

# **Acoustic and Visual Survey of Cetaceans at Palmyra Atoll**

**Trip report 11/2006**

**Palmyra, October 16 – November 7, 2006**

**Simone Baumann  
Charles Speed**

Contact: sbaumann@ucsd.edu, jhildebrand@ucsd.edu

**Scripps Institution of Oceanography  
John Hildebrand Lab**

## **Contents:**

Summary  
Sightings  
Environment

Appendix:  
Drawing HARP

## Summary

### 1. HARP Deployment/Recovery

A new high-frequency acoustic recording package (HARP) was deployed on October 18, 2006 off the south-western outer reef at 05° 51.846' N 162° 09.907' W in 650 m of water. The instrument was redesigned in a mooring style to prevent sliding and becoming stuck in the steep topography. With this type of setup deployment and recovery off the local small boat became easier (see appendix 1 for a drawing of the instrument). The recording was set to a sampling frequency of 200 kHz, with a recording duration of 5 minutes and a recording interval of 20 minutes. The instrument is supplied with 16 hard drives of 120 GB data storage capability each, adding up to a total of 1.92 TB of data. The recording started on October 18, 2006 at 6 pm local time and will be running for approximately 6 months until the hard drives are filled. On Friday November 3, 2006 the HARP was enabled and responded to interrogation pings showing that the location was still as on the day of deployment.

The first HARP deployed September 2005 off the north-western outer reef that had been shifted to 05° 54.205' N 162° 07.488' W in a water depth of 700 m as determined during our last visit in July 2006 is still at this location. The attempt at recovery on Friday October 23, 2006 was not successful. The acoustic release on the instrument package was again successfully enabled and responded appropriately to both interrogation pings and release commands. However the instrument never lifted free from the seafloor.

At the end of all operations the acoustics of the releases were disabled to maintain battery life.

### 2. Cetacean Survey and Acoustic Recording

During the three weeks cetacean survey at Palmyra Atoll we had the local boat to our disposal during Monday to Friday, 8 am to 5 pm, resulting in 12.5 days out at sea. The weather conditions were exceptionally good. The sea state was usually between 1 and 2, rarely 3 with only 2 rougher days and 1 day where wind and waves made going offshore impossible (see table environment). This allowed us to circle the atoll completely, at some days even twice (see figures 1-13). The vessel used was 25 ft long, traveling at a speed of about 10-16 knots. When the hydrophone array was deployed survey speed was between 0 and 10 knots. The total traveling distance within 82 hours of survey was approximately 650 miles. For further details please see appendix 2 with all GPS data and figure 1.

For the acoustic survey we used a 6 channel hydrophone array with 80 m of cable while 4 channels were recorded simultaneously with a sampling frequency of 192 kHz. These 4 channels were regularly spaced with 80 cm in between elements. The array was towed 80 m behind the boat over deep waters resulting in an approximate water depth of the hydrophones at 10 m. While over shallow reef areas the cable was shortened to 15 m and the depth of the hydrophones was at around 5 m. The array was only deployed in the presence of animals. It was either towed or stationary depending on the cetacean behavior.

Over 40% of the total survey time was spent during encounters with the animals. We had a total number of 103 encounters summing up to 34 hours of sighting duration. There were 22 encounters with melon-headed whales (*Peponocephala electra*), 67 encounters with bottlenose dolphins (*Tursiops truncatus*), 12 encounters with spinner dolphins (*Stenella longirostris*) and 2 distant sightings of larger unidentified cetaceans. The term "resighting" 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. The encounters were

distributed all around the atoll with no noticeable preference. As for population estimates there were approximately 700 to 1000 melon-headed whales, 150 to 200 bottlenose dolphins and 100 to 150 spinner dolphins that we regularly met circling the atoll.

The time spent with the melon-headed whales (*Peponocephala electra*) was approximately 10 hours 30 minutes resulting in almost 5 hours of recordings. The melon-headed whales were, as during our last visit in July, in large numbers of hundreds of whales mostly milling and socially interacting with each other. During the time of our stay we got the impression that the animals were increasingly used to the presence of the boat and more frequently approached it. We observed the group to be passive, occasionally with mother-calf interactions, spyhops, tailslaps, etc. (please see detailed notes at sighting table). Only during one encounter when the waves were fairly high the whole pod was actively surfing these waves. The group we observed was stretched in loose aggregation forming clusters of two to ten individuals swimming very close to each other and interacting with each other. The melon-headed whales were always together in the whole pod during these three weeks and were most often observed on the south side of the atoll always over deeper water in the vicinity of the reef.

During almost 17 hours that we spent with the bottlenose dolphins (*Tursiops truncatus*) we were able to acquire about 6 hours of recordings. We saw the animals both in smaller groups of a few individuals up to bigger groups of 30 to 50, sometimes up to 100 or more animals. On several days there were small and medium groups stretched out all around the atoll. We would call each group a sighting if we did not see any more animals for several minutes while on other days a larger number of animals seemed to be closer affiliated which we then did not split up into subgroup sightings.

During the last trip we had the impression that there were resident smaller animals over the western terrace and an oceanic group passing through. During this trip we were not able to confirm this observation. We had sightings throughout the survey both on the terrace and over deeper water off the reef. A closer look at the photos that have been taken might reveal some more information regarding subgroups around the atoll. Over the course of the trip we were able to recognize individuals that approached the boat repeatedly to bow ride.

We observed at least five individuals of bottlenose dolphins with circular lesions (see figure 14-16). These lesions were only on one side of the animals' body except for the individual in figure 14 that has a circular hole in its dorsal fin. Suggested causes for these wounds could be either gunshots or chronic ulcers. Dr. Daniel F. Cowan, Professor of Pathology at The University of Texas Medical Branch has seen similar lesions that were infested and infected with a protozoan. This has been noticed before, (Schulman, F. Y., Lipscomb, T. P., 1999. Veterinary Pathology, Vol 36, Issue 2 171-174, Dermatitis with invasive ciliated protozoa in dolphins that died during the 1987-1988 Atlantic Bottlenose Dolphin morbilliviral epizootic) and the argument has been between a primary infection by the protozoa, or whether they were a secondary opportunistic invader.

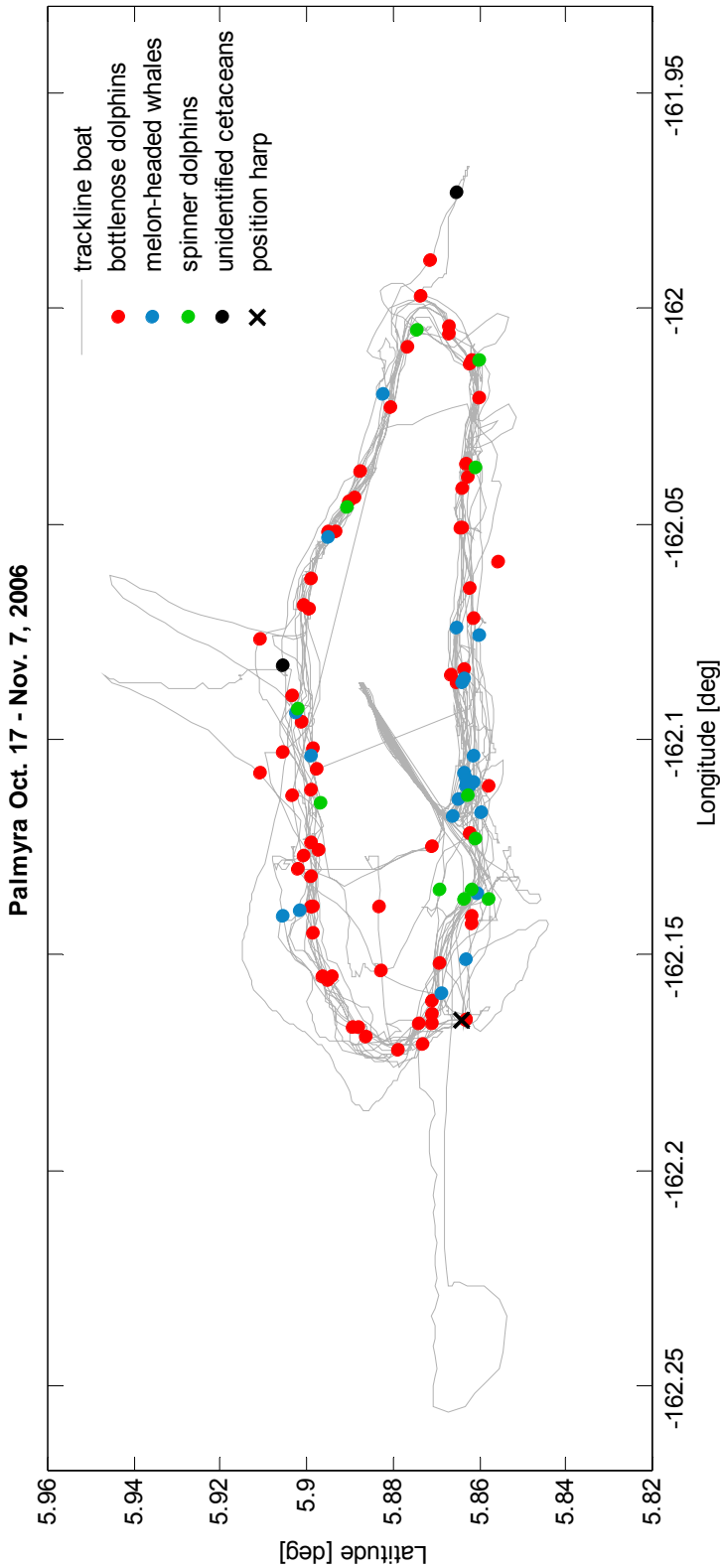
The bottlenose dolphins would bow ride on many encounters and several times they would follow the boat along the western terrace. This made it possible to lead several groups of animals towards the HARP that is located on the southwestern tip of the terrace. During these approaches the position of the boat and the distance to the HARP was monitored while recordings were made with the towed hydrophone array and the autonomous HARP. This data can be matched in the future and we can make an approximation of the monitoring radius of the instrument at that particular spot.

