

## STAR 2006: NOAA Ship *David Starr Jordan* Weekly Science Report

*Sarah L. Mesnick, Cruise Leader*  
6 December 2006

### **Science Summary: 30 November – 6 December 2006**

This weekly covers our final five days of survey for STAR 2006 and two days of transit back to San Diego. At this writing, we are sailing under our final at-sea sunrise, with the full moon still high in the sky. The Baja Peninsula is visible to the east and everyone's thoughts are of home.

This week we left behind warm subtropical waters with their foraging schools of spinner and spotted dolphins, with their flocks of Brown, Masked and Red-footed Boobies, Wedge-Tailed Shearwaters, and Sooty Terns, and gradually entered the California Current, where we saw our first California Gull, loggerhead turtle and common dolphin in months.

The primary objective of STAR 2006 is to investigate trends in the population size of the species of dolphins most affected by the eastern tropical Pacific tuna-purse seine fishery. This is the tenth year of investigations spread out over the past twenty years, with previous cruises in 1986-1990, 1998-2000, and 2003. Each year, additional data on other aspects of the environment have been added to the collection protocol, so that now the STAR cruises are arguably the largest, most comprehensive, long-term monitoring program of a tropical ocean ecosystem on the planet.

Thus, the data collected during STAR enable us not only to investigate dolphin population trends, but also to address how tropical ocean ecosystems function and ultimately, address other big questions, such as the identity of "hot spots" in oceanic systems and the impact of climate change on living marine resources.

The R/V David Starr Jordan left San Diego on July 28<sup>th</sup> 2006 with high hopes, binders of empty sighting forms, boxes of empty sample vials, and lots of pens and pencils. Today, on the 6<sup>th</sup> of December, we return to San Diego borrowing the last working pencil, our spirits high, bodies tired and with a lot of data packed away. Here's a brief look at what we have collected and the types of studies for which these data are collected.

The DSJ covered 7756 miles of trackline in which we surveyed visually for marine mammals, marine turtles, sea birds, sea bird flocks, flying fish and marine debris. We recorded 985 sightings of 23 species of marine mammals. Once we come upon groups of marine mammals, the identity and size of the school is determined by the observers watching through "big eyes" 25x power binoculars mounted on the flying bridge. These data are used to determine the distribution and abundance of each species in the survey area as well as population trends of the focal species. Behavioral data recorded by the observers enables us to determine how dolphins respond to the research vessel, and how this response varies over large spatial and temporal scales. Photographs are taken to verify the identity of the species, including species within mixed schools. For some species, such as killer whales, blue whales and sperm whales, photographs are taken to identify individuals, which are then compared to photo-ID catalogues and thus linked to photographs of the same individuals taken in other areas at different times. The DSJ photographed 219 schools and individuals whales. Acoustic recordings are made when pure schools are sighted. We had over 63 acoustic detections, adding another trait to our ability to discriminate population identity, as different populations often have different acoustic characteristics. Directed biopsies are also taken. These small pieces of tissue are used in genetic studies (population and social structure), hormone studies (pregnancy and stress) and diet studies. The DSJ returned to San Diego with 438 biopsies from 17

different species. Seven of these were split for cell culture, a joint project with the “Living Zoo” at the San Diego Zoo.

The birders recorded 120 different bird species and counted 225 bird flocks. A directed study by Scripps Institution of Oceanography graduate student, Nacho Vilchis, looked at the foraging habits of birds on islands. Gut contents and bird regurgitations are also collected during island stops to better understand the foraging habits of the oceanic birds that nest on these islands. At sea, the birders also record every piece of marine debris that floats through the transect area, for a collaborative study, and every flying fish that flushes when the ship passes by. The flying fish are important as an indicator of prey for the marine mammals and birds. Every time a turtle is observed, and conditions are conducive, a small boat is launched, the turtle is caught and many types of data are collected: blood, tissue, scute and sometimes also stomach contents. The DSJ is conducting the first-time large scale oceanic survey of marine turtles. These data will enable researchers to understand population structure, food habits and growth of marine turtles. The DSJ sampled 359 marine turtles of three different species.

