ORCAWALE 2008: Weekly Report

Report Dates: 19-25 October 2008 Chief Scientist: *Jay Barlow* Leg 4 Cruise Leader: *Karin Forney*

Weekly Science Summary

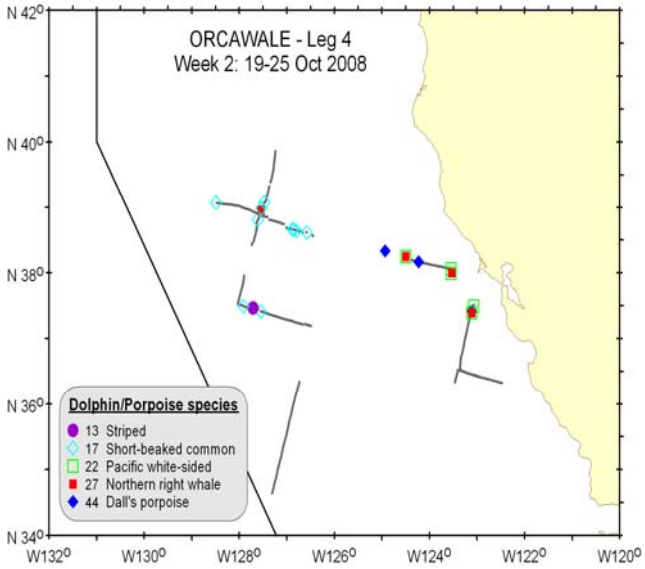
Karin Forney

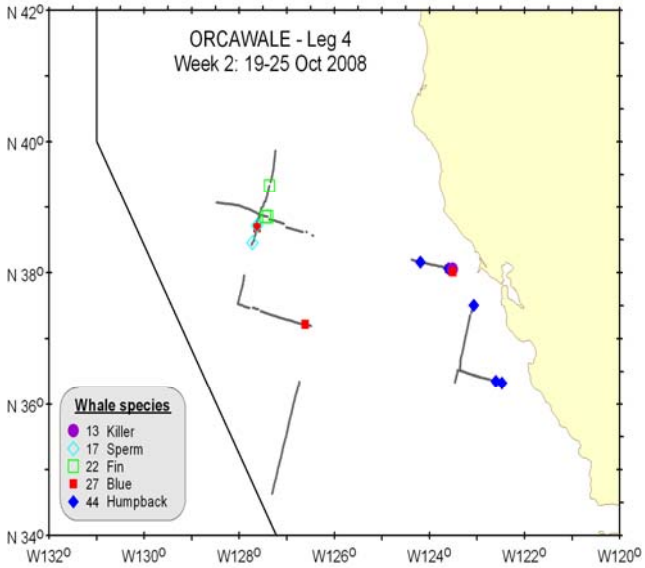
As the second week of Leg 4 comes to a close, I am happy to report that we have had great success filling in the remaining transect gap off northern California! This was an important goal for Leg 4, and the weather has been very cooperative. We were able to work there for just enough time to call it "done." As winds picked up in the offshore realm, we headed back towards shore, where we will try to fill in as many central California transects as possible before the end of the leg.

Our course this week has taken us north and south, inshore and offshore, across diverse marine habitats of the California Current (see oceanography report below). The cetacean species we have encountered reflect this mixture: warm-temperate species such as striped dolphins and short-beaked common dolphins in the warmer offshore waters, and cold-temperate Pacific white-sided dolphins, northern right whale dolphins, and Dall's porpoise in the cooler waters closer to shore. We have also continued to encounter many whales - fin, blue, sperm, humpback, and even one small group of killer whales.

Notable observations this week included a heavily parasitized fin whale and two short-beaked common dolphins with very unusual coloration (see photo report below). Our squid jiggers finally found some squid again this week, and the acoustics team has been busy documenting all the clicks, whistles, and even whale songs picked up by the array.

As we conclude the week, a low fog bank rolled in from the north, like an early Halloween ghost, and parked itself squarely in our target area. Although the fog prevented us from working part of Saturday, we are hopeful the fog will lift and allow us to work during the coming days. Stay tuned for next week's update…. (Sneak preview: I will report on a sighting of a cetacean not seen during our California Current research cruises since 1993 - can you guess which one?)





Marine Mammal Effort Summary.

