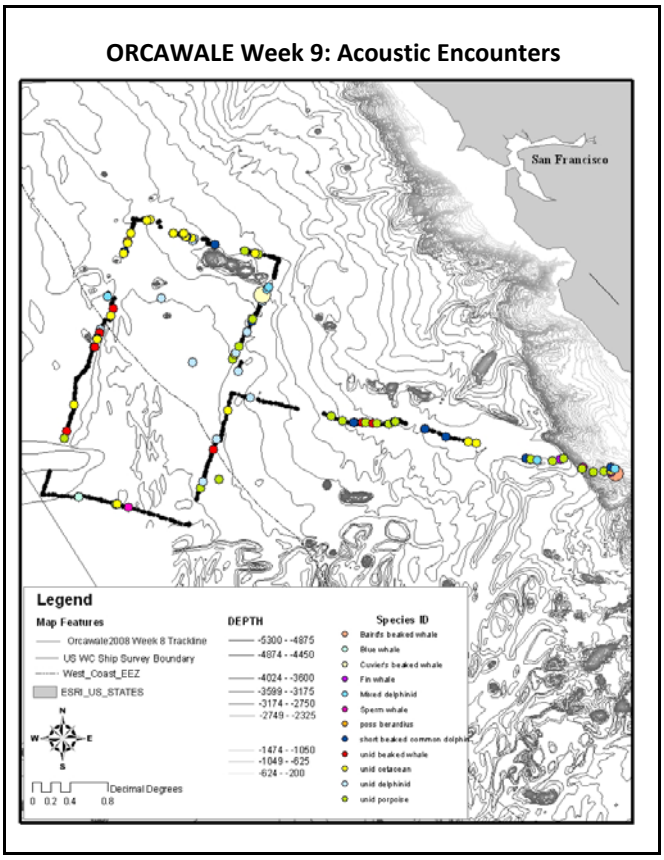
ORCAWALE 2008: Weekly Report

Report Dates: 28 Sep – 4 Oct 2008 Chief Scientist: *Jay Barlow* Leg 3 Cruise Leader: *Jim Carretta*

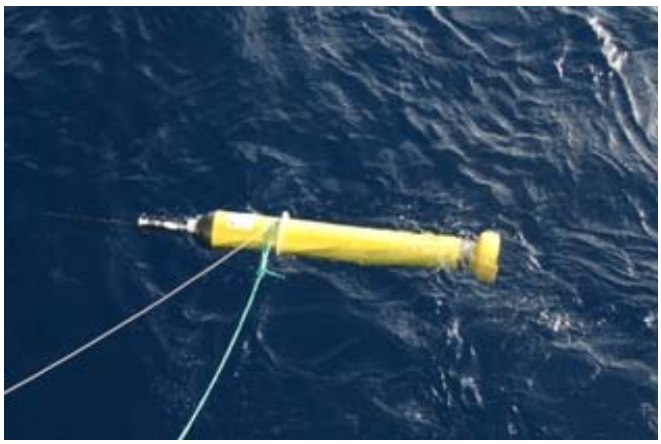
Weekly Science Summary
Jim Carretta

Our good luck with weather has continued and in this line of work, weather means everything. Good weather makes it easier to sleep, easier to see marine mammals, easier to deploy nets, and easier to take down the Commanding Officer in a game of cribbage. Schools of short-beaked common dolphin, mixed with striped dolphin, have characterized our days, along with an abundance of fin whales. We even managed a couple of fin whale biopsies this week, thanks to some expert marksmanship from Suzanne Yin. She hates to be the center of attention, by the way. We have also had numerous sightings of northern fur seals (*Callorhinus ursinus*) up to a couple of hundred miles from land. These animals are usually seen rafting at the surface, often associated with a ragged piece of kelp, one flipper held aloft and curled back towards it body, in a pose we refer to as "jug-handling." Our first ARGO buoy of the cruise was deployed and has already started transmitting data! This leg is coming to a close quickly and we will be throwing our ropes to our line handlers in San Diego. I'd like to thank all the crew, scientists, and officers for making this such an enjoyable and safe adventure.

An ARGO buoy is gently lowered into the water. What is an ARGO buoy? Imagine a CTD that can continually record data for 5 years without any babysitting!



ORCAWALE 2008 week 9, acoustic encounters map and tracklines.



The Argo buoy just before being released.

Marine Mammal Effort Summary.

