Acoustic and Visual Survey of Cetaceans at Palmyra Atoll

Trip report 10/2009

Palmyra, September 10 – October 7, 2009

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Summary (Trip Period: September 10 – October 7, 2009)

1. HARP Recovery / Deployment

The high-frequency acoustic recording package (HARP), which had been deployed off the northeast shore of the atoll, was recovered on September 26, 2009. This instrument started recording on June 1, 2009, located at position 05˚ 54.252' N 162˚ 02.219' W in 1085 m of water. Data recording was still ongoing at the time of recovery and preliminary analysis of the data showed good data quality.

By October 3, 2009 the instrument was refurbished and was redeployed at a nearby location in shallower water. The new position is 05˚ 53.719' N 162˚ 02.229' W at a depth of 700 m (). The instrument was again set to sample at a frequency of 200 kHz, with a recording duration of 5 minutes and a recording interval of 20 minutes. The instrument is configured with 16 hard drives with a capacity of 120 GB each, or a total of 1.92 TB data storage. Recording was programmed to begin at 12 am GMT on October 5, 2009. Recording should continue for 220 days, or approximately seven months, at which point there will be no available hard disk space or the battery capacity will drop below the required voltage. The HARP instrument – including hydrophone, datalogger, battery, and acoustic release components – was configured into a miniature mooring with glass spheres (i.e. flotation) and barbell weights (i.e. ballast weight), so that hand deployment from a small vessel such as *Zenobia* was feasible.

2. Cetacean Survey and Acoustic Recording

In addition to refurbishing the HARP, visual surveys were conducted to obtain species identification and numbers. Photographs, biopsy samples, and acoustic recordings were taken for certain species when conditions allowed. The focus of the survey effort was on the unidentified beaked whale (*Mesoplodon sp*.) known to frequent the nearshore waters.

Cetacean vocalizations were recorded with a towed 6-channel hydrophone array. A MOTU Traveler system was used for data acquisition (sampling up to 192 kHz) with a laptop running acquisition software and recording to an external hard drive. The hydrophone was deployed when beaked whales were sighted or believed to be in the area. Survey speeds were from 0-6 knots dependent upon conditions. Occasionally the boat was stopped, the engine and echo sounder were turned off, and *Zenobia* drifted with the prevailing currents. Under normal circumstances, the array was towed 80 m behind the boat over deep waters resulting in an approximate water depth of the hydrophones at 10-20 m depending on boat speed, but up to a maximum of 80 m when the boat was fully stopped.

All data was input with IFAW Logger software including the boat's position, effort and sighting information, and environmental conditions. This software created and stored all data in a Microsoft Access database.

Over the period of the initially planned 3.5 weeks on the atoll the *R/V Zenobia* was available for 73 hours of survey effort covering approximately 800km of trackline (). The visibility was between good and fair, occasionally poor. Most days were at least a Beaufort 3 or 4, only with half a day at level 2 on the scale. Due to the prevalent southerly swell direction, the best survey conditions occurred in the lee off of the north side of the atoll. The cloud cover was on average about 70%, with occasional light rain.

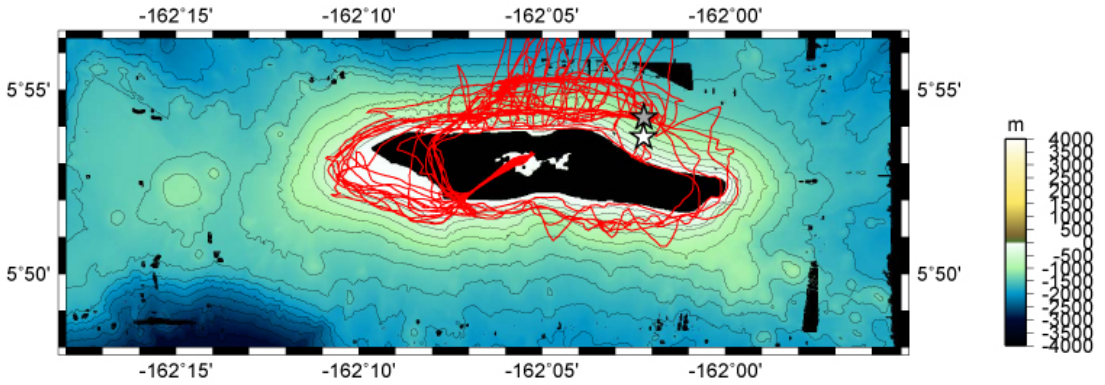

Figure 1: Bathymetric map of Palmyra Atoll (200 m contour lines) with trackline of cetacean survey (red) showing survey effort and positions of HARPs indicated with stars (grey: old HARP recovered, white: new HARP deployed).

