

Explore

Blue Ocean Writings

Diary

Carl Safina's voyages around the world have brought him face-to-face with giant, car-sized Leatherback turtles, hundreds of thousands of nesting albatrosses, and pods of dolphins facing death from tuna fishing. Scroll below to read some of his diary entries:

Log from Eastern Tropical Pacific, October 2006 - Hi there...I'm on a 3-week trip into the Eastern Tropical Pacific region. Because email from the ship works reasonably well most days, I'll be sending you a log every day or two, giving you a window on an unusual trip and an unusual region.

Where we are and why we're here:

Political issues re tuna/dolphin: We're headed into the Eastern Tropical Pacific (ETP). This is where many of those cans of tuna in your pantry come from. I'm not at the cannery or on a fishing boat. I'm at the source, a place which, like any source, feels so deeply authentic the sense of it is awe-inspiring, spiritual. Anyone who eats tuna salad has been part of this ecosystem and its politics.

Here as nowhere else, very large schools of adult yellowfin tuna (and some bigeye tuna) follow schools of dolphins. The full nature of the relationship is uncertain, but tuna stick with the dolphins even if the dolphins are running hard. Before the 1950s tuna boats rode up to dolphin schools and caught the tuna with pole and line. The dolphins were unafraid. Then nets called purse seines were introduced, and the whole mixed group of dolphins (sometimes hundreds) and tuna (sometimes hundreds of tons) would be encircled together with a net hundreds of feet deep and a mile long. Though the dolphins were at first not afraid of boats and nets, they soon learned to be. The tuna boats used to bring the entire contents of the net aboard—including all the dolphins, which died wholesale. From the 1950s to the 1980s millions of dolphins drowned in tuna nets in the Eastern Tropical Pacific ocean. To this day, they run from ships.

Even though fishing practices in the last 20 years ensure that 99% of the dolphins are released alive, the dolphins want nothing to do with getting netted. They run hard from approaching ships, which deploy speedboats to outrun, outmaneuver, exhaust and corral the dolphins until the ship can catch up and set its net. The question is now why dolphin populations, which declined to roughly a quarter of their original numbers, have shown no signs of recovery in the last 20 years. (They should be increasing 4 percent annually.) Scientists suspect, and many believe, that the stress of the chase interferes with reproduction, quite possibly because mothers and calves may get separated and the calves lost.

Tuna caught by wrapping a net around dolphins may not be sold in the USA due to the legal definition of 'dolphin safe.' That fish goes to Europe and Asia. However, the fishing industry has been leaning on Congress for years to allow them back in, since they say they've reduced dolphin drownings by 99% and observers agree. Congress did in fact allow them back, but before that actually happened, environmental groups sued and won. A federal judge said more study was needed.

So here we are, counting dolphins daily to get further estimates of their population numbers.

The ETP's productivity is caused by a shallow "dome" of the thermocline (layer where warm surface water meets cool deep water), bringing deep cool nutrient-rich water nearer the surface than in most of the tropics. The equatorial Counter Current comes west to east and strikes the continental land mass; it and the North Equatorial Current going east to west diverge due to Coriolis forces, creating a vacuum that draws water up from below. Ten degrees north latitude is the main part of the "thermocline ridge" where the cool water is pulled up into that seam between diverging currents. The nutrients, newly available in a zone with sunlight, allow photosynthetic plants to bloom, enriching and igniting the whole food chain.

October 3, 2006:

Left Puerto Quetzal, Guatemala, in late morning. We spent the whole afternoon on the continental shelf and slope, making about 35 miles offshore at sundown. Almost immediately we saw dolphins and the whole day were busy with sightings: coastal spotted dolphins and bottlenose, almost exclusively. The taxonomy is complex. Coastal spotted are heavier bodied and lighter colored than offshore spotted because they're more densely spotted with light dots. As our survey leader Dr. Lisa Ballance says, they're real pretty animals. There were dolphins in sight in little groups virtually all afternoon. That's because the shelf is very productive and also because the people here have miraculous eyes and 25-power giant binoculars like small cannons mounted on swiveling posts. Toward sunset we saw a Brydes whale, which is pronounced broodis. We also had numerous Olive Ridley Turtles. Using an outboard zodiac, the crew and I captured about eight. We would ride until we saw a head or back, or a booby sitting on something. Then zoom up to it and jump in, either grabbing it by landing feet first next to it and grabbing the front and back of the shell, or diving below and coming up and grabbing it. I jumped in on one. It was harder than I thought to stay at the surface, because the turtle has virtually no buoyancy. So it's like treading water without your arms, plus your arms are full of struggling turtle. I lost my grip at the front of the shell and, while holding the rear only, the turtle immediately started taking me down in that bottomless warm blue water but I quickly regained my grasp at the forward part of the plastron, maneuvered the turtle to point up, and it took me to the surface where I regained my breath. On board, they are tagged and blood and shell samples are taken for various analyses. Also saw several free-jumping sailfish.