We were able to spend more than 5 hours with spinner dolphins (*Stenella longirostris*) which resulted in 2 hours 20 minutes recordings. The spinner dolphins were more indifferent to the approach of our boat. They only came to bow ride during few encounters and sometimes even showed evasive behavior. Although we did not see spinner dolphins on a daily basis, like the two

other species, the regularity of encounters suggests a stronger affiliation with the atoll if not even a permanent residency there.

There were two distant sightings of larger unidentified cetaceans. On October 23 we had a sighting (# 16) off the north shore which might have been a beaked whale sighting of 2 individuals. We were able to resight the animals once about 20 minutes after they had initiated a dive. The second unidentified cetacean (# 68) was seen leaping in the distance but was not found again. In both cases the recordings do not show any cetacean sounds.

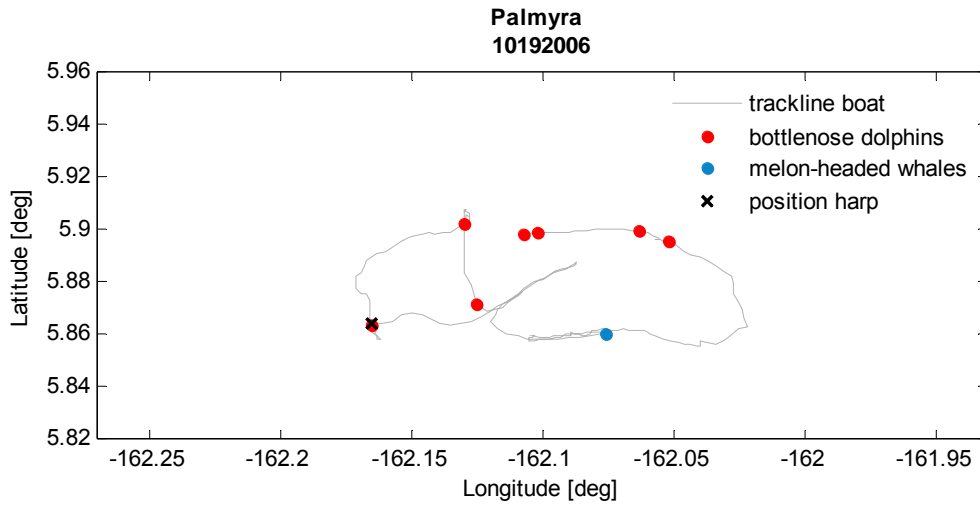
### Sightings



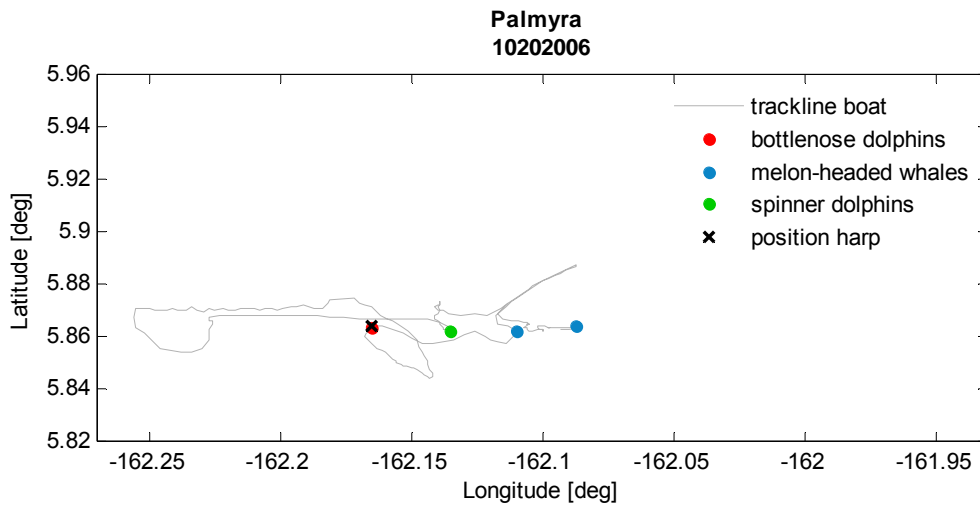
**Figure 1:** Total survey effort and sightings throughout October 17 to November 7, 2006 with approx. 650 miles of survey track.

# of encounters:  
 melon-headed whales – 22  
 bottlenose dolphins – 67  
 spinner dolphins – 12  
 unidentified cetaceans – 2

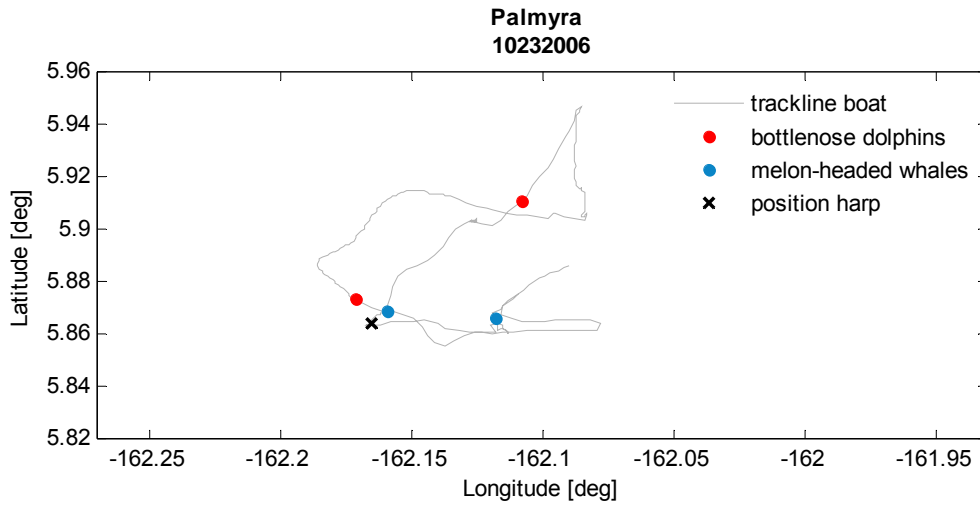
The circle to the west was made because of a deep-sea pinnacle. The lobes offshore to the north were pursued because of one possible beaked whale sighting both this and last trip in the area.



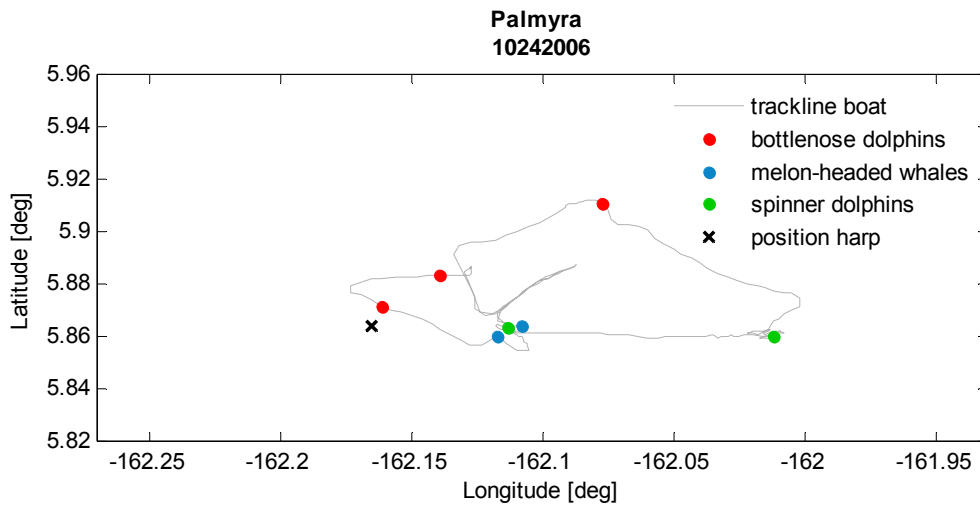
**Figure 2:** Survey track on October 19, 2006 with 7 encounters with bottlenose dolphins, 1 encounter with melon-headed whales.



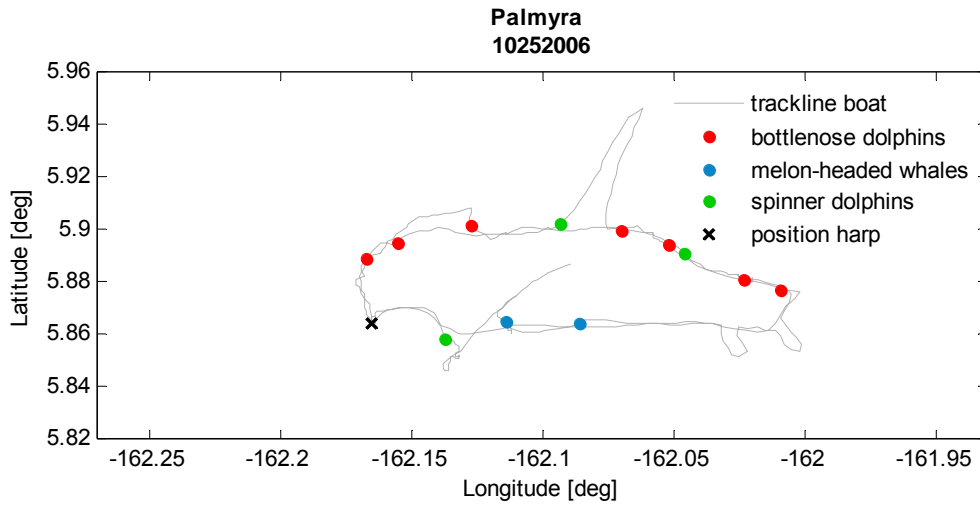
**Figure 3:** Survey track on October 20, 2006 with 1 encounter with bottlenose dolphins, 2 encounters with melon-headed whales and 1 encounter with spinner dolphins.



