

Acoustic and Visual Survey of Cetaceans at Palmyra Atoll

Trip report 08/2010

Palmyra, August 18 – September 9, 2010

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Summary (Trip Period: August 18 - September 9, 2010)

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 24 August 2010. This instrument started recording on 12 June 2010, located at position 05° 53.690' N 162° 02.224' W in 700 m of water. New circuit boards were installed the previous trip that permitted data compression. Although data recording this deployment (PAL09) was continuous, due to the short duration between trips data was still being recorded at the time of recovery. The last recorded file occurred soon after recovery and preliminary analysis of the data showed good quality.

The instrument was refurbished and was redeployed (PAL10) on 25 August 2010 at almost the same location. The new position is 05° 53.705' N 162° 02.240' W at a depth of 700 m. The instrument was set to record continuously at a frequency of 200 kHz and to begin at 00:00:00 August 27, 2010 GMT. 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 should continue for approximately 110 days, or 4 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 small 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 (Figure 1).

2. Cetacean Survey

In addition to refurbishing the HARP, visual surveys were conducted to obtain species identification and abundance. 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. We continued an additional project added on last trip which was to photograph manta rays (*Manta alfredi*) for identification and size. We dedicated a small portion of each day to photographing mantas in the channel and when conditions prohibited cetacean surveys, more time was spent researching mantas. The manta work is detailed in a separate report.

During the three weeks on the atoll, a total of 107 hours of boat time was logged on the *R/V Zenobia* of which 67 hours were on effort (Figure 2). Sea surface state ranged from Beaufort 2 to 6. Several days of survey effort were lost due to high winds and/or swell. Due to the prevalent southerly swell direction, the best survey conditions occurred in the lee off of the north side of the atoll. Unlike the previous trip in June, very little rain fell.

A total of 68 cetacean sightings were made (Table 1) including two sightings of cetaceans never before recorded near the atoll. The species and number of sightings included 57 groups of bottlenose dolphin (*Tursiops truncatus*), one group of melon-headed whales (*Peponocephala electra*), two groups of spinner dolphins (*Stenella*

longirostris), five groups of unidentified beaked whale (*Mesoplodon sp.*), one group of killer whales (*Orcinus orca*), and one group of humpback whales (*Megaptera novaeangliae*). Although not a cetacean, it is of note that there was one sighting of a single whale shark (*Rhincodon typus*).

Most of the beaked whale sightings took place north of Strawn Island (Figure 3) in the same general location where sightings occurred in the fall 2009 trip and the one sighting in the spring 2010 trip. For this reason and also because of favorable weather conditions, most survey effort focused in this area. The vessel remained on site after an initial sighting for an additional hour in an attempt to re-sight the whale(s). The high number of beaked whale sightings correlates with the higher acoustic detection rate by the HARP during this time of year. The low sighting rate during the spring trip and the high sighting rate during this trip provides support that the animals may use different areas of the atoll during different times of the year or, more likely, may move away from the atoll entirely for parts of the year.

We recorded five encounters with unidentified beaked whales. During three sightings only one individual was seen, during another sighting two whales were recorded and a calf was observed breaching, and on one sighting at least four adults were seen in close proximity. After reviewing sightings for this trip and the prior two trips, no pattern is seen regarding the time of day at which the sightings were made. After the initial sighting, we remained at the location for an hour in order to get a re-sighting in an attempt to get closer for better photos and a biopsy sample. On only one occasion, when the group of four beaked whales were seen, did we have a re-sighting. In that case, the animals surfaced approximately ½ mile away.

Many photos were taken of the beaked whales during two encounters (Figure 4). All beaked whales seen appeared to be dark gray in color with light scarring and healed cookie cutter shark bites (Figures 4a, 4c, 4d, 4f). None of the animals where the rostrum was viewed had evidence of teeth erupting (Fig 4b), an identifying characteristic for male whales of the *Ziphiidae* family. A strong indentation is visible around the blowhole which interrupts a smooth curve from the dorsal fin to the head (Figs 4c, 4d, 4e). The back appears to be not rounded, but somewhat peaked (4g), similar to Blainville's beaked whales (*M. densirostris*).

The group size for the 57 bottlenose dolphin encounters ranged from one to 60 animals and averaged seven animals. These groups were sighted around the atoll (Figure 5). Because of the tendency of bottlenose dolphins to approach the vessel and because of the small study area, it is certain that some of the sightings are actually re-sightings of the same individuals. While no biopsies were attempted for this species, photos were taken (1,793) when conditions allowed and unless more time was desired for other species.