Intermittently, marine fishes are caught by trolling lines off the back deck. These fishes are sampled for two different studies, one to determine the diet habits of highly migratory species such as tunas by Bob Olson of the Inter-American Tropical Tuna Commission (IATTC), and a new project by Scripps Institution of Oceanography graduate student, Leanne Duffy, on sexual reproduction of mahi mahi.

When the sun goes down, operations continue. Each evening, several projects commence. The “dip netters” spend an hour catching all manner of squids and fishes that are attracted to the ship’s lights. These “mid trophics” are representative of the prey base that the species we observe during the day might be feeding upon. Flying fish and myctophids are the most common fishes caught by the dipnetters; 1381 specimens of approximately 13 species of flying fish and 785 specimens of myctophids were collected this year. Sometimes tropical fishes are caught far from shore by the dipnetters, these are kept alive in tanks on the back deck and given to the Birch Aquarium at Scripps for public display. Each night, sea skaters, the only species of true oceanic insect is collected, contributing to a global study by Scripps Institution of Oceanography colleague, Lana Chang; 95 vials of approximately 2600 individuals were collected. We also collected 84 squids for a study University of New Mexico graduate student Iliana Ruiz-Cooley who is studying the prey of sperm whales and an additional 517 squids for a diet study by Bob Olson. We conduct two different types of plankton tows each night: manta tows and bongo tows. We collected about 75 jars filled with plankton from each type of tow.

An hour before dawn and an hour after dusk, we lower a “CTD” to 1000 meters of depth. This large instrument is laden with bottles that pop open at sequential depths and collect water samples to profile salinity and temperature. We lowered 170 CTD’s during STAR 2006 and during the day, collected similar data from 288 “XBT” launches; these provide data on the underlying physical oceanography in which we survey for animals. Particulate organic matter (POM) samples are also taken nightly to measure phytoplankton in relation to the squid samples taken above. Each day, continuously, a suite of other oceanographic data is compiled by the ship’s sensors.

The breadth and diversity of these projects would simply not be possible if not for the dedication, energy (seemingly endless) and “can do” attitude of the tremendous scientific complement, crew and command that sailed on the DSJ. It was my pleasure to sail with each and every one of you. Thank you, thank you, from all of us at home, for a huge job, incredibly well done.

**Sightings and Effort Summary for Marine Mammals**

| Date   | Start/<br>Stop Time | Position                | Total nmi | Average Beaufort |
|--------|---------------------|-------------------------|-----------|------------------|
| 113006 | 1521                | N16:29.87 W113:46.70    | 20.8 nmi  | 5.7              |
|        | 1830                | N16:50.89 W113:31.95    |           |                  |
| 120106 | 0654                | N17:58.07 W113:52.60    | 84.2 nmi  | 3.5              |
|        | 1748                | N17:51.45 W115:34.59    |           |                  |
| 120206 | 0702                | N18:45.03 W116:02.80    | 75.7 nmi  | 4.7              |
|        | 1734                | N20:00.71 W116:27.60    |           |                  |
| 120306 | 0736                | N21:26.79 W116:58.83    | 44.6 nmi  | 5.4              |
|        | 1743                | N22:52.81 W117:33.73    |           |                  |
| 120406 | 0724                | N17:20.99 W107:36.21    | 37.3 nmi  | 5.3              |
|        | 1159                | N24:03.24 W118:32.39    |           |                  |
| 120506 |                     | Full steam to San Diego |           | 3.5              |
| 120606 |                     | Full steam to San Diego |           | 2.0              |

| Code         | Species                                 | Number of Sightings |
|--------------|---|---------------------|
| 002          | <i>Stenella attenuata (offshore)</i>    | 1                   |
| 101          | <i>Stenella longirostris orientalis</i> | 1                   |
| 013          | <i>Stenella coeruleoalba</i>            | 2                   |
| 017          | <i>Delphinus delphis</i>                | 1                   |
| 018          | <i>Tursiops truncatus</i>               | 5                   |
| 021          | <i>Grampus griseus</i>                  | 1                   |
| 037          | <i>Orcinus orca</i>                     | 1                   |
| 049          | <i>Ziphiid whale</i>                    | 1                   |
| 070          | <i>Balaenoptera sp.</i>                 | 2                   |
| 077          | <i>unid dolphin</i>                     | 1                   |
| 079          | <i>unid. large whale</i>                | 2                   |
| <b>TOTAL</b> |   | 18                  |