Date	Start time Stop time	Start location Stop location	Distance surveyed (nm)	Average Beaufort
101908	0738	N34:38.17 W127:18.70	106.4	4.9
	1839	N36:20.74 W126:44.04		
102008	0744	N37:11.57 W126:29.64	89.3	2.8
	1837	N37:57.44 W127:53.70		
102108	0751	N38:25.44 W127:44.35	82.2	5.0
	1834	N39:52.00 W127:14.42		
102208	0756	N39:04.03 W128:28.73	85.0	4.7
	1830	N38:33.55 W126:26.51		
102308	1133	N38:11.94 W124:22.91	39.3	4.0
	1531	N38:03.34 W123:34.13		
102408	0736	N37:31.38 W123:03.80	64.2	4.0
	1636	N36:24.56 W122:54.10		
102508	0731	N36:24.49 W122:52.84	56.4	2.6
	1708	N36:20.01 W123:27.95		

Marine Mammal Sighting Summary.

Code	Species	Common name	No. sightings
013	*Stenella coeruleoalba*	Striped dolphin	1
017	*Delphinus delphis*	Short-beaked common dolphin	11
022	*Lagenorhynchus obliquidens*	Pacific white-sided dolphin	6
027	*Lissodelphis borealis*	Northern right whale dolphin	4
037	*Orcinus orca*	Killer whale	1
044	*Phocoenoides dalli*	Dall's porpoise	3
046	*Physeter macrocephalus*	Sperm whale	2
074	*Balaenoptera physalus*	Fin whale	3
075	*Balaenoptera musculus*	Blue whale	4
076	*Megaptera novaeangliae*	Humpback whale	5
079	Unid. large whale	Unidentified large whale	5
177	Unid. small delphinid	Unidentified small dolphin	3
CU	*Callorhinus ursinus*	Northern fur seal	8
MA	*Mirounga angustirostris*	Northern elephant seal	9
Total			**65**

Cetacean Biopsy Report
Suzanne Yin, Allan Ligon, and Rich Pagen

Species	Common name	No. weekly samples	No. weekly takes	Total samples	Total takes
Balaenoptera physalus	Fin whale	0	0	20	30
Berardius bairdii	Baird's beaked whale	0	0	1	1
Delphinus capensis	Long-beaked common dolphin	0	0	7	12
Delphinus delphis	Short-beaked common dolphin	9	33	93	243
Delphinus sp.	Unidentified common dolphin	0	0	3	4
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	2	2	12	25
Orcinus orca	Killer whale	0	0	2	9
Grand Total		**11**	**35**	**167**	**378**

Photo Report
Jim Cotton and Chris Cutler

This week we took pictures of eight different cetacean species from 15 “sightings” and added 90 individual ID-grade images to the archives. Among several interesting short-beaked common dolphins we photographed, one had a peculiar pigmentation, or skin condition, over much of its body. Another had a scar which appeared to be caused by a hook that had been lodged in the dolphin’s side and then dragged across its back.

Short-beaked common dolphins *(Delphinus delphis)*.

Amidst some blue whales we watched from the small boat we found one animal with a perfect hole through its dorsal fin and saw another ‘fluke-up’ with its impressive tail stock.

Blue whales (*Balaenoptera musculus*).

A fin whale (top photo below) had several parasitic copepods *(Pennella balaenopterae)* attached to its side. This is the largest copepod species and the only one known to parasitize cetaceans (P. Abaunza, *et al*. 2001)**.**

Adult female copepods embed themselves in the subcutaneous tissue of whales and, upon their ultimate departure, may leave tell-tale scars, as likely seen on this whale's body.

Other animals photographed included striped dolphins *(Stenella coeruleoalba*, second photo below, top) and Pacific white-sided dolphins *(Lagenorhynchus obliquidens*, second photo below, bottom).

Fin whale (*Balaenoptera physalus*) with copepods.

Top photo, striped dolphin; below, Pacific white-sided dolphin.

Photography Summary.

