

STAR 2006: NOAA Ship *McArthur II* Weekly Science Report

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Science Summary: 14 - 20 September 2006

We have been steadily steaming to the east all week, just about in sight of the Equator the entire time, whether slightly to the north or slightly to the south of it. At this latitude, and still some 2000 nautical miles from the coast of South America, the current flows strongly to the west. So strongly, in fact, that the Captain and Chief Engineer brought our fourth and last engine on line for a couple of days this week (to the tune of \$1000/day), just so we could get our forward speed above 8 knots. The water is cool and visibly green here due to the high concentration of surface chlorophyll, one result of upwelled waters rich in nutrients. We witnessed an extraordinary sea surface feature just before sunset on Friday – an east-west line of foam and small whitecaps clearly visible from the ship. As we crossed from N to S, the surface temperature dropped a full degree in less than a minute and the ship was pushed sharply to the north. It had all the features of the Equatorial Front, except that we had been in the South Equatorial Current for days. Interestingly, there was no concentration of life on “the line” that we could detect. This is quite different habitat from the clear blue waters of the “core area” where spotted and spinner dolphins are the king and queen of cetaceans. And the sights we see are, consequently, quite different, but no less impressive. My personal top three this week:

#3) Monday - Outrageous Bryde's whale sighting just after lunch. The animal was quite clearly curious about the ship repeatedly surprising us from the stern as it swam up along our side and toward the bow. After 30 minutes of this behavior, the entire scientific party was on the bow with camera lenses clicking away and biopsy sampling devices of all sorts poised and ready. JM Cotton shot twice with the Larsen gun – very close misses both, and on the third try he made a long shot of close to 200 m which hit the animal squarely in the back. (No visible response from the whale, by the way.) We proceeded to turn the ship around, acoustic array trailing behind, and picked up the dart on the first pass – port side. It was an outstanding effort from all involved and special thanks to the helmsmen, Stephen and Ben. (We had a repeat performance during event number 2 below.) Oh and by the way, mid-way through the sighting there appeared on our bow a dolphin of all things, which turned out to be a lone Rough-toothed dolphin. Usually in schools and not known for their bow-riding propensities, this animal swam some 10 m in front of the ship, back and forth, rolling on its side and turning its head this way and that, seeming to look up at us.

2) Tuesday and Wednesday - Blue whales! Our first since San Diego. The majority of our sightings were none other than cow-calf pairs!, some of the calves quite small and some of the pairs accompanied by a second large adult. We worked them with the ship, in most cases getting within half a mile or so and taking good lateral photographs of their distinctive color patterns (no biopsy samples allowed with cow-calf pairs!) One cow had a lengthy red wound running along her backbone, making her quite distinctive. This concentration of blue whale cows and calves along the equator is intriguing. We are in quintessential blue whale habitat - cool, upwelling-modified waters relatively high in productivity. Are these animals displaced from the Humboldt Current? Or have we discovered a calving ground for Southern Ocean populations?

1) Sunday – Lunchtime – from all spaces on the ship we hear the announcement “All observers to the flying bridge”. What we see at a distance of a mile or so is a clear disturbance on the surface that seems to span half a mile or so in length and a quarter of that in width. As we come closer, it is apparent that the

disturbance is made by a mass of animals swimming below the surface. A curious slick is several hundred meters away and dancing around just above it are some 50 Galápagos Storm Petrels, their white rumps gleaming against the steel blue water and looking for all the world like black butterflies. As we approach even closer, the animals finally start to move at the surface and soon the water is seething frothy white as hundreds of cetaceans porpoise along at the surface. They do not spread out but remain tightly packed, side to side like sardines in a can. Dense sheets of flyingfish flush all about them almost continuously. Because they are moving directly away, it takes some time to confirm that these are ... Melon-headed whales! ...and even more time to discover that there are ... Fraser's dolphins! with the school. (These are two relatively rare and highly coveted species for us cetacean groupies.) The two species appear to be segregated spatially, even within a very tight school. We follow them for almost an hour, mesmerized at this spectacle of nature.

Post Script: Happy Birthday to our Captain. (Rumor has it he's almost 40.) Congratulations to Ignacio, our jack of all trades, including Independent Observer, who racks up two official cetacean sightings this week.