Melon-headed whales were sighted only once this trip, the first sighting of the first day of survey (Figure 6). This contrasts with records from the spring 2010 trip where there were seven sightings. It is unknown if the animals left the atoll or were not seen again due to an increased survey effort towards the north shore. The group size was estimated to be approximately 90 animals, similar to the group size seen in the spring. It

should be noted that no encounters were recorded during the fall 2009 trip. Both the small group size and few or no sightings in 2009 and 2010 are contradictory to surveys in 2006-2008. It is possible, melon-headed whales regularly migrate away from Palmyra during part of the year or that influences starting 2009 (e.g. the strong El Niño year) had longer term effects on the prior stable and large population of up to 1000 animals at Palmyra atoll. Photos were taken to compare individuals seen on previous trips but no biopsies were attempted.

Spinner dolphins were encountered twice, over the reef at the west end of the atoll (Figure 7). The group sizes were estimated to be 125 and 200 dolphins. Because of the large swell usually present over the ends of the reefs, photos were difficult to take (71 photos during the first encounter) and only one biopsy was obtained.

On 31 August 2010 we observed a group of approximately four adult killer whales and one calf (Figure 8). Evidently, this is the first time killer whales have been seen near the atoll. No adult males were observed. Upon approaching the group it was noticed that a bottlenose dolphin was being held in the mouth of one individual (Figs 9a and 9b). Soon after the beginning of our encounter the group headed offshore and into Beaufort 5-6 conditions where *Zenobia* was unable to keep up with them. One biopsy and 95 photos were collected. The photos were compared to the western individuals in a catalog of eastern tropical Pacific killer whales (Paula Olson and Tim Gerrodette, 2008. Killer Whales of the Eastern Tropical Pacific: A Catalog of Photo-Identified Individuals, NOAA Tech Memo NOAA-TM-NMFS-SWFSC-428) but no matches were noted. Another catalog exists for killer whales in Hawaiian waters and the photographed Palmyra animals should be compared to individuals in that catalog for matches.

On 5 September 2010 we recorded the first known sighting of a humpback cow/calf pair in waters around Palmyra. This was an off-effort sighting (Figure 10). A member of our party saw the blows just outside the channel entrance where the reef drops off. Because we were in a lagoon boat, it was not possible for safety reasons to head to deep water for closer inspection. We recorded a small amount of video from a personal camera but the quality was low and results were insufficient. After returning on the *Zenobia* we were unable to obtain a re-sighting.

Another sighting of note, on 3 September we observed a whale shark off Strawn Island (Figure 11). A whale shark has been observed in at least one instance on 16 August 2008

(<http://www.whaleshark.org/encounters/encounter.jsp?number=2292008181340>)

We entered the water and obtained identification and size photos (Figure 12). The individual was estimated to be approximately 7 ft. in length. If a catalog that focuses on central Pacific whale sharks exists, it would be beneficial to submit this individual's photo to the catalog.

