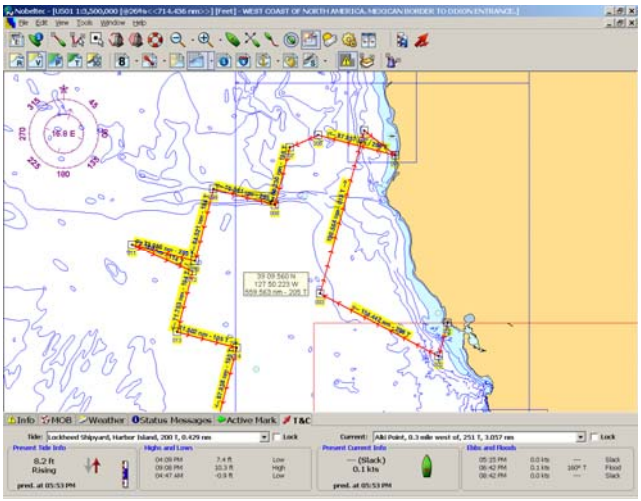
ORCAWALE 2008: Weekly Report

Report Dates: 14-20 September 2008 Chief Scientist: *Jay Barlow* Leg 3 Cruise Leader: *Jim Carretta*

Weekly Science Summary
Jim Carretta

One of the major forces behind the productivity of the California Current has been missing this week: wind. Not that any of us are complaining! The great coastal upwelling engine of the California Current is powered by wind, which in turn, creates the oceanographic conditions to maintain primary and secondary productivity, which in turn provides the biomass necessary to support the diverse assemblages of whales, dolphins, and porpoises, which in turn, requires that these populations be monitored, which in turn, requires that approximately 2 dozen people eat French toast for breakfast 100 miles offshore each morning on one of the best research ships I've sailed on. This week we have surveyed the offshore waters of northern California on our way to our final destination of San Diego. Including me, we have six new scientists on board, who are already comfortably into the rhythm of life at sea: Shannon Lyday, Andrey Suntstov, Carl Mayhugh, Rich Pagen, and Aly Fleming. Welcome aboard! I'd also like to extend my thanks to our previous cruise leader, Jeremy Rusin, for all his hard work during Leg II. Our pass-the-baton cruise leader meeting over coffee during the San Francisco in port made it possible to smoothly transition from Leg II to III. The folks out here are still speaking fondly of you, Jeremy.

The California Current is like a tropical rainforest, only wetter. The great variety of animals that we are all fortunate enough to see is mind-boggling. From our midwater trawls come some of the scariest-looking and most alien-like creatures you will ever see, such as this viperfish (right), photographed by Carl Mayhugh -



The area between the latitudes of San Francisco and Eureka, CA that the NOAA ship *McArthur II* is surveying this week.

Viperfish. Photo: Carl Mayhugh.

Imagine being a prey item in <u>this</u> species' neighborhood. Below you will find many more descriptions of the creatures we encounter and the experiences we have out here. Enjoy.

Marine Mammal Effort Summary.

Date	Time start Time end	Start Location End location	Distance surveyed (nm)	Average Beaufort
091407		San Francisco Inport		
091507		San Francisco Inport		
091607		San Francisco Inport		
091708	1455 1840	N38:00.50 W122:53.82 N37:32.63 W123:00.81	17.3	1.1
091808	1111 1630	N38:33.67 W126:00.14 N39:18.04 W125:47.86	70.3	2.9
091908	0742 1856	N39:23.26 W125:43.13 N41:06.76 W125:09.60	68.5	3.5
092008	0734 1911	N41:12.89 W124:22.56 N41:24.21 W126:22.01	90.7	2.5

Marine Mammal Sighting Summary.

