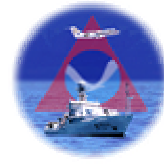




NOAA Teacher At Sea Geoff Goodenow Daily Logs



Geoff with a Mahi Mahi

Students at Lewisburg High School in Lewisburg, PA, will learn about marine science in an exciting new way this year, through the eyes and perceptions of their own biology teacher Geoff Goodenow, who is participating in the NOAA Teacher at Sea program.

Goodenow, a resident of Mifflinburg, PA, is sailing aboard the 224-ft. NOAA research ship Oscar Elton Sette May 2-25 from Honolulu, Hawaii, to work with scientists conducting swordfish assessment surveys using longline gear in waters west of the Island of Hawaii. The primary objective of the mission is to capture large spawning-size swordfish and attach pop-up satellite archival tags to them for tracking.

While on board, Goodenow will take pictures and write daily logs (PDF file) that include information about the latitude, longitude, sea temperatures and other data, research of the day, and interviews with scientists. Students and others can also email questions about the voyage to him at geoff.goodenow@noaa.gov.

DAILY LOGS

May 2, 2004

Science and Technology log:

This morning we set sail at 10AM. After lunch and drills, the crew set out a longline of about 2 miles of un-baited hooks which were immediately retrieved. This was done as a test of equipment and to help crew get the rhythm of the procedure. I was asked to stand by the spool as line was fed to the stern. My role was to watch for any slack in the line, brake the spool to take up any slack or stop the spool if it tangled (bird nested). All went well on the test.

Scientists and their teams were busy setting up their respective labs and preparing for the work ahead. One team will be doing vision studies using retinas removed from selected animals. Muscle tissue and blood samples will be taken for other studies. Plankton tows will be done at daylight and night to collect specific types present at those different times of the day.

Some fish will be tagged and released. The pop up archival tags record an animal's depth, latitude and longitudes and other data as it moves through the ocean over a specified period, perhaps 8 months. After that time, the tag automatically is released from the fish, pops to the surface and transmits its data to a satellite.

The longline was set to be deployed at 8PM, but due to rough seas that effort was cancelled. So as you can tell, this was a day of preparation, with the real science soon to come.

Personal Log:

I arrived Friday, April 30 after nearly 23 waking hours, 5000 air miles and 10.5 air hours from Harrisburg, Pa. It was not difficult to find comfort in my upper berth aboard the Sette. On Saturday, I was up by 8AM, walked about Honolulu most of the day. I had a brief tour of the ship with chief scientist Rich Brill. By Sunday, I felt well rested and comfortable at sea until after supper. By then things were a bit rough and most of supper and perhaps a bit of lunch came back up. But I slept well -- horizontal felt best.

Question for today:

Location, location, location:

Determine the change in latitude and longitude from your home to Honolulu. How many time zones are crossed? State the westernmost and easternmost longitudes of the entire Hawaiian Island chain. State the northernmost and southernmost latitudes of the Hawaiian Island chain.

Monday 5/3/04

Technical and Scientific log:

Due to the rough sea all work scheduled for last night as well as a troll (net) for 6AM was cancelled. As we steamed eastward a couple of lines were trolled and did bring in two fish, a mahi mahi and ono. Both fish were kept. Their eyes were dissected for lens and retina and muscle samples were taken.

I learned more of the eye studies today from Kerstin. Longlining has taken a toll on sea turtle populations. Recently a judge ordered the practice stopped in Hawaiian waters due to the turtle by-catch. One way to avoid turtles is to utilize larger hooks and bait that turtles don't like. As we set lines on this cruise we are employing those techniques. But Kerstin's work with eyes is an attempt to learn of different sensory abilities in the different animals to see if those differences can be used to make catch by longline more selective. A web search under longlining will lead you to some articles about the by-catch issues.

Plankton tow -- We did one at surface for an hour then one at depth for another hour. It is preferred to tow through visible surface "slicks" where target larvae (those of billfish) like to gather. No slicks were found as they were probably broken up in last night's rough water.

These samples are being gathered (1) for the eye studies and (2) to be used to see if a genetic marker can be found that will be useful in identifying species in the larval stage. If found, identification will be much easier than doing so morphologically and will make reproductive studies easier.

Tonight at 8PM we set our first baited longline. I started at the spool with "brake shoe" in hand poised for trouble that never came. After an hour or so of that I was "promoted" to bait boy--in the heart of the action! I kept the bait box full for Bruce as he attached the herring through the eyes to hooks. We set 180 pounds of fish on 400 hooks along 9 miles of line. Our leaders were metal tonight as our targets, sharks, can't bite through the metal. Monofilament is used when the target is billfish because the metal leaders damage those animals in ways that monofilament does not. Every so often a temperature/depth recorder is attached to the line. About every 4th hook also gets a light stick attached as an attractant for fish. Buoys go over at regular intervals to help hold the line at desired depth and of course to mark its position. We will pick up the line after breakfast and see how well our efforts are rewarded

Personal log:

I was none too excited about getting out of bed this morning and leaving the prone position which had proved to be the most effective at preventing unpleasentries. But I had to make the move. The sea was still rough and sure enough that memorable sensation returned and put me on my knees before the toilet bowl once again. A couple of dry gags

settled me, but I immediately headed to our physician assistant for appropriate meds. We found much calmer water on the west side of Hawaii and those of us who were quite unsettled this morning found our comfort growing through the day. Someone said swells/waves last night were 10-12 feet and coming from various directions. No wonder I felt as though I had been in a washing machine.

Question:

How does the altitude of the sun (its angle above the horizon) at noon at 18 degrees north latitude compare with its altitude at 42 degrees north over the course of a year? To find out, use an analemma to find out the sun's position with respect to the equator. Graph altitude (0-90 degrees) on the y axis and the 21st of each month on the x axis. Describe similarities and differences in the patterns.

Tuesday, May 4, 2004

Latitude: 19 19

Longitude 156 05

Sunny with scattered clouds

Air temp 26C

Barometer 1013.75

Wind 130 degrees at 9 knots

Relative humidity 59%

Sea temp 26.5

Ocean depth 2770 meters

Scientific and Technical log:

This morning we hauled in the longline. This is the first time this team has used the larger hooks and herring (as opposed to squid) for bait as a means of avoiding taking of turtles. In that sense, we had tremendous success -- no turtles. But on the downside, we caught only two fish -- a mahi mahi (*Coryphaena hippurus*), still alive, and a wahoo (*Acanthocybium solandri*) which had died on the line. Eyes, liver, blood, and muscle tissue were taken from both. For the experiments on vision that Kerstin is doing only live eyes are useful.

Some surface plankton tows were conducted over a couple hours this afternoon. Several eggs were gathered and preserved. More tows will be conducted after the longline is set.

When nothing else was going on, two lines were trolled off the stern. This method yielded 4 fish including bigeye tuna (*Thunnus obesus*), skipjack tuna (*Katsuwonus pelamis*) and yellowfin tuna (*T. albacares*). These were sampled as above and in addition we kept stomachs for later study of contents. So 400 hooks sitting in the longline for 12 hours so far isn't looking nearly as effective as a good old fishing line and a lure.

Tonight at 8PM we again set the longline, this one about 20 miles north of last night's set. Because the winds are still very strong outside the shelter of the big island we are a bit

restricted as to where we can go to fish right now. Winds are to become calmer over the next 48 hours.

Here is the longline set up in more detail than before. A spool holding about 40 miles of line sits parallel to length of ship on port side approx. mid-ship. Line feeds off to a pulley along side of ship which directs line 90 degrees to stern. Via a couple more pulleys the line goes to starboard side of stern. A team on the stern takes care of it from here. At center is person with basket of hooks attached to metal or monofilament leads with a clip on the other end. He withdraws the hook and clip, passing the hook to his right and the clip to his left while pulling the leader from the basket. The hook is baited, while the clip is passed to the next man to the left. On a signal about every 12 seconds, the leader is clipped to the line as it pours off the stern and the baited hook is tossed. A light stick goes on every fourth leader or so to attract fish. Better luck to us tonight!

Personal log:

My role this morning as line was retrieved was to record information (catch location, length, weight, sex) about each fish brought aboard and to assist in gathering muscle tissue samples for Brittany who is not present on this cruise as well as for others. Again I was brake man and bait boy on the longline tonight.

The afternoon hours seem to be those of least to do unless the troll lines are hot. Today I felt settled enough in the stomach to dare to enter a very confined space and enjoy my first shower at sea. Then I sought out a shadey spot on the upper deck where I parked myself for a bit of reading. The wind was light and sea calm; I had a nice view of the west side of Hawaii. The lush, green slopes were interrupted in several places by lava flows. I had the opportunity to talk with the captain about many aspects of the ship, weather, ocean currents much of which I will try to incorporate into upcoming reports. But I was particularly interested in our rough weather of Sunday and he explained it as follows. As we crossed open water we were encountering winds of 20-25 knots, but as we entered the channel between Maui and Hawaii wind speeds were 35-40 knots. The reason for the increase is that both islands have very high mountains so the air is being funneled through a rather narrow slot and speeding up. This produced 10-12 foot waves with very short periods, and the ability to create a lot of discomfort in those at sea.

Tonight as we work, the light of a full (?) moon dances on the water.

Question:

One more (easy) location question for the astronomy buffs: Our latitude today is about 19 degrees north. What is the altitude of the North star (Polaris) as we view it from here? What is its altitude at your latitude?

OK, so we know where we are, but how did the Hawaiian islands get here? All of these islands are of volcanic origin. The Hotspot theory explains how the islands formed here. Briefly describe this theory.

Which of the islands (easternmost or westernmost) are the oldest in the Hawaiian Island chain? How long ago are the oldest islands estimated to have formed?

The Galapagos Islands also formed according to the hotspot theory. Which islands in that chain are oldest (eastern or western islands)? How old are the oldest of those islands?

For those who are wondering, yes, I do expect to be able to post some pictures, but we are not quite set up yet at this end to do so. That's all for now,

Geoff

Wednesday, May 5, 2004

These data noted at about 1600 hours:

Lat: 19 27

Long: 156 02

Sky: Sunshine; clouds hanging over coastline

Air temp: 26C

Barometer: 1011.0

Wind: 290 at 11 knots

Relative humidity: 55%

Sea temp: 26.7C

Depth: 2392 m

Science and Technology log:

Retrieving the longline takes about 2.5 hours. This morning it brought in one mahi mahi (dolphinfish) alive, and one bigeye tuna that had died on the line. Trolling afterwards brought in 3 more fish including one big eye and two yellowfin tunas. Samples were collected as yesterday.

I will give you a better idea over the next few reports as to how different samples are going to be used. I'll start with the blood serum, liver and muscle tissue samples being taken by Michele who is from Virginia Institute of Marine Sciences (VIMS).