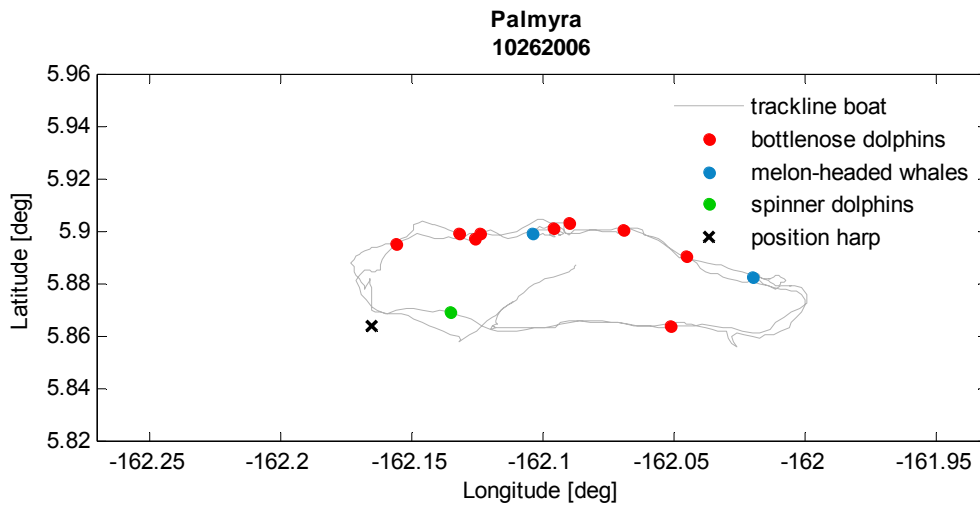
**Figure 4:** Survey track on October 23, 2006 with 2 encounters with bottlenose dolphins and 2 encounters with melon-headed whales.



**Figure 5:** Survey track on October 24, 2006 with 3 encounters with bottlenose dolphins, 2 encounters with melon-headed whales and 3 encounters with spinner dolphins.

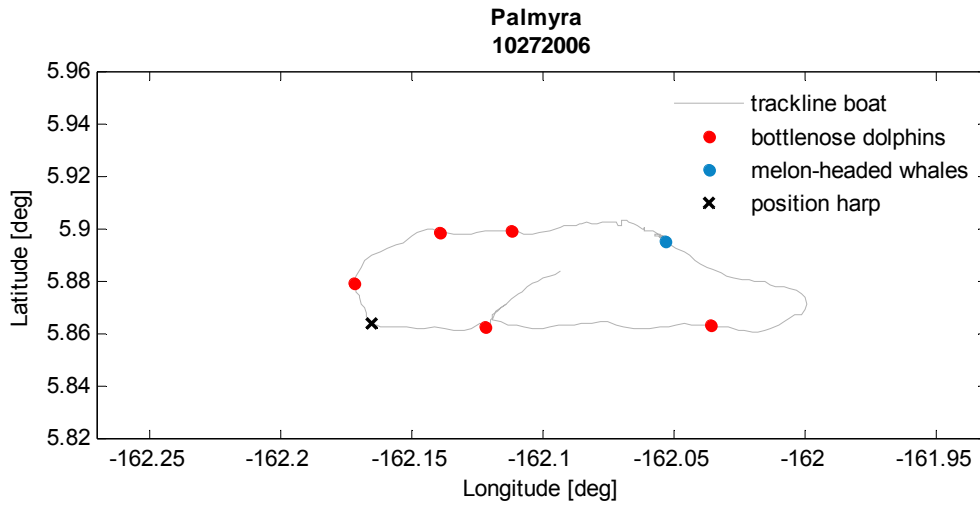


**Figure 6:** Survey track on October 25, 2006 with 7 encounters with bottlenose dolphins, 2 encounters with melon-headed whales and 3 encounters with spinner dolphins.

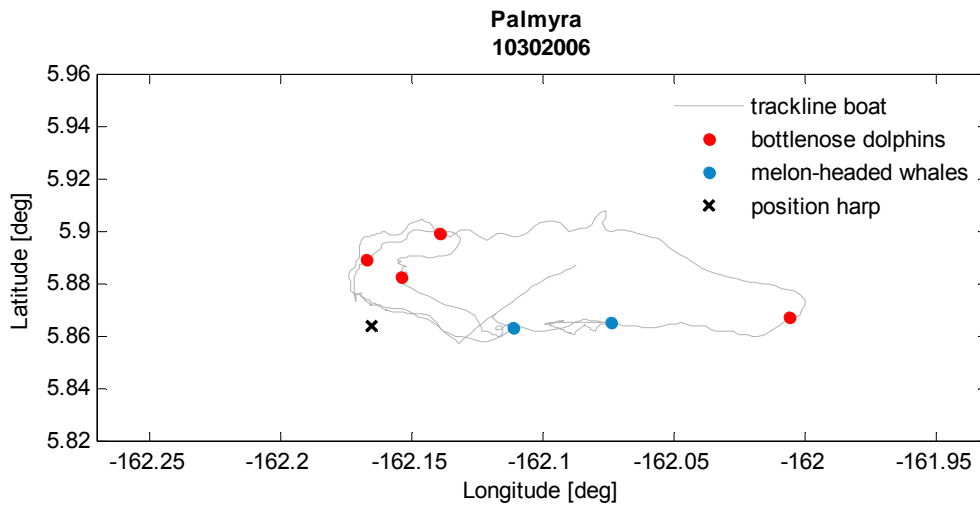


**Figure 7:** Survey track on October 26, 2006 with 9 encounters with bottlenose dolphins, 2 encounters with melon-headed whales and 1 encounter with spinner dolphins.





**Figure 8:** Survey track on October 27, 2006 with 5 encounters with bottlenose dolphins and 1 encounter with melon-headed whales.



**Figure 9:** Survey track on October 30, 2006 with 4 encounters with bottlenose dolphins and 2 encounters with melon-headed whales.

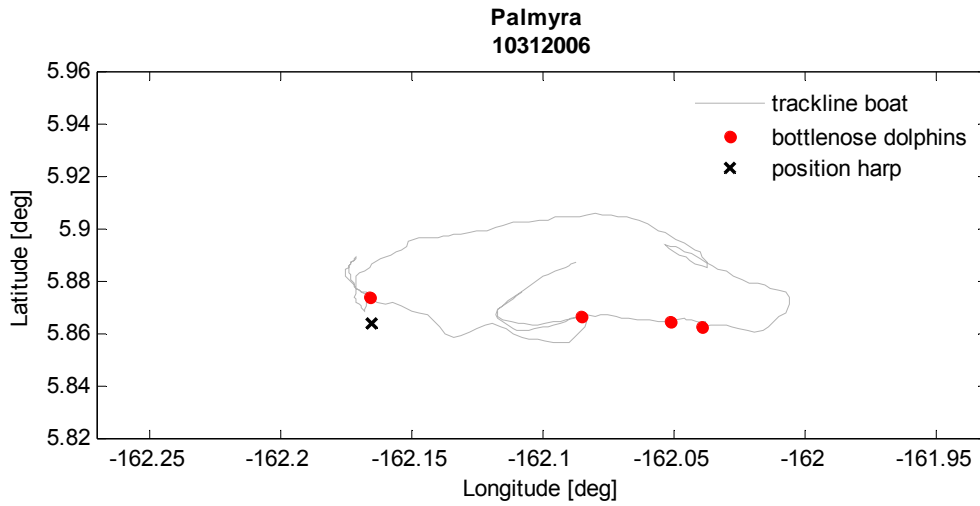


Figure 10: Survey track on October 31, 2006 with 4 encounters with bottlenose dolphins.