**Photography (Cornelia Oedekoven, Laura Morse, Adam Ü)**

During our last week of the cruise we added another three schools of bottle-nosed dolphins adding up to a total of 37 schools which makes this the species with the second highest count of schools photographed in our list. The stenella dolphins - our highest priority - are in the lead with a total of 90 schools photographed including 45 spotted, 33 spinner and 12 striped dolphin schools. The common dolphins - our next priority after spotters and spinners - score fourth place with 32 schools photographed. The individual whale-id comes to a rather successful total count of 47 killer, 23 blue, 21 sperm and six humpback whales for the cruise. Two killer whale ids were added during the last day of the cruise.

| Species Code | Species                                 | This week | Total |
|--------------|---|-----------|-------|
| 002          | <i>Stenella attenuata</i> (offshore)    |           | 33    |
| 003          | <i>Stenella longirostris</i> (unid.)    |           | 6     |
| 006          | <i>Stenella attenuata graffmani</i>     |           | 11    |
| 010          | <i>Stenella longirostris orientalis</i> |           | 27    |
| 013          | <i>Stenella coeruleoalba</i>            |           | 12    |
| 015          | <i>Steno bredanensis</i>                |           | 15    |
| 017          | <i>Delphinus delphis</i>                |           | 32    |
| 018          | <i>Tursiops truncatus</i>               | 3         | 37    |
| 021          | <i>Grampus griseus</i>                  |           | 10    |
| 032          | <i>Feresa attenuata</i>                 |           | 4     |
| 033          | <i>Pseudorca crassidens</i>             |           | 4     |
| 036          | <i>Globicephala macrorhynchus</i>       |           | 12    |
| 037          | <i>Orcinus orca</i>                     | 2*        | 47*   |
| 046          | <i>Physeter macrocephalus</i>           |           | 21*   |
| 048          | <i>Kogia sima</i>                       |           | 1     |
| 049          | Ziphiid whale                           |           | 2     |
| 063          | <i>Berardius bairdii</i>                |           | 3     |
| 071          | <i>Balaenoptera acutorostrata</i>       |           | 1*    |
| 072          | <i>Balaenoptera edeni</i>               |           | 3     |
| 074          | <i>Balaenoptera physalus</i>            |           | 2*    |
| 075          | <i>Balaenoptera musculus</i>            |           | 23*   |
| 076          | <i>Megaptera novaeangliae</i>           |           | 6*    |
| 090          | <i>Stenella attenuata</i> (unid.)       |           | 1     |
| 099          | <i>Balaenoptera borealis/edeni</i>      |           | 6     |

\* Individual whales photographed

### **Biopsy (Juan Carlos Salinas Vargas)**

| Cruise 1630 Weekly Cetacean Biopsy Report for 11/23/2006 to 11/29/2006 |                             |                  |                |               |             |
|--|-----------------------------|------------------|----------------|---------------|-------------|
| Species  | Common Name                 | # Weekly samples | # Weekly Takes | Total Samples | Total Takes |
| <i>Balaenoptera edeni</i>  | Byrde's whale               | 0                | 0              | 4             | 4           |
| <i>Balaenoptera musculus</i>   | Blue whale                  | 0                | 0              | 9             | 17          |
| <i>Delphinus delphis</i>   | Short-beaked common dolphin | 0                | 0              | 19            | 40          |
| <i>Feresa attenuata</i>  | Pygmy killer whale          | 0                |                | 1             | 4           |
| <i>Globicephala macrorhynchus</i>                                      | Short-finned pilot whale    | 0                | 0              | 62            | 137         |
| <i>Megaptera novaeangliae</i>  | Humpback whale              | 0                | 0              | 2             | 5           |
| <i>Orcinus orca</i>  | Killer whale                | 3                | 11             | 22            | 55          |
| <i>Physeter macrocephalus</i>  | Sperm whale                 | 0                | 0              | 8             | 8           |
| <i>Pseudorca crassidens</i>  | False killer whale          | 0                | 0              | 1             | 7           |

