not over two inches long.

The rain continued, and shortly before twelve I told Tom we had better

go up or the boat would be coming down. It was high time. Everything in it was awash. I had brought along a spare camera to do some topside shots and had put it for safe-keeping in our lunch bag under a seat. It was soaked and ruined. The first time in twelve years of shooting that I have wet a camera. This was a good thorough job -- and completely unnecessary. I should have stowed it in a safer place -- or moved it when the rains came. This day has not been a success.

August 9.

Big hopes today of coming to some sort of grips with the octopus-moray business. With no clouds to speak of, we got out to work at once, glassed up the shooting pen, spread the diffuser, put the octopus and house in an advantageous spot, and went to work. Tom put a crab in the pen and steered it back and forth in front of the octo's doorway. That worthy put his eye up to the hole and peered out at us, but although he has had no food for many days, he was content with watching the crab, occasionally bobbing his eye up and down, changing its color from deep brown to tan to pale gray. But as for coming out, not a chance. He felt just fine at home, and did not plan to move a muscle.

Finally Tom coaxed the crab to within inches of the octo's door. One of his arms shot out and caught it. He wouldn't come out of his house, however, but did his best to pull the crab in through the two-inch opening. Not being able to do this he pulled off the two big claws and retired out

of sight with them.

The boys had caught another octopus out near Goulding a few days ago. Nothing to do but run him in as replacement. We put his house in the pen and brought in a new crab. The octo watched from his doorway, appearing to be quite interested. After a half-hour he grabbed the crab on a near pass and actually came outside to eat it. But since he could not get back into his house and wanted a better location, he headed across the pen and ended by sliding into the cave usually occupied by the moray.

We assumed that when the moray arrived the octopus would come flying out of this haven in a hurry. The moray was ready, and came slithering in the moment we opened the gate. He went for his usual den -- now occupied by the octopus -- and went in. And nothing happened. I could see the octopus through an opening, he turned pale and flattened himself into a solid knot. The moray may have nudged him a little, but aside from that gave him no trouble. In a few minutes the octo was back at the business of eating his crab, and the moray was looking out of a hole in the rocks. Apparently a moray frightens an octopus at any time, but does not always cause it to panic.

We put the moray back into his part of the cage, closed the door and went up for lunch. When I dropped back to the bottom afterwards both octos were tramping about the coral in the pen. I opened the door for the moray. One octopus let out a puff of ink and hid behind the coral against a back glass. The other one stayed where he was up in a corner just beneath the

pen top. I went around the pen and found the octo cowered against the glass. The moray had his head within six inches, but was gazing steadily out at the scenery.

The day was not a total loss. Chris came down with a cucumber and a fierasfer in a jar. I glassed up the auxiliary pen while Tom kept his eye on things, and put in the cucumber. When the fierasfer was turned loose he gave a perfect demonstration of his technique, examining the cucumber carefully from end to end, and in the course of two or three minutes selecting the opening that suited him and wriggling in out of sight.

August 10.

We did not try the octopus today. It appears we have spent about as much time on it as we can. Since the moray was in the shooting pen we put the small Nassau grouper in with him to record his reactions. He does not like the moray at all, and bristles up to it whenever it puts its head out of its den. He goes at it sidewise, with his fins all extended and his gills out. He does not bite at it because he has no dental equipment for such a job, but he looks like a little bully trying to pick a fight. Sometimes the moray responds by snapping at him in a peevish sort of way; not trying to catch him, but more as though he were simply annoyed. It is all very strange behavior.

A great many of the reef fish behave in much the same way as the grouper. The angels, squirrels, conies, especially, will follow a moray all over a

reef to bristle at it whenever it sticks its head out of a hole. Why they do this I cannot imagine. The larger fish are in no danger, but I have seen squirrels perform in this way that were small enough to be a potential meal for the moray. I suppose there is a simple answer to their actions, but I don't know what it is.