Code	Species	Total sightings
013	*Stenella coeruleoalba*	1
017	*Delphinus delphis*	2
040	*Phocoena phocoena*	3
044	*Phocoenoides dalli*	24
063	*Berardius bairdii*	2
070	*Balaenoptera* sp.	3
074	*Balaenoptera physalus*	3
075	*Balaenoptera musculus*	1
076	*Megaptera novaeangliae*	15
079	unid. large whale	2
177	unid. small delphinid	1
CU	*Callorhinus ursinus*	8
MA	*Mirounga angustirostris*	15
Total		**80**

Cetacean Biopsy Report

Suzanne Yin, Allan Ligon, and Rich Pagen

Species	Common Name	No of Weekly Samples	No of Weekly Takes	Total Samples	Total Takes
Balaenoptera physalus	Fin whale	0	0	14	20
Berardius bairdii	Baird's beaked whale	0	0	1	1
Delphinus delphis	Short-beaked common dolphin	0	0	22	55
Globicephala macrorhynchus	Short-finned pilot whale	0	0	4	5
Lagenorhynchus obliquidens	Pacific white-sided dolphin	0	0	25	49
Lissodelphis borealis	Northern right whale dolphin	0	0	10	23
Orcinus orca	Killer whale	0	0	2	9
Grand Total		**0**	**0**	**78**	**162**

Photo Report
Jim Cotton and Chris Cutler

During this "week," actually three-and-a-half days, we had some fine "Kodak moments", with the caveat that we could in truth shoot-like-mad and delete scads of digital images later on. On our first day out, in the remarkably productive waters off the Farallon Islands, we could see humpback whales in all directions. Because we wanted to maximize time on our survey track lines, we only photographed a handful of them, obtaining nine IDs. Many of the whales were in the company of aggregating seabirds, like this one with a shearwater (Fig 1). Another humpback was missing about one-third of its fluke, though the trailing edge of the attenuated appendage was sweptback and curved as in a "normal" fluke, as if the deformity had been congenital (Fig 2).

Suzanne Yin, often found with crossbow in hand, had the quick reflexes to photograph a Baird's beaked whale that surfaced close to the ship (Fig 3 – note the extensive scarring). We saw our first mixed species school of striped nothing to do with us and fled rapidly as we approached, yielding zero IDs. We had better luck with a couple of blue whales which surfaced unexpectedly close to the small boat. Note the tooth-rake scars, likely from an orca whale, close to the fin of one whale (Fig 3). One blue whale with skin lesions was also photographed and is a subject of interest as they may indicate a disease state. Research by SWFSC personnel on blue whales in Chile is currently investigating such skin conditions.

Figure 2. Attenuated humpback flukes.

Figure 1. Humpback whale and shearwater.

Figure 3. Blue whale with possible tooth rake marks near dorsal fin.

Photography summary table.

Common Name	Weekly Totals: Sightings Photographed	Weekly Totals: Individual IDs	Cruise Totals: Sightings Photographed	Cruise Totals: Individual IDs
Pacific white-sided dolphin	0	0	10	52
Northern right whale dolphin	0	0	8	6
Short-beaked common dolphin	1	0	8	50
Striped dolphin	1	0	1	0
Dall's porpoise	1	0	1	0
Sperm whale	0	0	2	2
Baird's beaked whale	1	1	3	12
Sei whale	0	0	3	9
Fin whale	0	0	22	45
Blue whale	1	2	10	14
Humpback whale	4	9	12	16
Killer whale	0	0	3	37
Cuvier's beaked whale	0	0	1	1
Pilot whale	0	0	1	39
Total	9	12	85	283

Seabirds

Michael Force and Sophie Webb

A combination of a series of near shore-off shore trackline coverage resulted in an outstanding (four day) week for the seabird department. We found 30 species, and our daily average of 17 was our highest ever. A number of reasons account for this, primarily location and timing. Put another way, we were in the right place at the right time. This was certainly the case for jaegers! On some days, jaegers (as a group) were the most abundant seabird. Flocks of Long-tailed Jaegers, in flight and roosting on the water, with many others slowly winging their way south, seemed to be everywhere one looked. Parasitic and Pomarine Jaegers were also fairly common and there were a few South Polar Skuas around most days. It hardly needs to be said that the final week of August and the first couple of weeks of September is the peak period for migrating jaegers, a pattern observed on previous ORCAWALE surveys. As summer gives way to fall, we can expect the proportion of juveniles to increase (adults migrate earlier than immatures) as well as a drop in overall numbers.

