ORCAWALE 2008: Weekly Report

Report Dates: 03-09 August 2008 Chief Scientist: *Jay Barlow* Leg 1 Cruise Leader: *Jay Barlow*

Weekly Science Summary
Jay Barlow

During the past week we have been primarily surveying in waters far offshore of northern Oregon and southern Washington (see plot below). We have been rapidly accomplishing all our planned transect lines and have been adding lines where we can. Although we have seen our fair share of wind and fog, the weather has been generally kind to us.

Transect lines completed to date. Note that not all lines were surveyed for marine mammals during daylight hours.

What has surprised us most about the waters out here is the lack of dolphins and porpoises. This week we have had only one dolphin sighting and only five sightings of Dall's porpoises. Normally we would expect several sightings of each every day. In fact, the most common sighting this week is the mighty fin whale. This is the second largest species in the history of our planet, second only to the blue whale (and we saw two of those this week too, see photo). We rounded out the week with a sighting of sei whales. This species is rarely seen in California Current waters.

Although these largest of whales spark the excitement of even the most experienced of our marine mammal observers, it was the obscure Baird's beaked whale that really could be called the "sighting of the week." The beaked whales

Blue whale raises its flukes before a long dive.

include a very large group of poorly known species; in fact, we are still discovering new ones. Beaked whales live in deep, offshore waters and are seldom seen by anyone who is not a sea-going cetolologist (whale person). Baird's beaked whale is the largest of the beaked whale species, growing to a maximum of 40 feet and weighing up to 14 tons. Being larger than most beaked whale and found in larger groups, this species is conspicuous when they are at the surface. Their blows appear as little puffs of smoke at the horizon. In our encounter this week, however, the puffs disappeared as the animals began a long dive. Our crack acoustician, Tina Yack, was able to track them as they moved in three dimensions below us. We cannot tell how deep they were, but other beaked whales commonly dive to 1 km depth or more. After 68 minutes, the whales finally surfaced again and we were able to direct the small boat towards the closely packed group to obtain photographs and a biopsy sample. This is the longest dive we have ever measured for this species and we would almost certainly have given up if we did not have acoustic tracking.

Baird's beaked whales: note their long beak protruding past their bulbous heads. The lower jaw protrudes even more, revealing two large teeth. Scars on their backs are from these teeth.

Marine Mammal Effort Summary.

Date	Start time Stop time	Start location Stop location	Distance surveyed (nm)	Average Beaufort
080308	0643 0920	N46:19.45 W129:48.77 N45:52.85 W129:56.04	27.1	4.0
080408	0652 2007	N45:17.11 W130:54.45 N45:05.76 W128:59.32	94.5	5.0
080508	1049 2037	N45:07.20 W128:35.56 N46:14.22 W128:10.50	59.0	5.0
080608	0645 2020	N46:24.42 W128:02.75 N45:03.56 W126:59.77	111.2	3.8
080708	0639 2030	N45:02.98 W127:01.61 N45:02.11 W128:35.26	70.4	2.6
080808	0635 2040	N45:02.12 W128:37.19 N43:41.39 W129:26.38	100.5	4.5
080908	0647 1801	N43:42.67 W129:28.24 N44:24.10 W130:34.28	79.5	4.8

Marine Mammal Sighting Summary.

Code	Species	Common name	No. sightings
027	*Lissodelphis borealis*	Northern right whale dolphin	1
044	*Phocoenoides dalli*	Dall's porpoise	5
046	*Physeter macrocephalus*	Sperm whale	1
049	Ziphiid whale	Ziphiid whale	1
061	*Ziphius cavirostris*	Cuvier's beaked whale	1
063	*Berardius bairdii*	Baird's beaked whale	1
070	*Balaenoptera* sp.	Baleen whale	2
073	*Balaenoptera borealis*	Sei whale	1
074	*Balaenoptera physalus*	Fin whale	11
075	*Balaenoptera musculus*	Blue whale	2
078	Unid. small whale	Unidentified small whale	1
096	Unid. cetacean	Unidentified cetacean	1
MA	*Mirounga angustirostris*	Northern elephant seal	2
		Weekly Total	**30**

