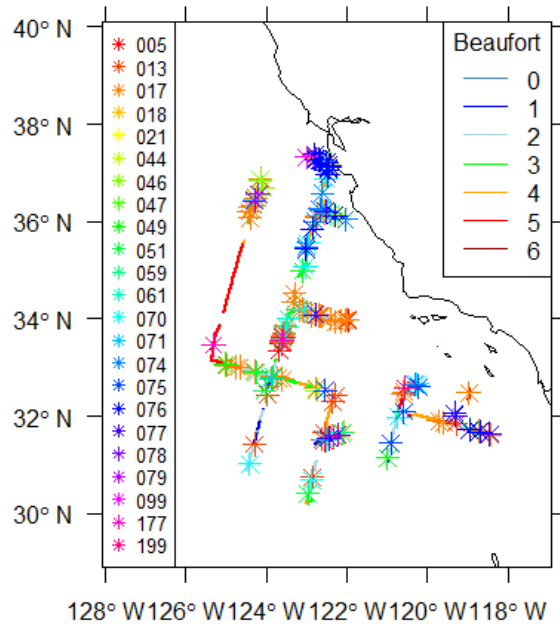


California Current Cetacean & Ecosystem Survey (CalCurCEAS): End of Leg Report: 29 November – 10 December, 2014 (Leg 5)

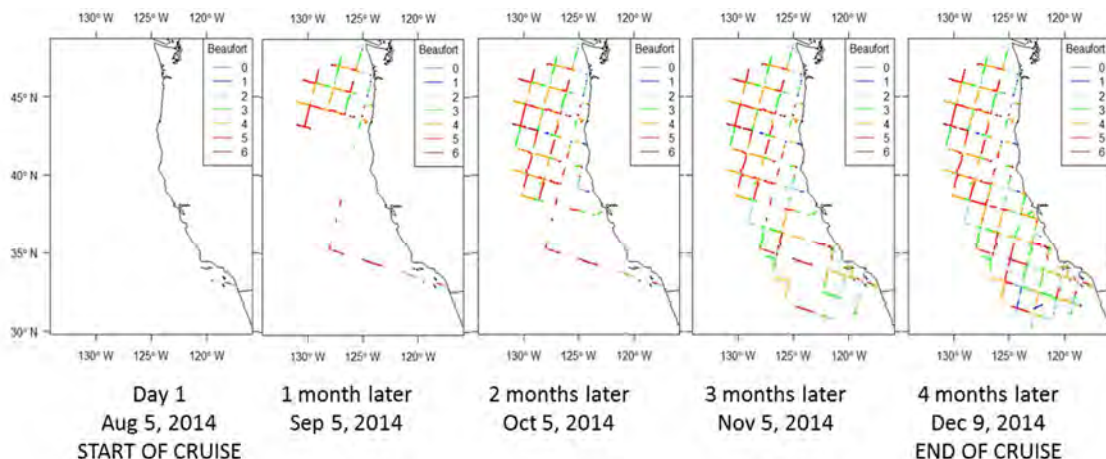
Synopsis (Karin Forney, Cruise Leader)

This final report for CalCurCEAS 2014 marks the end of a successful leg and very successful 4-month cruise! Our completed transect lines for Leg 5 are shown at right, along with sighting locations for dolphin, whale and porpoise species seen. While this looks like a rather strange set of lines, it perfectly completes our project survey grid! As I created the full survey map (far right panel below), I pondered the incredible planning, dedication, hard work, and good weather luck that allowed us to complete this entire grid during the past four months, as we cruised around the California Current at 8kts speed (slower than a bicycle!). When the *Ocean Starr* set sail on August 5th and the team

completed the first of many lines as they left San Diego (left panel below), it was hard to imagine that a comprehensive grid would ultimately be completed. By the time one month had passed, the northern part of the grid was nearly completed. Each successive month brought us closer to our goal, as Labor Day, Halloween and Thanksgiving all came and went. Seeing this long process come to a successful close is a wonderful feeling, knowing that we have collected an amazing array of data on marine mammals, seabirds, and oceanography of the California Current Ecosystem. The results of the cruise will yield new population estimates for whales, dolphins and porpoises, and will provide important



Transect lines completed during Leg 5 and locations of cetacean sightings.