Buller's Shearwater, rightly regarded as the most beautiful of the world's 28 species of shearwaters, was seen with increasing frequency this week. This species, named for the infamous

"Father of New Zealand Ornithology" Sir Walter Lawry Buller, nests only at Poor Knights Islands, a motley collection of vegetated rocks, stacks and islets totaling only 24 square kilometres located off the east coast of Northland, New Zealand. Upon completion of nesting, Buller's Shearwaters (formerly known as New Zealand Shearwater) disperse on a broad front throughout the north Pacific Ocean, reaching the west coast of North America in late summer and fall. A large mixed seabird feeding flock associating with humpback whales contained at least 50 of these gorgeous shearwaters. In addition, 700 Sooty, 300 Pink-footed and one Flesh-footed Shearwater were taking advantage of the concentrated food supply. The seabird highlight this week, however, has to be Cook's Petrel, the first for ORCAWALE 2008.

A recurring theme the past few weeks has been displaced and/or disoriented southbound migrants. Boosting our weekly total were Black-bellied Plover, Greater Yellowlegs and Northern Pintail

Acoustics Squeakly Report
Tina Yack and Aly Fleming

After a short in port we are back at sea and busy as ever. I'm happy to report that we are fully stocked with a new supply of espresso beans (Thanks Yin & Allan). I'm also ecstatic to report that I have a new addition and valuable asset to the acoustics department (formerly consisting of yours truly), Aly Fleming (Welcome aboard Aly!). Despite our short week of monitoring effort we have had numerous new acoustic adventures.

This week, during three days of acoustic effort there were approximately 33 hours of recording effort and 30 hours of monitoring effort (Table 1). During this time, there were 48 acoustic encounters, 15 of which matched visual sightings (Table 2). The highlights of this weeks acoustic adventures include; two Baird's beaked whale encounters (as we were steaming to a new track-line), a fin whale encounter, a mixed species encounter of short-beaked common dolphin and striped dolphin, numerous Dall's porpoise encounters, and several acoustic unidentified beaked whale encounters.

From an acoustics perspective, one of the most exciting things that happened this week was an acoustics only beaked whale encounter. As we were traveling north near Mendocino ridge, I was explaining my Nancy Drew beaked whale mystery (see week 5 for details) to Aly when a few pesky mid-frequency echolocation clicks caught my eye. These were matched to a few automated beaked whale detections. I assumed this would be another example of my inability to localize these mysterious creatures but to my surprise I began getting some good bearings. This was followed by an explosion of beaked whale auto detections and a cacophony of characteristic beaked whale echolocations on the spectrogram (Figure 1). I estimated that the animal(s) was approximately 1 nm away at a bearing of 60° initially, and approximately 0.8 nm away when it passed the beam of the ship. My range of detection was estimated to be 1.5 nm. The bad news however, was that we were in the midst of a fog bank with extremely limited visibility and no chance for an associated sighting (coincidence, I think not, the beaked whales are conspiring against me…). In the end,

Nancy may be a step closer to solving the mystery. Stay tuned next week when we cross the Mendocino Ridge again, and hope for simultaneous visibility and acoustic detections.

Table 1. Rainbow Click Recording Effort (Sample Rate: 480 kHz: Hydrophones 4 and 5).

Date	Average Beaufort	Recording Start	Recording End	Recording Time	Monitoring Effort	Acoustic Encounters
9/14/2008	OFF	OFF	OFF	OFF	OFF	OFF
9/15/2008	OFF	OFF	OFF	OFF	OFF	OFF
9/16/2008	OFF	OFF	OFF	OFF	OFF	OFF
9/17/2008	OFF	OFF	OFF	OFF	OFF	OFF
9/18/2008	2.9	7:04	16:44	9:40	9:10	18
9/19/2008	3.5	7:19	19:35	12:16	11:16	20
9/20/2008	2.5	7:36	19:12	11:36	10:00	10
Total				33:32:00	30:26:00	48

Table 2. Acoustic Encounters

Species ID	Number of Acoustic Encounters
Baird's beaked whale	2
Dall's porpoise	10
Fin whale	1
Mixed delphinid	1
Unid beaked whale	8
Unid cetacean	9
Unid delphinid	2
Unid porpoise	11
Possible Baird's beaked whale	4
Total	**48**

