



## University of Hawaii at Manoa

Hawaii Institute of Marine Biology  
P.O.Box 1346 • Coconut Island • Kaneohe, Hawaii 96744  
Cable Address: UNIHAW

August 10, 1979

Mr. Dougal Robertson  
Author of "Survive the Savage Sea"  
c/o Bantam Books, Inc.  
666 Fifth Avenue  
New York, N. Y. 10019

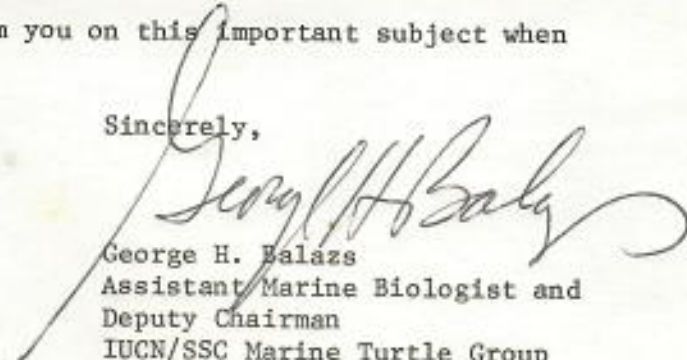
Dear Mr. Robertson:

The purpose of this letter is to ask for your kind assistance in gaining information on the sea turtles that you and your family judiciously utilized during the period adrift in the Eastern Pacific from June - July 1972. Your observations can be of considerable importance to the scientific community, as very little is known of the lives of sea turtles in the open ocean environment. I do not know if you have been contacted about this subject at an earlier date, however I am hopeful that you will have the opportunity to respond to my inquiry.

The most important point that I would like to determine at this time is the kind(s) of turtles that you observed. To the best of your knowledge, did they all appear to be the same species? There are only five kinds of turtles that could be present in that area of the ocean, and they are all quite different from one another. For reference purposes, I have enclosed some drawings that should be helpful for making an approximate identification.

I look forward to hearing from you on this important subject when your time permits.

Sincerely,



George H. Balazs  
Assistant Marine Biologist and  
Deputy Chairman  
IUCN/SSC Marine Turtle Group

GHB:md

Enclosures

immature  
specimens



note  
greater number  
of plates that  
almost always  
occurs on  
the right side

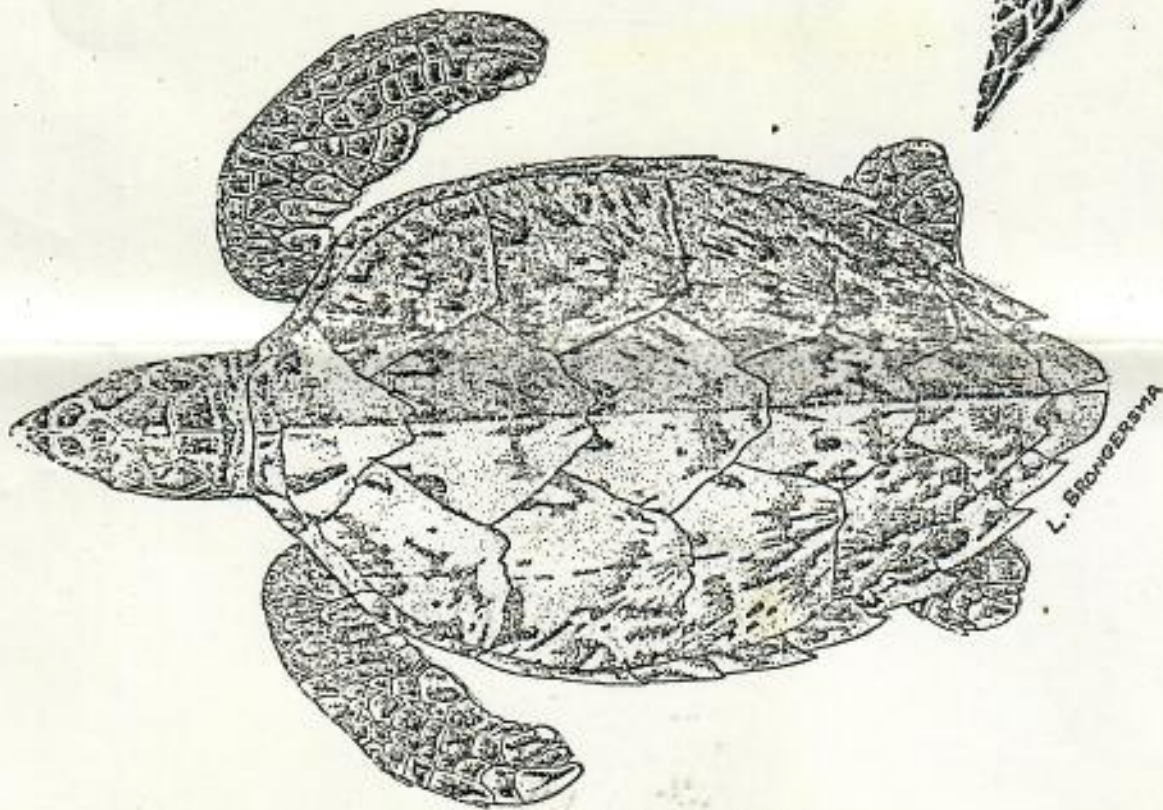
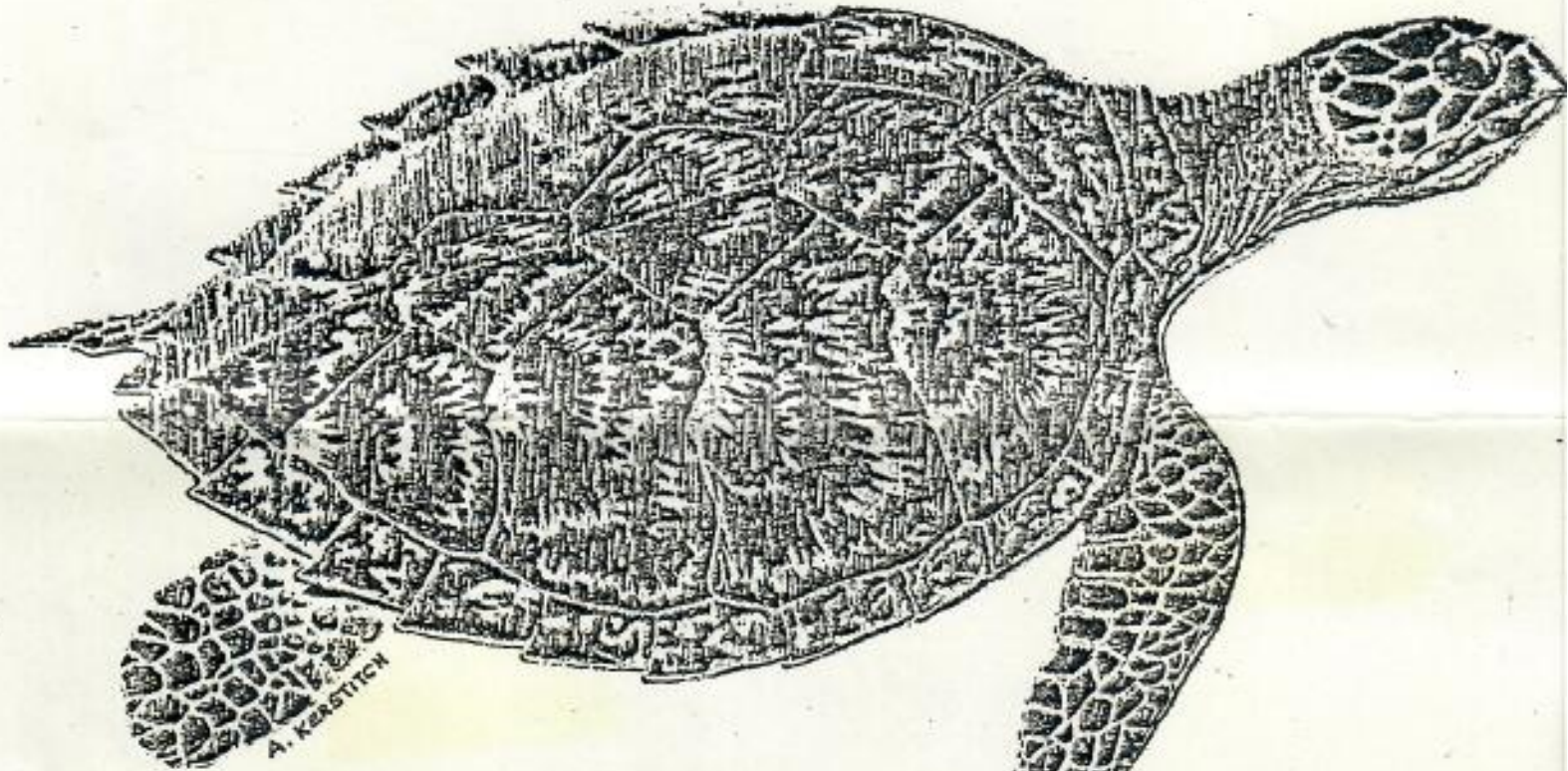


Adult

OLIVE Ridley

# HAWKSBILL TURTLE

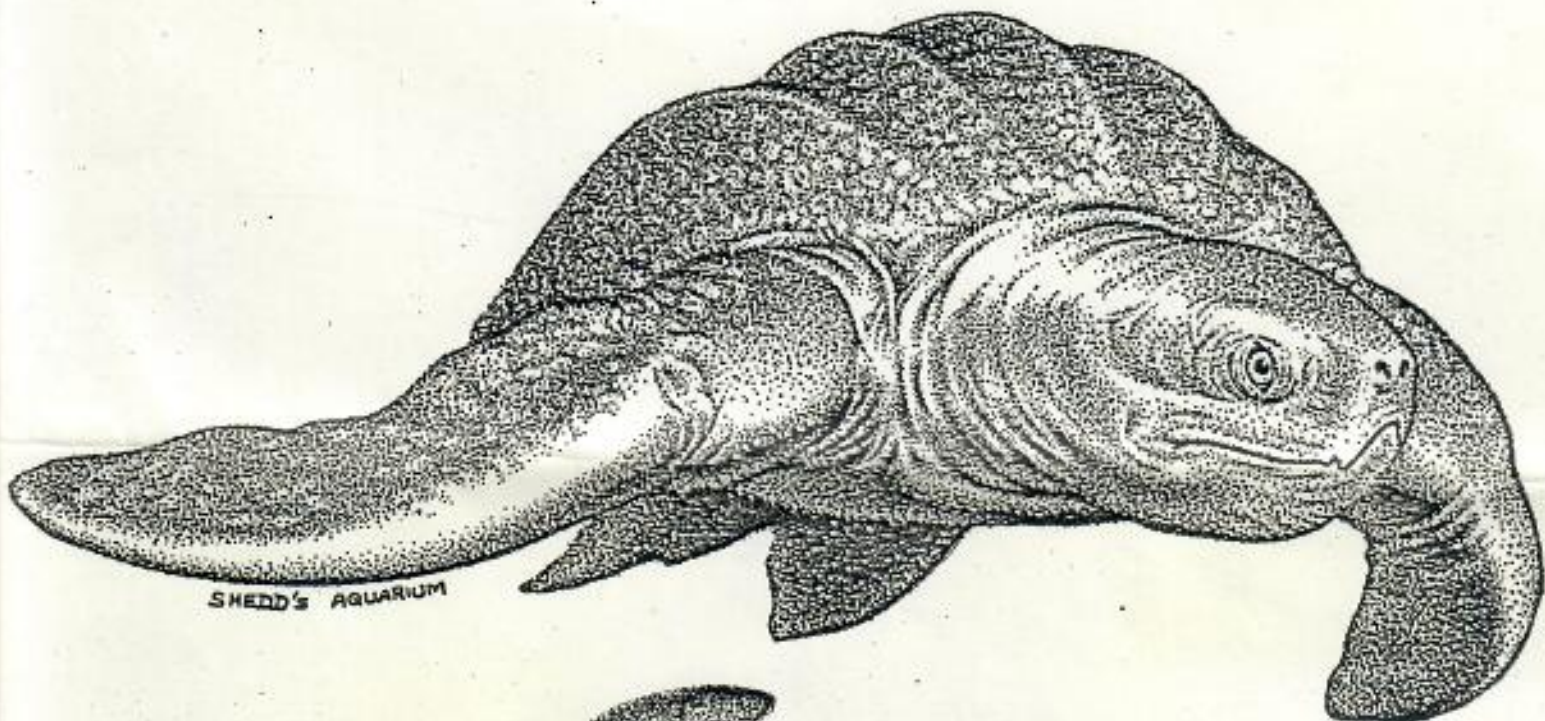
*Eretmochelys imbricata*



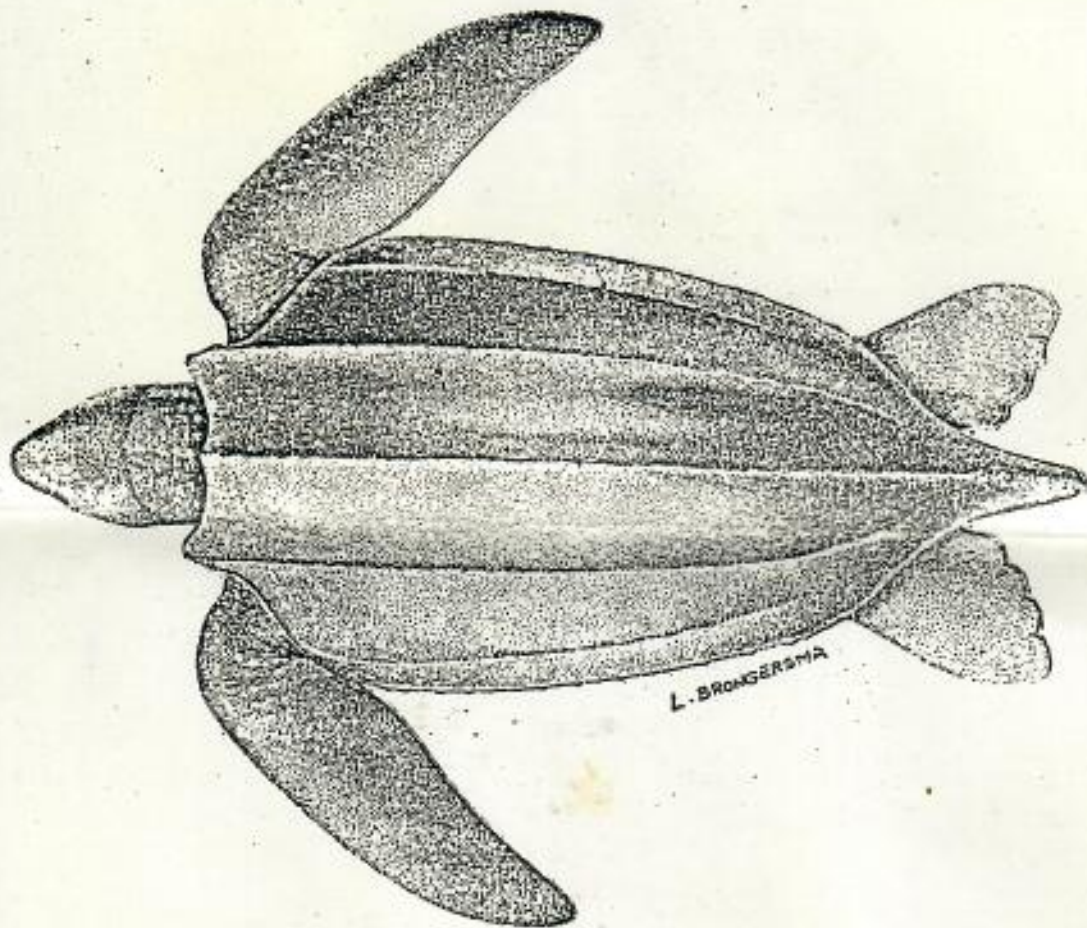
G. H. Balazs  
Hawaii Institute of Marine Biology  
P.O. Box 1346  
Kaneohe, Hawaii 96744  
Tel. 247-6631

# LEATHERBACK TURTLE

*Dermochelys coriacea*



SHEDD'S AQUARIUM

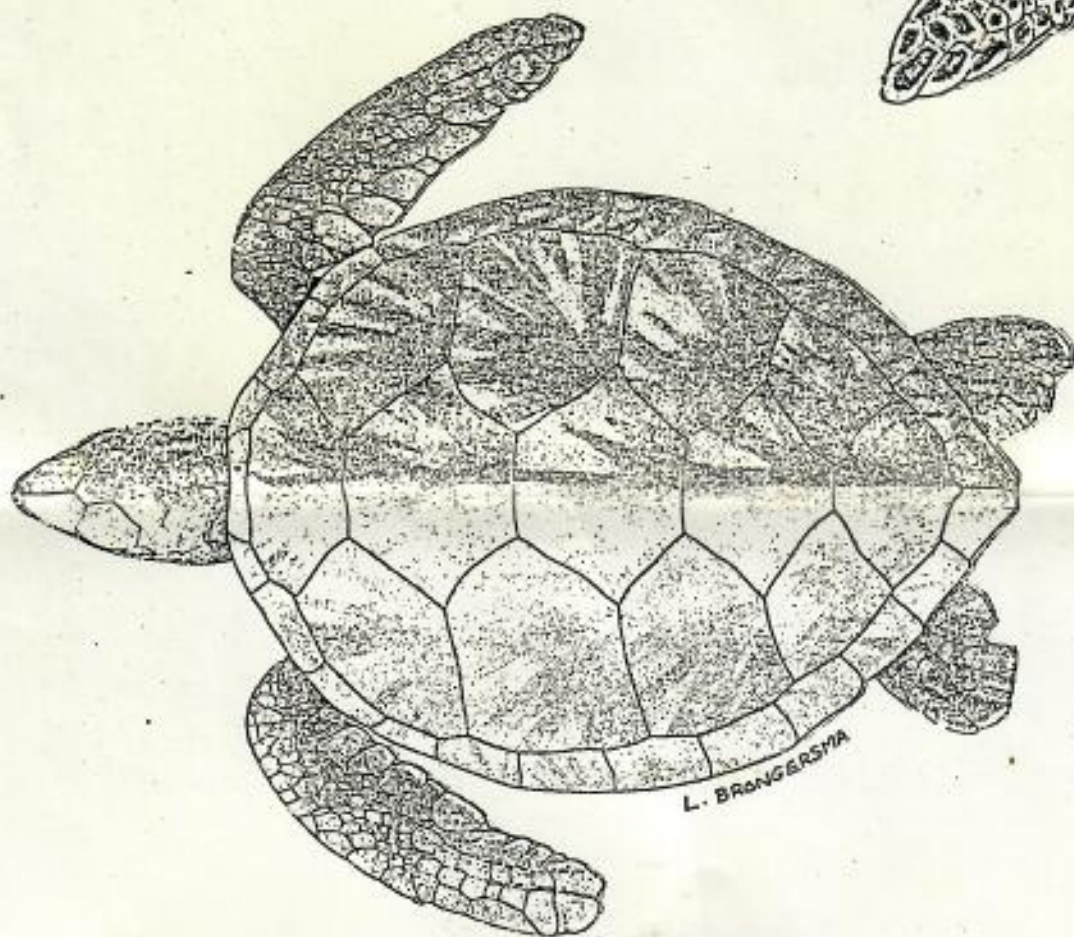
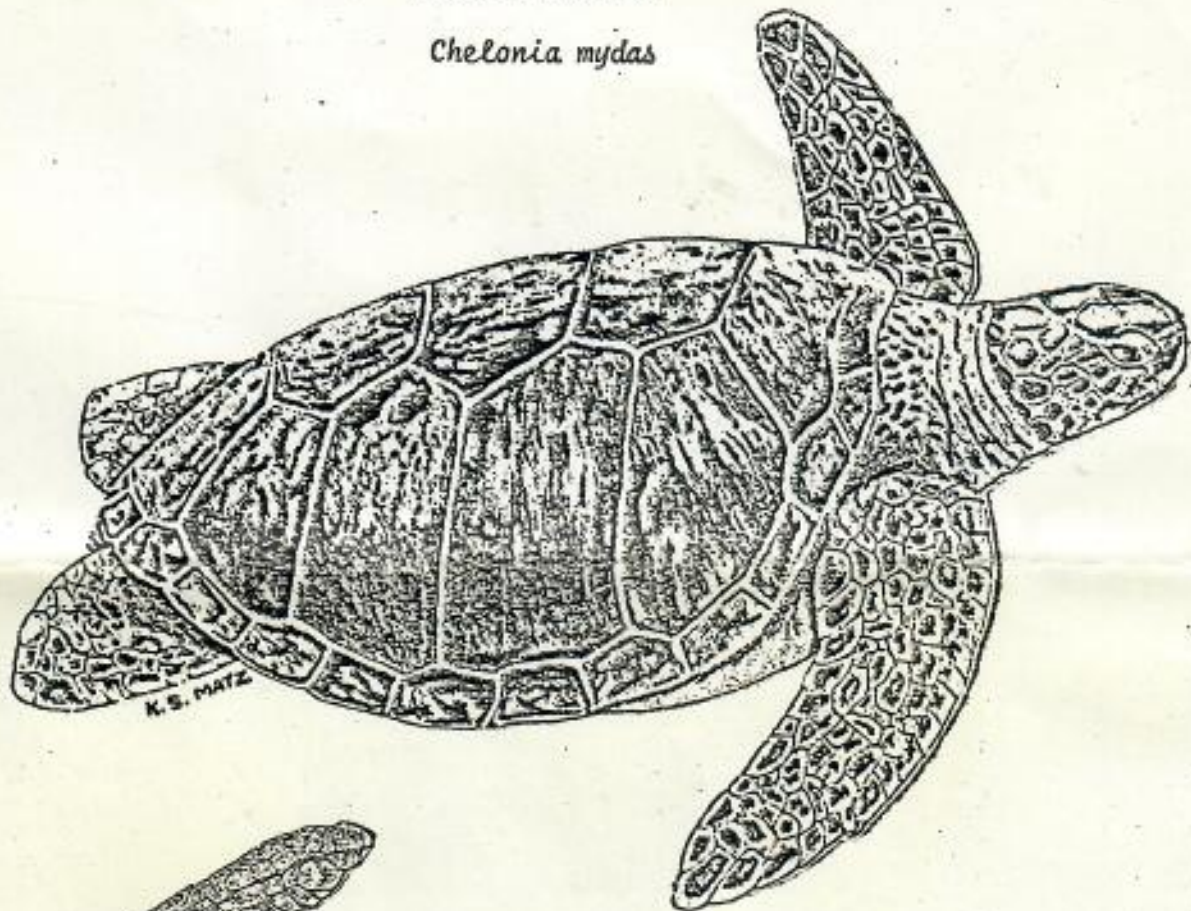


L. BRONGERSMA

G. H. Balazs  
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GREEN TURTLE

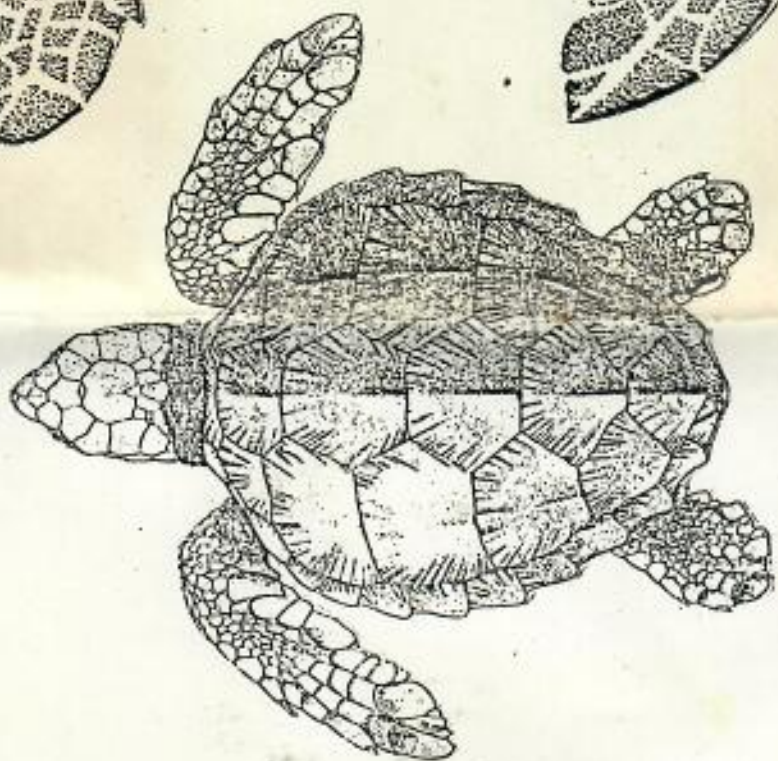
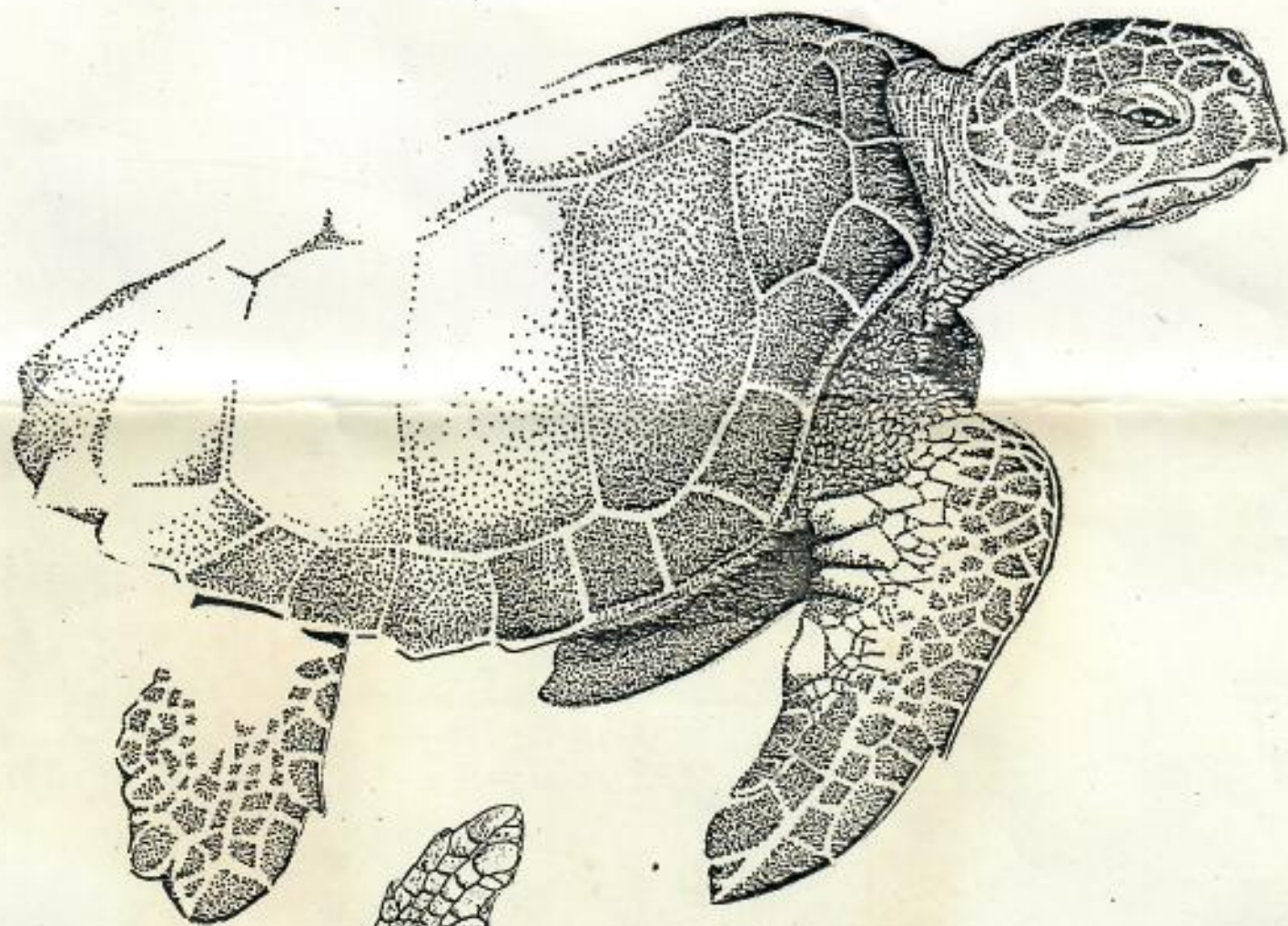
*Chelonia mydas*



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LOGGERHEAD TURTLE

*Caretta caretta*



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# 119 DAYS ADRIFT

Four days after leaving New Zealand on a two-week voyage to Tonga, the trimaran *Rose-Noëlle*, built and skippered by John Glennie and with a crew of three, struck a wild storm and was capsized by a rogue wave, trapping the men in the half-flooded cabin below. Missing, believed dead, they drifted about the South Pacific in their upturned vessel at the mercy of winds and currents for four months. In a new book, *The Spirit Of The Rose-Noëlle*, JOHN GLENNIE and JANE PHARE tell the remarkable story of survival against the odds.





ILLUSTRATION: DAVID FRANCIS

# T

he death of Rose-Noëlle came quickly. The wave hit like a freight train roaring out of the darkness towards us. There was nowhere to go, nothing we could do. It hit side on and 6.5 tonnes of boat flipped over as if it were a toy plucked from a bath by a child's hand and dumped unceremoniously on its head.

It was 6am, June 4, 1989, mid-winter in New Zealand and still dark. I had lashed the wheel and we had gone below to ride out the storm, knowing there was nothing more we could do. We crawled into our bunks and lay listening to the angry water heaving around us.

The capsized me onto the roof of the cabin above the dinette seat where I had been curled up under a rug. Two of my crew — New Zealander Rick Hellreigel and American Jim Nalepka — were lying in their sleeping bags on the opposite starboard double bunk. When the wave hit, they hurtled into the air and crashed down onto the dinette table below, landing in a bruised heap on the skylight hatch in the ceiling. I crawled across to join them.

