



NOAA Teacher at Sea
Heather Diaz
Onboard NOAA Ship DAVID STARR JORDAN
July 6 – 15, 2006

NOAA Teacher at Sea: Heather Diaz
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Mission: Juvenile Shark Abundance Survey
Day 1: Thursday, July 6, 2006

Science and Technology Log

After everyone boarded the ship and we were underway, the OOD, Junior Officer Sean Finney held a short welcome aboard meeting. He explained the expectations of the scientific crew and regulations while aboard the ship. Afterwards, the Chief Scientist, Dr. Suzy Kohin, held a meeting to explain our mission and to show us how the longlines would be set.

The mission of our cruise is to complete the second leg of the Juvenile Shark Abundance Survey, which is done annually. The first leg was completed last week. During this leg, we will resample the same blocks, so that the data can be compared. Data will then be analyzed from the last 10 years to see if there have been in changes in the mako and blue shark populations. The primary targets for this survey are the juvenile pelagic sharks, the mako and blue sharks. Any other animal that is caught will be measured and that data will also be recorded.

Sharks will be tagged and released. If there happens to be a shark that is no longer alive or who is too unhealthy to be released, they will be dissected and specific parts will be preserved for further research. We are hoping that this will not happen. We will also be taking a DNA sample from each shark that is caught. At the end of each set, temperature and latitude and longitude will be recorded. Primary and Secondary Blocks have been predetermined (as these have been the same for the survey over the past 10 years); however, there are a few days in which we may do sets in areas where the temperature of the water or slope of the ocean floor appear to be optimal for catching sharks to tag.

In addition to the primary survey, we will also be doing a Swordfish Feasibility Study, which is a project being conducted by Dr. Heidi Dewar. She is looking to see if it is possible to catch swordfish in this area using a longline set, similar to the one we are using for the Shark Survey. They are also looking at whether or not it would be possible to control the fish well enough to be able to tag its dorsal fin.



California sea lions catch a nap on a buoy marker in San Diego Harbor as the DAVID STARR JORDAN leaves port for the second leg of the Juvenile Shark Abundance Survey.

Following our meetings, we practiced putting on our “gumby gear” (survival suit), which is made of neoprene and is intended to be worn only during abandon ship situations. It is called “gumby gear” because it covers a person from head to toe in bright red neoprene. Crew members aboard the ship are expected to keep their abandon ship gear close by in case of an emergency, and we have abandon ship drills and fire drills once a week. Every stateroom is equipped with two survival suits and two life jackets. Man overboard drills are conducted once every month or so.

The first longline, which we set at 4pm, was considered a practice set. Setting the longline is comprised of several jobs. The first job is done by Rand Rasmussen. He begins the process by preparing the bait. For the shark sets, we use frozen mackerel. Rand Rasmussen counts out the frozen mackerel and thaws them in 2 coolers using sea water. The mackerel are not baited completely thawed and are actually easier to bait if they are still a little frozen.

The next step is that the deck crew members prepare the lines by taking part of the line and unrolling it from the main roll. They then string it through a pulley that runs along the side of the ship. After the line is ready, the bridge positions the ship so that we are in line with where we should be setting the line. Then, when everyone is in place, they toss the flag. The flag is a flag that is connected to a long pole. The bottom of the pole has a float on it, so that it stands upright. There is also a bright yellow bag that looks like a windsock (called a sea anchor), which is also thrown into the water. This catches the current, and helps to keep that end of the line straight.

Then, one person will unclip the leaders. These are made up of a gangion clip at one end, about 3 fathoms (18 feet) of steel wire, and a stainless steel hook at the other end. The gangions are kept in cans, with 2 rows on 4 sides to which the gangions are clipped. The hooks are looped inside one end of the gangion to keep our hands safe and out of the way from hands that might reach into the can. There are 2 cans of gangions/hooks, and we set around 200 hooks during each set. Once the gangion is unclipped from the can, the hook is removed from the loop, and both ends are handed off to the baiter. The baiter puts the hook into the mackerel’s mouth, then loops it out the underside of the mouth and is then pushed into the back, making a sort of loop around the spine with the hook. The line is then pulled tight.

The baited line is then passed off to the “clipper”. This person waits for a small crimp to pass by on the line as it comes through the pulley and goes down into the water (towards the flag). There are actually 2 small crimps on the line which serve two purposes. First, they keep the gangions from sliding off the line or moving positions. Second, it makes sure that the spacing is uniform on the line. The spacing for this survey is about 25 feet between each gangion. The clipper grabs the line with one hand, and then clips the gangion into the “slot” with the other. The line moves very quickly because the ship is actually moving forward the whole time at a few knots, so the clipper must be fast and accurate.