We were surveying from about noon to about 7 pm, and ran into 8 groups of dolphins and a Brydes Whale. Six of the 8 groups of dolphins came to bow ride.

October 4, 2006:

All day the science party scans the remorseless glare. Today the ocean is banded with rough water. Dr. Lisa Ballance says, We call this Delphinus water. They [common dolphins] like upwelled water where the cool water comes practically to the surface and there's a lot of mixing. So do blue whales. Spotters and spinners like more stratified water. Lisa says the roughening may be caused by internal waves traveling at the upper part of the boundary between warm and cool layers. I've never heard of that. Spotteds and Spinners prefer strong, shallow thermoclines with a distinct warm layer on the surface and a sharp boundary to cool water.

We see one group of a few dolphins that seems somehow to build to over a hundred, forming a broad escort, with small phalanxes spurting synchronously and occasional individuals doing balletic leaps, clearing fully two body lengths of height and vigorously pumping their tails in the air before side-flopping into the swallowing swells. Eventually they fall away.

We see 4 Olive Ridley turtles, including a pair getting ready to mate, and then a dark flying carpet in the sea: a 10-foot manta ray. We see a group of about 40 storm petrels, Galapagos and Markhams.

We nicked the edge of the ETP and ran across our first aggregation of tuna, dolphins, and seabirds, mainly Nazca Boobies, Christmas and Wedge-tailed Sharwaters, and Arctic Terns. The animals covered several acres, and as we approached the wheeling and diving birds we could see tuna ripping through the surface as spinner dolphins augured their way through the air. As the ship neared the dolphins seemed to startle and suddenly began tearing in white streaks away from the boat. When they settled down we slowed the ship to deploy the small boat, and again they picked up and ran hard. This is because they've learned that a ship behaving this way is about to set a net around them, and they try to flee. This seemed to end the tuna feeding, because the birds dispersed. It was disturbing to see how much disruption we caused them; they're too used to having to respond to fishing boats. When we see a few bottlenose dolphins later, they come to bow-ride. They don't associate with tuna so aren't harassed by tuna fishing boats.

Birds included Nazca Boobies, Christmas and Wedge-tailed Sharwaters, and Arctic Terns, also a pomerine skua and a belted Kingfisher! A warbler and several swallows came aboard, cliff, bank, and barn.

We also saw several flocks of phalaropes, red and red-necked. In the birds we saw through the day were Tahiti Petrels, with striking dark hoods. They tend to be loners, as are the stunningly beautiful tropicbirds we've seen occasionally.

October 5, 2006:

We've been running west since leaving Central America, but also south. Several hundred miles from the coast, we spent much of today in an area called the Costa Rica Dome. Here the currents happen to form a circling gyre that spins water to the edge of the eddy, creating a vacuum that's filled by cool, nutrient-rich deep water coming up from below. That's upwelling. The resulting bloom of plankton gives the blue-gray sea a faint aquamarine cast. People with an eye for it say the water looks very green.

After just one brief sighting of a distant group of striped dolphins, we saw a young blue whale, perhaps 45 feet long, maybe a year or so old. We tried to maneuver to get a skin biopsy but could not get close enough. We then deployed the small rubberized boat to chase it in the swells, but, though there were at least 4 blue whales sighted during the afternoon, we never got a sample. Several times we got close enough for a marginal shot, but the dart never struck squarely. That took most of the afternoon. But Ill tell you this: when you're in a little rubber boat and a whale surfaces nearby, it looks like a big overturned boat spouting hot steam and it gets your attention.