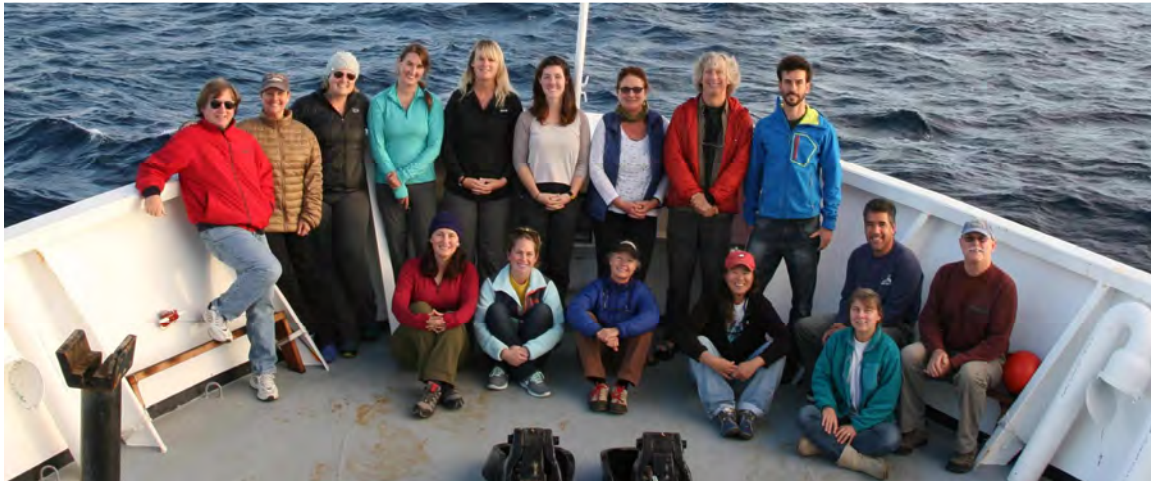


ecosystem data to advance our understanding of this highly productive ocean region. We look forward to analyzing the data for years to come. Project-specific summaries for the second half of the leg are described below in the individual project sections. Highlights include a visual and acoustic identification of a rarely encountered Blainville's beaked whale, the discovery of an aggregation of juvenile loggerhead turtles in the southwest corner of our study area, and a few last opportunities to obtain individual identification photographs of blue whales before they head south for the winter.



Blue whale. The unique pigmentation pattern allows recognition of individuals (Photo: P. Olson)

As we pack up all our equipment and prepare to leave the ship tomorrow, we would like to express our sincere thanks to the crew of the R/V *Ocean Starr*: Captain Bud Hanson, Bill Rothschild, Bob Overmon, Armando Urritia, Adam Gautney, Andrew Eigenrauch, Jose Valentin, Charlie Tullier, Don Huffman, Jerry Taylor, George Rayford Jr., Justice Sagoe and Crystal Nailor. THANK YOU from the entire Leg 5 CalCurCEAS team.



CalCurCEAS Leg 5 Scientific Team: (standing, left to right) Jim Gilpatrick, Dawn Breese, Jennifer Keating, Nicky Beaulieu, Morgan Richie, Morgan Arrington, Lori Beraha, Mike Force, Camillo Saavedra; (seated, left to right) Morgane Lauf, Arial Brewer, Paula Olson, Suzanne Yin, Karin Forney, Juan Carlos Salinas, Scott Benson.