Cetacean Biopsy Report
Suzanne Yin and Allan Ligon

Species	Common name	No. weekly samples	No. weekly takes	Total samples	Total takes
Balaenoptera physalus	Fin whale	5	5	8	9
Berardius bairdii	Baird's beaked whale	1	1	1	1
Lagenorhynchus obliquidens	Pacific white-sided dolphin	0	0	1	1
Lissodelphis borealis	Northern right whale dolphin	1	1	4	9
	Weekly Total	**7**	**7**	**14**	**20**

Photo Report
Jim Cotton and Chris Cutler

With winds up to 20 kts and swells to eight feet, the visual pursuit of animals that only come to the surface to breathe (and occasionally expose themselves further) can challenge us observers. We overcome the vagaries of weather (sometimes) by approaching cetaceans with the ship and easing up on them to identify species, obtain biopsies and take photographs. When the seas are remarkably calm, as happened one day this past week, we take to the small boat, or RHIB, for what we hope will be a closer look.

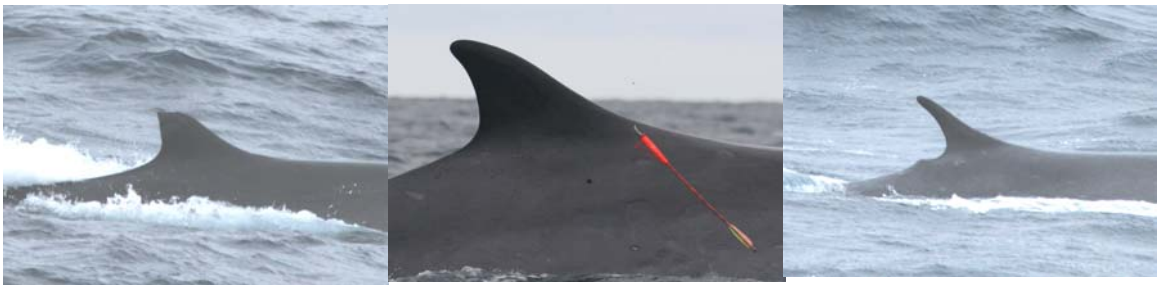
This week we captured images of 28 uniquely identifiable individual cetaceans from six species in 14 different sightings. Among them, the majority were mysticetes (baleen whales), with eight fin whale sightings, one mixed fin and blue whale group, and singles of blue and sei whales, the latter with a massive, falcate dorsal fin and a body pock-marked by old cutter-shark bite scars. We also photographed a few odontocetes (toothed whales), including a lone sperm whale, some northern right whale dolphins, and a pod of Baird's beaked whales. Of the 14 different fin whale dorsal fin photographs we obtained, two whales in one group were successfully biopsied from the ship as well. Though distant, the sperm whale that lifted its tail into the air gave us the opportunity to shoot its fluke straight-on before it plunged straight down into the abyss.

The highlight of the week was the Baird's beaked whales. We reveled in close studies of these enigmatic, deep-diving, little known socialites as they moved

together in a tight group; breathing, diving, and surfacing synchronously like Olympians or bunching up like Rugby players in a scrum. Upon surfacing, some rolled on their sides to drag a fluke through the water or poked their long, uniquely four-toothed 'beaks' just above the water, and all revealed bodies chock-a-block with long keloid-like tooth-rake scars and deep gashes. We obtained close-up photographs of nine individuals, including a biopsied animal; the ingredients needed to start the family photo album of a group of far-flung sea-goers that, just perhaps, had never been seen well by humans before.

The blue whales were a bit more difficult as we pursued them like eager shutter-bugs. They dove, surfaced, swam, changed direction, and befuddled us like any being avoiding the limelight, yet we managed to get some dorsal fin shots and a diving event as graceful as the most expert Beijing-bound spring-boarder. Several of our colleagues have added to the archives and we greatly appreciate their rapid reflexes, digital digits, and snapping shutters – each shot documenting a unique moment in a cetacean's life.

Variation in dorsal fins of fin whales



Fin whale dorsal fins showing some the variation that is used to identify distinctive individuals. The biopsy dart in the center picture has just bounced off the whale after having taken a tiny sample of skin and blubber. The tissue can be used to answer questions about the population identity, social structure, reproductive state and sex of the whale.

