ORCAWALE 2008: Weekly Report

Report Dates: 7/28 to 08/02/08 Chief Scientist: *Jay Barlow* Cruise Leader: *Jay Barlow*

Weekly Science Summary
Jay Barlow

This is the first of what will be many weekly reports from the ORCAWALE Survey. The ORCAWALE survey is the ORegon, CAlifornia and WAshington Line-transect and Ecosystem Survey. This 4-month long cruise is designed to estimate the abundance of marine mammals along the U.S. West Coast and to investigate as many aspects of their environment as possible. On this survey we have experts in marine mammal survey methods and species identification, acoustic detection of marine mammals, physical and biological oceanography, harmful algal blooms, pelagic fishes and squids, seabirds, and hydroacoustics. It is always a joy to see such a talented group of people working together to accomplish so much. The whole will certainly be greater than the sum of the parts. We are deeply aware that we could not be here without out magnificent shore support team, including Annette Henry, Robert Holland, and Anthony Cossio. Thanks to all who helped make this expedition a reality.

Last Monday, July 28, we cast off the lines in Lake Washington and traveled through four draw bridges, Lake Union, and Ballard Locks to reach Puget Sound. There we refueled and, late at night, Tony Cossio calibrated our EK-60 scientific sounder (for recording the quantity of fish, squid and plankton in the waters that pass deep under the ship). We set Tony ashore well after midnight and proceeded out the Straits of Juan de Fuca.

By Tuesday morning, we were out in the wild Pacific, and it was wild that day. But the observers did not let 20 knot winds and 12 foot seas stand in their way. Surveys for both mammals and birds were in full swing as soon as we cleared Canadian waters.

On this cruise, in addition to our mammal and bird surveys and our normal suite of oceanographic measurements, we added three new components to our ecosystem sampling. During the nightly oceanographic station, we have started jigging for the large Humboldt squid that have been invading our coast in recent years. We want to map their northward invasion to help understand how they are likely to affect the California Current Ecosystem. We have also started towing our "big net" to catch the fish and larger zooplankton that frequently evade our smaller plankton nets. This 6-foot wide net (see photo above) is called an Isaacs-Kidd Mid-water Trawl, or simply IKMT. Pete Davison, a fish expert from Scripps Institution of Oceanography, is leading our "big net" efforts. The third new project is a study of the phytoplankton that causes harmful algal blooms. These are dense aggregation of tiny plants that produce toxins. Recently, the incidence of toxic algae blooms appears to be increasing, and Misty Blakely is along on our cruise to study why that might be happening.

Marine Mammal Observations

Jim Cotton, Chris Cutler, Jim Gilpatrick,
Allan Ligon, Richard Rowlett, and Suzanne Yin

Our first week of marine mammal surveys covered areas off Washington State, from near the coast to approximately 250 miles offshore. We use a sampling method known as line-transects. Using this method, we travel along a grid of transect lines, searching the waters for any signs of a fin, a splash or a blow. Our ability to see things is certainly affected by weather, and so far, the weather has not been too harsh (mostly Beaufort 3, 4 and 5). We have lost very little survey time due to unworkable weather conditions and weather off Washington can be very bad at times.

Pacific white-sided dolphin.

Inshore we saw many humpback whales, Pacific white-sided dolphins and northern right whale dolphins (see photos). In more offshore areas, the marine mammal fauna was dominated by fin whales and Dall's porpoises. A complete accounting of what we saw is given below.

Northern right whale dolphins.

Marine Mammal Effort Summary.

Date	Start time Stop time	Start location Stop location	Distance surveyed (nm)	Average Beaufort
072908	1400 2054	N48:21.20W125:15.37 N47:50.50W125:57.38	31.1	3.2
073008	0612 1933	N47:29.17W126:07.76 N46:01.92W125:59.77	96.6	2.6
073108	0607 1515	N45:56.25W125:54.38 N46:42.26W124:41.42	68.3	3.3
080108	0615 2043	N47:15.33W124:23.07 N47:43.68W126:46.68	84.4	4.6
080308	0643 0920	N46:19.45W129:48.77 N45:52.85W129:56.04	27.1	4.0

Marine Mammal Sighting Summary.