We could hear the third crewmember, New Zealander Phil Hofman, screaming out somewhere in the darkness. He had been lying in a single bunk up behind the dinette seat on the port side. With the back of the dinette seat forming a side to the bunk, it resembled a cot; the moment we turned upside down it became a potential coffin, with sea water pouring in. He was trapped in his sleeping bag while lying on the roof above the bunk with the mattress and bedding on top of him. We called out, hoping that he would crawl towards our voices.

Phil was 1.7 metres tall and weighed 89kgs. Rotund or not, sheer panic and terror gave him the temporary agility of a gymnast. He scuttled through the water, across the roof and under the dinette table as if his life depended on it. It did.

The cabin was filling with water fast. I knew the trimaran would reach a state of equilibrium and the water would eventually rise no further. My crew were not quite so convinced. Phil rushed for the companionway doors and kicked them open — a mistake that was understandable in his panic to find an escape route, but one that was to cost us dearly. The sea surged in — and out, taking with it equipment



and provisions. The emergency flares were the first to go.

I knew we had to move quickly to save everything that was left. I told the others to grab everything that was floating and throw it into the aft cabin, which would end up at the highest level above the sea water.

We worked feverishly; by now the water was waist height at the front of the main cabin, where the bows rode high, and chest height back aft by the galley. It stopped rising and the level was to remain that way for the next 119 days.

I had waited 19 years for this dream voyage. I was full of expectation and a sense of adventure, and anxious to leave. This urgency caused me to set sail with three crew members whom I did not know and who had very little sailing experience.

Ideally I wanted friends along, but at the last minute my pre-arranged crew — all good sailors — had to pull out. Two of them planned to join me in Tonga for the next leg of the cruise. Many times in the next four months I was to regret deeply that I did not have at least one friend out there with me.

● The cabin was filling with water fast. Phil rushed for the companionway doors and kicked them open in his panic to find an escape route. The sea surged in. ●

By the end of May I was desperate for crew and Phil Hofman was keen to try blue water sailing. With his wife Karen and their two teenage children, he had spent the previous three years living aboard their 13-metre yacht *Toroa*, at Picton, in Queen Charlotte Sound in New Zealand's South Island.

A few days before I planned to leave, Rick Helreigel arrived at the wharf. Married and with an eight-month-old son, he had experienced a disastrous trip to Fiji some years back and was keen to give ocean cruising another chance. Rick's friend, Jim Nalepka, a cook, was also keen to come.

After the boat capsized, Phil's fear left him. He had been more terrified at the thought of turning upside down than when it actually happened. But in the place of his fear was an attitude far more dangerous. He was convinced he was going to die and there was nothing he or anyone else could do about



Sail layout. Opposite: The last picture of Rose-Noëlle.

it. He just didn't seem to care about survival. That made him a dangerous person to have on board.

The aft cabin behind the galley, once on the lowest level on the boat, now became the highest. But it wasn't high enough. Water sloshed over the ceiling, now the floor, soaking the bedding and mattress that had tumbled onto it. We would have to build a platform to keep ourselves dry until we were rescued. At that stage we still believed our "adventure" would be short-lived. We had the EPIRB (Electronic Position-▷

“There's never been a better time to feel the snow fall in the high country.”



*“down by Kosciusko, where the pine-clad ridges raise  
their torn and rugged battlements on high,  
Where the air is clear as crystal, and the white stars fairly blaze  
At midnight in the cold and frosty sky.”*

Good time  
Aussie holidays

Experience a snow fall in the high country this winter and you'll understand the love Banjo felt for the mountains.

◁ Indicating Radio Beacon) and we figured it would be only a matter of days before we were rescued. I knew there was a good supply of canned food in one of the lockers beneath the dinette. The hatch had come off and a lot of the cans had toppled out, but there were still plenty jammed in there, enough to make it an important cache. I paused over the split bag of wholemeal flour but then pulled it out of the way and let it fall into the water. What possible use could it be? I was to remember the flour that I had tossed away so extravagantly when, weeks later, food became the most important and valuable commodity on board.

We decided that we should set the EPIRB going as soon as possible before we drifted further away from land. I had a large range of tools on board which were trapped in the forward hanging locker. We hacked a hole through the side of the hull leading out onto the wingdeck: Rick and Phil clamped the EPIRB to the side of the hull with the aerial poking outside and switched it on.

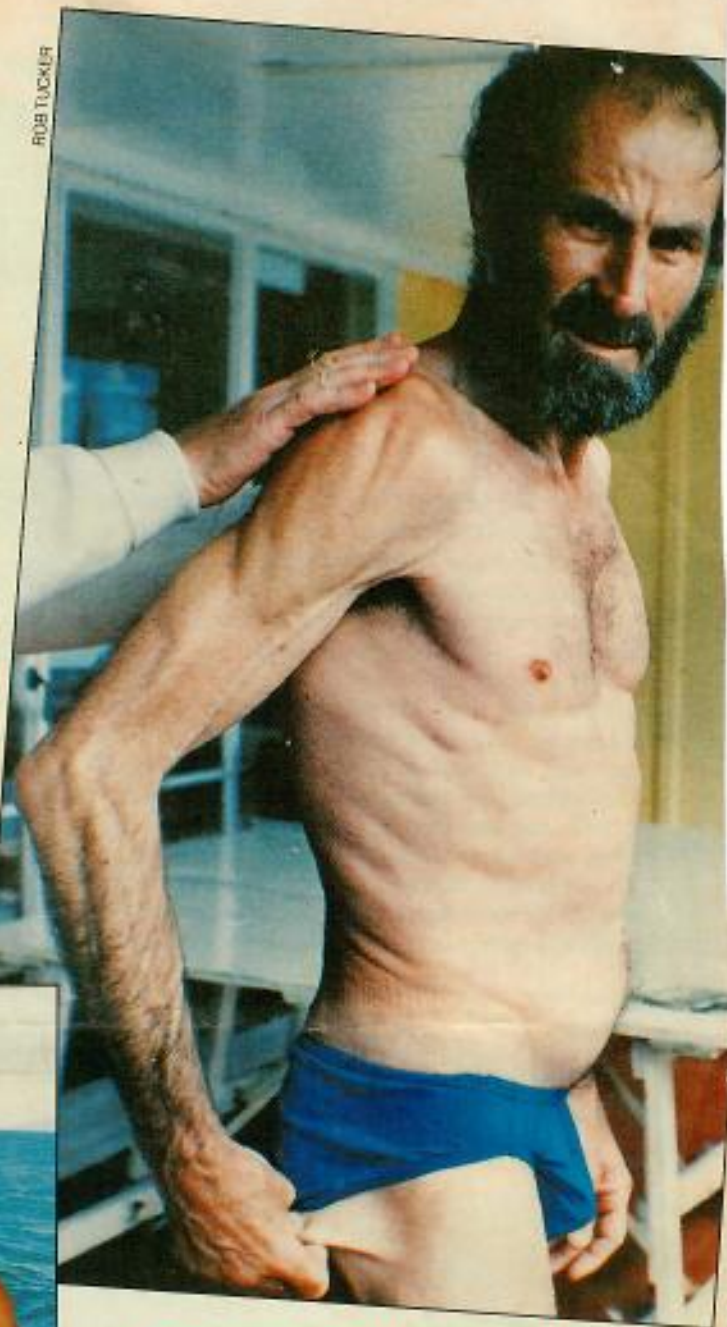
The red light flashed straight away, signalling a message to the outside world. We were elated. Now all we had to hope was that we would drift beneath a commercial airline flight path in the next week or so — and that the flight crew were listening.

On our first day out on deck we peeled off our damp clothes and inspected our bodies. Saltwater sores had already begun to fester. I seemed to suffer least of all and I suspect that this was because I had a layer of wool against my skin. Rick and Jim still had grazing and bruising on their thighs from hitting the dinette table when *Rose-Noëlle* capsized. I dived into the forward cabin, found the medical kit and took out some antiseptic cream for the sores. Within a couple of days they had cleared up, and from then on any tiny cut or abrasion was treated successfully.

Our spirits sank a couple of weeks later when we realised that our precious medical kit had been washed away in the surge by one of the countless storms which plucked and pulled at possessions stored in the main cabin.

Eight days after we capsized, the EPIRB stopped transmitting: now we were on our own. We had to face the possibility of drifting for longer than a few days, so we began to ration what we ate and drank. A single can of food began to last four meals — two or three spoonfuls making up a meal. Though much of the foodstores had washed away we still had a reasonable cache: cans of corned beef, mackerel, baked beans, beetroot, sweet corn, fruit, condensed milk, reduced cream and coconut milk. There were five trays of kiwifruit, upside down but still intact. Stored in the dark and rationed out, these lasted 100 days, giving us a much-needed source of vitamin C.

As the weeks wore on, we knew real hunger for the first time in our lives — the empty cramps in the stomach, the feeling of lethargy, the endless dreams about food. We were now down to less than half a cup of liquid a day. After 40 days adrift, Rick,



**Above: Although well fed after his ordeal, John Glennie shows how the fat beneath his skin has wasted away. Left: Cruising the Whitsundays in 1987.**

Phil and Jim wanted to erect a jury rig and try to sail upside down back to land. We had several arguments on this subject because I was convinced our priority was to remain safe and well, and to concentrate on survival, using the resources about the boat until we were spotted by a ship or found land. That meant building a reliable water catchment and establishing a regular supply of fish, something at which we had been unsuccessful so far.

The trimaran was not designed to sail upside down three-quarters full of water and would be near impossible to steer. To make any progress against our drift we would have to work long and hard at a time when we were rapidly losing weight and strength. Our time would be taken up with trying to sail the boat rather than catching fish and water, our only chance of

long-term survival. Eventually we came to a compromise. I dived down to one of the trimaran floats to see if I could salvage any of the sail bags. However, when I checked inside I found it was almost completely empty. The capsizing had been so fast and forceful, the hatch cover had been ripped clean off, and as the float thumped down the contents had been emptied right out. In a way I was relieved the sails had gone; I no longer had to appear the bad guy by arguing against a plan I knew was

● *As the weeks wore on, we knew real hunger for the first time — empty cramps in the stomach, endless dreams about food. We were down to less than half a cup of liquid a day.* ●

foolhardy. I also suspected by now that we could be well on our way to South America, and unless we were lucky enough to bump into something like the Maria Theresa Reef, we could be in for a long wait. To me, the water-catchment system was our top priority.

Using some lengths of plastic pipe we managed to retrieve, we built a framework by splitting the pipes up the middle and lashing them side by side with fishing line to lengths of timber. We secured the frame to a mast we had rigged from a spinnaker pole and gathered the pipes in at the bottom to drain into a bucket. All we needed now was a miracle. And we got it.

The next day it rained. The bucket beneath the conduit pipes slowly filled and water trickled through the pipes of the guttering system we had rigged along the hull. From that day on, life was more bearable. We were able to make cold drinks of Milo and coffee, and mix water with orange powder to make juice.

After a month upturned, tiny molluscs and barnacles began to form below the waterline. The more that grew, the more fish, mainly yellowtail and kingfish, became interested in them. And they interested us. They wouldn't take a bait, but Rick and Jim were able to rig up a fishing gaff from a 10cm hook lashed to a sail batten. Then they put together a landing net. The four of us developed into an efficient team. Jim would dangle a lure from a line and entice the fish to the surface (though they wouldn't strike). Phil emerged as the dab hand with the gaff. When he struck, Rick was ready

with the net to secure the shiny creatures — up to half a metre long. I stood behind Rick to transfer the catch, clean it and stand it in vinegar.

On good fishing days we forgot to look for ships, we didn't argue, we stopped dwelling on our loved ones. All we thought about was catching fish — and more fish. We ate them raw, Tahitian-style. And they were delicious.

About this time, I began to keep my log. I knew there were exercise books stored beneath the dinette seat. I began to write down what we did each day, what we ate and how much, how we organised ourselves and descriptions of our various ▶

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Good time  
AUSSIE holidays

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inventions. To keep myself occupied I began to write articles on capsizing. I also began writing letters to family and friends; it was such a comfort to absorb myself in communicating silently with those close to me. And I began to design a catamaran called a Sounds Cruiser, ideal for exploring the Marlborough Sounds in NZ. Rick also began to write letters to his wife Heather in the form of a diary. Our loved ones were never to see the various letters we wrote — all washed away when the Rose-Noëlle broke up at the end of our voyage.

Jim naturally became the chef. With only a few ingredients he could make us think we had just eaten a sumptuous meal. He experimented with flavours, combining seasonings and spices from the galley cupboard with all the flair and imagination his training could muster. I consider it was Jim's culinary expertise that contributed more than anything to keeping up morale during those 119 days. But no matter how hard you try to dress it up, cold food is cold food. And in the middle of winter in a soaking-wet cabin, that can be depressing.

When I first dived to the port float to retrieve the conduit pipe for the water system, I noticed my stainless-steel barbecue still wedged in there. A couple of days later I went back to get it. We had timber, kerosene and matches. Up till then Jim had made rolls of raw dough filled with a layer of jam as a treat, and now we were about to taste the cooked version. The fat got hotter and the smoke thickened. There was no way we could

**Rose-Noëlle below decks before the capsizing. The small cabin (bottom left) was home for the four men for four months.**

JOHN GLENNE



control the heat coming off the barbecue. We could have done ourselves some serious damage. For six weeks we had survived the capsizing and storms, and been eking out a reasonable existence catching fish and molluscs that gathered on the weed beneath — only to risk death by smoke inhalation or third-degree burns from an out-of-control barbecue. After that we only ever lit the barbecue up on deck on a very calm day.

Then I remembered a kerosene lamp I had rescued from a locker. Rick cut a wick from the tie straps of a life-jacket and got the lamp working. While Phil and I held the lamp and kept it going, Rick would hold an old baked-bean can half full of water over the flame. As it heated Jim would concoct one of his wonderful sauces, using gravy or custard powder as

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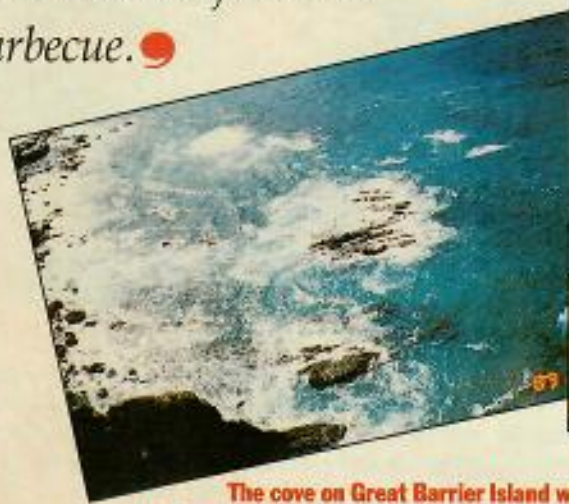


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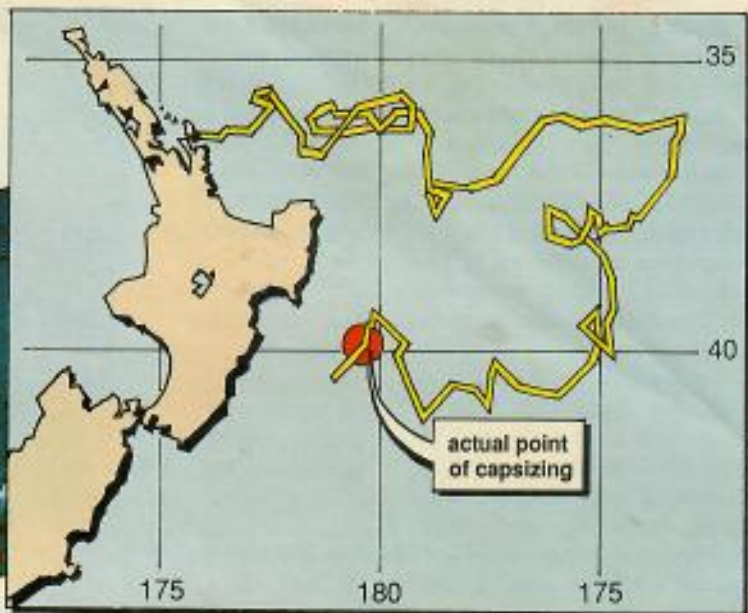
Good time  
AUSSIE holidays

DT112-5/RRP/70

● We had survived — only to nearly die of smoke inhalation from an out of control barbecue. ●



The cove on Great Barrier Island where the *Rose-Noëlle* was wrecked, and the Auckland Weather Office's estimation of its drift.



NZ YACHTING MAGAZINE

◁ thickener and maybe adding chilli powder or tandoori mix to pour over a little cold rice or fish.

Later we salvaged some gas bottles and were able to rig up an efficient and reliable burner. We still had three full gas bottles on board, enough to last us up to a year if used

sparingly. It was a calculation I dared not repeat to Rick, Jim and Phil for fear of an angry reaction. They would not face up to the possibility that we could be in for a long wait and resented my attitude of acceptance of our plight. No-one liked to think we might still be floating around the Pacific Ocean on Day 100 — but we were.

One by one we had conquered our problems to survive and make life reasonably comfortable. We had a healthy water supply, we were catching fish, and we could cook. But by

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August, the New Zealand Water Safety Council had given us up for dead. In its August/September 1989 bulletin, John Glennie, Rick Hellreigel, Phil Hofman and Jim Nalepka are listed as drowned in the vicinity of the Kermadec Islands.

**S**oon after we capsized, I became determined to make the most of each day. I would make an attempt at humour, but the others were not amused. They blamed me for the situation we were in and they were not about to let me forget it. Rick in particular used to resent my attitude and he would round on me and snap, "You're enjoying this, aren't you? This is the highlight of your life." Rick and I would clash bitterly over many things. There were times when I thought we would come to blows, but then there were times when all of us could have come to blows with someone. But we never did. We never got to the stage where we lost that final thread of self-control and could not pull back. Sometimes I wondered if we argued for the sake of it, because we were bored and sick of the sight of each other.

My three crewmates resented the fact that I appeared to be enjoying myself. In a way I was. Apart from spasmodic flashes of regret about the ruin of my beautiful boat, I had accepted our situation more or less straight away. There was nothing any of us could do about our predicament. There was no point in laying blame or regretting ever having stepped foot on Rose-Noëlle — although I am sure all three of them did.

I thought the whole experience would be a total tragedy if we did not learn from it. I don't mean safety procedures or survival techniques, but learn personally from our enforced time adrift, all those hours to think and reflect. No-one was about to help us; our hope, our belief, had to come from ▶

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MARK MITCHELL/HERALD

**From left to right: Crewmen Phil Hofman, Rick Hellreigel and Jim Nalepka about to leave Great Barrier Island by helicopter after their ordeal.**

longest journey in an upside-down yacht — although in 1942 Poon Lim of the British merchant navy survived for 133 days alone on a raft in the Atlantic after his ship, the SS Ben Lomond, was torpedoed.

While I would have dreaded surviving out there on my own, there were occasions when all of us needed time to ourselves. Even Rick and Jim would lose patience with each other, and because they were so close, their arguments seemed worse. They would say bitter, personal things

and then a few minutes later would apologise and hug. The worst arguments happened at night. We always seemed to strike bad storms at night when the hours of darkness dragged on and on.

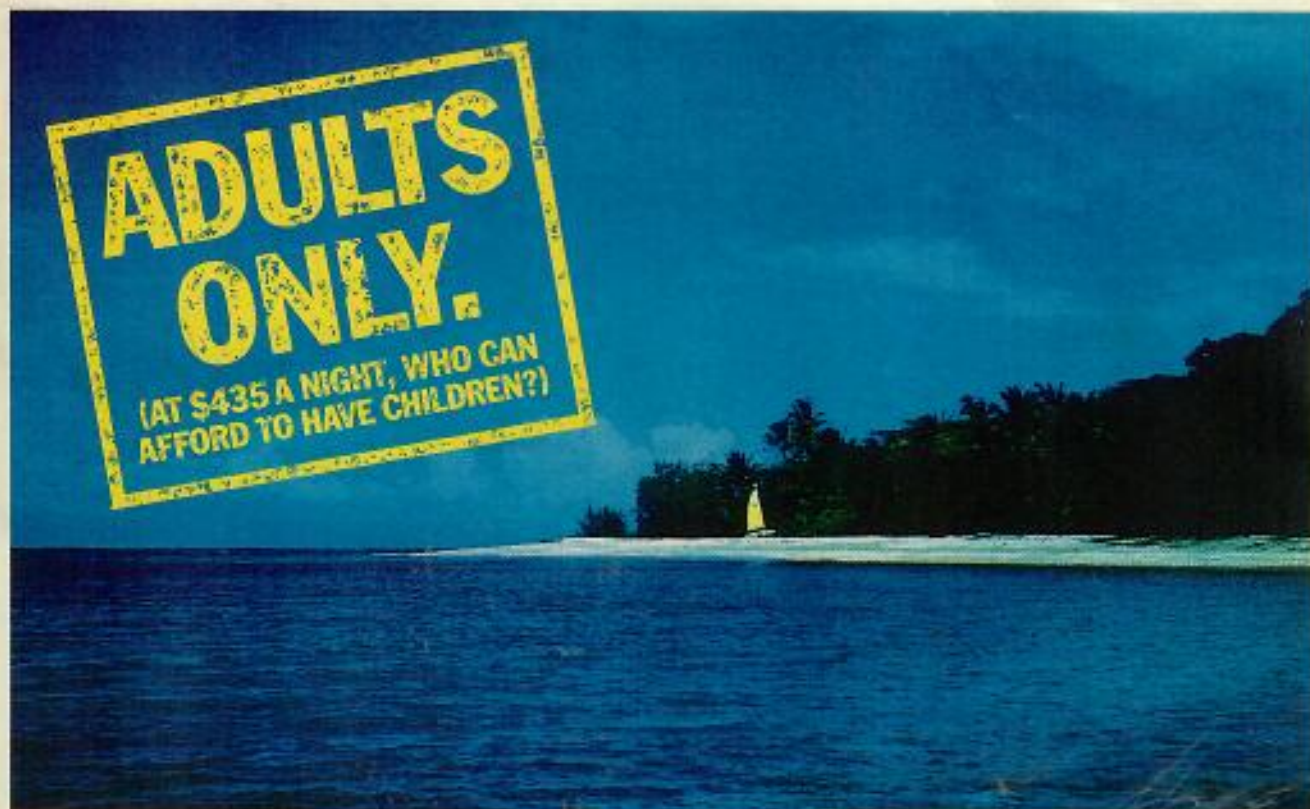
and then a few minutes later would apologise and hug. The worst arguments happened at night. We always seemed to strike bad storms at night when the hours of darkness dragged on and on.

Little mannerisms irritated. Sometimes I would clean the bowls with my finger, and that irritated Rick. In the early days Phil used to have a variety of habits that grated, from belching to sighing loudly after he had drunk his ration of liquid. When we were nestled together at night, Phil could never keep still. He had a habit of jerking his head up and his long hairs would tickle the face of whoever was lying directly behind him, usually me. Eventually I got so impatient I'd pull his hair.

I even pondered about the longest record for being adrift. Would we beat it? Certainly we would have endured the

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We did have some special, enjoyable days; days when the weather was fine, we caught fish, Jim cooked an excellent meal and we were full of hope. On good days when we were all getting along well and I was feeling happy, I used to sit up on deck and sing.

On the morning of Rick's birthday, August 19, I was up early watching a magnificent sunrise. Rick, Phil and Jim were below and I thought they should share in the beauty. "Hey, isn't anyone going to come up and watch the sun rise?" I called. There was no response. "Isn't anyone going to celebrate his birthday?" Still no response.

Suddenly my eyes riveted on a white shape on the horizon. A sail! There was a yacht out there. This would make them move, I thought. "Does anyone want to see this yacht sail by?" There was a flurry of bodies and bedding as they struggled to clamber out of the cabin at the same time.

"Quick, get the barbecue lit," Rick yelled.

Like others who have been adrift at sea for a long time, I soon came to the conclusion that a passing yacht or ship would have to be close enough to see us easily, rather than the other way around. We had already seen two ships in the distance, both at night, but they sailed on, oblivious to our frantic signalling with a tiny strobe light.

We loaded the barbecue with kindling and added a little petrol which Phil had syphoned from an old generator. Once the fire was alight we added a rubber flipper and some epoxy resin to create black smoke, hoping it would rise in the air like an Indian smoke signal.

But there was a tiny breeze, just enough to pull the smoke sideways and disperse it. The white sail got smaller and smaller until it disappeared. We sagged with disappointment. ▷

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DT100.11.11.73

◀ Monday, September 11 marked 100 days since the capsizement. We could hardly believe how quickly the time had gone. All four of us had lost a lot of weight and Rick and I were particularly thin. Lying wedged on my side in the cabin I found the pressure on my hips and knees extremely uncomfortable at times. Phil had lost his big paunch and in its place were handfuls of skin hanging down from his stomach.

Overall we had been blessed with good health. Although we

● *I wrote in my log: 'It's been 116 days today. Is that enough? Can I go home now?' I knew I was a better person for the experience.* ●

were cold and wet for much of the time, particularly during the early days, none of us caught cold. Rick had not suffered from asthma nor been even the slightest bit wheezy. (He was dismayed to find that within a week of returning to land he once again needed his inhaler.) In the early days Phil was on medication for a heart condition but he eventually stopped taking that. Perhaps he'd taken it more from habit than anything else.

Towards the end the weather began to improve and we were catching so much fish that I was able to dry some of our catch to save for a rainy day. We kept worrying about what would happen if the weather packed up and we were once again



**Glennie is reunited with sister Christabel, and her husband Malcolm Tomes.**

confined to the cabin, unable to fish. Our supply of cans was starting to run out and we were loath to return to the days of just a few teaspoonfuls of food. The more fish we caught, the more we wanted.

We stopped dreaming about childhood treats — white bread, roast dinners and pavlova. We were catching plenty and had more than enough to eat, yet we wanted to catch more. It was as though we were panning for gold.

One day we decided we were sick of looking at each other's shaggy appearance. I had found a pair of scissors and we sat up on deck to operate on one another. On our 116th day adrift I



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wrote in my log: "It's been 116 days today. Is that enough? Can I go home now?" I considered we had done well. We had coped with the initial shock, we had surmounted the problems as they arose, and we had learned to work as a team. Each one of us had done a great deal of thinking during our time adrift and I knew I was a better person for the experience. None of us would ever be the same again.

I had personally learned it was possible to manifest miracles; the saying "Where there's a will there's a way" had never rung more true. I knew now how to appreciate the simple things in life and to be happy with what I had, rather than always looking towards some elusive dream at the end of a non-existent rainbow.

We thought land couldn't be far away. We had spotted bluebottle jellyfish in the water, the fish were changing and there were more land-based seabirds about. I sensed our time was almost up. The next day, September 28, we spotted land.

You would have thought that once we had established that terra firma lay dead ahead we would have whooped and jumped for joy. Instead, our reactions were all very matter of fact and calm. We kept fishing and looking ahead at the dark, misty form, which gradually sharpened. Maybe we didn't want to get our hopes up in case we were wrong or in case the winds and currents played a cruel trick and pushed us away.

On the morning of day 118 the outline of the land was quite clear and the colour had deepened to dark green. We were all up on deck early, eagerly checking to make sure that our landmark was still there and that we were still drifting towards it. After so many days of scanning an empty horizon it was hard to believe that we were nearly home. Rick and Phil became convinced that the mountainous shape ahead was

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DT113...RHP/70

◁ Great Barrier Island, which forms a barrier to the Hauraki Gulf at its north-eastern boundary, 80km from Auckland. Both Rick and Phil had grown up in Auckland and Rick had spent time hiking on the island as a youngster.

That night we slept fitfully, the atmosphere tense, wondering what the morning would bring. It was obvious that we were going to hit land that day and I scanned the horizon anxiously for fishermen or pleasure cruisers who might be in the area. Knowing that there was no longer any need to conserve food and water, we ate well that day. The meal fortified us for what lay ahead. The four of us sat up on the keel clutching our bundles, waiting. High above on a ridge across a valley I could make out the pitched roof and television aerial of a house, the first sign of life. I decided that would be a good spot to head for once we got ashore.

While the sea had been relatively calm offshore, the waves grew stronger and angrier as we approached land and now they picked up Rose-Noëlle and pushed her towards the rocks. She hit with a sickening crunch; the waves lifted her firmly onto the reef and abandoned her, leaving the full weight of the upturned trimaran to grind itself over the remains of the mast and rigging.

We sat on the reef for an hour or more while the waves crashed around us. While the land looked agonisingly close, the stretch of water in between was turbulent and peppered with rocks. If we hung on until the last minute we could clamber ashore — all we had to do was sit tight and keep an eye out for rogue waves which might wash us off the hull.

As time wore on, the others became concerned that we should make a move soon, before the sun sank much lower. But finally we hit rocks near the foot of the cliff and the wreck ▷

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DT115.NRHR.78

could go no further. It was time to leave. We stumbled and clawed our way through the water until we reached dry land. We had made it.

Behind me, Rose-Noëlle was in her death throes, her gleaming yellow hull starting to break up. She had stayed with us until the end, having floated 3000km around the ocean, looking for somewhere to rest. I never even looked back at her.

I had long decided it was all meant to be for a reason, and losing the boat did not worry me. I had believed in our future. I had done what was expected of me, and Rose-Noëlle had done the same.

**P**ostscript: On September 31, 1989, John Glennie, Phil Hofman, Rick Hellreigel and Jim Nalepka clambered ashore at Little Waterfall Bay on the rocky shores of Great Barrier Island, as the Rose-Noëlle smashed to pieces beneath them. On either side of the bay was a line of rugged and inhospitable coastline, impossible to penetrate from sea level. The wreck site was the only cove in the area where the bush ran down to the shore offering a way out. Had the Rose-Noëlle drifted a few hundred metres either side of the cove their story might have had a tragic ending.

After their ordeal Jim Nalepka broke up with his girlfriend and returned to the United States; Rick Hellreigel and Phil Hofman resumed their former lives with their families; John Glennie turned his back on the sea and boatbuilding and is pursuing a new career writing and lecturing. Except for Rick and Jim, none of the crew of the Rose-Noëlle keep in touch.