October 6, 2006:

A very slow day but at 4:30 pm simultaneous pods of pilot whales, bottlenose and rough-toothed dolphins appeared and approached the ship, giving us the chance for getting biopsies from the bow.

Dr. Lisa Ballance, our scientific cruise leader, says, It's really important to get a feel for the distances and the nothingness between patches of life. To get a feel for this region and the three major currents takes about three months. But that's a huge time commitment for most people.

Spent an hour talking with crewman Joao Alves, who worked on tuna seiners from 1975 to 2000. He told me a lot about the economics of the fishery, and how the dolphin safe restrictions forced American boats to fish in the western Pacific, where, because of fuel costs, they could not remain U.S. based and most ultimately went out of business. His most chilling tale was of a tuna boat captain whose son came out for a summer vacation. While the son was in the net helping to release dolphins over the cork line, an oceanic whitetip shark grabbed him and shook so hard it ripped his arm off at the shoulder. With no way to apply a tourniquet, the captain watched his son bleed to death. He quit fishing after that. Every aspect has many dimensions.

October 7, 2006:

Gorgeous morning. Lisa says humorously, This sea is Beaufort 1, and its threatening Beaufort 0. Dolphins are visible from miles away, and were doubtless seeing more because it's so calm. It's a flyingfish sea, complete with occasional manta rays and several sailfish jumping repeatedly for no easily apparent reason. I figure the motive for their leaping is either sheer joy or parasites, but it could be something in between. We've seen more Tahiti Petrels, Galapagos, Markhams and Leachs Storm Petrels, and a cattle egret has landed on our ship and is trying to eat the fish in the outdoor fish tank. Olive Ridley turtles were numerous on the calm sea, including one brought aboard with a fish hook in its mouth. It was a large longline circle-hook, a design used more and more because it hooks fewer turtles. The turtle had been cut free and was trailing a few feet of line. The crew removed the hook. Because the weather was so slick, I decided to go into the small boat and help catch some of the many turtles we were seeing. I left my camera bag out on the bridge after looking around and assuring myself there was no chance of rain in the next hour. Lisa said shed bring it in if rain arrived. I was in the boat five minutes enough for Pitman to catch a turtle when the sky darkened to a purple bruise and we began to get hit with gusts of cold air. We sped back to the ship as over a period of one minute the anemometer registered wind

going from 3 knots to 36 knots as rain and wind enveloped us. Sleeping is difficult as one is constantly rolled back and forth.

October 8, 2006:

Two mixed groups of spotted/spinner dolphins came to bowride today. This sparked an interesting debate about why. In the core area these are the dolphins who are set on by the tuna boats and the ones we've seen running hard away from the boat. From the bow of the ship, Pitman and the crossbow guys got several biopsies from several of each species. So, why? Possibly its because were approaching the continental shelf again, and were nearing the Gulf of Tehuantepec where strong winds preclude purse seine netting, so the dolphins might not be afraid of boats. And Pitman reminded us that were headed landward, and in many parts of the world coastal dolphins bow-ride. But the spotted in this group were the offshore type, with finer spotting. So they should not like boats. Yet they were bowriding, and doing it a long while, more than half an hour. Joao the former tuna fisherman offered another possibility. The tuna fisherman know of dolphins they call untouchables. They've apparently learned that boats mean getting chased and rounded up and having a net wrapped around them, and all that ensues. But they've figured out so the tuna-men say that they can avoid all that by sticking to the hull of the ship. If they stay right with the ship, the ship can't set its net around them. Interesting.

Sunset was unusually brilliant and everyone on the flying bridge wanted to watch it. But the ship was sliding past the setting sun. No one had the nerve to ask the helm to turn and stop the ship just so we could watch the sun go down. So one of the biologists picked up the radio and called the helm room, saying, Carl Safina requests that the ship come 90 left so he can watch the sunset. And it did. It was amusing but also embarrassing. In the morning I went to the ship's Captain and said that I had not in fact requested that the ship turn and stop. He said, I wasn't on helm at sunset, but I heard about it.

October 9, 2006:

Gorgeous morning today. We're in outer Gulf of Tehuantepec off southern Mexico, headed offshore again after our zig-zag. This course is intended to bring us squarely within the core Eastern Tropical Pacific region for the duration.

