

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

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Science Summary: 9 - 15 November 2006

As has been chronicled in weekly reports since the start of STAR 2006, we use an ecosystem approach to fulfill our mission of investigating trends in populations of spotted and spinner dolphins. This week's highlight pertains to an important ecosystem indicator - Clipperton Island. A French-owned jewel in the heart of the eastern tropical Pacific, it is an isolated island with an intriguing history. A lone remnant of an ancient volcanic island that almost certainly was once home to species found nowhere else in the world, it is now a small speck of coral atoll in a vast ocean, not infrequently washed over by hurricane-induced seas. Legendary for its rich marine life (fanatic sport fishers pay astronomical prices to take the 5000 km round-trip from San Diego for a chance to catch a 100+ pound yellowfin tuna), eerie human history (phosphate miners were stranded on the island during the Mexican revolution and the lighthouse keeper made slaves of the small enclave of women that remained after their husbands sailed away in a makeshift raft in a desperate attempt to reach help), and wicked shore break (more than one scientific expedition has lost equipment attempting to land on the island in boats accidentally overturned by crashing waves), it is significant to STAR for one reason. Clipperton is the largest Masked Booby breeding colony in the world. The Masked Booby is the world's largest tropical seabird and 120,000 of them nest on an island with less than 2 square km of land surface. As such, the Masked Booby, and therefore, Clipperton Island, are important ecological indicators of the state of the eastern tropical Pacific ecosystem – and scientists at the Southwest Fisheries Science Center have been monitoring both since 1986.

On Friday, we landed on the northeast shore of Clipperton to spend the next 5 hours in an attempt to census the Masked Booby population. Working in pairs, we completed 24 transects, each running from the outer beach to the inner lagoon side of the atoll, counting birds within each one. We also took great care to photo document the state of the island, in particular, its vegetation. During our short time at and around Clipperton we also conducted a hydrographic survey of the little known Clipperton Ridge, in support of the NOAA-IFREMER bilateral. This Herculean effort required long hours around the clock from our oceanographer and NOAA Corps officers to collect, compile and document the data, now in a comprehensive package that we will send to this cutting edge French oceanographic institution (see Oceanographic Operations Report below).

Our short stay on the island indicates that the Masked Booby population appears healthy. Adult birds on nests, many with eggs and some with tiny chicks, were everywhere. Since our first visit in 1987, this population has been growing by leaps and bounds, walking right through two El Niño events of the century with little noticeable effect. The fact that these seabirds feed in association with yellowfin tuna and spotted and spinner dolphins indicates that these birds can tell us a lot about other aspects of the ecosystem.

The bad news is that the rat population of Clipperton also appears healthy. Introduced to the island accidentally sometime between 1990 and 1998 (likely from a wrecked fishing vessel), the rats have now established themselves firmly on the island. Rats and seabirds usually do not mix well; seabirds evolved without these predators and rats that accidentally spill onto an island will eat seabird chicks, eggs, and even adults of some small-bodied species. Clipperton Masked Boobies seem too big for a rat to tackle, so instead, the rats eat an endemic orange land crab. These crabs survive on vegetation and scavenge other

edible items (spilled bits of fish intended for booby chicks, molted feathers, etc.). Clipperton in its natural state is therefore quite devoid of large, leafy plants but this is changing. As our photos documented, the bleached white coral rubble is being overtaken by introduced, weedy plants and seedling palms. Left unchecked, the island will become lush and green, lovely for humans to look at, and deadly for Masked Boobies, for they cannot nest in habitat other than open, flat space. It is in this way that a single, accidental event on an isolated remote atoll could literally change the face of the largest tropical ocean in the world.

We finished our week on a 450 nautical mile beeline to Manzanillo, surveying along the way and finding, believe it or not, another group of killer whales. This, the fourth killer whale sighting of this leg alone, is quite unusual when compared with past survey years. What might explain their prevalence?