Date	Time start Time end	Start Location End location	Distance surveyed (nm)	Average Beaufort
092808	0724 1900	N35:39.37 W125:19.62 N36:55.98 W125:18.54	56.4	2.3
092908	0731 1843	N37:00.08 W125:38.04 N36:52.01 W126:33.11	41.4	2.3
093008	0729 1856	N36:28.72 W126:41.99 N34:55.92 W127:10.59	90.9	5.1
100108	0734 1901	N34:35.61 W127:19.21 N34:03.63 W125:50.43	92.4	4.5
100208	0733 1855	N34:17.49 W125:45.99 N35:14.91 W124:40.64	92.3	2.4
100308	0723 1841	N35:11.91 W124:24.97 N34:53.01 W122:47.21	63.1	3.9
100408	0721 1837	N34:44.29 W122:21.41 N34:32.67 W121:16.24	44.6	3.5

Marine Mammal Sighting Summary.

Code	Species	Total sightings
005	*Delphinus* sp.	2
013	*Stenella coeruleoalba*	5
017	*Delphinus delphis*	22
044	*Phocoenoides dalli*	1
046	*Physeter macrocephalus*	2
061	*Ziphius cavirostris*	1
063	*Berardius bairdii*	1
070	*Balaenoptera* sp.	7
074	*Balaenoptera physalus*	22
075	*Balaenoptera musculus*	1
079	Unid. large whale	1
0177	Unid. small delphinid	6
CU	*Callorhinus ursinus*	33
MA	*Mirounga angustirostris*	4
UA	Unid. fur seal	1
Total		**109**

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	3	5	17	26
Berardius bairdii	Baird's beaked whale	0	0	1	1
Delphinus delphis	Short-beaked common dolphin	34	84	77	196
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		**37**	**89**	**136**	**309**

Photo Report
Jim Cotton and Chris Cutler

Of the 18 different cetacean sightings from which we obtained good photographs, 78 different animals provided ID-grade images. The vast majority came from short-beaked common dolphins with 64 uniquely scarred and/or pigmented individuals photographed. Among 13 different fin whales added to the photo archives, one whale swam very close to the ship, exhaling from its paired blowholes and then showing its white lower-right jaw (see photos).

Common dolphin. Are those tooth-rake marks behind and above the eye?

Fin whale surfacing close to the vessel.

Fin whale, showing paired blowholes.

A perfect mirror image of a short-beaked common dolphin.

Seabirds

Michael Force and Sophie Webb

Immature Lazuli Bunting. Photo by Sophie Webb.

The avian events this week lurched from quotidian to extraordinary, highlighted by displaced southbound landbird migrants. Five lost songbird species, all hatching year birds making their first trip south, found temporary reprieve from their ocean wanderings aboard the *McArthur II*. Yellow-rumped and Blackpoll Warblers, Chipping and White-crowned Sparrows, and Lazuli Bunting all sought refuge onboard. Four of these were discovered on the same morning and coincide with a similar fall-out of migrant warblers observed the previous day off Monterey. All except the Yellow-rumped Warbler had departed by the afternoon of the day they arrived. The Yellow-rumped, thanks to the paternal efforts of Chris Cutler, remained

for four days; however, her fate beyond that is unknown. Extraordinary was seeing a White-rumped Sandpiper fly past the ship about 280 nm west of Point Piedras Blancas. During the fall, their primary migration route on their way to southern South America is along the Atlantic coast. They are extremely unusual at this time of year anywhere west of the Cascade Mountains.

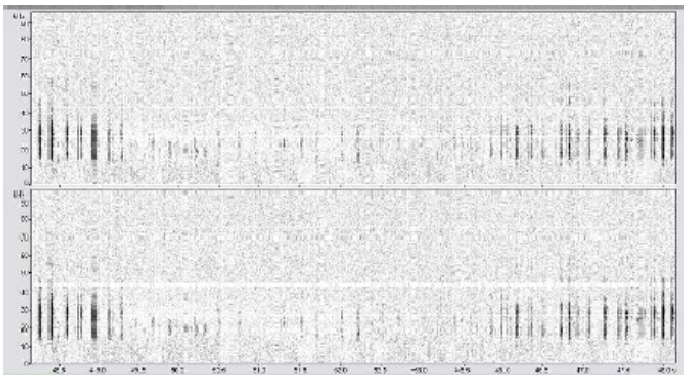
Mature female Brown Booby. Photo by Sophie Webb.