Extracted from *The Spirit Of The Rose-Noëlle*, by John Glennie and Jane Phare, published by Viking, RRP \$29.99 □

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The  
Saturday  
Reader

# Car Ship Saves I

## 'Looked Like the Biggest Par

By Murry Engle  
Star-Bulletin Writer

C. Nicholas Dunn awoke on the sixth morning after being shipwrecked 80 miles off Costa Rica, intending to kill himself. Luckily, he decided to struggle on.

"Just then, three miles away, appeared the 720-foot Venus Diamond of the Hachiuma Steamship Co. Ltd. out of Kobe, Japan," Dunn said.

"It was built to carry 5,000 cars, but empty, looked like the biggest parking garage in the world coming straight at me. I

had only one flare, so I took a mirror, and started directing flashes at the bridge. It kept coming.

"I was crying, 'I'm gonna be saved.' When it got within a fourth of a mile, I realized it was going to run me over. I dove for the flare gun.

"WHEN IT WAS within 30 feet, I shot the flare at the bridge wing. Nothing happened. I hadn't cocked the gun. Then I shot it over the railing, in front of the bridge window.

"I saw no one. It passed like a ghost ship; a bow wave flip-

# Desperate Sailor

## King Garage in the World'

ping the raft, knocking me 20 feet. I got back in and watched the ship go, thinking I was going to die. After a mile, it began to turn.

"To slow down, they'd had to change fuel oil. I cut away from the L'Escargot (his wrecked, capsized trimaran). They lowered a ladder and a rope."

This week, at the Sheraton Princess Kaiulani, where he is resting and planning to buy a 40-foot catamaran, he said he'd never forget the rescue ship's crew or the Jan. 28 arrival in Honolulu.

WHEN HE GOT aboard the Japanese ship, Dunn said, "I threw my arms around the chief officer and sobbed. They put me in a Mitsubishi pickup and we drove surreally, at breakneck speed over the circular lots up 16 car decks."

After a bath, egg-drop soup and a weigh-in at 14 pounds less, the ship notified his mother in Key West and headed for Honolulu.

Dunn, a commercial pilot from Key West, Fla., left Seattle in November for that sail of

Turn to Page A-5, Col. 4



Nicholas Dunn  
"Luck saved me."



# Shipwrecked Sailor Says Rescue Was Case of Luck

Continued from Page One

a lifetime on his 26-foot trimaran, L'Escargot. It was to be a five-month trip, down the West Coast, to Mexico and Costa Rica, through the Panama Canal, up to Jamaica, the Cairns, maybe over to Cuba and back to Key West.

In Newport Beach, Calif., he stopped to re-rig and add a satellite navigation system and then he was on his way, sailing and renewing friendships from other voyages. With two 45-foot boats, he formed a convoy.

CROSSING THE Gulf of Tehuantepec, for the roughest part of the cruise, he took his last fix on Jan. 22, 120 miles off Costa Rica's coast.

"The autopilot was broken, so that night I tied the tiller to keep on course, so I could get dry, eat, sit on the bunk and try not sleep, but I did."

He awoke in the dark hull, falling naked out of the bunk, with the boat canted at a 90-degree angle and water rushing in.

He opened the hatch, dove through, swam from underneath the overturned boat and shot up on the underside of the wing between the main hull and a pontoon, "which I straddled but kept getting washed off."

Settling to 20 degrees, the boat revealed a missing deck panel, one pierced pontoon and the main hull, both under water, the other pontoon exposed. Dunn said it apparently had struck a submerged object.

"I hoped there was enough air in the hull that I'd be able to live in it. It was eerie, swim-

*"The cook said that as I climbed back on the dinghy, a 17-foot hammerhead shark was circling me. If I hadn't shot the flare when and where I did, the deck officers, taking a sunsight, wouldn't have seen it."*

ming through the upside down cockpit, more so when I lost a contact lens. I swam with the good eye closed so I wouldn't lose the other. It was life or death to go back in. I wouldn't have enough air to get back if there was no air in the hull."

INSIDE, HE jammed under the chart table, squirmed into a foot of air in the bilge, and squatted in water up to his shoulders. He found a waterproof flashlight, stored water bottles, and got dungarees and a sweater. Swimming out, he lost the other contact lens.

"With the sun coming up, I decided to get the dinghy I'd left partially inflated in a pontoon. I'd sealed it in good." Diving repeatedly, he opened the hatch, ripped it off and, with a screwdriver, scratched on the date, his position and "SOS."

By midafternoon he'd gotten the bouyant raft down, out, around and up, blown up and stashed with water, four oranges, a can of chili and a "space blanket, which was not nearly as effective as adver-

tised," Dunn said. He'd been diving 12 hours.

Warmed by the sun, he settled in for the night, only to have a sea turtle with horns on its back start nipping his backside. As he threw him downwind, the seas picked up. He couldn't sleep for bailing.

AFTER THE DINGHY tipped over, he got it upright and started diving again to get a wetsuit and a flotation foul weather suit, left over from an aborted sail to Alaska.

Coming up from one dive, he saw a freighter a mile off. He shot five of his six flares, but it went on over the horizon.

"In the suit, salt water sores formed the second day all over my body," he said. "It was cumbersome and not very warm. I never slept long. Nightmares began the second night. I'd be in a Mexican hotel looking forward to a hot shower, good food, a warm bed. Then a wave would crash. I was shivering uncontrollably."

During the next days, he overturned, bailed, ate sparingly, scared away a shark and began drifting away from the shipping lane. It was then he almost gave up.

"Luck saved me," Dunn said. "My dinghy had been recovered from the sea by a boat off Mexico. The Japanese captain changed course at midnight rather than noon, or they would've missed me."

"The cook said that as I climbed back on the dinghy, a 17-foot hammerhead shark was circling me. If I hadn't shot the flare when and where I did, the deck officers, taking a sunsight, wouldn't have seen it."

I-Kiribati fisherman's 36-day ordeal at sea

On September 4th I-Kiribati fisherman Tetuai Bina lost sight of land while fishing from his canoe, and drifted for 36 days without food or water before being rescued by a passing Japanese longliner 400 miles from his home village. The November 18th issue of the I-Kiribati weekly newspaper 'Te Uekara' contains Mr Bina's account of his ordeal, and warns of the dangers facing unwary small boat fishermen.

"It was dawn when one of my daughters and I dragged my canoe to sea. It was a one-man sailing canoe. As soon as my canoe could float I boarded it and sailed to a place where I thought I could get a good catch. I knew the current was strong and that it would drag me away from the land but I thought I could manage to get back easily. I first lost sight of land after chasing a school of fish, which led me away from the land. The current was also in the same direction and when I tried to turn back, I couldn't. I knew then that I was lost.

"The first few days I ate my catch and drank their blood. Then I was left with no food and drink. I decided to float beside my canoe to cool my body which was dry. I did not stay there long in fear of the sharks which often circled my canoe. It was getting dark, so I propped up my sail to shield myself from the cold night breeze. Before sleeping I prayed and recited a verse from the Bible I knew well, sang a few hymns and then lay down. I have a wife and children and at that moment I began to think of them, until at last I fell asleep.

"I woke up the next morning at dawn and said my usual prayers. No rain had fallen and I had no food so I sat down depressed and ever so lonely. My only hope was in God Almighty so I prayed again. This was my fourth day at sea, and on this day I lay down on my chest, dangling my feet in water as hour by hour I prayed tirelessly.

"I did not know how long I stayed like that. I suddenly felt something banging into my feet. I turned and saw a turtle diving away. Quickly I dived after it opening my eyes so that I could not lose it. I caught it, killed it and drank its blood. I ate some of its flesh and kept the rest which kept me going for one week. At the end of the week I had nothing left. For a few days I had no food but I never got tired of praying for help.

"One day a bird (red footed booby) came and sat on my head. I caught it and drank its blood and ate every part of its flesh, brain and even the intestines which I cleaned with seawater. At dusk I prayed: "Jesus, you are the way to life, please guide me to land if it is your will". After praying I prepared myself to sleep and just when I was about to lie down another bird came and sat on my head. I caught this one, drank its blood and kept the flesh for the next day.

"I woke up the next morning, said my prayers with nothing on my mind but to reach land. After saying my prayers this time, a lot of birds came and some settled on my head, and some on my canoe. I caught as many as I could; some of them I ate and the rest, I tied to my canoe alive, to be eaten later. It took me two weeks to eat all the birds.

"After those two weeks with food and drink from the birds, I began to realise the fact that it had not rained. At this time rain clouds gathered overhead and then floated away, leaving me praying harder. If it rained, it did not rain where I was but further away.

"One night it stormed. I thought the howling winds would capsize my canoe or the huge waves would sink it. I did not know what to do to keep me warm so I stood up, sat down again, shivered and even cried. Crying did not help so I started singing hymns, putting into pictures the words of the songs and I thank God for giving me hope and courage, during these dreadful moments.

"On the day I was found, I had had no food for days and I had given up hope of reaching land. I had prepared myself before death came. I made a sort of hammock with some ropes on which I was going to lie, tied and covered with the sail. All was completed and I was lying down on my deathbed covered with my sail. It was not very long after I lay down when I heard a horn blown twice. I peeped from under the sail and saw a ship to the west of me. I got up as quickly as I could and waved hard to attract the crews attention. It was no use. The ship just went on its way and soon it was out of sight. As soon as it disappeared I collapsed onto my canoe and started crying. It was about three o'clock in the afternoon.

"I did not give up hope. I prayed and prayed, harder than I had ever prayed that the ship be returned to pick me up. At about five o'clock in the afternoon I sighted the ship heading towards me. After a while it reached me but it hit the back of my canoe breaking it. Aboard the ship with my canoe the crew asked my name and where I came from. I told them that I came from Makin. On hearing this they told me that they would drop me at Makin after three days. On the third day which was a Friday we finally reached Makin at about 7 in the morning".

#### Second International Conference on Warm Water Aquaculture Announced

The Hawaii Campus of the Brigham Young University has announced that its second International Conference on Warm Water Aquaculture is to be held at Laie, Hawaii from February 5-8 1985.

Whereas the first conference, held in 1983, focussed specifically on crustaceans, the second conference will be devoted to topics dealing with the culture of commercially important finfish. Sessions are envisaged on; Hatchery Technology and Larval Biology; Maturation, Spawning and Breeding; Nutrition, Feeds and Feeding Practices; Diseases and Predators; Growout Management Techniques and Water Quality; Production Economics and Marketing; Government Support and Attitudes; and Legal Aspects of Fish Farming.

Participants are encouraged to present papers at the meeting, either orally or by preparing a poster presentation. The deadline for the submission of abstracts of such papers is June 1st 1984.

More details can be obtained from Professor T. Aaron Lim, Division of Continuing Education, Brigham Young University, Hawaii Campus, Laie, Hawaii 96762, USA.



# FISHERIES NEWSLETTER

No. 27 October - December 1983

## This issue ....

.... contains a new occasional feature, 'Abstracts', which is introduced at the suggestion of one of our readers, and which specifically addresses the problems associated with the dissemination of marine resource information in the SPC region.

The function of the 'Abstracts' section is to announce the existence of fisheries-related documentation produced in SPC member countries but not widely circulated. A good deal of literature falls into this category, including, for instance, project documents or reports of ongoing work which are written informally, often in a hurry and distributed only to those immediately connected with the project in question. Material of this type may never receive a wider circulation despite its potential usefulness to technical staff working on similar projects elsewhere in the Pacific.

In the 'Abstracts' feature we will (with the permission of the authors) briefly describe 'limited-distribution' documents of this nature and give information on contacts for those who wish to obtain copies. By definition, the type of literature we hope to cover will be very limited in availability. We will not be including journal publications, major books or other material likely to appear in academic bibliographies or reference listings.

'Abstracts' appears for the first time on an experimental basis and its regular or occasional inclusion in future issues will depend upon response. Readers who are involved in or aware of the production of 'limited-distribution' documents of potential technical interest to fisheries specialists in the SPC region are invited to write in with information and, if possible, sample copies.

## Contents

## Page

- |  |    |
|--|----|
| 1) <u>SPC Activities</u>   | 2  |
| 2) <u>News From In and Around the Region</u>   | 6  |
| 3) <u>Abstracts</u>  | 23 |
| 4) <u>Synopsis of the Third International Artificial Reef Conference by Dr Richard Brock</u> | 25 |

Mother -  
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NO. OCCASIONS -

FEB 8, 1986 HONOLULU

# 'Easy' rescue fails; capsized

By Jim Borg  
Advertiser Staff Writer

Carl Nicholas Dunn stood on his capsized trimaran and fired a flare at the approaching freighter.

He was almost disappointed, he recalls. His rescue would be almost "too easy," coming after only a day adrift in the eastern Pacific.

He fired four or five more flares.

But the freighter, about a mile away at its closest point, kept going, and a heavy feeling of dread washed over the sailor. With only one flare left, he watched the ship disappear over the horizon.

"I was more than heartbroken," he said.

"Nick" Dunn, a 40-year-old commercial seaplane pilot from Key West, Fla., was sailing his 26-foot trimaran from San Diego to Florida when it capsized about 80 miles off the coast of Costa Rica on Jan. 22. His ordeal ended six days later, when a Japanese automobile carrier rescued him under almost miraculous circumstances.

"I'm a very lucky man,"



Carl Nicholas Dunn  
"More than heartbroken"

Dunn admitted after the ship, the Venus Diamond, dropped him off Thursday afternoon in Honolulu.

Dunn was sailing at night through bad weather toward the Panama Canal when his boat collided with what he believes to be a submerged log.

He was thrown naked into

the rough seas, but managed to get his 5-foot rubber dinghy into the water. The trimaran did not sink, but turned over, and Dunn tied his raft to it.

By swimming underwater through the submerged hatch of the boat and groping around the cabin, he salvaged a half-gallon container of water, four oranges and a can of chili.

One of Dunn's contact lenses had washed out when he was thrown overboard. And in fear of losing the other, he kept that eye closed, relying on his poor 20/200 vision in the other to spot supplies.

Another ship appeared, about 4 to 5 miles away, but Dunn chose not to risk his last flare.

"At night, it was very cold," he said in an interview. "After the first night, I realized I would die of exposure if I didn't get my survival gear."

A day-long effort was required to retrieve his foul-weather clothing, stowed in a hard-to-get-to locker with a stuck latch.

The next few nights might have been bearable but for the heavy seas and 20-mph winds.

"Every half hour or so a wave would break over the raft

LATI  
LONG.

ADVERTISER A3

## sailor spends week at sea

and fill it with water, and I'd have to bail with half a canister I had my flares in," said Dunn. "Uncontrollable shivering."

In a recurring dream, he said, his boat would be anchored in a quiet cove near a Mexican village. The owner of the hotel would come down and invite him to stay in one of his hotel rooms, which were warm and dry.

"I'd get this great sense of well-being, and then I'd wake up and I'd be lying in six inches of cold water."

His emergency locator transmitter, called an EPIRB, went dead on the fourth day, twice its expected life. (These signals can be picked up by satellite and transferred to a ground station.)

Dunn had sunscreen and lip-screen, so he did not burn, but sores developed on his hands and feet from saltwater exposure.

The appearance of sea turtles at first delighted him. "I welcomed them for company, but they started to bite and I decided a little hole in that raft and it'd ruin my day."

He hit at their eyes with broken oars and they went way.

A 5-foot shark visited one night, but also went away.

As morning broke the sixth day, Dunn said, he decided to kill himself rather than spend another cold night in the open raft.

"The idea was growing in me that if I was going to be out here for 30, 40 days, what a lousy way to go. And maybe I should find a way to end it quick."

But as the day grew warm, he said, he reconsidered.

The captain of the Venus Diamond, Dunn was told later, routinely changed course every noon to stay on a great-circle route over long distances. On Jan. 27, for some reason the captain could not explain, he changed direction at midnight.

Dunn spotted the ship the next day when it was three miles away, heading directly for him. With a mirror, he flashed sunlight at it.

"I was all choked up," he recalled. "I was going to be saved. Then I noticed she hadn't slowed down and I thought,

'Oh, shit, she doesn't see me.' I dove for the sail bag and got my flare gun and shot almost directly up at the bridge. I was in quite an agitated state."

The flare gun misfired. Dunn pulled the trigger again, and the flare shot almost vertically at the bridge.

Seconds later, the ship's bow wake overturned the raft and threw Dunn into the water. The open sail bag donated its contents to the depths.

On the ship's bridge, Dunn heard later, one of the officers glanced up after taking a sextant reading. He saw something flash by the window.

"If I'd have fired the first time, he wouldn't have seen it," Dunn said.

Dunn righted the dinghy and watched the ship grow distant. "I was staring at it, trying to concentrate my mental powers on it," he said. "When I realized she was really making a turn, I probably filled up the boat with water worse than the waves cracking over the top."

A 10-foot hammerhead was circling when they picked him up.

NICK -

Tel. (305) 296-7374

KEY WEST



U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
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P. O. Box 3830  
Honolulu, Hawaii 96812

NICK DUNN

2601 S. ROOSEVELT  
APT. 2075  
KEY WEST, FL 33040

February 12, 1986 F/SWC2:GHB

Mr. Carl Nicholas Dunn  
c/o Princess Kaiulani Hotel  
120 Kaiulani Avenue  
Honolulu, HI 96815

Dear Mr. Dunn:

I am interested in obtaining more information about the sea turtles you sighted while adrift in the eastern Pacific after your trimaran capsized. Your encounter with these animals was mentioned in a newspaper article that appeared in the Honolulu Advertiser on February 8, 1986 (copy enclosed). It would be helpful to our research program on sea turtles if you would provide whatever information possible on the following subjects.

I  
Called  
5/23/86

Thinks they were  
Cran of  
1000 lb  
st  
1-20 lb  
Pinnacles  
Spines  
along back

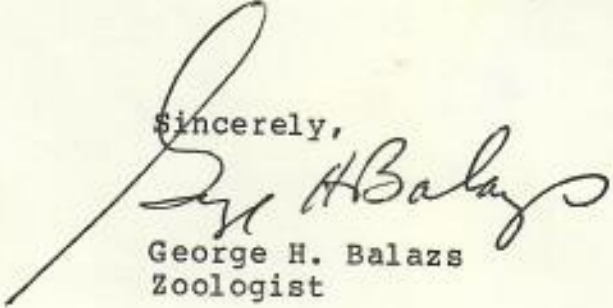
1. The approximate latitude and longitude of the sightings. *NIC. - C.R. Border - 80 miles out when capsized. Moved 30 miles a day W-SW (for a total of 180 miles).*
2. The number of turtles seen. *3 total*
3. The approximate sizes of the turtles (estimate of shell length--one, two, or three feet).
4. The time of day (day or night). *saw 1 2*
5. What the turtles may have been feeding upon (besides your raft!). *trying to bite raft*
6. The species of sea turtles sighted (identification sheets with drawings and photographs have been enclosed).

You will probably be interested to know that, on at least two previous occasions, sailors adrift in the eastern Pacific survived by eating sea turtles that came around their raft. In addition, there is a well-documented case of a woman in the Philippines being kept afloat for two days by a large sea turtle following a shipwreck. I can provide you with more information on these cases, if you wish.

I look forward to hearing from you at your earliest convenience. A postpaid self-addressed envelope has been enclosed to make it easier for you to respond. Or, if you prefer, just send me a telephone number where you can be reached. I presume that you have now returned to the mainland United States.

Best regards.

Sincerely,



George H. Balazs  
Zoologist

Enclosure



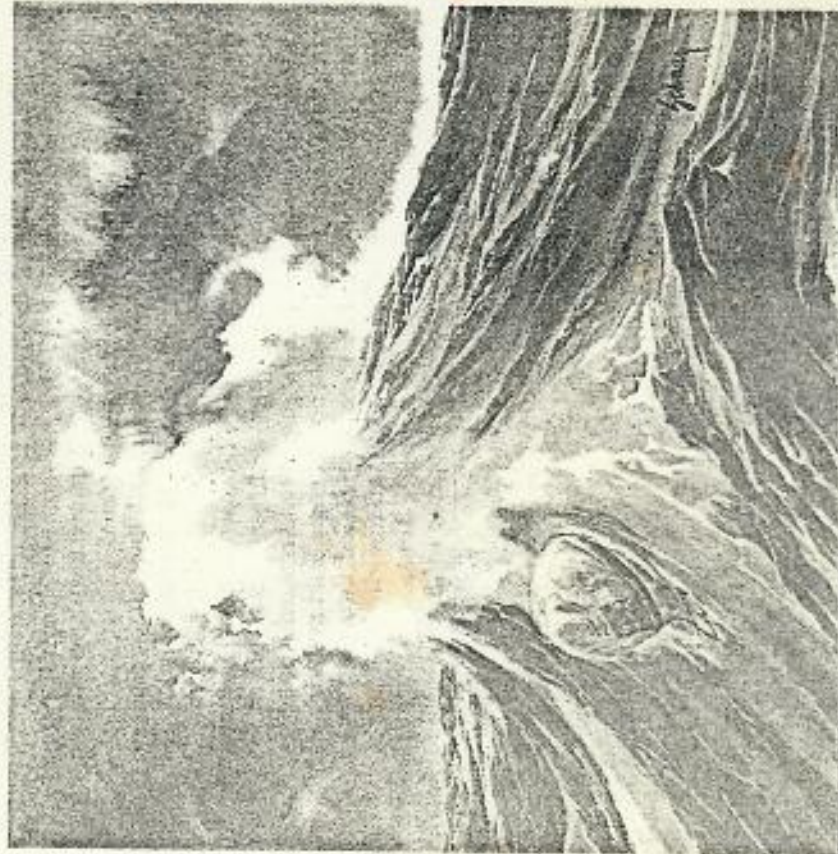
# SACRIFICE AT SEA

They were alone on a sinking raft far out in the Pacific. Together, they would probably perish. But one man by himself might survive

By JIM SANDERSON

## Drama in Real Life®

AT MIDDAY on July 2, 1978, a 40-foot trimaran eased out of his uncle, Bill Quinlan, 38. David San Diego's crowded harbor. Aboard the *Mara* were David Lucas, an 18-year-old student at tance, but Bill was decidedly uneasy.



For years, Bill Quinlan had dreamed of sailing to the Galápagos Islands, 600 miles west of Ecuador.

A furniture salesman in Arcata, Calif., he had taught himself navigation and seamanship in his spare time, and had crewed on the *Mara*, which was owned by a friend. Once he decided to go ahead with his 3000-mile voyage, Bill leased the boat and asked David, who had no prior boating experience, if he'd like to come along.

Now, on this sparkling Pacific afternoon, Bill was finally realizing his dream. But several precious weeks had slipped away while the two waited for David's passport. Because of the approaching hurricane season, the delay meant they would have to leave the *Mara* in Ecuador and fly home, returning the following year to sail the boat back to California. Still, Bill felt there was time enough to reach the Galápagos in safety. He felt that the *Mara*, with her stable three-hull construction, could ride out any ordinary tropical storm.

Bill had to weigh two other critical risks, as well. If he sailed in the well-traveled sea lanes, the *Mara* might be run down at night by some large ship which missed seeing the small boat or couldn't turn fast enough. Yet if he sailed several hundred miles from shore to run free of traffic, he would be far from help in case of emergency. Bill chose the offshore route: he intended to avoid the sea lanes by sailing 500 miles straight west from San Diego, and

then following a southeasterly course. It was a fateful decision.

Cruel Seas. Bill and David soon sailed into continuously overcast and foggy weather. By the afternoon of July 12, a light rain forced them to don foul-weather gear. They were 500 miles southwest of the tip of Baja California and had not seen a ship or plane since leaving port. Nor had they heard a human voice other than their own, since their two-way radio's batteries were not recharging well. Moreover, the small apparatus only allowed for communication within a 10 to 15 mile radius.

Early that evening, torrents of rain poured on them, and the wind and waves rose. By 10 p.m., the two were clinging to the *Mara* for their lives; tropical Hurricane Fico had hit them full force.

"I tied myself down," David says, "but even so it took all my strength just to hang on. I looked up at the 50-foot mast and saw waves twice as high right above us. I suppose we were both too exhausted to panic."

Shortly before dawn, a monstrous wave hurled them sideways and another flipped the *Mara* upside down. "I found myself swimming underwater," says David. "When I came up in the cockpit's air pocket, I thought Bill was gone. Then I heard him say, 'I'm getting out!' As soon as I could, I dived down and swam outside, too." He managed to scramble up on the keel and lash himself there with his safety rope.

Then, with astonishing swiftness, the ocean calmed. "We're in the

eye," Bill called from the *Mara's* two tins of rations. Bill cursed the stern. "Better get out the life raft while we can."

Bill dived down to the cockpit, returned with the package and pulled the cord. Both managed a weak cheer when the bright-orange rescue raft inflated. As a shark fin began to circle them in the mirror-calm sea, they scrambled aboard the round raft. It measured barely five feet in diameter, but had an inflatable tent-like roof designed to make it more seaworthy.

The eye of the hurricane passed as quickly as it came. With winds gusting again and waves tossing the raft higher and higher, sea water poured in and threatened to swamp them. A line attaching the raft to the sailboat snapped, and within minutes they had lost sight of the capsized *Mara*.

The hurricane raged all that day and far into the night, sweeping the tiny raft through endless roller-coaster climbs and plunges. More than a score of times the crest of a gigantic wave cupped the raft and hurled it down into a deep trough. Again and again Bill and David were slammed together, almost drowning in the tent until one or the other managed to spill out some water. Not until late in the afternoon of July 14 did the sea quiet to a running swell, and the two battered, exhausted men let themselves drift into unconsciousness.

*Life Stories and Dreams*. The 15th dawned cold and gray but no longer menacing. They now had only five 10-ounce cans of water plus

"I knew what he was doing," David says. "But I thought it might be good therapy for him too. I was beginning to get the idea we were a lot worse off than he had been saying."

At last, on the morning of July 16, the sun came out. It was the first sun they had seen in four days, and they could finally dry out their clothes and get warm. By noon, however, the canopy had collapsed so much that it was impossible for both of them to remain in the shade. Soon they were getting badly burned. Even worse, the heat increased their thirst.

"I couldn't keep my eyes off those water cans," David says. "I knew we had to wait until we were almost out of our heads with thirst, because once we opened a can we had to drink it. There was no way to re-seal it so it wouldn't spill."

In the stupefying boredom of a glaring sun and a motionless sea, a large sea turtle swam majestically past the raft. Although its shell was more than three feet long, Bill and David wrestled the turtle aboard, hoping to kill it, so they could drink its blood and eat its meat. With their blunted knife, they repeatedly sawed on the animal without really wounding it. They tried to strangle it, even to drown it.

"Finally we were so worn out that we pushed it overboard," David says. "The turtle just swam away as if nothing had happened. Bill was almost crying because we were so totally helpless. I

think this was when he made up his mind."

A Loving Farewell. Bill began to blame himself out loud for all of his "mistakes." He should not have risked their lives so close to the hurricane season; moreover, the inshore route would have given them better odds despite the risk of nighttime collision.

That night, after hours of silence, Bill suddenly asked, "Do you believe in God?"

"I guess so," David answered.

"Well, nobody seems to be watching over us right now," Bill snapped. "If we're going to survive we have to do it ourselves."

"But what can we do?" David asked.

"You can't do anything. But I can get in the water and just swim out of sight." Bill poked the two remaining cans of water at their feet. "If you try," he continued, "you could stretch these for five or six days. You could last three or four days after that."

David was horrified. He knew that his uncle was a "take charge" guy who always meant what he said. "If we have to die, we'll do it together," David insisted.

Although it was painful to talk, they argued most of the night. "What if I do get out of here?" David cried angrily. "For the rest of my life, I'll know you killed yourself for me."

"You're tough—you can handle it," Bill answered.

What about Bill's wife and his two

small children? Didn't he care about them?

"David, we're trapped here," Bill answered. "I can't help them. The only good I can do now in this world is to give you a few more days." Bill reminded his nephew that the raft was getting softer each day. Who knew how long it would last with the weight of two men?

July 17 dawned and Bill would no longer talk. He spent the entire morning scratching a loving farewell message to his wife and children on an empty water can. About noon he handed his wedding ring to David. "Will you give this to my son when he's old enough to understand?" he asked. "And try to tell both of my children a little about me."

David accepted the ring, too exhausted to argue. Bill slipped into the water, and then swam away in a slow breast stroke. About 50 yards out, he turned for a long instant and smiled at David.

"I couldn't really believe he was going," David says. "When he was almost out of sight I began to yell to him. How could anybody just keep swimming like that? He had to come back! Even after he was out of sight, I kept calling until I couldn't make any more sound. Then I waited. He didn't come back."

It was an hour or more before David accepted the reality of his uncle's sacrifice. He felt overwhelming guilt, grief and panicky loneliness. He cried hysterically, and finally collapsed into a restless sleep.

The devout Portuguese fishermen pointed to a print of "The Last Supper" on the wall. "That's the Man who helped you," they said.

What if Bill Quinlan had stayed on that raft? Would he be alive today? "I asked dozens of fishermen and Coast Guardsmen that question," David says. "I had to know. They all say that even if the raft had held up a little longer, the current and wind were pushing it steadily out into the Pacific. If Bill's weight had been in the raft we might have

been carried farther. The crew of the *Rosa Oliveira* told me I was at the extreme range of their lookout. If I'd drifted a hundred yards farther they never would have seen me."

Fully recovered, David Lucas went back to college. He isn't sure yet what career he will pursue but says, "I know I have to do something important with my life." He spends as many hours with his uncle's children as he can, and still wonders, when they grow older, what he will say to them about Bill.



### Caught in Passing

WOMAN TO HUSBAND in football stadium: "What gets me is, after fighting traffic for 20 miles, we cheer some guy for gaining 15 yards."

—Franklin Folger, *Field Newspaper Syndicate*

MAN TO FELLOW WORKER: "I'm proud to say that I have worked for 30 years—saved, scrimped, budgeted, invested—just so I could give my kids what I never had: a father up to his eyeballs in debt."

—Harry Maddox in *Quare Magazine*

BEAUTY-PARLOR OPERATOR to client: "Lady, it's a comb, not a magic wand."

—"Almanac" in *Mississippi Tribune*

ONE JOGGER to another: "Yes, running has really increased my body awareness—parts of me hurt that I never even knew existed!"

—Bob Thaves, *Newspaper Enterprise Assn.*

MAN AT AIRPORT: "If Rome wasn't built in a day, why did we have to see it in a day?"