Marine Mammal Observations (Paula Olson, Juan Carlos Salinas, Suzanne Yin, Jim Gilpatrick, Scott Benson, Morgane Lauf, Morgan Richie, Lori Beraha, Karin Forney)

Search Effort by Day

Date	Time Start	Time End	Latitude	Longitude	Nautical Miles Surveyed	Average Beaufort
112914	0708	1651	N33:10.46	W123:44.99	77.9 nmi	3.0
113014	0705	1645	N32:06.52	W120:39.26	63.2 nmi	3.9
120114	1418	1634	N31:48.81	W119:16.66	61.6 nmi	1.9
120214	0744	0744	N33:26.87	W119:44.74	0.0 nmi	5.0 rain
120314	0706	1639	N32:06.73	W120:42.12	55.7 nmi	2.3
120414	0802	1658	N30:13.32	W122:59.13	55.6 nmi	2.5
120514	0705	1632	N31:23.31	W122:39.42	55.4 nmi	3.9
120614	0704	1658	N32:09.50	W124:04.00	78.1 nmi	1.5
120714	0710	1550	N31:26.20	W122:47.45	40.5 nmi	0.8 ← ☺ !!!
120814	0704	1309	N32:09.56	W120:41.39	42.2 nmi	5.0
120914	0657	0924	N32:34.92	W118:57.03	15.1 nmi	5.0
			N32:20.48	W119:01.04		



Striped dolphins (Photo: M. Richie)

Number of Cetacean Sightings by Species

CODE	SPECIES	TOT#
005	<i>Delphinus</i> sp.	1
013	<i>Stenella coeruleoalba</i>	8
016	<i>Delphinus capensis</i>	1
017	<i>Delphinus delphis</i>	12
018	<i>Tursiops truncatus</i>	1
046	<i>Physeter macrocephalus</i>	1
049	ziphiid whale	2
051	<i>Mesoplodon</i> sp.	2
059	<i>Mesoplodon densirostris</i>	1
070	<i>Balaenoptera</i> sp.	4
071	<i>Balaenoptera acutorostrata</i>	1
074	<i>Balaenoptera physalus</i>	1
075	<i>Balaenoptera musculus</i>	4
076	<i>Megaptera novaeangliae</i>	3
077	unid. dolphin	3
078	unid. small whale	1
080	<i>Kogia</i> sp.	1
199	Fin/Sei/Bryde's whale	1
TOTAL		48



Bottlenose dolphins (Photo: P. Olson)

Seabird Observations (Michael Force, Dawn Breese)

On the final 11 days of the final leg of CalCurCEAS 2014, we found 503 birds of 32 species, our lowest since the beginning of the cruise. It would appear the birds have moved on. However, our daily average of 10 species was only one less than the overall cruise daily average. And, of course, there are always some exciting highlights surveying waters rarely visited by seabird observers. We added a new species that is very rare in Southern California, an adult Masked Booby. We also found several Laysan Albatrosses, three Brown Boobies, a couple of “Dark-rumped” Petrels (either Hawaiian or Galapagos—the former more likely, but the latter not out of the realm of possibility), a single Mottled Petrel, two Cook’s Petrels, and a very late Flesh-footed Shearwater. Extremely late (and off course!) migrant land birds included a Yellow-rumped (Myrtle) Warbler and a Lapland Longspur. One of the more remarkable stories was the high numbers of Red-tailed Tropicbirds we found: 16, including eight in a single day! This species is supposed to be so uncommon in California waters that all reports of this species are reviewed by the Western Field Ornithologists’ California Rare Birds Committee for authenticity.



Adult Red-tailed Tropicbird observed about 155 nautical miles southwest of San Nicolas Island, California (Photo: P. Olson)

Looking nostalgically at the past 114 days of survey effort, we found 15,547 birds of 85 species and 30 unidentified species groups. Not all seabirds, but a mixture of lost terrestrial migrants, waterfowl, shorebirds, and assorted odds and ends. With so many, it is impossible to choose the rarest, the most glamorous or even a personal favorite. Instead, we will simply rank the top three in terms of overall abundance: Sooty Shearwater (2300), Leach’s Storm-Petrel (2253), and Red Phalarope (1513), all quintessential seabirds of the California Current. Readers who are interested in some of the more unusual species we saw are encouraged to review our previous seabird reports.