Sightings and Effort Summary for Marine Mammals

Date	Start/ Stop Time	Position	Total nm	Average Beaufort
091406	0609	N01:26.26 W124:05.77	55.2	4.6
	1712	N01:01.49 W122:44.29		
091506	0701	N00:43.67 W121:38.18	93.0	4.7
	1853	N00:16.61 W120:03.93		
091606	0649	S00:21.42 W118:38.02	88.	4.4
	1846	S01:02.86 W117:08.52		
091706	0636	S01:15.99 W115:34.52	101.7	4.2
	1826	S01:22.76 W113:51.86		
091806	0623	S01:29.02 W112:32.60	104.5	3.9
	1815	S01:35.48 W110:46.58		
091906	0608	S01:44.21 W109:20.66	90.2	4.7
	1800	S01:51.88 W107:43.86		
092006	0657	S01:58.50 W106:20.09	57.5	5.0
	1848	S02:05.62 W105:06.31		

Code	Species	Number of Sightings
002	<i>Stenella attenuata</i> (offshore)	1
013	<i>Stenella coeruleoalba</i>	4
015	<i>Steno bredanensis</i>	1
026	<i>Lagenodelphis hosei</i>	1
031	<i>Peponocephala electra</i>	1
032	<i>Feresa attenuata</i>	1
033	<i>Pseudorca crassidens</i>	1
036	<i>Globicephala macrorhynchus</i>	6
051	<i>Mesoplodon</i> sp.	2

Code	Species	Number of Sightings
061	<i>Ziphius cavirostris</i>	1
070	<i>Balaenoptera</i> sp.	4
072	<i>Balaenoptera edeni</i>	3
075	<i>Balaenoptera musculus</i>	4
078	Unid. Small whale	1
098	Unid. Whale	1
099	<i>Balaenoptera borealis/edeni</i>	1
101	<i>Stenella longirostris</i> (southwestern)	1
Total		34

Biopsies (Suzanne Yin and Erin LaBrecque)

Species	Common Name	Weekly		Total	
		Samples	Takes	Samples	Takes
<i>Balaenoptera edeni</i>	Bryde's whale	1	1	1	1
<i>Balaenoptera musculus</i>	Blue whale	1	1	1	1
<i>Delphinus delphis</i>	Short-beaked common dolphin	-	-	2	3
<i>Stenella attenuata</i>	Pantropical spotted dolphin	-	-	1	1
<i>Tursiops truncatus</i>	Bottlenose dolphin	-	-	6	9
Total		2	2	11	15

Photo Project (Isabel Beasley and Jim Cotton)

A very exciting week for photo-identification, with an abundance of blue whales, two Bryde's whales and some less frequently sighted cetaceans being photographed. We had blue whale sightings two days this week, with good lateral photographs being taken of at least eight adults. Three of the adults were accompanied by very small calves. The calves were trickier to photograph, often not showing much of their bodies as they surfaced. However, at least two calves were potentially identifiable – and photographed swimming next to an accompanying adult (presumably the mother). Since the body of a blue whale appears aqua blue as it is swimming underwater – compared to the darker bodies of the other Balaenopterids such as Bryde's whales, we could easily follow them and obtained some great head and body shots of animals as they surfaced. We also obtained excellent photographs of the successful long-distance biopsy shot of a Bryde's whale (with the dart in the photograph!).

Another highlight for the week was a large mixed group of Fraser's dolphins and melon-headed whales. Although most were hind shots as the group ran away from the ship, we did manage to get some great images of both species.

Species	Weekly Photographs		Total	
	Individuals	Schools	Individuals	Schools
<i>Stenella attenuata</i> (offshore)	-	-	-	1
<i>Stenella longirostris</i> (whitebelly)	-	-	-	6
<i>Stenella coeruleoalba</i>	-	-	-	2
<i>Delphinus delphis</i>	-	-	-	5
<i>Tursiops truncatus</i>	-	-	-	3
<i>Steno bredanensis</i>	-	1	-	1

Species	Weekly Photographs		Total	
	Individuals	Schools	Individuals	Schools
<i>Lagenodelphis hosei</i>	-	1		2
<i>Peponocephala electra</i>	-	1		1
<i>Pseudorca crassidens</i>	-	1	2	3
<i>Globicephala macrorhynchus</i>	-	3	2	8
<i>Orcinus orca</i>	-	-	5	1
<i>Physeter macrocephalus</i>	-	-	-	1
<i>Balaenoptera edeni</i>	2	2	3	4
<i>Balaenoptera musculus</i>	8	4	9	5
<i>Stenella longirostris</i> (southwestern)	-	-		1
Total	10	13	21	44

Seabird and Marine Debris (Michael Force and Sophie Webb)

We did our best to cleanse the ship of pesky Pollywogs, but judging from the lack of diversity once we “Crossed the Line,” King Neptune must still be concerned about the possibility of stowaways on board. We managed to complete two 10-species days at the beginning of the week, after which avian diversity took a nosedive, recording our lowest daily average since the first week of August when we were in the western edge of the California Current. Five species in a single day can now be considered a good day, and our faithful feathered friends, Sooty Tern, Wedge-tailed Shearwater, and Juan Fernandez Petrel, have disappeared. We also lost Peter, our Pacific Golden Plover. After 10 days of easy living on the foredeck, he (she?) vanished. Perhaps there was just too much commotion that morning, with 13 ‘wogs obediently mustered beside his supper dish.

