HICEAS: Hawaiian Islands Cetacean and Ecosystem Assessment Survey

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NATIONAL MARINE FISHERIES SERVICE

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http://swfsc.noaa.gov/prd-hiceas.aspx

ADDITIONAL INFORMATION ABOUT PROTECTED RESOURCES DIVISION:
http://swfsc.noaa.gov/prd.aspx

Leg 1, *Oscar Elton Sette* Report: 1-30 September 2010

Erin Oleson, Cruise Leader

The 2010 HICEAS cruise is a 2-ship effort, as it would be impossible to adequately survey the roughly 800,000 nmi^2 with a single vessel. NOAA Ship *Sette* has now completed the first of their 2 legs in the study as part of HICEAS, and what a great trip it has been so far. The first leg on the *Sette* took our intrepid group to the bitter ends of the Hawaiian Archipelago, from Kure Atoll at the north, to the Island of Hawaii at the south (Figs. 1 and 2). Along the way we surveyed inshore and offshore, and wound our way through some sections of the Papahānaumokuākea Marine National Monument, close to each of the islands, looking for local resident cetaceans. We had amazing weather this month, not losing a single day to high winds or swell, not even a single day of Beaufort 6! We had many amazing cetacean sightings, though perhaps one of the more memorable days was the day of the dead cetacean- when we pulled a very fresh dead Kogia onto our deck and conducted a necropsy. Debate still rages on among the science party as whether this animals was a pygmy or dwarf sperm whale, as its length and other characters seemed to be a hybrid of the standard measures of these two species. Genetics will eventually tell, and we also collected samples to look at diet and physiology and even the dorsal fin to assist with satellite tag design. Other notable events included rescuing a juvenile green sea turtle from a tangle of fishing net, the amazing number of beaked whales around the northwestern most islands, and the beautiful encounter with false killer whales near Nihoa. Read more about this encounter below, especially the update on the locations provided by the satellite tag we placed on one whale's dorsal fin.