| Cruise 1630 Weekly Cetacean Biopsy Report for 11/23/2006 to 11/29/2006 |   |                  |                |               |             |
|--|---|------------------|----------------|---------------|-------------|
| Species  | Common Name   | # Weekly samples | # Weekly Takes | Total Samples | Total Takes |
| <i>Stenella attenuata</i>  | Pantropical spotted dolphin                         | 0                |                | 110           | 186         |
| <i>Stenella attenuata graffmani</i>                                    | Coastal spotted dolphin                             | 0                | 0              | 27            | 42          |
| <i>Stenella coeruleoalba</i>   | Striped dolphin                                     | 0                | 0              | 2             | 8           |
| <i>Stenella longirostris orientalis</i>                                | Eastern spinner dolphin                             | 0                |                | 73            | 186         |
| <i>Stenella longirostris subsp.</i>                                    | unidentified spinner dolphin                        | 0                | 0              | 25            | 42          |
| <i>Steno bredanensis</i>   | Rough-toothed dolphin                               | 0                | 2              | 13            | 25          |
| <i>Tursiops truncatus</i>  | Bottlenose dolphin                                  | 10               | 10             | 58            | 88          |
| Unid. small delphinid  | Unidentified small delphinid (e.g., Delphinus, Lag) | 0                | 0              | 2             | 2           |
| <b>Total</b>   |   | <b>13</b>        | <b>21</b>      | <b>438</b>    | <b>856</b>  |

### **Marine Mammal Acoustics (Laura Morse)**

We are now in the last days of our cruise, and as we look towards getting ashore, we reflect on the past 4 months and what has been accomplished. Despite the equipment travails that always accompany acoustic operations, it has been a successful cruise. We have had over 63 acoustic detection events, with recordings from a wide range of species including spinners, spotters, striped, bottlenose dolphins and pseudorca. Highlights from the cruise are from our bigger species: Blue whales, Killer whales and most recently Minke whales. These last 3 species were of the highest high priority for acoustics on this cruise. As always acquiring acoustic data is challenging and often times without success, so these nuggets of data really are more valuable than gold.

Finally, I would like to thank all those that have assisted with the efforts on board to gather this data. Your help has been greatly appreciated, thank you!!!!

### **Seabirds and Marine Debris (Rich Pagen and Chris Cutler)**

For much of the STAR 2006 cruise, we have had ship-following boobies of various flavors in tow; but there are few words that can come close to describing how beautiful our final escorts were, following us to the northern edge of their "property line", and then banking into the low angle sunlight one last time before disappearing in our wake. These guides from our last days in the eastern tropical Pacific were an entourage of adult white-morph Red-footed Boobies (say that ten times quickly). It was hard to keep our eyes off them as we steamed north towards the finish line, knowing that at anytime we may have unknowingly gotten our last glance of the trip at a booby of any variety.

On par with their exquisite beauty is the thrilling show they put on when flyingfish are nervously flushing from the sea with the approach of our ship. Red-footed Boobies far surpass the other booby species in their grace and agility on the wing. During their high speed acrobatic dives in hot pursuit of flyingfish, their eyes take on a devious look not unlike that of a cat perched on a window sill drooling over goldfinches at a bird feeder.

Each day's first morning climb up the stairs to the flying bridge this week presented us with a reminder of the steady and certain drop in water and air temperatures that was occurring with our progress towards San Diego. We left our feeding flocks of Sooty Terns, Brown and Masked Boobies, and Wedge-tailed Shearwaters behind early in the week, and soon occasional kelp rafts and a lone Loggerhead Turtle signaled that we had entered a new realm of ocean. Because our trackline kept us more than several hundred miles from the Baja Peninsula, bird density was low. Leach's Storm-petrels and the sporadic Sooty Shearwater made up the avian world in these parts, and several days passed where we saw little else. Within sight of Clarion Island (Mexico), a curious Black-footed Albatross made several passes by the ship, and aroused a curiosity in us as to whether its presence around the Revillagigedo Islands was a mere coincidence or if this individual, whose species breeds in the central Pacific, may have been prospecting for other potential nesting sites.