After 5 baited lines have been clipped, a buoy is clipped on in what would then be the 6th slot on the line. The buoy goes through 2 stages of preparation. First, the buoy is taken from the port side of the ship, where they are stored while not in use. Then, they are clipped on a line near the setting line. One person takes a leader line of nylon rope (again, about 3 fathoms long) and they attach it to the buoy. Then they pass it off to a buoy person, who counts the gangions as they go by and then passes the buoy off to the clipper at the appropriate time.

While the scientists are working with the line, the deck crew is also working with the line at the winch. There are always at least 2 deck crew members on hand to supervise the set. One person runs the winch, and they can adjust the winch to run the line faster or slower as needed. The other person carefully watches the line, to make sure that everyone is being safe and that the line is moving along safely. They signal the winch operator if the line needs to be stopped or sped up. They also keep in constant contact with the bridge to tell them how the set is going.

The bridge can watch the set process through a camera, which they can maneuver so that they can see the line as it comes off the winch, as it is being baited, and as it is deployed in the water. In addition, they can see the line on a computer screen which shows them the “box” where they are trying to set the line. The box is an area on the navigational chart that the scientists have determined as the area in which they would like to set the line. We aren’t concerned about keeping the entire set within the box once we start, but the start point is selected so that most of the line will be in the box. The bridge is responsible for watching for any other boats/ships that might be in the area which could interfere with our line.

Once all the buoys and lines have been deployed, the deck crew disconnects the lines from the winch and attaches the line at the back of the ship. The bridge then watches the line while it “soaks” to make sure it stays as straight as possible. The standard length of soak time for this survey is 4 hours. While we are soaking, the scientists usually take a nap, play a game, catch up on email or research, relax on deck or in the crew’s lounge, get a temperature profile, prepare tags for the haul, catch up on data entry from previous sets, etc.

When it is time to haul, all of the scientists and 3 deck hands are needed. The set up is a little different when we haul in the line, because there are 2 main areas of activity instead of just one. At the very rear of the ship, there is the tagging/measuring area. This is done on two levels. The top level, which is on the same level as the aft deck, is where the data recorders and the deck hand that is operating the platform/cradle lift are located. They are on opposite sides of the ramp. The bottom level is at the bottom of the ramp and is where the platform and the “cradle” are located. Usually Suzy Kohin, the Chief Scientist, and 2 or 3 other scientists are down on the platform during the haul-in. I will explain more about all these jobs below.

The area of activity nearest to the front (bow) of the ship begins with the deck crew members and the line. Once the line is disconnected from the back of the ship, it is

brought forwards so that it is in line with the winch. It is threaded across a sort of pulley, and is reconnected to the winch. Two deck hands make sure the line is wound back on the main roll of line evenly. To do this, one person operates the winch's speed, and they can stop it if necessary, while the other person keeps pressure on the line by holding it with a special tool. This makes sure the line winds correctly and does not get snagged.

Once the line is connected, the process is ready to begin. The bridge gives permission for us to begin hauling in the line, and the first person, who stands near the pulley, unclips the gangion from the line. That person then passes it off to one of two de-baiters. These people pull the bait off the hook and drop it into the ocean. They then put the hook into the gangion loop and pass the whole thing back to the clipper. The clipper then clips the gangions back into their can (the exact reverse of the process when we set). When buoys come up, the buoy line is handed over to a buoy person, who pulls up the leader line and disconnects the buoy from it. They then coil the leader back into its basket while another person takes the buoy to the other side of the deck and attaches it to a line where it is kept while not in use. If there is an animal on the line, everyone yells, "Shark!", or whatever the animal is. This alerts those at the rear of the ship that there is an animal coming to them. The line that has the animal on it is unclipped, and then a "rope leader" is attached to it, which makes it possible to tie off the line to the ship if there are too many to be processed right away. Then someone "wrangles" the shark to the rear of the ship by literally walking the animal along the side of the boat until they reach the cradle. It's a very important job because they have to keep enough tension on the animal that the hook doesn't slip out of their mouth, but they have to also be careful not to pull the animal up and out of the water, which could cause injury to the animal.

The cradle is a sort of half-tube that can be raised and lowered so that it is either closer or farther away from the water. When an animal is brought around, the cradle is lowered so that it is in the water. One of the scientists takes the leader line and takes off the rope. They then pull the animal into the cradle so that its head is facing the port side of the ship. The other scientist is waiting for the animal and he catches its mouth and eyes with one hand and covers the animal's face with a wet cloth so that it can't see and to help calm the animal. He uses his arm and other hand to hold the animal down. The scientist that lead the animal into the cradle also gets down on the platform and uses his arms to keep the animal still.

The first thing that is done is a DNA sample. This is done by the Chief Scientist who uses hemostats to hold a small section of the animal's fin (in the case of a shark, this is the dorsal fin). Then a small scalpel is used to remove a tiny section of fin. This is held in the grip of the hemostat, which is then passed up to the data recorder on deck. They put the sample into a small glass jar which is then labeled with the animal's number and species. Most DNA samples collected were from makos because the researchers are trying to determine the population genetics structure of the shortfin mako shark in the North Pacific, though 3 other types of animals were also caught.