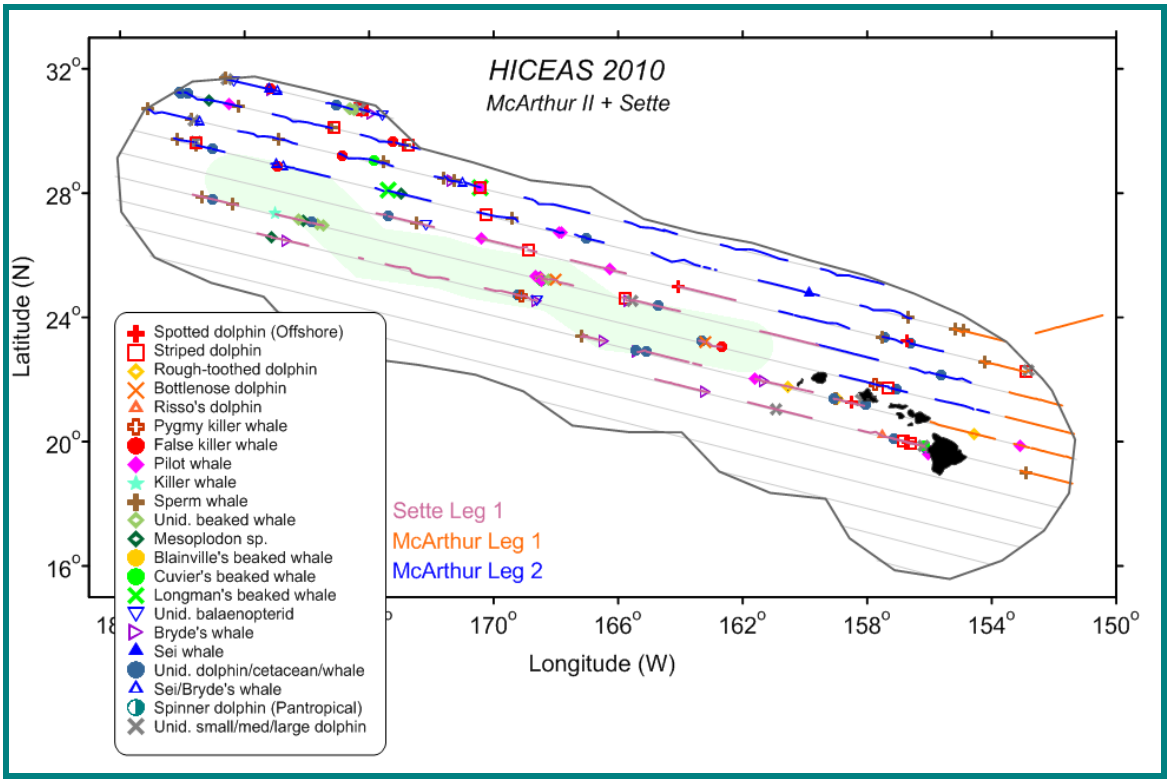


Figure 1. Tracklines and cetacean sightings by ship and leg: NOAA Ship *Sette*, Leg 1 tracklines are pink; NOAA Ship *McArthur II*, Leg 1 tracklines are orange and Leg 2 are blue.

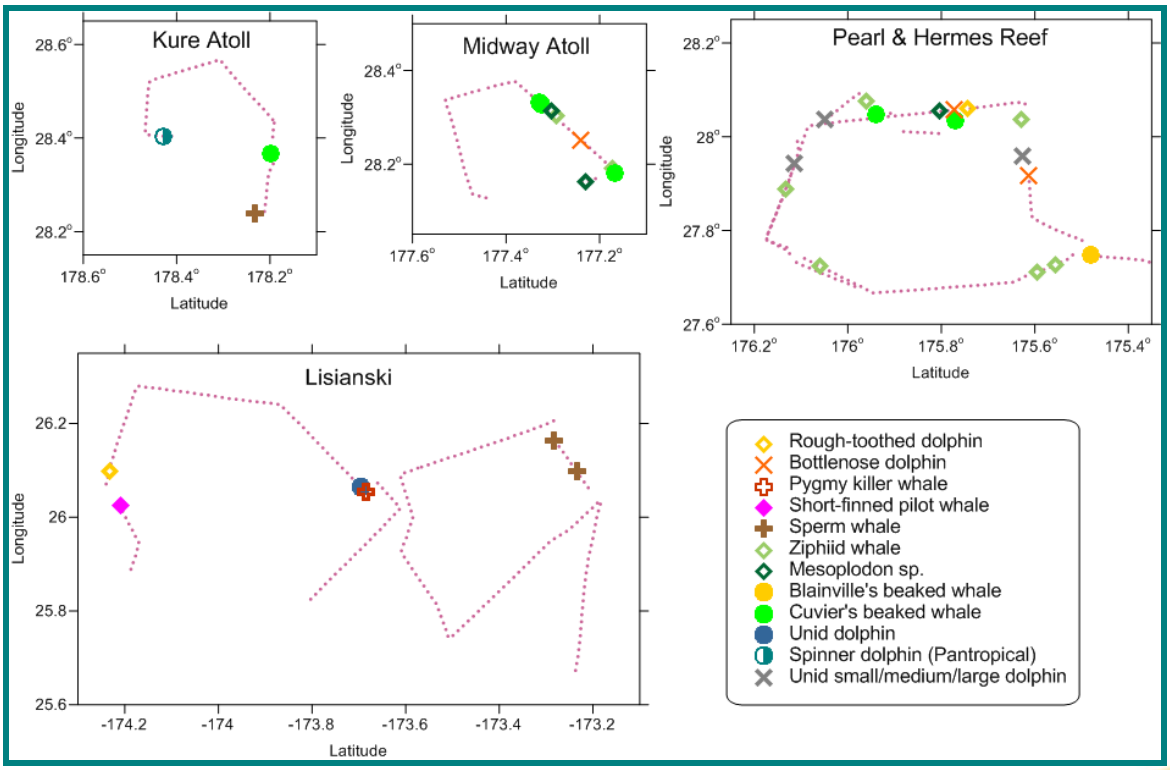


Figure 2. NOAA Ship *Sette* tracklines and cetacean sightings the northwest part of the Hawaiian Archipelago.