Marine debris this week was sparse as far offshore as we were. Perhaps most interesting was recognizing a 2-liter plastic Coke bottle of the kind sold (and thrown in the trash) in the United States, in contrast to the plastic bottles that are familiar sights in stores in Mexico. We're almost home.

It has been a fantastic trip, shared with an equally fantastic group of people. We tallied a total of 120 bird species over the past four months, of which 62 were seabird species. We also determined the composition of 225 bird flocks. Some highlights of the trip include sightings of both Burrowing and Short-eared Owls, 30+ Parkinson's Petrels in a flock off of southern Mexico, and a White-bellied Storm-petrel 245 nautical miles southeast of Clarion Island (well north of its usual range).

As the sun is setting on this cruise and a nearly full moonrise is in our future this evening, one can't help but become sentimental about all we've seen, all we've learned, and all that we've shared with one another on this journey. The Swallow-tailed Gulls that came in and out of the nighttime darkness like phantoms during our September stop at Malpelo Island transitioned into Laughing Gulls crossing the harbor as we watched the sun come up over a looming Manzanillo in November. Now, December has arrived and an inquisitive flock of young California Gulls is ushering us to the US/Mexico border, the sound of their calls and the smell of the north Pacific acting as reminders that tomorrow we will carry our bags off the ship one last time, and launch ourselves into the awaiting open arms of friends, loved ones and happy little faces.

### **Turtle Operations (Lindsey Peavey, *et al.*)**

Our last week of effort was an interesting one as we waved goodbye to the tropics and nostalgically steamed towards home and decidedly brisker water. Among many other "lasts," we hand captured and processed our last turtle of the cruise: A kelp paddy, an unfamiliar site in the tropics but very common off the coast of Baja and California, provided shelter to a male olive ridley and numerous Mahi Mahi. After several fishing passes with a 172-ft research vessel (aka the DSJ), I was sure the turtle would be spooked and out of reach. Luckily, the turtle wasn't easily persuaded away from its home and we were able to resight him and squeeze in one last small boat ride. With help from our expert observers on the flying bridge, we snuck up on the turtle swimming nearby the flotsam and hand captured our last sea turtle for STAR 2006 (don't worry, the water was 24°C, still quite a pleasant temperature).

What an amazing cruise for the turtle project. I wasn't sure what to expect joining the well-oiled machine they call the "STAR ETP Survey," and had only heard turtle tales from the grandfather of ETP pelagic turtle studies, Bob Pitman. Therefore, I set a goal to collect data from 40 turtles per leg, totaling 240 for the entire cruise. If you've been keeping tabs, you'll know we surpassed that goal by 100 and then some! As I have reported week after week, this is by no means a one-woman show. I have a number of people

to thank for their help in making this a wildly successful project. First and foremost, Bob Pitman is ‘the man’ when it comes to turtles in ETP pelagic zones. He was a patient, enabling, and supportive teacher who provided me with priceless direction and encouragement. I consider myself extremely fortunate to have had the opportunity to learn from and work with the best of the best. In the same respect, I received incredible support from Jeff Seminoff, Peter Dutton, Robin LeRoux and the entire Marine Turtle Research Program back at the Southwest Fisheries Science Center. Jeff was an unwavering resource for me who promptly replied to the dozens of emails I’ve flooded his inbox with over the past four months! He also ensured that all necessary supplies were sent down at each inport, which allowed me to stay equipped and ready for more and more turtles. Irreplaceable Survey Coordinator Annette Henry (who’s namesake is our 3<sup>rd</sup> and final satellite tagged turtle) took care of finding creative ways to get all those supply packages to the ship – thank you! Denise Parker (of Northwest Fisheries Science Center) and Peter Dutton provided timely geographical updates (see turtle track maps!) for our three famous satellite tagged turtles.