—Earl Wilson, *Field Newspaper Syndicate*

WEARY HOUSEWIFE to neighbor: "I never understood why my mother liked burned toast and chicken backs until I became a mother."

—Contributed by Jennifer Gilly

IN A THEATER LOBBY: "With the whole world of people to fall in love with, he chose himself."

—Joan Belmont in *National Enquirer*

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BOOK SECTION II

# SURVIVE THE SAVAGE SEA



Condensed from the book by

**DOUGAL ROBERTSON**

*Robertson*

# SURVIVE THE SAVAGE SEA

by DOUGAL ROBERTSON



*"I knew from hard-won experience that where the land may be kindly to man, the sea was as impartial as the sky."*

For 15 years, Dougal Robertson wrested an existence from the soil of England. Prior to that, for almost as long, he had followed the sea professionally. Then in 1971, he, his wife and their growing children set out in a 43-foot schooner to circle the globe. The unexpected, the totally unforeseeable, occurred off the Galapagos Islands in the largest stretch of open ocean in the world. Robertson's narrative of his family's subsequent ordeal ranks with the greatest of man's stories of survival.

**W**ERE ON THE EVE OF our departure for the Marquesas Islands, 3000 miles to the west, but as the wind swung to the east under a gray mantle of rain cloud, I felt anxious to be gone. If we left now, we would be out from under the lee of Fernandina, the most westerly of the Galapagos Islands, by morning. My wife Lyn protested vehemently at starting schooner *Lucette* moved easily

our journey on June 13, though I pointed out that the most superstitious of seafarers didn't mind, so long as it wasn't a Friday as well. My son Douglas and our 22-year-old passenger, Robin, both joined with my feelings of anxiety to be off, and by 5 p.m. we were ready for sea. With mainsail and jibs set, we weighed anchor, and our 43-foot schooner *Lucette* moved easily

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along the ragged black coastline of Fernandina toward the largest stretch of ocean in the world.

In spite of the fact that we had been sailing for over a year—we had left England at the end of January 1971—our stomachs still took time to adjust to the lively movement of the open sea, and throughout the next day those of us not steering and sailing rested as best we could in the bunks below. Unused to the sea, Robin had been sick most of the way from Panama, where he had joined us, but now he seemed better adjusted, and could help Douglas and me with the night watches, while Lyn—assisted by our 12-year-old twins, Neil and Sandy—took over during the day.

On the morning of the 15th we had our first glimpse of sun since leaving the Galapagos, and I balanced myself against the surge of *Lucette's* deck, sextant glued to my eye, waiting for the right moment to get a reading. At last, sun, horizon and deck cooperated to give me a fairly accurate shot, and I retired to the after cabin to work out our longitude. It was my first position sight since leaving the islands.

With my sextant carefully re-

placed in its box, I had turned to my reckoning, when sledgehammer blows of incredible force struck the hull beneath my feet. As I was hurled against the bulk, the noise of the impact almost deafened me to the roar of intruding water. From the cockpit, however, I heard the cry of "Whales!" Dropping to my knees, I lifted the floorboards to gaze in horror at the blue Pacific through a large, splintered hole punched up in the hull planking. Water was pouring in with torrential force, and although Lyn called out that it was no use—for water was also coming in from another hole under the WC flooring—I jammed my foot down on the broken planking and shouted to her to give me large cloths, anything to stem the flood. She threw me a pillow, and I pressed it onto the planking, rammed the floorboard on top and stood on it. The roar of the incoming water scarcely diminished.

Douglas cried from the deck, "Are we sinking, Dad?"  
"Yes! Abandon ship!" My voice felt remote, as numbly I watched the water rise. It was lapping my knees. I leaped for the companionway.

On deck, Lyn was tying the



twins' lifejackets with rapid efficiency. I slashed at the lashings holding our dinghy to the mainmast; Douglas struggled to free the self-inflatable raft from beneath it. Then he got the oars and thrust them under the thwart of the dinghy as I slid the little boat seaward, Robin holding the painter to keep the craft from floating away. The inflatable raft, to our great and lasting relief, went off with a bung and was already half filled.

I caught up a knife from Lyn, who had cut loose the water containers and flares, and again shouted, "Abandon ship!"—then severed the lashings on a bag of onions and two bags of oranges and lemons, which I threw into the dinghy. Noting that it was three-

quarters full of water, and that Neil was sitting there, I shouted that he should make for the raft where the others were. He jumped back on *Lucette*, clutching his teddy bears, then plunged into the sea, swimming strongly. Lyn and I joined him (first I threw the knife into the dinghy), the waters closing over *Lucette's* scuppers as we left her. Moments later, when I looked again, she was gone.

I climbed wearily into the yellow inflatable, a sense of unreality flooding through me. I looked at my watch; it was one minute before 10 a.m. Since my sextant sighting, four minutes had passed. "Killer whales," said Douglas. "All sizes, about 20 of them. I think three of them hit us at once."

at the door of the canopy to retrieve any useful debris and gazed with dumb longing at a distant five-gallon polystyrene water container, bobbing ever farther away in the steady trade wind.

"I suppose we'd better find out how we stand," Lyn said at last.

This was the moment I had been dreading. Feelings of guilt, not only that our present predicament was due to my unorthodox ideas on educating our children, but also that I had failed to foresee this type of disaster, engulfed me. How could I have been so foolish!

For 15 years Lyn and I had endured a deteriorating standard of living on our small dairy farm in North Staffordshire. Then, in 1968, the idea had come to us: "Let's buy a boat and go round the world." The thought, in part, was to broaden our children's horizons, already stunted by the limitations of their environment. But no doubt there was something else: the unyielding routine of farm labor, which had allowed me 14 days' vacation in 15 years; the discontent which results from seeing hopes and visions crumble under the realities of economic necessity.

We were reasonably well qualified to undertake such a voyage. Before settling on the farm, I had spent 12 years at sea, gaining a Foreign Going Master Mariner's certificate. Lyn was a registered nurse. We were all in tough physical condition.

Two years later, after selling our

Three killer whales! I remembered that the one in the Miami Seaquarium had weighed three tons, and that they were said to swim into an attack at about 30 knots. No wonder the holes in *Lucette!*

We sat on the raft floor, our faces a bilious color under the yellow canopy, and gazed in silent disbelief at our surroundings. Of the whales which had so recently shattered our existence, there was no sign.

#### Grim Alternatives

GRABUALLY the reality of our situation seeped through to our consciousness. Neil, his teddy bears gone, sobbed along with Sandy, while Lyn repeated the Lord's Prayer. Douglas and Robin watched

farm, the 50-year-old, 19-ton *Lucette* had been purchased in Malta and subjected to a rigorous survey and rebuilding.

Her hull had taken a full minute to sink below the waves, but a modern boat, constructed with less regard to brute strength than *Lucette*, would have sustained much heavier damage and sunk even more quickly with more terrible results.

I looked at Douglas, now 18; he had grown to manhood in our months at sea; the twins, previously shy, introspective farm lads, had become interested in the different people we had met, and were now keen to learn more. I tried to ease my conscience with the thought that they had derived much benefit from their voyage and that our sinking was as unforeseeable as an earthquake, or an airplane crash.

We cleared a space on the floor and opened the survival kit, which was part of the raft's equipment. Slowly we took stock:

Vitamins-fortified bread and glucose for ten men for two days, 18 pints of water, eight flares, one bailer, four fishhooks, a 25-pound fishing line, a knife which would not puncture the raft (or anything else for that matter), a signal mirror, flashlight, first-aid box, two sea anchors, bellows and three paddles. In addition, we had salvaged a dozen onions, a tin of biscuits, ten oranges, six lemons, a Genoa sail and a fishing line.

As I looked at our meager stores,

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the food, I estimated that six of us might live for ten days. Beyond that, our chances seemed doubtful indeed.

Lyn leaned forward. "Tell us how we stand," she said. "We want to know the truth."

I could not tell them I thought they were going to die, so I slowly spelled out the alternatives. Suddenly I knew there was only one course open to us: we must sail with the trade winds to the doldrums 400 miles north. The only possible shipping route lay in that direction—plus our only possible chance of rainwater, our only possible chance of reaching land. "We'll stay here for 24 hours to see if any other wreckage appears," I said. "Then we must head north."

The sun set, and the wind grew suddenly colder. We had fashioned sheets from a salvaged sail, and we shivered as we drew them about us. Turning and twisting, seeking comfort for our aching limbs, we began to experience curious bumps and sharp nudges through the inflated floor of the raft. At first I thought something sharp had wedged under the raft, and worried lest it should puncture the flotation chambers. But Douglas, on lookout, said that he could see large fish swimming under the raft—dorado, he thought—and they seemed to be after some smaller fish close beneath the raft's bottom.

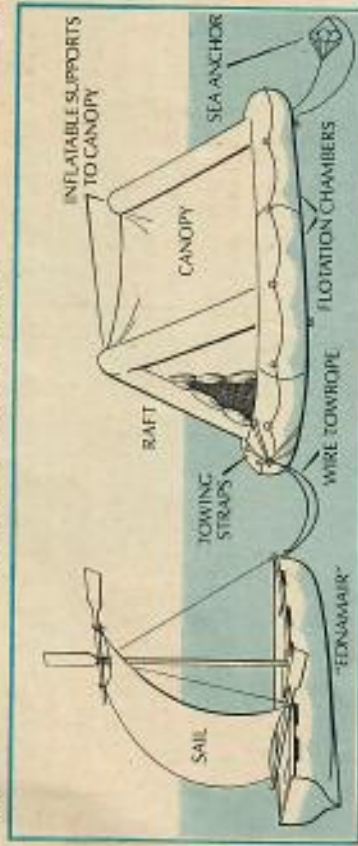
"We'll have to do something about them," he said. "Like catching them."

### Gifts From the Sea

THE PRESSURE in the raft's flotation chambers dropped drastically during the night, so our first task in the morning was to top up with air. The bellows was ineffective, so, cutting the bellows' tube, Douglas put it to his mouth, blew mightily, and the raft was soon back to normal. Breakfast consisted, for each of us, of ¼-ounce of biscuit, a piece of onion and a sip of water. We ate slowly, savoring each bite. Then Douglas and I went to the door of the raft. Pulling on our wire tow-ropes, we brought the swamped dinghy *Ednamair* alongside and bailed it dry. In the bottom Douglas found his watch, still going. He also retrieved what was to prove our most valuable possession—the stainless-steel knife I had thrown in after the fruit.

I climbed aboard and, using the oars (for mast and spars) and part of the salvaged sail, started work on a jury rig that was to turn *Ednamair* into a tugboat for our journey north. At 2 p.m., the sail filled, and we began our voyage to the doldrums. The dinghy proceeded stern first to permit her to ride the seas without swamping. I estimated our speed at about one knot.

During the day, Lyn cut pieces of sail for the twins and Douglas to write letters on, telling their friends in England and America what had happened. Robin wrote to his mother, while Lyn herself wrote a loving farewell to our 19-year-old daughter,



Anne, who had left us in the Bahamas to follow her own destiny. These notes were placed in a waterproof wrapping and tucked in one of the pockets of the raft. We all felt depressed at the prospect of our imminent demise, especially Neil, who, I supposed, could visualize more clearly the privations ahead without realizing the ways in which they could be avoided. He looked a very sad and forlorn little boy, lying in his mother's arms, gazing, unblinking, into space and seeing heaven knows what terrors in his mind's eye.

As soon as it was light the next morning, I pulled in the dinghy and climbed aboard to inspect the sail fastenings and stays, one of which had worked loose during the night. While I was fixing it, I caught sight of a small black shape under a seat. I stooped and lifted our first contrabution from the sea—an eight-inch flying fish. I gutted and sealed it, then passed it over to Lyn to marinate in a squeeze of lemon juice. We breakfasted at seven, each savoring

his tiny piece of fish, followed by a crunchy bite of onion and a mouthful of water.

The clouds thickened as the day advanced, and the high cumulus began to drop rain in isolated showers. The wind freshened, and waves slopped through the canopy door. We closed the drawstrings on the flaps as much as we could without cutting off all ventilation. Douglas blew lustily into the inflating tube to make the raft as rigid as possible in the heavy seas.

*Ednamair* bounced at the end of her towrope like a pup on a leash, and I was considering taking the sail down when the patter of drops on the canopy warned us that we were about to get rain. A pipe led down from the center of the rain-catching area on the roof and, fascinated, we gazed at the liquid that dribbled from its end: bright yellow and saltier than the sea.

As soon as the salt had been washed off the roof, we managed to collect a half-pint of yellowish, rubbery-tasting liquid before the shower



passed over. I looked sadly at the jar of whatever it was—one could hardly call it water. We would need to do a lot better than that if we were to survive.

The following dawn brought calmer seas. I climbed over to *Edna-mair* to adjust the sail, and to my delight found a large and a small flying fish in the bottom of the boat. They were duly dressed, then divided with much ceremony, and the heads were saved for bait. Later, from *Edna-mair*, I tried my hand at catching a dorado. I cast in all directions, trolling at different speeds, trying variations of red and white baiting on the spinner and flying-fish heads on the hook, but to no avail. The dorado would follow the line with interest, but would not strike. I gave up, exhausted, my mouth dry with thirst under the noonday sun.

The raft now required topping up with air at much shorter intervals—three or four times a watch—and though we looked again for a leak, it wasn't until Lyn went on watch in the evening that she spotted tell-tale bubbles rising from beneath the towing straps. We spread out the puncture outfit. The raft, an old model, had been given to us in Miami. We found now that the adhesive-rubber solution had dried out and had the consistency of chewing gum. The patches were old ones, too, and didn't have the sealing compound on them which one finds in a modern outfit. We had four rubber plugs, some patches of ordi-

nary rubberized fabric, needles and thread, and a bit of emery paper. The next day, we allowed the raft to deflate at the towing end, where we had located the leak about three inches below the waterline. Then we doubled the floor back and managed to bring the damaged area into the raft. Three small holes leaked air in an area of torn fabric under one of the towing straps (*Edna-mair's* pull on the rope had been too vigorous in the strong breeze). The surface was cleaned and allowed to dry in the sun; then, after roughening the surface with emery paper, I tried to get the dried-out solution to stick in and around the small holes. No luck. Blown up, the raft deflated even more quickly than before.

I leaned over the doubled-up raft and found another hole, a quarter-inch in diameter, worn in the fabric by one of the ropes. No wonder we'd had to keep blowing! I plugged this one with a rubber stopper, and lashed the paper-thin fabric tight around the plug with nylon thread. Then, noting that the patches had started peeling off the other holes, I stripped them off altogether, enlarged the pinholes in the fabric enough to insert rubber plugs in them, and we blew up the chamber again. It stayed up this time, and we relaxed, happily relieved of our blowing routine for a while.

Rain came just after dark, a heavy shower of short duration from which we collected a pint and a half of yellow water. As our ex-

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ciment subsided with the passing of the shower, we settled down again in our now continuously wet clothing, though hardly to sleep. I rarely slept at all now, listening all the time to the sounds of the raft, the sea, the fish, the dinghy, and thinking of ways of catching fish, of the possibility of straining plankton from the sea, of what would happen to us when the raft began sinking, as it must in time.

I knew that Lyn, too, lay awake at night, and that her thoughts were never far from methods of helping us to survive. Lyn had always been tremendously competent in emergencies, and my deep respect for her capabilities as a nurse, a wife and mother had grown steadily over our 20 years of married life.

At about ten o'clock, a strange new sound like a giant exhaled breath intruded on the usual noises. Douglas, on watch, grunted from the door of the raft, "Whale." We were all frightened, for the memory of the killer whales had grown more terrible with the passing of time. We soon identified it as a large, slow-moving sei whale. Though I tried to reassure Lyn that this one would not harm us, she prayed desperately that we be spared a second attack. The whale surfaced many times around us during the following 30 minutes, often coming quite close. Sandy had fallen asleep again, and now the whale's blowing coincided so precisely with his snoring that we all ended up laughing at the duet.

### A Decent Breakfast

THE SIXTH day started at two in the morning, when a noise like a flapping sail from *Ednamar* announced that a large fish had miscalculated its flight path. Quickly pulling the dinghy alongside, I jumped aboard and fell on top of a huge dorado struggling in the bottom of the boat. I pulled the knife from the thwart where it was kept, plunged it into the head and sawed desperately, finally severing it. At daybreak, I returned to the *Ednamar* to dress the dorado, and so we had our first decent breakfast since *Laetete* had been taken from us. Our stomachs, unaccustomed to such bulk, felt quite full. Afterward, I tried fishing again, but without success. Once a shark took everything: bait, hook, nylon line.

The sky darkened from the north as the afternoon progressed, and I looked hopefully for rain. Instead the skies cleared, the heat of the declining sun beat into the raft, and we lapsed into silent endurance until evening, occasionally splashing water on what was left of our clothes and on the raft.

Our clothing had suffered wear and tear from early on, and Douglas had now discarded his tattered swimming trunks completely to ease the pain from the area of raw flesh around his buttocks and thighs, developed through continuous contact with salt water. Neil was similarly affected, and Lyn had torn the bottom section from her

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housecoat to protect his thighs, while preserving her modesty by fabricating a sort of bikini from a piece of sail. My shorts had disintegrated, leaving me with underpants only, while Robin and Sundry preserved their swimsuits intact. The boys had shirts; and my undershirt, though somewhat blood-stained, was still in one piece.

As the sun crept round to the port side of the raft, we lay gasping in the torrid air, sucking at pieces of rubber to create saliva to ease the burden of our thirst. I watched the dark shadows under Douglas' eyes as he kept looking for ships, his mouth working to try to retain saliva. His face had suddenly gone much thinner, and the hollowness of his cheeks, clenched against the dryness of his palate, gave his head a skull-like appearance.

I shut my eyes and lay back to think out the problem of how to select the fish I wanted to catch without interference from the other varieties. I could think of only one answer—a spear of some description. I had seen plenty of fish spears during my travels, but their strength and design lay in a type of wood that was not available to me.

As the evening shadows darkened inside the raft, I opened another tin of water. The breeze blowing gently from the south died away, leaving the sea almost calm. *Ednamair's* sail hung limp for the first time since we had started north. We still had about 150 miles of northing to make before we

would come under the influence of the doldrums weather. With six pints of water left (including the brackish stuff), I wondered if we had come to the end of the road.

#### Primeval Response

THE FORL dryness of our mouths aggravated the discomfort of our sleepless bodies as we tried to ease the agony of our thirst by twisting this way and that. Then, breathlessly, we watched the gathering clouds obscure the stars and, as dawn paled the eastern horizon, rain began to fall—a steady down-pour. Soon the water in the pipe from the canopy ran clear, and we filled our empty cans and spare plastic bags, our bellies and our mouths. We lay with our faces turned to the sky and let the pure, fresh water cleanse the salt from our beards and hair. Suddenly we had moved from the shadow of death to the joyful prospect of life—and all because of a rain shower. We would make the doldrums now!

Douglas, looking at the dispersing clouds, suddenly sat up with a start, pointing excitedly, "A ship! A ship! It's a ship!" he yelled. We all crowded to the door of the raft. A cargo vessel of about 6000 tons was approaching on a course that would bring her within about three miles of us, I felt my heart pound against my ribs.

"Get out the flares!" I shouted hoarsely.

Three miles was a fair distance, but on a dull day like this, against



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a background of rain, the ship should see us easily. I clambered into the dinghy, and Douglas passed me the rockets and flares. My hands trembled as I ripped open a parachute rocket and, with a mute appeal to the rocket to fire, struck the igniter on the fuse. It spluttered and hissed, then roared off high above the raft, its pinkish magnesium flare spiraling slowly downward, leaving a trail of smoke. They couldn't fail to see that!

I waited a moment or two for the ship to alter course, then struck a hand flare, holding it high above my head. The blinding red light was hot to hold, and I pointed it away from the wind to ease my hand, the red embers of the flare dropping into the dinghy. As it went out, I struck another. Smoke from the first was now a rising plume in the sky—surely they must see that. I waited a little, my hands trembling.

"This chance might not come again," I said as anxious faces crowded the door of the raft. "I'm going to use our last rocket flare and one more hand flare." We watched tensely as the second rocket soared and spiraled its gleaming message high above us. Desperately I struck the third hand flare and held it up, standing on the seat and holding on to the mast. "Look! Look this way!" I shouted.

The ship sailed on, slowly disappearing behind a rain shower. When she reappeared, her hull was half obscured by the horizon, five

miles distant and disappearing fast. "We daren't use another," I said. "We have to keep something for the next ship." We had three hand flares left.

I surveyed the empty flare cations bitterly. In that moment, something happened that for me changed the whole aspect of our predicament. If those bloody seamen couldn't rescue us, then we would have to make it on our own and to hell with them. We would survive without them. Yes, that was the word from now on—"survival." Not "rescue" or "help" or dependence of any kind.

I felt the strength flooding through me, lifting me from depression and disappointment to a state of almost cheerful abandon. I felt the bitter aggression of the predator fill my mind. This was not our environment, and the beasts around us would eat us if we failed. We would carve a place for ourselves among them. They had millions of years of adaptation on their side, but we had brains and some tools. We would live for three months or six months from the sea if necessary. But we would "get these boys to land," as Lyn had said—and we would do it ourselves. From that instant on, I became a savage.

Toward late afternoon, we felt an unusually hard bump on the raft's bottom, unlike the thrust of the striking dorado. Looking out, we saw the large, scaly head of a turtle surveying us dispassionate-

ly. The day before, I would have said, "Leave it; we can't manage that." Now, however, things were different.

"We'll have this one," I said. "Let's get it aboard the dinghy."

The turtle's flippers had become entangled in our sea-anchor line. So, first passing a rope from the dinghy under the raft, we made it fast to one of the back flippers. Then, carefully avoiding the searching beak, we freed the turtle from the sea-anchor rope and towed it around the raft to the *Edumair*. I scrambled into the dinghy and pulled the now-struggling turtle alongside, reaching down to grasp the back flippers and heave.

The beast was surprisingly heavy and, as it slid aboard, the dinghy tilted alarmingly. I threw my weight to the other side to trim her

until finally, with a thrashing of claws, the turtle lay on its back in the bottom of the boat—all 80 pounds, I estimated. I signaled thumbs-up to the twins and Douglas watching from the raft, and they cheered excitedly.

Now for the difficult bit. I looked at the armored reptile with a farmer's eye. I had helped slaughter a few pigs and lambs, and had a pretty good idea how to tackle this one. I grasped the pointed knife in my right hand and, putting a foot on each of the front flippers, held the turtle's beak with my left hand, then plunged the knife into the leathery skin of the neck, deep into the spinal column. Then, with quick, outward strokes of the knife to right and left, I cut both vein and artery. Deep red blood spurted into the bottom of the dinghy, and gradually beak and flippers ceased thrashing as the beast died.

Twenty-four hours previously, I would not have had the stomach for such a bloody business. But the laws of survival applied now, and the first principle, "The fittest survive, the weakest go to the wall," had become our way of life.

As dawn broke, I began to dress the turtle. It took me an hour and a half to remove the belly shell, sawing



and hacking with the knife blade, which grew blunter as the shell seemed to grow thicker. I managed to lift the shell off and set about extracting the meat. I also opened the stomach and found, to my delight, a golden cascade of egg yolks awaiting collection.

Back in the raft, we eyed the raw meat with some distaste. A grace attributed to Robert Burns came to my mind, and I quoted, "Some hae meat, and canna eat, and some wad eat that want it; But we hae meat and we can eat, and sae the Lord be thankit."

Neil grinned and sank his teeth into a piece of steak. "Good!" was all he said, and the rest of us fell to with a will. We swallowed the egg yolks, bursting them like yellow plums inside our mouths, enjoying the flavor of the raw food as only starving people can.

Robin declined the eggs, but chewed vigorously at the tender meat, declaring that he enjoyed his steaks "rare." Douglas, Lyn and Sandy, after some initial distaste, chewed at the meat with increasing interest. With the inside of the raft shaped like a cave, it was not difficult to imagine that we had dropped a few thousand years in time. Not only did we look like cave dwellers; I, at least, felt like one.

#### Slippery Babe in Arms

On the tenth day, we shook the reef out of the sail and resumed course. We had paid lip service to standard rescue practices by re-

maintaining in the area where we had seen the ship as long as we could. Now I was anxious that no more time should be wasted, for we were still some distance from the rain area, and our stock of water was dwindling once more.

As soon as we were moving, I dumped the turtle oil. Dozens of scavenger fish appeared from nowhere, the sea swirling as they fought to devour the scraps. In a few minutes, we saw the fins of four sharks, and from then on we were never without at least one shark in attendance.

Our noon position confirmed that the doldrums were now a mere 90 miles away. The raft, however, was giving us increasing trouble, and had to be bailed every ten minutes.

There was no doubt in my mind that we would eventually become dependent on *Ednamar* for our lives, but the prospect of the six of us living within the confines of the nine-foot, two-inch boat, along with our supplies and other equipment, appalled me. The slightest imbalance would surely bring the sea flooding in over the low freeboard.

On the night of our 12th day, I was on watch between 9 and 11, and as I stopped bailing for a few minutes, a fish splashed noisily beside the raft. I dropped my arm into the water, hand taut like a claw, and hoped that coincidence would bring it in contact with the right part of a dorado to let me pull it aboard. I had touched their backs a time or



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two, always in the wrong place, but I'm an optimist, and I felt sure that sooner or later the right thing had to happen.

I was ready when the fish jumped again. As it landed against the side of the raft, I hooked my right arm under it and grabbed quickly with my left hand. Then, feeling the unslippery skin, I looked down at the white belly and U-shaped mouth of a five-foot shark lying docilely in my arms like a baby. Realizing that one slash of that mouth would finish the raft completely, I dropped it as if it were a red-hot poker. It snapped its savage jaws, and was gone. Thankfully I resumed bailing. We didn't want to evacuate just yet!

TWO DAYS later—our 14th as castaways—Sandy found a hole which was letting water into the after section. I felt that this was probably the beginning of the end of the raft. It was unlikely that I would be able to plug this hole; yet, if I left it, it would certainly split open in the next heavy sea. I made a plug and inserted it into the hole, tape ready to bind it if it held. The hole split across, and water flooded in. I rammed the plug home in disgust, and stopped enough of the water to bail the compartment dry. But the raft would now need constant bailing at both ends.

After breakfast, I was crossing to the dinghy to try for a dorado, when a bump at the stern of the raft attracted Sandy's attention. "Turtle!" he shouted. This one was much

smaller than the first, and I lifted it aboard without much trouble. "Catch the blood," Lyn said as I made the incision into the throat. "It should be all right to drink." I held a plastic cup under the copious flow; then, raising it to my lips, I tested it cautiously. It wasn't salty at all. I tilted the cup and drained it. "Good stuff!" I shouted. I felt as if I had just consumed the elixir of life.

"Here, take this," I said, and I passed a bailer full of blood, about a pint, over to the raft. Everyone seemed to think it tasted all right. The sky was serenely blue that afternoon. By dead reckoning, I worked out our position and decided that we had arrived at the official limits of the doldrums. Was this, then, doldrum weather? Was "The Rime of the Ancient Mariner" right with its "Nor any drop to drink"? We had only four tins of water left, one of them half sea

water. I looked around the raft at the remains of Robin and the Robertson family. Our wrinkled skin was covered with salt-water boils and raw, red patches of rash. We lay in the bottom of the raft unmoving, except to bail occasionally, and then only halfheartedly. Our bones showed clearly through our scanty flesh; we had become much thinner these last few days, and our condition was deteriorating fast. The raft was killing us with its demands on our energy.

I started to bail mechanically. We (Continued on page 328)

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would have to abandon the raft soon, I thought, and that meant ditching all the unnecessary stuff. In the dinghy there would be room only for food, water, flares and us. We'd start to sort things out in the morning.

### A Swim for Life

IT RAINED at dawn—beautiful, gorgeous rain. We saved  $3\frac{1}{2}$  gallons and drank our fill besides. Then we talked of the ship that didn't see us, for that had happened after the last rain.

The twins were talking when Douglas, on watch, his voice desperate with dismay, called out, "Dad, the dinghy's gone!"

I was across the raft in an instant. I looked at the broken end of wire trailing in the water. The dinghy was 60 yards away, sailing still, and our lives were sailing away with it. I was the fastest swimmer. No time for good-bys. To hell with sharks. I dived through the door, my arms flailing in a racing crawl even as I hit the water. I heard Lyn cry out, but there was no time for talk. Could I swim faster than the dinghy could sail?—that was the point. I glanced at it as I lifted my head to breathe; the sail had collapsed as the dinghy yawed. I moved my arms faster, kicked harder. Would the sharks let me be?—that was another point.

I glanced again; only 30 yards to go, but the dinghy was sailing again. I felt no fatigue; my body was a machine as I thrashed through the sea, only one thought in mind—the

dinghy or us. Then I was there. With a quick heave I pulled myself over the stern of the dinghy, reached up and tore down the sail before my knees buckled and I lay across the seat trembling and gasping for breath, my heart pounding like a hammer.

I lifted an arm and waved to the raft, now 200 yards away. Then, slowly, I untied the paddle from the sail and paddled back to the raft. It took nearly half an hour. The long shapes of two sharks circled curiously 20 feet down; they must have had breakfast. Later, I learned one had actually been close behind me!

On my return to the raft, we tested the wire and found it frayed in two places, broke it, rejoined it and, in doing so, made it short enough to fasten a large nylon rope between the raft and the dinghy as a reserve. After this, we rigged up a sea anchor which would automatically trip if the *Ednamair* broke away from the raft again, and stop her from sailing away. We had not only closed the stable door; we'd hobbled the horse as well. I didn't relish a repeat performance of that swim—not ever.

Our noon position put us well inside the official limits of the doldrums; we had made the rain area in 15 days. We had traveled about 400 miles, with about 700 to go to the coast of Central America, and had perhaps even more food and water than when we started. Our condition was worse, it was true;

but I hoped that the increase in our water supply would help to put that right. I solemnly reflected that if we had stayed at sea anchor where *Lucette* sank and hoped for rescue, we should have been dead by now.

### A New Home

IT BEGAN to rain and continued all night long, and most of the next day, too. Our mouths were raw from the rough surface of the inflating tube; our lungs and cheeks ached with the effort of keeping the raft blown up. Lyn was terrified that one of the twins might fall asleep face downward in the after compartment and drown, for we now bailed only in the forward section, and even then we could not bail quickly enough to keep it dry. The after section was flooded to a depth of three inches.