Cetacean Photography Report – Andrea Bendlin and Abbie Sloan

At the end of Leg 1 on the *Sette* it took 2 days to copy all of the ID photos to an external drive for storage off the ship. It took 2 days because we took over 7000 images! Many of the photos during this leg were taken of dolphins near the Northwest Hawaiian Islands and should be useful for evaluating population structure and movements of individuals among islands, a very important aspect of understanding the biology of each species in the study area. This leg is the first time the Northwest Hawaiian Islands have been intensively studied for cetaceans, except for spinners, so every photo should provide a great opportunity to learn more about these critters.

Table 1. Summary of photographs.

Species	*Sette* Leg 1 sightings	*Sette* Leg 1 photos	Total sightings	Total photos
Pantropical spotted dolphin	2	43	2	43
Striped dolphin	2	169	8	338
Rough-toothed dolphin	4	284	5	308
Bottlenose dolphin	5	1093	6	1097
Risso's dolphin	1	194	1	194
Long-beaked common dolphin	0	0	2	10
Short-beaked common dolphin	0	0	3	36
Pygmy killer whale	2	365	3	369
False killer whale	1	1431	5	1749
Short-finned pilot whale	5	468	9	705
Killer whale	1	344	1	344
Sperm whale	5	902	19	1740
Unidentified Mesoplodon	2	96	2	96
Blainville's beaked whale	1	27	1	27
Cuvier's beaked whale	4	163	4	163
Longman's beaked whale	0	0	2	943
Bryde's whale	7	1255	4	1389
Sei whale	0	0	1	13
Sei or Bryde's whale	0	0	2	20
Blue whale	0	0	2	74
Total	**44**	**7228**	**91**	**10,052**

Cetacean Biopsy Report – Juan Carlos Salinas and Ernesto Vázquez

Table 2: Summary of biopsy effort.

Species	Common name	*Sette* Leg 1 samples	*Sette* Leg 1 takes	Total samples	Total takes
Balaenoptera edeni	Bryde's whale	1	2	1	2
Physeter macrocephalus	Sperm whale	6	12	9	16
Pseudorca crassidens	False killer whale	9	14	18	26
Stenella attenuata	Pantropical spotted dolphin	1	2	1	2
Stenella longirostris longirostris	Gray's spinner dolphin	16	20	16	20
Tursiops truncatus	Bottlenose dolphin	38	65	39	66
	Total	**71**	**115**	**84**	**132**

Cetacean Acoustics Report – Yvonne Barkley, Susannah Calderan, and Nicky Beaulieu

On the evening of September 1, 2010, the acoustics team was geared up for an exciting acoustic survey of cetaceans in the EEZ. The oil array was filled, the hardware was set up, and all was right with the world. As we slept in our bunks, there was no way of knowing the number of challenges and gremlins that lay ahead.

On the morning of September 2, 2010, we deployed the array for the first time 300m behind the ship. This oil-filled array contained 2 mid frequency elements and 2 high frequency elements to capture a full range of acoustic data. Our first challenge began when we only had enough signal processing equipment to obtain recordings from either the mid frequency or high frequency elements. We chose the 2 high frequency elements to allow us to record beaked whales and *Kogia* sp. and for localizing and tracking animals in the audible range. Our dolphin whistle classifier software, Real-time Odontocete Call Classification Algorithm (ROCCA), and click detector were still operational.

Once we began monitoring the hydrophones, the gremlins came out to play. We were bombarded with loads of snowy static, crackling, and a noise similar to a wind tunnel. Certain moments offered the quiet, serene sound of water, but were quickly interrupted by a loud crack of noise that made your ears ring. After spending a few days adjusting our software settings and grounding every piece of our hardware to the ship, we were faced with the decision of dismantling the array itself. This decision was not for the fainthearted as none of the acoustic team had any first-hand experience in building one. We performed an intricate, diagnostic deck test to confirm that the noise was indeed caused by the innards of the array. We concluded that certain internal components were badly connected and the array needed to be drained and inspected to have any chance of decent recordings.