The blood serum contains a compound called vitellogenin. It is a precursor to a protein needed for egg yolk production. It is typically in relatively high levels in females. Environmental stresses such as persistent organic pollutants (POPs) which include PCBs, pesticides such as DDT and chemical flame retardants among others, can elevate vitellogenin levels noticeably in males. A heightened level suggests that their immune system is compromised. Serum will be analyzed for levels of that compound.

Liver, muscle tissue and serum will be analyzed by gas chromatography and mass spectrometry for the presence of POPs. From all of this it might become possible to determine if there is a correlation between level of POP and presence of vitellogenin and therefore stress on the immune system.

Surface plankton tows were done this afternoon, and tows at depth (60 meters) will take place tonight after longline is set. Tonight's set of the longline will be north to south just a few miles west of where the first two were set. Both of those were set along a north to south line which overlapped by about 1/3. (They were not 20 miles apart as I stated yesterday) I learned that the line was intentionally cut last night probably by some fishermen who felt this line intruded upon their territory. We did recover all of our gear.

Personal log:

It was not until nearly the end of the longline recovery that the two fish were hauled in. Consequently, it was a long morning and as it was looking totally unproductive, Chris, our physician assistant/medical officer, suggested that the teacher at sea program was really a way to get people on board in case a sacrifice is needed to make the waters more productive. No wonder my students were encouraging me to participate. But later I heard that it was bad luck for our fishing to eat bananas on deck so eyes turned toward several who were in violation and ignoring that doctrine. I wonder what it will be tomorrow.

The big eye which came aboard was not identified with certainty until opened. Striations on its liver, I presume not present in other tuna species (certainly not in all) confirmed it to be big eye. I asked chief scientist, Rich Brill, the significance of those and he explained in some detail that they are part of a mechanism for keeping the liver warm. I will attempt to explain that mechanism another time. It is a neat piece of plumbing for sure.

I also observed Steve as he used a laser to determine the focal point of a big eye's lens for each color of light. This, too, is something I will try to explain at another time. The big eye tuna's lens was nearly spherical and about 3 cm diameter.

For a change of pace, here are a few bits about the ship that the captain shared with me yesterday. This was built for the navy in the 1980s as a listening ship for submarines. It was refitted for research in Jacksonville, Fl then brought here through the Panama Canal. It can store about 30 days of food and enough fuel (160,000 gallons of diesel) to stay out comfortably for about 50 days. We can make our own fresh water at a rate of approximately 3000 gal/day.

Questions:

How do eruptions of Hawaiian volcanoes compare to those like Mount St. Helens, for example?

The height of these volcanic islands affects wind speeds and sea conditions as noted yesterday. How much above sea level is the highest point on Maui? on Hawaii? If you consider its base on the ocean floor as part of its overall height, how tall is the highest peak on Hawaii? Is that taller than Mt. Everest?

It's nice to be hearing from some of you; thanks for writing. That's all for now.

Geoff

Thursday, May 6, 2004

Local Time: 1600

Lat: 19 19 N

Long: 155 57 W

Sky: thin overcast

Air temp: 25.5 C

Barometer: 1011.28

Wind: 348 degrees at 9 knots

Relative humidity: 59.9

Sea temp: 26.6 C

Depth: 1997 m

Technical and Scientific log:

Longline retrieval began as usual at 800 hours (Can you tell I'm getting more than just my sea legs?). Everyone was feeling optimistic as various (secret) measures were employed through the night to ward off another disappointing haul. We did begin with a bit of bad luck as the line somehow got under the hull. (Obviously we have a few kinks to work out of the rituals.) Rich indicated that we had lost a couple big ones because of that. But we did land 4 fish – 2 dophinfish, alive, and 2 broadbill swordfish (*Xiphias gladius*) both dead on arrival. The latter were young fish just over 100 cm and each with a bill of about 52 cm which I collected. Hoping to get them home, but airline security might have something to say about that. We also brought on a couple yellowfin and a skipjack tuna while trolling through the afternoon and evening.

Yesterday I gave you an idea as to how Michele will use the blood, liver and tissue samples she is collecting. I am gathering muscle tissue samples for Brittany who is a grad student at Univ. of Hawaii, I believe. Those samples are to be used for stable isotope analysis of these pelagic fishes. I cannot recall enough about this and no one on board can help me give you an explanation of that work, but I will get details eventually. Let it be enough for now to say that the data collected should provide info on the trophic history and possible migration patterns of these fishes.

Some pilot whales and dolphins swam with us briefly today. No day time plankton tows today.

The depth of our longline sets the past couple nights has been about 40 meters. Depth of set depends on what you are trying to catch and the lunar cycle. Rich suggests that perhaps we should have been deeper. On full moon, for example, you would set deeper than at new moon. The fish tend to adjust their depth to maintain a rather constant level of light.

We are not setting the longline tonight. Winds have calmed outside of this area so we are going to head away through the night in search of happier hunting grounds (or should I say "fishing waters?")

Personal log:

Given "gentle" seas, life on this vessel is very comfortable. Of course, gentle is a relative term and one that I hope in short time comes to be useful to me in situations that currently bring on thoughts like "why did I ever decide to do this?" (That only happened Sunday into early Monday; I'm having a great time since then.) Today I want to tell a bit what it's like on board.

Most interior space in the ship is air conditioned; only stairwells are not. This contrasts quite favorably to the first research ship I went on. I remember very well the mens' quarters -- hot, hot, hot as it was just forward of the engine room, always smelling of diesel, "bunks" 3 high with about a foot of head room, and only a red lamp for lighting.

Here, I share a room about midship just above the main deck with Rickard, a Swedish graduate student working with Kerstin on the vision studies. Our stateroom is about 10X15 feet. It is carpeted, we have bunk beds, a desk, sink, closet and a window. We share a toilet and shower with one other person, a crew member, in the adjoining room. I think all of the science personnel are on this deck.

Meals/food service are excellent. The galley is always open and we may help ourselves to a variety of treats, snacks and real food at any time of day. For breakfast, cold cereals, bread, fruits, hot drinks and juices are available and the galley staff will prepare eggs, pancakes, meats, hot cereals as to your order.

Lunch and supper always include a salad bar and your choice of 2 entrees and a variety of side dishes. Not that we are on a strictly fish diet, but all of the fish that we have taken for specimens are immediately iced down and saved for the cooks who have many ways of making them a treat for the palate. Tonight featured freshly caught ahi cooked on a grill on deck.

Last night's sunset was a beauty. I saw for the first time, the "green flash".

Questions:

Lets turn to the atmosphere for a few questions. If you are keeping up with answering the questions (or just look above), you have an idea of the latitude of the islands. What is the name, including direction, of the global wind belt the Hawaiian islands lie within?

The ship has been sailing along the west coast of the big island, Hawaii. Is this the windward or the leeward side of the island? The heights of Maui and Hawaii help create the weather observed on different parts of the islands. Look at a map of Hawaii and find the towns, Hilo and Kona. Which of the two would you predict to have the drier climate? Why? Check some other sources for precipitation records to find out if you are correct.

You can try the same for Maui. Hana is on the east side and Lahaina is on the west. Make some predictions as to the relative climates of each town then check other sources of climate data to see if you are correct.

If you have any questions, please send them my way.

Geoff

Friday, May 7, 2004

Time: 1615

Lat: 18 41N

Long: 158 34W

Sky: scattered cumulus clouds; bright and sunny

Air temp: 26.6 C

Barometer: 1012.04

Wind: 87 degrees at knots 6.7 knots

Relative humidity: 50%

Sea temp: 26 C

Depth: 4558 m

Scientific and Technical log:

We left the shelter of the Kona coast and steamed all night toward Cross seamount arriving there between 0900 and 1000 hours. We trolled a couple lines across it for several hours but pulled in no fish. This is where we wanted to lay the line tonight, but in communicating with a fishing vessel in the area, that crew indicated they have 30 miles of line in the water now. Protocol, I presume, says it's their place for now so we will respect that and go elsewhere.

Elsewhere is another seamount about 45 miles west and slightly north of Cross. But why are we hanging out at these things called seamounts? Rich (remember, chief scientist) explained to me that above seamounts are local currents called Taylor Columns that sort of swirl around above these features. Small fish tend to concentrate within these and, of course, that attracts the big boys. Cross is well known for that effect due to its shallowness (182 fathoms). The one we are going to is much deeper and consequently does not have as dramatic an impact as Cross.

Here is a bit about a couple tools that we are not using on this ship for this mission. One is called the Acoustic Doppler Current Profiler. It sends out a high frequency signal and allows determination of current direction and speed under the ship. Another is the CTD (conductivity, temperature and depth). This circular array of water sampling bottles is lowered into the water. Temperature and conductivity are monitored and recorded continuously as it moves through the water. On ascent, bottles can be triggered to close at specific depths thereby bringing water samples from different levels in the water column for further testing on board.

Personal log:

More about life on the ship:

There will be no shore time during this trip, but there are several forms of entertainment aboard. Just listening to crew members speak of other places and projects around the globe they have participated in on NOAA vessels is fascinating. There is a small work out room and a couple rooms where we can view videos/cds or watch TV. There is quite a library of viewing materials and books available. Some crew members have their own TVs and stereo equipment in their cabins. On the more mundane side, there is a laundry to do personal items and once a week stewards give us a change of linens and towels.

Communication with home:

We download and upload email three times per day: 0700, 1300, and 1900 hours. Phone calls can be made but they are expensive and generally reserved for emergencies. The ship's total communications bill can run up to \$10,000 per month. So far, a typical day for me has been something like this after breakfast (0700-0800): collect samples from longline catch, assist cleanup, cleanup self, lunch (1100-1200). Check emails, enter some notes to log until tiring of that, R&R (reading, snoozing on shaded deck, interview someone or observe their work) and help with any fish coming in on troll lines. Dinner (1630-1730), R&R, input to log, help set longline (2000 -2130), finish the day's log and send to Washington (that makes me sound pretty important doesn't it?), R&R, and to bed 2300-2400 hours.

Since we did not set a line last night and no fish came on by trolling today was kind of slow. I used the time to have a tour of the bridge by executive officer Sarah and electrical technician, John. It was very interesting to learn more about the ship's scientific monitoring abilities (as briefly and incompletely described above), navigation and safety features for times of distress.

Crew assisted me to string my swordfish bills so to drag along behind us. This is done to get some of the flesh and oils out of them. I am told that this will take a week or more to accomplish.

Questions:

Estimate the distance in miles between yesterday's and today's position (today at 2018 hours we are at Lat 18 53 N and Long 158.59 W).

What is a seamount?

Looking at the nautical chart on the bridge I can see the top of Cross seamount is at (a shallow) 182 fathoms. We are headed to one that is 406 fathoms. Between the two the chart shows a maximum depth of 2585 fathoms. What is the depth of the water over the seamounts and the deepest point between them in feet?