On Wednesday morning, we pulled into Manzanillo, Mexico, as planned, to refuel, reprovision, and relax. A successful Leg 5 it has been! Some interesting statistics: 14 cetacean species identified, 204 cetacean sightings recorded, 156 biopsy samples collected, 23 calibration schools worked, 9 acoustic recordings made, 28 seabird species identified, 43 seabird flocks counted, 33 CTD casts made, 16 dipnet stations conducted, 14 manta net tows, 13 bongo net tows, 39 XBTs deployed, 1 Halloween and 2 birthday parties enjoyed, 1 Aft Lab Café appearance (by songwriter and bird biologist Rich Pagen), and 15 scientific meetings attended.

Post Script - Hurricane Sergio has other plans for the David Starr Jordan. Instead of a few days off, we headed back out to sea on Wednesday afternoon, mere hours after our arrival, in a determined effort to get south of the building storm, due to arrive offshore of Manzanillo in a few days. Leg 5 has been extended!

Sightings and Effort Summary for Marine Mammals

Date	Start/ Stop Time	Position	Total nmi	Average Beaufort
110906	---	---	0	6+
	---	---		
111006*	---	---	0	---
	---	---		
111106	0710	N10:44.21 W108:51.09	99.0	4.1
	1837	N12:04.38 W107:49.27		
111206	0706	N13:09.72 W106:58.56	44.0	2.1
	1735	N13:48.81 W106:20.97		
111306	0704	N15:14.56 W105:22.42	75.4	3.4
	1810	N16:23.31 W104:28.60		
111406	0700	N16:58.89 W104:01.99	43.7	3.0
	1802	N17:45.65 W104:10.30		
111506	---	Manzanillo	0	---

*Clipperton Island Operations

Code	Species	Number of Sightings
002	<i>Stenella attenuata</i> (offshore)	6
010	<i>Stenella longirostris orientalis</i>	7
015	<i>Steno bredanensis</i>	4
018	<i>Tursiops truncatus</i>	1
021	<i>Grampus griseus</i>	2
033	<i>Pseudorca crassidens</i>	4
037	<i>Orcinus orca</i>	2
051	<i>Mesoplodon</i> sp.	2
099	<i>Balaenoptera borealis/edeni</i>	1
TOTAL		29

Photography (Cornelia Oedekoven, Laura Morse, Adam Ü)

Another fabulous week for blackfish! The last day of the leg generally being the busiest for the photo-id team as it is, we found a nice-sized group of killer whales which turned out to be quite the show stopper for the ship (page from the bridge to all hands: “aerobatic killer whales on the bow”) and small boat. Although we are not able to top last week (24 killer whale IDs from 2 sightings), we have identified eight individuals from the 297 images taken from ship and small boat so far on our last miles towards Manzanillo. Chances are big that we will find another one or two after some R&R in port. These eight individuals include three large males with two corresponding biopsies. Finally, false killer whales entered our horizons as well. About midday on November 12, we found our first school of false killer whales for the cruise, followed by three more sightings of the same species the same afternoon. Three sightings were photographed, the first group being particularly cooperative with 3-4 whales approaching the ship and spending considerable time within 100 m.

Species Code	Species	This week	Total
2	<i>Stenella attenuata</i> (offshore)	2	30
3	<i>Stenella longirostris</i> (unid.)		6
6	<i>Stenella attenuata graffmani</i>		11
10	<i>Stenella longirostris orientalis</i>	1	25
13	<i>Stenella coeruleoalba</i>		11
15	<i>Steno bredanensis</i>		12
17	<i>Delphinus delphis</i>		31
18	<i>Tursiops truncatus</i>		34
21	<i>Grampus griseus</i>		8
32	<i>Feresa attenuata</i>		3
33	<i>Pseudorca crassidens</i>	3	3
36	<i>Globicephala macrorhynchus</i>		12
37	<i>Orcinus orca</i>	8*	45*
46	<i>Physeter macrocephalus</i>		20*
49	<i>Ziphiid whale</i>		2
63	<i>Berardius bairdii</i>		3
72	<i>Balaenoptera edeni</i>		3
74	<i>Balaenoptera physalus</i>		2*
75	<i>Balaenoptera musculus</i>		23*
76	<i>Megaptera novaeangliae</i>		6*