On September 7, 2010, we took advantage of a medical evacuation and used that day to dive in and grab the array by the cables. After carefully draining out more than half of the oil, we took over the wet lab, and the greasy guts of the array were laid out and then inspected. We reconnected loose pieces, carefully removed unused components, and meticulously scanned for anything noticeably unusual.

The outcome of this operation was less than ideal. When retesting each hydrophone element, we were never able to obtain consistent functionality of each hydrophone. After 2 days of testing, soldering, and pulling our hair out, we concluded that using this array was no longer feasible.

Fortunately, we had a plan B. Sitting quietly in a fish box, a solid Seiche array awaited patiently to be spliced on and put to work. Lucky for us, it contained 4 high frequency elements that we could continue to use with our hardware set up. We spliced the Seiche onto our tow cable, lost all faith in epoxy, and had our system up and running in time to circumnavigate the Northwestern Hawaiian Islands, even with a mystery pinhole in the double-layer epoxy mold.

The acoustics team detected several different species, including bow-riding bottlenose dolphins, rough-toothed dolphins, sperm whales, pilot whales, one false killer whale detection and one pygmy killer whale detection. The pygmy killer whales were vocal and we were excited to obtain recordings from this species given that they are not well-documented acoustically. We even encountered plain old killer whales, but unfortunately did not detect any vocalizations from this group. Multiple beaked whale sightings were reported and we initiated 7 acoustic passes over their dive locations. In addition, the small boat deployed the Biological Underwater Recording Package (BURP) on four sightings to obtain high-fidelity recordings isolated from any boat noise. A preliminary review of these recordings showed no evidence of beaked whale clicks, though further analysis will be necessary.

After island-hopping in the Papahānaumokuākea National Marine Monument, we decided it was not worth the risk of allowing water into the array through the mold's minuscule pinhole and opted to redo the splice. Little did we know that the gremlins had already gone to work themselves.

While chopping off the array end, everything appeared dry and normal. This feeling of relief soon dissolved into sheer disbelief after cutting through the tow cable and having saltwater fizz out onto the floor. After apprehensively cutting 20m up the tow cable, finding only soggy wires, and questioning our sanity, our ET noticed something unusual on the outer jacket of cable scrap. Closer inspection revealed several deep bite marks large enough to allow water to invade the cable.

Given our salty situation and limited resources, we made the best of it. With one week left, we fashioned a splice between the water-logged tow cable and Seiche array that would hopefully spare the array from any damage. Thankfully, we employed the skills from several of the *Sette's* crew and successfully reconnected everything to full functionality.

Despite the gremlins and unexpected surprises, Leg 1 of the *Sette's* acoustic adventure has taught us many lessons. For example, a normal day of work is a pleasure. We were able to put in about 191 hours of total effort, which does not include the long hours spent deliberating and splicing in the wet lab. Our acoustics team has worked together through each challenge beautifully and could only hope to have a dull moment. The one normal aspect of the acoustic survey- a total of 39 sonobuoys were routinely deployed before evening CTDs. Sonobuoys were also deployed to record the lower frequency vocalizations of several baleen whale encounters.

Table 3. Acoustic detections (awaiting table)

Cetacean Satellite Tagging Report – Allan Ligon

Remotely deployed satellite tags have been used in recent years to better understand habitat use and movements of several species of cetaceans around the Main Hawaiian Islands. These tags provide location data multiple times per day for a period ranging from a few days to up to 3 months, with a rough average of 20 to 30 days of location data per deployment. In particular, these tags have helped define the range of what has become known as the Hawaii insular stock of false killer whales.

For HICEAS 2010, six Wildlife Computers Spot-5 Satellite tags were provided: One dedicated for the chance encounter with killer whales; the other five intended for deployment on false killer whales outside of the known range of the Hawaii insular stock in the hopes of gaining insight on movements and range of other populations, as well as to assess movements in relation to the Hawaii longline fleet.

Early in the cruise we did have a killer whale encounter. Unfortunately, this was a sunset sighting, and although the small boat was launched fairly quickly, the animals were lost in the waning light and no tagging approach was made.