Geoff

Saturday, May 8, 2004

Time: 1820 (I'm late today)

Lat: 18 12 N

Long: 158 26 W

Sky: beautiful day; blue sky with scattered cumulus

Air temp: 25.9 C

Barometer: 1011.9

Wind: 70 degrees at 6 knots

Relative humidity: 52%

Sea temp: 27 C

Depth: 3571 m

Scientific and technical log:

The longline brought in just two escolar (*Lepidocybium flavobrunneum*), an oily tuna (not ones we keep for eating) that tends to live rather deep. It is a dark colored fish unlike the shallower water tunas and mahi we have brought up which are nicely (sometimes brilliantly) colored. Its eye is very large and reflective like a cat's eye though silvery. It is quite striking. So anyway, a bit of excitement there, and I got to see a species new to me. I don't think I gave any description of the longline retrieval yet. The ship maintains a course to keep the line perhaps 30-40 degrees off port side. The line comes up midship over a pulley at the spool and is wound onto the spool. As leaders come up they are unclipped at the pulley and passed to others who remove bait and return hooks, leaders and clips to storage barrel. If a fish comes on, the spool is stopped until it is landed and removed from the retrieval area. It is a challenge for crew on the bridge to maintain the proper course for the ship with respect to the line. Because the ship is moving slowly during the process and the process must be stopped for fish or entanglements, recovery of the line takes much longer than the set. I don't think we've done it in less than 2 hours. Nothing came up by trolling today and no plankton tows were done. Tonight we are south of Cross Seamount (at 2000 we are at 18 08 N, 158 27 W) to set the line. Again we are not at Cross because of another boat's presence. I'm the starter on the bait box tonight. I hope I can fulfill the duties, after all I'm a rookie and used to coming in only as the closer so far. I guess they'll try anything to change our luck.

Personal log:

After completing my log last night at about 2030 I went to an upper deck where we have strung a hammock. I was a beautiful starry night -- the clearest we have had. A warm gentle wind blew over a sea rolling under us as one foot swells. The bright orange waning gibbous moon rose 20 minutes later a cast its long shimmering light across the water as it rose higher. The Big Dipper was easily apparent pointing toward Polaris only 18 degrees or so above the horizon. As new constellations took their place above the eastern horizon a couple of meteors streaked by. I was reluctant to leave the scene for my cabin. I made the mistake of telling folks about it today; there could be some competition for that hammock tonight! In preparation for upcoming editions of the log I

spent an hour or so with Kerstin discussing her work with vision in these pelagic fishes. Wow! I'll be sorting that out for awhile -- very interesting stuff. I finished a book, *The Great Biologists*, written in 1932. Obviously many more recent greats are not included, but I enjoyed reading about the men included from a 1932 perspective. It is of interest to me to learn more of the impact of particular work at its time in history and of the personalities of the men themselves. It adds some new dimensions to teaching of biology that might captivate a few students as bits and pieces can be appropriately included. We had a small group of dolphins leaping high as they passed the boat. Flying fish are a common sight; crewmen report that often they are found on deck in the morning. We have a pair of birds, a type of booby I believe, hitching a ride with us. They are leaving their mark all over the bow which is not pleasing the crew and have thus been dubbed "John's nemesis". But for those of us who don't have to swab the deck, it is neat to have them around and to watch them feed. From their perch they seem to spot a fish leap from the water and take off. They follow the fish 10-20 feet over the water as it swims and at an instant make a fast dive for it and quickly take flight again. Many of us had our supper on the deck tonight -- my first mid-ocean picnic. A clear horizon at sunset gave me another view of the green flash. Venus (I think) set about 2135 just as set of the longline finished. And as predicted, there is a crowd gathering on the bow for moonrise.

Question:

There is no "south pole star" as we think of Polaris as our "north pole star". How can you use the Southern Cross to point you in the direction of the south pole?

Off to join the bow party,

Geoff

Sunday, May 9, 2004

Time: 1600

Lat: 18 39 N

Long: 158 17 W

Sky: A few more cumulus clouds around today (40% cover)
but they didn't

seem to get in the way of the sun too often. Some thin
stratus and
cirrus around too.

Air temp: 26 C

Barometer: 1011.5

Wind: 120 degrees at 3.5 Knots

Relative humidity: 56 %

Sea temp: 27.1 C

Depth: 959.3 m

The sea was very,very smooth throughout the day.

Science and Technology log:

The line last night was put out at Swordfish Seamount (500 meters deep), about 35 miles south of Cross. It was a bit longer than usual. Longline retrieval began 0800 and was not complete until 1130. Both the length and our better fortune accounted for the longer effort. We brought in 7 on the line today including 4 sharks. Species included the following: 1 snakefish (*Gempylus serpens* - 104 cm long and about 7 cm wide with a big eye, pointy snout and lined with very sharp teeth-- dead), oceanic white tipped shark (*Carcharhinus longimanus*) alive, 157 cm and nasty; a blue shark (*Prionace glauca*), alive, 132 cm and 32.5 kg, rather docile onboard, very pretty coloration -- grayish belly softly blending to a blue dorsally; a big eye thresher shark (*Alopias superciliosus* -- love that name) a bit of life in him but not much, 136 cm + tailfin, 51 kg, its curved tail fin nearly the length of his body; a silky shark (?) alive; an ono or wahoo, a dolphinfish and an escolar. I took some samples of blue shark and thresher shark teeth. A pretty exciting and busy morning. For most of these fish their fate in our hands was the same as usual. But the real excitement was bringing on the live sharks. As they are drawn near the ship, netting held in place on a 3 foot by 6 foot rectangular metal frame is lower to the water by a winch. The fish is brought onto it and hoisted aboard. There are a few seconds of near terror as this thrashing animal hits the deck wielding danger at both ends of its body. A mattress like cover is thrown over each end and weighted down by human bodies (mine was not one of them today, but I'll take my turn eventually; how many people do you know who have ridden a shark?).

The oceanic white and the silky were tagged with the pop ups. To do this a hole is drilled through the base of the dorsal fin. Line looped through that hole attaches the pop up to the animal. Fin clips and blood samples (if possible) are taken as are any remoras attached to the sharks. Then another moment of fear -- restraints are withdrawn and animal is sent overboard as quickly as possible. Description of the satellite pop up tags: Each is about 12 inches tall. At the base is a light sensor, above that a cylindrical housing about 1 inch diameter, next a swollen area about 1.75 inch diameter (the pressure sensor) above which is an antenna about 6 inches long. Each costs about \$4000.00 including about \$300 satellite time to upload data. Since a signal cannot be sent through seawater to the satellite, the units acquire and store data until a preset pop up date (8 months is about max given battery power of the unit). Then they are released automatically, pop to the surface, find a satellite and dump info to it. The system allows us to track fishes vertical movements (by pressure changes) and horizontal movements by measuring ambient light levels. The latter tells us daylength which can be used to estimate latitude to perhaps within a degree and time of dusk and dawn, which when compared to Greenwich can indicate longitude.

But what if the animal dies before the 8 months are passed? If the animal is headed to the depths, at 1200 meters pressure causes release of the pop up. If no vertical change is detected over 4 days (animal has died in shallow water), they release. Other things can happen that disable the pop ups. They might get broken or eaten by other animals. Only about 1 in 3 tagged swordfish and big eye thresher sharks are heard from if tagged.

Those animals go surface to 600 meters often and rapidly subjecting tags to quick temperature and pressure changes that might disrupt operation of the device. In spite of the obstacles, data is gathered from about 60% of the pop up tags deployed. An alternative is small archival tags that get implanted right onto the animal. These cost only \$800 and have much greater storage capacity than pop ups so can provide much more data. However, these must be recovered -- the fish have to be recaptured in order to get the info from the tag. That's a tough order in this big ocean and recovery rate is indeed low. Setting longline again tonight in same area. At 2042 we are at lat 18 16 N and long 158 27 W.

Personal log:

Last night was spectacular. Brilliant stars horizon to horizon -- a star show above, including the Southern Cross, that was equalled in beauty and wonder by the light show in the water. Bioluminescent organisms were ablaze off stern. It looked like the Milky Way in the water but with the stars turning on and off and swirling about in a frenzy. Some were mere points of light, sometimes things flashed as a light bulb going quickly on and off, and once in a while a ghostly basketball sized sphere tumbled through the view. It was hard to know whether to look up or down for fear of missing the next dazzling event.

And yes, there was a small crowd at the bow to admire the moonrise at about 2345. The ship as always held its position near the longline set. As such we are sort of at the mercy of the sea, just rocking and rolling as it moves beneath us. It is to me a very pleasant motion, one that just rocks you gently to sleep. I have never been on a cruise ship, but friends who have tell me there is no (or little) sense of motion to the ship. Perhaps this is comforting to some, but I like the total experience (within reasonable limits, of course) and these last two nights have been perfect in all respects. I am handing off my duties as brake and bait man to others this evening so that I might digest and organize some of the info passed to me by Kerstin and others in the last couple days.

Questions:

Here are a couple relating to ocean currents. Look at a chart that shows ocean currents along the US east coast (southern and mid-Atlantic states) and for the US west coast (Washington to California). What is the general direction of the flow along each coast? Along which coast, especially in summer, would you expect ocean water to be warmer? Why?

I have given you daily temperature readings for the sea water here at about 18 degrees north. The Galapagos Islands straddle the equator far to the east of here off the west coast of South America. You would most likely expect the water there to be warmer on average than around the Hawaiian Islands. Is it? If not, what accounts for the difference?

Happy Mother's Day,

Geoff

Monday, May 10, 2004.

Time: 1600

Lat: 18 41 N

Long: 158 19 W

Sky: Sunshine with scattered cumulus; beautiful day.

Air temp: 27.3 C

Barometer: 1010.92

Wind: 68 degrees at 8 Knots

Relative humidity: 47.9%

Sea temp: 27.1 C

Depth: 1674m (at 1800 hours, Lat 18 25N, Long 158 27W)

Sea: A few white caps tonight. What might they foretell?

Science and Technology log:

Pretty good day on the line. We tagged a yellowfin tuna (on board) and a broadbill swordfish (in the water). In the latter case, the tag was attached by sort of harpooning it into the animal from deck. We also pulled in a snakefish (head only), a big eye tuna, 2 escolar, a barracuda (of no interest so simply cut off the line) and 3 blue sharks. One was too large to safely bring aboard; it was cut loose. The two others were brought on board. From one we took blood and fin clips after which it was released. One fish was brought in by trolling today.