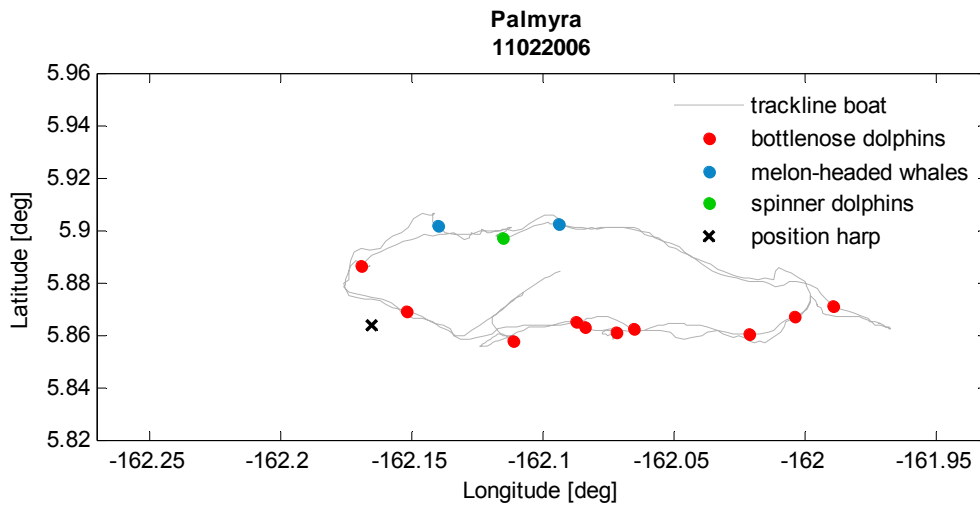
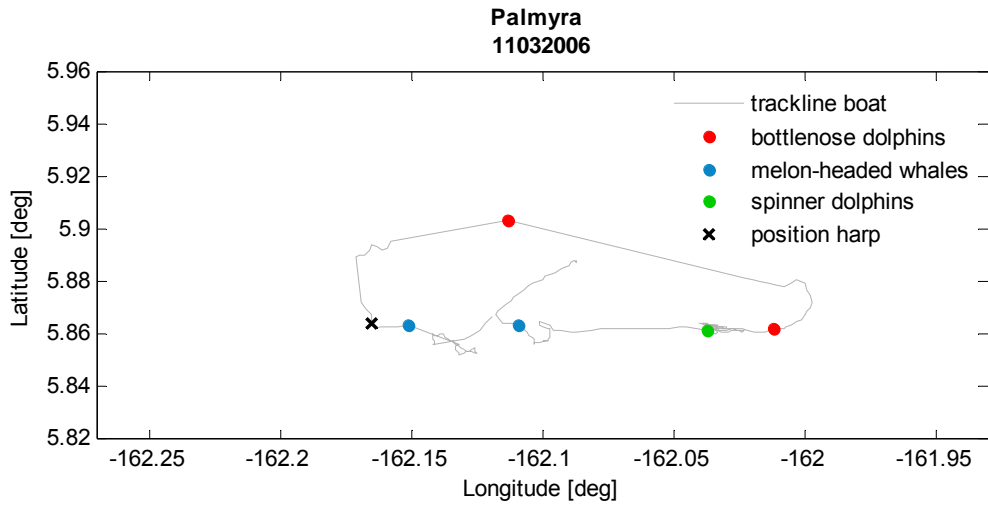
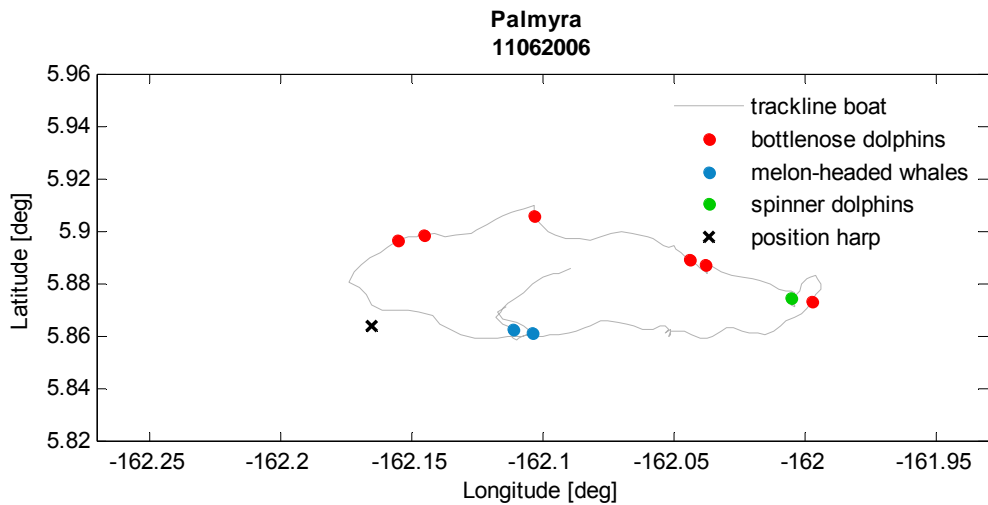


Figure 11: Survey track on November 02, 2006 with 10 encounters with bottlenose dolphins, 2 encounters with melon-headed whales and one encounter with spinner dolphins.



**Figure 12:** Survey track on November 03, 2006 with 2 encounters with bottlenose dolphins, 2 encounters with melon-headed whales and one encounter with spinner dolphins.



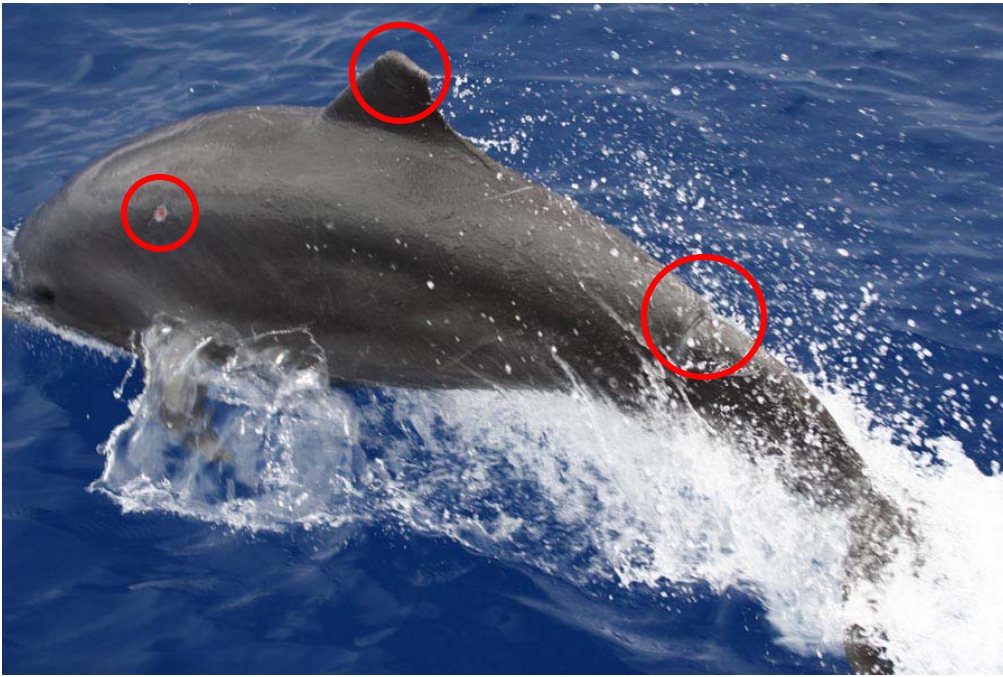
**Figure 13:** Survey track on November 06, 2006 with 6 encounters with bottlenose dolphins, 2 encounters with melon-headed whales and one encounter with spinner dolphins.



**Figure 14:** Bottlenose dolphin with circular lesion in dorsal fin.



**Figure 15:** Bottlenose dolphin with lateral circular lesion.



**Figure 16:** Bottlenose dolphin with lateral circular lesion, missing tip of dorsal fin and older trauma on tail.

Sighting No	GpsIndex	GMT Time	End Time (GMT)	Sighting Duration [min]	Recording	Palmyra Date	Palmyra Time	Latitude	Longitude
<b>Tuesday October 17, 2006</b>									
1	-	10/17/2006 10:31:43 PM	10:44:37 PM	13	Yes	10/17/2006	12:31:43 AM	5.855694	162.059383
2	-	10/17/2006 11:18:15 PM	11:42:04 AM	24	Yes	10/17/2006	1:18:15 PM	5.8623	162.012583
3	-	10/18/2006 1:48:01 AM	2:17:01 AM	29	Yes	10/17/2006	3:48:01 PM	5.9056	162.14145
<b>Thursday October 19, 2006</b>									
4	28	10/19/2006 8:34:19 PM	9:06:57 PM	32	Yes	10/19/2006	10:34:19 AM	5.863516	-162.1651
5	99	10/19/2006 9:45:09 PM	9:58:08 PM	13	Yes	10/19/2006	11:45:09 AM	5.9021	-162.1299
6	123	10/19/2006 10:08:59 PM	10:09:49 PM	1	No	10/19/2006	12:09:49 AM	5.87115	-162.1245
7	194	10/19/2006 11:19:59 PM	12:20:14 AM	61	Yes	10/19/2006	2:19:59 PM	5.860184	-162.0756
8	310	10/20/2006 1:16:21 AM	1:21:59 AM	5	Yes	10/19/2006	3:16:21 PM	5.895333	-162.0524
Resighting 8	321	10/20/2006 1:25:55 AM	1:28:31 AM	3	No	10/19/2006	3:25:55 PM	5.899133	-162.0632
9	338	10/20/2006 1:43:19 AM	1:47:16 AM	4	Yes	10/19/2006	3:43:19 PM	5.898901	-162.1017
10	342	10/20/2006 1:47:21 AM	2:17:03 AM	30	Yes	10/19/2006	4:17:03 PM	5.898	-162.1065
<b>Friday October 20, 2006</b>									
11	351	10/20/2006 7:55:38 PM	9:24:53 PM	30	Yes	10/20/2006	9:55:38 AM	5.864	-162.0874
Resighting 11	475	10/20/2006 11:51:02 PM	11:54:11 PM	3	No	10/20/2006	1:52:19 PM	5.861766	-162.11
12	493	10/21/2006 12:08:19 AM	12:41:08 AM	43	Yes	10/20/2006	2:08:19 PM	5.863516	-162.165
13	628	10/21/2006 2:24:53 AM	2:52:04 AM	28	Yes	10/20/2006	4:24:53 PM	5.862116	-162.1348
<b>Monday October 23, 2006</b>									
14	675	10/23/2006 8:12:31 PM	8:47:19 PM	35	Yes	10/23/2006	10:12:31 AM	5.86625	-162.1177
15	735	10/23/2006 9:11:56 PM	10:28:34 PM	74	Yes	10/23/2006	11:11:56 AM	5.873267	-162.1714
16	824	10/23/2006 10:40:36 PM	11:45:38 PM	65	Yes	10/23/2006	12:40:36 AM	5.905833	-162.0825
17	904	10/24/2006 12:00:38 AM	12:07:38 AM	7	No	10/23/2006	2:00:38 PM	5.910883	-162.1081
18	950	10/24/2006 12:47:01 AM	1:56:48 AM	69	No	10/23/2006	2:47:01 PM	5.868967	-162.1588
<b>Tuesday October 24, 2006</b>									
19	1078	10/24/2006 8:57:42 PM	9:33:33 PM	36	Yes	10/24/2006	10:57:42 AM	5.8637	-162.1081
20	1163	10/24/2006 10:22:52 PM	11:43:47 PM	71	Yes	10/24/2006	12:22:52 AM	5.860184	-162.0122
21	1275	10/25/2006 12:13:46 AM	12:27:19 AM	14	Yes	10/24/2006	2:13:46 PM	5.910817	-162.077
22	1348	10/25/2006 1:25:41 AM	1:38:02 AM	13	Yes	10/24/2006	3:25:41 PM	5.863067	-162.1125
Resighting 19	1367	10/25/2006 1:45:53 AM	1:51:51 AM	6	No	10/24/2006	3:45:53 PM	5.859717	-162.1168
23	1382	10/25/2006 2:00:36 AM	2:07:31 AM	1	No	10/24/2006	4:00:36 PM	5.871367	-162.1607
24	1394	10/25/2006 2:12:53 AM	2:22:30 AM	10	No	10/24/2006	4:12:53 PM	5.883433	-162.1393
<b>Wednesday October 25, 2006</b>									
25	1444	10/25/2006 7:05:00 PM	7:38:06 PM	33	Yes	10/25/2006	9:05:00 AM	5.864883	-162.114
26	1526	10/25/2006 8:27:09 PM	8:48:06 PM	21	Yes	10/25/2006	10:27:09 AM	5.88065	-162.0226
27	1560	10/25/2006 9:00:26 PM	9:16:29 PM	16	Yes	10/25/2006	11:00:26 AM	5.890883	-162.0463
28	1610	10/25/2006 9:50:31 PM	10:01:10 PM	11	No	10/25/2006	11:50:31 AM	5.9022	-162.0934
29	1628	10/25/2006 10:08:31 PM	10:53:46 PM	45	Yes	10/25/2006	12:08:31 AM	5.901133	-162.1273
30	1693	10/25/2006 11:13:33 PM	11:16:30 PM	3	No	10/25/2006	1:13:33 PM	5.863917	-162.0859
31	1719	10/25/2006 11:39:33 PM	11:50:02 PM	11	No	10/25/2006	1:39:33 PM	5.8769	-162.0092
32	1746	10/26/2006 12:06:22 AM	12:17:09 AM	11	No	10/25/2006	2:06:22 PM	5.893667	-162.0517
33	1757	10/26/2006 12:17:11 AM	12:25:54 AM	1	No	10/25/2006	2:17:11 PM	5.899666	-162.0701
34	1787	10/26/2006 12:46:34 AM	12:57:13 AM	11	No	10/25/2006	2:46:34 PM	5.8945	-162.1545
35	1802	10/26/2006 1:01:34 AM	1:45:15 AM	44	Yes	10/25/2006	3:03:34 PM	5.8884	-162.1665
36	1855	10/26/2006 1:52:21 AM	2:23:44 AM	31	Yes	10/25/2006	3:52:21 PM	5.858033	-162.1365