Code	Species	Common name	No. sightings
22	*Lagenorhynchus obliquidens*	Pacific white-sided dolphin	3
27	*Lissodelphis borealis*	Northern right whale dolphin	2
44	*Phocoenoides dalli*	Dall's porpoise	12
46	*Physeter macrocephalus*	Sperm whale	1
70	*Balaenoptera sp.*	Unidentified baleen whale	1
74	*Balaenoptera physalus*	Fin whale	2
76	*Megaptera novaeangliae*	Humpback whale	9
96	*Unid. cetacean*	Unidentified cetacean	1
CU	*Callorhinus ursinus*	Northern fur seal	2
		Total	**33**

Cetacean Biopsy Report
Suzanne Yin and Allan Ligon

We have collected skin and blubber samples from three SWFSC "Priority 1" species already this leg. These samples will be used for studies of genetic population structure, pollutants, and micro-constituents.

Marine Mammal Biopsy Summary.

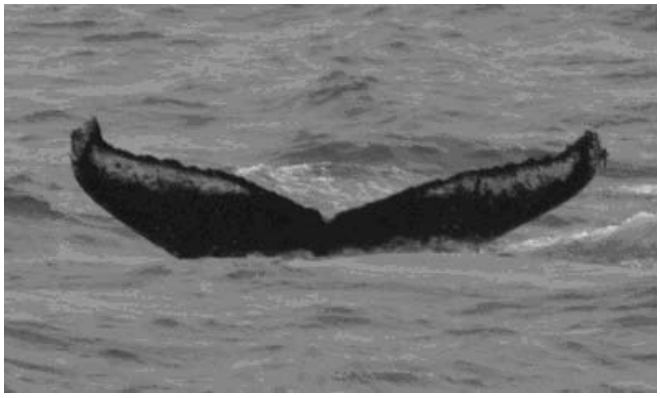
Species	Common name	No. weekly samples	No. weekly takes	Total samples	Total takes
Balaenoptera physalus	Fin whale	3	4	3	4
Lagenorhynchus obliquidens	Pacific white-sided dolphin	1	1	1	1
Lissodelphis borealis	Northern right whale dolphin	3	8	3	8
Total		**7**	**13**	**7**	**13**

Photo Report
Jim Cotton and Chris Cutler

Throughout this cruise, telephoto lenses will be extended, shutters will be clicked, and 'chimping', (the behavior of photographers whilst reviewing their 'captures') will be observed among the paparazzi onboard. Our 'celebrities' of course are cetaceans, denizens of the North Pacific whose lives are often as elusive as those wily, well-groomed residents of Beverly Hills. We can gain insights into their mysterious lives with a mere snapshot (the cetaceans, not the celebrities). Depending on the dolphin or whale in question, photographs may assist in the identification of species, document morphological differences between animals within a population, detect signs of conflict with humans (i.e., entanglement scars), and reveal the secrets of *known* individuals (animals previously photographed elsewhere). We get all that AND we will end this cruise with a gallery of images of some of the most aesthetically appealing, poorly known, and intriguing inhabitants of the planet.

So far we have photographed animals from ten different 'sightings'. Among those, we have

Fin whale dorsal fin.



Humpback whale flukes.

obtained ID-grade fluke images of three different humpback whales, and shots of another humpback with former entanglement scars on the leading edge of its fluke.

Humpback whale fluke photographs have helped to document some of the greatest migratory movements of any mammal. Of three fin whale groups that were photographed, clear dorsal fin pictures of seven individuals have been obtained, three of them having remarkably distinctive scars (see photo above). Regional photo catalogs of individual animals for both species will provide a variety of useful information and serve as important image archives in years to come. In the waning light of one evening we were treated to a spectacular acrobatic display of dozens of northern right-whale dolphins that somersaulted, back-flipped, tail-walked and otherwise flung themselves skyward as they swam with a group of Pacific white-sided dolphins. The whale paparazzi are off and running and looking forward to a plethora of flukes and fins among the cetaceans of the California Current.