As you have noticed water temperature here would be quite comfortable for us (but we are not taking afternoon swims). Rich explained to me that here there is mixing of the surface layers such that the surface temps. I have been reporting would apply to a depth of about 100 meters. Then between there and 400 meters we would see about a 10 degree C drop. While some fish stay in the upper layers others hang in the depths or make regular vertical transgressions across these zones.

Fish are generally regarded as having body temperature at or very near ambient. Any heat produced in the muscles by aerobic respiration is picked up by the blood and circulated through the gills where that heat is dumped efficiently to the environment. Some saltwater fish (no freshwater ones) including tunas and some sharks have developed a kind of heat exchange system. Heat from venous blood is passed to arterial flow in order to keep certain muscles and organs above ambient temp. by as much as 20 degrees C in large fish. This allows body tissues and organs to work more efficiently.

Billfish such as swordfish also have a heat exchange system but it is located only around the eye and brain. Here certain eye muscle is reduced to little more than a container for mitochondria which generate lots of heat. The heat exchange system then only serves this region of the body keeping it above water temp. Still busy at Cross Seamount. The

fishermen must be having a big time up there. We are setting at Swordfish again tonight. (Lat 18 17N Long 158 22W at finish of set)

Personal log:

Those oily escolar are not being kept for consumption. This morning we took one's eyes and made a short incision along the belly just to take some muscle tissue. In returning the escolar bodies to the sea I have scored their diving entries 1-10 as in competitive events. Most have been dropped straight in, but this morning I thought of trying something with a higher difficulty factor -- a one and half back flip with tail entry. But on its first rotation, a bit of the entrails was ejected shipward striking me on the shoulder before falling to the deck. Unfortunately, this was not captured on film for replay tonight on "Funniest Ship Videos", but for those present, it provided a good bit of humor to start the morning. Hereafter, we might just stay with the less ambitious dives. Spectators were glad it was I and not they.

Later I made my debut as a shark wrestler. As a rookie I was given the tail end. Even though the blues are comparatively tame once on board, the strength in the animal's body was very evident as it tried to move -- not so sure I care to deal with the other end of these babies!



Questions:

This question relates to paragraph two of the science log. What is the thermocline within a body of water? How would you expect a temperature profile to change through the seasons in a deep lake in central Pennsylvania?

Any questions from you folks???

Geoff

Tuesday, May 11, 2004

Time: 1600

Lat: 18 49 N

Long: 158 03 W

Sky: A gray overcast morning with a couple of showers. Brightened through the late morning and stayed mostly(thin)overcast but enough sun to cast shadows and feel pretty intense. 90% cloud cover through most of daylight hours. Tonight the sky is star-filled -- beautiful.

Air temp: 26.3 C

Barometer: 1011.9

Wind: 100 degrees at 8 knots

Relative humidity: 66.9%

Sea temp: 26.7 C

Depth: 3333 m

Sea: A bit of chop especially this morning when wind seemed stronger. There were a couple of splashes onto the deck as we brought in the line this morning. Still some whitecaps this afternoon; well settled this evening.

Salinity: 34.4 (I thought some might be wondering; it has been consistent throughout)

Scientific and Technical log:

This morning we brought in several escolar (none scoring better than 4 as they belly flopped to the surface), a yellowfin tuna which was tagged and released, and three blue sharks (one was kept and two were returned after blood samples and a couple remoras were secured). Shark wrestling is getting to be routine. Since then we have been steaming northeast beyond Cross Seamount. At 2000 we are at Lat 19 10N and Long 157 45 W as we begin the set.

On minor correction: sharks and other big fish brought on board are hoisted by human muscle using a block and tackle (not a mechanical winch as stated previously)

Kerstin Fritsches from the University of Queensland in Brisbane, Australia is working on vision studies of the fish. Her husband, Steven Evill (often affectionately referred to as Dr. Evil) assists as do three graduate students, Rickard and Eva from Sweden, and Kylie, also from Brisbane. It is for these studies that the eyes are taken from the animals. I will attempt to explain some practical applications of their studies and give you a sense

of the kinds of work being done on board. I will do this in several editions of the log -- not all at once. So to start ---

Fishes, depending on species may use a variety of senses to know their environment. Scent, for example, may allow them to home in on prey. While research goes on by others to analyze other sensory structures and abilities, Kerstin's work is about vision. The attempt is being made to find out just what these different fishes are able to see. Do they see differently and, if so, how so? The practical application for longline fisheries, a very indiscriminate practice, is to eliminate by-catch. This can help protect endangered species and make longlining more cost and time efficient by finding ways to attract only economically valued species.

The water column is visually quite a varied environment. Longer wavelengths of red light are essentially filtered out and gone within the first 50 meters below the surface while shorter wavelengths in the blue range penetrate the depths. But imagine hanging out, living, and hunting at 600 meters as some of these fish do, in daytime light levels the equivalent of a starry night at the surface. Some such as swordfish and bigeye tuna come toward the surface at night keeping their exposure to light levels constant. Imagine your life spent in light levels no greater than that of a starlit night. What adaptations do these animals have to accommodate such a lifestyle? What are different parts of the visual apparatus doing in these animals? In order to help uncover answers to these and other questions, three kinds of projects are going on here.

When a live fish of desired species comes aboard, it is first killed then its eyes are taken. Kerstin and Rickard must have living tissue from the retina for their studies. They have about 20 minutes in which to get the tissue they need into a special oxygen-rich solution in which the tissues will be good for 6-8 hours. Steven works with lenses which do tend to cloud over time, but he is able to easily accomplish his work before that happens. For Eva and Kylie there is no rush as their samples, retinas and eyes with only lenses removed, are destined to be preserved for later study at home. I'll pick up from here tomorrow with details about specific aspects of the work on vision. In preparation you might look up what the retina and lens of the eye do.

Personal log:

I observed our hitchhiking birds in a new feeding maneuver this morning. A bunch of flying fish took to the air and were happily gliding along. Our friends took after them and approaching from the rear snatched them out of the air.

Filling in the non-fishing time gaps: Last night I interviewed Eva about her part of the vision studies and this afternoon Rickard took me through his experiments. At home in Sweden he does vision studies on insects, moths and butterflies in particular. I am also reading Adam's Navel which I can recommend to those with an interest in human biology written in an interesting non-technical and often humorous style. And it is often nice to find some shade, a comfortable deck chair and with a beverage in hand stare across that wide, blue expanse of water.

The days pass quickly.



Sunset from the ship.

Questions: I am happy to report that we are eating quite well on our voyage, but that was not the case for early voyagers across the seas. At times they might have had plenty to fill their stomachs, but at the same time lack a balanced diet. Because of this, one condition the mariners suffered was scurvy. What are the symptoms/problems associated with that condition? What can be done to prevent it? See if you can find out when and how the solution to the problem was discovered.

Geof

Wednesday, May 12, 2004

Time: 1745 (Later than usual due to busy late afternoon fishing)

Lat: 18 33N

Long: 158 20 W

Sky: Somewhat overcast this morning but a nice sunny day overall.

Air temp: 26.5 C

Barometer: 1013.5

Wind: 90 degrees at 10 knots

Relative humidity: 63.5%

Sea temp: 26.3 C

Depth: (forgot to check)

Sea condition: Good sized swells today kept us rocking and rolling pretty good throughout the afternoon and evening. But it wasn't discomforting at all.

Scientific and Technical log:

Brought up 3 escolar and one wahoo on the longline this morning -- not a very exciting time. The set was about 30 miles ne of Cross seamount. After retrieval we steamed south again through/over Cross and back to the area of success around Swordfish seamount to set the line tonight. Along the way we encountered several so called "bird piles", congregations of birds on the water, indicative of fish below. Passing over Cross we pulled in 5 mahi mahi, a small yellowfin tuna, and 4 bigeye tunas. It was a busy late afternoon. There's lots of fish on ice for upcoming meals!

Returning now to the vision studies:

This afternoon Eva gave me the tools and an escolar eye and had me go through the procedures she follows to get what she needs for her studies. (Kylie basically does the same procedure but uses skipjack tunas). I'm not ready for microsurgery yet, but she gave my effort a thumbs up as I successfully secured the materials she needs for later study.

As the eye is taken from the animal marks are made on it with a scapel to mark its orientation in the animal. After measuring eye cup and pupil size, the cornea and lens are removed and a bit more scraping and cleaning eventually leaves her with optic nerve, retina and vitreous to be preserved. This took me about 45 minutes to do.

Back at her university lab, the retina alone will be used. sections of the retina will be mounted for microscopic examination. With it she can answer questions such as 1) what do the photoreceptor cells look like? 2) Is there a variety of types of receptors in their eye? 3) What is the density/distribution of receptors across the retina? In another study she makes other preps for microscopic examination to observe density of ganglia in the retina.

Personal log:

I had some ideas for tonight's entry in this section, but this boat is rocking pretty hard right now and sitting in front of the computer is not particularly pleasant. I'm cutting things short tonight.

Geoff

Thursday, May 13, 2004

Time: 1545

Lat: 18 42 N

Long: 158 16W

Sky: Sunshine; scattered thin cumulus clouds around

Air temp: 27 C

Barometer: 1010.9

Wind: 120 degrees at 12 knots

Relative humidity: 58.3%

Sea temp: 26.3 C

Depth: 378 m

Sea: Much settled from yesterday; the ride is far more comfortable today.

Scientific and Technical log:

Longline was not too productive today with only a few couple escolar, two barracuda which we just cut loose, a blue shark that got away before getting onto deck and a dead swordfish. I think the only thing we kept was a small remora which came back on one of the baitfish. It was different from remoras we have seen on the sharks in that its body was more eel-like. Remoras have a head that is flattened on top where they have an adhesive disk. It allows them to attach to other animals. Some remora species are host specific, but many will attach to a variety of animals.

Longline is set tonight again at Swordfish Seamount. Still busy at Cross.

I cut off on Eva's and Kylie's work a bit abruptly yesterday so lets go back to the significance of what their particular aspect of the vision studies reveals. Several photoreceptors can feed into one ganglion. The number of photoreceptors feeding into a given ganglion can give us clues about how the animal sees. The higher the number of receptors plugged into a given ganglion the more sensitive it is to light but the less acute is the vision.

The types of photoreceptors present can give us a sense of whether the animal has color vision or not. Color vision is associated with the cones; rods with black and white. Among the cones, there are double cones and single cones. Their distribution in the retina is important. Double cones tend to be more sensitive to light than single cones. In blue marlin, for example, it has been found that double cones are concentrated at the top of the retina. They are, therefore, directed downward where the light is dimmer; single cones are at the bottom and directed upward at brighter areas.

More tomorrow about vision studies (if I get it figured out).

Personal log:

The bunk seems to get more comfortable every night. This morning I didn't wake up until sun was well up and shining brightly upon us. Must be the soothing rhythm of the waves rocking us all (or just me) to a good rest.