Species Code	Species	This week	Total
90	<i>Stenella attenuata</i> (unid.)		1
99	<i>Balaenoptera borealis/edeni</i>		6

* Individual whales photographed

Biopsy (Juan Carlos Salinas Vargas and Ernesto Isaac Vázquez Morquecho)

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>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	6	19	44
<i>Physeter macrocephalus</i>	Sperm whale	0	0	8	8
<i>Pseudorca crassidens</i>	False killer whale	1	7	1	7
<i>Stenella attenuata</i>	Pantropical spotted dolphin	6	12	105	179
<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	2	11	64	169
<i>Stenella longirostris subsp.</i>	unidentified spinner dolphin	0	0	25	42
<i>Steno bredanensis</i>	Rough-toothed dolphin	1	1	12	23
<i>Tursiops truncatus</i>	Bottlenose dolphin	0	0	48	78
<i>Unid</i>	Unidentified small delphinid (e.g., <i>Delphinus</i> , <i>Lag</i>	0	0	2	2
		13	37	409	805

* Unidentified biopsy samples and takes were collected from a mixed school of spotted and spinner dolphins

Acoustics (Laura Morse)

It has been another banner week for acoustics. On the 12th we were surprised with our first *Pseudorca* sighting for the entire cruise. As we approached to within 50 meters I dashed to the acoustic den to turn on the bow hydrophone and to my great excitement the animals were chatting away. Over 20 minutes of high quality recordings were made. These are one of my favorite species to listen to, so I was extremely pleased. Not to be out done, last week's killer whale recording was a first for me in ETP waters, and I thought may be the only recording for this cruise....happily I was wrong! On Nov 16th killer whales were once again sighted and a sonobuoy deployed. At first the vocalizations were sparse and as we and the animals moved farther from the buoy, I thought that was that. But with M&M powers on my side (still no magic beans on this ship), the animals moved slowly back towards the buoy and were detected. When the small boat headed back to the ship, the animals' vocal behavior changed and call rates dramatically increased. The most outrageous calls heard yet on this cruise were recorded. You can listen to a sample of these 2 species calls on the STAR webpage soon.

Seabirds and Marine Debris (Rich Pagen and Chris Cutler)

The week began with us heading west toward Clipperton Island, the remote atoll breeding site of thousands upon thousands of seabirds and the final resting place of even more pieces of jetsam and flotsam, a sort of marine debris paradise if such a place could exist. Landing on Clipperton and witnessing for ourselves the largest Masked Booby colony on earth was certainly the dominant seabird theme this week. It was, as well, the dominant debris theme.

While assessing the nesting status of Masked Boobies, we also saw large numbers of Brown Boobies, the sexes strikingly different in plumage, and smaller numbers of Red-footed Boobies, Brown Noddies and Great Frigatebirds (which only recently were recorded nesting there). Of particular interest were the few Nazca Boobies, their orange-colored bills subtly apparent amidst the thousands-strong ‘sea’ of yellow-billed (though otherwise almost identical) Masked Boobies. One such Nazca was seen paired, or at least consorting with, its congeneric and close evolutionary cousin the Masked. The small Sooty Tern colony on the island, relegated to tiny islets in the central lagoon, appears to be waning each year as the population of introduced black rats (arrived in the late 1990’s) improves its foothold on the island.

Nineteen species of non-seabirds were recorded during our Clipperton visit, including an assortment of lost landbirds which hit the jackpot when they accidentally stumbled upon this needle-in-a-haystack resting place in an otherwise hostile and vast sea. Some highlights include Wood Thrush, Summer Tanager, Grey-cheeked Thrush and Belted Kingfisher. Trash and debris (much of it plastic) is a significant feature of the island, its beaches covered with everything from arc welding masks to the left arm of a toy doll.

Flock highlights this week include thirteen Pomarine Jaegers joining a feeding flock of Brown Boobies, and Tahiti Petrels and Leach’s Storm-petrels attending a group of False Killer Whales.