Species	best # animals	high # animals	low # animals	Ship Heading [deg]	Distance [m]	Juveniles	Calves Newborn	Calves Older	Behaviour1	Behaviour2	Behaviour3	Behaviour4
<b>Tuesday October 17, 2006</b>												
<i>Tursiops truncatus</i> - Bottlenose Dolphins	5				10	No	No	No	BR		AV	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	12	15	10		10	No	No	No	BR		AV	AL
<i>Peponocephala electra</i> - Melon-headed Whales	600	1000	400		20	No	No	No	BR	TS	AV	
<b>Thursday October 19, 2006</b>												
<i>Tursiops truncatus</i> - Bottlenose Dolphins	100	150	70	324.8	10	No	No	No	SO	TS	AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	7	9	5	161	50	No	No	No	BR		AV	
<i>Tursiops truncatus</i> - Bottlenose Dolphins	2	5	2	100.7	50	No	No	No				
<i>Peponocephala electra</i> - Melon-headed Whales	500	750	400	80.8	10	No	No	No	MI		AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	4			294.3	10	No	No	No	BR		AV	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	6	8	4	281.5	40	No	No	No	ST			
<i>Tursiops truncatus</i> - Bottlenose Dolphins	1			263.9	20	No	No	No	ST			
<i>Tursiops truncatus</i> - Bottlenose Dolphins	2				40	Yes	No	No	BR		AV	AL
<b>Friday October 20, 2006</b>												
<i>Peponocephala electra</i> - Melon-headed Whales	500	700	400	32	50	Yes	No	No	MI	SH		AL
<i>Peponocephala electra</i> - Melon-headed Whales	500	700	400	277.1	50	Yes	No	No	MI			
<i>Tursiops truncatus</i> - Bottlenose Dolphins	3	6	3	326.3	300	No	No	No	BR		AV	AL
<i>Stenella longirostris</i> - Spinner Dolphins	150	200	100	54.4		Yes	Yes	No	AS	LE	AV	AL
<b>Monday October 23, 2006</b>												
<i>Peponocephala electra</i> - Melon-headed Whales	700	900	500	225.1	50	No	No	No	MI	SH	AV	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	150	200	100	108.2	5	Yes	Yes	No	BR	TS		AL
<i>Unidentified Cetacean</i>	2	2	2	221.8		No	No	No				
<i>Tursiops truncatus</i> - Bottlenose Dolphins	5			113.7		No	No	No				
<i>Peponocephala electra</i> - Melon-headed Whales	700	900	600	202.3	50	No	No	No	ST	LE		
<b>Tuesday October 24, 2006</b>												
<i>Peponocephala electra</i> - Melon-headed Whales	600	700	500	81.9	20	Yes	Yes	Yes	MI	TS	AV	AT
<i>Stenella longirostris</i> - Spinner Dolphins	150	200	100	54.4	20	Yes	No	Yes	MI	LE	AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	3	3	3	238.3		No	No	No	BR		AV	
<i>Stenella longirostris</i> - Spinner Dolphins	4	5	4	271.3	100	No	No	No				
<i>Peponocephala electra</i> - Melon-headed Whales	600	800	400	296.1		Yes	No	Yes				
<i>Tursiops truncatus</i> - Bottlenose Dolphins	75	100	50	89.9		No	No	No				
<i>Tursiops truncatus</i> - Bottlenose Dolphins	14	20	14	59.5	50	No	No	No				
<b>Wednesday October 25, 2006</b>												
<i>Peponocephala electra</i> - Melon-headed Whales	700	900	600	68.3		No	No	No	MI	SH	AV	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	7	10	6	291	30	No	No	No	SL		AV	AT
<i>Stenella longirostris</i> - Spinner Dolphins	150	200	150	277.7	80	No	No	No	ST		RA	AL
<i>Stenella longirostris</i> - Spinner Dolphins	10	15	8	294.8	300	No	No	No	FT		RA	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	100	125	80	69.6		No	No	No	BR	LE	AV	AL
<i>Peponocephala electra</i> - Melon-headed Whales	750	1000	600	99.8	20	No	No	No		LE	AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	15	20	13	300.3	20	Yes	No	Yes	MI	SH		AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	6	8	4	270.3		No	No	No	BR		AV	
<i>Tursiops truncatus</i> - Bottlenose Dolphins	30	40	20	298.4	20	No	No	No	WR	LE	AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	25	30	20	279.3	10	No	No	Yes	MI		AV	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	60	80	50	82.2	10	Yes	Yes	No	BR	LE	AV	AL
<i>Stenella longirostris</i> - Spinner Dolphins	150	200	100	59.7		No	No	No	AS	LE	AV	AL

Further (Behavioural) Notes
<b>Tuesday October 17, 2006</b>
Spy hopping,
<b>Thursday October 19, 2006</b>
above harp western terrace, LOTS of animals, socializing, checking out array, smaller groups, porpoising, spy hopping, leaping, large animals
over 10m on the terrace spy hopping, leaping, splashing, socializing,
<b>Friday October 20, 2006</b>
groups of 5-10, breaching, generally mellow a bit western and offshore than before we left, very calm!
were in groups of 5-10
<b>Monday October 23, 2006</b>
little tail splashing, grouped in pairs and rolling and sticking together very wide spread aggregation, as far as you can see - surrounded, swimming belly up, leaping, calm, cruising along slowly 22:00 surface >1 mile off
wider spread than usual, active behaviour, whole group passed, maybe feeding (lots of leaping, tailslapping, splashing of a whole group), socializing
<b>Tuesday October 24, 2006</b>
resting but more active than yesterday earlier in the morning, a lot of bowriding, spy hopping, at least 4 calves around boat just on the edge of the eastern reef, bowriding, wakeriding when we approached closer after recording
more active, bowriding
on terrace
<b>Wednesday October 25, 2006</b>
active behavior, wanted to be with boat, approached boat very quickly after sighting approach and bowride for 30-60 meters and then leave back towards reef to original location, only 3-4 would generally approach boat
hardly any acoustic activity, mostly submerged, few approach vessel, very calm, groups of 5-10 swimming together
recognized dolphin with hole in dorsal fin and also dolphin with cookie cutter on left side underneath the dorsal; end over HARP some approaching vessel, some swimming away, maybe feeding, quick drive by for location of pod maybe the one with the cookie cutter shark spot again?
little groups of 5-10 animals very far spread out, bowriding maybe smaller - terrace group? animal w/ whole in dorsal ( now called Wyatt); recording over HARP w/ few animals left

#### Abbreviations

##### Behaviour1: School Behaviour

FT=	Fast Traveling
ST=	Slow Traveling
BR=	Bow Riding
SL=	Stationary/Logging
SO=	Socializing
MI=	Milling
AS=	Associated Swimming