	Weekly Totals		Cruise Totals	
Common Name	**Sightings Photographed**	**Individual IDs**	**Sightings Photographed**	**Individual IDs**
Pacific white-sided dolphin	0	0	1	1
Northern right whale dolphin	1	1	3	3
Sperm whale	1	1	1	1
Baird's beaked whale	1	9	1	6
Sei whale	1	1	1	1
Fin whale	8	14	11	19
Blue whale	2	2	2	2
Humpback whale	0	0	5	7
Total	**14**	**28**	**25**	**40**

Seabirds
Michael Force and Sophie Webb

We spent this week surveying the deep pelagic waters well beyond the avian cornucopia often associated with the neritic waters of the continental shelf—a tiny fragment of the Pacific Ocean within reach of land-based seabird enthusiasts and thus more familiar and well-studied. Out here in what is often referred to as the "Final Frontier" of North American field ornithology, one doesn't really know what to expect.

Bird of the week: Upland Sandpiper (*Bartramia longicauda*). Photograph: S. Webb.

Gone were the swirling hoards of shearwaters and fulmars, jaegers and skuas, gulls and alcids, to be replaced by scattered Red Phalaropes, Black-footed Albatrosses, Arctic Terns and Long-tailed Jaegers. Even Leach's Storm-Petrels were hard to find! Scarce food resources equates to a very low avian diversity and overall density. Nevertheless, survey conditions were generally good to excellent and we managed to find an average of eight species per day and a weekly total of 18 species, including several new to ORCAWALE 2008. These included Hawaiian Petrels (two sightings), southbound Buller's Shearwaters, and two sightings of Xantus's' Murrelets of the expected southern subspecies *Synthliboramphus hypoleucus hypoleucus*.

Displaced and confused fall migrants constitute the avian "wild card" out here on the Big Blue: non-marine species making the long trip south frequently end up lost and off course, their fates unknown. This week we saw the "expected" Brown-headed Cowbirds, flocks of Whimbrels and several small sandpipers, likely Least Sandpiper. However, taking the crown of "most unexpected" was the adult Upland Sandpiper (see photo) that visited the ship 158 nautical miles west of Yaquina Head, Oregon. This species, which nests on the prairies and migrates to the Argentine pampas, is extremely rare anywhere west of the Cascades.

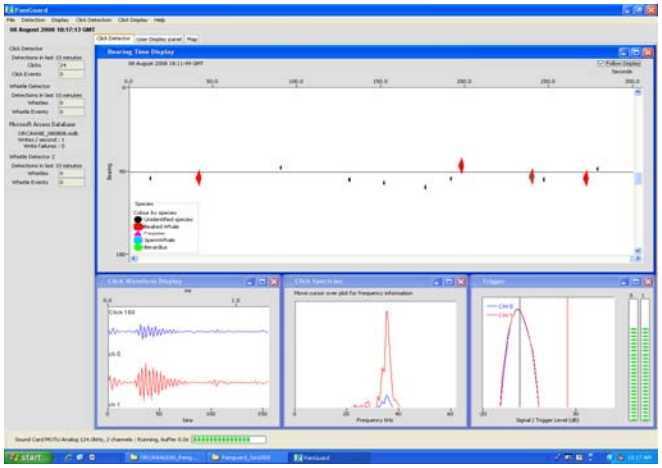
Acoustics Squeakly Report
Tina Yack

The dolphins and whales have been squeaky indeed this week, keeping me busy from sunrise to sunset. Fueled by coffee and chocolate covered espresso beans my efforts to localize these chatty creatures could not be thwarted. This week, the array was deployed for approximately 93 hours with 70 hours of monitoring effort (Table 1). During this time there were 26 acoustic detections, of which 12 were associated with a visual sighting (Table 2). The most noteworthy of these detections were three automated detections of Dall's porpoise, two Cuvier's beaked whales, one unidentified Ziphiid, and one Baird's beaked whale detection using both automated and manual acoustic methods, a sperm whale detection, a Pacific white-sided dolphin detection, and fin and blue whale vocal detections. I was able to calibrate the automated beaked whale detector during sightings of beaked whales, so that valid detections can be distinguished from false detections.