False killer whales didn't make an appearance until Sept 26, nearly 4 weeks into Leg 1, within 20 miles of Nihoa. We made 3 tagging attempts. One deflected off the back of an animal and was lost. The other two were successfully deployed. One of these has been working fine, providing several locations per day over the last 5 days since deployment. However, the other deployed tag has provided a bit more drama. It was solidly deployed at the base of the dorsal fin and should stay in place for a couple months, but a plastic boot used to hold the tag onto the end of the deployment dart, snapped off when it hit the whale

and remained in place over the tag interfering with its ability to transmit. Finally, after 4 anxious days with no signal, the boot came off and we have been able to track the whale as it moved around Nihoa and then started moving northwest through the islands. The map below (Fig. 3) shows the movement of the tagged whales for the first 10 days after deployment. (Note: The points on the map have not yet gone through post-processing and should be viewed as preliminary only.)

Figure 3. Movement of false killer whales satellite tagged on HICEAS. Note: The points on the map have not yet gone through post-processing and should be viewed as preliminary.

Seabirds – Dawn Breese and Scott Mills

A superb survey took place from Honolulu, NNW to nearly the International Dateline at the edge of the NW Hawaiian Islands, SSE to Kona, and back to Honolulu from 1-30 September 2010. Overall weather was very favorable and surveys were conducted on all 28 working days at sea.

A total of thirty nine bird species was observed. Daily species totals ranged from 9 to 21 with a mean of 14.6. Wedge-tailed Shearwaters and Red-footed Boobies, both resident breeders (RB), were both seen on 27 of the 28 days at sea. Five species, all seasonal visitors (SV), were each seen on only one day: Herald Petrel, Buller's (New Zealand) Shearwater, Wilson's Storm-Petrel, Wandering Tattler, and Sanderling. Of the thirty nine species seen, eight were Pterodroma Petrels -

Herald Petrel (SV), Kermadec Petrel (SV), White-necked Petrel (SV), Juan Fernandez Petrel (SV), Hawaiian Petrel (RB), Cook's Petrel (SV), Black-winged Petrel (SV), and Bonin Petrel (RB). Other tubenoses seen were Bulwer's Petrel (RB), Wedge-tailed Shearwater (RB), Newell's Shearwater (RB), Christmas Island Shearwater (RB), Buller's Shearwater (SV), Sooty Shearwater (SV), Short-tailed Shearwater (SV), Band-rumped Storm-Petrel (RB), and Wilson's Storm-Petrel (SV). Both resident tropic birds, White-tailed and Red-tailed, all three resident boobies, Red-footed, Masked, and Brown, and the resident Great Frigatebird were all seen frequently. Seven species of shorebirds were observed including five that regularly winter in Hawaii (Pacific Golden Plover, Bristle-thighed Curlew, Wandering Tattler, Sanderling, and Ruddy Turnstone) and two that pass through on migration (Bar-tailed Godwit and Red Phalarope). Five species of terns, all resident breeders – White Tern, Black Noddy, Brown Noddy, Gray-backed Tern, and Sooty Tern - were seen. The remaining four species observed were South Polar Skua and Pomarine, Parasitic, and Long-tailed Jaegers, all seasonal visitors.

Highlights of the cruise included both resident and migrant birds. From 13 to 26 September we were in or quite close to the heart of the Papahānaumokuākea Marine National Monument and the proximity to these wonderful islands and atolls was evident in the sheer numbers of birds. Impressive numbers of Bonin Petrels were seen with highs around Midway and Lisianski Atolls, where thousands of birds appeared to be waiting offshore to visit nesting sites on the islands at night. Gray-backed Terns were seen on nine days, both near the main Hawaiian Islands and around the NW low lying atolls. Short-tailed Shearwaters were seen most days heading from their austral wintering areas in the Bering Sea south to Australia, where they breed. Highest numbers were seen on 17 September around Kure Atoll, when birds were streaming by almost continuously. We conservatively estimated that more than 40,000 birds were seen by the combined efforts of the two bird observers. We were also fortunate to observe flocks of Bar-tailed Godwits flying south from their Alaskan breeding grounds south to their wintering areas in Australia or New Zealand (15 on 18 Sept and 85 on 25 Sept). Evidence indicates that these birds make the flight nonstop. A couple of hours spent on Midway were very interesting. Though the famous albatrosses were not present (they breed in the winter), many other species including White Terns, Great Frigatebirds, Bristle-thighed Curlews, and, of course, Common Canaries were seen.