We lost our light immediately after lunch, and I exposed no film in the afternoon. Spent the time looking all over the bottom and in the holes in coral heads for mantises. No. Perhaps the fact that I am always accompanied by a swarm of hungry fish may have something to do with their staying away out of sight.

When it was obvious that the sun had gone for the day and I was unable to come up with any shrimps I still had some minnows left in my bait jar. I held the jar up to the grouper. He could see the minnows but the opening was too small for him to get his mouth in. He did not know what to do, but the trigger solved the problem for him. She swam up and bit my finger, causing me to jump and spill the minnows. That triggerfish is a very tricky gal.

August 11.

Tom and I took some mojaras out to the location this morning to allow two anemones to have a tug-of-war over one of them. When we were putting the glass on the front of the shooting pen I looked down to see a pile of sand and a quarter-sized hole near the shooting pen. A mantis again! He must have dug the hole during the night. I put part of a minnow at the

opening, and like a flash he jerked it out of my hand, giving my finger a good whack in the process. We resolved to do our best with this fellow when we had finished with the anemones.

We tried allowing the tentacles from each of two side-by-side giganteas to take a firm hold on a small mojara to learn what would happen. Turned out that the anemones were not too interested. Whether they were not too hungry or whether they were uneasy over the manipulation I do not know, but the struggle was very brief. Each anemone would hang onto the fish with only two or three tentacles, and first the fish would go to one and then to the other in the course of several tries.

We next turned our attention to the mantis who had so obligingly established himself where we could get at him. We cleared away the holding pen to give us more room, moved in the auxiliary pen and set it down over his hole -- the pen is three by four feet -- and put on the glass sides. The pen had had a screen floor, but it had been cut to a four-inch flap all around. We buried this in sand so that a mantis would have to begin digging well out from the wall to tunnel out.

The mantis was digging, and I photographed him coming out with armfuls of sand and pitching it on the mound. He appears to be the same species as the other one I found early in the summer. After recording his digging operations for awhile we went up to lunch. When I returned an hour later the hole opening had been filled in, leaving only a tiny opening for his eyes to be thrust above the sand floor. But he wasn't visible in it so I

uncovered the hole and put the two surviving mojaras in the pen. The mantis soon came up to repair the damaged cover, and paid no attention to the minnows, although one of them was in bad shape and was lying on the bottom a short distance away. In the course of the next hour or so I had Tom steering the lively mojara all around the home of the stomatopod, but all he did was to come up, repair the top of his doorway and vanish. At times the mojara was within two inches of his head, possibly closer. At last we abandoned working with the lively mojara and moved the moribund one closer and closer to the burrow. The mantis paid no attention to it until it was within an inch and a half. The little rascal flashed out and vanished with the fish.

At least we have learned one thing. The large mantis roofs over the opening to his burrow, leaving only a pea-sized hole in the sand. It will make looking for similar burrows much easier. I had been searching for holes a half-inch or more across.

August 12.

Although the clouds were heavy this morning and obviously it soon would be raining Tom and I went out to the location. Our aim was to see what the mantis was up to, and with our new information about the appearance of mantis dens to try to find others like it.

The mantis hole was open when we arrived, and it was evident that he had been digging during the night. We waited twenty minutes or so, but he did not appear. I began to think that he had managed somehow to leave the premises. I adjusted the screens more carefully so that there was no

sign of opening through which he could squeeze himself, and then Tom and I went mantis hunting. Rain was falling heavily, and had been almost from the time we had hit bottom, but visibility was good, and we felt very snug walking about with a fine roof of water ten feet up.

The area in which our mantis had built his house was covered with sparse
33 > turtle grass, so we began to search the area, checking every sandy mound as far as our hoses would reach in a circle two hundred feet in diameter. There were lug worm mounds and other hillocks of sand with unknown inhabitants, but there were none that answered the description of the one built by our mantis. Whenever one appeared even vaguely promising we scraped the top off or scooped the center out to learn if it was a roofed-over hole. No luck at all. And I had been confident that we would find several. After two hours of vain searching we returned to home base. The mantis was digging again, and tossed out an armload of sand as we came up. We were glad to know that he hadn't escaped.