The rain stopped the following morning, and I announced that I planned to transfer to the dinghy. I estimated that we could probably keep the raft afloat for a few days more, but the effort involved was depriving us of all bodily stamina. Our limbs, almost hourly, suffered extensions of boil-infested areas; we were pouring our lives away in the struggle to keep afloat.

I set Douglas to cutting away the door pieces on the raft for capes to shield us from rain and, after preparing a small canopy, I went over to *Ednamair* to fit it over the bow to shed spray. Then, while Douglas and I began to strip the raft, the others made the transfer.

We cut off the canopy first, passing it over to the dinghy, and backed off one of the canopy's inflatable arch supports to use as a flotation collar around the dinghy's bow in order to increase its stability. Then Douglas went aboard the dinghy while I cut away the remaining useful pieces with the knife. The whole raft had now collapsed except for the forward floor piece, which, though inflated, leaked rather badly. Waist-deep in water, I made my way to the dinghy, climbed aboard and shoved the remains of the raft away. It had served us well, and as its bits floated around us, we felt sad at its passing; for, when it was gone, there would be nothing but the sea to look at.

As we started to clean up the boat, we were careful not to move our weight to one side of the dinghy without first warning somebody on the other side to move simultaneously in the opposite direction. But the dinghy turned out to be more stable, with all the weight lowering her center of gravity, than I had imagined she would be.

The twins tucked their small bodies under the canopy in the bow; Lyn and Robin distributed themselves at the stern, leaving the cramped middle of the boat to Douglas or myself—one of us, or Lyn or Robin, always being awake and on watch.

Our 20th day, July 4, was Lyn's birthday. We caught another turtle in the morning, then rested quietly in the afternoon, and talked of all

the nice things to eat we had had on previous birthdays. After a long-drawn-out birthday "tea"—30 minutes of slow chewing and sipping water—we sang "Happy Birthday." It sounded a bit odd in a small boat in the middle of the Pacific, but it did our morale good.

I decided that it would be beneficial for the children to see our progress toward the coast, so I showed them on a hand-drawn chart where my dead rockomg placed us. When Douglas asked for an estimate of how much longer it would take us to get to land, I said 35 days, trying to make it sound like less than a month.

On the 22nd day we caught another turtle, the largest so far, and after our meal we lay back, our stomachs feeling truly full for the second time since *Lacette* sank. In fact, our stomachs had contracted so much that it now took very little to fill them.

The late afternoon brought squally conditions, and as the evening advanced, the seas heightened. Grimly we prepared for a rough night; the waves were slopping aboard frequently now, and the watchkeeper had to bail almost continuously. The rain came about 8 p.m. and, with the wind swinging to the south, it increased steadily in volume until by 10 a torrential downpour was lashing us.

At 2 a.m. the wind dropped completely, and to our astonishment the rain doubled in intensity and grew colder until I wondered if we would

have hailstones. Lyn and Robin bailed with increasing speed. I was so cold that I did not realize that the moaning noise I heard came from myself. Lightning hissed and flashed with mounting frequency, and thunder pealed deafeningly in an almost continuous reverberation of sound.

Above the noise of the storm I could hear Sandy sobbing and Lyn praying. Douglas was now bailing as well, while the twins held the bow canopy from spilling water into the boat. Like a statue I sat, cold seeping through to my very brain, hands clenching the sail, ready to trim it the instant the next squall struck.

Lyn's voice rose above the tumult, coming from the darkness as if from another world. Quite distinctly I heard her say, "Rub him, Robin!" And yet when I saw Robin in front of me, his arms stretched out toward me, I could feel nothing. Slowly he rubbed the feeling back into my body.

Dawn found us still bailing wearily, almost mechanically. I sat in the stern, rigid with cold, able only to move my arms to pull the sail this way and that as *Ednamair* yawed in the squally wind. The rain continued throughout the day and into the night again. With Douglas at the helm, Robin and I knelt side by side under the yellow sheet of raft canopy, our knees flattened against the fiber glass, our heads against the seat as we threw the water over the side. The steady beat of the rain on our capes served only to lull our

senses, and sleep tried hard to take us unawares. I felt Robin lean against me as he dozed in exhausted slumber; then he would jerk awake to the tyranny of the bailing cup.

We could no longer feel pain; our hands and limbs were soaked to the bone; our skin was a crumpled mess of nerveless wrinkles. We shivered and bailed and sang songs, any songs, to keep our circulation going. When we were too tired to sing, Lyn pummeled and rubbed our insensative bodies to life again. Our hopes, our fears, our thirst, our despair were all forgotten in the emotionless limbo of anesthesia by exhaustion.

When dawn came, Robin was asleep, his kneeling body sagging sideways against the gunwale, the bailing cup still clatched in his hand. Lyn knelt asleep against the stern seat, her body close to mine for warmth. My arm still moved in the motion of bailing until I realized that it had stopped raining and so sank into grateful oblivion. Death could have come to us at this moment, without our knowledge or any resistance to its coming.

### We Stand Alone

ON THE 29th day, as I sat working on some fishing equipment, I looked down into the sea past the flashing blue, green and gold of the dorado, and spotted the brown shape of a shark. It was the first small one I had seen since my short-lived love affair with the one on the raft.

We had caught a flying fish in the night, so I put it on a hook and,

weighting the line heavily, cast well out to clear the scavenger fish. The hook drifted down past the shark, and at first I thought he was going to ignore it. After it came to rest, though, he turned and nosed toward it.

Douglas called out, "What are you doing, Dad?"

"Catching a shark," I said calmly. "You're mad," Douglas said, sitting up quickly. Robin, too, was sitting up apprehensively. Lyn said, "You mustn't."

"Good old Dad," said Neil and Sandy from the bow.

"I'm having him," I said, watching tensely now as the shark reached the bait. The moment I felt him touch, I would have to strike; for if he got the nylon line between his teeth, he would bite through it like butter. I was going to try to get the steel shank of the hook between his jaws. He was over it now. I felt the contact with tingling fingers and struck swiftly. The line exploded into action. The shark was hooked!

He fought with alternate periods of listless acquiescence and galvanic action, twisting and plunging savagely to rid himself of the hook. I was afraid that the line would break, but I feared more the arrival of a larger shark which would attack the hooked one. Slowly, foot by foot, he came to the surface, the line cutting deeply into the heel of my hand. Lyn sat ready in the stern, holding a paddle. The shark broke surface, struggled savagely and plunged deeply. I had to let him run, for he was



thought of rescue as one of the main objectives of our existence. We no longer had that helpless feeling of dependence on others for our continued existence. We stood alone, inhabitants of the savage sea.

**"Hit Him, You Bully!"**

While we were trying to land a turtle on the 31st day, we knocked a plastic water bag from its lashing and spilled the entire contents. The loss was serious, for it left us with only eight pints, two of which we discovered were foul.

If we were to run out of water, only turtle or dorado could save us. Turtles came only when it suited them, but the dorado were there for the catching. It was on the dorado I had to concentrate.

I had already made two spears, fashioning the point and barbs from a piece of the dinghy's cypress seats. But both had broken. Discouraged, I set about making a gaff, with which I could strike up instead of down. Laboriously, I fastened one of the large fishhooks to the end of an oar.

The first one failed, but a second proved more durable, and I caught my first dorado on our 32nd day. I had lowered the gaff; then the swift upward pull, the surge of weight, a gleaming arc of silver, and pandemonium as we fell on the wildly struggling fish in the bottom of the boat.

We ate some of the flesh for lunch, but concentrated mainly on the juicy liver and heart. We severed the ver-

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still too strong, but he was a nice five-footer. A mako shark, Douglas said.

Back up he came. "We'll have him this time," I grunted, my hands aching. "Be ready to take the line, Robin. I'm going to grab his tail and pull him in." Robin and Lyn appeared a bit uncomfortable at being given the biting end to look after, but were determined to do their best.

The shark surfaced. Gingerly, Robin took the line from my hand as I leaned over and grabbed the beast's tail. "Trim!" I shouted, and Douglas leaned out the other side of the dinghy to balance my weight. The harsh skin gave me a good grip and with a quick pull the shark lay over the gunwale. "Lift its head in

now!" I kept a firm grip on the tail as Robin raised the struggling fish inbound with the line. Lyn rammed the paddle into the gaping jaws, and they clamped shut on it. Knife in hand, I leaned forward and stabbed the shark through the eye. He struggled, then lay still.

Giving Douglas the tail to hold, I stuck the knife into the gill slits, sawing away until finally the head was severed. We had turned the tables on our most feared enemy. Sharks would not eat Robertsons. Robertsons would eat sharks!

Later, watching the pieces of shark swinging against the sky as they dried, we felt some justifiable satisfaction. With the turtle meat already in store, we had enough food to last us a week. We no longer

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tebrae and sucked the spinal fluid from the cavities. Robin, chewing at the head (his favorite piece), found that the large eyes were nearly all moisture, and by sucking reduced them from an inch in diameter to the size of a small pea.

The next day, I caught three more dorado. With 40 pounds of fish drying and a good quantity of turtle meat already dry, we had established a certain amount of security; we needed only water now. But the sun rose in a cloudless sky as the day advanced, and the sea, mirror calm, reflected the glare of the sun under our pieces of sail. So, by noon, we were wilting in the furnace of the sun's rays. Listless and weary, I poured salt water on Douglas and Robin. Then I passed the bailer to Lyn, who similarly soaked the twins. Douglas' deep-set eyes searched the horizon, not for ships, but for the high-reaching cumulus of a rain cloud.

As daylight approached on the 34th day, we all lay sleepless and unrested. Soon the white-hot sun was beating mercilessly on our little craft. Lyn and I bickered at each other until Lyn dissolved in tears. Robin, acting with good intent, made the grievous error of coming between husband and wife of 20 years' standing, and promptly became the butt of our joint wrath. Then Douglas shouted, "Turtle!" and our quarrels were forgotten in the flurry of clearing the necessary space and getting the trim right. When the turtle bumped the side of

the boat, Douglas reached down and grabbed it. As I waited for Robin and Douglas to swing the turtle aboard, the lengthening silence made me anxious. "Come on, let's have it!" I shouted.

"It's gone, I let go of it!" Douglas' voice was contrite with misery. "You what?" I yelled. "Why the hell don't you leave it to me if you can't manage!" Furious, I slapped his knee with my open palm.

"That's right. Hit him, you big bully!" came Lyn's voice from the bow.

We spent the rest of the morning contemplating our misery, without even the benefit of companionship to ease our thirst.

Finally, on the 35th day, the dawn brought rain. An hour of heavy, beautiful rain. We filled the containers, tins and plastic bags, then filled our shrunken stomachs to uncomfortable distention.

My schemes for saving ourselves had originally had three phases. The first was to get to the doldrums. Once there, we could take advantage of an eastward current to carry us toward Central America. Finally, as we got within a few hundred miles of land, I planned to row at night.

As we approached Phase 3, each day acquired a single objective—to build up our reserve stores of food and water until there would be enough to get us to the coast. I looked upon each turtle as the last, each fish as the one before I might

lose the hook through an error in strike.

Lyn washed and mended our clothes, which now had the appearance of aboriginal garb. Douglas had only his shirt left; Lyn's housecoat, in ribbons, was more ornamental than functional, and my tattered underpants and undershirt were stiff with turtle blood and fat. Salt-water boils and scars covered our arms, legs and buttocks, and were scattered on other parts of our anatomy, intermingled with clawmarks from turtles.

Nonetheless, we were in better physical condition than when we had abandoned the raft. Many of our sores had healed, and our bodies were functioning again. We were eating and drinking more, and our ability to gnaw bones and suck nutrition from them increased daily.

My chart indicated that we were now approaching the direct route between Panama and Hawaii, and so the possibility of sighting a ship was becoming greater. The indifference with which this snippet of information was received was a source of satisfaction to me, for now that our hopes were pinned on making a landfall, there would be no distress if a distant ship ignored us.

We spent the evening of our 37th day talking quietly of the distance we could row in a night, and how long it would take us to reach the coast. I estimated that at 350 miles it was about 15 days away. We had well over three gallons of water in store, and the night sky looked

heavy with rain cloud. A vague excitement stirred within me as I decided that, if rain came tomorrow, we would be ready to start the third and last phase of our voyage.

### Something That Was Not Sea

ON OUR 38th day, as I fished for dorado, the long-feared happened. The hook gave way and was lost. My initial reaction was one of extreme dejection. The fish had gone with our last big hook; no more fresh dorado. But my spirits picked up as I realized that our stocks of dorado exceeded those of turtle meat, and that we had enough of both now to get us to the coast, even if we caught no more fresh turtle. And I still had a small hook to use for inshore fishing if that should be necessary.

I chopped up some dried turtle meat for tea, and Lyn put it with a little wet dorado to soak in the fish juice. As we talked, my eye, looking past the sail, caught sight of something that was not sea. I stopped talking and stared. The others all looked at me.

"A ship," I said. "There's a ship, and it's coming toward us!" I could hardly believe it, but it seemed solid enough. In the sudden surge of excitement, everyone wanted to see. "Trim her!" I shouted. "We mustn't capsize now!" All sank back to their places.

My voice trembled as I told them that I was going to stand on the seat and hold a flare above the sail. They trimmed the dinghy, and I stood



up. "Hand me a flare now, and remember what happened with the last ship we saw!" They suddenly fell silent.

"O God," prayed Lyn, "please let them see us."

I could see the ship quite clearly now—a Japanese tuna fisher. Her gray and white paint stood out clearly against the dark cross-swell.

"Like a great white bird," Lyn said to the twins.

She would pass within about a mile of us at her nearest approach, I calculated. I relayed the information as the others listened excitedly, the tension of imminent rescue building like an unbearable unreality. "I'm going to light the flare now," I said. "Have the flashlight ready in case it doesn't work."

The flare smoked, then sparked into life, the red glare illuminating *Ednamar* and the sea around us in the twilight. I could feel my index finger roasting under the fire of the flare, and waved it to and fro to escape the searing heat. Finally, unable to bear it any longer, I dropped my arm, nearly scorching Lyn's face, and threw the flare high in the air. It curved in a brilliant arc and dropped into the sea.

"Hand me another! I think she's altered course!" My voice was hoarse with pain and excitement, and I felt sick with apprehension that the tuna fisher might only be corkscrewing in the swell, for she had made no signal that she had seen us.

The second flare didn't work. I cursed it in frustrated anguish as

the priming substance chipped off instead of lighting. "The flashlight!" I shouted—but it wasn't needed.

The boat had seen us.

I flopped down on the seat. Lyn and the twins were crying with happiness. Douglas, with tears of joy in his eyes, hugged his mother. Robin laughed and cried at the same time, slapped me on the back and shouted, "Wonderful! We've done it. Oh! Wonderful!" I put my arms about Lyn, feeling the tears stinging my eyes, and said, "We'll get these boys to land after all."

### A New Generation

THE HIGH, flared bows of *Toka Maru* towered over us as she closed in, pitching and rolling in the uneasy swell. The Japanese seamen lining the bulwarks threw out lines, and then willing hands reached down and we were hauled bodily through the bulwark door—Neil first, then Sandy and the rest of us.

As I was lifted up, I saw Lyn, Douglas, Robin and the twins lying in a line along the deck. I wondered what was wrong with them—until I tried to walk and found that my legs wouldn't work. I clutched at the bulwark for support.



Finally, I staggered to the companionway leading to the bridge. Pulling myself up with my arms, I greeted the captain of the *Toka Maru* and thanked him warmly in sign language. I had no Japanese, and he had no English. I produced my logbook, and we went into the chartroom to check positions. My estimated latitude was only five miles off, but we were 100 miles nearer land than I had estimated and would have reached it five days sooner than I had said!

I drew a small picture of *Lucette* and the killer whales, then wrote a list of our names and nationality so that our worried relatives would know we were safe. The captain nodded his understanding. Then, shaking hands once more, he wrin-

kled his nose, pointed at my tattered underclothing and said, "Showa! Showa!" I could well imagine the powerful odors emanating from my blood- and grease-soaked rags, though I myself could smell nothing.

The Japanese crew carried the twins to a large, four-foot-deep, hot-water bath, Robin and Douglas tottering along behind on uncertain legs. First, in the shower, we soaped and lathered ourselves, scrubbing at the brown scurf that our skins had developed, then luxuriated in the warmth of the deep tub. The simple joy of soap lathering in fresh water is surely one of the greatest pleasures of civilized mankind.

Later, we tried to settle down to sleep in the fo'c's'le, but the unaccustomed warmth was stifling. Also, the whole attitude of relaxation and freedom to move around was so strange that sleep would not come, exhausted as we were. At about midnight, we could stand it no longer and staggered out on deck. Soon we were resting under the stars.

In the days that followed, the Japanese crew took the twins to their hearts and showered them with kindness. The men had already made gifts of clothing to all of us, plus soap, towels, notebooks and pens.

It took four days for *Toke Maru* to reach Panama. In those four days,

Capt. Kiyoto Suzuki and his wonderful crew brought the milk of human kindness to our tortured spirits and peace to our savage minds. They also removed a bitter canker of revenge from my character. During World War II, when I was a young man, my ship had been bombed and sunk by the Japanese. The memory of the screams of the trapped firemen in the stockhold and of the flesh hanging in strips from the bodies of my friends had lived with me in bitterness through the years — through later visits to Japan, even through this rescue.

But these kindly fishermen were a new generation of men whose character bore no resemblance to the ogres in my memory. Their humanity, not only toward us but toward each other, restored my respect for their nation.

If for no other reason than this, the voyage of *Lacette* had been worth our while. But, as we watched Douglas, Robin and the twins talking and drawing pictures with their newfound Japanese friends, Lyn and I felt that they, too, had become citizens of the world, learning to communicate without the help of language, knowing that men and women of other nations and races have hopes, fears and ambitions which are not so different from our own.

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WHAT IS SO delightful as Indian Summer — which, as everyone knows, comes just before or after the first or second frost and either was or wasn't named by the Indians.

—Franklin P. Jones in *Philadelphia Sunday Bulletin Magazine*

March 21, 1992

Dear George..

Your note written while flying into Honolulu from Japan arrived yesterday and will hasten to reply while I enjoy a lull in my book publishing activities. 11 of the top NYC publishers rejected my story which forced me to publish on my own. The challenge is fascinating, educational and has my vital juices flowing once again. I hope to have my work to a printer by late next week and books ready to sell by mid June latest. I like the story and it draws tears every time I edit it..I hope others feel the same.

Now to your letter..I cannot identify the turtle we caught and ate from the "Hawaiian Sea Turtle" brochure. Simonne identifies it as the turtle used in the olden days to manufacture eye-glass frames..I will make a trip to our library to research the subject further..it's easier to reach a positive conclusion with two eye-witnesses and I am sure we can come up with a positive ID.

Dr. Bolton at the University of Florida in Gainesville, whom I visited last summer, suggested that the turtles that virtually lived with us, the ones with the large black rings around their eyes, were Black Sea Turtles. Actually, we remember many details of the trip as many of our moments weren't all that stressful. We had many calm, peaceful days...beautiful sunsets..easy breezes.. no sharks..I'll enclose a chapter I wrote labeled Sharks for your perusal. I'd appreciate a note should you find anything that may be out of line.

We didn't eat more turtles because I was convinced that their size and strength would prove too much for us. I operated on the principal that we could survive without food but if we punctured the raft in an attempt to catch food we would die. We were surrounded by thousands of mahi-mahi and other varieties of fish dolphins but I dared not try to catch one for I could not see clearly how I could fight it and land it without endangering the raft. One day while fishing, after catching two fairly large triple tails..and they put up a good fight and have many long hard dorsal spines..I decided..like many a fisherman..to go after one more small fish for bait..the two triple tails would more than feed us but I couldn't resist trying my luck once again..I always fished with my bait an inch or two under the surface so I could watch it. This time I

carelessly let it dropped four or five feet and suddenly received a hard jerk. I pulled and placed the hook. Damn, I thought..I caught a shark..and with my only hook..I kept it down there while I figured out what to do...I had Sim place the sail bag over the air chamber to protect it and hold the pole while I ran the line back up through the eye on the end and pulled on the line while looking over the side. My surprise was total when I saw I had a big bull dolphin..40-45 pounds...exactly what I'd been dreaming about eating. My appetite was kept alive by the dolphin's habit of jumping six or more feet clear of the surface to land flat with a resounding slap..to celebrate the joy of living, I presume ..every day and night while we had calm weather, we'd hear the dolphins hit the water..what surprised me was that this bull wasn't fighting like it should. We got all ready and in a second I tugged it aboard, onto the sailbag on my lap, wrapped the bag around it and held it tight..we exploded with joy and laughter..we did it!! I stabbed the dolphin with my knife, it died and soon later I posed for a snap with the dolphin across my lap and a triple tail in one hand..when we cut into the dolphin..it was mushy and smelled bad. I tasted it and gagged..the fish was practically dead when we caught it..without a second thought we dropped it over the side where it sank like a rock...our appetite for the great tasting triple-tails dampened.

All of the Black sea turtles we met were 30 to 36" inches in diameter..and weighed, I would venture, a hundred pounds or more. I never once considered taking one on..I have no doubt we would have met with disaster should I have attempted to kill one. Their struggles when caught in one of the lines hanging off the side made me respect their strength. Ultimately, after battling many a drowning turtle caught in the loose hanging life lines raft manufacturers are forced to provide on the outside of rafts..I cut all lines loose. I dared not fight an adult sea turtle. The nails on their flippers were sharp and when in stress they react violently..I'm afraid the raft would have lost that battle. Handling the small turtle we caught was a two person job..if we had a solid dinghy I would have tried for a larger one but the small plastic raft presented no viable way to board a large turtle, contain it, then cut its throat while it lashed out with beak and four flippers..I have a lot of respect for the turtles..lethargic and all, when nailed they put up one hell of a fight..the abundance of trigger fish precluded the need to search further for food...I caught 20 plus triple tails and rainbow

runners and more than 300 trigger fish..all but one or two with my hands. The Lord made all that possible. All for now..let's stay in touch..regards..

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## LIFE AMIDST THE WORLD OF SHARKS

Simonne and I agree without reservation on one point: were it not for the shark population in the Pacific Ocean, our 66 day, 1200 mile voyage in a six foot plastic raft would have been a breeze. Except for the first five and the last six days sharks continuously menaced us with instant death. Sharks battered the raft at all hours, day and night. The same sharks travelled along with us while we drifted 600 miles. We could tell they were the same sharks by their time of arrival and pattern of attack. Two had tags.

I labeled one bunch of sharks that paid us a daily visit "SHARK PACK." They called on us every day for five weeks at between ten and eleven in the morning. They may have attacked at night as well but it was impossible to tell. It was easy to spot "SHARK PACK." Two of the sharks had tags. One five footer had a white one inch round tag just ahead of its dorsal fin. The other, a six foot lemon shark wore a two inch long tag alongside the dorsal fin. Sims' good Franco-Italian blood exploded during their visits. "I would like to meet the PEEG who tagged these monsters instead of blasting them!" she would exclaim again and again. As time passed our relationship with "SHARK PACK" evolved from sheer terror at their very first call to *deja' vu* towards the end of our voyage.

We still remember vividly the first time a shark hit our raft. It happened on day 5 after two in the morning. Up to that moment our nights had been more or less pleasant. We'd sleep four to six hours at a time if the seas were not pounding and the raft did not need air. We had nothing more to worry about than a turtle or two a day, getting found and what to use for bait when our food ran out. That

first bash completely changed our life style.

Seas at that time were four to six feet on 25 foot swells, relatively easy going. Once every hour or so a wave bigger than average would come boiling towards us and give the raft a good wash. After two nights, we were growing accustomed to the roar of breaking waves and the crash splash that followed. We even napped between soakings. Then of a sudden the raft is struck so violently both of us jump. I thought a fifty foot breaker had washed over us. Sim leaned over and whispered "Shark!" We embraced tightly. I shushed needlessly for the only sound around came from two pounding hearts.

The next crash spun the raft around 180 degrees. My side was now to leeward, not good since I was using my extra weight to windward for stability. Five more slaps in a row put us into a real panic. Neither of us moved. Not a word was said. I held Simonne tightly, my mind wildly trying to sort out this new situation. Whack. Whack. Whack again. Sim whispered, "Pray." We prayed. The shark left. Too tense to sleep, we held each other tightly until dawn.

During the following three days sharks battered the raft regularly, day and night. Our reaction was always the same. Panic. We embraced tightly and prayed. Over the next 50 days sharks whacked our raft more than 3500 times. As days passed we observed how they approached and slapped our tiny vessel. This led us to the why behind their behavior.

Sharks as we know them now have been around for a long time, over 25,000,000 years. Their roots go back even further, to the Middle Devonian Period, 375,000,000 years ago. Twenty seven species of sharks attack man and boats. Most sharks are scavengers and carnivorous. We saw several hammerhead sharks. They eat everything from a wide variety of fish including other sharks to turtles, birds, seals, squid, garbage (including plastic) and carrion. Fortunately a particular plastic raft was not on its menu du jour. All sharks love warm water except the Great White which will go anywhere for a meal. The water temperature during our entire voyage ranged between 24 to 26 degrees C (78 to 82 F), a perfect habitat for sharks. From day ten onwards, we were surrounded

continuously by these predators.

Whenever I started to fish I would first take a look around to determine what was around. The sharks were always there. On calm and sunny days our giant underwater aquarium held hundreds of fish of various varieties, at different levels, with sharks intermixed at all depths with fish of all sizes. The fish did not appear at all concerned with the presence of the sharks and the sharks never made a move against a member of our growing "family." Whenever the fish population disappeared I started to worry.

Smaller sharks remained close to the surface and near the raft. Large sharks approached from below and would circle the raft in ever shallower orbits. "SHARK PACK" was an exception. Often they came surfing in, fins out of the water much like dolphins and at the last second duck under the raft. Some had a great time zipping between our ballast bags. One devil got his daily kicks by whacking inside the ballast bags. Sharks segregate according to size which protects the smaller individuals from predation by the larger ones. There was a regular "nipping" order, with the leader demanding and receiving plenty of space.

Mature sharks segregate by sex and come together only during the mating season. When parturition is imminent, the female moves to a nursery area, gives birth, and leaves her offspring with other newborn. Floating slowly along, we picked up increasing numbers of small sharks that looked to us for protection. Sharks have a slow rate of growth, one to three inches per year. Males of the same age stick together because if they mix with larger sharks they will become part of the days menu. The twenty to thirty sharks in "SHARK PACK" were all five to six feet long.

Although we couldn't tell a male shark from a female as it zipped by, I feel all sharks that whacked the raft were males fulfilling a mating ritual etched eons ago. We had over two months to view and take note of their behavior and the conclusions we have reached are based on hundreds of observations. A shark marks its territory or presence by spraying, as do many species in the animal kingdom. With a virtually empty ocean, our raft, travelling at a top speed over the bottom of one knot, became a favorite outlet for the sex drive of all the local male shark population.

A typical day would begin at ten in the morning with a whack or two by immature sharks of less than two feet. As the day progressed, larger and larger sharks would swim by and we got the impression each was driven to remove the scent left by our earlier admirers. At 1030 "SHARK PACK" would arrive and keep us entertained with an hour of punishment. When the "PACK" left, we would relax, meditate and prepare for lunch. Sim would grasp the opportunity to chew me out for the 912th time for getting her into this horrible situation from where she would never get out alive and thus never see her babies again who would never know what happened, etc, etc. I lost count of the times I prayed for a shark.

After noon I usually started fishing. Though our raft was always surrounded by sharks, none came close while I fished. Occasionally very small sharks went for the bait but it was never seriously approached by a mature shark. Large sharks circled in ten feet of water but never approached my bait...I not why. During our voyage I landed more than 330 fish and disposed of each carcass over the side. The trigger fish would move in first then hurriedly give space to the first shark which would gulp the remains.

Right around four in the afternoon sharks would pummel the raft again a couple of times, never too intensely. Usually, it was a member of the runt pack that resided full time under the raft. Dusk was normally one of our quieter moments. Simonne would read the psalms, then we'd pray, watch the sunset if any, and prepare our sleeping quarters for the evening. As the sky slowly changed from day to night, the immatures were replaced by the BIG ONES. I spotted them first around sundown during our third week. At least twice as long as the raft, several monster sharks circled ten feet away. At first I couldn't tell what it was. Later I saw the unmistakable shape of a hammerhead. Others were mature silkies. Obviously, a BIG ONE never touched us.

Some sharks circled the raft in one direction to strike all four sides progressively. Others, would whack one side, skip two sides, and appear from below to whack the fourth side. Many times, a shark shot from under the raft, went out ten feet and turned back. As it shot towards the raft it would turn belly up at the last moment. When even with the raft it would spray it with an oily substance.

Still belly up, the shark would deal the raft a violent whack with its tail. Often, the raft would spin from the blow. The shark continued to circle and whack the raft again and again, to punish us without mercy.

We had to fight back or risk losing the raft. One morning, a three foot lemon shark tried my patience by whacking all four sides of the raft over and again. I prepared the heavy half of our fishing rod and lay in wait with rod poised harpoon fashion. As the shark approached and turned bottom side up I gave it a good zonk on the belly. It flipped its tail, soaking me. I declared WAR! Its next pass was a swim-by to check out what had happened. I caught the shark between the eyes. It left the area. We weren't bothered by sharks during the next three hours. Success.

From this moment on, our approach to sharks changed to that of aggressor. No longer were we going to placidly await obvious disaster. Experience taught us that a lone shark would first approach the raft from the depths and slowly circle towards the surface. On its first close approach it would merely brush the sides of the raft. This became our signal to get ready. Simonne was much more sensitive to sharks than I, and oftentimes I would ask her "Was that a wave or a shark?" If a shark, I would sit up, get the pole ready and wait.

Sometimes, the shark vanished, but more often it would circle under the raft and come back for another try. I had to remain alert and nail it before it got excited and increased speed. This approach considerably reduced damage to the raft and to our nervous systems. Unfortunately, there were a bunch of non-conforming sharks that remained unimpressed by my bonking skills. They whacked the raft no matter what we did.