From our New Acoustician Aly Fleming

Never having been a real wiz at computers or a fan of the technical stuff, I certainly found the above scene pretty intimidating when I first sat down with Tina, the resident acoustic expert. Luckily for me, Tina is also a very good instructor and she quickly got me up to speed on the basics so I could at least attempt to be helpful! The 4 computers above each tell us a different piece of information. Two computers are detectors which look for certain prescribed characteristics of the sounds that our hydrophones pick up. If the sounds match these characteristics, the computer labels them as a specific type of whale and then color codes them for us. One detector is for porpoises and the other searches out the tell-tale signs of beaked whale vocalizations. As these displays scroll along in real time, we also watch our 3rd computer using the program Ishmael which shows us a spectrogram of the signal being picked up on our hydrophones. We monitor this display for areas of intensity that may be indicative of marine mammals in the area. By recording where these vocalizations are in

relation to the ship, we can narrow in on the geographical location of the animals on the 4th and final computer and get an actual GPS position for them.

All this information is particularly useful when combined with the marine mammal observations taking place a few floors above us on the flying bridge. Sometimes we see the cetaceans but don't hear them and other times we can hear them but never make a visual observation of them. By having visual and acoustic monitoring simultaneously, we are able to get a more holistic and accurate estimate of marine mammal distribution in the California Current. It has been an exciting week so far with great weather and quite a number of marine mammal encounters. It will be interesting to see how things might change as we head south later this week