Despite the paucity of birds, there were a few highlights. Absolutely mind-boggling was a bird believed to have been a White-headed Petrel. This sub-Antarctic species is unlikely this far north (perhaps never?), but seabirds don’t read the field guides and are known to wander far from their nesting islands. We also saw a Galapagos Petrel, our first of the trip, and exactly where we would expect to find one – on the western edge of its range. We also saw our first Band-rumped (Harcourt’s) Storm-Petrel in at least a month; we expect to see a few more of this species as we near the Galapagos, one of their nesting sites. An Arctic Tern flew past, our first since the first week in August. On Wednesday we witnessed an impressive southbound migration of Gould’s (White-winged) Petrels. More than 200 of this gorgeous *Pterodroma* flew past in a couple of hours. And then, as if someone had turned off the tap, they were gone. A small piece of lumber, a plastic bottle, and a plastic fishing float are our first trash sightings in a couple of weeks.

Fish Sampled for Diet and Isotope Analysis

Species	Samples	
	Weekly	Total
Wahoo	-	1

Oceanographic Operations (Melinda Kelley)

We started the week with a curtailed schedule of ecosystem sampling due to the fact that we had too many trackline miles to cover in too little time. However, by Sunday, our team members found themselves back in full swing with an adjusted trackline allowing us to complete all operations as

originally planned. The real excitement began as we moved back into full operations and our Electronic and Survey Technicians faced the late night trials of yet another re-termination of the CTD conducting cable (due to unraveling). They effectively completed the midnight task and the morning CTD cast was conducted successfully - thanks Stan and Lacey.

Another notable event this week was the crossing of the Equatorial Front. It seems that almost everyone but me observed the amazing line across the sea surface. As we crossed, however, I did manage to observe a one-degree temperature drop on our monitoring computer. We started the week with sea surface temperatures of 26 C (79 F) and currently the readings have decreased to 24 C (75.2 F). Additionally, the mixed layer is reaching 55 m. With the help of our net tow team, Ignacio and Maria, productive net tow samples are still being successfully collected. In particular, the manta tows have delivered beautiful specimens including blue buttons, Myctophids, Halobates, and eel larvae.

Date	CTD	XBT	Bongo tow	Manta tow
14 Sept	1	3	1	1
15 Sept	2	3	1	1
16 Sept	1	4	1	1
17 Sept	2	3	1	1
18 Sept	2	3	1	1
19 Sept	2	3	1	1
20 Sept	2	3	1	1
Total	12	22	7	7

Squeakly Report (Shannon Rankin and Liz Zele)

The week started with a chaotic mass of false killer whales, which are notoriously difficult to detect visually in all but the best of weather conditions (they are, however, little chatterboxes). We've managed to obtain fantastic recordings of pilot whales, rough-toothed dolphins, spotted and spinner dolphins, striped dolphins, and a mixed group of Fraser's and melon-headed whales, in addition to 24 detections of dolphins not sighted by the observers. Unfortunately, we were given the silent treatment by the sightings of beaked whales and pygmy killer whales.

Our luck with equipment this leg has significantly improved, thanks to Liz's fantastic splicing job. Now that she is a pro, I look forward to her incredible workmanship during future breakdowns. We have had ample opportunity to work with sonobuoys this week, with seven deployments (four on blue whales, and three on Bryde's). The good news is that nearly all of our sonobuoys are functional (a miracle in itself!), but the bad news is that these whales had better things to do than talk to us. It is a difficult task to juggle sonobuoy deployments while continuously monitoring the array, and we are deeply indebted to Ignacio for his help deploying and monitoring sonobuoys this past week.

Dippers' Doldrums (Jim Cotton)

It was another slow week for flyingfish collecting. High winds hampered the evening collecting efforts but our ace team managed to capture some Black-wing fliers (*Cheilopogon xenopterus*) and a hybrid Black-wing/Yellow-stripe (*C. dorsomacula*). Of the three species of two-winged flyingfish that occur here, the Barbel flyingfish (*Exocoetus monocirrhus*) was the most abundant in our sample this week. Lantern fish were common at all the stations and *Halobates*, an aquatic insect, were few in numbers and only present at half the stations. This week, we're in the overlap area where Humboldt and Lemon squids

Dosidicus gigas and *Sthenoteuthis oualaniensis*) occur sympatrically. These Lantern fish predators were seen at most stations and samples of each were collected for further study.

For the second time this cruise, a small (2.5 meter) Hammerhead shark passed quickly beneath our floodlights. Twenty years ago, it was not uncommon to see sharks at the evening CTD stations; unfortunately, these sightings now fall in the category of uncommon to rare.