##### Behaviour2: Individual Behaviour

LE=	Leaping
SH=	Spyhopping
TS=	Tail Slapping

##### Behaviour3: Reaction to Vessel

AV=	Approach to Vessel
RA=	Running Away

##### Behaviour4: Spatial Distribution

AT=	Aggregation tight
AL=	Aggregation loose



Sighting No	GpsIndex	GMT Time	End Time (GMT)	Sighting Duration [min]	Recording	Palmyra Date	Palmyra Time	Latitude	Longitude
<b>Thursday October 26, 2006</b>									
37	1955	10/26/2006 7:39:11 PM	7:46:29 PM	7	No	10/26/2006	9:39:11 AM	5.864116	-162.0506
38	2031	10/26/2006 8:55:06 PM	9:12:57 PM	17	Yes	10/26/2006	10:55:06 AM	5.901417	-162.0962
39	2050	10/26/2006 9:11:26 PM	9:39:15 PM	27	Yes	10/26/2006	11:12:59 AM	5.89905	-162.1036
40	2095	10/26/2006 9:58:18 PM	10:53:56 PM	55	No	10/26/2006	11:58:18 AM	5.899233	-162.1324
41	2151	10/26/2006 10:31:18 PM	10:40:39 PM	9	No	10/26/2006	12:54:18 AM	5.869617	-162.1352
42	2204	10/26/2006 11:46:19 PM	12:19:21 AM	33	Yes	10/26/2006	1:46:19 PM	5.882417	-162.0204
43	2247	10/27/2006 12:29:19 AM	12:32:17 AM	3	No	10/26/2006	2:29:19 PM	5.890383	-162.0453
44	2263	10/27/2006 12:45:05 AM	12:50:15 AM	5	No	10/26/2006	2:45:05 PM	5.900817	-162.0694
45	2284	10/27/2006 12:55:19 AM	1:06:49 AM	11	No	10/26/2006	3:06:19 PM	5.9036	-162.09
46	2299	10/27/2006 1:20:02 AM	1:26:12 AM	6	No	10/26/2006	3:20:02 PM	5.8994	-162.1235
47	2306	10/27/2006 1:27:04 AM	1:34:32 AM	7	No	10/26/2006	3:27:04 PM	5.897433	-162.126
48	2319	10/27/2006 1:40:19 AM	1:43:22 AM	3	No	10/26/2006	3:40:19 PM	5.89545	-162.1557
<b>Friday October 27, 2006</b>									
49	2403	10/27/2006 11:35:04 PM	11:38:00 PM	3	No	10/27/2006	1:35:04 PM	5.863234	-162.0361
50	2444	10/28/2006 12:16:07 AM	1:25:41 AM	69	Yes	10/27/2006	2:16:07 PM	5.895433	-162.0532
51	2520	10/28/2006 1:31:44 AM	1:38:01 AM	7	No	10/27/2006	3:31:44 PM	5.89935	-162.1116
52	2532	10/28/2006 1:42:52 AM	1:45:03 AM	3	No	10/27/2006	3:42:52 PM	5.898833	-162.1393
53	2545	10/28/2006 1:56:12 AM	2:11:21 AM	14	Yes	10/27/2006	3:56:12 PM	5.879183	-162.1721
54	2571	10/28/2006 2:21:59 AM	2:30:15 AM	9	No	10/27/2006	4:21:59 PM	5.862633	-162.1219
<b>Monday October 30, 2006</b>									
55	2624	10/30/2006 7:30:37 PM	8:39:39 PM	69	Yes	10/30/2006	9:30:37 AM	5.865651	-162.0741
56	2729	10/30/2006 9:14:52 PM	9:19:01 PM	4	No	10/30/2006	11:14:52 AM	5.8671	-162.0061
57	2800	10/30/2006 10:24:49 PM	11:23:27 PM	55	Yes	10/30/2006	12:24:49 PM	5.899366	-162.1392
58	2880	10/30/2006 11:44:53 PM	12:17:23 AM	32	Yes	10/30/2006	1:44:53 PM	5.86325	-162.1112
59	2924	10/31/2006 12:28:04 AM	12:50:18 AM	22	Yes	10/30/2006	2:28:04 PM	5.882833	-162.1535
60	2973	10/31/2006 1:16:58 AM	1:57:50 AM	41	Yes	10/30/2006	3:16:58 PM	5.88935	-162.1669
<b>Tuesday October 31, 2006</b>									
61	3094	10/31/2006 8:02:09 PM	9:16:17 PM	74	Yes	10/31/2006	10:02:09 AM	5.8742	-162.1655
62	3247	10/31/2006 10:35:10 PM	10:38:53 PM	3	No	10/31/2006	12:35:10 PM	5.862967	-162.0385
63	3258	10/31/2006 10:46:10 PM	10:47:25 PM	1	No	10/31/2006	12:46:10 PM	5.864784	-162.0513
64	3271	10/31/2006 10:58:44 PM	11:00:53 PM	2	No	10/31/2006	12:58:44 PM	5.866951	-162.0845
<b>Thursday November 2, 2006</b>									
65	3312	11/2/2006 6:55:21 PM	7:33:02 PM	38	Yes	11/02/2006	8:55:20 AM	5.8581	-162.1113
66	3358	11/2/2006 7:41:08 PM	7:46:36 PM	5	No	11/02/2006	9:41:23 AM	5.865333	-162.0867
67	3368	11/2/2006 7:51:12 PM	8:46:53 PM	55	No	11/02/2006	9:51:23 AM	5.862516	-162.0654
68	3424	11/2/2006 8:46:58 PM	9:11:40 PM	25	Yes	11/02/2006	10:47:24 AM	5.865484	-161.9727
Resighting 67	3457	11/2/2006 9:19:59 PM	9:34:00 PM	15	No	11/02/2006	11:20:25 AM	5.871551	-161.9891
69	3499	11/2/2006 10:02:02 PM	10:08:47 PM	6	No	11/02/2006	12:02:25 PM	5.902533	-162.0936
70	3510	11/2/2006 10:13:25 PM	10:44:12 PM	31	Yes	11/02/2006	12:13:25 PM	5.89715	-162.1151
71	3557	11/2/2006 11:00:25 PM	11:03:58 PM	3	No	11/02/2006	1:00:25 PM	5.886701	-162.1692
72	3576	11/2/2006 11:19:25 PM	11:25:20 PM	6	No	11/02/2006	1:19:25 PM	5.869217	-162.1515
73	3599	11/2/2006 11:42:23 PM	11:45:18 PM	3	No	11/02/2006	1:42:25 PM	5.86355	-162.0839
74	3604	11/2/2006 11:47:25 PM	12:10:59 AM	23	Yes	11/02/2006	1:47:25 PM	5.8616	-162.0724
75	3646	11/3/2006 12:28:00 AM	12:31:09 AM	3	No	11/02/2006	2:28:26 PM	5.86045	-162.0213
76	3652	11/3/2006 12:34:19 AM	12:44:29 AM	10	No	11/02/2006	2:34:26 PM	5.867033	-162.0039
77	3708	11/3/2006 1:30:26 AM	1:41:49 AM	11	Yes	11/02/2006	3:30:26 PM	5.901717	-162.1397

Species	best	high	low	Ship Heading [deg]	Distance [m]	Juveniles	Calves Newborn	Calves Older	Behaviour1	Behaviour2	Behaviour3	Behaviour4
<b>Thursday October 26, 2006</b>												
<i>Tursiops truncatus</i> - Bottlenose Dolphins	15	20	10	107.3		Yes	No	Yes	MI		AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	20	30	15	348.1	10	Yes	No	No	ST		AV	AT
<i>Peponocephala electra</i> - Melon-headed Whales	600	700	500	111	10	Yes	Yes	Yes	ST	SH	AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	25	30	20	108.9		No	No	No	BR	LE	AV	AT
<i>Stenella longirostris</i> - Spinner Dolphins	100	150	50	126.9	200	No	No	No	ST	LE		AL
<i>Peponocephala electra</i> - Melon-headed Whales	650	800	550	279.1	10	No	No	Yes	ST	LE	AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	10	14	10	318.9	10	No	No	No	BR		AV	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	3	3	3	267.3	30	No	No	No	ST			
<i>Tursiops truncatus</i> - Bottlenose Dolphins	40	50	30	274.9		Yes	Yes	Yes	MI			AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	8	12	9	248.7		No	No	No	MI		AV	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	2	2	2	282.3	5	No	No	No	BR		AV	
<i>Tursiops truncatus</i> - Bottlenose Dolphins	7	9	5	186.2	50	No	No	No	BR		AV	AL
<b>Friday October 27, 2006</b>												
<i>Tursiops truncatus</i> - Bottlenose Dolphins	1			96.8		No	No	No	BR		AV	
<i>Peponocephala electra</i> - Melon-headed Whales	750	900	650	249.5		No	No	No	AS	LE	AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	10	15	8	260.3	20	No	No	No	BR		AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	2			260.1	20	No	No	No	BR			
<i>Tursiops truncatus</i> - Bottlenose Dolphins	12	15	12	87.4	50	No	No	No	BR		AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	30	40	20	53.4	30	No	No	Yes	BR	LE	AV	AL
<b>Monday October 30, 2006</b>												
<i>Peponocephala electra</i> - Melon-headed Whales	750	900	650	98.1		No	No	No	BR	LE	AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	50	70	30	5.2	30	No	No	No	ST	LE	AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	50	75	40	91.5	20	No	No	No	BR	LE	AV	AL
<i>Peponocephala electra</i> - Melon-headed Whales	700	900	600	303.7		No	No	No	ST	SH	AV	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	16	20	12	94.6		No	No	No	BR		AV	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	18	25	14	93.6		No	No	No	BR		AV	AL
<b>Tuesday October 31, 2006</b>												
<i>Tursiops truncatus</i> - Bottlenose Dolphins	100	150	75	85.7		No	No	No	BR	LE	AV	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	20		12	295.2		No	No	No	MI	LE	AV	
<i>Tursiops truncatus</i> - Bottlenose Dolphins	4	12	4	274.7		No	No	No	MI		AV	
<i>Tursiops truncatus</i> - Bottlenose Dolphins	5	10	5	52.9		No	No	No	MI		AV	
<b>Thursday November 2, 2006</b>												
<i>Tursiops truncatus</i> - Bottlenose Dolphins	16	25	10	80.4	10	No	No	No	BR		AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	2			106	10	No	No	No	BR		AV	
<i>Tursiops truncatus</i> - Bottlenose Dolphins	50	60	40	92.4	10	No	No	No	BR		AV	AL
Unidentified Cetacean	1			288	1000	No	No	No		LE		
<i>Tursiops truncatus</i> - Bottlenose Dolphins	150	200	100	284.2	10	Yes	No	No	BR	LE	AV	AL
<i>Peponocephala electra</i> - Melon-headed Whales	700	900	600	252.4	10	No	No	No	ST		AV	AT
<i>Stenella longirostris</i> - Spinner Dolphins	30	40	20	208.9	100	No	No	Yes	MI		RA	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	3	5	3	260.4	20	No	No	No	MI		AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	10	15	8	155.7	20	No	No	No	BR		AV	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	2			70.4		No	No	No	BR		AV	
<i>Tursiops truncatus</i> - Bottlenose Dolphins	4	4	4	102.2		Yes	No	Yes	MI			
<i>Tursiops truncatus</i> - Bottlenose Dolphins	4	4		55.8	50	No	No	No	BR		AV	
<i>Tursiops truncatus</i> - Bottlenose Dolphins	30	40	20	214.5	10	No	No	Yes	BR	LE	AV	AL
<i>Peponocephala electra</i> - Melon-headed Whales	600	700	500	237.7		No	No	No	MI	LE		AT