A total of 68 cetacean sightings were made, which resulted in about 30% of the survey time spent during a sighting (Table 1). These included 3 beaked whale (*Mesoplodon sp*.), 55 bottlenose dolphin (*Tursiops truncatus*), 8 spinner dolphin (*Stenella longirostris*), 1 short-finned pilot whale (*Globicephala macrorhynchus*), and 1 unidentified cetacean (most likely a beaked whale due to large, single animal with large footprint) encounters. It should also be noted that there were no sightings of melon-headed whales (*Peponocephala electra*), which was highly unusual as this species has been sighted during all previous trips, often in large numbers. The term “re-sighting” was only used if a group of animals was seen again shortly after the initial sighting but not if maybe the same group of animals was seen later in the day or the next day, though most sightings were technically re-sightings of the same resident animals/groups on different days.

All three beaked whale and the unidentified whale sighting took place within a small area north of Strawn Island (Figure 2). For this reason and also because of favorable weather conditions, most survey effort focused in this area. All sightings were similar in that a blow was sighted a few hundred meters away, *Zenobia* turned toward the animals, they surfaced one or two more times and when approached closer (but still out of biopsy range), they dove and were not resighted. All sighting encounters lasted for a total of about 2 hours. The vessel remained on site after the initial sighting from 20 to 45 minutes longer attempting to resight the whale. Sightings occurred during both morning and afternoon hours. Group size was estimated as one, two, and three whales. Photos were obtained for some sightings (Figure 3) that revealed a high amount of scarring. The hydrophone was deployed soon after a sighting although it is unknown at this time if vocalizations were recorded.

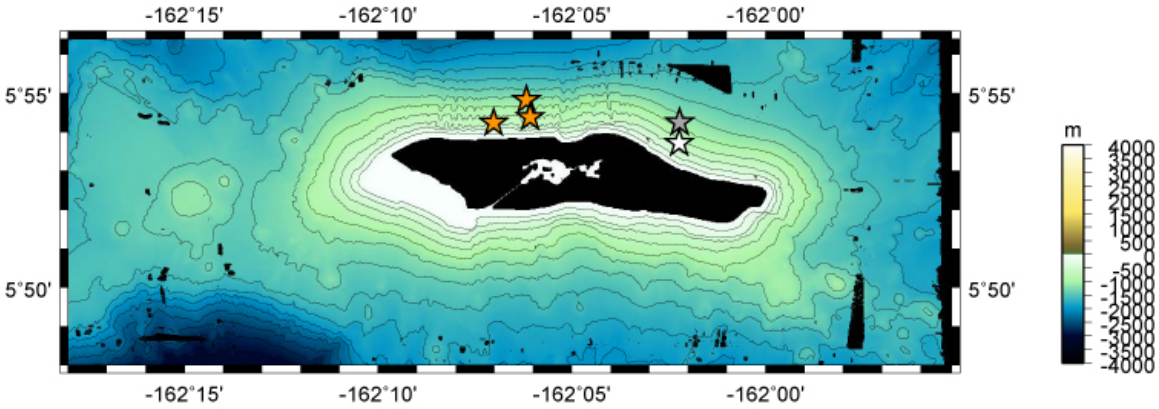

Figure 2: Bathymetric map of Palmyra Atoll (200 m contour lines), showing sightings of unknown mesoplodont beaked whales (*Mesoplodon sp.*) and positions of HARPs indicated with stars (grey: old HARP recovered, white: new HARP deployed).

Figure 3. Photo of unidentified beaked whale (*Mesoplodon sp.*) showing extensive scarring.

The group size for the 55 bottlenose dolphin encounters ranged from one to 55 animals and averaged 10 animals. These groups were sighted around the atoll (Figure 4). Seven biopsies were obtained as well as photos. No attempt was made to record vocalizations of bottlenose dolphins because several recordings exist from previous trips and the beaked whale was the priority species.