In case anyone is wondering, we did indeed find seabirds this week. Most notable were Red-tailed Tropicbirds. This tropical and sub-tropical species was found far offshore in areas where the sea surface temperature was 18° C. We also found our first Red-billed Tropicbird for the cruise. Another first was an adult female Brown Booby. Having spent so many hundreds of days surveying seabirds in the tropics, where this species is common, we almost didn't think much of this bird hanging motionless off the bow until we regained our senses and realized where we were: about 340 nm west of Point Conception! Eighty to one hundred Leach's Storm-Petrels were rescued off the deck and released unharmed this week, almost 60% of them in a single night. Thanks to the efforts of scientists and crew, there was only one mortality. For those keeping track, we found an average of 10 species per day, while our weekly species total was 27, one above the cruise average.

Acoustics Squeakly Report

Tina Yack and Aly Fleming

This week has again blessed with many days of sunny skies and calm seas. We have spent most of our time this week over 100 nm offshore, transiting south of San Francisco to Santa Barbara, with many acoustical encounters along the way (see figure on page 1). This has resulted in 76 hours of acoustic recording effort and 67 hours of monitoring effort (Table 1). During this time, there were 92 acoustic encounters, approximately 32% of which matched visual sightings (Table 2). There were two joint visual/acoustic beaked whale encounters (Cuvier's and Baird's), four fin whale encounters, one blue whale encounter, two sperm whale encounters, nine short beaked common dolphin encounters, and five mixed dolphin schools. One of the highlights of the week was a joint acoustic/visual encounter with a group of Baird's beaked whales. We were able to stay with this group for approximately two hours. During this time we obtained valuable acoustic recordings. A spectrogram of echolocation clicks from this encounter is shown below. On Thursday, we will be arriving in San Diego for a long in-port and some much needed relaxation. Stay tuned for your next squeakly report from Leg4.



Spectrogram of Berardius clicks.

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

Date	Average Beaufort	Average Visibility Range (nm)	Recording Start	Recording End	Recording Time	Monitoring Effort	Acoustic Encounters
09/28/08	2.4	6.5	7:20	19:08	11:48	10:00	17
09/29/08	2.3	6.8	7:17	19:00	11:43	11:00	17
09/30/08	5.1	5.2	7:30	18:57	11:27	10:00	14
10/1/08	4.5	6.4	10:55	19:03	8:08	7:30	4
10/2/08	2.3	6.6	7:46	19:34	11:48	9:30	10
10/3/08	3.9	5.8	7:18	18:57	9:39	8:39	14
10/4/08	3.6	4.2	7:22	18:39	11:17	10:00	16
Total					**75:50:00**	**66:39:00**	**92**

Oceanography

Ryan Driscoll, Shannon Lyday and Jim Carretta

We have turned from our blue oligotrophic (low productivity) off shore waters and headed inshore toward greener pastures. Along the way we managed to deploy the first of our four Argo floats. Stay tuned to next leg to hear about these amazing ocean wanderers. Our net got up close and personal with the local color, and a little out of their league, when a blue shark decided to check things out. Our fragile phytoplankton net survived but a little shaken. And we witnessed one of nature's wonders late at night with an amazing display of bioluminescence at the bow.

Many plankton have the ability to give off light from fish to krill. However, phytoplankton, especially dinoflagellates, are often responsible for the display of watery stars and ghostly shapes we saw a few nights ago. Dinoflagellates used to be known as Pyrrophyta meaning "fire plant." A compound called luciferin emits light inside the cell usually in response to agitation. The emission of light is thought to be a defense against predation. A bloom of phytoplankton in the water can make the whole ocean glow and when dolphins come to the bow in the dead of night, a surreal spectacle occurs. The dolphins are seen as the light of thousands of tiny plants disturbed by their swimming. The long indiglo jetstreams can be seen trailing through the water tracing their recent history. Never quite distinct in shape, a group of dolphins will cluster in one ghostly ball then suddenly break apart like so many shooting stars. It was a sight that will have many of us coming back to the bow on calm nights.