In order to find out what this type of mantis eats we put a smallish crab into the enclosure. It walked about -- and the mantis paid no attention to it. We had a spare crab claw. I smashed it to get some juice from it into the water, and put it near the mantis hole. No sale. The mantis began roofing over his doorway. We moved the crab claw closer and closer. Still no results. Finally I placed the claw squarely across the opening of the hole. The mantis roofed over the hole using the claw as part of the

cover. Perhaps this mantis is on a diet. We went up into the rain and home for lunch.

August 13.

Sunday. Went out to Goulding hoping to do some typical reef scenes. The compressor motor refused to start. I worked with it for an hour or more. Had lunch, took siesta, tried some more. Gave up, dove down and picked up the camera. All this time the sun had been shining and the day being wasted. Tried the motor one last time. It began to run, and worked fine. Jumped into the water post haste, and had possibly five minutes of sun. Clouds remained for the rest of the day.

August 14.

Rained most of the night, and this morning the sky was leaden. We decided to devote the day to looking for specimens to use on experiments with anemones. The weather people announce that we are in the midst of an easterly wave. A bad time it chose for coming along. We may load up with subjects and have no light for taking their pictures.

We ran out to the location and started from there in a methodical search for other stomatopods like the one in the den in our cage. We carried the anchor and pulled the boat along all morning, checking every sand mound and every hole. And we found not a single big mantis. I picked up two or three small ones from old conchs, but none of the species we wanted. It is a mystery that I should have stumbled upon two of them --

or the same one twice -- and yet be unable to come up with any others. Perhaps he is the surviving member of a dying race. The sun remained hidden during the entire morning.

In one conch I came upon a very strange little fish living with an annulata anemone -- at least strange to me. It is less than two inches long, about the width and color of a blade of turtle grass, and compressed to almost the same thinness as a grass blade. It has an oyster white dorsal the full length of it, and two slender white fern-like projections on the top of its head. It appeared to be very shy, but came to the opening in an old conch in which it and the anemone were living to have a look at what was going on. I left it on the bottom and plan to return when there is sun to photograph it. I am constantly surprised by the number and variety of animals that inhabit the area immediately surrounding an anemone and appear to be sheltered by it. The annulata is by far the most popular refuge.

In the afternoon, there still being no sun, we collected specimens of stomatopods, anemones, and some of their other associates, on the south edge of Clifton Bay. We will try to keep them alive and well until tomorrow.

August 15.

Weather has taken a change for the better. We loaded our tub of various small marine animals -- pistol shrimps and stomatopods for the most part -- into the boat and went early to the shooting location. We have nine rolls

of film remaining and two and a half days of shooting left for the summer. We were set to make the day count. Most of the work would be with the mantis shrimps and the anemones, and we were loaded with subjects.

I had only begun assembling the equipment when I realized that something was wrong with the number three camera carrying the 100mm lenses. Carried it to the surface, opened the box and found the focussing cable broken. I had used it yesterday afternoon, and nothing was wrong with it. An evening's work would be required to replace it.

With only the wide-angle camera available we decided to clean up that type of material. We placed the octopus in the shooting cage for the last time. He refused to come out of his house, even for a crab. With our time limited we could not wait for him to make up his mind, so I reached through his back door and poked him out into the open with my hand. He stomped about the pen still refusing to touch the crab. We opened the door for the moray, and he came in fast. The octo puffed ink and headed for a high corner of the cage. The moray made a couple of passes at him and then subsided, so far as I could see, without touching the octopus. The latter was very excited, and this was not relieved by the trigger and the small Nassau grouper. They would move in on him from time to time -- the trigger from outside the glass, the grouper from inside. Neither one could hurt him, but it did not steady his nerves.