Common Name	Weekly Totals		Cruise Totals	
	Sightings Photographed	Individual IDs	Sightings Photographed	Individual IDs
Pacific white-sided dolphin	1	9	14	69
Northern right whale dolphin	1	0	9	6
Short-beaked common	6	67	43	183
Long-beaked common	0	0	6	23
Bottlenose dolphin	0	0	1	1
Striped dolphin	1	4	4	4
Dall's Porpoise	0	0	1	0
Sperm Whale	0	0	1	2
Baird's beaked whale	0	0	3	12
Sei whale	0	0	3	9
Fin whale	1	1	38	78
Blue whale	3	7	18	27
Humpback whale	1	2	13	18
Killer whale	1	0	4	37
Cuvier's beaked whale	0	0	1	1
Pilot whale	0	0	1	39
Total	**15**	**90**	**169**	**542**

Seabirds

Michael Force and Sophie Webb

Perhaps this week marks the beginning of the slide down the slippery slope of diminishing returns as fall migration slowly wraps up for another year. Case in point: this is the first week for some time with no lost landbird migrants. Moreover, many of the seabirds common earlier in the season are now scarce to non-existent, such as Arctic Tern and Sabine's Gull (none of the former, few of the latter). Not in this category, however, is Buller's Shearwater, still migrating southwards to New Zealand in high numbers. Flocks of hundreds of this most exquisitely beautiful of the shearwaters were seen on Cordell Bank and enjoyed by all in the lovely evening light. Our weekly species total of 32 is ten less than last week's record high; similarly, the daily average of 12 was down one.

Survey lines on the outer edge of the ORCAWALE study area could at times appear devoid of birds; nonetheless, we had some spectacular days for offshore diversity and species of interest. We experienced several evening "flights" of Mottled Petrels, and the total number of Cook's Petrels seen on some days reached double-digits.

Cook's Petrel (left) and Mottled Petrel (right).

A single Murphy's Petrel was seen along with a couple of Stejneger's Petrels. In light of their known propensity for migrating across open water, it wouldn't be all that surprising then to see a couple of flocks of Cackling (Aleutian) Geese, such as we did on Sunday and Monday, about 200nm from shore. Other noteworthy sightings include Laysan Albatross, a pair of the southern subspecies *(hypoleucus)* of Xantus's Murrelets, an adult Thayer's Gull, and a couple of Black Scoters.

Acoustics Squeakly Report

Tina Yack and Elizabeth Becker

This week we traveled all over offshore and nearshore of the central coast of California, trying to finish of tracklines and follow the pockets of good weather. Acoustics has been very busy this week, with another record number of acoustic encounters (Figure 1, Table 1). Our efforts have resulted in approximately 74 hr of acoustic recording effort and 55 hr of monitoring effort (Table 2). During this time, there were 127 acoustic encounters, approximately 19% of which matched visual sightings. The highlights of this weeks acoustic encounters include; a singing humpback, two blue whale, three Dall's porpoise, seven sperm whale, seven short beaked common dolphin, one northern right whale dolphin, one Pacific white-sided dolphin, and three mixed dolphin schools.

Table 1. Acoustic Encounters.

Species ID	No. of Acoustic Encounters
Short beaked common dolphin	7
Pacific white sided dolphin	1
Northern right whale dolphin	1
Mixed delphinid	3
Humpback whale	1
Blue whale	2
Mixed Balaenoptera	1
Sperm whale	7
Dall's porpoise	3
unid beaked whale	5
possible Baird's beaked whale	1
unid cetacean	74
unid porpoise	8
unid small delphinid	1
unid delphinid	11
unid large whale	1
Total	**127**

This week we've continued to have success detecting Dall's porpoise using our automated detection methods. We detected 100% of sighted Dall's porpoise! Another exciting acoustic adventure was an encounter with a singing humpback (Figure 2). Male humpback whales produce stereotyped songs that are thought to be associated with reproduction. These songs are complex and typically range from <20Hz to 4 kHz.

Songs are produced in late fall, winter, and spring by solitary animals. Tune in next week for further reports of our acoustic encounters along the central CA coast.

Table 2. 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
10/19/2008	2.4	6.5	7:31	18:43	11:12	7:00
10/20/2008	2.7	5.7	7:36	18:38	11:02	8:00
10/21/2008	5.0	7.0	7:38	18:35	10:57	9:30
10/22/2008	4.7	6.8	7:54	18:48	10:54	9:00
10/23/2008	4.0	6.7	7:35	18:40	11:05	10:00
10/24/2008	4	2.9	7:34	17:45	10:11	6:30
10/25/2008	2.6	3.1	8:35	17:48	9:13	5:30
Total				**74:34:00**	**55:30:00**	**127.00**