During the beaked whale sightings, acoustics was able to cue the visual observers as to when and where the animals may surface from a dive. This process was also used for the sperm whale detection.

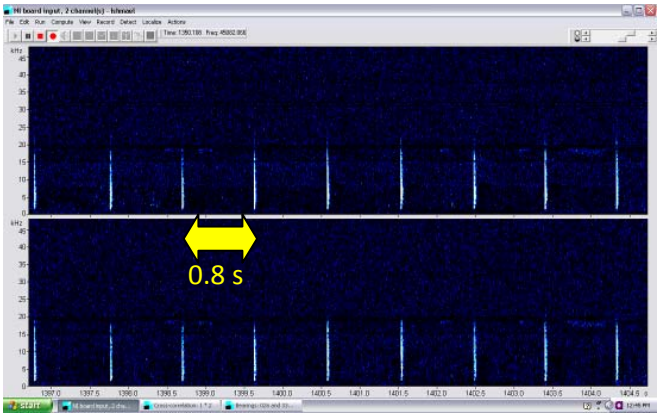
In order to obtain a location of a vocalizing dolphin, the acoustician must first obtain an angle to a

vocalization and then obtain successive angles as the ship moves along the transect line. By plotting these successive angles, we are able to see convergence on our map, indicating the location of the individual or group, which can become a little hectic when there are many vocalizing animals. During baleen whale sightings, the acoustics protocol is a bit different



Automated detections of beaked whale appear as red diamonds in the PamGuard display.

given that the vocalizations of the animals are at much lower frequencies than odontocetes and therefore more difficult to detect amongst the low frequency ship noise. Nonetheless, acoustics stays busy tossing sonobuoys and preparing tapes for recordings. This week 13 sonobuoys were deployed on fin whale and blue whale sightings, of which eight sonobuoys successfully recorded.



Sperm whale clicks appear as vertical lines (spaced 0.8 seconds apart) in this ISHMAEL display.

Table 1. Rainbow Click recording effort (sample rate: 480 kHz: hydrophones 3 and 4).

Date	Average Beaufort	Recording Start	Recording End	Recording Time	Monitoring Effort	Acoustic Encounters
8/3/2008	4.1	05:59	20:43	14:44	14:00	7
8/4/2008	5.1	06:40	20:39	13:59	10:00	5
8/5/2008	5.0	10:41	19:41	9:00	8:00	2
8/6/2008	3.8	06:31	21:22	14:51	12:00	4
8/7/2008	3.4	06:23	20:40	14:17	12:00	2
8/8/2008	4.6	06:25	20:44	14:19	9:00	3
8/9/2008	4.7	06:36	18:00	11:24	5:00	3
			Weekly Total	**92:34:00**	**70:00:00**	**26**

Table 2. Acoustic Detections.

Date/Time	Acoustic ID	Latitude	Longitude	Visual Sighting	Visual ID
8/03/2008 06:29	unid beaked whale	46.3692 N	129.7870 W	NA	NA
8/03/2008 09:24	unid cetacean	45.8740 N	129.9407 W	34	unidentified dolphin
8/3/2008 10:23	unid porpoise	45.8623 N	129.9289 W	NA	NA
8/03/2004 11:50	unid beaked whale	45.6467 N	130.0198 W	NA	NA
8/03/2008 14:09	unid cetacean	45.4870 N	129.9957 W	NA	NA
8/03/2008 16:47	unid beaked whale	46.1061 N	130.2917 W	39	Cuvier's beaked whale
8/03/2008 19:38	unid beaked whale	44.7358 N	130.4357 W	NA	NA
8/04/2008 09:02	unid beaked whale	45.4266 N	130.7626 W	NA	NA