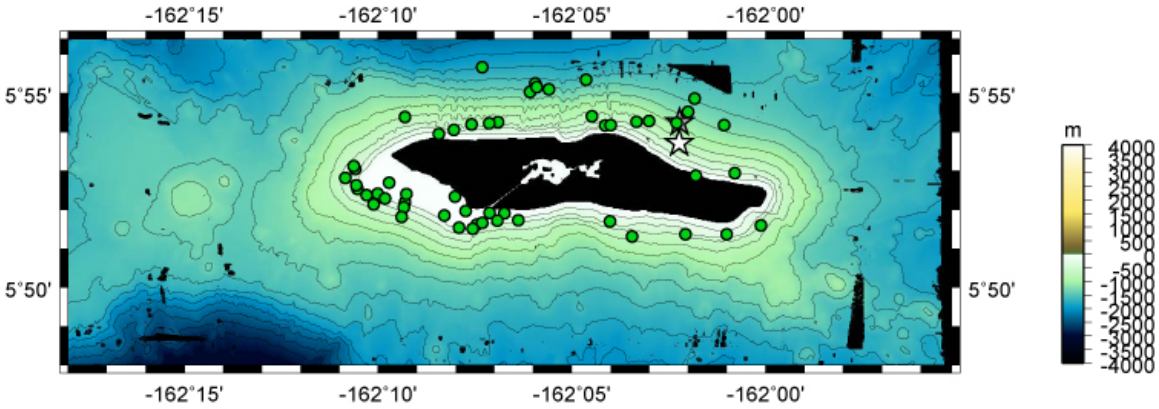

Figure 4: Bathymetric map of Palmyra Atoll (200 m contour lines), showing sightings of bottlenose dolphins (*Tursiops truncatus*) and positions of HARPs indicated with stars (grey: old HARP recovered, white: new HARP deployed).

Spinner dolphins were encountered primarily over and next to the reefs at the east and west ends of the atoll (Figure 5). The group size for the eight sightings ranged from 25 to 400 and averaged 172 dolphins. Because of the large swell usually present over the ends of the reefs, photos were difficult to obtain and biopsies were not attempted. Also, due to the swell and in some cases depths less than 80 m, acoustic recordings were not attempted.

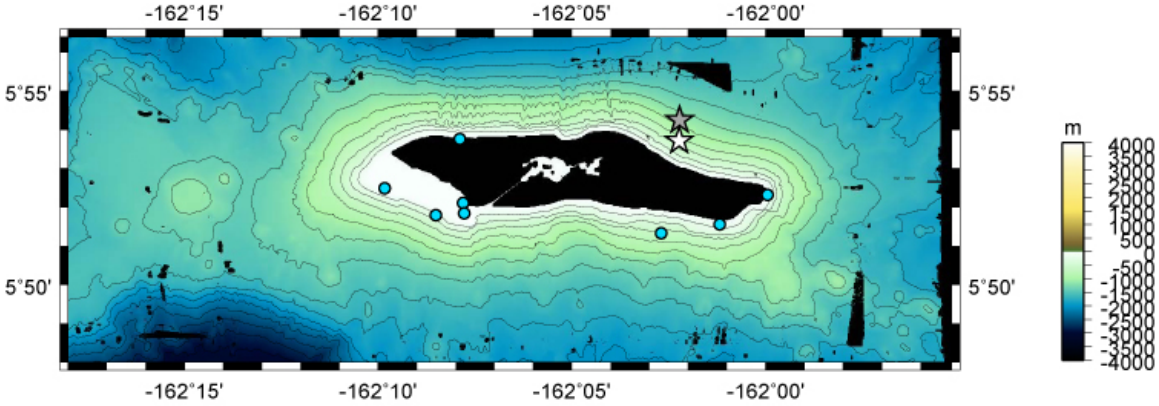

Figure 5: Bathymetric map of Palmyra Atoll (200 m contour lines), showing sightings of spinner dolphins (*Stenella longirostris*) and positions of HARPs indicated with stars (grey: old HARP recovered, white: new HARP deployed).

One goal of the survey effort was to explore areas further offshore than previous trips to identify any species that might be present. One result of this was an encounter with approximately 30 short-finned pilot whales, a species that has only once been previously sighted around the atoll (Figure 6). Soon after approaching the group it began to disband and individuals became evasive. We obtained photos but no biopsies for this species.