Oceanographic Data Collections – Corey Sheredy

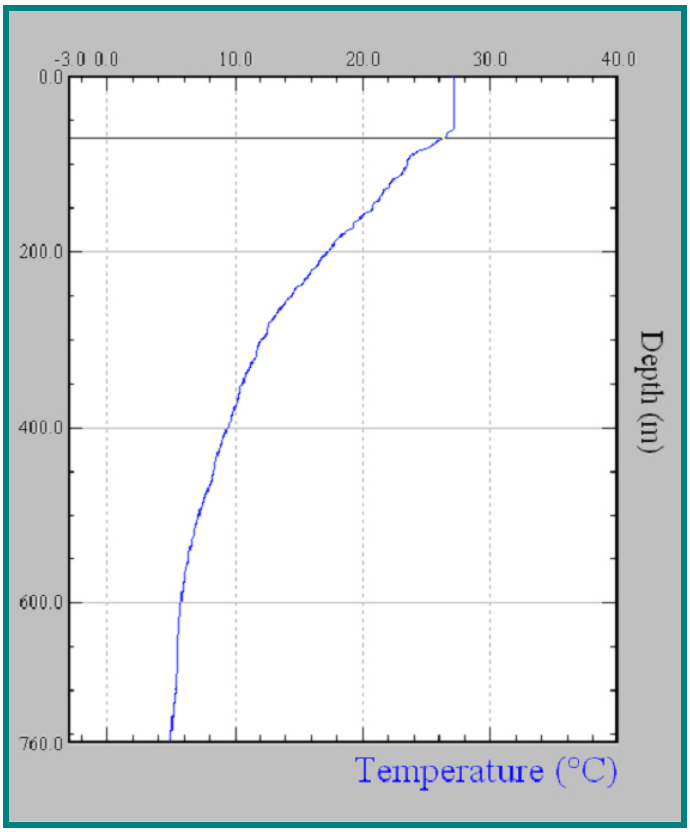
Aloha from the *Sette's* Team Oceo! I am extremely happy to report that as of the end of Leg 1, all oceanographic equipment issues have been smoothed out. Chief ET Kim Belveal once mentioned (facetiously, I hope) "it's not fun unless it's complicated." We've certainly had our fair share of fun here between Survey Technician shuffling and melodramatic equipment. Alas, equipment drama is part of the fun and games out at sea!

Regardless, we've had a wonderful time catching some sun rays and some bucket samples, of course. To start off the day nice and early, a CTD cast is conducted one hour before sunrise. The morning cast is a profile only, meaning no water samples are captured until the surface. One of the best things about running the early morning CTD is we get to see some of the most spectacular sunrises! I'm crossing my fingers we'll witness the elusive green flash sunrise next leg.

Following the CTD (and a possible nap), four stations are conducted throughout the day. These stations include an XBT (expendable bathythermograph) followed by a surface chlorophyll collection (a.k.a. a bucket sample). The day is finished off with a full 1000m CTD cast, where water samples are captured at twelve

different depths. Each water sample collected is filtered, extracted in acetone and analyzed for chlorophyll content 24 hours later. It has been very neat to see the differences in chlorophyll content between the open ocean (very low) and inner-islands (much higher). I'm just glad all those oceanography classes are being put to use!

Chlorophyll content is of course not the only noticeable difference. There is a distinct change in the thermoclines as well, as shown by the XBTs and CTDs. Deep and steep thermoclines have been the personal touch of the pelagic, while shallower thermoclines are reserved for closer to shore.



Temperature and depth profile.