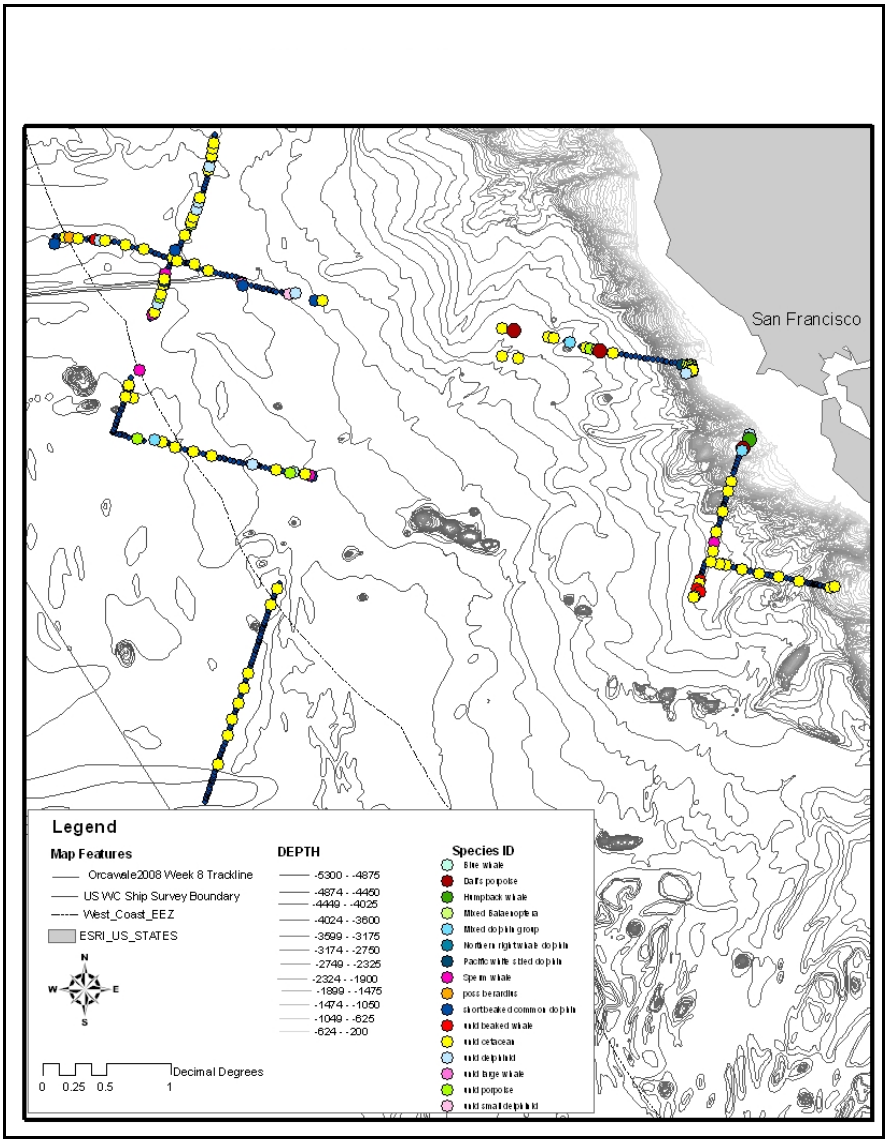
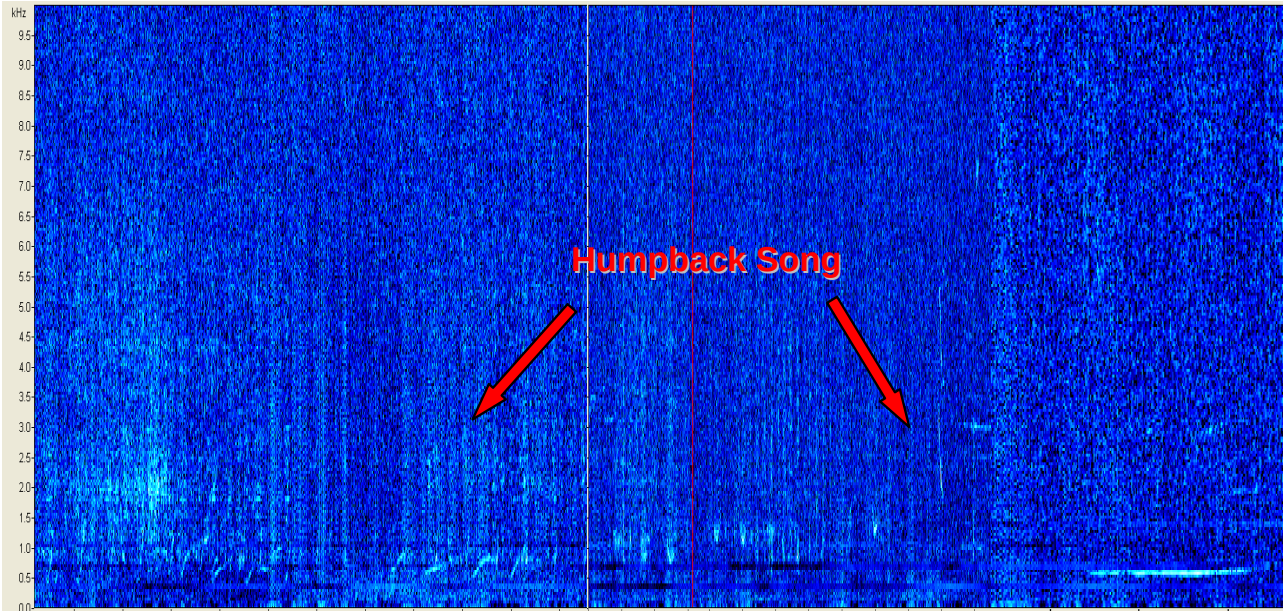