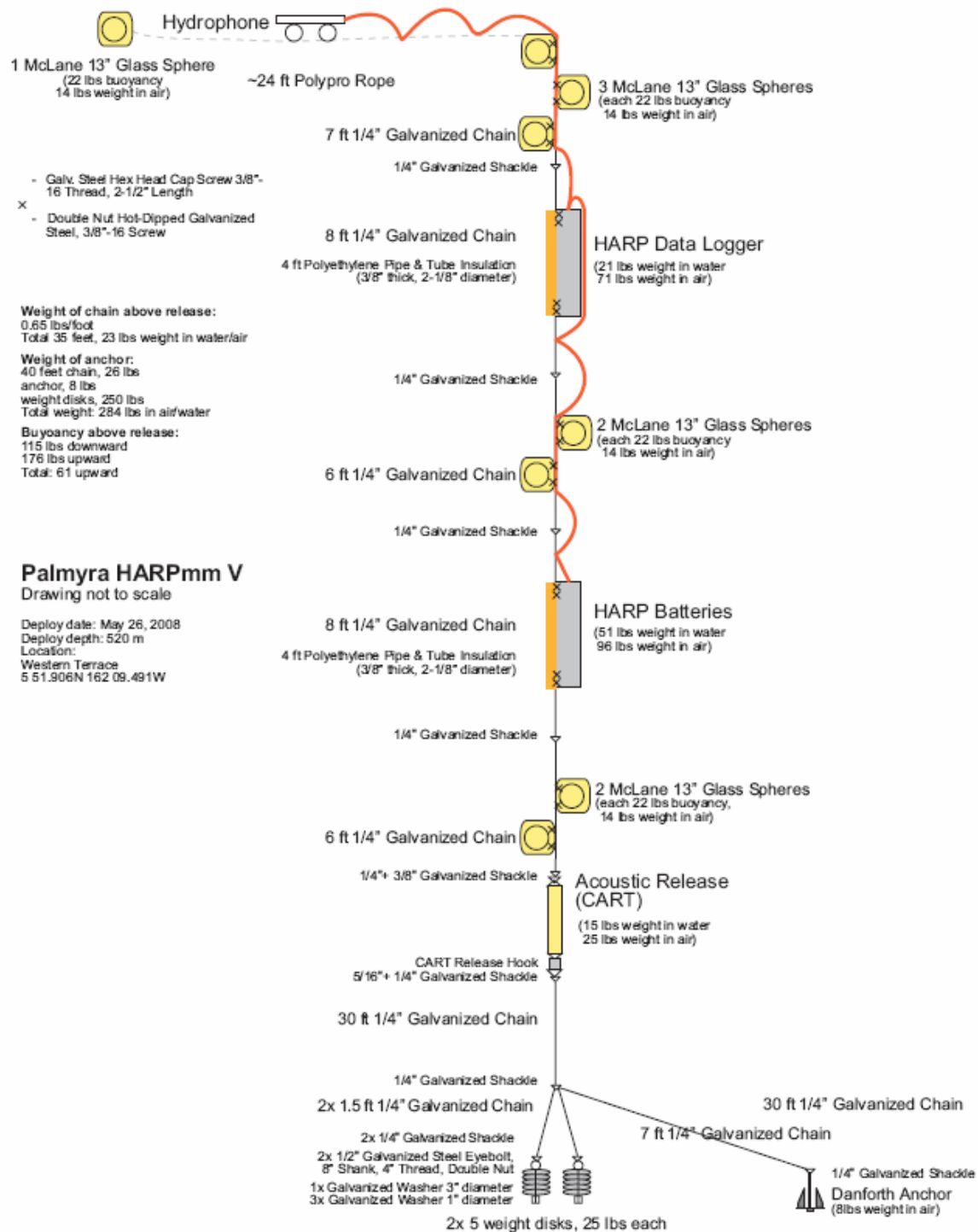


Figure 1: HARP mooring configuration.

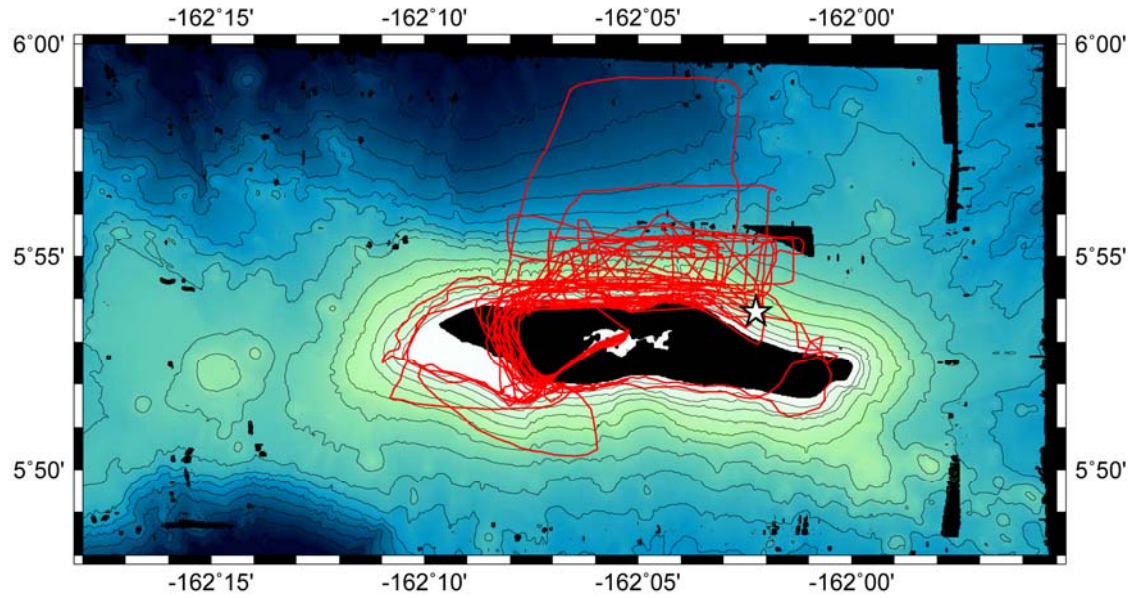


Figure 2. Surveyed tracklines (red) for all 67 hours of effort. Bathymetry lines every 200 m. Black indicates areas with no depth data.