When we turned seaward we were just 15 miles from the coast, but haze blocked any sight of land. Nonetheless, migrating land birds made themselves quite evident. Had a Parula Warbler, yellow-breasted chat, tropical kingbird, barn swallow, and probable Connecticut warbler land aboard. A merlin went by.

Lots of turtles here. We put a satellite transmitter on one. At one point from the flying bridge I mistook a coconut for a turtle and called it; that was embarrassing! But I had my 8-power binoculars and the other people were on the 25-power giant "big-eyes". That was my excuse.

Small manta this morning and great looks at bow-riding coastal spotted dolphins including a baby with mother. We had a total of 17 encounters with mammals, of which 12 were bottlenose and most of the rest coastal spotted dolphins, unidentified dolphins, and a Brydes whale.

Dinner was served picnic-style on the back deck; grilled tuna and chicken.

By sundown we were 100 miles offshore, but the water was still relatively greenish. After dark we set up the lights again to dip-net using fine-mesh nets about a yard across, on 20 foot handles. I must be getting my sea legs pretty good, because without feeling much motion I suddenly noticed the stars overhead were waving back and forth. Why do the stars rock back and forth in the ocean sky? Bobs response: theyre rock stars! To our floodlight halo came e a lot of foot-long juvenile Humboldt squid and swarms of frigate mackerel eating all kinds of little fishes drawn to the lights. Yesterday at sunset we saw big schools of probable frigate mackerel on the surface. How much these schools must eat! How much everything out here must eat!! The many juvenile fish that we dip-netted included juvenile triggerfish, goatfish (oddly enough), baby mahimahi, flyingfish, jacks, needlefish and a sailfish less than an inch long.

October 10, 2006:

Another day, a different neighborhood at sea. Our track today kept us about 200 to 220 miles from shore. Yesterday brought 17 marine mammal encounters, mostly bottlenose dolphins. Today: only three encounters, none bottlenose. A small dolphin pod in the late morning and one at sunset bookended only one sizeable midday group of a couple hundred offshore spotted and spinner dolphins. Yesterday, turtles were everywhere; I don't think we saw one today. After sundown, the flyingfishes wed been seeing under the lights were replaced by short-winged flyingfish that can hop but not really sail out of the water (the tradeoff: long-winged species of flying fish can't swim fast but can glide exceptionally well, often easily 50 yards; shorter wings mean you can swim faster. If you can't avoid predators by swimming, you'd better fly well, but watch out for the boobies. If you are trying to minimize your exposure to birds, you'd better be a very fast underwater sprinter. But you can't have it both ways.) The juvenile Humboldt squid were replaced by Stenoteuthis squid, and last nights frigate mackerel were nowhere to be seen tonight. Like I said, were in a different hood today.

We got within a few hundred yards of today's big dolphin group before they all got up and bolted away in white explosions and long leaps. It's sad to see how much they've learned to fear people. Sadder is that originally their lack of fear proved fatal, and now their fear itself is the problem; it would be better for them to just cooperate with fishing boats, get the netting over with, and get released rather than burn themselves up and risk losing their calves while fleeing.

We had a couple of redstarts land on the ship, and an oriole, and I saw a dragonfly. It makes you appreciate how far and wide these land-dependent animals disperse while migrating, and the risks to which they're exposed.

The big excitement of the afternoon was a waterspout, a compact tornado with a funnel only a few yards across, vacuuming up seawater into a long, high-spiring pulsing spout like a charmed snake rising up into the low clouds. We passed very close, less than half a mile. Right behind it was a major downpour that overtook us.

The water temp is about 30 Celsius, around 86 F.

Just after dark, large patches of phosphorescence set the sea aglow for a brief period.

October 11, 2006:

At a rainy daybreak we were 280 miles from land. Harcourt's storm petrels made a good showing, and the first Juan Fernandez petrels, which are associated with the core ETP region, have appeared.

In this blank, shape-shifting desert of water, only the birds cannot vanish downward. When they rest the sea floats them and does not swallow them. When they dive the sea returns them to the surface. A flyingfish tries hard to be a thing of air but the ocean always reclaims it—unless a booby plucks it. Birds take fish toward the heavens and swallow them; thus fish become birds.