Day	CTD	XBT	Surface chlorophyll	Bongo tow	HAB	Argo
09/28/2008	1	3	3	1	25	
09/29/2008	1	3	3	1	25	
09/30/2008	1	4	4	1	31	
10/01/2008	1	3	3	1	25	1
10/02/2008	1	4	4	1	31	
10/03/2008	1	3	3	1	25	
10/04/2008	1	2	2	1	19	
Grand Total	**54**	**225**	**208**	**47**	**1,314**	**1**

Midwater Trawling Weekly Report

Andrey Suntsov and Carl Mayhugh

This was another productive week for us, midwater trawl folks, with good weather prevailing and mostly offshore sampling which brings higher diversity and lower volumes of zooplankton to sort through. We added few more midwater fish species to our collection, including two hatchetfishes (*Argyropelecus sladeni* and *Valenciennellus tripunctulatus*), beautifully colored juvenile paperbone (*Scopelosaurus harryi*), large robust blacksmelt (*Pseudobathylagus milleri*), bulldog lightfish (*Ichthyococcus irregularis*), pelagic basslet (*Howella* sp.) and a small pearleye (*Benthalbella dentata*). On Friday night we were rewarded with a foot-long specimen of a shining tubeshoulder (*Sagamichthys abei*, Fam. Platytroctidae) in near perfect condition, recovered with our deeper trawl (500-0 m). As mentioned briefly in the previous narrative, tubeshoulders are remarkable in their ability to squirt a bioluminescent fluid out of a small tube located just above the pectoral fin. This large specimen, still alive when brought onboard, gave us a unique opportunity to witness this rare phenomenon. When picked up from a sample bucket, the fish showered my hands with hundreds of bright-blue shiny particles, quickly fading away. In the darkness of the night, this was a surreal, magnificent sight! Tapping the tubeshoulder would produce one portion of such scintillating particles after another. I played with this fish for some time in the darkness of the night, hoping to capture its light production on camera, finally exhausting the fish as well as its supply of living light. This species also sports some of the very unusual photophores among deep-sea fishes, with belly crossed by three narrow bands of whitish light organs and additional tear-shaped photophores found on branchiostegal membranes and lower portion of the body. We can only guess what kind of light is produced from these and what it is used for (likely for species recognition and not for counterillumination camouflage, so common in midwaters!). The final puzzle of this deep-sea wonder is that its head scales are reverse-imbricated.

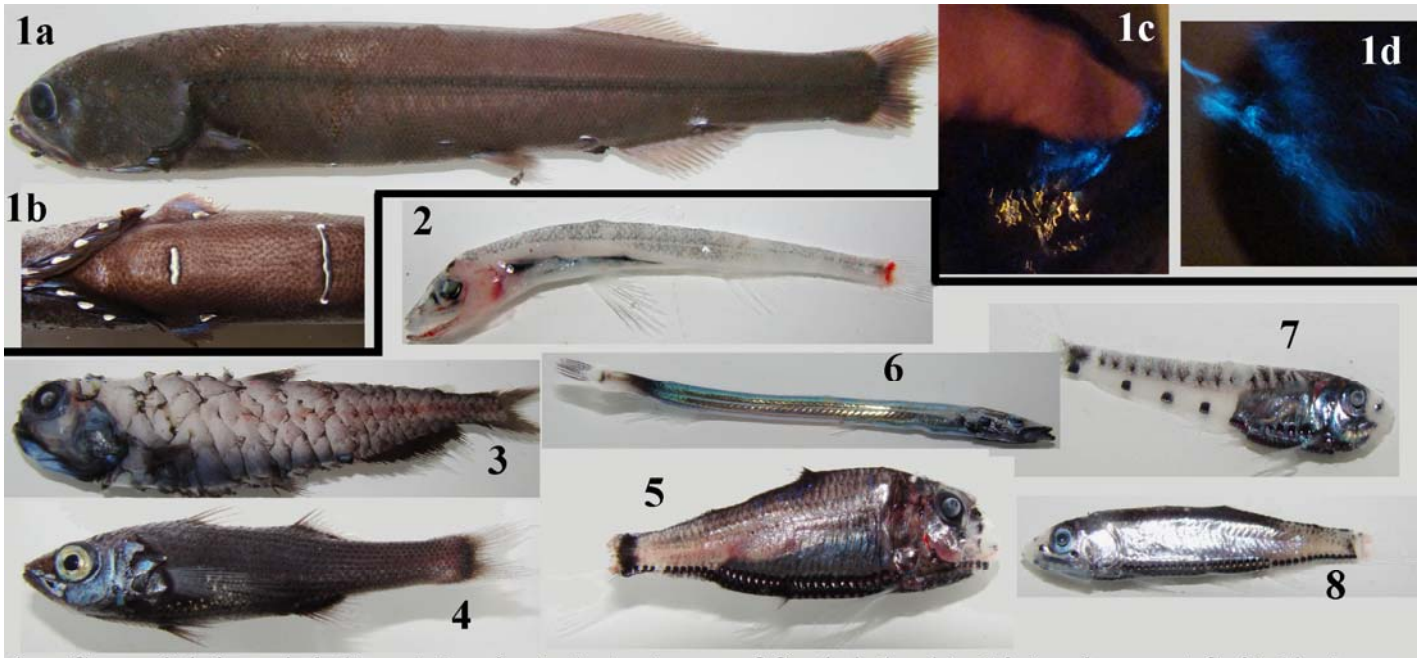
Our collection of deep-sea cephalopods this week was enriched by collecting a famous vampire squid (*Vampyroteuthis infernalis*) – an archaic cephalopod with a peculiar mixture of characters from both octopi and squids. This gelatinous creature is found at meso-bahypelagic levels in warm-water and temperate oceans wordwide and is relatively common in the southern portion of California Current, where it mostly resides in the oxygen minimum layer. *Vampyroteuthis* has a number of light producing organs on the body and at arm tips, and is also capable of producing a bright luminescent fluid composed of microscopic glowing particles (probably not unlike that of tubeshoulder fishes!). The animal has an unusual and probably defensive “pinapple posture”, spreading its arms and web over the head and mantle, with arm cirri extended outward, which gives an animal a prickly, ball-like appearance. Our small specimen was mostly blackish, with bright red eyes.