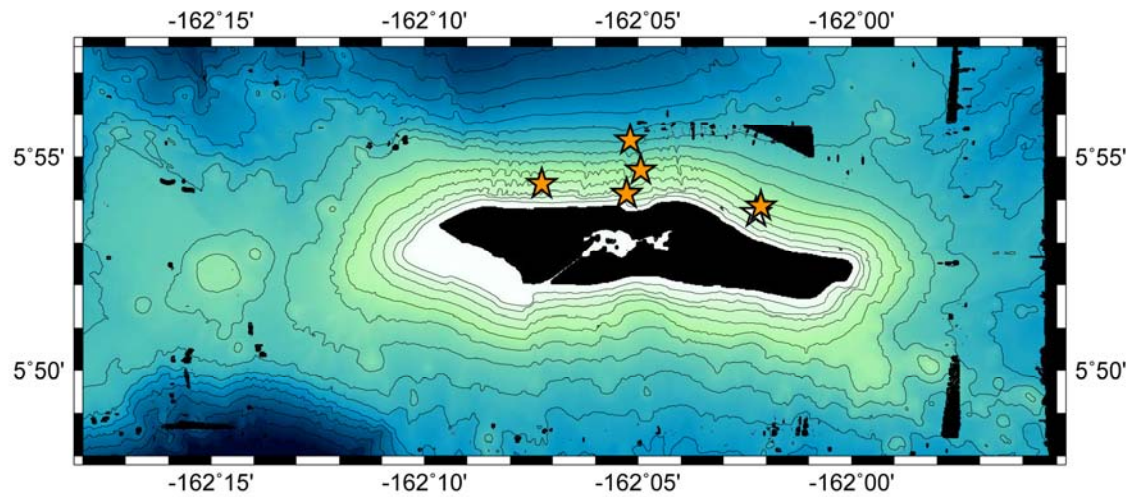


Figure 3. Sighting location of beaked whale (orange star) and HARP location (white star). Bathymetry lines every 200 m. Black indicates areas with no depth data.



Figure 4a. Beaked whale (*Mesoplodon sp.*) identification photo – light scarring and healed cookie cutter shark bites.



Figure 4b. Beaked whale (*Mesoplodon sp.*) identification photo – surfacing female.



Figure 4c. Beaked whale (*Mesoplodon sp.*) identification photo – light scarring and healed cookie cutter shark bites, strong indentation around blowhole interrupts smooth curve from head to dorsal fin.



Figure 4d. Beaked whale (*Mesoplodon sp.*) identification photo – light scarring and healed cookie cutter shark bites, strong indentation around blowhole interrupts smooth curve from head to dorsal fin.



Figure 4e. Beaked whale (*Mesoplodon sp.*) identification photo – light scarring and healed cookie cutter shark bites, strong indentation around blowhole interrupts smooth curve from head to dorsal fin.



Figure 4f. Beaked whale (*Mesoplodon sp.*) identification photo – light scarring and healed cookie cutter shark bites.



Figure 4g. Beaked whale (*Mesoplodon sp.*) identification photo – the back appears to be not rounded, but somewhat peaked, similar to Blainville's beaked whales (*M. densirostris*).

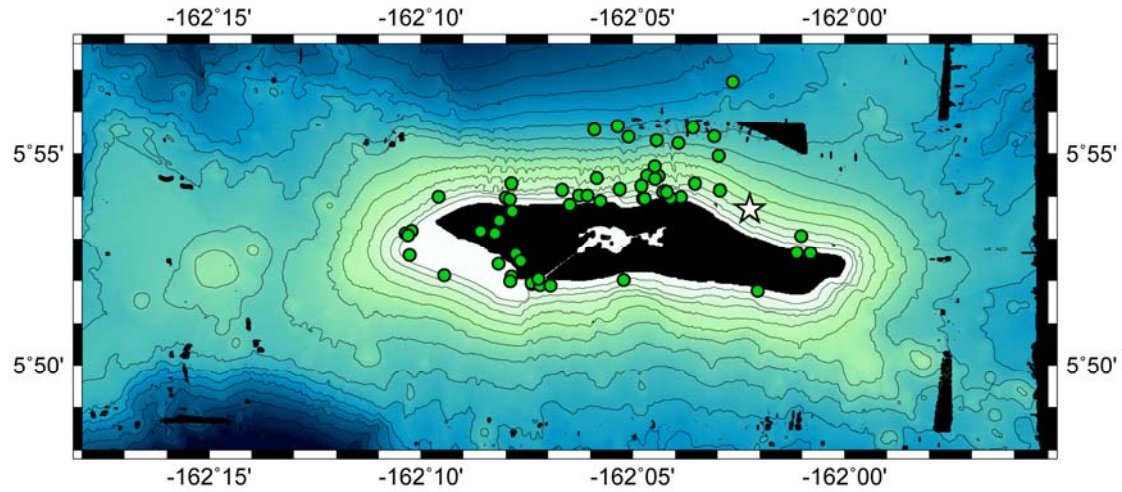


Figure 5. Sighting location of bottlenose dolphins (green dots) and HARP location (white star). Bathymetry lines every 200 m. Black indicates areas with no depth data.