Darkness enveloped the raft minutes after sunset. No lingering tropical cornucopia of colors in the deep Pacific. Just shades of grey. The shark population normally gave us a break until after 10 at night. We would get a hit or two just before midnight, but nothing very scary. All hell would break loose sometime around two in the morning. The first time it happened I was sure we had been run over by a freighter. This shark appeared nightly, during more than forty nights. Besides arriving at the same time every night, the attack pattern was always the same.

Faster than a destroyer at flank speed, it would zoom past all four sides of the raft, spraying and whacking, spraying and whacking. I would splash, bonk, and even yell at it. I hit it many times. None of my tactics worked. During all the shark attacks Simonne prayed intensely. After days trying to subdue our 2 am fiend physically without success I gave up. Lying down, with the raft receiving incredible punishment, I prayed. Our prayers seldom failed to be acted on at once.

Many sharks attacked at night or during the day during violent rain storms. Some storms lasted 36 hours. In this case our only defense against sharks was prayer. We would pray and the sharks would leave. I never ceased to be amazed. Often, after I had prayed and the sharks had backed off, my mind would wander. Whack. Just a reminder to keep praying. Once our two AM shark left, life quieted down until mid-morning.

When fishing, I had always to be on the lookout. To keep from losing my only hook, I would keep the bait small and never more than six inches below the surface.

CHAPTER XXII

SAN FRANCISCO TO PANAMA

**Catching Turtle**—The Island of Socorro and what we found there—  
The tale of a Russian Finn—Quibo Island—Suffering of the  
Natives from Elephantiasis—A Haul with the Seine.

On the 20th of January, 1916, we left the harbour of San Francisco, and proceeded to get well clear of the land, as the glass told us to expect a blow: and in due course it came—and plenty of it. We hove-to for twenty-four hours, with oil bags to windward, for the seas were high and untrue. The weather then moderated, so we let draw, and put her on her course, and were soon in a more pleasant climate.

The Panama Canal had been closed to all traffic for many months past, in consequence of land-slides. Of course *Mama*, drawing but 11 feet, and only 72 feet on the waterline, would experience no difficulty in passing, if the Administration would permit her to do so. But would it? We had been unable to discover, through any source in San Francisco, whether we should, or should not, be allowed to traverse the Canal. The only course left open to us was to go to the Isthmus and see what could be done on the spot: if we could not get through we must continue onwards to the S'uth'ard, and go round the Horn. Mr. Gilliam and the Owner were quite keen on doing so. Mr. Gilliam thought it was only fair to the vessel "to give her a chance of showing what a good little ship she was." The crew, however, said they were quite satisfied on that point, and after three years of it, sighed only for Britain, Beer, and Beauty. So firmly were they convinced that our plucky Sailing-master would take her round the Horn, just for the sake of doing so, should he chance to come back alone without the Owner, that, when they signed on again at Tahiti for the voyage home, it was subject to the proviso that the outside passage round Cape Horn should not be taken without their consent.

So, from the so-called Golden Gate of San Francisco town, to the real Balboa gate of the Panama Canal, sailed we in the pious hope that something would turn up in our favour, and believing that it would do so, for *Mæna* is a "lucky ship." And of course that "something" did: but other events, not devoid of interest, intervene and demand recital.

At this point political conditions must be referred to for the due understanding of our story. Absurd though it be, the fact remains that, just as England meekly allows herself to be bamboozled, robbed, insulted, and defied by one petty *saw-entôte* province, so do the United States submit to like treatment from Mexico: the same small  $\delta$  that represents mathematically the consideration in which an Irishman holds the British Government, may be said equally to symbolise the degree of respect in which the American Eagle is held by the patriots of Mexico. Therefore, argued we, as the noble Mexican does not hesitate to pluck the Eagle, whenever that fowl comes hopping on his ground, still less will he refrain from depilating the Lion, should he want some fur for fly-tying. No, we will give the coast of Mexico a good berth. A vessel like the *Mæna* would, at the moment, have been an invaluable capture for the "patriots," whose acquaintance we had no wish to cultivate. We thought of the many-oared row-boats of the Riff coast, and how they could come at speed over the smooth windless sea and board us on either quarter. Of course our motor would have been in our favour, but, all the same, discretion was perhaps better than valour, as we were unarmed. So we decided to keep 200 miles off the land in working down the coast of Lower California and Mexico, though it would have been better navigation, and more interesting, to have come close in.

The climate was now delightful: smooth water: gentle fair breezes. These conditions enabled us to capture all the turtle, and more than all, we wanted. They were asleep at the surface: the sea like glass, and heaving rhythmically. The undulations of a sea like this are so long, and wide, and gentle, that one somehow ceases to regard them as waves, and thinks of the movement of the water immediately around the craft as being only a local pulsation.

We had noticed, from time to time, isolated seagulls heaving into sight on the top of the swell. Sometimes there would be as

many as three or four within calling distance from one another. Each seemed to stand on a separate piece of drift-wood, never two on the same piece. Some seemed occupied with affairs, swearing all the time, as seagulls always do; some stood silently on one leg, "a-staring into vacancy" and thinking on their past. Some preened and oiled their feathers. We could not understand why there should be drift-wood, all small, and all over the place like this, so bore down on a sleeping bird, when, to our great surprise, we found that his resting-place was the back of one of Nature's U-boats—a turtle. Some may think then that all we had to do, if we wanted a turtle, was to approach a resting bird, but not a bit of it. If the bird, for reasons of his own, flew away from the back of the turtle, the turtle remained as before, nor did he ever seem to draw the line at the profanity with which his visitor argued some point with the nearest neighbour, but let a boat approach, however gently and innocently, and the gull decide to clear, because he did not like the look of it—even as the bird did so, did Master Turtle down with his head and up with his heels, and where he had been, he was not; without a splash, or a swirl, or a bubble. If any fail to understand this description, he should betake himself to Africa and stalk rhino in high grass whilst they have their red-billed birds in attendance scrambling all over the huge bodies hunting for ticks. Let but one bird spring up suddenly in alarm from a rhino's back, forthwith will occur proceedings that shall not fail to leave a lasting impression on the observer.

When we wanted a turtle, however, we went to work in this way. The little 12 ft. dinghy, having two thwarts and a stern-seat, was lowered from the starboard quarter and towed astern. A sharp look-out was kept ahead, and to leeward, for a turtle asleep on the surface. On one being sighted, the vessel was run off towards it. Simultaneously the dinghy was hauled up alongside, and two of us, barefooted, dropped into her: she was then passed astern again and towed. One man sat in the stern sheets and steered with a paddle, having handy a strong gaff hook lashed on the end of the staff of a six-foot boat-hook: the coarsman occupied the foreward thwart with his paddles shipped in the rowlocks. The leather of the oars had been well greased previously, so as to make no sound. The dinghy silently sped after the ship. On the vessel arriving within some 50 yards of



the turtle, an arm on the quarter deck was waved: the dinghy slipped her tow line, the ship's helm was put up, and she edged-off to leeward away from the fish, whilst the dinghy continued, under the way she carried, on the line of the vessel's former course, and therefore straight towards the turtle. On the sitter catching sight of the fish, if the boat was carrying sufficient way to bring him up to it, he laid aside the steering oar, and at the right moment made a sign to his mate, who then gently dipped one of his paddles in the water. The boat in consequence made half a rotation, coming stern-on to the turtle, instead of bows-on as previously. The oarsman then saw the fish for the first time and commenced to back her down with gentle touches of his two paddles right on to the top of the fish. Meanwhile the sitter slid off the after seat, turned himself round so as to face the stern and knelt on the bottom of the boat with his knees placed well under the after seat, his chest resting on the transom, his arm outstretched over the water, rigidly holding the gaff extended like a bumpkin, with the point of the hook directed downwards towards the water, and about two inches above its surface.

Now the old turtle is roosting on the water with the edges of his shell just awash, his dome-shaped back rising just clear of it, and his head hanging downwards in order that he may keep his brains cool. At the opposite end to his head is his tail. This detail may seem unnecessary. But it is not so. It is an essential point. When a turtle is surprised he does not express it by throwing himself backward head uppermost on to his tail, and show his white waistcoat, and wave his arms in depreciation of the interview, but he downs with his head and ups with his heels and the tip of his tail, if you are able to recognise it, is the last you see of Master Turtle. And when he acts thus he shows much decision of character: there is no hesitation: in a moment of time he is absent. Hence, when you approach a turtle, you must first decide where away lies his tail, and so place your craft that her keel, and the turtle's spine, shall lie in the same straight line. Then, as she is backed stern foremost towards him, the staff of the gaff is brought, by the movement of the boat, immediately above the length of his back. Now for it! the fisherman suddenly thrusts the gaff from him till the point of the hook is beyond the rim of the shell: raises his hand the least

trifle, so as to depress the hook slightly, then savagely snatches the gaff backward, at the same time shortening his grasp on the shaft. The turtle awakes from his dreams to find that he is in a position in which he is helpless—standing on his tail, with his back against the boat's transome, and his fore flippers out of water. But he is not given time to think. As his back touches the flat end of the boat, the fisherman springs from his knees to his feet and, with one lusty heave, hoicks Uncle up on to the edge of the transome and balances him there for the moment. Down goes the stern of the little boat, well towards water level under the combined weight of man and fish. Then the slightest further pull, and into the bottom of the dinghy the turtle slides with a crash, whilst the fisherman, whose only thought now is for the safety of his toes, gracefully sinks down upon the middle thwart, takes hold of the gunnel with either hand, and hangs one bare leg overboard to starboard, and the other to port, until the turtle has decided in which part of the boat he proposes permanently to place his head. Slowly he opens and closes his bill, shaped like the forceps of a dentist, and slowly he blinks his eye, as much as to say, "Just put a foot in my neighbour-hood or even one big toe." Turtles have no charity.

The turtle and the fisherman have engrossed one another's attention so far, but there are three other elements in the equation; they are (a) the boat, (b) the boatman, and (c) the shark. Each of these requires a word in passing. Now a 12 ft. dinghy, like any other of God's creatures, has feelings: these it expresses amongst other ways, when treated unreasonably, by capsizing, and turtle catching it puts in the neighbourhood of the limit. Not infrequently it happens that the long black fin of a San Francisco pilot comes mouching around at a turtle hunt, as if to incite the long-suffering dinghy to show temper. Hence it is sometimes quite interesting to view, from the ship, the sympathetic way in which the oarsman exerts himself to humour every whim of the little boat, in order to induce it to maintain its centre of gravity during the scrimmage. He quite seems to have the idea in his head that, with the shark assisting at the ceremony, a capsized would be anything but a joke for him. Anyhow, it is all right this time, so we make for the vessel, now gently rising high on the top of the swell, anon slowly sinking until only her vane is visible.

"Lee-Oah!" Round she comes. "Let the staysail bide!"

As she lofes her way the dinghy shoots up towards her, a line comes flying in straightening coils from the bows of the ship and falls, with a whack, across the dinghy's nose. The oarsman claps a turn with it around the for'ard thwart, and quickly gets his weight out of her bows, by shifting to the middle thwart, before the strain comes. At the same time the fisherman nips aft, whilst keeping an eye on Master Turtle's jaws, squats on the after seat, picks up an oar and sheers her in towards the ship. Then a strop falls into the sternsheets: the oarsman slips it over a hind flipper, one of the dinghy's falls is swayed to him, he hooks it into the strop, and up runs Baba Turtle, to be swung in-board the next moment into the arms of the Japanese cook, who receives him with a Japanese smile as he bares his sniggery-snee.

We had now been more than a fortnight at sea. After a run of this length we generally found it well to touch somewhere to refresh. The chart showed ahead of us the Island of Socorro which we could fetch by edging off a little. The Sailing Directions told us it was uninhabited, and rarely visited: that there was no fresh water on it, but nevertheless that sheep and goats were to be found, and that landing was possible. The early morning of February the 5th showed its single lofty peak standing out clearly above the lower mist, and in a line with our bowsprit, whilst a light breeze on our quarter made us raise it fairly fast. In the chart room we pored over the only chart we had, a small-scale one, using it for what it was worth to elucidate the Sailing Directions. These indicated an anchorage and landing-place on its south-western side: poor, but possible: and no outlying dangers. We therefore decided to examine that coast, and see what we could find in the way of anchorage and landing facilities. At the same time the conversation turned on the apparent excellence of the place as a gun-running depot for the Mexican Revolutionaries, and the exceeding awkwardness of our position if we suddenly shoved our nose into any such hornets' nest. The pow-wow finished, up the ladder we tumbled on to the quarter-deck, and turned to the island, and lo! round a point was emerging a something—first appearing as a boat with bare masts—then as a boat with sails—she has presumably come out under oars and is now getting the canvas on her. She has seen us making for the island and is clearing out! They are at the

game, then, after all! Now she grows into a vessel under canvas: now she fades away. No ship had we seen since getting well clear of San Francisco. We could make nothing of her in the haze and the mirage, for the air was all a-quiver with the heat. The general opinion seemed to be that she was a small schooner sailing with her arms akimbo, which, with the wind as we had it, was impossible. Anyhow she was approaching us rapidly in the teeth of the wind—goose-winged; but anything seems to our mariners possible "in these 'ere fur'rin parts." But alas for Romance! Gradually she revealed herself through the haze as a tramp steamer with a high deck cargo. Her black hull and black-painted mast tops, as she opened the land and partly showed her length, had made her the small boat with bare pole masts: afterwards, when she shifted her helm and came towards us bows on, she became the small schooner running before a fair wind off the land—her light-coloured deck cargo, high built up, and white-painted bridge formed the goose's wings extended on either side of the black masts, that rose above them, and stood out distinctly against the sky. We kept our course. She passed us close to starboard. We ran up our ensign and number and asked her to report us, but she took no notice. Only one man was seen aboard her. We thought at the time she was from the Canal, but afterwards learnt that nothing had come through it for some months, also that a somewhat similar vessel had, in May last, lain for a month off Socorro to . . . . . admire the Scenery.

We closed with the land, at its western extremity, about 3 p.m., and then slowly ranged along the south-western shore, examining it carefully with the glasses for indications of a landing-place. The water was smooth and crystal-clear, and the sun behind us, so that, comfortably ensconced in the fore-top, we could see well ahead in the line of the ship's progress, and to a great depth. We were able therefore, without risk, to hug the shore, and to examine it with precision. Everywhere was the same low cliff: on its top, scrubby vegetation with a sheen like the foliage of the olive—(sage bush). Immediately below this a broad scarlet band—(disintegrated lava)—then a greyish red, or black, cliff wall of igneous rock—at its foot a snow white girdle of foam from the ocean swell dashing against it.

So we progressed, until we reached what we decided must be

Braithwaite Bay, at the S.W. corner of the island. The Sailing Directions gave this as the only anchorage. Mr. Gillam jumped into the dinghy and pulled in to examine it, whilst we followed her in very slowly with the ship. A couple of whales seemed to find the floor of the bay quite to their taste as a dressing-room. The huge fellows quietly spouted and wallowed, "a-cleaning of themselves," and took no notice of us. The dinghy did not like the look of things for either landing or anchorage, so held up an oar. Thereupon we put the ship round, and went out on the same track as that on which we had entered. Nightfall was now approaching. We picked up the dinghy and stood off a bit, and then hove-to.

Now, immediately before reaching Braithwaite Bay, we had noticed in the coast-line, from the mast-head, an indentation or small inlet, across which there was no line of breakers. Also we had observed a remarkable white patch set deeply into the land apparently at the head of this indentation. Of these points presently. During the night, whilst hove to some distance off, the watch picked up a beautifully modelled painted and weighted decoy duck, with the initials "H. T." cut into it. This wooden fowl, we concluded, had drifted down from San Francisco, for there they are largely used in duck shooting. It had broken its anchoring line, been swept through the Golden Gate, and then by the prevailing winds and currents carried to the point where we had picked it up. The find was interesting as showing that our navigation was correctly based for current.

With the daylight we again stood in, this time towards the inlet, and after an early breakfast, the cutter was swung out. A breaker of water, a cooking-pot or two, a watertight box of food, another containing ammunition, the photographic and botanical outfits, and a Mauser rifle in its water-tight bag, were put into her and, with five hands, we started off.

As we approached the break in the cliffs we again met our two friends of yesterday—the whales. They had shifted their ground and were now right in the entrance to the cove, so we had to lay on our oars for quite a while, until they gradually moved away. It was most interesting to watch the great brutes comparatively close alongside, yet absolutely indifferent to, or unaware of, the boat's presence. Certainly we kept quiet, and did not allow objects in the boat to rattle or roll. Sound waves

are transmitted through the water just as they are through the air. Each of these fish would have been worth £1,000 at least at pre-war prices. "Life is full of vain regrets."

Our break in the cliff proved the entrance to a fissure in the land-mass comparatively far extending. On either hand it had nearly vertical cliff walls, and these again had steep ground above and behind them. It had a regular, gradually rising bottom, deep water at the entrance, and at the head a shelving beach of sand and small stones, yet steep-to enough to allow the cutter to float with only her nose aground. Not a trace of swell: an ideal boat harbour. As it had no name, and is to-day undefined in the Admiralty plan of Braithwaite Bay (cf. inset on Chart No. 1936), we christened it Cruising Club Cove—dropping the "Royal" for the gain of alliteration.

As we lay off the entrance, waiting for the whales to shift, many, and varied, were our speculations as to what the white object, previously referred to as situated at the head of the cove, could possibly be. Not till we were close up did we make it out. It then proved to be a red-painted boat, covered with a white sail. Now a dry torrent bed forms the head of our little fiord. The detritus brought down by the torrent is spread out as a small, flat, channel-cut plain, that meets the sea with a fan-shaped border. On to this flat the mystery boat was hauled up, but only to just above high-water mark. Close to her side was a grave with wooden cross. From her bows hung a bottle closed with a wooden plug and sealed with red paint. Keenly interested in it all we disturbed nothing, so that we might the better be able to piece together the evidence, after gathering all we could. She was evidently laid up: practically new: amateur built: her material new deal house-flooring boards: flat-bottomed: sharp at both ends (dory type). Left as she was, the surf of the first gale from the South would lift her. They must have been either weak handed to leave her close to the water's edge like that, or else they had been in a great hurry to get away. No painter and anchor was laid out to prevent her floating off: no seaman would leave a boat thus unsecured. (For there was cordage in her.) Her sail was cut out of an old sail of heavy canvas belonging to some big ship. They had ship's stores to draw upon.

Casting around, we soon found a track running through the

# THE MYSTERY OF EASTER ISLAND

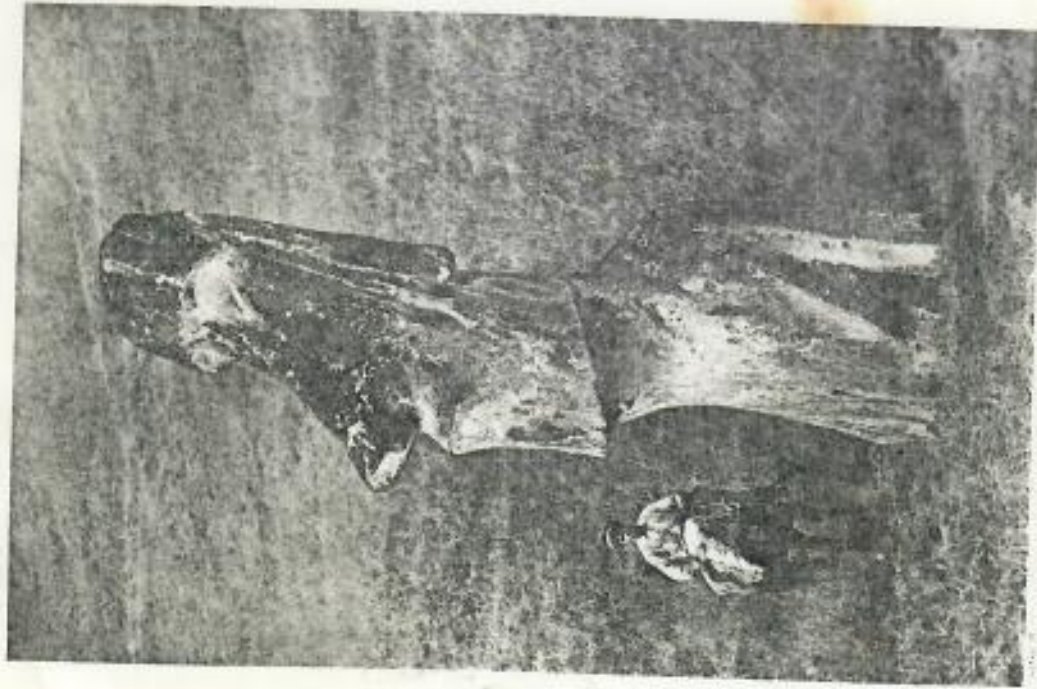
THE STORY OF AN EXPEDITION

BY  
MRS. SCORESBY ROUTLEDGE

HONOURS MOD. HIST. OXFORD; M.A. DUBLIN

JOINT AUTHOR OF

"WITH A PREHISTORIC PEOPLE: THE ANGIUVO OF BRITISH WEST AFRICA"



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SARA MILLER-aboard-

# Canadians Arrive After Sea Ordeal

Friend - Pat MacASIC  
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By Harold Morse  
Star-Bulletin Writer

The worst part of the experience shared by seven shipwrecked Canadians who were flown to Honolulu yesterday was the fear that they might not be rescued, that they would die in their life rafts floating far from shipping lanes.

Jon Van Tamelen, 42, skipper of the 91-foot pleasure craft White Eagle, which burned and sank several hundred miles north of Midway Island a little over two weeks ago, told reporters here not knowing what their fate would be was the bad part.

The seven drifted eight days in the life rafts, living on a few ounces of water each day, nine fish they snagged with bare hooks and ate raw "eyeballs and all," canned peaches and mandarin oranges, with sharks buffeting their rafts day and night.

THEY WERE finally rescued by a Russian whaler, transferred to a U.S. Navy tug near Midway and flown to Hickam Air Force Base.

On arrival here last night, the seven looked fit and in good spirits.

They were on the Russian ship four days and five nights and were fed Russian fare of potatoes, bread, borscht (soup) and fish, they said.

Todd Van Tamelen, 15, youngest aboard and son of the skipper, recalled the rendezvous shortly before dark with the Russians hundreds of miles from Midway.

"We just spotted them on the horizon, and we sent up a parachute flare, and we had a canister of smoke—orange smoke—and we held up hand flares," he said.

Sara Müller, 30, was first to spot the ship.

life rafts. "The hull was still full of fire as it was sinking."

Lloyd Parker, 62, the owner, said the White Eagle was insured but not for its full value. Earlier, Van Tamelen had said the yacht cost \$1.2 million.

From Hong Kong the yacht had stopped at the Philippines, Okinawa and Japan before sailing for Hawaii, Parker said.

All the Canadians are from Vancouver.

PARKER SAID he has a dealership for Kenworth trucks there.

Other passengers were Donald Holtom, 54, Ann Mathisen, 34, and Marguerite Mahy, 35.

Mahy, a nurse, recalled her emotions when the Russian whaler, the Vidnye, was sighted.

"I thought I was so calm and strong," she said. "I just broke into tears."

"I thought I saw their mast," she said.

What did she do then?

"Screamed," she replied.

THE SHIP WAS about 2 1/2 miles away, and it took the Russians 15 or 20 minutes to get to them after noticing their signals, she said.

The Russians relied on orders from a mother ship in their whaling fleet on what to do with the rescued Canadians, and radio communication was slow, she said.

"They just took us aboard and asked us if we were all right and fed us and that's about it," said young Van Tamelen. "They were very nice, friendly people."

"One man (the navigator) spoke a few words of English," he said.

The two 6 1/2-foot rafts and an eight-foot dinghy were tied together, and "we caught some fish," the boy said.

"We hooked up three hooks to a line and jigged."

HIS FATHER, skipper Van Tamelen, recalled the late-afternoon fire aboard the yacht, which had been custom-built in Taiwan, completed in Hong Kong and was on its way to Honolulu from Yokohama, Japan, when it went down.

Van Tamelen said they watched it for two hours after they got into the

A-2 Honolulu Star-Bulletin Friday, July 27, 1979

## Rescued by tuna boat southeast of Oahu

# Costa Rican fishermen

By Steve Elliott

Associated Press

Five Costa Rican fishermen drifted 3,600 miles for five months after their boat ran out of fuel, surviving on rain-water and what fish they could catch before they were rescued southeast of Honolulu, the Coast Guard said yesterday. The five will arrive in Honolulu today aboard the Japanese tuna boat that rescued them.

"We ate anything that came near our boat, such as fish, turtles and sharks," Joel Omar Gonzalez, one of the

fishermen, told the Coast Guard in Honolulu. "We got water because it rained a few days and we managed to fill a lot of empty cans we had on board our boat."

Coast Guard Petty Officer Jeff Crawley said the 30-foot boat was discovered drifting 700 miles southeast of Honolulu Wednesday. The boat set out Jan. 19 from Puntarenas, Costa Rica, for an eight-day fishing trip, he said.

"A storm came upon us so we started heading for shore, but the winds were too strong and they pulled us out

to sea," Gonzalez said. "We ran out of diesel (fuel) and have been adrift ever since then."

Crawley said the men ate anything they could catch. Gonzalez added: "We survived by throwing over bait which we had for our fishing trip."

Crawley said the fishermen were picked up by the Kinei Maru 128 from Japan, and all five were reported in good condition.

The Honolulu agent for the Kinei Maru 128 identified the Costa Rican craft as the Cairo

6-17-88 AI  
HA

## adrift 5 months



III. The Coast Guard called it the Cadiro III.

The Kinei spotted the fishing boat adrift with the five

waving on its deck, Crawley said. The tuna boat rescued the men and left the stricken vessel adrift, he said.

1967  
Fish. Bull.  
66: 13-29

## ASSOCIATION OF FISHES WITH FLOTSAM IN THE OFFSHORE WATERS OF CENTRAL AMERICA

BY JOHN R. HUNTER, *Fishery Biologist (Research)*, AND CHARLES T. MITCHELL *Fishery Aid*  
BUREAU OF COMMERCIAL FISHERIES TUNA RESOURCES LABORATORY, LA JOLLA, CALIF. 92038

### ABSTRACT

During April, May, June, and October, 1963, a total of 70 purse seine collections were made of the fishes associated with floating objects. Nearly all of these collections were from the offshore waters of Costa Rica. Twelve families of fishes (Lobotidae, Carangidae, Coryphaenidae, Mullidae, Kyphosidae, Pomacentridae, Scombridae, Blenniidae, Stromateidae, Mugilidae, Polynemidae, and Balistidae) and 32 species were represented in the collections. Most of the species were present during both spring and fall, and nearly all of the fishes were juveniles.

Nine of the 32 species, including the 2 most abundant ones, *Caranx caballus* Günther and *Selar crumenophthalmus* (Bloch), were carangids. The lengths of two species, *Abudefduf saxatilis* (Linnaeus) and *Seriola* sp. were greater the farther an object was located from shore. Some species such as *C. caballus*, *Psene pacificus* Meek and Hildebrand, and *Canthidermis maculatus* (Bloch) were present in almost a complete series of juvenile stages; others as *Chromis atrilobata* Gill,

*Pseudupeneus grandisquamis* (Gill), and *Agonostomus monticola* (Bancroft) were represented by only a single juvenile stage. More fishes were collected under large objects than under small objects. The total number of individuals present near moored objects after 5 days did not differ from the numbers present after 20 or more days. The coloration of fishes was related to their association behavior. Silvery colored fishes did not remain as close to the object as did the more darkly colored species. Most adult fishes, which did not remain as near the object as did juveniles, appeared beneath an object only intermittently. *Canthidermis maculatus*, however, maintained close contact with drifting objects both as adults and juveniles.

Observations of the behavior of species are discussed in relation to the mechanisms for the association of fish with flotsam that have been postulated by other authors. None of their hypotheses was supported by our data. Additional mechanisms were postulated.

The association of fishes with floating objects has been exploited by a number of fisheries. Japanese pole-and-line fisheries and American purse seine and live-bait fisheries take advantage of the association of yellowfin tuna, *Thunnus albacares* (Bonnatere), and oceanic skipjack, *Katsuwonus pelamis* (Linnaeus), with algae, logs, and other flotsam (Uda, 1933; McNeely, 1961). Uda and Tsukushi (1934), and Yabe and Mori (1950) reported that log-associated schools of tuna provide a consistently higher yield per unit fishing effort than unassociated schools.

Moored rafts of bamboo or palm fronds are used to attract dolphin-fish, *Coryphaena hippurus* (Linnaeus), in seine fisheries of Japan (Kojima, 1955,

1956, 1960a, 1960b, and 1961). Moored cork-slabs serve the same purpose for Maltese fishermen (Galea, 1961). Two types of palm-rafts are used by Indonesian fishermen to attract various clupeids, scombrids, *Decapterus* spp., and other carangids (Hardenberg, 1950; Soemarto, 1960). In addition to these commercially important species, many others of lesser or no commercial value are also encountered (Murray and Hjort (1912), Yabe and Mori (1950), Uchida and Shojima (1958), Besednov (1960), Kojima (1960a), Mansueti (1963), and Gooding and Magnuson<sup>1</sup>).

<sup>1</sup>Reginald M. Gooding and John J. Magnuson—Observations on the ecology and behavior of fishes around a drifting raft near Hawaii during the first 48 hours adrift. Manuscript, Bureau of Commercial Fisheries Biological Laboratory, Honolulu, Hawaii.

Note: Approved for publication March 8, 1966.

Gooding and Magnuson reviewed the hypotheses that have been advanced to explain this habit: (1) attraction by food (smaller fish, algae, decaying palm fronds, and plankton made more visible by the shade of the object); (2) negative phototaxis in response to the shadow cast by the object; (3) shelter from predators; and (4) use of the object as a spawning substrate. They also suggested an additional hypothesis that floating objects are cleaning stations where pelagic fishes go to have their parasites removed by other fish.

This paper provides information on the ecology and behavior of fishes associated with floating objects in the offshore waters of Central America. Special attention is given to the frequency, abundance, and size of the species which compose flotsam-associated aggregations and how these characteristics are related to the location and size of the object. These studies are the framework upon which future behavior investigations will be based. The aim of our program is to determine whether a device can be designed that will be maximally efficient in aggregating tuna and skipjack. The potential value to the tuna fishery of establishing such devices has been discussed by Alverson and Wilimovsky (1963).