Seabirds

Michael Force and Sophie Webb

The first week of survey effort revealed a seabird distribution pattern typical for coastal Washington and Oregon: high abundance and diversity near shore (i.e., over the continental shelf) with hundreds to thousands of Sooty and Pink-footed Shearwaters, mixed with various gulls and alcids (primarily Common Murres and Rhinoceros Auklets). Densities such as these easily tax our data collection efforts as we strive to keep up with the constant flow of seabirds through our strip transect! Meanwhile the opposite situation prevails once we move into deep pelagic water where the occasional Leach's Storm-Petrel and Red Phalarope enliven an otherwise empty sea. Long-tailed Jaegers, early fall migrants and one of the first indicators of the changing seasons, graced our strip transect several times. One flock contained nine lovely adults, many still in breeding plumage, their long central tail feathers blowing around in the breeze. Providing an exotic change from the gray and brown plumages typical of most seabirds are the strikingly patterned Sabine's Gulls. We saw a number of adults, including several small flocks, migrating south ahead of the juveniles, who have yet to make an appearance. Standing out among the 24 species seen this week was a single Laysan Albatross and a pair of unidentified murrelets, likely Xantus's Murrelets. Our first wayward land bird, a juvenile Brown-headed Cowbird, managed to find the *McArthur II* during a rain squall. We want to extend our thanks to Robert Holland and ET's Charlie Goertzen and Jim Kintzele, whose effort and skill made for a relatively trouble-free installation of our data acquisition system.

Acoustics Squeakly Report

Tina Yack (keeping Shannon's traditions alive)

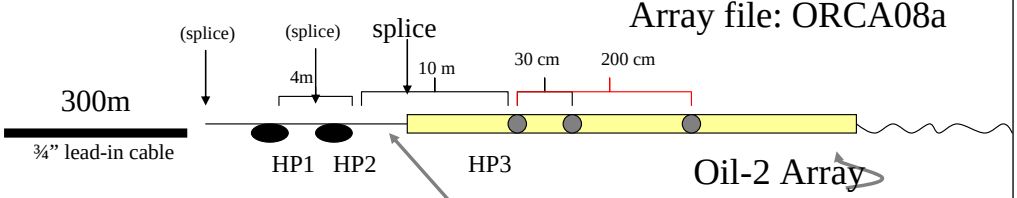
After years of observations, we have noticed that marine mammals are very thoroughly wet. We infer, from this, that they must be spending a lot of time underwater where we cannot see them. To counter any attempt to evade use, we have started towing hydrophones behind our ship to detect the noisy ones. Our new, homemade array, affectionately known as "Oil-2," was first deployed on 7/29 at 3:50 p.m. The array contains five hydrophones, including two mid-frequency and three high-frequency channels (see fig. 1). We are using two automated detection programs in addition to our typical Whaltrak/Ishmael manual detection system. The first automated detection program is Rainbow Click which is designed to detect porpoise echolocation. The second program is PamGuard, which will be used to detect beaked whale clicks, sperm whale clicks, dolphin echolocation, and dolphin whistles.

This week (Tuesday through Saturday) the array was deployed for approximately 58 hours with 46 hours of monitoring effort (Table 1). An additional 6 hours of opportunistic recordings were made using Ishmael software (96 kHz). During this time there were 10 acoustic detections (Table 2). The most noteworthy of these detections was an automated detection of Dall's porpoise, low frequency 'feeding' vocalizations from a lone humpback, vocalizations from a mixed group of Pacific white-sided and northern right whale dolphins, and burst pulse and echolocation signals from a group of Pacific white-sided dolphins.

July 28, 2008

In-Line Mid-Frequency and OIL-2 Array

Array file: ORCA08a



HP #	Type	Distance	Wire Colors	Oil-2 Array Wire Colors
1	SWFSC	0 m	yellow/white	
2	SWFSC	4 m	green/white	
3	OIL	14 m	gray/white	green/white
4	OIL	14.3 m	brown/white	gray/white
5	OIL	16 m	orange/white	yellow/white
Power Positive			red	red
Power Negative			black	black (n/a)
Power Ground			white	white

Figure 1. Inline Mid-Frequency and "Oil-2" Array.