In the morning we encountered a big—couple hundred—mixed herd of spotted and spinner dolphins, with seabirds (boobies, petrels, shearwaters) and some large leaping tuna. Those dolphins fled us in fear. But later another group approached and seemed rather confiding. Lisa suspects the latter were another group of untouchables, dolphins that have learned to avoid getting set on by hugging the ship. It's unlikely they are naïve; Lisa and Bob say that statistical analyses suggest that each dolphin is likely caught in a tuna net dozens of times in its life.

Today's biggest thrill by far was a pod of nine killer whales. I was in the ship's lab when they were announced over the radio, and by the time I scrambled outside to get into the small inflatable boat that was holding alongside the ship (to try to go and get biopsy samples), the killers were already directly alongside—and underneath the small boat! This brought pandemonium—and a lot of yelling (“Look down! You've got a whale right under you!”) For a few moments it was hard to know where to look; we were surrounded by black backs and slicing fins. (See photo; I'm in blue and note biopsy dart headed for nearest whale.)

This group of killer whales was an unusually large pod for the tropics, unusually cohesive and close-knit, and unusually curious. Bob Pitman says they're matriarchal and that a pod is usually a female, her offspring, and perhaps grandchildren. This one seemed to have all those members, including a large male that Pitman suspects is a grown son. Several times when that male was lost from view, I turned to see if he was following. There's the theoretical possibility they could attack, though Pitman says he's never seen killers act aggressive to a small boat (he has seen them kill sperm whales, though).

All in all, the encounter was awesome! Perhaps more amazing is that although the killer whale is probably the most widely recognizable animal in the sea for most people, scientists still don't know how many species there are; there now seem to be at least two different species but that was just recently determined. Bob thinks there may be more. That's how big and hard to study the ocean still is.

Dipnetting was cancelled tonight due to 40 knots of wind and slanting sheets of rain. There's no point going to bed early; there'll be plenty of “zero gravity” moments in the bunk tonight.

October 12, 2006:

Four hundred miles offshore, 10° North. Heavy weather. Plenty of bleary eyes aboard this morning. A couple of times last night I'd swear the ship got airborne before the next swell re-engaged the hull with a hard shudder.

It's Beaufort 6 this morning. Hard to see much at any kind of distance. The mammal people will be "off effort" half the day because of rough seas and rain. While they're on, they'll sight four small pods of mammals: Bottlenose, Spotters, Spinners, and Commons. They'll spend the rest of the time in the lab, in the mess hall playing cards and board games, in their bunks, or organizing their photos on their computers.

One industrious mammal-guy, Adam U, looked through 300 frames of yesterday's Killer Whales (collected from numerous cameras) and spent a few hours with a photo-ID manual of individual killer whales previously seen in this region in past years. He made positive, highly detailed matches of 5 members of yesterday's pod; they were in a pod of 7 seen and photographed in this region in 1999. So this is a long-standing group. That was pretty amazing and it took exceptional expertise and systematic organization to make those matches based on very subtle identifying features.

For a long while today I watched a café au lait colored Red-footed Booby that was hanging in the updraft off the flying bridge, holding like a pointer in the stiff wind, every few minutes sprinting like a cheetah at the flyingfish that the heaving bow scared airborne. In an ocean of the fittest, opponents out here are pretty evenly matched. Red-foots know what they're doing, but so apparently do flyingfish. I watched at least a dozen attempts but each time the bird closed in tight behind, the flyingfish dropped into the sea ahead of that deadly bill. I never saw the bird succeed.

Over a lunch made leisurely because the weather had no one hurrying, Bob had some billfish stories. He once came upon a dead turtle with a broken-off sailfish bill sticking out both sides of its shell. He saw a photo of a swordfish (big, maybe 500 pounds) that had taken a bait on a longline and been caught—while carrying around an adult Green Turtle skewered on its massive bill. Why would a billfish stab such objects they can't eat when collision with them could be injurious or fatal? Consider the diver who saw a smallish fish sprint straight toward him and scoot around behind him. A moment later a billfish struck the diver in the forehead, breaking its bill-tip in the man's skull. Accidents happen.