#### PROCEDURES

Nearly all of our studies were in the offshore waters of Costa Rica (fig. 1) because yellowfin tuna and skipjack are often associated with the flotsam in this region (logbook records obtained through the courtesy of the Inter-American Tropical Tuna Commission). Several collections were near the coast of southern Mexico and 1 near Cocos Island. Samples were collected by encircling flotsam and its associated fauna with a small  $\frac{1}{16}$ -inch (11 mm.) stretch-mesh purse seine, 12 feet deep (3.7 m.) and 110 feet (33.5 m.) long (Aasted, MS.)<sup>2</sup>. An average of 66 percent of the fishes observed beneath an object were captured in the seine. Fish larger than 100 mm. standard length may have escaped the net, and fish smaller than 15 mm. occasionally swam through the webbing. When the net was set, fish tended to stay near the flotsam or even swim upward. Thus, fish swimming at a depth greater than the maximum depth of the seine also may have been caught. Sampling errors due to fish escaping from or entering the seined cylinder of water were probably small.

<sup>2</sup> Donald C. Aasted, A miniature purse seine for capturing small pelagic fishes. Manuscript, Bureau of Commercial Fisheries Tuna Resources Laboratory, La Jolla, Calif.

Twenty-three purse seine collections of fishes were made during April, May, and June, 1963, and 47 during October. Of these samples, 62 were of fishes associated with naturally occurring flotsam, and 8 were of fishes collected beneath moored logs, buoys, and other objects.

After a collection was made, the success of the set was estimated, the object was described and measured, and motile and attached organisms were preserved. In the October studies, to determine the rate and direction of movement of drifting materials, all objects were tagged and marked with a small flag prior to release. Underwater observations and cinematic photographs were used to describe the behavior and estimate the abundance of fishes.

#### CHARACTERISTICS AND DISTRIBUTION OF FLOTSAM

Far more drifting materials were in the study area in October than in the spring. The Gulf of Nicoya was littered with floating logs and other plant debris. The greater abundance of flotsam in October was not surprising because rainfalls are usually heaviest during this period (Peterson, 1960).

Fish were not seen beneath the flotsam in the Gulf and were only rarely associated with inshore logs between Cape Blanco and Piedra Blanca (fig. 1). Northwest of this area, however, nearly every drifting object encountered had its own associated fish population. Most often these objects were aggregated in areas of current convergence.

During April, May, and June, currents in the area usually set northwest at an estimated 2 knots; currents also set northwest during October but were not as strong. Three logs tagged in October and later recovered had drifted northwest at 0.28, 0.45, and 0.33 knot.

Only one of the drifting objects sampled had attached invertebrates—goose barnacles, *Conchoderma virgatum* (Spengler). This species and other goose barnacles of the genus *Lepas* were found in quantity on moored objects after 14 or more days.

Adult and megalops grapsoid crabs of the genus *Plagusia* were numerous on nearly all logs. Individuals in the megalops stage frequently were swimming near drifting objects.

#### SEASONAL VARIATION IN OCCURRENCE OF FISH

Over 12,000 fishes were captured beneath floating objects in this study; 12 families and 32 species were



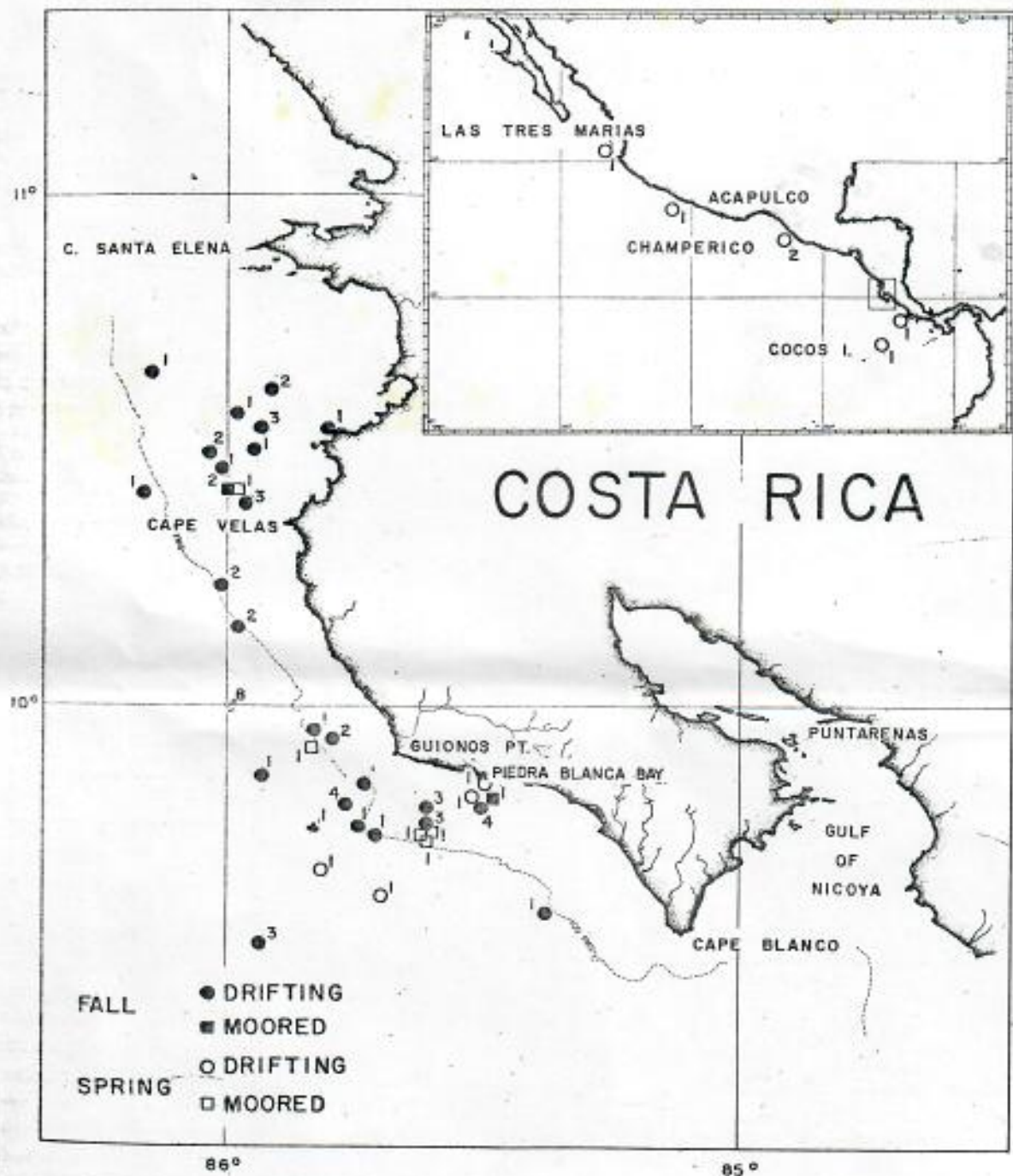


FIGURE 1.—Positions of collections made of fishes beneath flotsam in April, May, and June 1963 (spring) and October 1963 (fall). Numerals indicate number of collections made in each locality. Inset at top shows location of study area and position of the six collections made outside this area.

represented. The scientific name, family, and season of occurrence of these species are presented in table 1. Abbreviated names are used in the text and subsequent tables.

There was little seasonal variation in the occurrence of species. Twenty-four of the total of 32 species were captured or observed during both spring and fall. The seasonal occurrence of adult

TABLE 1.—Length, life stage, and seasonal occurrence of species collected beneath flotsam in the offshore waters of Central America<sup>1</sup> in 1963

Species	Life stage		Total captured	Range of standard length	Season	
	Adult	Juvenile			Spring	Fall
<b>Lobotidae (triplatalis)</b>			<b>Number</b>	<b>Mm.</b>		
<i>Lobotes pooleus</i> Gilbert	-	x	3	73-248	-	x
<b>Carangidae (jacks and snads)</b>						
<i>Caranx caballus</i> Günther	x <sup>2</sup>	x	6,215	9-212	x	x
<i>Caranx hippos</i> (Linnaeus)	-	x	105	16-85	x	x
<i>Caranx marulius</i> (Gill)	-	x	44	17-101	x	x
<i>Decapterus</i> sp. <sup>3</sup>	-	x	293	17-100	x	x
<i>Elogatis bipinnulatus</i> (Quoy and Gaimard)	-	x	218	11-283	x	x
<i>Neseretes doerzi</i> (Linnaeus)	-	x	43	29-143	x	x
<i>Selar crumenophthalmus</i> (Bloch)	x <sup>2</sup>	x	1,368	15-108	x	x
<i>Seriola coburni</i> (Evermann and Clark)	-	x	5	103-154	x	-
<i>Seriola</i> sp. <sup>3</sup>	-	x	315	10-153	x	x
<b>Coryphaenidae (dolphins)</b>						
<i>Coryphaena equuleus</i> Linnaeus	-	x	5	35-68	x	-
<i>Coryphaena hippurus</i> Linnaeus	x <sup>2</sup>	x	2	34-42	x	x
<b>Mullidae (mulletfishes)</b>						
<i>Pseudomugil grandisquamis</i> (Gill)	-	x	329	26-54	x	x
<b>Kyphosidae (sea chubs)</b>						
<i>Kyphosus apuleius</i> (Gill)	-	x	5	63-137	x	x
<i>Kyphosus elegans</i> (Peters)	-	x	22	32-105	x	x
<i>Kyphosus</i> sp. <sup>3</sup>	-	x	2	18-59	x	x
<i>Sectator ocyurus</i> (Jordan and Gilbert)	x <sup>4</sup>	x	248	17-253	x	x
<b>Pomacentridae (damselfishes)</b>						
<i>Abudefduf saratilis</i> (Linnaeus)	-	x	437	8-46	x	x
<i>Chromis striatata</i> Gill	-	x	1,419	21-32	x	x
<b>Scombridae (mackerels and tunas)</b>						
<i>Auxis thazard</i> (Lacépède)	-	x	1	48	x	-
<i>Euthynnus lineatus</i> Richardson	x <sup>4</sup>	x	7	37-477 <sup>5</sup>	x	x
<i>Katsuwonus pelamis</i> (Linnaeus)	x <sup>4</sup>	-	435	230-467 <sup>5</sup>	-	x
<i>Thunnus albacares</i> (Bonmattei)	x <sup>4</sup>	-	149	500-730 <sup>5</sup>	x	-
<b>Blepharidae (combtooth blennies)</b>						
<i>Blepharodes variegatus</i> (Günther)	x	x	39	13-31	x	x
<b>Stromateidae (butterfishes)</b>						
<i>Paraserranus perciformis</i> Meek and Hildebrand	-	x	822	10-133	x	x
<b>Mugilidae (mullets)</b>						
<i>Agonostomus monticola</i> (Bancroft)	-	x	38	11-30	-	x
<i>Mugil curema</i> Valenciennes	-	x	6	18-47	x	x
<b>Polyssemaidae (threadfins)</b>						
<i>Polyssema appenninus</i> (Lay and Bennett)	-	x	30	23-47	x	x
<i>Polydactylus opercularis</i> (Gill)	-	x	1	40	-	x
<b>Monacanthidae (filefishes)</b>						
<i>Aluterus monoceros</i> (Linnaeus)	x <sup>2</sup>	x	1	107	-	x
<i>Aluterus scriptus</i> (Osbeck)	x <sup>2</sup>	x	1	72	-	x
<b>Balistidae (trigprid fishes)</b>						
<i>Balistes polylepis</i> Steindachner	-	x	9	28-184	x	x
<i>Centridus maculatus</i> (Bloch)	x	x	178	20-226	x	x

<sup>1</sup> Specimens cataloged in Marine Vertebrates collection, Scripps Institution of Oceanography.

<sup>2</sup> Adults observed but not captured.

<sup>3</sup> Specific name unknown.

<sup>4</sup> Adults collected by method other than small purse seine.

<sup>5</sup> Fork length.

scombrids can be ascribed to variation in collection methods rather than to seasonal differences. Adult frigate mackerel, *Auxis thazard*, black skipjack, *Euthynnus lineatus*, oceanic skipjack, and yellowfin tuna were present during both seasons, and all are known to associate with flotsam.

The mountain mullet, *Agonostomus monticola*, was not in the spring collections but occurred in 10 of the 47 fall collections. This species inhabits marine waters only as a prejuvenile (Ebeling, 1961). Thus its occurrence in only the fall collections could be due to a seasonal difference in reproductive activities.

The remainder of the species that were taken during only 1 season were relatively uncommon in the collections. Their absence during 1 season could be due to chance alone.

### LIFE STAGE OF FISHES ASSOCIATED WITH FLOTSAM

Nearly all of the fishes observed and captured beneath drifting objects were juveniles; however, adult sharks, *Carcharhinus limbatus* (Müller and Henle) and *Carcharhinus azureus* (Gilbert and Starks), and schools of adult *Caranx caballus*, *Selar crumenophthalmus*, *Coryphaena hippurus*, *Sectator ocyurus*, and *Euthynnus lineatus* were observed. With the exception of *S. ocyurus*, these adults did not swim as close to the object as did the smaller fishes, and they remained near it only for short periods. None of these adults were captured by the small purse seine. Some were captured, however, by other methods. Owing to the infrequent capture of these adults and to the difficulty of ascertaining whether or not they were in fact associated with a particular object, our presentation is limited to the fishes captured by the small seine. *Canthidermis maculatus* was the only species that frequently occurred both as adult and juvenile; both stages were captured in the seines.

To determine if the size of the fishes was related to the distance of an object from shore, the shortest distance to the shore from the location of each collection was measured to the nearest nautical mile. The length measurements of species from different collections captured at the same distance from shore were combined, and a mean and range were established (figs. 2, 3, and 4).

The mean and minimum length of *Abudefduf saratilis* and *Seriola* sp. increased with the distance of an object from shore (chi-square test for two independent samples,  $p < .01$ )—figs. 2 and 3. The

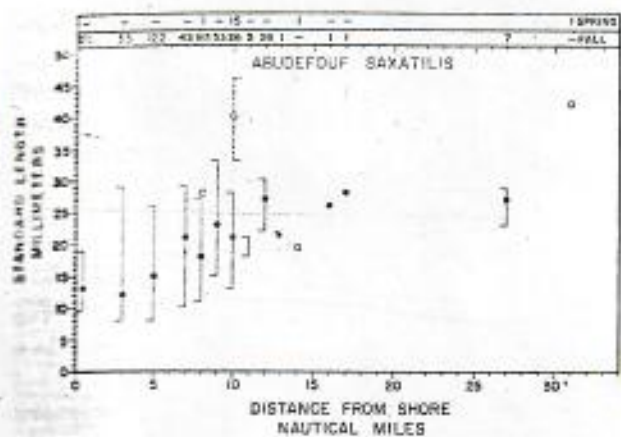


FIGURE 2.—Range and mean standard length of *Abudefduf saxatilis* collected beneath flotsam in the offshore waters of Central America at various distances from shore. Broken lines indicate range for spring collection, solid lines, range for fall collections. Open circles indicate mean for spring, filled circles, mean for fall; circles without bars indicate single fish. Upper numerals are total number of *Abudefduf* captured in spring of 1963, lower numerals, fall 1963.

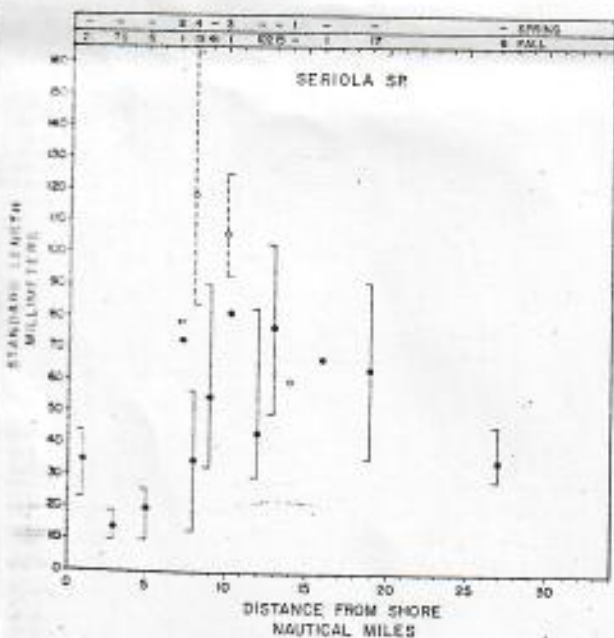


FIGURE 3.—Range and mean standard length of *Seriola* sp. collected beneath flotsam in the offshore waters of Central America at various distances from shore. Broken lines indicate range for spring collections, solid lines range for fall collections. Open circles indicate mean for spring, filled circles, mean for fall; circles without bars indicate single fish. Upper numerals are total number of *Seriola* sp. captured in spring of 1963, lower numerals, fall of 1963.

maximum size of these two species did not show this change. The mean length of *Selar crumenophthalmus* also increased with distance, but this change was not as marked as in the other two species (fig. 4).

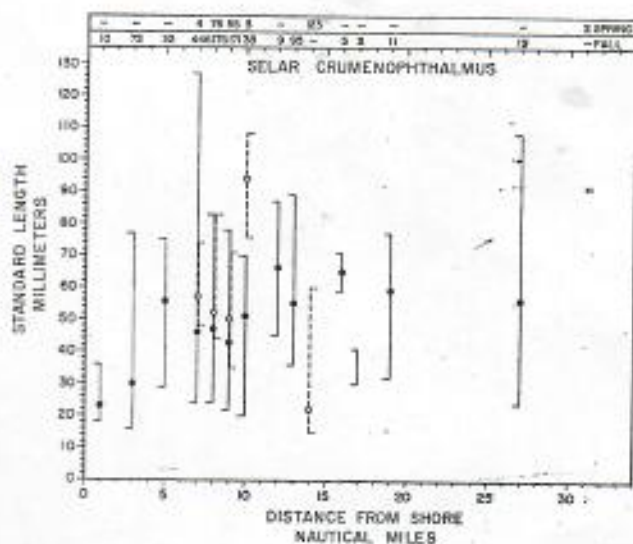


FIGURE 4.—Range and mean standard length of *Selar crumenophthalmus* collected beneath flotsam in the offshore waters of Central America at various distances from shore. Broken lines indicate range for spring collections, solid lines, range for fall collections. Open circles indicate mean for spring, filled circles, mean for fall. Upper numerals are total number of *Selar* captured in spring of 1963, lower numerals, fall of 1963.

*Abudefduf saxatilis* spawns inshore on rocks or reefs, and the males defend the clutch of eggs (R. Rosenblatt, personal communication); thus, larvae and juveniles of this species may be more abundant inshore. It seems possible that individuals captured offshore were originally recruited to the object inshore and accompanied it as it drifted away from land. The larger size of the offshore specimens could be attributed to growth while the fish were associated with the object.

In the remainder of the fishes no obvious relation was evident between the distance from shore and the minimum or mean length; however, the ranges of sizes at which these fishes were associated with flotsam differed widely. Some species were represented by almost a complete series of juvenile stages. *Caranx caballus* and *Psenes pacificus* are good examples of this group (fig. 5). Less abundant species in this group were *Elagatis bipinnulatus*, *Kyphosus elegans*, *Sectator ocyurus*, and *Canthidermis maculatus*

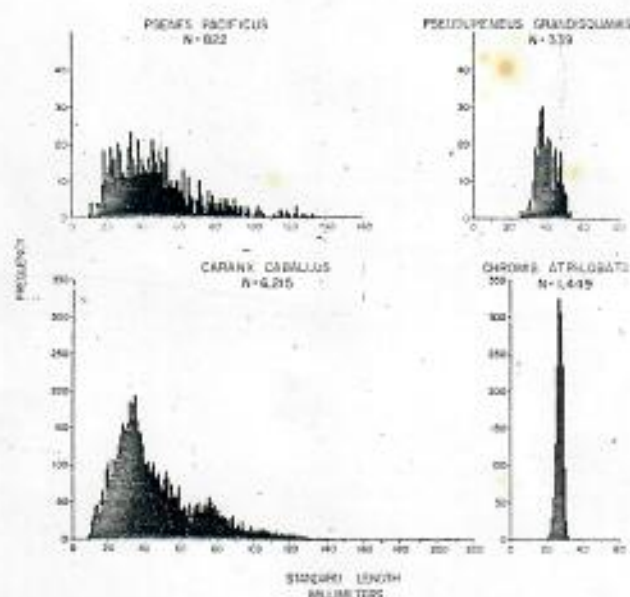


FIGURE 5.—Length frequency for *Psenes pacificus*, *Pseudupeneus grandisquamis*, *Caranx caballus*, and *Chromis atrilobata*. Numbers are totals for combined spring and fall collections.

(table 1). The size range of juveniles of other species was extremely restricted. *Chromis atrilobata* and *Pseudupeneus grandisquamis* had this compact type of size distribution (fig. 5). Other species, not figured, which also had a limited size range included *Agonostomus monticola*, *Polydactylus approximans*, and *Blennioides brevipinnis*. *Pseudupeneus*, *Chromis*, *Agonostomus*, and *Polydactylus* have pelagic juvenile stages but as adults inhabit other areas. The upper size limit of these species in our collections probably was determined by the size at which they end the pelagic phase of their lives.

*Blennioides brevipinnis* is a small species; females 19.5 mm. long can be sexually mature (Krejsa, 1960). Adults and juveniles have been found near drifting logs as well as among rocks and coral heads in inshore areas (Krejsa, 1960). Apparently for both adults and juveniles of this species, drifting objects are a suitable pelagic substitute for inshore habitats.

#### FREQUENCY, ABUNDANCE, AND DOMINANCE OF FISHES COLLECTED BENEATH FLOTSAM

The characters used by Fager and McGowan (1963) for the analysis of zooplankton populations were used to describe the structure of the flotsam-

associated aggregations of fish: (1) frequency—the total number of collections in which a species occurred; (2) abundance—the range and median of the numbers of individuals per collection in which the species was found; and (3) dominance—the number of samples in which a particular species or a group including this species comprised 50 percent or more of the total number of individuals in a given collection. As the structure of the populations in the spring was similar to that in the fall, the two series of collections were combined to calculate these statistics.

Fifteen of the 32 species had frequencies greater than 10. These were ranked from 1 to 15 on the basis of their frequency, median abundance, and dominance. Tied values were given the average of the ranks (table 2 and fig. 6). The remainder of the species was ranked only by frequency (table 3).

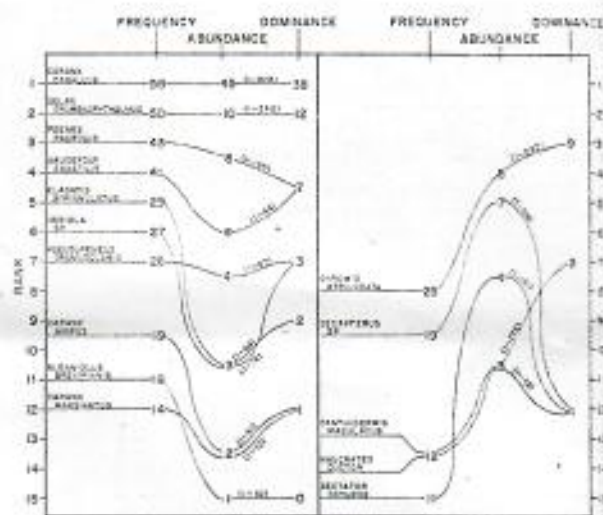


FIGURE 6.—Ecological characters of the 15 species most frequently captured beneath flotsam in the offshore waters of Central America in 1963. Each species was ranked separately by: frequency, the total number of collections in which the species occurred; abundance, median of the numbers of individuals per collection in which the species was found; and dominance, the number of collections in which a species was among those making up 50 percent of the individuals. Lines indicate the rank held by each species in the three rankings. Values upon which ranks were based are shown in each column. In the second column, parentheses enclose the range of the number of individuals per collection of occurrence. For clarity, we separated the 15 species into 2 groups: left half of figure, species whose ranked abundance was the same as or lower than the ranked frequency; and right half, species whose ranked abundance was higher than the ranked frequency. The total number of collections was 70.

TABLE 2.—Ecological characters of the 15 most frequently captured species collected beneath flotsam in the offshore waters of Central America in 1963<sup>1</sup>

Species	Frequency <sup>2</sup>	Rank <sup>2</sup>	Abundance		Rank <sup>3</sup>	Dominance <sup>4</sup>	Rank <sup>4</sup>
			Range <sup>5</sup>	Median <sup>6</sup>			
<i>Caranx colinus</i> .....	58	1	(1-827)	45	1	35	1
<i>Caranx hippos</i> .....	19	9.5	(1-31)	2	13.5	1	12
<i>Caranx marginatus</i> .....	14	12	(1-13)	2	13.5	1	12
<i>Caranx marginatus</i> .....	19	9.5	(1-86)	7	5	1	12
<i>Eleotris sp.</i> .....	20	8	(1-64)	8	10.5	2	9
<i>Eleotris bipinnulata</i> .....	12	15.5	(1-12)	3	10.5	1	12
<i>Eleotris bipinnulata</i> .....	12	15.5	(1-340)	10	2	12	2
<i>Neocates dufur</i> .....	50	2	(1-24)	3	10.5	3	7
<i>Selar crumenophthalmus</i> .....	27	6	(1-57)	4	7.5	1	12
<i>Selar sp.</i> .....	26	7	(1-161)	4	7.5	1	7
<i>Parasiphenus grandisquamis</i> .....	11	15	(1-44)	6	6	1	4.5
<i>Sector ocyurus</i> .....	41	4	(1-262)	8	4	9	15
<i>Abudefduf saxatilis</i> .....	25	8	(1-10)	1	15	0	4.5
<i>Chromis atrilobata</i> .....	18	11	(1-135)	8	3.5	7	7
<i>Blennioides brevipinnis</i> .....	43	3	(1-176)	3	10.5	8	7
<i>Canthidermis maculatus</i> .....	12	13.5					

<sup>1</sup> The total number of collections was 70.

<sup>2</sup> The total number of collections in which the species occurred.

<sup>3</sup> Rank based on figures in adjacent columns.

<sup>4</sup> The number of samples in which a particular species or a group including this species comprised 50 percent or more of the total number of individuals in a given collection.

<sup>5</sup> Range of the numbers of individuals per collection in which species was found.

<sup>6</sup> Median of the numbers of individuals per collection in which species was found.

TABLE 3.—Frequency, abundance, and dominance of species occurring in 10 or fewer collections made in the offshore waters of Central America in 1963. Listed in order of frequency

Species	Frequency	Abundance <sup>1</sup>	Dominance
<i>Apolectonotus maculatus</i> .....	10	1 (1-11)	0
<i>Pseudoclinemus apurimicus</i> .....	9	1 (1-12)	0
<i>Kyphosus oligopus</i> .....	8	1 (1-12)	0
<i>Micropogonias undulatus</i> .....	5	1 (1-3)	0
<i>Isotria medeolae</i> .....	5	1 (1-1)	0
<i>Kyphosus encaustus</i> .....	3	1 (1)	0
<i>Setaria pacifica</i> .....	3	1 (1)	0
<i>Seriola lalandi</i> .....	2	— (2-3)	0
<i>Chromis hippargus</i> .....	2	— (1)	2
<i>Chromis episcopi</i> .....	2	— (2-3)	0
<i>Kyphosus sp.</i> .....	2	— (1)	0
<i>Pseudoclinemus opercularis</i> .....	1	— (1)	0
<i>Acropora thalassia</i> .....	1	— (1)	0
<i>Blennioides brevipinnis</i> .....	1	— (1)	0
<i>Alutera maculata</i> .....	1	— (1)	0
<i>Aridia scripta</i> .....	1	— (1)	0

<sup>1</sup> Figures in parentheses show range in number of individuals per collection of occurrence.

Nine of the 32 species were carangids, and all but 1 of these, *Seriola colburni*, were among the 15 most frequent species. The carangid, *C. caballus* was by far the most frequent, abundant, and dominant species collected. This fish contributed 50 percent or more of the individuals in more than half of the collections. *Selar crumenophthalmus*, also a carangid, ranked second in frequency, abundance, and dominance. No other family was represented as frequently in the collections. The family Kyphosidae was represented by four species but only one, *Sector ocyurus*, occurred in more than 10 collections.

On the basis of their rank by frequency, abundance, and dominance, the 15 most frequent species can be divided into three groups: (1) species that occupied about the same rank in all three categories;

(2) species that were captured frequently but were not abundant in the collections in which they occurred; and (3) species captured less frequently that were abundant in the collections in which they occurred. The three highest ranking species, *C. caballus*, *Selar crumenophthalmus*, and *Psenes pacificus* were in the first group. *Abudefduf saxatilis* and *Blennioides brevipinnis* exemplify the second group, and *Chromis atrilobata* and *Canthidermis maculatus* the third.

The factors responsible for the differences in frequency and abundance of species are unknown. For some species, evidence suggested that schooling was a significant factor. All of the 15 most frequently captured species, except *Abudefduf* and *Blennioides*, schooled either with their own or other species beneath flotsam. *Abudefduf* remained near the object and appeared to defend small territories; *Blennioides* maintained contact with the surface of the object and were not aggregated. Possibly the solitary or individual habits of these species were responsible for their lower abundance. Juvenile *Chromis* school at the stage at which they associate with flotsam. This species was dominant in seven of eight collections made in the same area on the same day. The median number of individuals in these seven collections was 199. *Chromis* was dominant only once in the remainder of the collections, and the median number of fish per collection was two. The irregular abundance of *Chromis* could be ascribed to a tendency toward the recruitment of an entire school.

*Canthidermis maculatus* also was a schooling species and tended to be abundant in the collections in which it occurred. This species did not show the limited temporal and regional abundance described for juvenile *Chromis*, but the distribution of *Canthidermis* appeared to extend farther to-sea than other species. The collection farthest from shore (200 nautical miles) contained 87 *Canthidermis* and 4 *Balistes polylepis*. Only *Canthidermis* was observed beneath other drifting material in the same area. The four *B. polylepis* were located inside the cavity of a large bamboo stem and probably did not represent a usual component of high-seas aggregations. Had we taken more collections from flotsam drifting 100 or more nautical miles from shore we feel the frequencies for *Canthidermis* would have increased proportionately.