Once the DNA sample is done, the Chief Scientist inserts an ID tag, called a spaghetti tag, which is from NMFS (National Marine Fisheries Services) into the animal, just in

front of the dorsal fin. This is done by making a very small cut with the scalpel, and then the tag is inserted with a long metal probe, which lodges the tag underneath the skin. The tag information is recorded by the data recorder, who later completes a registration card which will identify the animal by the date caught, length, sex, and species. The registration card is kept on file, so that if the animal is ever caught in the future, they can track where the animal has been.

After the spaghetti tag is done, they do another tag, which is placed directly on the dorsal fin. This is called a Roto tag. To do this, the Chief Scientist punches a hole in the dorsal fin with a punch tool. Then, the tag is lined up with the hole and is riveted together. This tag number is also recorded by the data recorder. On some animals, they also place satellite tags and pop-off archival tags, but I have to learn more about how those work. We didn't do any of those today. The Roto tag has a special tag on it with instructions for fishermen. If the animal is ever recaptured, they can send the tag and some of the animal's vertebrae in for a one hundred dollar reward. This is only done on animals which receive the OTC injection.

Once the animal has been tagged, they turn it on one side to get the sex. This is also recorded by the data recorder. Then, they inject the animal with OTC (oxytetracycline) which is supposed to stain the animal's vertebrae, which can later help to determine the age of the animal (like the rings on a tree). It also works as an antibiotic, though that is not its primary purpose. This injection is given just about in the middle of what most people would consider the belly of the animal into the visceral cavity. The dosage is based on the approximate length of the animal and is measured out of a small needle. The Chief Scientist gives the injection and holds the tiny hole where the injection was given for a few seconds to prevent any of the OTC from leaking out.

Then, they flip the animal back onto its stomach so that they can remove the hook. They record where the hook was located (either the jaw or if they swallowed it). They usually have to cut the barbed end of the hook off with bolt cutters. The line and the broken hook are then thrown up to the deck to be recycled and refitted with new hooks for use again.

Once the hook is out, the animal is pushed to the end of the cradle and the tip of its nose is lined up with the very edge of the cradle. The side of the cradle has a measuring stick on it. They hold the tail out straight and measure to the very end of it along the tape. Once they have a measurement, they lower the cradle down into the water, and gently push the animal out the end so that it can swim away. Usually makos dive straight down, but blues tend to swim around a while on the surface before diving out of sight.

Everything happens very quickly, so those who are processing the animal must be quick and efficient. The entire process takes no more than a few minutes, which is intended to limit the amount of stress on the animal, and so that we don't keep them out of the water any longer than absolutely necessary.

Personal Log

When we pulled out of the harbor, I was standing on the fly bridge (the very top). I could see all the other ships and the other boat yards. One cool thing I saw was the Naval Dolphin Training Station. It just looks like a bunch of square cement rings. I could see the dolphins in them, though I don't know if the pix came out or not. I also saw a pier that was loaded with sea lions. In front of that, we passed a buoy marker which had become the napping place for 2 sea lions...they were very cute. Once we were at sea, I was able to get in my room (room 01-1) and put my things away. Then, I hit the bed and fell sound asleep. While I was asleep Chico Gomez, Chief Boatswain, and Sean Suk caught some Bonita...very pretty fish! I didn't get to see them whole. But, the meat was a gorgeous salmony-pink color. They said they will smoke it tomorrow afternoon. They said I can try fishing sometime this week. I will give it a try in a few days.

Because this afternoon was our first set, everyone was very excited to do all of the jobs. I chose to do baiting first, and then I switched to doing the unclipping. Both were fun, and everyone talks and laughs, so it was fun. I was really excited to finally be on board and to get to meet everyone. Hauling in the first set was amazing, and I got to see so many sharks! After the set, I spent the time unpacking and getting things ready for the rest of the cruise.

We caught 11 blues, 3 makos, and 1 pelagic ray. We also caught 1 mola mola, but I didn't see it. I am looking forward to seeing a mola at some point. I couldn't believe how different it was to see sharks so close, and not in an aquarium!

Today I learned how to tell the difference between a mako and a blue shark...the makos have more streamlined noses, a more silvery color, and they have a more symmetrical tail. The blues have a definite blue color to them, and their tails are distinctively larger on top than on the bottom. Also, makos have a more "thick" area in front of their tail, kind of like the keel of a boat, whereas the blues are more streamlined. You can also tell the difference by their teeth. Mako sharks have little, almost needle-like teeth, whereas the blue sharks have triangular teeth which are serrated on the sides (that is, if you happen to get close enough to see one with its jaws open!). But, they are all very cute!

The ray was also very amazing to see...they are a kind of steely-grey color, and kind of "spaceship" shaped. Very different than the rays I've seen around the waters near Florida. I can't wait to see more sharks and other sea animals tomorrow!