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

Turtles are like most other animals we encounter in the ETP: patchy. It’s hard to believe we processed 138 olive ridleys over the previous two weeks, and this week only one. Heading offshore I expected to see low turtle density, but as we neared Manzanillo it was surprising to hit just one small patch of turtles, of which we were only able to capture one juvenile. However, the last two evening net tows have revealed pelagic red crabs (*Pleuroncodes*), a major food source for loggerhead sea turtles in the eastern Pacific. Hopefully we’ll see loggerheads again on Leg 6, as we did on Leg 1 sailing off the coast of the Baja California peninsula.

You’ll remember from last week we deployed a satellite tag on a sub-adult female olive ridley, “Annette.” Annette is transmitting well and over the past ten days she’s stayed near shore and just off the continental shelf in the northern part of the Gulf of Tehuantepec (between Punte Escondido and Tehuantepec) in depths of between 1,000-3,000m. Check the STAR website for maps of all three satellite tagged turtles and follow their tracks through the ETP!

Species	Common name	Number sampled	
		Weekly	Total
<i>Caretta caretta</i>	Loggerhead	0	8

Species	Common name	Number sampled	
		Weekly	Total
<i>Eretmochelys imbricata</i>	Hawksbill	0	1
<i>Lepidochelys olivacea</i>	Olive ridley	1	314
Total		1	323

Fish Sampled for Diet and Isotope Analysis

Species	Samples	
	Weekly	Total
Yellowfin tuna	1	26
Skipjack*	0	13
Wahoo	0	3
Mahi mahi	0	11

*includes black skipjack

Oceanographic Operations (Candy Hall)

This week was excitingly different from the norm as we undertook a special oceanographic project – mapping the hydrography to and from French-owned Clipperton Island. The world-renowned French oceanographic institute, IFREMER, requested that we collect bathymetric data in the vicinity of the island for their UNCLOS (extension of the continental shelf request to the UN) work. I am rather proud of the product we were able to produce with little preparation time, especially as the *Jordan* is not geared to record data of this sort. We cranked up the 320B/R Knudsen Echosounder and although found it impossible to automatically record the digital Knudsen data, managed to capture the trace of the dramatically rising ridge that culminates in Clipperton Island.

This method of data recording involves a depth trace that has to be constantly monitored while it is matched to our Bridge program, Nobeltec Navigation Suite. The DSJ Officers were highly involved in this project and without their help it probably would not have succeeded. A thousand thanks to Commanding Officer LCDR Keith Roberts, and augmenting ET Roy Toliver, for brainstorming a workable data recording solution with me. The CO and XO, LT William Mowitt, stepped in, or should I say ‘sat down’ to relieve me during the long nightly recording shifts, severely cutting down on their own sleep as they crammed yet more hours of effort into their day. Gentlemen, the rest of the ship thank you for ensuring that I was able to obtain a few hours of sleep and retain some semblance of a personality! Navigational Officer, ENS David Gothan transcribed all our mark points into an Excel file for me, while our Operations Officer, ENS Sean Finney, consolidated our two outputs into one, descriptively clear word document. Thank you so much for the effort and commitment you four gave to this project, completely beyond the bounds of your responsibilities but so characteristic of the versatility and dedication of the NOAA *David Starr Jordan* officers and crew.

But alas, another leg draws to a close and with it the inevitable change of guard. Nacho Vilchis the Great has been CTD sentry with me every morning and night for the last three legs – we’ve seen our fair share of sunsets and rises! Many thanks to Nacho for all of his help, CTD balance and pull-up displays. I know his schedule was as rough as mine, yet he never complained about the early mornings. Best of luck with your thesis, Nacho, I hope it’s all smooth sailing..!

Date	CTD	XBT	Bongo Tow	Manta Tow
9 Nov	1	4	0	0
10 Nov	1	0	1	1
11 Nov	1	3	1	1
12 Nov	2	3	1	1
13 Nov	2	3	1	1
14 Nov	2	3	1	1
15 Nov	---	---	---	---
Week Total	9	16	5	5
Grand Total	159	244	65	68