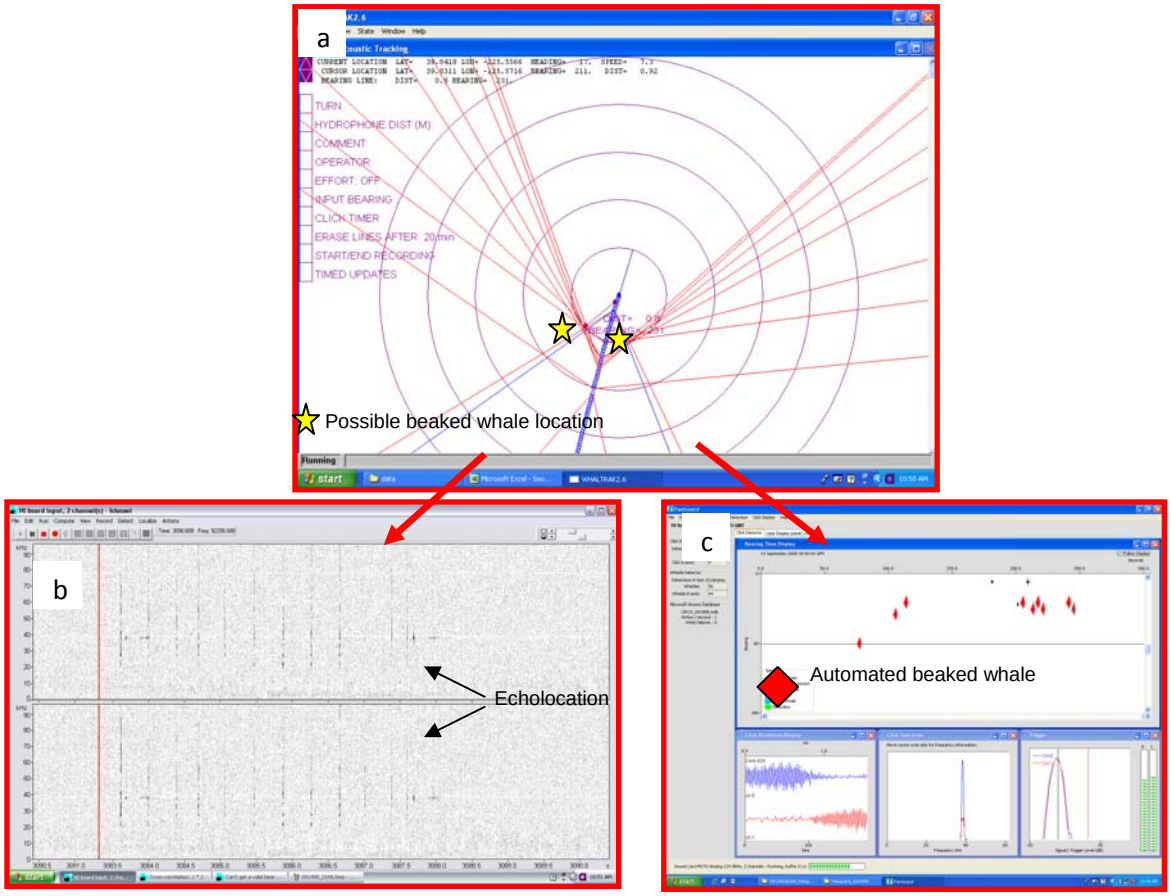


Figure 1. Acoustic encounter of probable beaked whales at 10:45 on 9/19/08. Figure 1a, shows the Whaltrack localization of the received signals (Yellow stars indicate estimated animal positions). Figure 1b depicts an Ishmael spectrogram of probable beaked whale echolocation and figure 1c illustrates the PamGuard automated detection (red diamonds indicate individual beaked whale echolocation clicks).

Oceanography

Ryan Driscoll, Shannon Lyday, Jim Carretta

We will start Leg 3 right and get back to Oceanography Expose. In the past few weeks we have met "Rosy", followed the oceans temperature with XBTs, learned how wind affects the ocean and glimpsed the vastly important world of phytoplankton. Starting from

the latter we will move up the food chain to Zooplankton; how and why we sample it.

Zooplankton grazers (plankton that eats phytoplankton) are the major link between the energy stored by plants and the rest of the food web. Euphausiids "Krill" and copepods are two examples of grazers consumed directly by Baleen Whales (Mysteceti). Grazers and their predators are also consumed by larval fish and squid, who often are often plankton themselves if only while young (Meroplankton). Even birds get in on the action.

Timing the life cycles of zooplankton, fish, squid, whales, birds and phytoplankton with the currents and seasons has been a scheduling nightmare that only evolution could work out with thousands of years of practice. It is our goal by sampling the what, when where and wow much, to try and understand this complicated process, the Why. We do this by deploying a Bongo net. So called because it can be played during impromptu jam sessions as well as catch zooplankton, or maybe just because it resembles bongos. There are two nets on either ring of the Bongo allowing for two different mesh sizes. Varying mesh sizes allows us to sample our target organisms more precisely.

State of the Ocean: We have had an excellent start to Leg 3 as I think all the departments have. Joining Oceanography this time around are Shannon, Jim and our new augmenting Survey Tech, Lillian. We've crossed in and out of some very cold upwelling zones near Cape Mendocino in the past few days and are entering offshore waters for the next few weeks. The Bongo yielded some interesting results. Sticky mats of chain diatoms turned our smaller net into a thick pea soup and our larger net turned up a surprise in the form of a Dragon Fish.

Day	CTD	XBT	Surface chlorophylls	Bongo Tows	HAB
9/17/2008	0	2	2	0	12
9/18/2008	2	2	2	1	12
9/19/2008	1	4	4	1	24
9/20/2008	1	4	4	1	24
Grand Total	40	175	159	33	928

IKMT Midwater Trawling Weekly Report

Andrey Suntsov and Carl Mayhugh

During past three days since the beginning of the third leg (September 17, 2008) we have completed three regular IKMT (Isaacs-Kidd Midwater Trawl) nightly pairs (150 and 500 m), as well as one test tow at day light prior to the beginning of regular work. Our trawls to date have yielded a regular assortment of oceanic micronekton – small, actively moving animals with size range between plankton (<2 cm) and nekton (>10

cm). Briefly, our fish collection included several species of lanternfishes (Fam. Myctophidae) common for the northern California Current such as northern lampfish (*Stenobrachius leucopsarus)*, California headlightfish *Diaphus theta* and blue light lanternfish (*Tarletonbeania crenularis*). Our deeper trawls (500m) have also yielded several species of non-migrating bistlemouths (*Cyclothone* spp.) and one species of bigscales (Fam. Melamphaeidae). Predatory fishes in our catches were represented by only two species – *Tactostoma macropus* (Fam. Melanostomiidae) and *Chauliodus macouni* (Fam. Chauliodontidae). IKMT also retains large fish larvae – for the most part these are different larval *Sebastes,* larval viperfish (*Chauliodus*) and *Tactostoma macropus*, with infrequent occurrences of barracudinas (Fam. Paralepididae) and some flatfishes - e.g. larval rex sole (*Glyptocephalus zachirus*).