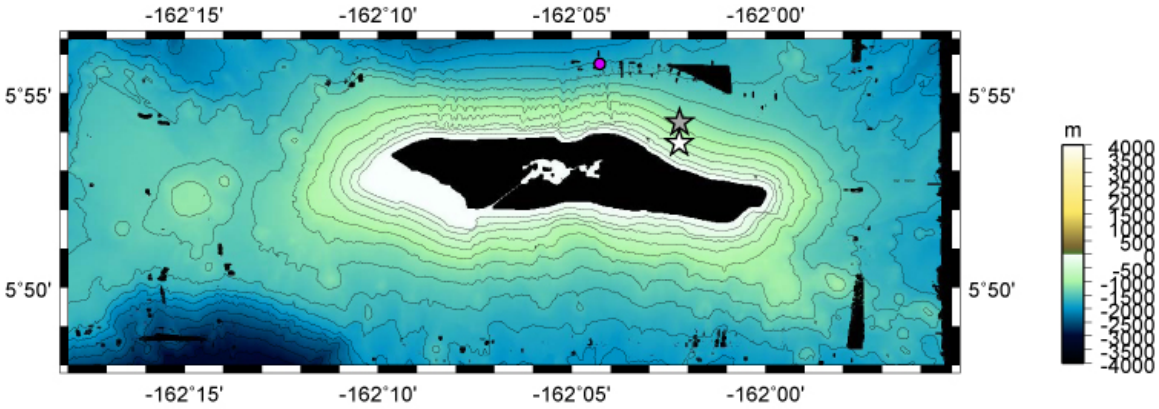

Figure 6: Bathymetric map of Palmyra Atoll (200 m contour lines), showing sightings of short-finned pilot whales (*Globicephala macrorhynchus*) and positions of HARPs indicated with stars (grey: old HARP recovered, white: new HARP deployed).

Table 1. Date, location, species, and group size estimates for all sightings.

Palmyra Date/Time	Latitude	Longitude	Species	best # animals	high # animals	low # animals
9/13/09 10:50:39	5.869702	-162.1552	*Tursiops truncatus*	1	1	1
9/13/09 10:55:31	5.873570	-162.1668	*Tursiops truncatus*	1	1	1
9/13/09 10:58:39	5.875705	-162.1755	*Tursiops truncatus*	2	2	2
9/13/09 12:00:16	5.914415	-162.0305	*Tursiops truncatus*	3	5	2
9/13/09 13:01:36	5.903958	-162.0382	*Tursiops truncatus*	6	10	6
9/13/09 14:39:35	5.865223	-162.1123	*Tursiops truncatus*	5	6	5
9/13/09 14:47:26	5.865273	-162.1187	*Tursiops truncatus*	20	25	14
9/13/09 14:56:13	5.866047	-162.1290	*Tursiops truncatus*	55	80	40
9/13/09 15:09:21	5.873392	-162.1545	*Tursiops truncatus*	7	10	5
9/13/09 15:09:21	5.873392	-162.1545	*Tursiops truncatus*	6	8	4
9/13/09 15:12:39	5.878266	-162.1620	*Tursiops truncatus*	5	8	4
9/14/09 10:47:42	5.871938	-161.9992	*Stenella longirostris*	200	300	150
9/14/09 11:18:35	5.903008	-162.0178	*Tursiops truncatus*	1	1	1
9/14/09 13:04:24	5.902864	-162.0690	*Tursiops truncatus*	3	4	3
9/14/09 15:09:21	5.904368	-162.1151	*Tursiops truncatus*	14	20	12
9/14/09 15:19:51	5.927919	-162.1218	*Tursiops truncatus*	7	9	12
9/14/09 15:19:51	5.927919	-162.1218	*Tursiops truncatus*	14	19	10
9/19/09 09:54:36	5.855103	-162.0574	*Tursiops truncatus*	16	25	12
9/19/09 10:18:51	5.856135	-162.0345	*Tursiops truncatus*	17	25	11
9/19/09 10:30:11	5.859231	-162.0197	*Stenella longirostris*	25	35	20
9/19/09 10:37:47	5.860012	-162.0020	*Tursiops truncatus*	9	13	7
9/19/09 13:18:11	5.906842	-162.0747	*Tursiops truncatus*	2	4	2
9/19/09 14:53:11	5.920048	-162.0979	Unidentified cetacean	1	2	1
9/19/09 15:34:04	5.918453	-162.0932	*Tursiops truncatus*	16	25	10
9/20/09 09:58:38	5.868482	-162.1301	*Stenella longirostris*	250	330	200
9/20/09 10:16:32	5.872951	-162.1716	*Tursiops truncatus*	20	2	15
9/20/09 11:27:54	5.904505	-162.0556	*Tursiops truncatus*	6	9	6
9/20/09 11:33:53	5.904860	-162.0501	*Tursiops truncatus*	2	2	2