The moray paid no further attention to the octopus. I photographed the grouper blustering about the moray's head, bristling and making faces.

Most of the morning had gone, and our time for photographing this sort of action was over. We caught the octopus and the moray and took them up to the boat. Their day was finished. In a few hours they would be Dr. Schmitt's specimens, labelled and in jars. Too bad.

In the afternoon we went to the location of the jawfish that had had the eggs in its mouth early in summer, and I was to photograph Chris catching it by luring it out of its house, putting a glass plate over the door and scooping the fish up with his hand net. The jawfish came out readily for a piece of minnow, and spun around on his nose trying to get back into his house through the glass Chris had put over the opening while its back was turned. At this point Chris was supposed to catch the fish -- he had done it many times before. But this little fish was too quick for him, and finally gave up trying to get back into his house. He headed out across the flat, and the moment he reached the home of another jawfish he popped into it. And in no time the former resident was out in the cold. I caught this one with no trouble in the net, but it appeared to be of a different species than our escapee. Our man stayed in the new hole with just the tip of his nose sticking out, and would not emerge for bait, having too recently had experience with what happens sometimes when morsels are offered by strangers. We marked the spot and left him in peace.

Tom and I then returned to the shooting location and I spent the remainder of the afternoon photographing the reaction of an annulata's pistol shrimps to a pistol shrimp taken from another annulata, and diving

in for asylum. The anemone appeared to give him no trouble, but the pistol shrimp inhabitants immediately booted him out. Sometimes he would snuggle under the protecting fringes of the anemone, hoping not to be noticed, but always the resident shrimps would find him and run him off. It appears that anemones do not give intruders as much trouble as the animals that associate with them.

While I was busy with the anemone and shrimps Tom began dismantling the shooting pen. When I had finished he had all of the individual frames lying out on the grass ready to be taken to shore.

August 16.

Good sun this morning, and light breeze. I had repaired the camera cable last night, so we were ready again for big business. Headed for the reef shortly after nine, and all things operated for a change. We had some mojara minnows along, and recorded the behavior of the reef fish to strange minnows -- disastrous for the strangers. All of the reef fish in sight piled onto them instantly, although they were as hale and hearty as any of the fish of similar size living in the area. No hospitality at all.

Later we held a boxer shrimp several feet off the bottom and released him to see if fish refuse to eat cleaners only at their cleaning stations. When Tom dropped the first one all of the yellowtails rushed up to it as though they were about to tear it to bits -- and then stopped a few inches short and all followed it as it sailed down through the water. And not a yellowtail touched it. But the Nassau grouper saw what was going on and

grabbed the shrimp in his big mouth, only to spit it out again apparently intact. I was about to conclude that it possessed a charmed life when the queen trigger spotted it. She rushed in and gobbled it up without a moment's hesitation. One of its claws dropped off, and a yellowtail grabbed that. The charm was gone. And the boxer with it.

We tried another boxer, and the same thing happened. There must be something not too palatable about a boxer, however, because the trigger spat it out four or five times before finally swallowing it. We tried one more boxer, while keeping the trigger out of the fracas. The other fish followed its descent until it landed on a finger sponge, but it walked quietly down the sponge unharmed. Triggers are non-conformists, it appears.

In the afternoon we placed another pistol shrimp at the doorway of the annulata. He dived in and was immediately kicked out -- right into the mouth of a passing grouper. The next pistol shrimp was bigger. When he entered the lair of the anemone there was a flurry of pistol shots like a wild-west gun battle, and a good deal of commotion. But the new shrimp stayed in. I watched for an hour or more, and although there was bickering, and some gunplay, the new shrimp held fast, and when we left he was still in the anemone.