In addition to a 300 meter strip transect, we simultaneously conducted a seabird feeding flock survey with the assistance of the marine mammal observers who detect these flocks during their marine mammal effort. We counted 12,458 birds of 29 species in 71 feeding flocks. Fifty-eight percent (7320) were Black-vented Shearwaters in 14 feeding flocks, the vast majority seen during four survey days in the Santa Barbara Channel associating with Long-beaked Common Dolphins. Pink-footed Shearwater (2401), Western Gull (2270) and Sooty Shearwater (1107) were the runner ups. About 42% of these feeding flocks were associating with nine species of cetaceans (principally Short-beaked and Long-beaked Common Dolphins) and two species of pinnipeds. The others were either over fish, on a

surface slick (favored by storm-petrels) or some other undetermined food item. One of the most remarkable feeding flocks, aside from the enormous Black-vented Shearwater and Western Gull flocks in the Santa Barbara Channel, was a flock associating with feeding Killer Whales. This flock consisted of 130 Black-footed Albatrosses (and one plucky Northern Fulmar) eagerly devouring the heart and lungs of a Pygmy Sperm Whale.

We want to thank all who contributed to the success of the seabird project: the various on board Cruise Leaders; the marine mammal observers who assisted with detecting distant seabirds; the officers and crew of the R/V Ocean Starr; and Dr. Jay Barlow, Chief Scientist.

Biopsy (Juan Carlos Salinas & Suzanne Yin)

Weekly Cetacean Biopsy Report for 11/29/2014 to 12/9/2014

Species	Common Name	# Weekly Samples	# Weekly Takes	Total Samples	Total Takes
<i>Balaenoptera borealis</i>	Sei whale	0	0	2	7
<i>Balaenoptera musculus</i>	Blue whale	0	0	3	4
<i>Balaenoptera physalus</i>	Fin whale	0	0	13	42
<i>Bryde's/Sei/Fin whale</i>	Bryde's/Sei/Fin whale	0	0	1	2
<i>Delphinus capensis</i>	Long-beaked common dolphin	0	0	11	13
<i>Delphinus delphis</i>	Short-beaked common dolphin	2	2	134	245
<i>Feresa attenuata</i>	Pygmy killer whale	0	0	2	4
<i>Globicephala macrorhynchus</i>	Short-finned pilot whale	0	0	7	15
<i>Lagenorhynchus obliquidens</i>	Pacific white-sided dolphin	0	0	38	65
<i>Lissodelphis borealis</i>	Northern right whale dolphin	0	0	23	49
<i>Megaptera novaeangliae</i>	Humpback whale	0	0	1	2
<i>Orcinus orca</i>	Killer whale	0	0	5	16
<i>Phocoenoides dalli</i>	Dall's porpoise	0	0	16	21
<i>Physeter macrocephalus</i>	Sperm whale	0	0	6	9
<i>Stenella coeruleoalba</i>	Striped dolphin	0	0	9	14
<i>Tursiops truncatus</i>	Bottlenose dolphin	23	34	31	46
<i>Unid squid Architeuthis sp</i>	Giant squid	0	0	1	1
Grand Total		25	36	303	555

Cetacean Photographic Sampling (Paula Olson, Jim Gilpatrick, Suzanne Yin, Morgane Lauf, Morgan Richie)



Blue whale blow
(Photo: P. Olson)

Individual ID's	29 Nov-09 Dec 2014	Cruise totals to-date
SF pilot whale		7
Killer whale		12
Sperm whale flukes	1	13
Sei whale		8
Fin whale		57
Blue whale	2	19
Humpback flukes	1	13