After the uneventful longline retrieval, I spent time working through some of the material Kerstin gave me related to the vision studies attempting to put it my own understandable terms. She and her assistants have been very willing and able aids in that formidable task. Mid-afternoon studies were interrupted by a ruckus on the stern. Kylie and I rushed to the scene --- And there they were, two men engaged in a duel with an unidentified opponent. Doc Chris was apparently first to come to the alarm as line fed furiously off the reel of our trolling gear. Though untrained in this kind of battle (as he is more familiar with tactics on the chess board) he stood his ground with grit and determination. Biceps bulging, faced flushed red, beaded with sweat he battled his foe for 10, 15, 20 minutes or more (with momentary time outs for photo ops, of course -- the

family had to see this!). In stepped assistant scientist Mike to double team the beast for a time. Chris kept control while Mike rested the rod over his shoulder and two others pulled on the line. It was four against one. But one what??? As Chris neared exhaustion, Mike took the rod, dropped to a sitting position in a deck chair and took charge. We had yet to see what we were up against. No fight was felt in the line, just a steady tug. Was the battle with a fish or someone's discarded net? Suddenly Mike's chair was thrown or pulled forward dropping the front legs into a crevasse in the deck. To a more fortunate beast this might have meant its freedom, but Mike was focused on his duty and didn't miss a beat in the struggle. Twenty minutes more, now with the assistance of Dan and Chris (yep, the doc's right back in the action!) pulling the line in and feeding it to the reel as Mike cranked, the reel getting so hot that Mike called for a water bath. An army of cheering fans gathered for the spectacle. Mike detects a fight in the line. Soon afterwards onlookers spot flashes of color. It's a beautiful yellowfin tuna perhaps 150lbs. "Tag it, tag it" shouted the crowd among a few calls for the gaff. Rich, initially reluctant to try for the tag, took up the challenge, but short reach and inability to position the fish for a good shot at it made success seem but a lost hope. More calls for the gaff. Then someone suggested maneuvering to port side and hoisting it with the net. A scramble to remove obstacles cleared the way for the operation. New players entered the scene -- our skilled team of mariners swiftly deployed the necessary gear and landed our quarry on deck. Subdued, bestowed with its \$4000 adornment, it was quickly released to serve as a swimming laboratory for the next 8 months. Cheers to all with special accolades to Chris and Mike on a job well done.

A night off from longline duties for me tonight. spent some time with Kerstin for clarifications that with a bit of luck I will be able to recall tomorrow.

Questions:

Striped marlin have bands on their body that show up in the ultraviolet range of the spectrum yet these animals do not see far into that range themselves. Some of their prey do see well into that range. Can you suggest any ideas as to why their bodies would have coloration that they cannot see but that their prey can? Could there be any selective advantage in this for the marlin? for the prey?

Geoff

Friday, May 14, 2004

Time: 1600

Lat: 18 40 N

Long: 158 14 W

Sky: Sunny with widely scattered cumulus

Air temp: 26.4 C

Barometer: 1011.26

Wind: 172 degrees at 12 knots

Relative humidity: 61.4%

Sea temp: 26.4 C

Depth: 888.5 m

Sea: A few white caps out there; swells in 1-3 foot range -- easy going today.

Science and Technology log:

A fairly exciting morning on the longline. Several escolar, a barracuda, and a pomfret (a laterally flattened fish about 30cm long but only 2-3 cm in width with a fine set of sharp teeth). Samples taken from all. We also had a blue shark from which samples were taken and an oceanic white tip shark which was tagged and released. I got to wrestle both. Picked up a few remoras from the sharks. We think we have at least two species of remoras.

This afternoon we passed over Cross Seamount and traversed it several times as we trolled but to no avail. There will be no longline set tonight since we have a date in Kona to drop off one of the current scientific party.

I want to fill in with more of the vision story this evening if I can stay coherent long enough to convey it sensibly. I will touch on the work of Steven, Kerstin, and Rickard.

I have been collecting samples of fish lenses. They vary in size, as you would expect, among different sized fishes. What makes the lenses different from those of most vertebrates is that they are spherical rather than oval in cross section. The cornea of fish is also optically non-functional. Since it has the same refractive index as water, focusing is done by moving the lens back and forth in the eye rather than by changing the shape of the lens as our eye muscles do.

Steven uses laser light to determine the focal point for different colors of light. He suspends lenses in a fluid medium then turns on a laser beam that makes two vertical passes through the diameter of the lens. You can watch light's path change as the beam migrates. Computer analysis then determines focal point.

Kerstin and Rickard must have live cells from the retina for their studies. Among other things, they are looking at the sensitivity of these cells to different light intensities. Live retina cells convert light to electrical signals which travel via the optical nerve to the brain to produce an image. By attaching electrodes to tissue samples about 1 cm square in size and subjecting the cells to different intensities of light electrical responses of different strengths can be detected and measured. They appear as a wave pattern on a screen. As light intensity is increased, the amplitude of the wave pattern increases. So a flat line (no response) becomes one with small amplitude waves which grow as light intensity increases to a point where more light produces no greater effect.

Lets compare two species, mahi mahi, which stay nearer well lit surface and bigeye tuna which like deeper environs. Which eye would you expect to be more light sensitive? The bigeye. Their cells are stimulated by much lower intensities of light than the mahi's. They (bigeye) have to be able to detect their prey under minimal light conditions and

need the more sensitive eye to do that. Big eyes, big pupils (fish pupil size is fixed) and a "super" sensitive set of retinal cells are adaptations of these fish to their deep environment.

I've had enough (as I suppose you have too). I will wrap up the vision story tomorrow or Sunday.

Personal log:

We are headed for Kona. Although we probably will not get any shore time, it has been suggested that there might be an excursion to a place where we can swim/snorkel for awhile. I am hoping very much this is true as are others. A plunge into this element (I guess I should say compound) that we have bobbed around on top of for the past 13 days would be a pleasant change in the routine and scenery.

Reading E.O. Wilson's The Diversity of Life.

I would like to thank, Ron, a fellow teacher from Michigan who I have never met, for writing a note to tell me that he has been enjoying the logs and also to pose a question. Much appreciated!

Questions:

Sunrise here today is at 6AM and the great yellow ball sets here at 7PM. What time is it rising and setting in your area at this time of year? Find out sunrise and sunset times for the solstices for Honolulu and your area. From that determine A) how much longer the sun is above the horizon for each place in summer vs winter B) which place, Honolulu or your home has more sun time at each solstice? If you find that there are differences explain why they exist.

Geoff

Saturday, May 15, 2004

Time: 1550

Lat: 18 52 N

Long: 155 47 W

Sky: Bright and sunny over us but the island has a layer of stratus obscuring views to top

Air temp: 26.3 C

Barometer: 1012.72

Wind: 202 degrees at 12 knots

Relative humidity: 62.4

Sea temp: 26.2 C

Depth: 2015.4 m

Sea: Rolling along with 2-3 foot swells; no big deal.

Scientific and Technical log:

Scientific name for the pomfret we caught yesterday is *Brama brama* and for the silky shark (caught a week or so ago) it is *Carcharhinus falciformis*.

Today as we trolled just off the Hawaii shoreline as we steamed south to our longline set position. Mike and Chris teamed up again to land a shortbilled spearfish (*Tetraturus angustirostris*) 161 cm and 17 kg, silvery body with a deep blue dorsal fin -- beautiful fish. This one was kept for eye studies and other tissue samples. We pulled a nearly intact fish about 20 cm long from its stomach. The 2 man team of Chris and Mike is working smoothly and efficiently; no fish has a chance against them now.

We will set the longline tonight southeast of the southern tip of Hawaii at Apuupuu Seamount, 929 m below. (18 31N, 155.24 W). Following the set we will be doing a plankton tow.

Vision (one more time):

Another aspect of the vision studies is trying to assess the animal's speed of vision. Electroretinography measures the response of an eye to light pulses from a flickering source. So called flicker fusion (FF) is reached when the eye loses its ability to perceive individual pulses of light. A relatively high FF value is characteristic of shallow living species compared to deeper dwellers. In the dim light the speed of light gathering is slowed similar to the need to slow a camera's shutter speed to gather sufficient light.

In concluding this abbreviated look at the vision studies, I'll try to draw some of the pieces together. Pop up tags show where these animals spend their time in terms of depth, light and temperature realms. We can tell how sensitive an eye is to light and how fast it works. As you will recall, some of these fishes deep dwelling fishes have heat exchange system located in the eye which keep it warm. It has been shown that speed of vision is affected by temperature change -- a warm (above ambient) eye functions more effectively. Much more goes on, but perhaps you get a sense of how different areas of study contribute to a better picture of this function in these pelagic fishes.

To other (non-vision) studies tomorrow.

Personal log:

We steamed toward Kona through the night so that we could ferry Steven to shore and flights to other places. It was great to have met him; I'm sorry he had to jump ship. I got up at 5:30 to experience sunrise (around 6 o'clock). I thought it would be nice to see it rise over the island, but didn't count on the clouds hanging over the mountains to obscure anything that might have been spectacular; it wasn't even good from our perspective. But it was nice to see a color that I haven't seen (except as a flash) in over a week -- green. We have been wrapped in a beautiful blue and white world (which I am sure would excite fans of the Penn State Nittany Lions and the Mifflinburg HS Wildcats), but I tend to favor green fields and forests in the mix.

Unfortunately, we didn't get to touch the green or for that matter the briny deep as snorkeling was denied us. So it was a day of leisure on board. I spent time reading (Diversity of Life), making some journal entries and enjoying the sight of land -- perhaps the last for another 9 days (not complaining). I tried to ignore the typical signatures of human presence at Kona: autos, the Big K-Mart and Lowes perched to give exiting customers a grand view across the sea, a cruise ship at anchor, shore front hotels and homes dotting the mountainside. I directed my focus on the crashing surf, blankets of exposed black lava rock interrupting the predominant green, and sheer black cliffs dropping to the sea -- the natural stuff. It got better the further south we moved along the coast.

Dan guided Kylie and me through filleting of the spearfish this afternoon. Between the three of us (and the catch team, of course) we secured a good bit of food for the crew. This evening I split spool duty with Kerstin then took a chair from which to watch the rest of the set, read and talk with super fisherman Chris.

It's a great night back in the world of blue and white.

Question:

Can you find the point on the sea where you would be most distant in any direction from land?

Sunday, May 16, 2004

Time: 1615

Lat: 18 25 N

Long: 156 13 W

Sky: A dreary morning with gray stratus clouds all around and an occasional misting of precipitation. Much brighter sky by 1300 -- enough to cast shadows, but remained mostly cloudy throughout the day.

A pleasant evening with clearing skies.