Figure 1. ORCAWALE 2008: Week 11 Acoustic Encounter Map



Spectrogram (1024 FFT; Hanning) of an acoustic encounter with a singing humpback on 10/24/08.

Squid Jigging Efforts

Jim Cotton, with help from Sophie Webb, Rich Pagen, Allan Ligon, Suzanne Yin, Chris Cutler and Kevin Lackey

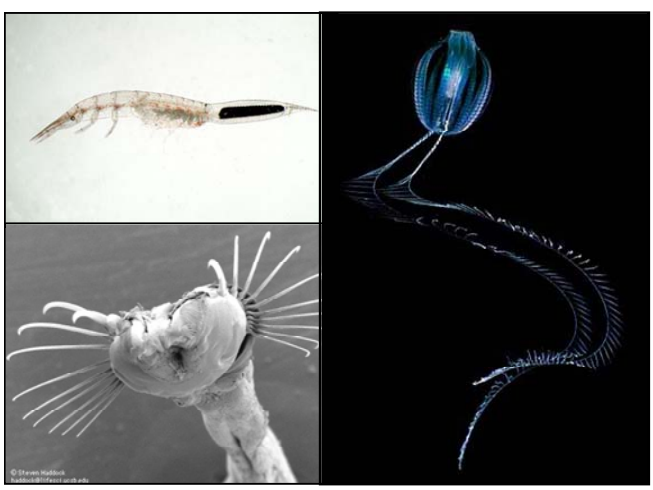
Squid catch summary.

Date	Position		No. collected	Squid weights (lbs)
10/19/2008	34:08N	125:50W	0	N/A
10/20/2008	37:58N	127:54W	2	23, 30
10/21/2008	39:52N	127:15W	1	8
10/22/2008	38:35N	126:24W	0	N/A
10/24/2008	36:26N	122:56W	6	29, 27, 23, 16, 24, 11
10/25/2008	36:20N	123:28W	0	N/A

Figure 2Kevin Lackey with Humboldt squid.

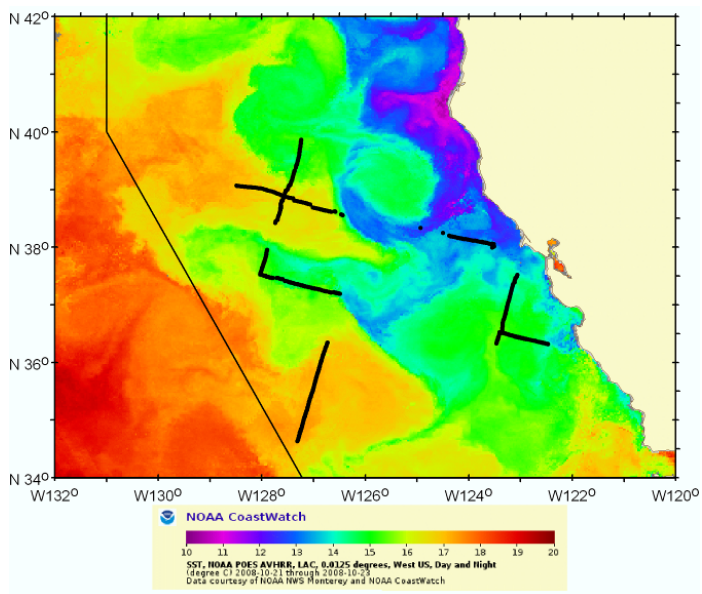
Oceanography
Ryan Driscoll and Justin Garver