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

Date	Recording Start	Recording End	Recording Time	Monitoring Effort
07/29/2008	15:50	20:55	05:05	04:50
07/30/2008	05:53	20:24	14:31	13:00
07/31/2008	06:18	18:41	12:23	09:00
08/01/2008	06:11	20:53	14:42	11:30
08/02/2008	06:48	18:24	11:36	08:00
		Total	**58:17:00**	**46:20:00**

Table 2. Acoustic Detections.

Date/Time	Latitude	Longitude	Visual Sighting	Acoustics Chase	Vocal Type	Detection Type	First Sighting
07/29/2008 17:25	48.1508 N	125.751 W	NA	FALSE	E	A	A
07/29/2008 19:45	47.8747 N	125.928 W	NA	FALSE	E	B	V
07/30/2008 06:14	47.4861 N	126.129 W	NA	FALSE	E	A	A
07/30/2008 13:40	46.2981 N	126.759 W	NA	FALSE	E	A	A
07/30/2008 19:39	46.0261N	125.946 W	19	TRUE	WEB	B	V
07/31/2008 06:29	45.9111N	125.812 W	20	TRUE	EB	B	B
07/31/2008 09:37	45.9111N	125.134 W	23	FALSE	W	B	V
07/31/2008 11:05	46.1042N	124.987 W	NA	FALSE	E	A	A
08/01/2008 07:57	47.2650N	124.769 W	27	FALSE	Y	B	B
08/02/2008 12:55	46.5283N	128.020 W	30	FALSE	E	B	V

Oceanography

Ryan Driscoll and Misty Blakely

In this, the first week of ORCAWALE 2008, Oceanography has jumped right in and got its feet wet, a hazard that comes with the job. We have taken on a host of new projects this year in addition to our familiar standards, all with the hope of better understanding the marine mammal's habitat. Let's take a look at what oceanography will be serving up this cruise.

Our normal sampling will call for daily Expendable BathyThermographs (XBTs) and surface chlorophyll samples. The former will give us a temperature profile of the water column underway and the latter will give us an idea of the primary productivity of phytoplankton at the surface. At night we will conduct a CTD cast to measure the temperature, salinity, oxygen and chlorophyll in the water column. This will be followed by a BONGO tow to get an idea of the general zooplankton assemblage in the water. In addition, the ship will collect constant surface temperature and salinity.

Our new projects include: 1) raucous XBT-Palooza's where XBTs are dropped hourly to look at fine scale variation in the water column; 2) extra BONGO samples to look at geographic variations in stable isotope ratios and the molecular genetics of zooplankton; 3) water samples for Pigment, qPCR, Phycotoxin, nutrients and phytoplankton assemblage to look at Harmful Algal Blooms (HAB); 4) deployment of ARGO floats which drift with prevailing currents, autonomously measuring salinity and temperature in the water column for 5 years; and lastly 5) CTD Yo-Yo' to look at internal waves. If all this leaves you with some questions, dear reader, don't worry. We have many months and many miles of ocean in which to explore the science, uses and history behind each, so stay tuned.

While fine tuning our new sampling this first week, we have already managed to get some interesting data. A persistent temperature inversion was found near the mouth of the Colombia River, whose less dense, colder,

fresher water floats on top of the warmer, saltier, ocean water. In addition, our first XBT-Palooza went off well covering two tracklines with the help of Chief Scientist, Jay Barlow who gave a tired oceanography team some much needed rest.