Tonight's dip-netting saw a return of juvenile Humboldt Squid, and these were hefty, maybe five pounders. They prefer more productive waters, which is what we're in. We also had Sthenoteuthis squid, bright red with a light oval on their dorsal mantle. They're adapted to less-productive waters. The convergence of species adapted to both more- and less-productive waters suggest the nearby boundary of two great water masses, which is what we have as we approach the edge of that Counter Current. But why would anyone be adapted to less-productive water? Because, like plants and animals adapted to deserts, there are resources worth exploiting, and less competition from other species who can't make it there. We also had 2-wing, 4-wing, and short-winged species of flying fish come to the lights and a few

Mictophid fish, which during the day stay very deep, part of a vast layer of vertically migrating life that occurs in much of the world ocean. One impressive aspect of these nightly dip-net sessions is that you can stop anywhere in this region, turn on the floodlights, and fish and squid appear alongside almost immediately.

October 13, 2006:

Murder aboard!!

We were all called to muster and told to be seated in the mess hall. One of the crew handed a white envelope to every person. In each envelope was a white piece of paper. In one envelope was also a purple piece of plastic with a yellow dot. The person who got that yellow dot is the murderer. That dot is the murder weapon. Anyone who finds the yellow dot—when they open their computer, or when they reach for a napkin, or next to their toothbrush, etc—is murdered. The object of the game is for the murderer to kill everyone aboard without getting detected. A murdered person cannot speak until someone asks, “Are you murdered?” After that, they can say where they found the weapon. Upon being murdered, the victim must turn the murder weapon so the yellow dot is down. The murderer must retrieve the weapon without being seen, and murder again. So far, Candy the oceanographer has been killed in the lab.

Six hundred and fifty miles offshore, wind remained so forceful the mammal observers got the whole day off. Hence the diversion of the murder game.

We’re firmly within the Equatorial Counter Current, in blue, sparse water. Birds are sparser here. Perhaps the main species is the Juan Fernandez Petrel, named after a Chilean island named after a person. Virtually all the eponymous petrels breed on that one island. A castaway on that island, Alexander Selkirk, was apparently the inspiration for Robinson Crusoe. Lisa reminded me that in fact most of the seabirds are not from nearby. There’s no place to nest for hundreds of miles. They’re from places like Galapagos, Chile, New Zealand, and the Pacific Northwest. They live lives with no cover whatsoever from any weather. They’re tough, and they can handle a range of pretty extreme conditions.

Things were likewise sparse at the dip-net station, enlivened mainly by Jimi Hendrix wailing like a ghost on the aft deck in the dark. The netters caught just a few flyingfish and two squid. Bob says, “Yeah, this is what most of the tropics looks like at night.” One squid, a species I hadn’t seen yet, was thumb-sized but very aggressive. It took Bob on, biting his finger repeatedly as he tried to steady it for a photo. One of the flyingfish, a juvenile, is white at this small size and stays at the surface spreading broad, rounded wings. Its disguise is to look like a sea-foam bubble. Much of life here is guile and deception, and trying to avoid being murdered by expecting the worst.

October 14, 2006:

800 miles from the Mexican coast, at 6° North, we turned northeast. We’ll maintain this direction for the duration. We’re as far from land as we’re going to get. We’re so far west of where we started (perhaps a thousand miles) dawn was coming much later, so Lisa decided to turn our clocks back an hour. We’re not in Kansas anymore.

The sea has settled a bit but remains whitecapped. It's a sparse sea. We're in the Counter Current all day. The water is a shocking electric blue. The thermocline is deep here. The water remains warm (27.7° C) down to 60 meters. That's a pretty thick warm layer. And not until 120 meters does it fully transition to cool water (12.2° C). From there it continues getting colder and at 750 meters (as deep as our morning probe goes) it's just under 6° C. Most of the world is cold and dark, even in the tropics.

From the flying bridge this morning I spotted one single piece of floating bamboo. We steered past it, handlines went over the stern, and in several passes that one stick yielded 17 large mahimahi and a wahoo. They'd been eating snake mackerel, squid, and flyingfish. One had eaten a puffer whose spines failed to save it. They made for a lot of excitement, rare and welcome diversion for the deck crew, and a delicious lunch.