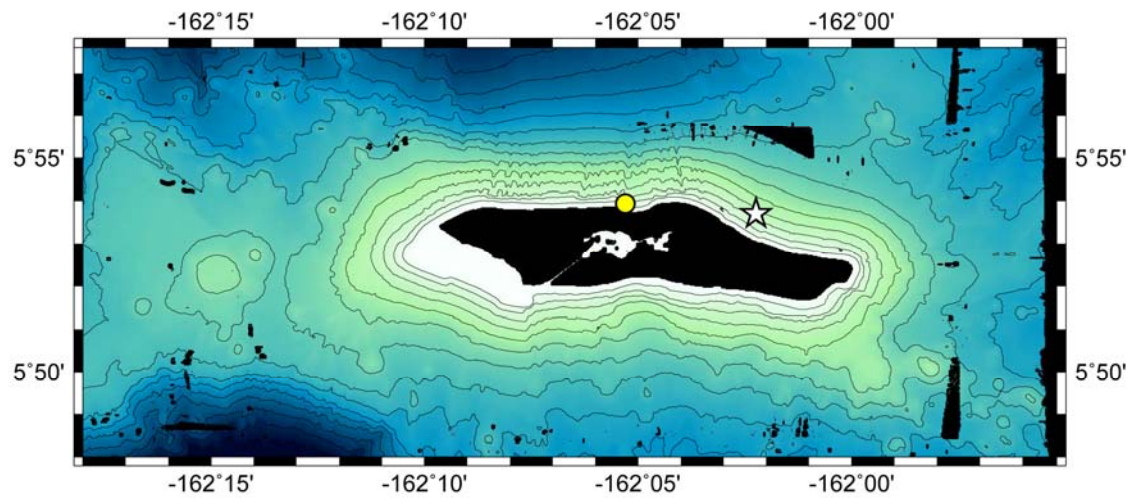


Figure 6. Sighting locations of melon-headed whales (yellow dots) and HARP location (white star). Bathymetry lines every 200 m. Black indicates areas with no depth data.

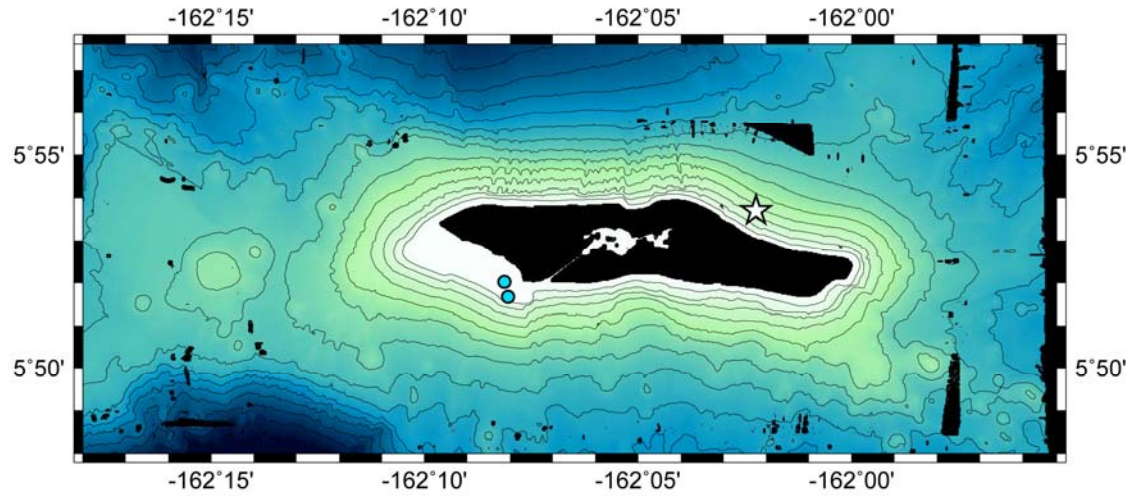


Figure 7. Sighting locations of spinner dolphins (blue dots) and HARP location (white star). Bathymetry lines every 200 m. Black indicates areas with no depth data.