In addition to a variety of common California Current midwater fishes, covered and pictured in earlier weekly reports, our trawls bring on board an interesting variety of other pelagic organisms such as midwater jellies – *Atolla vanhoeffeni* – a beautiful coronate medusa capable of producing brilliant bioluminescent display and *Periphylla periphylla* - another coronate scyphomedusa common in meso-/bathypelagic zone worldwide. Most of our crustacean catch is composed of krill (*Euphausia pacifica*), but we regularly get several species of hyperiid amphipods – a diverse group restricted to the oceanic pelagic realm, with many species developing intimate associations with gelatinous organisms. Our deeper tows (500 m) on several occasions brought an outstanding member of this group – *Cystisoma magna* – the largest representative of hyperiids (up to 100 mm, comparing to 10-20 mm for the majority of other species) and good example of deep-sea gigantism, totally transparent and very fragile. Other interesting deep pelagic crustaceans included sergestid shrimps such as semitransparent *Sergestes* and bright red *Sergia*, as well giant scarlet red mysid *Gnathophausia ingens* – a species commonly found in the oxygen minimum layer and capable of squirting a cloud of bioluminescent fluid to confuse or blind a potential predator. It can also grow to an impressive length of 30 cm (another example of deep-sea gigantism!) and is the largest entirely pelagic crustacean known to date. Some pictures of the pelagic animals mentioned here are provided below.

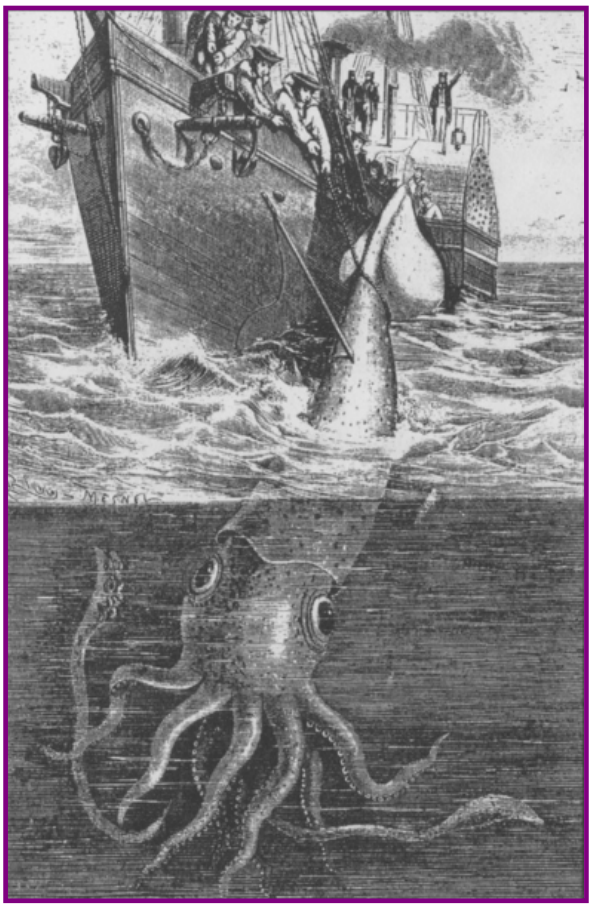
Coronate scyphozoid medusa *Atolla vanhoeffeni*

Pelagic shrimp of thegenus *Sergestes* (Fam. Sergestidae).

Largest hyperiid amphipod in the world
Cystisoma magna, ~80 mm (Fam. Cystisomatidae)

Deep-sea giant mysid *Gnathophausia ingens*.

Squid Jigging Project
Jim Cotton, Sophie Webb, Jim Carretta



We've taken to calling this project the "giant squid rodeo." The 1800s drawing of the struggle with the giant squid is actually not much different from our nightly fishing experiences. There are some sore arms and shoulders this week after nearly 30 large squid were brought onboard the McArthur, some weighing in at 29 pounds. One of the squid which was hooked and fought for some time eventually got away, but left its chitinous beak behind on the jig. Left defenseless among other members of a species that are known for their cannibalism, one almost shuddered to think about the fate that awaited it as it swam back into the black depths. There are some scary creatures down there.