But other sightings remained relatively few. We saw one medium-sized school of Spotteds and Spinners with birds, and a very small group of Striped Dolphins. Juan Fernandez Petrels continued to dominate, Leach's Storm Petrels outnumbered Galapagos Storm Petrels, and Sooty Terns replaced the Arctic Terns we've been seeing, the Nazca Boobies who prefer more productive water went missing, replaced by Masked Boobies. And among the Wedgies were all-dark birds that may originate in Hawaii.

By sundown the thermocline is a little shallower but still pretty deep. The temperature is 28°C straight down to nearly 40 meters. Dip-netting reflected the poor productivity of the ocean here; it was slim pickings with very few small fish and squid.

The murderer aboard has killed several more people, all biologists, giving rise to suspicion that only a biologist would so well know the movements of other biologists.

October 15, 2006:

Beaufort 7 today. Woke up to papers, clothes, chair and other stuff strewn around the room after sliding off their perches overnight. My desk chair is now held upright with a bungee cord, and in the lab a stool fell over with someone on it. In the shower you have to keep gripping a pipe with one hand. Ocean grizzled and streaked with foam, and the 7-foot swells are crosshatched, coming from 2 different directions. Wind blowing 30. The only consolations are Juan Fernandez Petrels and John Coltrane. Spray filled dip-netting station was yielding little and effort was called off after half an hour. There's a storm inshore of us and we're just waiting it out. Likely more of the same tomorrow. Meanwhile I'm transcribing my recordings of on-board interviews, trying to stay upright.

October 16, 2006:

Science cancelled today due to continued heavy weather. A lot of computer work is getting done, a lot of catching up.

The murder game came ended abruptly when, against the rules, a member of the deck crew hid the murder weapon—then saw me rummaging around for it.

October 17, 2006:

Bad weather, no science.

October 18, 2006:

Bad weather continues though not as rough. Still the mammal observers cannot work. Early in the day we came upon a large abandoned gillnet, greatly tangled up with itself. They crew decided to launch the small boat to retrieve it, and though they sank a large tangled portion, they brought a big portion on board. Surprisingly it had no tangled turtles. It did have numerous bones from at least one billfish. (see photo.)

We saw one large mixed seabird/dolphin/tuna aggregation, but rough seas precluded good looks.

Much rain part of the day. The longevity of this bout of bad weather is unusual here. All of us are making reasonably good use of the time doing other work, but we're eager for the return of fair winds.

October 19, 2006:

400 miles offshore, 12° North. Weather slowly relented over the course of the day but never got really below Beaufort 4 or 5 (numerous white caps and some spray). In the morning the wind rose again to 30 knots as rain swept in.

Birdwise, we're seeing Juan Fernandez Petrels, Wedgies, a few Leach's Storm Petrels, and a few Nazca Boobies. And I mean a few. I was thinking the bird density is about one per square mile. The professional, Rich Pagen, thinks it's more like four. Rich says, though, that it's hard to guess how many birds we might be seeing if not for human affects on seabird populations thousands of miles away. He says that, for instance, we might be seeing fair numbers of Parkinson's Petrels if not for the ravages of introduced rats and cats on New Zealand out-islands where they nest. His comment, "If it wasn't for the Juans and Leach's, there'd be very little to look at," prompted me to jot this blues song:

It's a big, big ocean,
It's a wide, wide space,
Ain't hardly nothin'
All over this place.

Ain't seen no turtles
For days and days,
And even the dolphins,
Have changed their ways,

Well it's lonely way out here,
And now I'm watchin' raindrops fall.
If it wasn't for Juan Fernandez Petrels,
I wouldn't have no Juan at all.

But actually, the day picked up. We added Brown Boobies and Red-footeds to the day's sightings and the first Pink-footed Shearwater of the trip for me, flying with a Wedgie for comparison. I watched a Juan skimming the wave contours for a long while and never saw it flap, just appropriating the wind's energy for its own flight, like one of its albatross cousins.

Throughout the day we saw four groups of dolphins: 2 Spotted, one mixed Spinner and Spotted, and one unidentified. All groups were small, and sea conditions made spotting difficult.

Night dip-netting proved us back into more productive water, with numerous flyingfish (2-wing, 4-wing, and short-winged species) and squid (*Sthenoteuthis*) in the lights.

Only a couple of days left before this magical mystery tour wraps.