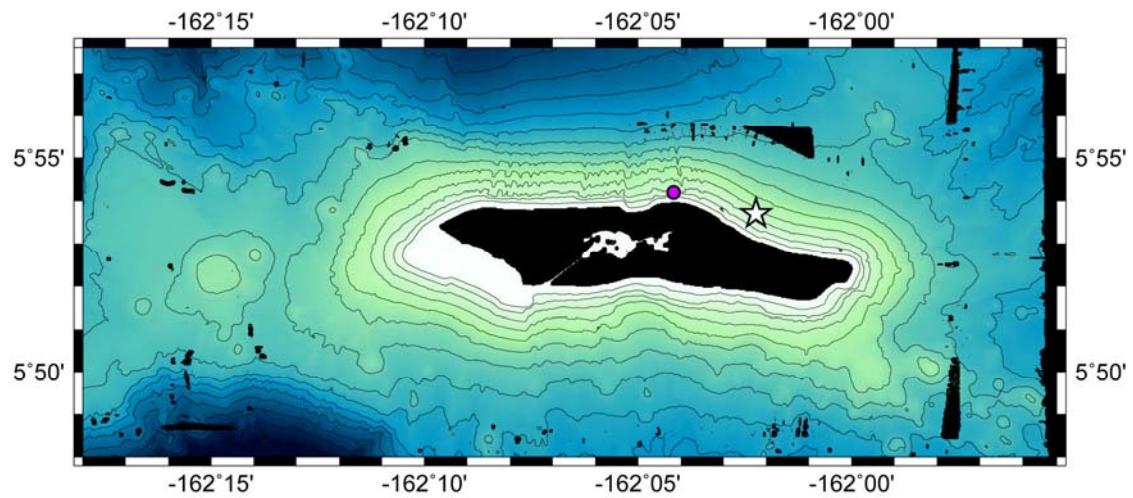


Figure 8. Sighting location of killer whales (pink dot) and HARP location (white star). Bathymetry lines every 200 m. Black indicates areas with no depth data.



Figure 9a. Killer whale identification photo.



Figure 9b. Killer whale identification photo. Animal with bottlenose dolphin held in mouth.

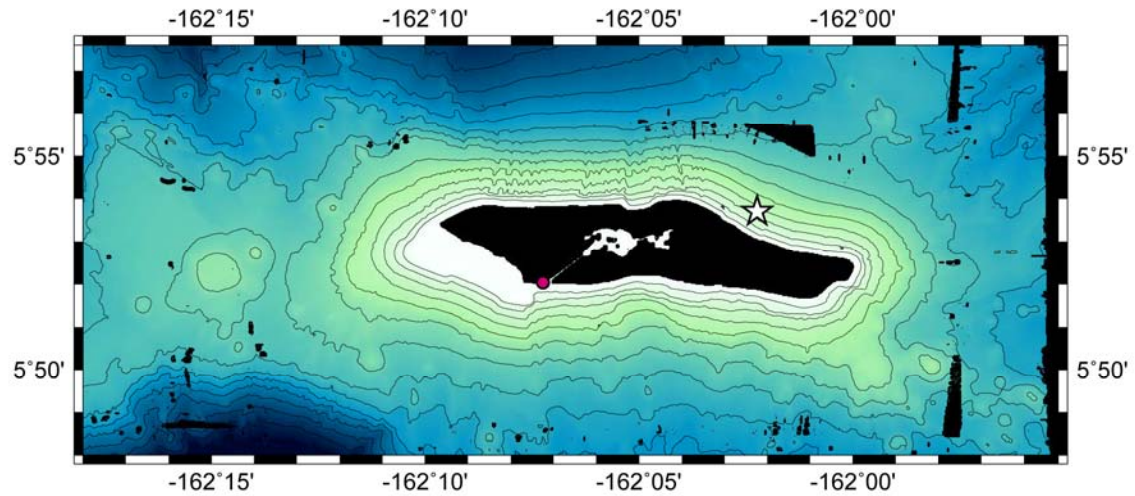


Figure 10. Sighting location of humpback whale mother/calf pair (pink dot) and HARP location (white star). Bathymetry lines every 200 m. Black indicates areas with no depth data.

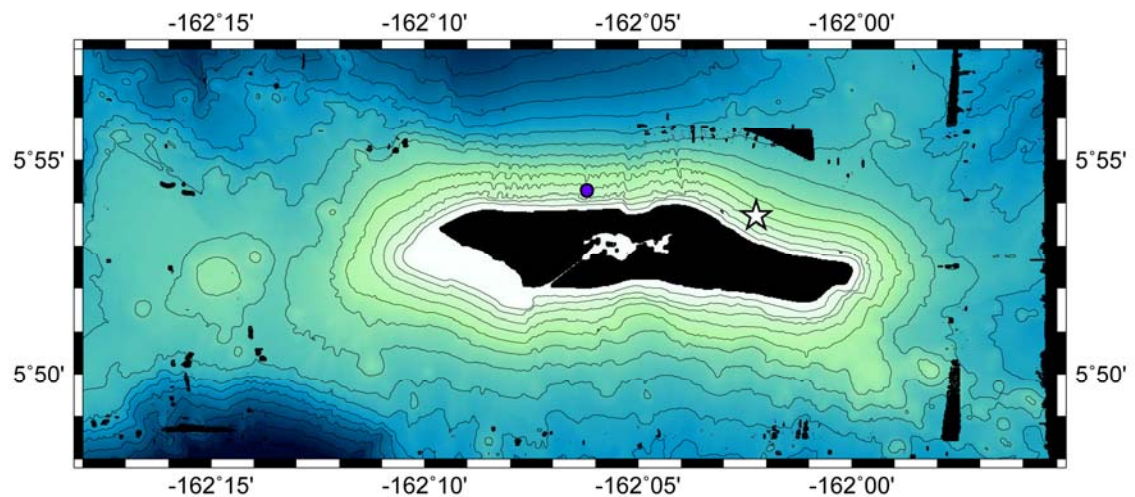


Figure 11. Sighting location of whale shark (blue dot) and HARP location (white star). Bathymetry lines every 200 m. Black indicates areas with no depth data.