Further (Behavioural) Notes

Thursday October 26, 2006

one individual with very light coloration at sides, one with top of fin cut off, smaller in size - maybe locals vs. offshore?  
one bowriding most of the time  
leaping, tail slapping  
two animals (marking behind dorsal + cookie cutter) recognized from first sighting this morning at northeastern tip  
parallel to bottlenose - chased away by them? spinning, twisting, over western terrace in shallower water  
seem to be getting comfortable with the boat and even beginning to break off farther from main pod to bowride  
were not as active with bowriding, wanted to stay more where they were initially approached  
very shallow water (8m off north shore)  
probably belongs together with group sighting 44  
liked boat but always stayed near location they were first approached

Friday October 27, 2006

approached vessel for very short period of time then left, came from terrace  
active, in the water with them  
Sandy (very light coloration on sides, scar marking on left behind dorsal)

Mira (scar markings left and top behind dorsal), Bill (marking of cookie cutter shark)

Monday October 30, 2006

riding the waves, jumping back through them, starting again at the bow;

some animals were suppressed from bowriding by other more dominant ones  
some bowriding and wave surfing but not as active as encounter earlier in day

trying to bring towards harp

Tuesday October 31, 2006

hard to make estimation on #, surfing, more active, fairly tight aggregation  
did not want to bowride, wanted to stay where they were at, not very active, some jumping in the waves  
quick driveby, bowriding for only a minute  
didn't follow very long

Thursday November 2, 2006

one with strong notch on top of tail (named Notch)  
larger animals - depth sounder on recording though?

numbers combined with what was seen on the south side of the eastern terrace, lot of surfing, jumping, and bowriding  
group was a lot mellower, only a few approached vessel, most were unaffected by the vessel

resting, very few animals active, some bowriding

Sighting No	GpsIndex	GMT Time	End Time (GMT)	Sighting Duration [min]	Recording	Palmyra Date	Palmyra Time	Latitude	Longitude
<b>Friday November 3, 2006</b>									
78	3812	11/3/2006 7:47:14 PM	8:47:48 PM	60	Yes	11/03/2006	9:47:24 AM	5.863417	-162.1089
79	3888	11/3/2006 9:03:26 PM	10:35:39 PM	92	Yes	11/03/2006	11:03:24 AM	5.8611	-162.0374
80	3986	11/3/2006 10:41:22 PM	10:49:41 PM	8	No	11/03/2006	12:41:24 PM	5.861983	-162.0121
81	4008	11/3/2006 11:35:32 PM	11:58:01 PM	23	No	11/03/2006	1:35:09 PM	5.9036	-162.1131
82	4035	11/4/2006 12:20:35 AM	1:30:53 AM	10	Yes	11/03/2006	2:20:35 PM	5.8631	-162.1514
<b>Monday November 6, 2006</b>									
83	4136	11/6/2006 7:00:47 PM	7:09:08 PM	9	No	11/06/2006	9:01:16 AM	5.862383	-162.1105
84	4187	11/6/2006 7:52:17 PM	7:55:37 PM	3	No	11/06/2006	9:52:16 AM	5.873634	-161.9973
85	4198	11/6/2006 8:01:54 PM	8:21:25 PM	20	No	11/06/2006	10:02:16 AM	5.87475	-162.0047
86	4224	11/6/2006 8:28:01 PM	8:33:59 PM	6	No	11/06/2006	10:28:17 AM	5.887633	-162.0376
87	4232	11/6/2006 8:36:17 PM	8:43:05 PM	7	No	11/06/2006	10:36:17 AM	5.88925	-162.0443
88	4251	11/6/2006 8:55:04 PM	9:05:13 PM	10	No	11/06/2006	10:55:17 AM	5.9058	-162.1027
89	4266	11/6/2006 9:10:17 PM	9:12:19 PM	2	No	11/06/2006	11:10:17 AM	5.89865	-162.1449
90	4270	11/6/2006 9:14:11 PM	9:17:27 PM	3	No	11/06/2006	11:14:17 AM	5.8966	-162.1547
91	4293	11/6/2006 9:37:17 PM	9:39:02 PM	2	No	11/06/2006	11:37:17 AM	5.861617	-162.1038
<b>Random Observations</b>									
92	4299	10/21/2006 9:02:00 PM	9:05:00 PM	3	No	10/21/2006	11:02:00 AM	5.862033	-162.1429
93	4300	10/21/2006 9:55:00 PM	9:59:00 PM	4	No	10/21/2006	11:02:00 AM	5.863633	-162.1369
94	4301	10/21/2006 10:35:00 PM	10:40:00 PM	5	No	10/21/2006	12:35:00 PM	5.861784	-162.1406
95	4302	10/28/2006 10:15:00 PM	10:25:00 PM	10	No	10/28/2006	12:15:00 PM	5.86435	-162.0424
96	4303	10/29/2006 11:57:00 PM	11:59:00 PM	2	No	10/29/2006	1:57:00 PM	5.871	-162.1638
Resighting 96	4304	10/30/2006 12:13:00 AM	12:15:00 AM	2	No	10/29/2006	2:13:00 PM	5.87135	-162.1663
97	4305	11/5/2006 9:10:00 PM	9:15:00 PM	5	No	11/05/2006	11:10:00 AM	5.860667	-162.1359
98	4306	11/5/2006 9:16:00 PM	9:20:00 PM	4	No	11/05/2006	11:16:00 AM	5.861333	-162.1234

Species	best	high	low	Ship Heading [deg]	Distance [m]	Juveniles	Calves Newborn	Calves Older	Behaviour1	Behaviour2	Behaviour3	Behaviour4
<b>Friday November 3, 2006</b>												
<i>Peponocephala electra</i> - Melon-headed Whales	850	1000	750	93.7		No	No	No	MI	SH	AV	AT
<i>Stenella longirostris</i> - Spinner Dolphins	100	125	75	111.8		No	Yes	Yes	AS	LE	AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	20	30	15	37.8	50	No	No	No	BR	LE	AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	12	15	10	275.8	10	No	No	No	ST			
<i>Peponocephala electra</i> - Melon-headed Whales	900	1000	800	172.8	10	Yes	No	Yes	ST		AV	AT
<b>Monday November 6, 2006</b>												
<i>Peponocephala electra</i> - Melon-headed Whales	800	1000	700	87	10	No	No	No	BR			
<i>Tursiops truncatus</i> - Bottlenose Dolphins	5	10	4	315.8	10	No	No	No	BR		AV	AL
<i>Stenella longirostris</i> - Spinner Dolphins	50	60	40	289.8	10	No	No	No	BR		AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	12	15	10	306.8	10	Yes	Yes	Yes	BR		AV	AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	30	35	25	282.8	10	No	Yes	No	ST		AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	45	50	40	228.9	10	Yes	No	Yes	MI	LE	AV	AL
<i>Tursiops truncatus</i> - Bottlenose Dolphins	20	25	15	237.3	10	No	No	No	ST	LE		AT
<i>Tursiops truncatus</i> - Bottlenose Dolphins	15	20	10	238.9	30	No	Yes	No	ST	LE	AV	
<i>Peponocephala electra</i> - Melon-headed Whales	600	700	500	278.1	50	Yes	Yes	Yes	MI			
<b>Random Observations</b>												
<i>Tursiops truncatus</i> - Bottlenose Dolphins	9	12	6		20	No	No	No				
<i>Stenella longirostris</i> - Spinner Dolphins	20	30	15		50	No	No	No				
<i>Tursiops truncatus</i> - Bottlenose Dolphins	3	5	3		50	No	No	No				
<i>Tursiops truncatus</i> - Bottlenose Dolphins	10	15	8		20	No	No	No			AV	
<i>Tursiops truncatus</i> - Bottlenose Dolphins	15	20	15		50	No	No	No				
<i>Tursiops truncatus</i> - Bottlenose Dolphins	15	20	15		100	No	No	No				
<i>Peponocephala electra</i> - Melon-headed Whales	600	700	500		50	No	No	No				
<i>Stenella longirostris</i> - Spinner Dolphins	80	100	60		50	No	No	No	ST			