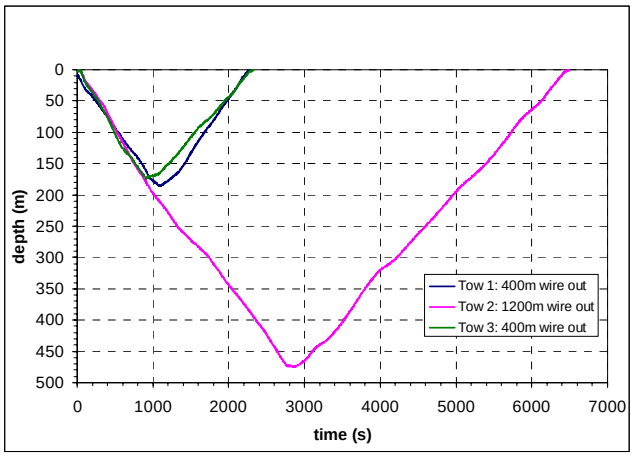
Summary of Oceanographic Operations.

Date	CTD	XBT	Surface chlorophylls	Bongo Tows	HAB	Other
07/29/2008	2	3	3	1	0	0
07/30/2008	1	5	5	1	24	0
07/31/2008	1	8	5	1	31	0
08/01/2008	1	5	5	1	24	0
08/02/2008	1	5	5	1	31	0
Weekly total	**6**	**26**	**23**	**5**	**110**	**0**
Grand total	**6**	**26**	**23**	**5**	**110**	**0**

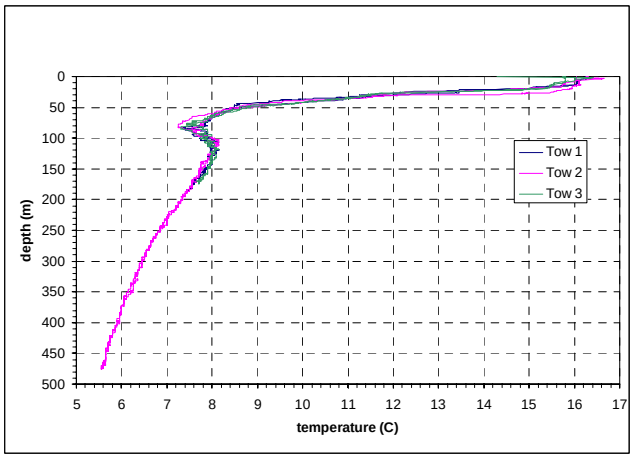
Midwater Trawling Weekly Report

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

We have completed 12 IKMT tows to date, which comprised four nightly pairs (150 and 500m) and four daylight tows-of-opportunity. Tows on the first evening at-sea were cancelled due to rough weather. We had expected to use a depth-sensitive pinger to tell us the depth of the net, but the hull-mounted hydrophone has not functioned correctly, so we are dependent on wire-angle estimates of depth. We hang a time-depth recorder (TDR) on the net and have adjusted the length of wire-out (based on the TDR measurements after each tow) to fine-tune the depths at which we fish the net. The wire-out estimates have been refined to 350m wire-out for the 150m tow, and 1300m wire-out for the 500m tow. TDR plots from the first day of trawling are shown to the right.



Time depth profiles from the IKMT trawl (July 30-31)



Temperature depth profiles from the IKMT trawl (July 30-31)

Night tows are catching micronekton composed primarily of crustaceans (shallow and deep), myctophids (shallow and deep), squid (shallow and deep), and stomiiformes (deep). No hatchetfish and few *Cyclothone* have been captured to date. The first two daylight tows were 150m oblique tows to sample the fish population (if any) in the epipelagic layer. As expected, no adult fish were caught. On 02 August, we successfully used the marine mammal hydrophone array to monitor the pinger in real time for two daylight targeted tows. These tows were designed to sample a surface acoustic layer in the top 50m and then a deeper 100-200m layer. Upon casual inspection of the catch, the shallow layer appears to be fish larvae and pteropods, while the deeper layer was primarily pteropods. Euphausiids were not found in significant quantity and no adult fish were captured. Photographs of some interesting animals captured in the IKMT this week are shown.

Pelagic polychaete worm

Stenobrachius leucopsarus, the dominant myctophid in this region

Diaphus theta, another common myctophid

Mesopelagic squid and its myctophid prey (*Stenobrachius leucopsarus*)

Another mesopelagic squid

Larval flatfish