Species Code	Scientific Name	Common Name	29 Nov-09 Dec 2014		Cruise totals to-date		
			# Sightings	# Photos	Total Sightings	Total Photos	
13	<i>Stenella coeruleoalba</i>	Striped dolphin		5	325	29	1239
16	<i>Delphinus capensis</i>	LB common dolphin		1	66	10	379
17	<i>Delphinus delphis</i>	SB common dolphin		9	308	152	5302
18	<i>Tursiops truncatus</i>	Bottlenose dolphin		1	838	5	1235
21	<i>Grampus griseus</i>	Risso's dolphin				9	452
22	<i>Lagenorhynchus obliquidens</i>	Pacific white-sided dolphin				13	244
27	<i>Lissodelphis borealis</i>	Northern right whale dolphin				6	576
32	<i>Feresa attenuata</i>	Pygmy killer whale				1	283
36	<i>Globicephala macrorhynchus</i>	Short-finned pilot whale				3	1861
37	<i>Orcinus orca</i>	Killer whale				4	2954
40	<i>Phocoena phocoena</i>	Harbor porpoise				1	27
44	<i>Phocoenoides dalli</i>	Dall's porpoise				10	121
46	<i>Physeter macrocephalus</i>	Sperm whale		1	50	13	2703
47	<i>Kogia breviceps</i>	Pygmy sperm whale				1	26
49	<i>Ziphiid whale</i>	Unidentified beaked whale				1	49
51	<i>Mesoplodon sp.</i>	Unidentified Mesoplodon				1	130
59	<i>Mesoplodon densirostris</i>	Blaineville's beaked whale		1	379	1	379
63	<i>Berardius bairdii</i>	Baird's beaked whale				4	620
70	<i>Balaenoptera sp.</i>	Unidentified rorqual				7	186
71	<i>Balaenoptera acutorostrata</i>	Common minke whale				1	2
72	<i>Balaenoptera edeni</i>	Bryde's whale				1	19
73	<i>Balaenoptera borealis</i>	Sei whale				11	1580
74	<i>Balaenoptera physalus</i>	Fin whale		1	132	72	9650
75	<i>Balaenoptera musculus</i>	Blue whale		2	743	25	3602
76	<i>Megaptera novaeangliae</i>	Humpback whale		1	14	22	464
99	<i>B. borealis/edeni</i>	Sei or Bryde's whale				6	200
199	<i>B. physalus / borealis / edeni</i>	Fin/Sei/Brydes whale		2	32	7	270

Oceanography and Prey Sampling (Morgan Arrington, Camillo Saavedra, Dawn Breese, Scott Benson)

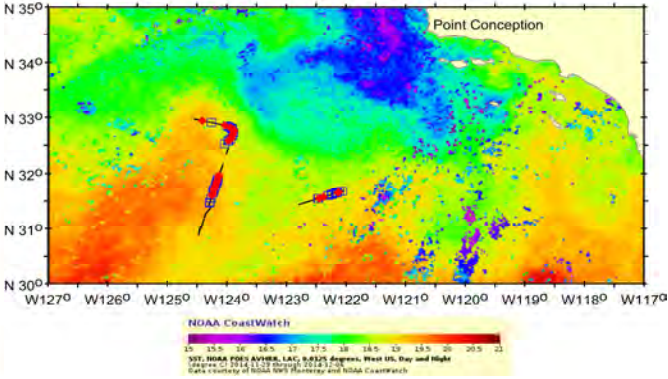
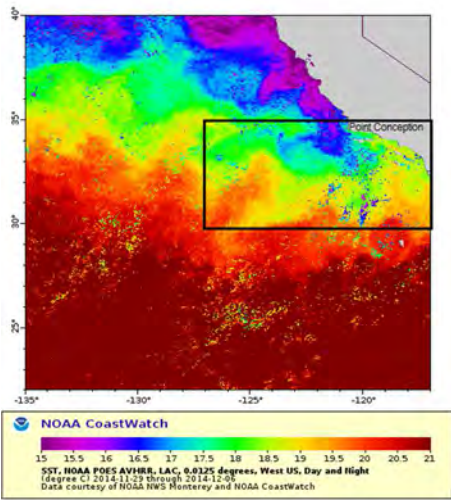
As our time aboard the R/V Ocean Starr for the CalCurCEAS 2014 draws to a close, we have continued to compliment visual and acoustic data with information on the physical and biological properties of the pelagic ecosystem along our last few segments of track line. We take daily readings of surface and sub-surface water temperature and salinity, monitor thermocline depth, and conduct nightly bongo net tows targeting the deep-scattering layer for cetacean prey organisms. During the second half of Leg 5, we have launched a total of 51 expendable bathythermographs (XBT's), performed six bongo tows, and jigged for squid a total of 5 hours.