Table 1 continued:

Palmyra Date/Time	Latitude	Longitude	Species	best # animals	high # animals	low # animals
9/20/09 11:44:54	5.908787	-162.0333	*Tursiops truncatus*	14	20	8
9/20/09 15:29:54	5.929409	-162.0713	*Globicephala mela*	30	40	20
9/20/09 16:49:54	5.921047	-162.0991	*Tursiops truncatus*	2	2	2
9/22/09 09:31:06	5.864121	-162.1296	*Stenella longirostris*	200	300	150
9/22/09 09:47:07	5.862001	-162.1154	*Tursiops truncatus*	7	10	5
9/22/09 10:08:07	5.884171	-162.1765	*Tursiops truncatus*	23	30	18
9/22/09 10:32:52	5.906603	-162.1552	*Tursiops truncatus*	1	1	1
9/22/09 14:27:51	5.917342	-162.1013	*Tursiops truncatus*	8	12	15
9/22/09 14:51:07	5.913816	-162.1028	Beaked whale	1	2	1
9/23/09 09:10:28	5.872305	-162.1336	*Tursiops truncatus*	11	15	9
9/23/09 09:22:28	5.899308	-162.1405	*Tursiops truncatus*	9	12	8
9/23/09 09:25:09	5.901039	-162.1340	*Tursiops truncatus*	3	4	2
9/23/09 09:28:09	5.903326	-162.1265	*Tursiops truncatus*	7	9	6
9/23/09 09:31:59	5.903823	-162.1188	*Tursiops truncatus*	16	20	14
9/23/09 15:41:01	5.867727	-162.1556	*Tursiops truncatus*	5	8	5
9/23/09 15:49:01	5.864187	-162.1382	*Tursiops truncatus*	14	22	10
9/25/09 10:19:41	5.860268	-162.1242	*Tursiops truncatus*	2	4	2
9/25/09 10:36:49	5.863636	-162.1566	*Tursiops truncatus*	10	13	9
9/25/09 10:52:05	5.880432	-162.1808	*Tursiops truncatus*	8	15	6
9/25/09 15:59:23	5.904093	-162.1169	Beaked whale	3	3	3
9/25/09 16:53:36	5.896125	-162.1316	*Stenella longirostris*	50	75	40
9/26/09 10:14:48	5.862165	-162.1064	*Tursiops truncatus*	10	15	9
9/26/09 10:52:48	5.855574	-162.0449	*Stenella longirostris*	400	500	350
9/26/09 11:22:29	5.882503	-162.0132	*Tursiops truncatus*	8	12	4
9/26/09 12:54:48	5.922559	-162.0773	*Tursiops truncatus*	17	23	14
9/26/09 13:25:48	5.919372	-162.0985	*Tursiops truncatus*	30	40	20
9/30/09 10:29:53	5.903141	-162.0666	*Tursiops truncatus*	6	10	3
9/30/09 15:19:31	5.881383	-162.0300	*Tursiops truncatus*	1	1	1
9/30/09 15:31:53	5.856091	-162.0167	*Tursiops truncatus*	2	2	2
9/30/09 15:49:53	5.861623	-162.0670	*Tursiops truncatus*	14	20	10
9/30/09 16:07:53	5.861033	-162.1219	*Tursiops truncatus*	1	1	1
9/30/09 16:14:53	5.863213	-162.1418	*Stenella longirostris*	150	200	100
9/30/09 16:22:53	5.871442	-162.1636	*Tursiops truncatus*	4	6	2
10/3/09 15:48:21	5.874914	-162.1639	*Stenella longirostris*	100	200	75
10/6/09 07:39:38	5.858572	-162.1260	*Tursiops truncatus*	40	70	30
10/6/09 08:05:42	5.868896	-162.1686	*Tursiops truncatus*	1	1	1
10/6/09 08:14:30	5.877198	-162.1761	*Tursiops truncatus*	8	14	5
10/6/09 08:21:44	5.885542	-162.1772	*Tursiops truncatus*	12	18	10
10/6/09 09:05:31	5.906388	-162.1013	Beaked whale	2	3	2
10/6/09 11:38:37	5.859056	-162.1319	*Tursiops truncatus*	8	12	6