I would also like to thank all of the marine mammal observers who work tirelessly on the flying bridge looking for marine mammals, seabirds, *and turtles*. They were enthusiastic about sighting sea turtles, and during their breaks they frequently jumped in the small boat to help with captures, or lent a hand with processing on the back deck. Oceanographer Candice Hall was also a huge help when her schedule allowed. Special thanks go to seabird observers Rich Pagen and Chris Cutler who provided invaluable assistance to the project. Many days, especially on the busiest turtle days, which were usually also the busiest marine mammal and seabird days, they would spend their entire two-hour break capturing turtles, processing turtles, recording data, spinning blood and/or labeling vials. At the end of their two-hour break from work (which they had spent working with turtles), I would joke that they could go back to their paid job, and I’d see them again in another two hours (I always did)! They became my right and left hands and kept me sane on the craziest of days. Not only do I appreciate being able to count on them for excellent assistance and their overwhelming support of the turtle project, but I really enjoyed working with them – never a dull moment with those two characters. Not to be forgotten are all the fabulous visiting scientists that spent hours upon hours sweating in the small boat and on the back deck in the heat of the tropics to help out. Because of their extra hands, muscles and senses of humor, the project kept up and didn’t skip a beat in the densest turtle hot spots.

This project would not be feasible without the amazing DSJ Deck Department led by Chief Bosun Chico Gomez. Chico has perhaps hand captured more turtles over the years than just about anyone, and I would doubt there is a more experienced group of people facilitating a turtle project out there – there is certainly not a finer group of men. Last but not least, I have an infinite appreciation for Chief Scientist Lisa Ballance, and all the DSJ cruise leaders, for putting up with my daily nagging to put the small boat in and undeniable single-mindedness: turtles turtles turtles! You not only entertained my (sometimes ridiculous) requests, but happily placed priority on small boat operations and the turtle project. That is why the project has flourished and we were able to surpass all my expectations. Sea turtle pelagic ecology is a significant part of the STAR ETP ecosystem study and it takes all the people I’ve mentioned and more to successfully pull it off. Simply put, we worked very hard and diligently on a very important project, and had a blast along the way! I hope you have enjoyed following our journey; I have enjoyed transcribing the highlights each week. Until next time!

| Species                       | Common name  | Number sampled |       |
|-------------------------------|--------------|----------------|-------|
|                               |              | Weekly         | Total |
| <i>Caretta caretta</i>        | Loggerhead   | 0              | 8     |
| <i>Eretmochelys imbricata</i> | Hawksbill    | 0              | 1     |
| <i>Lepidochelys olivacea</i>  | Olive ridley | 2              | 350   |
| <b>Total</b>                  |              | 2              | 359   |

### Turtle Stats:

Grand total of 359 turtles captured and released after data collection during STAR 2006:

350 olive ridleys

8 loggerheads

1 hawksbill

### Highlights:

- Processed more turtles than ever before during a 4-month STAR ETP survey
- Recorded encounters with four of the five eastern Pacific sea turtle species
- Sighted one sub-adult leatherback from the flying bridge (the most endangered sea turtle in the Pacific!)
- Deployed four Popup Archival Transmitting (PAT) tags on adult olive ridleys
- Detangled five olive ridley sea turtles, essentially saving their lives (removed one commercial fishing (circle) hook lodged in a turtle's lower mandible; removed one recreational fishing hook snagged on a turtle's front flipper; cut free two turtles wrapped up in heavy plastic; and cut one turtle free from of a 5kg mass of seine net towing several "J" hooks and plastic floats)
- 5 November – encountered an olive ridley hatchling (4.2cm SCL) 35 miles from the closest point of land
- 26 November - biggest day with 32 turtles processed, 72% being juvenile turtles (35cm SCL and smaller); flying bridge observers also sighted a hatchling (unidentified species) 79 miles from the closest point of land
- Deployed three Satellite-Linked Time-Depth Recorder (SDR):
  - 20 September – SDR on adult male named, "Ernesto"
  - 9 October – SDR on adult female named, "Iliana"
  - 5 November - SDR on sub adult female named, "Annette"

### Fish Sampled for Diet and Isotope Analysis and for Mahi Reproduction

| Species        | Samples |       |
|----------------|---------|-------|
|                | Weekly  | Total |
| Yellowfin tuna | 0       | 25    |
| Skipjack*      | 1       | 14    |
| Wahoo          | 20      | 23    |
| Mahi mahi      | 0       | 11    |

\*includes black skipjack

### Oceanographic Operations (Candice Hall)

Our proximity to the end of this cruise provides a perfect period for reflection on our STAR 2006 achievements. From an oceanographic standpoint, the David Starr Jordan (DSJ) has ferried us through a myriad of varying environments, from the cold California Current to the Pacific Warm Pool. Add to that



list the North Equatorial Countercurrent, Costa Rica Coastal Current, West Mexican Current and excitingly, the Costa Rica Dome and its associated Tehuantepec Bowl, and the immenseness of our target track becomes obvious. Our research in these regions will allow for a more in-depth understanding of these phenomena and their importance to the environment, its related fisheries and protected resources.