October 20, 2006:

300 miles west of Mexico, 12° North.

Everyone was back at work all day. Our sightings suggest that we are on the outer mixing zone with inshore fauna. One of the Spotted Dolphins might have been the inshore form; it looked quite husky. Brown Boobies showed up in numbers in the morning, and at 3 pm we started seeing a few turtles.

By the way, 30 years ago these turtles, the Olive Ridleys were quite rare. To use their meager skin for leather, people killed females by the hundreds of thousands when they came ashore Mexican beaches to nest. Now they are quite common.

I spent a long time watching a Brown Booby attempt to catch flyingfish scared airborne by our bow. The flyingfish don't fly, but they can glide as much as 100 meters. When they start to sag into the sea, rapid lashes of their lower tail-lobe can give them the boost they need to get airborne again. The effect is a fish capable of astonishingly rapid, prolonged, alert sailing above the waves. Chases between boobies and flying fish sometimes continue above and below the surface, and above again. When closing in behind a flyingfish that drops into the sea, a booby can make a very shallow dive at high speed and zoom through the water so fast that in a split second and seemingly without losing speed it is again airborne and in full pursuit. They are birds that can fly, dive, and fly again in one streaking motion that defies the eyes. But the flyingfish pose a challenging and deft match, and seem to value their lives. Most of the time, the birds miss.

Each night we deploy a wide-mouth fine-mesh net called a manta at the surface and a two-hoop device called a bongo-net deep, 200 to 300 meters. Their haul of plankton and other small animals reflects the general amount of life we see at the dip-netting station and the numbers of fishes, mammals, and birds we see during daylight. The more we see, the more plankton we find in the nets. Those nets also catch larger things, like the Barbled Dragonfish that the bongo net engulfed on the night of the 19th. Clearly the prototype for night-sweat-inducing monster, this eel-like, foot-long fish is black, its sides lined with

light-emitting organs called photophores, its mouth disproportionately enormous and lined with oversize dagger-teeth. It's capable of swallowing meals that are gigantic for its size. Thank god it doesn't grow to 15 feet.

October 21, 2006:

180 miles west of Mexico headed toward Acapulco. Weather is—finally—fair and fine. This will be our last full day at sea.

Our warm tropical layer of 28.6° C (upper 80s F) extends down to 36 meters, where the temperature drops rapidly with depth until it begins to stabilize at 112 meters at 14° C (upper 50s-ish F). We're in some new water, two miles deep.

Birdwise we feel a change: Brown Noddies have shown up for the first time. Galapagos Storm Petrels are back in the scene. And for the first time in days a land bird—a Barn Swallow—put in an appearance.

Expectations of a jump in turtle and dolphin sightings did not fully materialize. We had five dolphin schools. We caught two turtles, one a platter-sized babe perhaps not more than a year or so old. The other was larger, and I jumped in to get it (see photo).

While in the small inflatable boat we approached a flock of birds and dolphins. The dolphins came to accompany us and race the bow. They sliced and darted and leaped alongside. Though I have been many times lucky to share for a few minutes those special instances at the surface of oceans that bring dolphins and people almost together, their grace and vitality never fail to steal my breath. They make me happy.

This being, as said, our last day, I took some minutes at the rail to drink in the immensity of the whole ocean—no small task. The sea surface takes the same hold on us as does gazing into a fire, a million tongues of shape-shifting energy somehow taking form and changing instantly, somehow going somewhere—mesmerizing. Time loses its directionality at sea, and assumes the circularity of the water, the sky, the horizon. Circular time; where the wheel of life feels more obvious than ashore. It is perhaps time as an animal perceives it, each day the same replayed, with all major elements the same and every detail different. It has been strange to feel safer 800 miles from shore in water two miles deep than on land. Just before boarding the ship, the captain was robbed at knifepoint and one of the biologists had his wallet picked. And then there is the world's drift away from the peace that falls farther and farther back in humanity's wake as we venture toward wherever we're blindly heading devoid of compass and charts, taking with us so little of the wisdom that was so hard to make. Thus thoughts turn shoreward. Toward sunset, clouds picked up the pink of the sinking sun, looking brushed into the sky above the horizon. Dark descended while we all remained on the flying bridge, squeezing the marrow from the last minutes. And so it ends.