We also hauled in two other interesting midwater cephalopods – *Cranchia scabra* (Fam. Cranchiidae) and *Histioteuthis heteropsis* (Fam. Histioteuthidae). *Cranchia scabra* is a very small glass squid with mantle entirely covered by numerous cartilaginous tubercles (with unknown function). When threatened, the squid retracts its arms and head inside the mantle

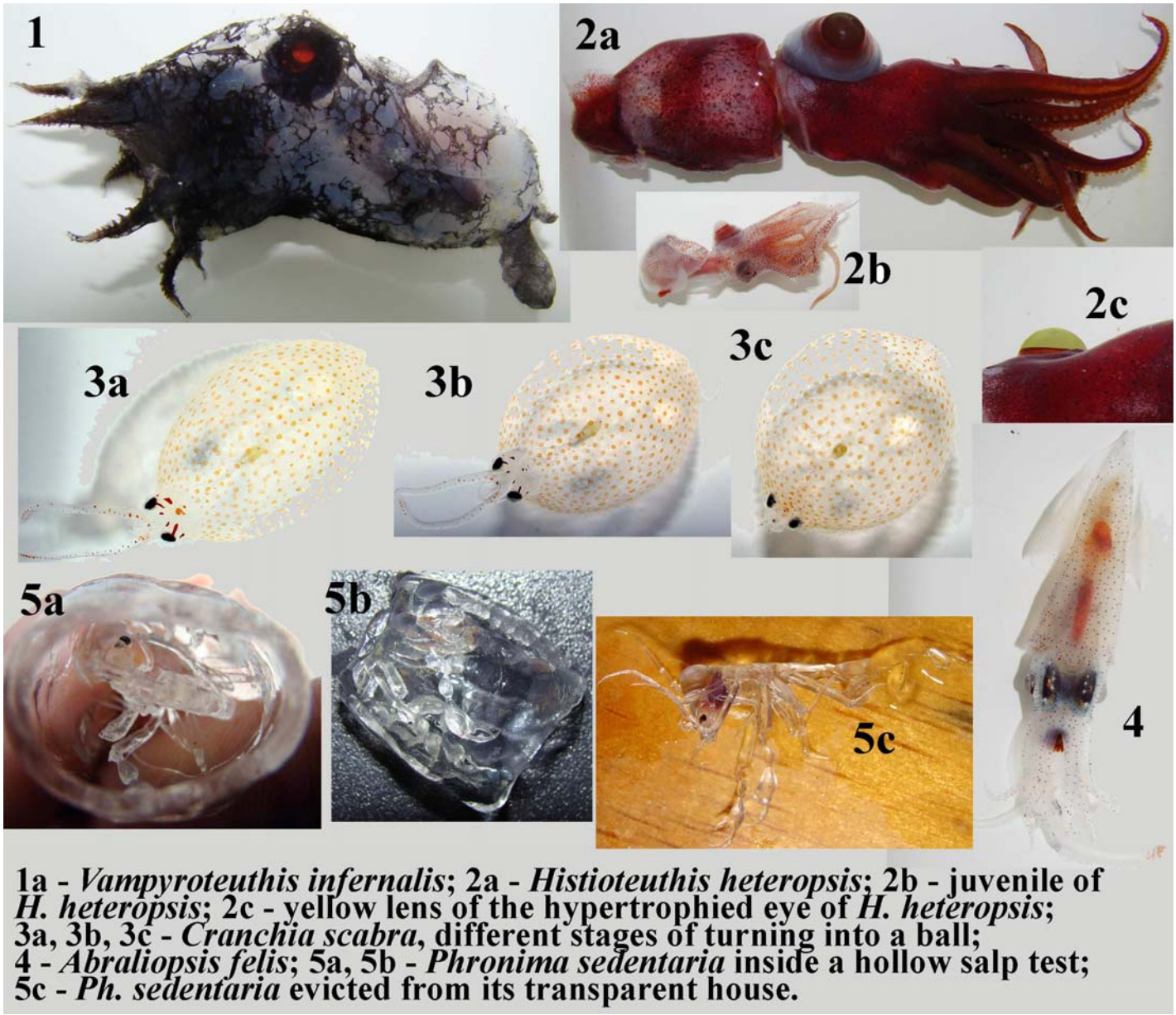
cavity, folds fins and turns into a perfect turgid ball with yellowish speckles of chromatophores. It was first spotted in exactly the same manner, floating around a sorting tray. For me, an ichthyologist, this defense strategy immediately brought to mind the inflating behavior of porcupine- or pufferfishes, which can quickly transform into a spiny ball by swallowing water or air.