An important collaboration this year was with Scripps Oceanographic Institute and the International Argo Program, involving the deployment of Argo floats at pre-determined locations. Argo is a global array of 3,000 free-drifting profiling floats that will measure the temperature and salinity of the upper 2000 m of the ocean. The program allows continuous monitoring of the temperature, salinity, and velocity of the upper ocean. Seven perfect float deployments, with more than enough helping hands, have turned our small contribution to this venture into a huge success.

Another enterprise completed aboard the DSJ during this STAR project was a comprehensive hydrographic mapping of the seafloor below our vessel while on route to and from the French-owned Clipperton Island. This project was requested by Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER), a French Oceanographic Institute. It's completion contributes to the September 2000 Joint Statement signed by the NOAA Under Secretary of Commerce and the President and Executive Director of IFREMER, reaffirming their commitment and interest in cooperative research in oceanography between the two countries.

Although there are many more exciting moments to report, of higher importance at this time is a heartfelt thanks to all of those who have willingly assisted oceanographic operations during this cruise. Firstly, Lindsey Peavey, thank you for your unflagging reliability in conducting the net tows and daily chlorophyll/XBT stations during this cruise. I'd be a wreck if it hadn't been for your dependability and commitment. Secondly, as always, I'd like to commend the Officers and Crew of the DSJ for whom nothing is too much trouble; who constantly work with great vigilance, even after 179 CTD's! Chico, João, Victor, Jose and Ryan, your professionalism and sense of humour are what make working on this vessel such a pleasure.

This leg we've had the added bonus of visiting scientists Jessica Kondel, Marisa Trego, Juan Manuel Gutierrez Urias and Lisa Schwarz. Jessica remembered her NOAA days of early morning CTD's, Juan Manuel and Marisa covered the evening CTD stations and Lisa manned the net tows with Lindsey and her crew. Both Jessica and Marisa relieved the XBT pressure during the day, to which I am eternally grateful as we close down this cruise. Thank you again to all those who helped on other legs of this cruise; to resist redundancy, you know who you are.

Sadly the DSJ loses it's infamous, I mean, famous ET extraordinaire to retirement this year. Jim Anthony, your knowledge is unsurpassable, your humour unforgettable and your presence is indispensable. Thank you for everything, ETFH, from all the SWFSC Oceanographers that have ever sailed with you! Enjoy your retirement, you've earned it, just don't forget us!

A final thank you to Dr. Lisa Ballance, Dr. Jessica Redfern and Annette Henry at the SWFSC lab for their technical and procedural support, dare I add emotional? Thank you so much for giving us this magical opportunity that is STAR 2006.

| <b>Date</b> | <b>CTD</b> | <b>XBT</b> | <b>Bongo Tow</b> | <b>Manta Tow</b> |
|-------------|------------|------------|------------------|------------------|
| 30 Nov      | 2          | 3          | 1                | 1                |
| 01 Dec      | 2          | 3          | 1                | 1                |

| <b>Date</b>        | <b>CTD</b> | <b>XBT</b> | <b>Bongo Tow</b> | <b>Manta Tow</b> |
|--------------------|------------|------------|------------------|------------------|
| 02 Dec             | 2          | 3          | 1                | 1                |
| 03 Dec             | 2          | 3          | 1                | 1                |
| 04 Dec             | 2          | 3          | 1                | 1                |
| 05 Dec             | 0*         | 5          | 0                | 0                |
| 06 Dec             | 0*         | 5          | 0                | 0                |
| <b>Week Total</b>  | 10         | 25         | 5                | 5                |
| <b>Grand Total</b> | 179        | 288        | 75               | 78               |

\* Time restrictions as we head for home!