Date	XBT's	Bongo Tows
17 Nov -28 Nov	51	6
29 Nov – 9 Dec	51	6
Total for Leg 5	102	12



Juvenile loggerhead turtle (Photo: M. Lauf)

Surface temperature readings have fluctuated between a high of 20.3°C and a low of 16.9°C, but were dominated by unseasonably warm temperatures in the 18°C and 19°C range. Satellite imagery taken from November 28th through December 6th captures a northward intrusion of warm, oligotrophic water uncharacteristic for this time of year (see Figure below). The outer boundary of this mesoscale feature coincided with our track lines and Scott Benson, who is co-investigator of the SWFSC's leatherback turtle ecology program, believes it may offer an explanation for our high surface temperature readings as well as the aggregations of juvenile loggerhead turtles encountered by the flying bridge observers on November 28th, December 6th, and December 7th (see Figure below). We also observed low density and diversity of mid-trophic level organisms in our nightly bongo tows, and this may be another indication of the nutrient poor mesoscale feature. We are interested in whether this feature may have implications for cetacean distribution as well.



Juvenile loggerhead (red) and unidentified hardshell turtles (blue) that were likely also loggerheads seen on transects covered Nov 28, Dec 6 and, Dec 7, with composite sea surface temperature satellite images for Nov 29-Dec 6.

In addition to our standard oceanographic sampling, we have continued to collect daily water samples for Scripps Oceanography Ph.D. student Eiren Jacobson. Eiren is interested in evaluating the feasibility of using trace amount of DNA in ocean water (also called eDNA, or environmental DNA) to survey cetaceans diversity over a large geographic area. We've collected water samples near fin whales, blue whales, and the first ever Blainville's beaked whale to be identified both visually and acoustically. We'll be interested to see if Eiren is able to obtain a genetic identification as well!

Acoustics (Jennifer Keating, Nicky Beaulieu, Ariel Brewer)

The acoustic component of this survey is comprised of three main parts. Chiefly, the bulk of our time is spent monitoring the live feed from the towed hydrophone array 300m behind the Ocean Starr. We not only detect vocalizing animals this way, we can localize their whereabouts as we travel down the transect line. Secondly, we are launching nightly sonobuoy stations, as well as opportunistic buoys during daytime sightings of high priority species (e.g. Bryde's and fin whales). And lastly, we are deploying new autonomous free-floating recording devices, known as DASBRs, to monitor the ocean soundscape at 100 meters depth without constant boat noise interference.