Besides the usual suspects, we've had some run-ins. The ever-beloved Portasal, which measures the salinity of certain CTD water samples, was the source of some strife. I discovered that the machine is very sensitive to room temperature change, and in a ship with few isolated rooms, it was a challenge. My poor fellow scientists and *Sette* crew members received a nice big stink eye, courtesy of yours truly whenever any body entered the wet lab while I was attempting to run the samples. A couple of tries later, they were finally completed! We also had a run in with the thermosalinograph (TSG), which records the water's salinity and temperature in real time. Fortunately the *Sette* was equipped with a spare unit from the now decommissioned NOAA Ship *David Starr Jordan*. I must say, it was some intelligent planning indeed!

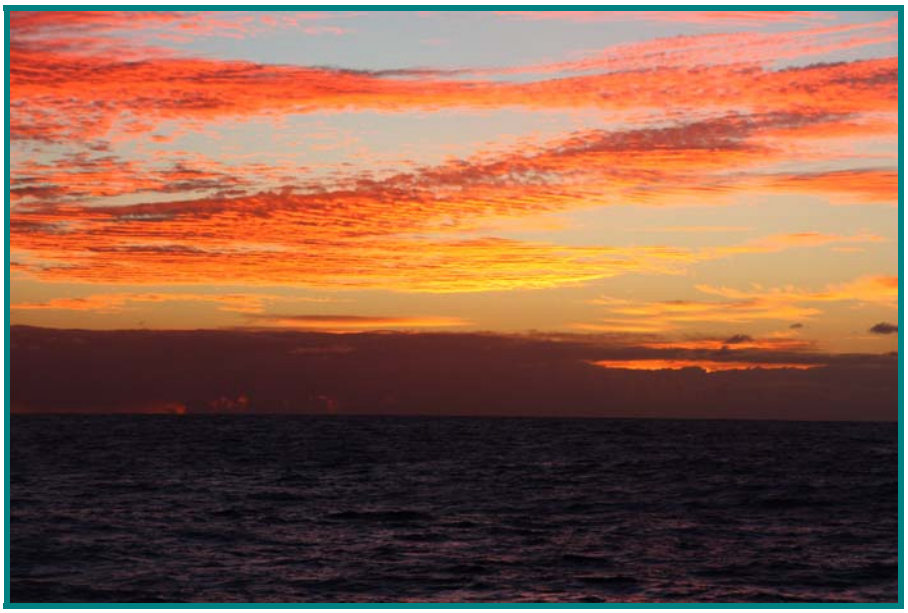
Lastly, we did have some fun with Styrofoam cups. The last night of Leg 1 was arts and crafts night, and many participated. See the works of art below:

Cups: before and after accompanying the CTD down to a depth of 1000m.

I think that about sums up the Leg for oceanography. A very special thanks to Aly Fleming and Donna Knutson, whom both very diligently assisted in CTD operations. Thank you two for sacrificing your time (and sleep) to help out! Lastly, thanks to Survey Technician Scott Allen for stepping up and fulfilling his duties on his first survey. Excellent work! That is all for now. Here's to Leg 2!

Table 4. Summary of oceanographic effort, *Oscar Sette*, Leg 1.

Leg	No. CTD casts	No. CTD chlorophyll samples	No. Surface chlorophyll samples	No. XBT drops
Leg 1	50	20	121	119
Cruise total	50	20	121	119



One of many tropical sunrises observed during the morning CTD.

Table 5. Summary of effort, NOAA Ship *Sette*, Leg 1.

Date	**Start/end time**	**Start/end latitude**	**Start/end longitude**	**Distance surveyed**	**Average Beaufort**
090210	0653	N21:35.75	W159:44.87	101.8 nmi	3.7
	1821	N22:01.34	W161:36.07		
090310	0646	N22:27.45	W163:19.71	108.4 nmi	4.6
	1820	N22:53.36	W165:22.84		
090410	0733	N23:21.56	W166:56.29	59.5 nmi	5
	1728	N23:14.16	W166:26.30		
090510	0643	N22:00.66	W164:48.67	98.9 nmi	5
	1857	N21:34.72	W163:04.46		
090610	0644	N21:16.22	W161:49.97	118.0 nmi	4.6
	1829	N20:45.40	W159:46.79		
090710	1107	N21:09.37	W158:05.94	59.3 nmi	4.5
	1839	N21:23.44	W159:04.90		
090810	0821	N23:05.91	W159:33.96	126.4 nmi	4.8
	1837	N23:33.49	W161:26.35		
090910	0633	N24:33.18	W162:14.05	101.9 nmi	4
	1739	N25:00.17	W164:04.09		
091010	0646	N25:24.81	W165:45.05	94.9 nmi	4.7
	1903	N25:50.69	W167:31.67		
091110	0708	N26:06.65	W168:37.34	97.2 nmi	3.9
	1733	N26:32.66	W170:24.76		