*Decapterus* sp. ranked fifth in abundance but only once dominated a collection. This species nearly always schooled with *Selar crumenophthalmus* but was less abundant in the mixed schools. *Decapterus* was captured without *Selar* in only 7 of 19 collections. Thus whenever a large number of *Decapterus* was taken, the number of *Selar* was usually larger. Hence, *Decapterus* rarely dominated a collection.

The use of only the numbers of individuals for the determination of dominance instead of numbers and weights obscured some of the relations among species. Had weights as well as numbers been used, *Canthidermis* and *Psenes* probably would have dominated more collections and *Chromis*, *Pseudupeneus*, and *Abudefduf* fewer. Owing to their large size range and abundance, little difference would be expected in the values for *C. caballus* and *Selar*.

#### OBJECT SIZE

To determine if the length or the number of fishes was related to the size of the object, we recorded for each collection the volume of the object in cubic centimeters, the total number of fishes captured, and the mean length of all fishes in the collection. Of the two variables only the number of individuals in the collection was obviously related to the volume of the object. Collections made beneath large objects tended to be larger than those taken beneath smaller objects (table 4).

Field observations indicated that the frequency of occurrence of larger fishes may be related to the size of the object. The largest object studied, an entire tree, was too large to be encompassed by the purse seine. The tree was 1 m. in diameter at the

root section, had a trunk diameter of 0.3 m. and was over 10 m. long. Associated with the tree was the largest aggregation of adult fishes seen during the study. There were large schools of adult *Sectator ocyurus*, *Canthidermis maculatus*, *Coryphaena hippurus*, and *Euthyanus lineatus* in addition to numerous juvenile fishes. A portion of the school of adult *Sectator* is shown in figure 7A, and in 7B some of the adult *Canthidermis* are shown among the branches of the tree. For comparison, two groups of juvenile fishes that were associated with two smaller objects are pictured in 7C and 7D. Yabe

TABLE 4.—Number of collections made of fishes associated with objects of three size classes and the number of fishes these collections contained

(Collections were made in the offshore waters of Central America in 1963)

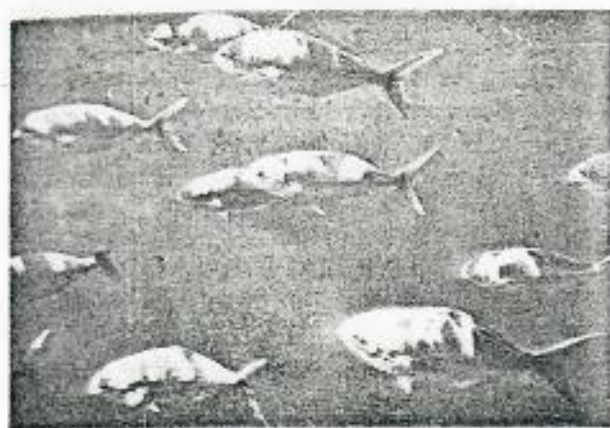
Fish in collection	Collections from objects of different volume (cubic centimeters)			Total
	101-5,000	5,001-100,000	100,001-5,000,000	
Number	Number	Number	Number	Number
1-10...	5	3	0	8
11-100...	2	14	6	22
101-1000...	0	19	19	35
Total...	7	36	25	68

\* Two collections omitted owing to lack of volume measurements.

and Mori (1950) captured, by hook and line, fishes associated with a tree of similar dimensions (1 m. in diameter at the butt and 15 m. long). The lengths of the fish of the species they captured exceeded the lengths of the fish in our purse seine collections by about a factor of 10. In our study, the juvenile fishes that were associated with the tree were of the same species and about the same size as those collected beneath smaller objects. Thus the size of the object appeared to be related to the presence or absence of large or adult fishes rather than differences among juveniles.

#### ARTIFICIAL MOORED OBJECTS

To study the rate of recruitment of fishes to floating materials, eight objects of various types were moored near the Costa Rican coast for periods of 15 hours to 46 days. Six objects were not visited from the time they were moored until the day the collection was made. Two balsa logs were moored in the same locality at the same time and were observed daily until collections were made on the fifth day.



A



B



C



D

FIGURE 7.—Fishes associated with drifting objects in the offshore waters of Central America in 1963. A, a school of adult *Sectator ocyurus* associated with an entire tree; the small fish in background were juvenile *Selar crumenophthalmus*. B, an aggregation of adult *Canthidermis maculatus* in the branches of the same tree; all but three had a dark coloration. C, a group of juvenile *Poeyes pacificus*, *Naucrates ductor*, and other carangids beneath a drifting plank; *Poeyes* are in a dense clump directly below the plank, *Naucrates* can be recognized by the presence of dark vertical bars. D, juvenile *Canthidermis maculatus*, *Naucrates ductor*, and various juvenile carangids beneath a drifting log.

Divers made daily counts of the number of individuals of each species beneath each of the two logs. The volumes of the two balsa logs calculated from their measurements were 0.021 m.<sup>3</sup> (log A) and 0.065 m.<sup>3</sup> (log B).

Counts of the number of individuals beneath logs A and B were 20 and 96 for the second day and 121 and 80 for the third day. By the fourth day it was not possible to make an accurate tabulation because the number of fish under each log was well over 100. On the fifth day 198 individuals were captured under

log A and 349 under log B. Prior to being moored log B was encountered 27 miles from shore and 236 fish representing 8 species were captured at that time. Thus more fish were captured after the log was moored 5 days than were collected when the log was drifting 27 miles from shore. Fewer species were represented, however. The larger number of individuals captured beneath log B may reflect the difference in volume of the logs.

Although logs A and B were moored only 100 m. apart, their associated fish populations differed in

species composition, dominant species, and the time at which each species was first observed. No ordered recruitment of species was evident (table 5).

The number of fish collected beneath inflated truck inner tubes varied greatly (table 6). All the tubes were identical in size and shape with the exception of the tube that had 10 manila lines attached. After periods longer than 5 days the number of fish collected beneath the tubes did not increase substantially with time through 20 or more days. The number of fish appears to increase rapidly during the first few days and thereafter to remain at about the same level.

Because a drifting object passes through inshore spawning areas, juveniles of species that spawn inshore would be expected to be more abundant beneath a drifting object than beneath an object moored offshore. *Abudefduf saxatilis* and perhaps *Seriola* sp. spawned inshore. Both species showed a

TABLE 5.—Species recruited to two balsa logs, A (volume, 0.021 m.<sup>3</sup> and B (volume, 0.065 m.<sup>3</sup>) moored 100 m. apart 7 nautical miles from the Costa Rican coast in 1963

Species	Log A		Log B	
	Day species first observed <sup>1</sup>	Fish captured on fifth day	Day species first observed <sup>1</sup>	Fish captured on fifth day
		Number		Number
<i>Pseudoperca grandisquamis</i>	3	87	2	31
<i>Selar crumenophthalmus</i>	3	79	3	304
<i>Corax ocellatus</i>	2	17	2	129
<i>Chromis atrilobata</i>	3	5	4	6
<i>Elagatis bipinnulatus</i>	5	6	5	2
<i>Paenaeus pacificus</i>	5	1	—	—
<i>Blenioides brevipinnis</i>	2	0	4	2
<i>Corax moripinnis</i>	3	0	3	0
<i>Polyplocatus approximens</i>	—	—	4	0
<i>Asteria</i>	—	—	—	—
Total		198		474

<sup>1</sup> No underwater observations were made on the day the log was moored (Day 1).

TABLE 6.—Number of fish and species recruited to various objects moored near the Costa Rican coast in 1963

Object	Time elapsed after establishment	Fish	Species	Distance from shore	Season
		Number	Number		
Truck inner tube <sup>1</sup>	15 hours	231	6	31	Spring
Balsa log (A)	5 days <sup>2</sup>	198	7	7	Fall
Balsa log (B)	5 days <sup>2</sup>	474	6	7	Do.
Truck inner tube	6 days	263	8	8	Spring
3 feet by 3 feet by 1/4 inch plywood	20 days	2	1	2	Fall
Truck inner tube	20 days	13	4	7	Spring
Truck inner tube	28 days	492	7	8	Do.
Truck inner tube	46 days	118	5	9	Do.

<sup>1</sup> Attached to this inner tube were ten 3/4-inch (19 mm.) manila lines 10 m. long. All tubes had a volume of 0.286 m.<sup>3</sup>

<sup>2</sup> Established at same time at same locality.

high frequency in the fall collections, but neither was found under the two balsa logs moored in the fall. With these two exceptions, no difference existed in the species composition or in the size of the individuals between populations of fishes associated with moored objects and those associated with drifting objects.

## BEHAVIOR

### DISTRIBUTION AND FRIGHT BEHAVIOR

When disturbed, nearly all species swam toward the drifting object and maintained a position much closer to it than when undisturbed. The fishes showed this behavior when a school of porpoise, *Stenella graffmani*, passed a log, when four porpoise, *Tursiops* sp., passed nearby, when a school of black skipjack approached a log, and when a shark, *Carcharhinus azureus*, swam beneath a log. The movements of a diver, skiff, and the research vessel also induced this response. The fishes rapidly habituated to the movement of the outboard skiff; after several passes of the skiff near the same log the fear reaction no longer could be evoked.

Most species showed a marked change in behavior when disturbed. *Abudefduf saxatilis* frequently entered holes or crevasses on the surface of the log. The kyphosids moved in and out of holes and swam back and forth rapidly over the log so close to it that their fins almost touched it. Schools of all species became more compact; sometimes individuals that were a part of a diffuse aggregation of several species separated into monotypic schools. For example, when only a few *Chromis atrilobata* were present under undisturbed conditions they remained with the carangids in a loose aggregation, but when frightened they formed a compact monotypic school.

The fear response produced a marked vertical stratification of species beneath the object. Species distributed at various distances from the log, or members of a common loose aggregation, separated into discrete compact groups. If large numbers of fishes were grouped in this manner the distribution usually resembled a cone, the apex of which was at the underside of the object. The base was usually formed by a large group of juvenile *Selar crumenophthalmus* and *Decapterus* sp. The fish were always in this position when the object was approached by the research vessel or the skiff. It was only after the skiff had been near the log for a half hour or longer that the fish lost these more rigid groupings.



and strayed from their position directly beneath the log.

When the fish were undisturbed, the conical distribution beneath the log was not apparent, owing to movements in the horizontal plane and the breaking up of groups. The mixed school of *C. caballus*, *C. kippos*, *C. marginatus*, *Elagatis bipinnulatus*, and *Pseus pacificus* broke up into smaller units, and these at times moved at least 15 m. away from the object. Juvenile kyphosids swam 1.5 to 3 m. away from the object but did not range as far as the juvenile carangids. Adult *Canthidermis maculatus* frequently swam beyond the limit of visibility—15 m.—and returned to the object. *Abudefduf saxatilis* and *Blenniulus brevipinnis*, on the other hand, always remained near the object.

The relative vertical position of species usually was maintained under both disturbed and undisturbed conditions. Those species that increased their horizontal range when undisturbed also increased, to a lesser extent, their vertical range of movements. The juvenile kyphosids swam as deep as 1.5 m. below the object; *Pseudupeneus*, *Decapterus*, and *Selar* were observed at a depth of 12 m. (limit of visibility from the surface). Adult *Canthidermis* was the only species whose relative vertical position changed markedly. Under disturbed conditions this species was often among those occupying a position close to the object, but after the disturbance had ceased they ranged from the surface to depths over

12 m. Juvenile *Canthidermis*, on the other hand, occupied the same relative vertical position under disturbed and undisturbed conditions.

Commonly the responses of juvenile fish to a drifting object differed from those of the adult. Adults swam deeper, ranged farther, and appeared beneath the object less frequently than did juveniles. With the exception of adult *Sectator* and *Canthidermis*, they did not always respond to movements of the skiff by moving toward the object as did all the juvenile fishes. It was not possible, therefore, to be certain that adult *Euthynnus lineatus*, *Coryphaena hippurus*, *Caranx caballus*, or *Selar crumenophthalmus* were truly associated with a particular object.

#### POSITION RELATIVE TO OBJECT AND LATERAL BODY COLORATION

The lateral coloration of the fishes and their position relative to the object were correlated. The species that remained closest to the log were darker than were those that maintained greater distances from the object or associated with the object only intermittently (table 7). For example, *Abudefduf saxatilis*, *Pseus pacificus*, all species of *Caranx*, the kyphosids, *Blenniulus brevipinnis*, and *Lobotes pacificus*, were yellow, brown, or black and remained near the log. On the other hand, *Chromis atrilobata*, brownish above, silvery below, occupied a deeper position, and *Selar crumenophthalmus* and *Decapterus* sp., which were silvery, regularly occupied the

TABLE 7.—Lateral coloration (live), estimated vertical distribution and aggregation type of certain species associated with flotsam in the offshore waters of Central America in 1963

Fishes <sup>1</sup>	Lateral coloration (live)	Estimated vertical distance from object <sup>2</sup>	Grouping
<b>Juvenile:</b>			
<i>Blenniulus brevipinnis</i>	Dark brown with black bars	0	Individual
<i>Abudefduf saxatilis</i>	Yellow with dusky bands	0-3	Pure school
<i>Canthidermis maculatus</i>	Blue with white spots to black	3	
<i>Polystichus approximatus</i>	Silvery below, blue above	3	
<i>Kyphosus crotalus</i>	Black with pale purple stripes and spots	0-15	Individual
<i>Kyphosus crotalus</i>	Black with pale purple stripes and spots		
<i>Sectator septatus</i>	Yellow with brown stripes below, dark olive green above	15-150	Mixed school
<i>Caranx caballus</i>	Yellow below, olive above		
<i>Caranx kippos</i>	Yellow with dark dusky bands		
<i>Caranx marginatus</i>	Yellow with dark dusky bands		
<i>Elagatis bipinnulatus</i>	Yellow with two blue stripes below, dark bluegreen above		
<i>Seriola</i> sp.	Yellow with black bands below, dark olive above		
<i>Pseus pacificus</i>	Yellow with brown stripes below, olive above		
<i>Chromis atrilobata</i>	Silvery below, pale brown above	150-200	Pure school
<i>Decapterus</i> sp.	Silvery below, blue above	150-600	Mixed school
<i>Selar crumenophthalmus</i>	Silvery below, blue above		
<i>Pseudupeneus pseudopneustes</i>	Silvery below, blue above	600-1200	Pure school
<b>Adult:</b>			
<i>Canthidermis maculatus</i>	Blue with white spots to black		
<i>Caranx caballus</i>	Silvery below, blue above		

<sup>1</sup> Only those species are included for which we have sufficient notes on vertical distribution.

<sup>2</sup> Estimate made under disturbed conditions.

<sup>3</sup> Did not school beneath log but to one side near the surface.

deepest position of all the permanently associated fishes. This relationship suggests a protective advantage afforded by the log other than the physical obstruction of predators. The dark brown, yellow, and black of the closely associated species was well adapted to the colors of the most commonly occurring flotsam. Thus, when associated with flotsam, the more darkly colored species were probably less conspicuous to predators than when isolated. From examination of fishes associated with flotsam in the Atlantic, Murray and Hjort (1912) made similar speculations. They also suggested that *Naucrates ductor*, blue with darker transverse bars, might occupy an intermediate position between the organisms strongly associated with flotsam and those which merely live near drifting objects.

Although both *Canthidermis maculatus* and *Polydactylus approximans* had a pelagic coloration, they were frequently near the object when frightened. The fright reaction of *Polydactylus* differed from that of other species. These fish formed a compact rapidly moving school a few centimeters below the water surface. The school moved about near the object but never below it. Adult *Canthidermis* when undisturbed swam deeper and ranged farther from the object than all the yellow, brown, and black species. When frightened they moved to 0 to 3 m. below the object. Thus, this species occupied a position in keeping with its pelagic coloration only under undisturbed conditions. *Canthidermis* has the ability to turn from the normal pelagic coloration, blue with white spots, to black. Juveniles and adults had intermediate color phases as well as pelagic and dark phases.

Within the same species, coloration appeared to reflect differences in the behavior of association. The silvery adult *C. caballus* did not maintain close contact with an object and appeared beneath it only intermittently. The yellowish juvenile *C. caballus*, on the other hand, maintained close contact with the object. Gooding and Magnuson (see footnote 1) reported that when *Psenes pacificus* was associated with their raft it was yellow, but unassociated individuals were silvery.

#### FEEDING BEHAVIOR

Adult *Canthidermis*, *Alutera*, and juvenile *Elagatis* frequently were seen feeding on colonial salps. Once we saw three *Canthidermis* nipping the base of the neck and legs of a green turtle. On no other occasion did we see this species engaged in activities that

could be interpreted as parasite cleaning. Occasionally juvenile kyphosids were observed snapping at the surface of a log or branch. Juvenile *Abudefduf* showed this behavior more frequently.

Adult *Coryphaena hippurus* frequently pursued smaller fishes located beneath flotsam. We did not see them capture fish, but the stomach of an adult *Coryphaena* taken by hook and line contained a *Caranx caballus*. Frequently fishes with lateral lesions were seen beneath logs. These included *Caranx caballus*, *Canthidermis maculatus*, and *Elagatis bipinnulatus*.

Two schools of skipjack, and one of yellowfin tuna were associated with logs in the study area and were seined by American tuna fishermen. When the boats reached port, stomach contents of fish from each school were examined and the lengths of the fish determined. Euphausiids and myctophids were the dominant food organisms in the stomachs of skipjack, and the portunid crab, *Portunus affinis*, in the stomachs of yellowfin tuna. Only seven stomachs contained fishes—carangids and scombrids—that may have been associated with flotsam (table 8). Stomachs from each of the three schools contained debris of the kind usually found near drifting logs (pieces of wood, thorns, and bird feathers).

TABLE 8.—Occurrence of flotsam-associated fishes in the stomachs of two schools of oceanic skipjack, and one school of yellowfin tuna associated with flotsam in offshore waters of Central America in 1963

Stomach contents	Skipjack seined October 3, 1963 (222-48) <sup>1</sup>		Skipjack seined October 6, 1963 (213-61) <sup>1</sup>		Yellowfin tuna seined July 18-22, 1960 (149-107) <sup>1</sup>	
	Number	Volume ML.	Number	Volume ML.	Number	Volume ML.
Fish						
Flotsam-associated species.....	0	0	1	77.0	6	573.0
Unassociated species.....	10	285.1	34	1448.5	7	206.0
Unidentified remains.....	3	0.3	0	0	44	790.0
Invertebrates.....	31	212.8	26	25.0	73	1379.0
Bird feathers and plant debris.....	5	—	2	—	3	—

<sup>1</sup> At left, number examined; at right, number with food.

#### COURTSHIP BEHAVIOR

No eggs of any kind were found attached to the flotsam. Some species observed near drifting objects were, however, in reproductive condition. Three ripe male black skipjack were captured from a school near a large drifting tree. Underwater observations of these fish revealed a high frequency of wobbling and chasing. This behavior was similar

to that described by Magnuson and Prescott<sup>3</sup> for the reproductive behavior of Pacific bonito, *Sarda chilensis* (Cuvier).

Nearly all the adult male and female *Canthidermis maculatus* captured in the fall were ripe. On one occasion these fish showed what may have been courtship behavior, but no spawning was observed.

#### TRANSFER OF FISHES TO OTHER OBJECTS AND HOMING

Some species were attracted to the skiff when it drifted alongside a floating object. Only the fishes that occupied upper positions in the aggregation, such as juvenile *Caranx caballus*, *Psenes pacificus*, *Elapatis bipinnulatus*, *Kyphosus elegans*, and *Sectator ocyurus*, showed this behavior. The more deeply positioned species, *Selar crumenophthalmus*, *Decapterus* sp., *Pseudupeneus grandisquamis*, and *Chromis atrilobata* did not transfer to the skiff. Those species most closely associated with the surface of the object, *Abudefduf saratilis* and *Blenniobius brevipinnis*, did not transfer unless the original object was removed from the water. Transfers to the skiff were only temporary. The fishes swam beneath the skiff, remained there a few minutes, and then returned to the original object. Movements back and forth from the object to the skiff lasted no longer than 30 minutes; thereafter, the fish remained beneath the original object.

Two attempts were made to transfer the fish population of a log to a 4- by 8-foot (122 cm. by 243 cm.), 1/4-inch (6 mm.) thick plywood sheet. A log with a fish population was attached to the plywood sheet 24 hours; then the two objects were separated. During daylight, underwater observations were made while the two objects were attached and after they were parted. At no time did the fishes congregate beneath the plywood sheet. They remained beneath the original object during the 24 hours the objects were attached and after they were separated. The experiment was repeated; this time, 60-cm. sections of unraveled 1/2-inch (13 mm.) manila line were attached at 10-cm. intervals in three rows to the underside of the plywood. The rope produced a dense mass of filaments. After 2 1/2 hours none of the fishes had transferred from the original log to the plywood, but 1 hour after the plywood was

freed from the original object, over 100 *C. caballus* had been recruited to the plywood.

The failure of fishes to form a permanent association with new objects, a skiff or plywood sheet, when already associated with another object suggests that a more familiar object may have a higher valence.

Ten adult *Canthidermis maculatus* were captured, tagged, and released separately; four were released 7.5 m. from their original log, four at 15 m. and two at 30.5 m. One hour and 30 minutes later, three of those released at 7.5 m. and three released at 15 m. had returned. Neither of the fish released at 30.5 m. returned. Conceivably the fish planted at the greatest distance could not see the log. The recapture of fish planted at lesser distances suggested that they may return to their log when it is within visual range.

#### RUBBING BEHAVIOR

Adults of *Coryphaena hippurus*, *Canthidermis maculatus*, and *Sectator ocyurus* frequently rubbed their dorsal surface or sides against the logs and the skiff. An entire school of adult *Sectator* showed this behavior.

#### SEA SNAKES

We frequently observed the sea snake, *Pelamis platurus*, swimming near the surface. Often a small school of fish of the genus *Polydactylus* was below a snake. On three occasions the snake was feeding. It began to swim backwards; the schooled fish reversed direction and began swimming with their heads oriented toward the tail of the snake. The snake then captured fish from the school by a rapid thrust of the head and anterior portion of the body, directed either to the side and posteriorly or downward and posteriorly.

Klauber (1935) also observed *P. platurus* feed on fish schooled beneath it.

Klawe (1964) examined the stomachs of 56 *P. platurus* from the eastern tropical Pacific. In the 22 which contained food, *Polydactylus approximans* was the most abundant food, *Pseudupeneus grandisquamis* was second, and Mugilidae third. One individual each of *Selar crumenophthalmus*, *Caranx hippos*, and *Fistularia corneta* also were found. Except for *F. corneta* we captured all of these species beneath flotsam, and there was no difference in size between the fishes we collected and those in the stomachs of sea snakes. Apparently *P. platurus* takes advantage of the habit of some species to congregate beneath flotsam.

<sup>3</sup> John J. Magnuson and John H. Prescott—Courtship, locomotion, feeding, and miscellaneous behavior of Pacific bonito (*Sarda chilensis*). Manuscript, Bureau of Commercial Fisheries Biological Laboratory, Honolulu, Hawaii.

## ECOLOGICAL INTERPRETATION

Fishes were recruited rapidly to moored objects. The number beneath objects moored 5 days and the number beneath those moored 20 or more days did not differ. Goose barnacles were attached to all four objects moored 14 days or longer, but they were found on only one drifting object. Thus, all but one of the drifting objects probably had been at sea not longer than 14 days. Rapid recruitment appears to be characteristic of the formation of flotsam-associated fish aggregations. Hardenberg (1950) reported that Indonesian fishermen harvest the fishes beneath their palm frond rafts at intervals of several days. Gooding and Magnuson (see footnote 1) stated that fishes were recruited to their raft minutes after it was set adrift.

Recruitment of fishes followed no particular sequence. Small collections containing only a few fish were not necessarily all of one species. The species composition and order of recruitment of fishes to two balsa logs moored 100 m. apart were dissimilar.

The same species dominated our collections in both fall and spring. Similarities were marked between the families and genera represented in our study area and those reported from other areas (Uchida and Shojima, 1958; Besednov, 1960; Kojima, 1960a; Mansueti, 1963). Juvenile carangids were by far the most important family in terms of abundance, number of species, and dominance. They were also by far the most frequently reported flotsam associate from other areas. Other families of fishes commonly encountered in this study and frequently reported by other authors included the Scombridae, Balistidae, Kyphosidae, and Stromateidae.

The presence of attached invertebrates on floating objects appeared not to influence the occurrence of fish species. The only drifting object that had goose barnacles attached did not have a species composition different from that of objects without the barnacles. Although barnacles were present on each of four objects moored 14 or more days, the species composition of the aggregations of fish did not differ from those of objects moored much shorter periods.

Many of the flotsam-associated fishes were schooling species. We believe that the habit of schooling and of association with drifting materials may be related. Two scombrids, *Katsuwonus pelamis* and *Thunnus albacares*, not only associate with inert materials but also with large sharks and whales, and

*T. albacares* is a common associate of porpoise schools (Uda and Tsukushi, 1934; and unpublished logbook records of the Inter-American Tropical Tuna Commission). The carangid, *Naucrutes ductor*, known for its association with sharks (Dales, 1957), also was found beneath flotsam in this and in other studies (Murray and Hjort, 1912; Galea, 1961). Many fishes school at times with fish other than their own species. *Katsuwonus pelamis* and *Thunnus albacares* school together (Orange, Schaefer, and Larmie, 1957), and juvenile *Selar crumenophthalmus* and *Decapterus* sp. were observed schooling together in this study. *Trachurus symmetricus* (Ayres), a carangid associate of flotsam in southern California waters, schools with *Scomber japonicus* Houttuyn and *Sardinops sagax* (Jenyns)<sup>4</sup> and associates with jellyfish (Limbaugh, 1955). The tendencies of fishes to associate with living animals other than their own species and to associate with inert drifting materials may be related. Atz (1953) suggested, among other possibilities that an aggregating companion for a schooling fish could represent merely "a simple point of reference for optical fixation". Flotsam could function in this capacity for schooling fishes.

A schooling mechanism cannot explain the presence of all the associated species. Some fishes did not school, and for others alternative mechanisms are equally plausible. Mechanisms postulated by other authors were: attraction to food, negative phototactic response to the shadow of the object, shelter from predators, presence of spawning substrate, and parasite-cleaning symbiosis.

Owing to the infrequent occurrence of flotsam-associated fishes in the stomachs of predators the food hypothesis probably can be eliminated for predacious adults.

For juveniles and nonpiscivorous adult fishes the food hypothesis would not apply, as the drifting materials were usually devoid of attached invertebrates and algae that would provide food. That fishes were attracted because plankton was more visible in the shadow cast by the object also seems unlikely, because the fishes did not remain in the shadow. Furthermore, plywood sheets that cast large shadows were less effective in attracting fish than were objects that produced smaller shadows.

That all the juvenile fishes and adult *Canthidermis maculatus* and *Sectator ocyurus* swam toward and beneath the object when predators appeared, sug-

<sup>4</sup> Unpublished data, Bureau of Commercial Fisheries, La Jolla, California.

gests the association has a selective advantage. This behavior was not, however, a mechanism for the association, because fishes remained near the object in the absence of predators.

Use of the object as a spawning substrate would apply only to adult fishes. Adults, however, represented only a small portion of the total individuals present. Adults of two species, *Euthynnus lineatus* and *Canthidermis maculatus*, were in reproductive condition. *Euthynnus* does not have attached eggs, however (Calkins and Klawe, 1963), and no eggs were found on any of the floating materials.

The cleaning-station hypothesis suggested by Gooding and Magnuson (see footnote 1) could apply only to some of the fishes. *Canthidermis maculatus* alone showed behavior that could possibly be interpreted as cleaning. This species was taken in only 14 of the 70 collections. Except in the collection made farthest from shore, where *Canthidermis* and *Balistes polylepis* were the only species present, no differences in the species composition were evident in the collections that contained *Canthidermis*. Thus, if *Canthidermis* regularly consumes parasites of other fishes the activity does not appear to influence the presence of these fishes.

Artificial reefs established in sandy locations rapidly attract groups of fishes that would not otherwise inhabit these areas (Carlisle et al., 1964). The artificial reef provides the habitat requirements for certain fishes in an otherwise unsuitable area. Similarly, a drifting object may provide a suitable habitat for inshore fishes that have pelagic juvenile stages or that have become displaced from shore. This explanation seems to be plausible for the presence of *Abudefduf saxatilis*, *Blenniulus brevipinnis*, *Balistes polylepis*, and other species. The very restricted size range of *Chromis atrilobata* and *Pseudupeneus grandisquamis* suggests that these species are available for association during a limited period. Many of the *Pseudupeneus* were near the size at which metamorphosis takes place. Approaching metamorphosis was indicated by the slight color changes in some of the individuals and by pronounced changes in coloration after the fish were kept in a shipboard aquarium 34 hours. Possibly large premetamorphic juveniles may be attracted to objects because of changes associated with metamorphosis; for these fish the object may represent an inshore or non-pelagic habitat.

In summary, we found little evidence to support the mechanisms postulated by other authors. We

have suggested two mechanisms: (1) fishes are attracted to drifting materials because the object functions as a schooling companion, and (2) for species not adapted to a pelagic life and others undergoing a change from a pelagic to other modes of existence, drifting materials may function as a substitute for a reef or other substrate. In both situations the object may have the same function, that is, provide a visual stimulus in an optical void.

The occurrence of juvenile fishes beneath flotsam was much more frequent than that of adults. That some species, as *Chromis atrilobata*, *Pseudupeneus grandisquamis*, and *Agonostomus monticola*, are pelagic only as juveniles can explain the absence of the adults. Of the species that are pelagic as juveniles and adults, the juveniles were in the vicinity of an object for longer periods and remained closer to the object than did the adults. Owing to their larger size and faster swimming speed, adults are probably less susceptible to predation. Thus, for adult fishes the selective advantage of maintaining a close association with a drifting object may be small. It is also possible that development is accompanied by an increase in the specificity of the responses of schooling fishes to other schooling companions. The valence of flotsam as a schooling object would then be lowered and intermittent association with drifting objects might be expected.

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