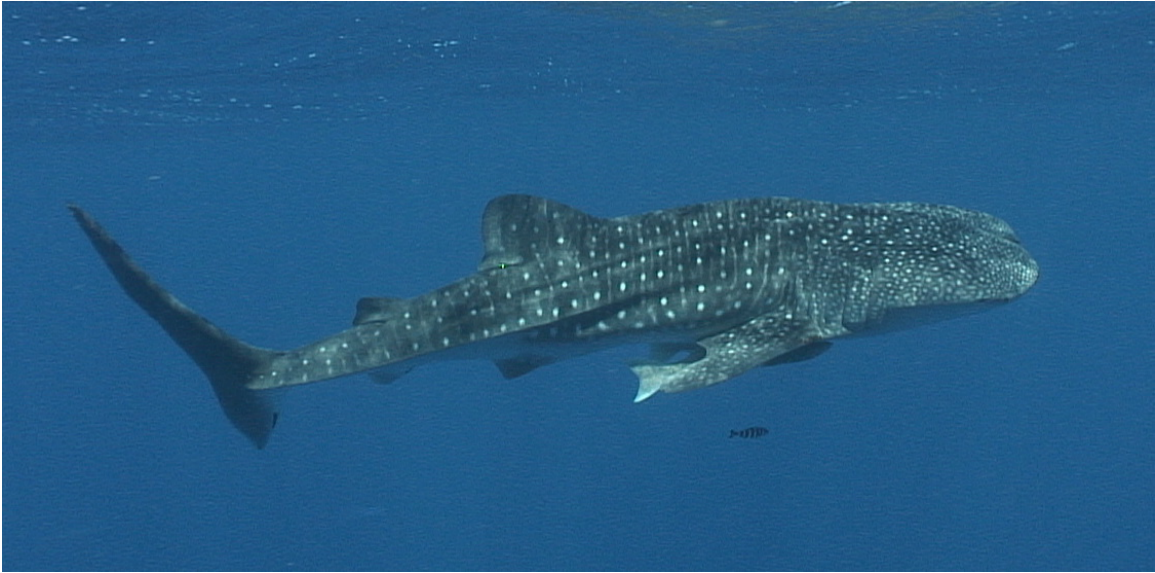


Figure 12. Whale shark identification photo.

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

Palmyra date and time	Latitude	Longitude	Species	Min Count	Best Count	Max Count
08/19/2010 11:54:38	5.8991	-162.0883	Melon-Headed Whales	75	90	110
08/19/2010 13:39:03	5.9006	-162.1045	Bottlenose Dolphin	3	3	3
08/19/2010 14:05:53	5.9024	-162.0879	Unidentified Beaked Whale	1	1	1
08/19/2010 14:30:21	5.9029	-162.0885	Bottlenose Dolphin	9	10	12
08/19/2010 15:49:36	5.9001	-162.1597	Bottlenose Dolphin	2	2	2
08/19/2010 15:59:17	5.8856	-162.1727	Bottlenose Dolphin	1	1	1
08/19/2010 16:08:58	5.8770	-162.1711	Bottlenose Dolphin	2	2	2
08/19/2010 16:20:51	5.8687	-162.1574	Bottlenose Dolphin	1	1	1
08/19/2010 16:40:16	5.8671	-162.1354	Spinner Dolphin	100	125	150
08/20/2010 13:36:31	5.9158	-162.0495	Bottlenose Dolphin	6	6	8
08/20/2010 14:07:45	5.9264	-162.0984	Bottlenose Dolphin	4	4	4
08/20/2010 15:19:54	5.9079	-162.0731	Bottlenose Dolphin	1	1	1
08/20/2010 15:19:54	5.9453	-162.0440	Bottlenose Dolphin	8	12	9
08/21/2010 10:45:14	5.8999	-162.0643	Bottlenose Dolphin	6	6	6
08/21/2010 10:55:54	5.9118	-162.0747	Bottlenose Dolphin	12	12	12
08/21/2010 13:01:04	5.8977	-162.0354	Unidentified Beaked Whale	2	2	2
08/21/2010 13:57:50	5.9237	-162.0513	Bottlenose Dolphin	7	7	8
08/21/2010 14:58:45	5.9277	-162.0892	Bottlenose Dolphin	1	1	1
08/21/2010 15:05:39	5.8865	-162.1703	Bottlenose Dolphin	2	2	2
08/21/2010 15:31:48	5.8612	-162.1340	Spinner Dolphin	100	200	250
08/24/2010 09:32:53	5.8735	-162.1361	Bottlenose Dolphin	5	5	5
08/24/2010 09:47:02	5.8997	-162.1333	Bottlenose Dolphin	4	4	4
08/24/2010 10:14:00	5.9114	-162.0823	Unidentified Beaked Whale	1	1	1
08/25/2010 15:15:03	5.8774	-162.1293	Bottlenose Dolphin	5	5	5
08/25/2010 15:15:03	5.8996	-162.0686	Bottlenose Dolphin	5	5	5
08/25/2010 16:17:24	5.8995	-162.0793	Bottlenose Dolphin	3	3	3
08/25/2010 16:23:09	5.8982	-162.0961	Bottlenose Dolphin	10	10	10
08/27/2010 09:23:37	5.8654	-162.1230	Bottlenose Dolphin	4	4	4
08/27/2010 10:04:01	5.9073	-162.0975	Bottlenose Dolphin	15	20	25
08/27/2010 10:34:52	5.9024	-162.0490	Bottlenose Dolphin	3	3	3
08/27/2010 11:05:03	5.9271	-162.0597	Bottlenose Dolphin	12	14	15
08/27/2010 12:20:56	5.9018	-162.0714	Bottlenose Dolphin	2	2	2
08/27/2010 12:32:10	5.9081	-162.0777	Bottlenose Dolphin	2	2	2
08/27/2010 15:05:08	5.9051	-162.1310	Bottlenose Dolphin	3	3	3
08/29/2010 13:32:27	5.9006	-162.1011	Bottlenose Dolphin	1	1	1
08/29/2010 13:46:38	5.8993	-162.0786	Bottlenose Dolphin	5	6	7
08/29/2010 16:32:43	5.8683	-162.1311	Bottlenose Dolphin	1	1	1
08/29/2010 16:36:50	5.8658	-162.1231	Bottlenose Dolphin	4	4	4
08/30/2010 09:34:31	5.9063	-162.1209	Unidentified Beaked Whale	4	4	6
08/30/2010 12:36:50	5.9210	-162.0653	Bottlenose Dolphin	9	11	15
08/30/2010 14:06:38	5.9041	-162.0800	Bottlenose Dolphin	15	20	25
08/30/2010 15:16:59	5.8778	-162.0189	Bottlenose Dolphin	2	2	2
08/30/2010 15:27:08	5.8777	-162.0133	Bottlenose Dolphin	8	10	12
08/30/2010 15:39:59	5.8626	-162.0342	Bottlenose Dolphin	40	50	60
08/30/2010 16:35:00	5.8649	-162.1198	Bottlenose Dolphin	12	18	25