Date	Start/end time	Start/end latitude	Start/end longitude	Distance surveyed	Average Beaufort
091210	0718	N26:54.38	W171:54.97	92.4 nmi	3
	1929	N27:20.98	W173:46.11		
091310	0854	N27:46.74	W175:29.96	51.6 nmi	3
	1929	N27:40.55	W175:58.30		
091410	0820	N27:43.75	W175:20.47	67.2 nmi	2.7
	1805	N28:03.44	W175:46.14		
091510	0726	N26:57.25	W175:27.55	76.4 nmi	1.8
	1845	N27:19.29	W177:00.44		
091610	0906	N28:08.87	W177:22.42	35.1 nmi	2.5
	1505	N28:09.51	W177:14.74		
091710	1043	N28:24.21	W178:24.65	22.9 nmi	2.5
	1616	N28:14.26	W178:14.10		
091810	0751	N27:57.07	W179:40.09	75.4 nmi	3.6
	1936	N27:36.31	W178:12.42		
091910	0757	N26:42.36	W177:36.01	87.6 nmi	3.7
	1934	N26:18.55	W175:57.06		
092010	0730	N25:55.19	W174:19.78	72.4 nmi	3.7
	1920	N25:49.06	W173:48.64		
092110	0727	N26:03.79	W173:12.62	55.7 nmi	4.1
	1917	N25:39.96	W173:14.28		
092210	0725	N25:42.81	W173:28.39	113.6 nmi	4.1
	1913	N25:13.27	W171:26.93		
092310	0714	N24:56.47	W170:17.10	91.7 nmi	3
	1753	N24:32.02	W168:36.49		
092410	0709	N25:19.28	W168:39.97	55.6 nmi	2.6
	1853	N25:01.61	W167:26.67		
092510	0657	N24:38.95	W165:52.99	100.5 nmi	3.4
	1836	N24:11.86	W164:00.60		
92610	0643	N23:15.21	W163:24.44	36.0 nmi	2.6
	1131	N23:03.05	W162:40.06		
92710	0640	N22:23.32	W160:44.60	100.4 nmi	3.4
	1824	N21:21.43	W159:13.44		
092810	0629	N20:22.92	W158:16.94	108.1 nmi	3.6
	1810	N19:54.78	W156:24.96		
092910	0941	N19:41.83	W156:04.72	63.3 nmi	2.7
	1800	N20:06.73	W157:12.72		

Table 6. Marine mammal sightings, *Oscar Sette*, Leg 1.

Code	Species	No. sightings
2	*Stenella attenuata* (offshore)	3
13	*Stenella coeruleoalba*	4
15	*Steno bredanensis*	5
18	*Tursiops truncatus*	5
21	*Grampus griseus*	1
32	*Feresa attenuata*	2
33	*Pseudorca crassidens*	1
36	*Globicephala macrorhynchus*	9
37	*Orcinus orca*	1
46	*Physeter macrocephalus*	9

49	*Ziphiid* whale	12
51	*Mesoplodon* sp.	6
59	*Mesoplodon densirostris*	1
61	*Ziphius cavirostris*	8
70	*Balaenoptera* sp.	2
72	*Balaenoptera edeni*	7
77	Unid. dolphin	8
78	Unid. small whale	2
79	Unid. large whale	2
96	Unid. cetacean	1
102	*Stenella longirostris (Gray's)*	2
177	Unid. small delphinid	3
277	Unid. medium delphinid	2
377	Unid. large delphinid	1
	Total	**97**