Date/Time	Acoustic ID	Latitude	Longitude	Visual Sighting	Visual ID
8/04/2008 10:44	unid whale	45.4127 N	130.6692 W	41	Fin whale
8/04/2008 13:01	unid whale	45.3190 N	130.1572 W	42	Fin whale
8/04/2008 14:23	unid porpoise	45.2201 N	130.0016 W	43	Dall's porpoise
8/04/2008 18:02	unid beaked whale	45.1869 N	129.4579 W	NA	NA
8/05/2008 15:37	unid cetacean	45.5094 N	128.4254 W	NA	NA
8/05/2008 18:17	unid beaked whale	45.3992 N	126.8568 W	NA	NA
8/6/2008 13:43	unid beaked whale	46.1123 N	126.6425 W	NA	NA
8/06/2008 14:20	unid cetacean	46.0047 N	126.6833 W	NA	NA
8/06/2008 15:48	unid porpoise	45.7599 N	126.7780 W	54	Dall's porpoise
8/06/2008 20:08	unid beaked whale	45.0627 N	126.9944 W	NA	NA
8/07/2008 10:08	unid beaked whale	44.8176 N	127.0160 W	56	Baird's beaked whale
8/07/2008 14:33	unid whale	44.8347 N	127.8690 W	58	Blue whale
8/08/2008 08:13	unid beaked whale	44.7411 N	128.7293 W	63	Unidentified Ziphiid
8/08/2008 09:05	unid beaked whale	44.6541 N	128.7663 W	NA	NA
8/08/2008 11:32	unid beaked whale	44.2641 N	128.9097 W	NA	NA
8/09/2008 12:15	Sperm whale	43.9237 N	130.5452 W	66	Sperm whale
8/09/2008 16:11	unid cetacean	44.2172 N	130.7474 W	67	Northern right whale dolphin
8/09/2008 0:00	unid beaked whale	44.2455 N	130.7235 W	68	Cuvier's beaked whale

Squid Jigging Efforts

Heather Judkins and Jared Cox

with the help from Sophie Webb, Jim Cotton, Colin Davis, Andrew Colgrove, Dave LaPointe, Jim Gilpatrick, Allan Ligon, Jim Kintzele, JJ Johnson

Well, week two of squid jigging ended with no squid to report but we are getting closer each night. Two events occurred to keep us believing that the elusive Humboldt squid does live in these waters. Andrew Colgrove had one on his line but just as he was pulling towards the surface, the animal took the jig to the depths of the ocean as the knot which held it couldn't hold. The next night when Colin Davis pulled his line in, what did he find? A lone sucker ring with a hook in it! Piece by piece we might just get a squid yet. Many, many thanks goes out to the crew and scientists who have been helping in jigging, advice and supplying equipment to make the effort a positive and fun hour each and every night!

Oceanography

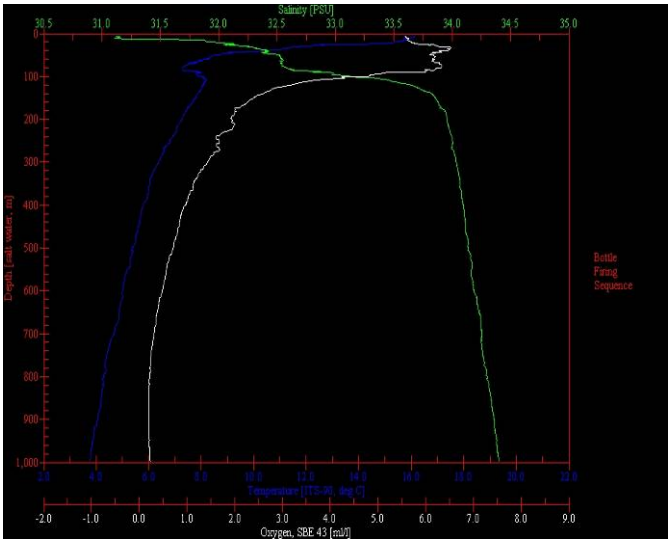
Ryan Driscoll and Misty Blakely

This Week in Oceanography we will: 1) Explore one of the central pieces of Oceanographic equipment, the CTD. 2) Find out what's been going on in the wet world of ORCAWALE2008 and 3) Learn about wing-footed gastropods.