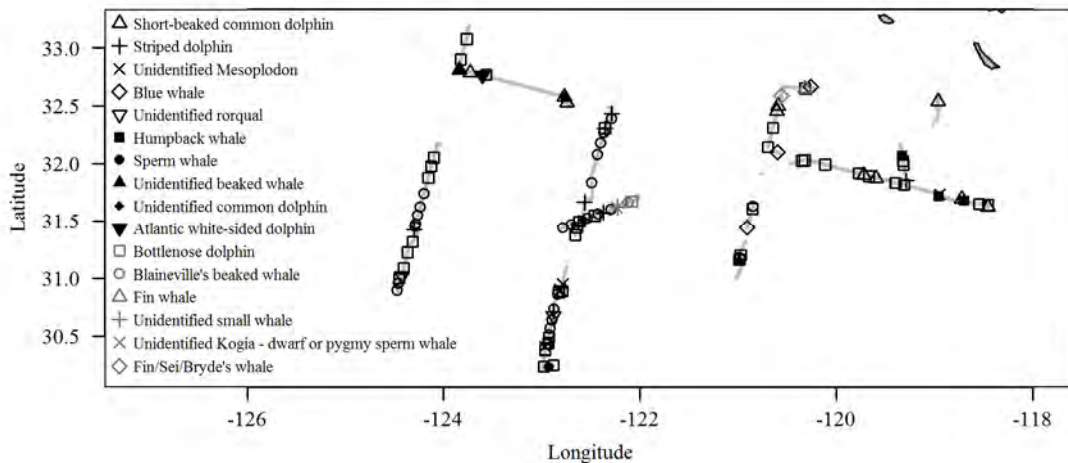


Figure 1. Map of total detections for the first half of Leg 5 (Nov. 29 – Dec. 9). The legend is ranked by number of detections (visual and acoustic detections combined). Distance traveled: 1248 km.

We have had a very productive end of the cruise! In the last 10 days (76 hours) on effort we have collected 92 acoustic detections (Fig. 1 & Table 1). Our most common animals detected during the second half of leg 5 were unidentified dolphins followed by minke whales. In addition we had several acoustic detections of beaked whales (Blainville's and Unidentified Mesoplodon) with visual confirmation. An unusual event occurred on December 3rd where one of our towed hydrophone arrays (Sugar Glider) was attacked by a large shark (Fig. 2). This is a first for having a towed array destroyed by a shark. On December 2nd we successfully retrieved a DASBR with a high frequency cetacean click detector (CPOD) attached that had been collecting acoustic recordings since October 24th in the California Current. Of the ten sonobuoy stations completed we have been able to capture sei, minke, humpback whale, and Bryde's whale vocalizations all in a single evening (Table 2, Fig. 2). We also detected long range blue and fin whales that would not have been possible with the towed array alone.



One of the Blainville's beaked whales observed, photographed, and detected acoustically (Photo: P. Olson)

Table 1. Summary of visual sightings and acoustic detections.

Species Name	# of Schools			% Vocal
	Total Detections	Vocal	Not Vocal	
Unid. dolphin or porpoise	42	41	1	98%
Common minke whale	25	23	2	92%
Short-beaked common dolphin	11	11	0	100%
Striped dolphin	8	6	2	75%
Unid. Mesoplodon	5	4	1	80%
Blue whale	3	0	3	0%
Unid. rorqual	2	1	1	50%
Humpback whale	3	0	3	0%
Sperm whale	2	2	0	100%
Unid. beaked whale	2	0	2	0%
Unid. common dolphin	1	1	0	100%
Atlantic white-sided dolphin	1	1	0	100%
Bottlenose dolphin	1	1	0	100%
Blainville's beaked whale	1	1	0	100%
Fin whale	1	0	1	0%
Unid. small whale	1	0	1	0%
Unid. Kogia	1	0	1	0%
Fin/Sei/Bryde's whale	1	0	1	0%
Overall	111	92	19	55%



Figure 2. The photo on the left is Ariel Brewer programming a sonobuoy for nighttime deployment and on the right is the acoustics team mourning the loss of a hydrophone array (Sugar Glider) due to a shark attack.

Table 2. Sonobuoy summary table, estimated detections.

Leg 4	Blue	Fin	Sei	Humpback	Bryde's	Sperm	Killer	Minke
Definite	7	9	1	1	1	0	0	3
probable	0	0	0	0	0	0	0	0
possible	1	2	0	0	0	0	0	0

Acknowledgments

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