Further (Behavioural) Notes
<b>Friday November 3, 2006</b>
a few approached the vessel, most shyed away, a little bit of bowriding, very little leaping Sandy?
some bowriding at beginning, midway they broke northward jumping and spread out in a straight line, at end of recording they were traveling slowly
<b>Monday November 6, 2006</b>
3 bowriding dolphins 12m water depth; mixed w/ bottlenose (3b:2s); Wyatt, Bill, Sandy, Notch
another Bill??? 2 groups, 2nd bigger (2:1), 2nd with calves some bowriding
<b>Random Observations</b>
overcast, seastate 2, 200m water depth, during diving
during diving
during diving
during diving
while fishing; resighting 2:13 pm
while fishing
while fishing; 130m water depth
while fishing; 200m water depth



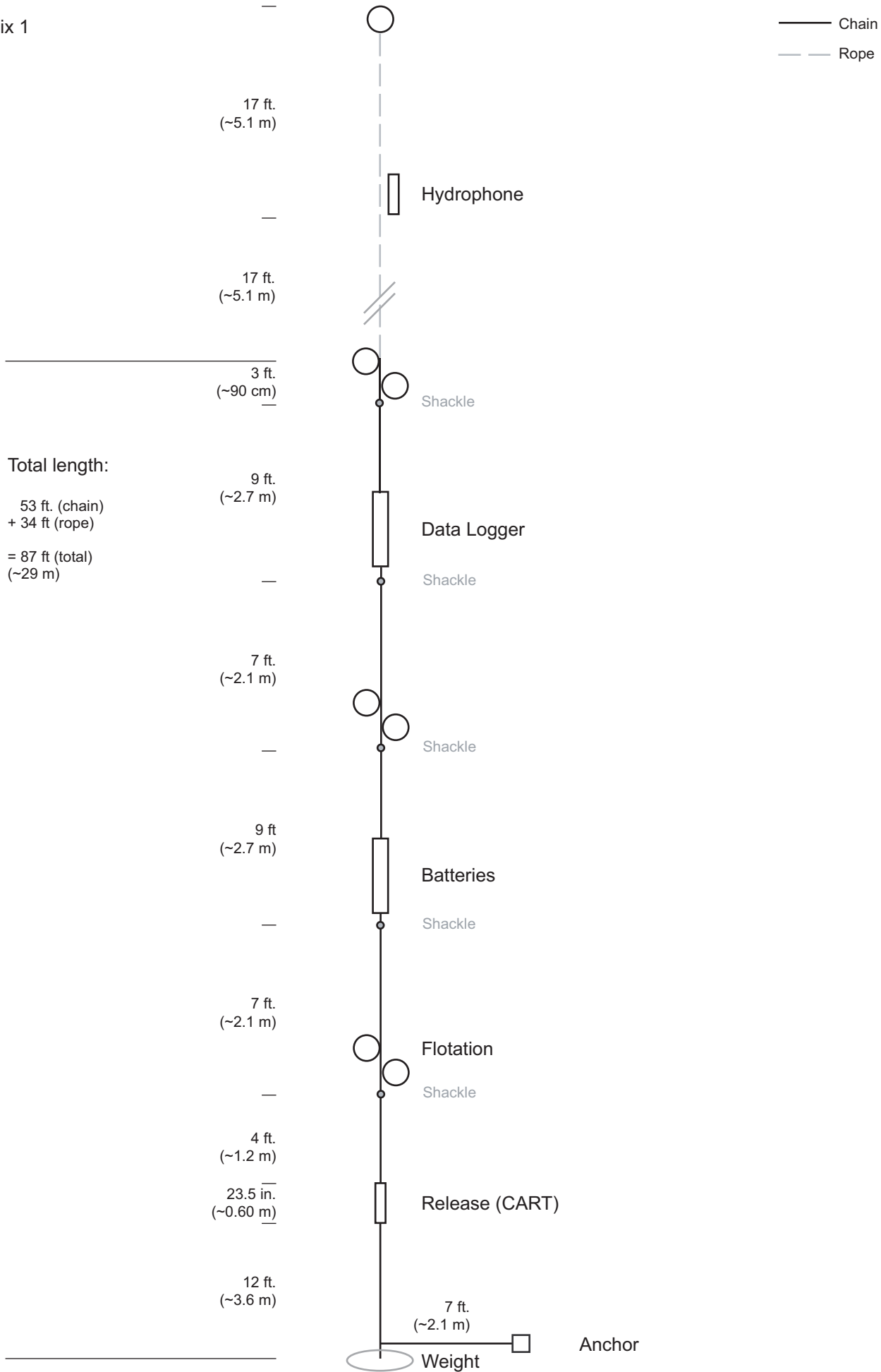
Depth	Sea State	Wave height	Swell	Weather	Cloud Cover [%]	Visibility	Notes
100	2	0.5	1	PC	50	E	
100	2	0.5	1	PC	50	E	
700	1	0.3	1	PC	30	E	
100	2	0.5	1	PC	40	E	
	1	0.3	0.5	HR	90	E	
600	2	0.5	1.5	PC	70	E	
100	1	0.3	0.5	LR	90	G	melon-headed whales
10	2	0.5	1	PC	50	E	
	2	0.5	1	PC	50	E	
400	2	0.5	1	OV	100	G	
60	2	0.3	0.5	OV	90	G	
700	1	0.2	0.5	PC	70	E	
800	1	0.2	0.5	PC	70	E	
500	2	0.2	0.5	PC	40	E	
	2	0.1	1	PC	20	E	
600	1	0.25	0.5	PC	20	E	
1250	2	0.05	1	PC	20	E	following whale
300	1	0.25	0.5	PC	30	E	
700	2	0.3	1	PC	20	E	
200	1	0.25	0.5	PC	30	E	
300	2	0.25	1	PC	40	E	
100	2	0.5	1	PC	40	E	
100	3	0.5	1	PC	40	E	spinner dolphins
700	2	0.2	1.3	PC	30	E	
50	1	0.25	1	PC	30	E	
	2	0.2	1	PC	40	E	
100	3	0.5	1	PC	80	F	
125	3	0.6	1.5	OV	90	G	north of eastern terrace
100	2	0.5	1	LR	100	F	
700	1	0.5	1	OV	100	G	
12	2	0.5	3	OV	100	G	
20	2	0.5	1	OV	100	F	
15	1	0.2	0.5	HR	100	P	
20	2	0.4	0.7	OV	90	G	
	2	0.8	1	OV	90	G	
110	3	0.5	1.5	PC	90	G	
20	2	0.5	1	PC	90	G	
500	2	0.5	1.2	PC	50	E	
300	2	0.3	0.8	OV	80	G	
100	1	0.2	0.5	PC	90	G	
350	2	0.1	1	PC	50	E	
300	2	0.6	1.5	PC	50	E	
100	3	0.3	2	PC	50	E	
60	2	0.5	1	PC	70	E	
400	3	1	1.8	PC	4	G	
500	3	1	1.8	PC	3	G	
35	4	0.5	1.5	PC	2	E	
100	2	0.2	0.5	PC	2	E	
300	3	0.5	1	PC	4	E	
300	3	0.5	1.4	PC	4	G	
20	3	0.3	1	PC	5	E	
20	3	0.5	1	PC	5	E	
15	4	0.5	2	LR	9	G	
20	3	0.5	2	OV	10	G	
20	3.5	0.8	2	OV	9	F	
20	3	0.3	1	OV	10	G	
15	4	1	3	OV	10	G	
300	3	1	2	OV	9	F	
30	3	0.3	1	PC	7	E	
200	2	0.4	0.8	PC	3	E	
500	2	0.3	1	PC	3	E	
300	1	0.1	0.4	PC	3	E	
100	1	0.2	0.5	PC	1	E	
200	2	0.3	0.8	PC	3	E	
300	1	0	0.5	PC	3	E	
30	1	0.1	0.5	PC	1	E	
250	1	0.1	0.3	PC	1	E	
150	2	0.2	0.7	PC	1	E	
300	1	0	0.3	CL	0	E	
500	2	0.4	1	CL	1	E	in upwelling waves
200	2	0.3	0.8	CL	0	E	
200	2	0.1	0.6	OV	10	E	
400	1	0.2	0.5	HR	10	P	
	2	0.1	0.7	OV	10	E	
200	1	0.1	0.2	OV	10	G	

**Abbreviations**

- Weather**  
PC Partly Cloudy  
HR Heavy Rain  
LR Light Rain  
OV Overcast
- Visibility**  
E Excellent  
G Good  
F Fair  
P Poor



Appendix 1



— Chain  
- - - Rope

17 ft.  
(~5.1 m)

Hydrophone

17 ft.  
(~5.1 m)

3 ft.  
(~90 cm)

Shackle

Total length:

53 ft. (chain)  
+ 34 ft (rope)  
= 87 ft (total)  
(~29 m)

9 ft.  
(~2.7 m)

Data Logger

Shackle

7 ft.  
(~2.1 m)

Shackle

9 ft.  
(~2.7 m)

Batteries

Shackle

7 ft.  
(~2.1 m)

Flotation

Shackle

4 ft.  
(~1.2 m)

Release (CART)

23.5 in.  
(~0.60 m)

12 ft.  
(~3.6 m)

7 ft.  
(~2.1 m)

Weight

Anchor