The CTD instrument gives oceanography a profile of the water column for any number of variables. The letters stand for the three basic measurements taken: Conductivity (for salinity), Temperature and Depth. Our CTD also has an oxygen sensor, Niskin Bottles for water collection, and backup temperature and conductivity sensors (making it a CTDONBTC?). The CTD and bottles are mounted on a frame called a Rosette which has lent it the affectionate nickname "Rosy" and also gives us someone to yell at when it is not working.

We depend on the steady hands of the McArthur's deck crew (such as Kevin Lackey, shown above) for the safe deployment of our CTD and nets.

Our Rosy is deployed down to 1,000m where she collects extremely precise data on the temperature, salinity and oxygen in real time. On her return home we close the Niskin bottles at certain depths to collect water for measurements on primary productivity. These measurements allow us to see where different masses of water start and end, the depth and thickness of the water layers and where they are most productive. Organisms will often seek out and live in the various densities in the water column based on what is optimal for them and Rosy gives a peek inside their home. We can use this data and compare it to the distribution and composition of whales and dolphins to get a better idea of why they are where they are.



CTD profiles of salinity (green), temperature (blue) and dissolved oxygen (white) as a function of depth along the vertical axis.

Dramatic differences in water properties can be seen near the mouths of rivers like the Columbia. Together, temperature and salinity determine the density of seawater at any given depth. In the CTD profile above, an inversion can be seen in the blue temperature line at 80m as well as a sharp increase in salinity. This is a density boundary between the fresher and saltier water, former floating on the latter like oil on vinegar. This profile also shows an interesting oxygen line (in white). When phytoplankton photosynthesizes it gives off O_2 which increases the oxygen in the water. Here there are two depths of maximum productivity at 20 and 40 m.

Who takes advantage of these density boundaries? Well Pteropods for one. This group of Gastropods has modified their foot into a "winged-foot" lending them their name. Some have lost their shells while others have modified them into delicate, glass-like coverings in fantastic shapes. These shells can often be seen on our fish finder as layers that coincide nicely with density boundaries.

Week two by the numbers.

Date	CTD	XBT	Surface chlorophylls	Bongo Tows	HAB	Other
08/3/2008	1	5	5	1	31	0
08/4/2008	1	5	5	1	30	0
08/5/2008	1	4	4	0*	18	0

Date	CTD	XBT	Surface chlorophylls	Bongo Tows	HAB	Other
08/6/2008	1	5	5	1	31	0
08/7/2008	1	4	4	1	25	0
08/8/2008	1	5	5	1	31	0
08/9/2008	1	4	4	1	31	0
Weekly total	7	32	33	6	197	0
Grand total	**6**	**60**	**56**	**11**	**307**	**0**

Midwater Trawling Weekly Report

IKMT Leader: Pete Davison; IKMT Assistants: Heather Judkins and Jared Cox
Vemco Pinger Expert: Jay Barlow

We have completed 27 Isaacs-Kidd Midwater Trawl (IKMT) tows to date, comprised of ten nightly pairs (150 and 500m) and seven daylight tows-of-opportunity. Tows were cancelled the night of August 4 due to rough weather.

A second hull-mounted hydrophone was configured to work with the acoustic pinger for tracking the depth of the net, with mixed results. Correct data is interspersed with bad data from some kind of interference. It is usable, but not ideal.

The Time-Depth Recorder (TDR) that we use on the net was sent down with the oceanographic Conductivity-Temperature-Depth profiler (CTD) for calibration. The TDR is reading too deep by about 10m at 250m of depth. At this depth, the acoustic pinger reads 20m shallower than the TDR, so the true depth is roughly half-way between the TDR and pinger readings.

A series of three daylight tows on August 9 targeted the surface layer and the 150-250m scattering layer. The surface layer is apparently large copepods. Upon casual inspection, no animals were captured that could be responsible for the 150-250m layer. This layer is very strong at 38 kHz and much weaker at 120 and 200 kHz. I suspect that this layer is composed of strongly-swimming fish such as juvenile hake or anchovies that are able to avoid the IKMT.

Copepod forming the 50m thick surface acoustic scattering layer.

Juvenile hake (*Merluccius productus*), possibly forming the 150-200m acoustic scattering layer.

A mesopelagic squid.