Halloween is fast approaching the *McArthur II*. We've put up decorations, wracked our brains for costume ideas, and are expecting myriads of little monsters to come knock on our door. But the fact is; we are visited by some of the ocean's weirdest, scariest creatures on a nightly basis. In keeping with the spirit, let's look at some of oddballs that haunt our nets. The chaetognath or "arrow worm" (photo bottom left) whose name means "bristle jaw" has to be one of the scariest monsters from the point of view of the world's copepods. Being invisible is one of the goals of many plankters. It allows them to escape predators and to surprise prey. The chaetognath has perfected this being nearly transparent except for two sets of long golden fangs splayed out wide on either side of the mouth (photo, bottom left). It hangs motionless in the water until its senses the vibrations of its choice food, a copepod, up to 20cm away. True to its name it darts forward and pierces its victim by snapping its fangs together. Some species even inject a neural toxin causing its prey to go still while its waiting jaws do their work. To scale this to our size, a copepod is about one-tenth the size of an arrow worm. Imagine a nearly invisible creature the size of a school bus with 5 foot wide fangs floating motionlessly in the dark that can sense your movement from 100ft away and cover the distance in seconds. Be glad you're not a copepod!



Amphipod (top L), Chaetognath (bottom L), Ctenophore (R)

Or one the many forms from the subgroup Amphipoda which are small shelled jointed organisms whose shapes and claws defy imagination. Some have fused eyes forming a single long bulbous black spine half the length of the body whose legs end in hooked claws. The function of this bizarre feature is unknown though it is thought it may use its spiky eye to impale prey. Less scary but often ghostly are the swarms of the Ctenophore *Pleurobrachia* sp. or "Sea Gooseberry" (photo right). These small round jellies have eight rows of "combs" or hairs that run the length of their body and two sticky tentacles. The combs move in a wave like motion and refract light which gives the mesmerizing impression of moving rainbows as it makes slow circles in the water.



<u>*State of the Ocean:*</u> With the end of week 2 for Leg 4, Team Oceo has seen the dynamic Central and Northern California coastal waters in full effect. Enormous coastal eddies are creating large temperature gradients from which we are seeing drastically changing temperature profiles.

One example of these changes was a nearly 4ºC drop within 22nm. Temperature profiles from XBT drops are showing the colder water regions of the eddy have a much less distinguished thermocline then the warmer regions. This is due to the large amount of mixing taking place within the eddy. These eddies are being fed by an extremely cold upwelling event occurring off Cape Mendocino which are bringing water temperatures of 10ºC and below to the surface. These upwelling events are being fueled by winds traveling south along the coastline forcing surface waters off shore which are then being replaced by very cold nutrient rich deep water. For more

information on upwelling refer to the ORCAWALE September 7th report.

The plan for another XBT palooza this past week has been thwarted by consistent heavy fog along the coastal regions of the transect zone. We have plotted a new path, and will be restarting the palooza so look for that update in the next weekly report. Fortunately, the conditions have not affected our nightly operations. The chlorophyll measurements taken from the CTD samples have shown rapidly increasing concentrations as we approach land. These increases are caused by the highly productive coastal upwelling events.