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

Palmyra date and time	Latitude	Longitude	Species	Min Count	Best Count	Max Count
08/31/2010 09:52:19	5.8674	-162.1205	Bottlenose Dolphin	1	1	1
08/31/2010 10:03:35	5.8864	-162.1433	Bottlenose Dolphin	10	10	10
08/31/2010 12:41:04	5.9019	-162.0700	Bottlenose Dolphin	4	4	4
08/31/2010 12:48:59	5.9033	-162.0694	Killer Whales	4	5	6
08/31/2010 14:42:50	5.8844	-162.0170	Bottlenose Dolphin	6	6	6
08/31/2010 14:42:50	5.8669	-162.0868	Bottlenose Dolphin	14	14	14
08/31/2010 15:56:00	5.8647	-162.1157	Bottlenose Dolphin	12	10	12
09/02/2010 14:23:42	5.8969	-162.1080	Bottlenose Dolphin	8	8	8
09/02/2010 14:29:40	5.8943	-162.1308	Bottlenose Dolphin	11	12	14
09/03/2010 10:06:21	5.8991	-162.1317	Bottlenose Dolphin	9	10	12
09/03/2010 10:34:59	5.9050	-162.1033	Whale Shark	1	1	1
09/03/2010 10:46:21	5.9068	-162.0746	Bottlenose Dolphin	6	7	8
09/03/2010 11:01:36	5.9051	-162.0588	Bottlenose Dolphin	2	2	2
09/03/2010 11:26:29	5.9220	-162.0739	Bottlenose Dolphin	1	1	1
09/03/2010 11:36:07	5.9235	-162.0850	Bottlenose Dolphin	15	17	20
09/04/2010 08:33:10	5.8744	-162.1274	Bottlenose Dolphin	6	6	6
09/04/2010 15:46:03	5.9026	-162.1112	Bottlenose Dolphin	7	7	7
09/04/2010 16:28:19	5.9232	-162.0864	Unidentified Beaked Whale	1	1	1
09/04/2010 17:18:55	5.8908	-162.1358	Bottlenose Dolphin	1	1	1
09/05/2010 12:00:00	5.8674	-162.1207	Humpback whale	2	2	2
09/07/2010 09:29:25	5.8665	-162.1316	Bottlenose Dolphin	2	2	2
09/07/2010 09:38:18	5.8856	-162.1375	Bottlenose Dolphin	3	3	3
09/07/2010 11:42:26	5.8848	-162.1718	Bottlenose Dolphin	10	11	13