Air temp: 25.7 C

Barometer: 1011.61

Wind: 352 degrees at 13 knots

Relative humidity: 71.5%

Sea temp: 26.4 C

Depth: 5012.1 m

Sea: 2-3 foot swells

Scientific and Technical log:

Longline retrieval started on a bad note this morning as the line went under the ship. It caused only a short delay as maneuvers were quickly and successfully made to keep it out of the propellers. We brought up an escolar, 2 snake mackerel, and a broadbill swordfish head. A large, angry silky shark came in also. The shark was released after being

tagged and "kindly" relinquishing a remora. And finally, a new species for the record, a lancetfish (*Alepisaurus ferox*). These guys look much like the snakemackerel, a long thin body up to 200cm, nearly cylindrical with a tall uneven dorsal fin (sail) standing perhaps 5 body widths high over nearly 2/3 of its back. The snake mackerel's dorsal fin does not rise nearly so much. The lancet's skin was very smooth, scaleless in fact, iridescent and rather pale. They have narrow snout with long sharp teeth.

For those interested in the studies of pelagic fishes, the Pelagic Fisheries Research Program (PFRP) publishes a newsletter which can be viewed online (I think) at <http://www.soest.hawaii.edu/PFRP>. For more on the eye work being done by Kerstin and others see Vol. 6 Number 3 (July-September 2001).

Other studies aboard the Sette:

Melissa is a master's program student at Virginia Institute of Marine Sciences (VIMS). She did her undergraduate study at UC San Diego. She has been collecting remoras, larvae from our plankton tows and stomach contents from some fishes, and fin clips from sharks. Here's what it's all about:

The remoras are being collected as a favor for her labmate's work at VIMS. That person is looking at the phylogenetics of remoras and also that of their hosts which include sharks, billfishes, and the occasional baitfish or float. She is also collecting fin clippings from sharks of the genus *Carcharhinus* (e.g. oceanic white tips, silky sharks) for another labmate working on the sandbar sharks (also in the *Carcharhinus* genus) off of Virginia, looking at natal homing patterns.

From the plankton tows, Melissa is interested in larvae of the fish family Scombridae which includes tunas, wahoo, bonitos, and mackerel. Can we find ways to identify them based on their genetics? Samples from all will be sequenced using their mitochondrial DNA in an attempt to find unique interspecific (between species) genetic markers. The value of this is that it would allow easier identification of larval types than does morphological identification. We might more readily then identify where and when particular species spawn and thereby attain a better understanding of their life histories. Are the genetics of a species uniform throughout the range of the fish? If there are significant genetic differences in populations then perhaps it is wise to manage fisheries of that species by area as opposed to globally (one size fits all approach) so as to preserve gene pool diversity. Answers to these questions could lead to management practices that better protect these resources.

This work also has applications in forensic studies. Fish that have been taken illegally and already filleted can be identified by genetic markers enabling better enforcement of regulations. Also, morphological identification of degraded tissue, as in stomach contents where enzymes have done their deed, is impossible. Stomach contents collected here will be screened using genetic markers for the tuna larvae to see if the larvae are part of that particular fish's diet. Applications from this work could potentially aid studies of trophic levels and predator/prey relationships.



Shark being lifted aboard

Personal log:

Suffered my first injury in shark wrestling today with a slight abrasion to left knee -- not enough to scare me away from the next match. Nothing too news worthy to report about the day. It was a rather slow day. Not much sun, humidity was above the norm -- a bit uncomfortable outside. Continued reading Wilson's book, did wash and stewards offered a linen change today which I took advantage of.

There was a moment of excitement this afternoon when a marlin took off with a troll line. It was out of control and our two champion fisherman couldn't handle it. Gears were stripped in the reel which actually smoked from the heat generated as line spinned off. That rod is out of action for the duration; the fish won that round.

This evening our electronics technician, John, gave me a pictorial introduction to other research cruises of the Sette which I will share with you another time. And, relieved of longline duties tonight, I spoke with Mike and science in general and some specific regarding his work in fisheries research.

To all of my '02-'03 Advanced Biology students, I am sorry to report that I was not able to make use of my Secchi disk nor did I even see one on the ship.

Question:

What does the term upwelling mean? Identify several general locations in the oceans where upwelling occurs. What is the biological impact of upwelling in those areas?

Geoff

Daily Logs

May 17 – 24, 2004

Monday, May 17, 2004

Time: 1600

Lat: 18 24 N

Long: 157 47 W

Sky: Stratus cloud layer shielded us from the sun until longline was in then it started to break up by 1030. Sun for awhile then clouded over again by midafternoon. Thinning by evening but still a good blanket on us.

Air temp: 27.3 C

Barometer: 1011.24

Wind: 35 degrees at 7 knots

Relative humidity: 54.5%

Sea temp: 26.8 C

Depth: 4489.2 m

Sea: 2-3 foot swells; no problems

Science and Technical log:

Yesterday after picking up the line we began a westward passage toward Swordfish Seamount. It was a long way off and there was no hope of getting there last night. The line was set along our course at 18 34 N and 156 47 W at no particular oceanographic feature that I am aware of. Perhaps that is why our haul today was none too exciting -- a couple escolar, a snake mackerel and two blue sharks. Only one of the blues was brought on board. We will be at Swordfish to set tonight and look forward to a more interesting catch tomorrow.

I have covered each of the areas of research going on by the science teams aboard for this cruise. Today, my focus will be on sharks. We have caught 4 species so far and that has aroused my interest in these animals. I'll provide some general info as well as some specifics for the species we have caught. For those of you interested in more, my information comes from two sources: Smiths' Sea Fishes by Margaret Smith and Phillip Heemstra, and Diversity of Life by E.O. Wilson.

Sharks along with skates and rays are among 700-800 species in the subclass Elasmobranchii of the Class Chondrichthyes. Like all members of the class, their skeletons are entirely cartilaginous, but

Elasmobranchs are distinguished by an upper jaw that is not fused to the skull and 5-7 pairs of gill slits.

There are about 350 species of sharks ranging in adult size from the 23 cm green lanternshark to whale sharks, the largest of all fishes, which reach 13 meters. Sharks lack a swim bladder, but produce large amounts of lipids which are stored as oils in the liver for buoyancy. The liver can account for up to 25% of the animal's total weight. Sharks maintain osmotic (water) balance by maintaining a high concentration of urea (so high as to be deadly to most fishes) in their blood and tissues thereby reducing water loss to their salty environment

All sharks we have caught (except the bigeye thresher, Order Lamniform) belong to the Order Carchariniform. This is the largest group of sharks; it includes about 200 species. These two orders are distinguished from one another in the following ways:

Carchariniforms: purse-like egg cases or live bearing; a movable nictitating membrane (eye covering).

Lamniforms: bear live young with uterine cannibalism (now there's an interesting bit) evident in some; no movable nictitating membrane.

There are also differences between the orders in the internal structure of their intestines -- very interesting but I won't go into description.

Specifics about each species of shark we have taken follow.

Blue sharks: the most fecund of all sharks; viviparous and bear 35-135 pups per litter; 50 cm at birth; attain 3.5 m; widespread in all oceans; favor water 12-16 C.

Oceanic white tip: in all oceans; away from continental shelves; viviparous bearing 6-8 pups usually; 60-65 cm at birth; up to 3 m; abundant in tropical seas.

Silky: widespread, prefer warm water; feeds inshore and in deep water; viviparous bearing 9-14 pups; 80-85 cm at birth; up to 3 m.

Bigeye thresher: widespread in warm ocean waters; ovoviviporous (provides embryo with no nourishment beyond the original yolk); 2 pups per litter; 100-130 cm at birth; attain 4.5 meters.

Personal log:

Well, I guess you can tell what I did today, and I might have a few more tidbits about sharks to add tomorrow. I am completing the log before the line set tonight so as to take in a movie afterwards. Don't know what's playing tonight, but it will be free and relaxing.

Tomorrow begins our last week at sea. Little time remains for you to file your questions with me. I'm looking too for suggestions for topics to try to address so if you have ideas, please suggest. I have asked for a tour of the engine room which is a possibility for Tuesday if tickets aren't sold out. That might give me some interesting goodies to pass along.

Question:

We have seen fish that are rather uniformly dark in color and some that are brightly colored. What are some of the roles of coloration in fishes (as well as other animals)? Describe countershading and how it serves an animal like the blue shark.

Geoff

Wednesday, May 19, 2004

Time: 1615

Lat: 19 15 N

Long: 157 14 W

Sky: Cloudy all day with light to moderate rain showers throughout the day after longline retrieval. Ended by supper time, but the sky remained overcast.

Air temp: 23.6 C

Barometer: 1012.5

Wind: 106 degrees 16 at knots

Relative humidity: 73.4%

Sea temp: 26.2 C

Depth: 3959.8 m

Sea: Swells less than a meter.

Science and technology log:

Not a big catch today, but everything we did catch came at once resulting in a flurry of activity for a short time. A blue shark

was kept, and our largest swordfish so far came up dead. Too bad as it would have been an excellent one to tag.

For today's in depth science report, I will refer to a couple of papers both coauthored by our chief scientist, Rich, relating to vertical movements of some of the species we have seen. Some fish tend to stay within particular vertical realms while others traverse them. What factors influence the animals' movements?

One seems to be temperature. In a study of yellowfin tuna, blue marlin and striped marlins, all three were found to descend to depths where water is no more than 8C below surface temperature. Where oxygen levels in the water are not a factor, all three of these species seem to be restricted by the effects of water temperature on cardiac muscle function.

Bigeye tuna as you will recall stay deep (500m) by day and rise to the surface waters at night. At depth the animals are exposing themselves to ambient temperatures that are up to 20C colder and oxygen levels much lower than in the upper layers. Swordfish and bigeye thresher sharks exhibit patterns similar to those of the bigeye tuna.

What about those heat exchange mechanisms described in earlier issues of my log? Shouldn't they, if present, allow a fish to tolerate a wide temperature range? While indeed they are present in some species, they are not working to keep blood warm as it goes to and through the heart. Any heat left in the blood on its return to the heart is lost as it passes through the gills. Since the heart is "downstream" of the gills, cardiac muscle remains within 1C of ambient temp. Studies show that temp. reductions cause heart rate and output to decrease. Yellowfin tuna and the marlins seem to have no ability to increase heart rate or cardiac output following sudden temperature reductions. Consequently, they stay within that 8C window of surface temp.

So how do the bigeye tunas and others manage to negotiate these temperature realms with apparent ease? The question remains, the full story unknown so untold. Perhaps by the time you are here as a teacher at sea you can fill us in with the details. I'll be waiting!

I'll complete this look at physiology tomorrow with a bit more to relay about the oxygen issue.



This was taken to show countershading and nuptial bites. The large bite is obvious but also note the smaller teeth marks below. The bites are made by the males on the females.