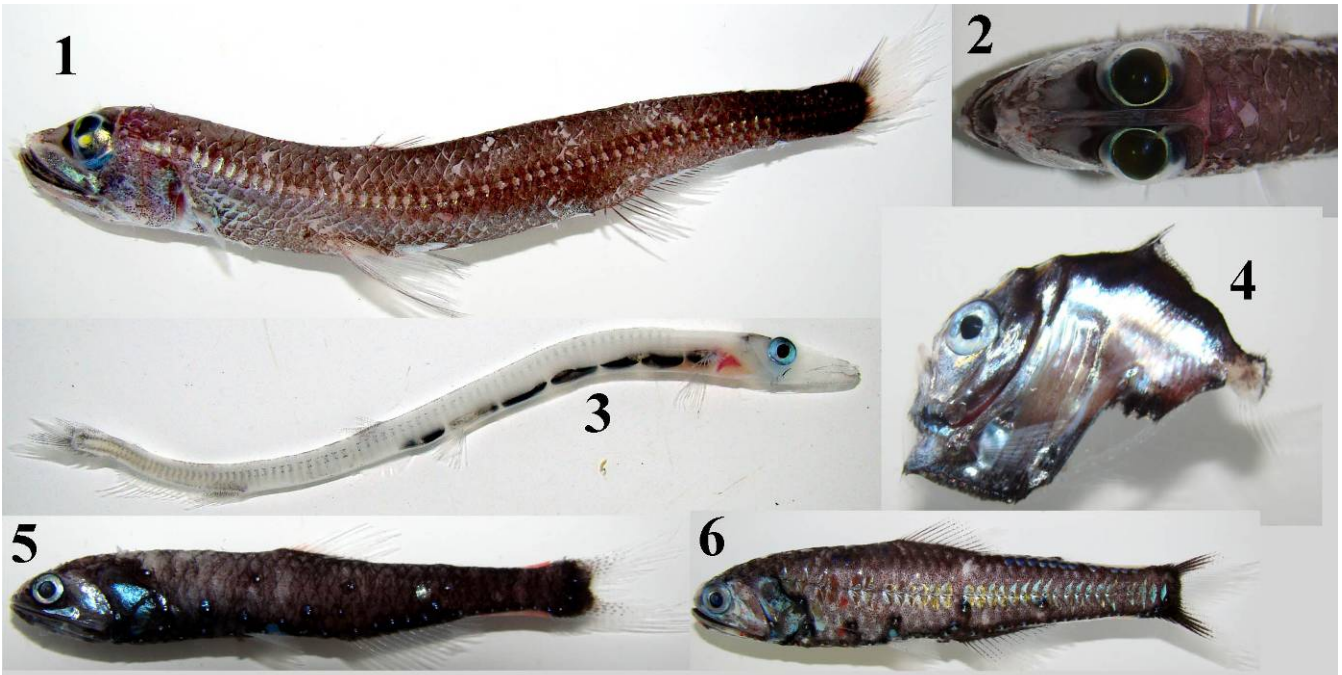
This week, by the numbers.

Date	CTD	XBT	Surface chlorophylls	Bongo Tows	HAB
10/19/2008	1	4	4	1	24
10/20/2008	1	3	3	1	28
10/21/2008	1	5	4	1	24
10/22/2008	1	4	4	1	24
10/23/2008	1	3	2	1	12
10/24/2008		4	4		24
10/25/2008	1	6	2	1	12
Weekly Total	**6**	**29**	**23**	**6**	**148**
Grand Total	**66**	**271**	**251**	**10**	**1586**

Midwater Trawling Weekly Report

IKMT Leader: Andrey Suntsov; IKMT Assistant: Jason Blackburn

We did 12 trawls this week (6 shallow 150-0 m and 6 deep 500-0 m), which yielded 2016 specimens from 30 midwater species. As usually, lanternfishes (Fam. Myctophidae) were the most diverse (10 species), followed by hatchetfishes (5). It appears that we almost reached the plateau for species diversity curve in this area and our depth strata, since we practically stopped recording any new species. However, this week we collected an excellent adult specimen of a northern pearleye, *Benthalbella dentata*, Fam. Scopelarchidae (only larvae and one juvenile recorded previously). Species of *Benthalbella* reach the largest size among pearleyes (up to 24 cm) and similar to many midwater fishes they are synchronous hermaphrodites, i.e. their gonads simultaneously produce both sperm and eggs. However, self fertilization is unlikely and during spawning one fish probably acts as a male and the other as a female, to ensure a better gene exchange. This particular species does not have photophores, but closely related *Benthalbella infans* is peculiar in its ability to transform muscles into light-producing organs. The teeth of *Benthalbella* are also quite unlike that of other fishes - they are forward pointing (how does it manage to hold struggling prey?) and lenses of its upward looking eyes have a bright yellow tint, helping to break down the counter-illumination camouflage by ventral photophores found in most midwater fish.



1 - northern pearleye *Benthalbella dentata*; 2 - dorsal view of head of *B. denta*ta; 3 - slender barracudina *Lestidiops ringens*; 4 - dollar hatchetfish *Sternoptyx* sp.; 5 - Mexican lampfish *Triphoturus mexicanus*; 6 - northern lampfish *Stenobrachius leucopsarus*.