The mantis in the burrow in the holding pen is not being very satisfactory as a subject. Each time we look at it the entrance to the hole is covered over except for the small spot into which the mantis can insert its

eyes. Actually, in covering over the doorway the mantis manages somehow to leave its eyes above the surface until it has packed the sand all around them. When it withdraws to the bottom of the burrow the hole remaining is precisely eye-size. It can insert its eyes in this space and all of him that is visible are these two ovals exactly the color of the surrounding sand. Whenever we break in the covering to reveal the entire opening the mantis comes up and quietly fills it in again.

So far we have been unable to entice him out of his house for anything. Today we placed a small green mantis in the pen. The big one either did not see it or did not care. Tom guided the small one around until it was on the sand mound surrounding the hole. The large mantis had disappeared by then. The green one poised on the edge of the hole for some time -- he was not too well -- and I expected the big fellow to come up at any moment and dispatch him. After awhile the sand gradually crumbled from beneath the feet of the small one and he fell into the hole. In five minutes his head appeared again, and he rested in the mouth of this oversize den as though he owned it. Once or twice he disappeared and I thought that the big one had snatched him from behind. But his head always reappeared again after a short space of time. I had other things to do and could not remain longer to watch -- this had taken perhaps an hour. When I returned in the course of twenty minutes the big mantis was up in the hole -- methodically filling in the door. And that was the end of that.

Once today I nearly fell over the barracuda that occasionally comes to the reef. I was walking over to pick up something or other and was watching Tom at his job of taking one of the pens apart. Suddenly I was aware of the barracuda almost at my feet, in the act of getting out of my way to keep from being stepped on (this one is constantly hanging about a few inches from the bottom where he is practically invisible.) Both of his dorsals were up and he looked peeved, and snapped his jaws a couple of times to let me know that he wasn't used to this sort of thing.

Later on in the afternoon I spotted him again lying alongside a big brain coral in the shadow of a gorgonian. The sun was back of a cloud, and I signalled Tom to come over and flash him with the still camera -- the setting was very pretty, and besides the fish had become mottled to blend with his surroundings in a manner one sees very rarely. Tom was just lining up on him when our larger grouper decided to get into the act. He rushed in and bumped (or bit) the barracuda in the tail. The Nassau is not over eighteen inches, against the barracuda's four feet. The 'cuda fled like a bullet, and then came back to find out what had hit him. He swam up to within three or four feet of Tom and me and gave us a dirty look, as though he blamed us for his troubles, and then turned and slowly swam out of sight, probably feeling that this piece of reef has become a heck of a place to try to rest in. The grouper, with his dorsal up and his jaws clamped, swam around and around in the place where the barracuda had been. No doubt

he thought that he had done quite a thing.

August 17.

End of the line. Tom and I went over to the place where the jawfish was living -- and where we had tried unsuccessfully to catch him a few days ago. He was back again in his old home, looking out at us as trusting as could be. We gave him a couple of scraps of minnow and he came out for them readily enough. With a heavy heart I pushed the plate glass over his doorway when he was out, and Tom caught him in the hand net before he could get away. We took him back to the house and gave him to Dr. Schmitt. I felt like a murderer.

In order to learn whether the fish on the reef were willing to make a snatch at cleaners other than the *stenopus hispidus* I sacrificed one of the *pedersonis* on the altar of science. No fish I have seen ever has made a grab at one when he was at home at his cleaning station. Tom held him up in the water and let him go. He hadn't floated downwards a foot before a yellowtail rushed up and swallowed him. No more cleaner. This really was not a fair test. Fish will make a pass at almost anything drifting down through the water. Often they will spit it out again if they find it not to their liking. I have seen a sinking piece of flotsam tackled by eight or ten fish in turn before they decided it wasn't worth swallowing and finally let it drift to the bottom. I suppose a better test would be to put one of the shrimps on a coral head or a sponge, or in some other spot

unusual to cleaners, and then see if he were set upon. We could not do this because we had completely run out of cleaners -- there were only three pedersonis in our area, and Dr. Schmitt got two of them for his specimen bottles. Perhaps next year.....