Personal log:

I usually have a good start on the log by supper time but not today. In the quiet following the period of intense longline activity, I began the process of securing the jaws of the blue shark for display. This was a female of good size (165cm, 45kg) and with a nice set of choppers. I was being pelted with rain as I worked through lunch and beyond. I thought if I stopped I wouldn't go back out to deal with it any more so I just kept peeling away the flesh to expose the teeth and reduce future odor issues. Had it pretty well done as chill started to get to me. I headed for the warmth of a stairwell over the engine room pausing momentarily to enjoy the (usually) stifling heat before finishing my route to room and warm shower. I did return to inspect my work. In comparing it to Eva's similar effort I felt more had to be done to match her high standard. But now it's done and jaws are held wide apart with crossed chopsticks as nature tends to the final phase.

No longline duties at the start of tonight's set which I think is in last night's neighborhood. Perhaps I will be in there as a reliever a bit later.

Question:

For something completely different and to address the history buffs among you:

How long ago is it estimated that Polynesians discovered and settled in the Hawaiian Islands? When were the islands discovered by European

explorers? Why was captain Cook first welcomed by the native people, but not received so well (and eventually killed) when he returned shortly after his departure?

Any subject areas I've not touched on yet?

Geoff

Thursday, May 20, 2004

Time: 1600

Lat: 19 15 N

Long: 157 06 W

Sky: Beautiful day; lots of sunshine with scattered cumulus clouds

Air temp: 26.6 C

Barometer: 1015.2

Wind: 132 degrees at 15 knots

Relative humidity: 62%

Sea temp: 26.7 C

Depth: 3116.6 m

Sea: Swells less than a meter offering up a very smooth and pleasant ride.

Science and Technology log:

Several escolar, 2 snake mackerel, 2 sharks and 2 swordfish on the line today. The sharks were both silky sharks. One was tagged and released. The same treatment was intended for the other but it broke free of the hook before we got it on board. Both swordfish were dead. The last of the swordfish was the biggest we have seen: 185 cm plus a sword of over 60cm and weighing in at 90kg. A couple skipjack tunas were landed with troll lines.

We are staying in the same area for the longline set tonight. We didn't even bother to check Cross seamount as things are pretty good here and we would probably have had to turn away from there out of respect for others' presence.

In reviewing Kylie's presentation (see personal log), Rich commented that we know what the movements of the animals are, but we don't know so well why they make various vertical movements nor how they are able

to deal with the stresses imposed by those movements. The temperature/cardiac function relationship described yesterday adds a bit to the puzzle as do studies of tolerance to oxygen reduction. I found this quite interesting and hope I can condense the story to something meaningful for you.

At depths reached by bigeye tuna oxygen levels are far lower than levels experienced by skipjack and yellowfin tunas at the depths they are normally found. Tunas characteristically have high metabolic rates which might seem impossible to maintain at low ambient oxygen levels experienced by the bigeye. Fishes tolerant of low oxygen levels are typically very sluggish, have low metabolic rates and have blood with a higher affinity for oxygen than less tolerant species. In exchange for that high oxygen affinity (a benefit at the gills), they sacrifice maximum delivery of that oxygen to their tissues; their blood just doesn't want to let go of it.

Bigeyes then, as you would expect, have blood that grabs oxygen more readily than blood of skipjacks and yellowfin. So how are bigeyes able to remain so active when their fellow fishes with high oxygen affinities just can't keep the pace? Recall those heat exchange units we've mentioned before??? Bigeyes' blood loses much of its grasp on the vital gas as it is warmed by those heat exchange units. And remember that at the gills the blood is "cold" again. What a great system -- readily grab and hold oxygen at the gills even in low ambient oxygen environments, and readily release it in the muscles. Pretty cool, I think.

To conclude, I quote from the summary section of my source as to the value of these studies. I presume that what is stated here specifically with respect to bigeye applies more broadly. "Understanding the vertical movements and depth distribution of bigeye tuna, as well as the physiological abilities/tolerances and oceanographic conditions controlling them, has been shown to be critical to improve longline catch-per-unit effort analysis and long term population assessments in the Pacific."



Geoff with a small oceanic white tip shark

Personal log:

Following the line retrieval, I managed to get some time on the upper deck in my favorite shadey spot with my book. Reading, snoozing and enjoying the view passed the afternoon along with an interruption to assist with a troll line catch. This was very nice after such a gloomy yesterday that was topped off with another late night at the movies (Pirates of the Caribbean).

Just before supper Kylie did a rehearsal of a presentation she will be making in Australia about her vision studies. Rich and Kerstin made comments and suggestions to help her polish the presentation. It was interesting to hear them address content and presentation issues much as I do with my own students.

Kerstin asked me today if it is getting tough coming up with material for the log. I suggested that indeed it is becoming more of a challenge. Perhaps out of sympathy, she called me to her lab early this evening to share with me some details related to the eye socket of a swordfish. Thanks, Kerstin, and keep 'em coming!

Questions:

Many native plants and animals of the Hawaiian Islands have suffered due to the introduction of non-native species to their environment. The green cover of the islands is very different in most places than what Polynesian settlers saw. Mongooses and ginger are two introduced species. See if you can find out how they got here, why they were introduced and specific impacts they have had on native species. (There are others for which you could do the same investigation including many in your home area).

Geoff

Friday, May 21, 2004

Time: 1600

Lat: 19 25 N

Long: 156 54 W

Sky: Overcast today. A bright unthreatening sky but clouds thick enough to prevent casting of shadows.

Air temp: 26.3 C

Relative humidity: 70%

Barometer: 1015.7

Wind: 146 degrees at 14 knots

Sea temp: 26.5 C

Depth: 4738 m (at 1645 hrs)

Sea: Rolling today with 3-5 foot swells but not uncomfortable. Much calmer this evening now that we are nearer the Kona coast.

Science and Technology log:

We began our retrieval of the longline at 0600 today; usually we begin at 0800. This change was made in light of the fact that we have been catching swordfish in this area and that they are dead when we get to them. These are animals (when alive) that we would like to tag. The thought is that if we get to them sooner we will have live animals to work with. I hate to see any of them dead, but it was especially hard to accept the loss of that big guy yesterday.

Did it work? Well, we didn't lose any swordfish today, but then we didn't catch any either. It was a very poor catch -- several escolar

(apparently the most abundant fish in the sea), one snakemackerel, and, the only thing worth getting up for (personal commentary), a bigeye thresher shark. This one was tagged by Rich who harpooned the pop up into its back with one swift and well aimed lunge. He was then cut free of the line -- another mobile laboratory.

Tonight we are again off the Kona coast for the line set. I don't know why the decision was made to come here as opposed to staying over one of the seamounts.

Yesterday I had a tour of the engine room. I thought I'd mention a couple things going on below deck and perhaps a few other tidbits about our floating city of 30-40 people. In an earlier log, I think I mentioned that we make our own fresh water. Waste heat from the engine cooling water heats sea water held in a partial vacuum where it can boil at less than 100 degrees C. then be recondensed to yield our water supply.

Our waste water treatment system is a Class 2 type according to chief engineer, Frank. All human waste and gray water goes to a holding tank. From there it is pumped through a unit to macerated solids. The slurry then passes through an electrical cell that completes the purification process before discharge to the sea.

Our little city generates its share of trash as well. Bins around the ship are marked as to the specific kinds of refuse we may put into each. Here's is what I understand concerning disposal of sewage and trash. Within 3 miles of shore everything must be held although I think if sewage is treated, as ours is, it is OK to let it go even there. Plastics are never to be dumped. From 3-12 miles out, we can dump trash and food waste ground to less than an inch, but no packaging and such that floats. At 12-25 miles, food wastes can go but again the floating debris is prohibited. Beyond 25 miles, I think all can go but the plastics. Cardboard boxes and paper trash go over the side out here and untreated sewage can be flushed.

And, of course, we have to eat. Todd and Susan are our stewards. Todd insisted that I write that "the second cook (in this case Susan) has the hardest job on the ship." Susan agrees. For a typical 24 day cruise, Todd (chief steward) spends \$5000-\$6000. To mention just a few of his purchases for this trip he packed on 48 gallons of milk, six cases of juices, a case being containing 4 three-liter bottles of 4-1 concentrate, and over 80 loaves of bread. Whatever he buys is supplemented by our catch. He noted too that in different areas, crews have different likes. For example, in Hawaii he packs on lots of fruits. In cold Alaska, crews like to have soup everyday whereas here

it's not as welcome because of the heat.

Well, that diversion got me (and you) away from fish science for today. Sorry if anyone is disappointed.

Personal log:

I think the early start jolted everyone's biorhythms or perhaps just mine. I liked being done with the line by 0830, but I did feel kind of lazy all day afterwards. Perhaps that along with the humid, overcast sky and an antibiotic the doc gave me for an infected finger combined to make napping the desired task of the day for me. So aside doing this log, soaking my finger and a bit of reading that's about all that happened for me today.

Questions:

Perhaps this should have preceded yesterday's questions. The Hawaiian Islands are some of the most remote island in the world. How did they originally (before the hands of humans) become inhabited by plants, animals, fungi? What are some of the mechanisms that permit dispersal of life to such isolated places as these?

Geoff

Saturday, May 22, 2004

Time: 1600

Lat: 19 24 N

Long: 156 53 W

Sky: Sunny this morning, but brightly overcast at the moment. Clear this evening.

Air temp: 26.5 C

Barometer: 1015.1

Relative humidity: 59.9%

Wind: 144 degrees at 6 knots

Sea temp: 26.7 C

Depth: 3810.4 m

Sea:

Science and Technology log:

Even with our normal start time today we were able to get to our one broadbill swordfish in time to tag and release it. We had a new species on -- a 176 cm blue marlin (). It looked as though it had been attacked by sharks while on the line. We were also able to tag an oceanic whitetip shark. Also for the first time on the longline we had a shortbill spearfish. The rest of the catch was rounded out by the regular cast of characters: 3 escolar, a snake mackerel, one great barracuda and one mahi mahi.

We trolled lines up to 40 miles away from the big island today but nothing grabbed the lures. Tonight we are setting again offshore of Kona, perhaps 25 miles out (not sure).

A chapter in Wilson's book and some comments made by Kirsten and Mike a couple days ago are the motivation for this part of today's log. Should we be looking for ways of expanding aquaculture and reducing our dependence on wild stocks to provide fish protein? Wilson in *Diversity of Life* (1992) states that 90% of fish consumed worldwide is taken from wild stocks. He further states that while about 300 finfish species are cultured throughout the world, 85% of the yield comes from just a few species, talapias, for example.