Histioteuthis heteropsis (cock eyed or jewel squid) - a common inhabitant of the mesopelagic zone off southern California that migrates to surface at night, is peculiar in its extremely dimorphic eyes. The left eye is much larger and is semitubular. This hypertrophied eye is facing upward, possibly looking for silhouettes of animals against the downwelling irradiance. Yellow lens in this eye is a good example of evolutionary "arms race" in midwaters, because counterilumination camouflage by abdominal photophores in many midwater species can be overcome by yellow filters in the lenses of predators, enhancing contrast of point light sources (many midwater fishes have also evolved yellow lenses as a counter measure!). The right eye in the squid is small and points laterally. Initially, we collected a juvenile specimen of *Histioteuthis*, complemented by subsequent capture of a magnificent dark red adult with mantle and arms densely covered with photophores. Of more frequent species, practically every of our trawls brings a small squid *Abraliopsis felis* – a very common enoploteuthid of the California Current with spherical black photophores at the tip of arm IV.

Our account of midwater diversity would be incomplete without a mention of a hyperiid amphipod *Phronima sedentaria*, a member of a large group of strictly marine crustaceans, ranking only third in abundance after copepods and euphausiids in oceanic zooplankton assemblage. Almost all hyperiids are symbiotic with gelatinous zooplankton (siphonophores, medusas, salps and ctenophores), using them for feeding or as a nursery ground for their young. The notorious alien-looking *Phronima* usually takes over a salp's test, apparently eating a host and making a transparent home out of it. We collect many of these glass-like gelatinous houses with transparent crustaceans comfortably sitting inside. Firmly lodged inside its residence, *Phronima* can somersault quickly inside its house facing either direction.



1a - *Sagamichthys abei*; 1b - abdominal photophores of *S. abei*; 1c, 1d - bioluminescent fluid discharge of *S. abei*; 2 - *Benthalbella dentata*; 3 - *Pseudobathylagus milleri*; 4 - *Howella* sp.; 5 - *Ichthyococcus irregularis*; 6 - *Scopelosaurus harryi*; 7 - *Valenciennellus tripunctulatus*; 8 - *Vinciguerria lucetia*



1a - *Vampyroteuthis infernalis*; 2a - *Histioteuthis heteropsis*; 2b - juvenile of *H. heteropsis*; 2c - yellow lens of the hypertrophied eye of *H. heteropsis*; 3a, 3b, 3c - *Cranchia scabra*, different stages of turning into a ball; 4 - *Abraliopsis felis*; 5a, 5b - *Phronima sedentaria* inside a hollow salp test; 5c - *Ph. sedentaria* evicted from its transparent house.

Squid Jigging

Jim Cotton, Sophie Webb, Jim Carretta, Chris Cutler, Allan Ligon, Suzanne Yin, Rich Pagen and Shannon Lyday

Several 20 pound class squid were brought aboard in far offshore waters this week. As always, the fishers and gaffers alike are getting a good upper body workout through their struggles with the giant cephalopods.