Kerstin told me of the southern blue fin tuna, a highly prized species, whose numbers crashed due to overfishing in the 1950's and 60's. A moratorium on taking the species was imposed and resulted in an increase in the wild stocks. Now quotas are set to protect the species. Australia meets its quota by capturing animals then towing them live to ocean pens at Port Lincoln. The pens are roughly 40 meters in diameter and 15-20 meters deep with about 2000 fish per enclosure. There the animals are fed a diet of fish over 3-4 months that brings their flesh to a desired quality. Of course, this demands harvesting many tons of feeder fish (from the wild) to support the pen raised stock.

In America and elsewhere we have turned from wild stocks of animals to support our numbers. We raise chickens, pigs, cattle and sheep to provide most of our meat. Hunting of wild game is reduced to controlled recreational seasons designed to protect those resources. Should we be doing much the same for more species of ocean fishes, that is, develop methods to economically raise several desired species and greatly reduce our take from wild stocks? Should some receive total protection?

Check out the question section below for some reading about certain aspects of the issues then decide what you think about the concerns raised.

Personal log:

The doc lanced my finger today and I'm still on the antibiotic and hot water soak routine. Feeling kind of sluggish today and appetite is not quite up to my norm; probably effects of antibiotic.

Sky cleared nicely before sunset providing a clear horizon and our first green flash in many days.

Hope to sit out the line set tonight and perhaps just take in a movie.

Question:

In the June 9, 2003 issue of U.S. News and World Report is an article titled "Fished Out" in which the state of oceanic fish populations is discussed. What is your reaction to the article?

On page 40, there is a reference to a report by scientists Myers and Worm. Rich and Mike have told me that there have been several rebuttals to the Myers and Worm report noting flaws in their methods and conclusions. Find such an article then rethink your attitude toward the US news and World Report article and issues raised above.

Geoff

Sunday, May 23, 2004

Time: 1600

Lat: 19 35 N

Long: 156 08 W

Sky: Hazy, bright sunshine; mostly cloudy by evening. No green flash or stars tonight.

Air temp: 26.8 C

Barometer: 1014.4

Relative humidity: 53.7%

Wind: 282 degrees at 6 knots

Sea temp: 27.3 C

Depth: 2611.9 m

Sea: Very gentle today. Not quite glassy but quite smooth.

Science and Technology log:

Eight fish on the longline this morning including a blue marlin (*Tetrapturus audax*) which was tagged and released. We had 2 representatives of a species, crocodile shark (*Pseudocharcharius kamoharai*) not previously caught. Also on the line were an oceanic white tip, a large barracuda, a mahi mahi, a swordfish and (you guessed it) an escolar.

Here are a few facts related to some species new since I reported on fish types previously. My source is the same. Please note that it was published in the 1980's and that some info could be out of date, but it's the best I have for you.

Crocodile sharks: There is only one genus and one species in the family. These are not very large sharks attaining about 110cm. Their teeth are long, curved and slender, very sharp (and, I thought, very impressive).

Striped marlin attain 2.9 m.

Blue marlin (*Makaira mazara*): Males reach about 150 kg but females can grow to 5 meters and weigh over 800 kg.

Tonight is out last set of the longline. Again we are off the coast of Kona.

I asked our electronics technician, John, to tell me about some of the safety systems on the ship. This would have been good to report first thing so as to put my mother's mind at ease. Anyway, here's a bit about how we are protected in case our ship encounters some sort of distress. These are all part of the global Maritime Distress Signal System.

We are capable of sending radio distress signals indicating our position. A VHF signal has a range of about 50 miles, and HF signal up to 1500 miles. A satellite connection for the "All Pacific Region" alerts stations from northern Alaska to the tip of South America and east to west across the Pacific.

Emergency Position Indicating Radio Beacon (EPIRB): This can be activated manually, but is activated automatically if it contacts saltwater. It sends a keycode to a satellite which alerts NOAA where the ship can be identified, its most recent position marked, and direct nearby ships to assist.

Search and Rescue Transponders (SARTs): Our ship as well as others are constantly sending out a signal at a certain frequency. Assume we have lost the ship and are in a boat/raft with our SART. When it detects the signal from a ship in the area it lights up. We would then turn on our SART which sends a signal to that ship's radar indicating our direction and distance.

I feel pretty confident that someone always knows where we are!

John also showed a couple of other pieces of gear on the ship. One is an Acoustic Doppler Current Profiler used to determine current speed and direction at various depths. In another, transducers on the bottom of the ship "ping" the bottom at low and high frequencies. Lower frequency signals travel farther and can give us a profile of the bottom. Higher frequency signals can actually detect schools of fish or concentrations of plankton.

Personal log:

Still on the finger soaks and antibiotics, but finger infection is clearing up. The crocodile shark teeth were so impressive to me and make a great contrast to the blue shark's jaw that I decided to risk further pain, discomfort and more infection in another jaw cleaning exercise. Small size and previous experience combined to make this a much shorter effort than that with the blue, but nonetheless painful as those needle sharp teeth penetrated gloved hand and found their mark in human epidermis.

Then it was to work on a eye cup from the blue marlin pulled in yesterday. Kylie made the official presentation to me last evening as Kerstin and Eva listened on. I had to finish the cleaning job then apply Kerstin's newly found hot water bath treatment to complete the removal of the flesh. I feel like a real, official Junior Eye Scientist Club member now that I've been awarded my first "medal".

Questions:

I'm drained; I can't think of any.

Geoff

Monday, May 24, 2004

Time: 1615

Lat: 20 09 N

Long: 156 15 W

Sky: Bright and sunny

Air temp: 26.5 C

Barometer: 1014.3

Relative humidity: 57%

Wind: 60 degrees at 28 knots gusting to 35

Sea temp: 26.3 C

Depth: 1227.6 m

Sea: Its really rocking at the moment!

Science and Technology log:

This was the last roundup -- and a rather disappointing finish. Four barracuda came up, an escolar and half of an escolar cleanly bitten in half by a shark. A blue shark and a blue marlin were on the line also but, unfortunately, dead. Trolling through early afternoon brought in a yellowfin tuna and a wahoo.

The main mission for the rest of the day is to make way for Honolulu.

In case some of you might be thinking about a Teacher at Sea experience, but wondering if longlining is for you, I thought I'd give you a bit of info related to other missions of the Sette. Perhaps one of those operations would be of more interest to you. (Of course, there are other ships in other places doing other things for different lengths of time.)

The next cruise for the Sette is a Protected Species Investigations cruise which takes the crew to the northwestern Hawaiian Islands. These are primarily resupply trips to take scientists and materials to and from temporary camps set up on these remote islands for the study of monk seals and bird populations. I read about these camps and found them quite interesting. For example, in an effort to prevent invasion of (more) exotics to these islands items going ashore are placed in a freezer for a time to kill hitchhiking critters.

Debris cruises are another NOAA mission. Yep, that's right, picking up trash from the island beaches and off of coral reefs. A crewman, John, related to me that the stomach contents of dead chicks are often clogged with plastics fed to them by their parents. He has even found plastic lighters, which to the birds might look like squids, in the

stomach remains of these birds. It's nice to know an effort is being made to reduce the hazards, but sad to note that the negative impact of humans strikes even in the most remote places.

Coral reef surveys are done to monitor health of those systems. Studies of benthic habitats are conducted as well as investigations of planktonic life. Later this year the Sette will do a lobster cruise to assess those populations. John, our electronics technician, described to me that overharvesting of spiny lobsters which like relatively shallow water opened up their habitat to invasion by the slipper lobster. Slippers typically stayed deep to avoid the spiny, but now that the species are encountering each other a hybrid has developed.

John also pointed out that regardless of the mission of the science teams aboard, the Sette is constantly collecting and filing data. Wherever the ship is, it is recording weather information and physical characteristics of the seawater and the seafloor. Perhaps you get the idea that this is a busy little platform sailing out here in the big blue sea.

Personal log:

At the time of my weather report we were passing through the channel between Hawaii and Maui. This is where we got blasted by heavy (much more so than today) seas on our first night out. I'm handling this well and would like to boast that I am now seaworthy enough to handle with ease forces as encountered on day 1. But then I don't want to tempt the sea gods to challenge me with a new test of my endurance. The sea is very pretty in this state (something I was in no condition to say 3 weeks ago). White-capped waves, snow white on a navy blue backdrop and fleeting rainbows of color as wind blown spray catches the light just right fill the gap between the island masses.

The sea calms dramatically as we pass between Maui and islands to its west. We are close enough now to Maui to see the green of the land with its black lava scars and the observatories perched atop 10,000 foot Haleakala glistening white in the late afternoon sun. To our southwest the surf crashes against the shear walls of the neighboring island, Kanoowlawe. Lanai and Molokai lie ahead and frame a beautiful sunset for our last night at sea as several of us enjoy it from the bow.

I will be doing my last edition of the log tomorrow (Tuesday). I think I lose my NOAA address as of tomorrow also. If you have any questions perhaps they will be forwarded to me through the Teacher at Sea website. I look forward to hearing from you.

Geoff

Tuesday, May 25, 2004

Time: 0815

Lat: 21 11 N

Long: 157 59 w

Sky: Clear

Air temp: 25 C

Barometer: 1018.3

Relative humidity: 60.9%

Wind: 73 degrees at 23.5 knots

Sea temp: 25.8

Depth: 438.2 m

Sea: A bit rough here just outside entrance to Pearl Harbor

Science and Technology log:

Here are our totals for the trip:

We set the longline 19 times and averaged about 400 hooks per set. In addition we trolled most every afternoon. 185 fish were caught by longline and 41 by trolls representing 19 species. 140 animals were kept and 71 released. A total of 15 were tagged.

I don't know how this compares with previous cruises, but it was enough to maintain my interest and excitement throughout.

Personal log:

I was on the bow all the way in to Pearl Harbor figuring this is not an experience I am ever likely to have again. It was a rather emotional experience -- enough said. We are currently in Pearl Harbor within sight of the Arizona memorial for refueling. That will take about 4 hours. I along with others will leave the ship shortly to begin our readjustment to life on land.

This has been a wonderful experience that will tie into to many aspects of my teaching and I look forward to sharing it outside the classroom as well. All involved, my mainland NOAA contacts Janice and Jennifer, officers and crew of the SETTE, and the science teams have contributed generously to making every part of this adventure meaningful, memorable and an outstanding one for me. To all of you, my sincerest thanks.

If there was any disappointment it was in not hearing from more people with questions. But I know what it's like for teachers and students in the classroom at the end of the school year. With so much to do and the excitement of the end drawing near, who has time to pay attention to something else? My thanks and appreciation to Kathy, Howard, Ron, and Jessica for assuring me that a few were paying attention.

I am spending another week in the islands splitting my time between Oahu and Hawaii before returning to home on June 2. If you have any questions I would be glad to try to answer them for you.

Questions:

The Teacher at Sea program is open to elementary through college level educators, regardless of discipline. Why don't you take a serious look at participating in this program?

That's all folks!

Geoff