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Aerial Survey Marine Mammal Monitoring off Southern California in Conjunction with US Navy Major Training Events (MTE)

# SOCAL July & September 2010

Final Report

Prepared for:	Commander, Pacific Fleet, Pearl Harbor, HI								
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29333 SE 64<sup>th</sup> St., Issaquah, WA 98027 www.smultea.com

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Mari A. Smultea<sup>1</sup>, Cathy Bacon<sup>2</sup> and Jenelle S. Black<sup>3</sup>

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## <sup>1</sup>msmultea@gmail.com

<sup>3</sup> jblacksciencesvcs@yahoo.com

Cover Photos (from top to bottom): a minke whale (*Balaenoptera acutorostrata*), two lunge-feeding sei/Bryde's whales (*B. borealis/edeni*), and a Bryde's whale (*B. edeni*) photographed with a telephoto lens from the Partenavia fixed-wing aircraft during the SOCAL September 2010 aerial monitoring survey. Photos by Bernd Würsig under NMFS Permit 15369.

<sup>&</sup>lt;sup>2</sup> cathyebacon@gmail.com

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# Section 1 Introduction

Per the Scope of Work (SOW), this report provides a combined summary of aerial surveys conducted in July and September 2010 in support of the U.S. Navy's (Navy) Marine Mammal Monitoring Plan (M3P) in the Southern California Range Complex (SOCAL) (DoN 2009). These were the seventh and eighth such aerial surveys in SOCAL conducted by SES or SES/Marine Mammal Research Consultants (MMRC). Monitoring occurred before, during, after and in conjunction with several Navy Major Training Events (MTEs) involving mid-frequency-active sonar (MFAS).

Protocol was the same as that implemented for aerial surveys in SOCAL in November 2009 (Smultea and Lomac-MacNair 2010) and May 2010 (Smultea et al. 2010). The survey purpose was to obtain baseline data and monitor for potential effects of MTEs on marine mammals (see Smultea et al. 2009a,b, Smultea and Lomac-MacNair 2010). However, for the first time during the July 2010 survey, a helicopter (Bell 206) was used for part of the survey to assess the feasibility and utility of this platform to address survey goals, particularly collecting behavioral data using focal follow techniques by circling sightings for extended periods and obtaining video (see Methods below).

# Section 2 Methods

Methods followed those used in previous SOCAL aerial surveys as described in Smultea et al. (2009a,b, 2010a,b. Differences from previous methods are identified below.

Two aircraft were used for the July survey: (1) a fixed-wing, twin-engine Partenavia P-68 OBS Observer with a glass nose (the same one used on our previous SOCAL surveys), and (2) a Bell 206 helicopter (front cover) (both owned and operated by Aspen Helicopters, Oxnard, California). The helicopter was used evaluate its utility for conducting focal observations given its advantages of larger and multiple-opening windows and the ability to circle at a slower speed around focal groups. During the September survey, the Partenavia Observer was the only aircraft used.

The only opening window in the Partenavia was a small (approximately 4-inch diameter) flip-up circular window in the right front seat where the recorder/videographer/photographer sat. Two observers sat in the two middle seats of the plane and looked through bubble windows (that did not open). In the helicopter, 12 by 12 inch sliding windows opened in the rear two seats where two observers sat, and an approximately 6 by 12 inch sliding window opened in the front left seat where the recorder/photographer sat. In the helicopter, the pilot sat in the right front seat while the survey recorder/photographer sat in the left rear seat.

A Sony HD HDR-XR550 12.0 megapixels video camera with a 10x zoom lens, internal image stabilization, and a 1.4 power converter lens were used to video focal follow groups. The video camera was mounted on a 30-cm telescoping chest pod to improve stabilization. (A Canon HD video camera was used during the five aerial surveys prior to May 2010).

Prior to the September 2010 survey, SES communicated with the Navy NTR and Dr. Brandon Southall of Southall Environmental Associates to identify ways in which the aircraft crew could assist the SOCAL Behavioral Response Study (BRS). Plans were made to contact the BRS group via email or cell phone each evening to learn the proposed location of the BRS survey vessels the following day, and to identify how efforts could be coordinated. Each morning, the survey aircraft would contact the BRS vessel when within range (~20 km or 10 nm) of the pre-communicated study area and identify how/if the aircraft crew could aid the BRS. The latter generally consisted of identifying and communicating the locations of cetaceans within their study area, and/or assisting them in relocating sightings.



Figure 1. Location of the aerial survey monitoring area and underwater topographic features within the Navy's Southern California Range Complex (SOCAL). Numbers indicate survey areas of interest to the Navy in order of priority; orange line designates the SOCAL boundary; blue lines designate the Southern California Offshore Anti-submarine Warfare Range (SOAR); icons are approximate locations of Navy-funded bottom-mounted passive- acoustic high-frequency acoustic recording packages (HARPs).

# Section 3 Results

This section follows the format of the Nov 2009 and May 2010 SOCAL aerial survey monitoring reports (Smultea et al. 2010a,b). The exception is that sighting encounter rates for the May, July and September SOCAL aerial surveys are included herein, per the SOWs. Results are summarized in Tables 1 - 10, Figures 2 - 10, and Appendices A - E. Unlike previous reports, Tables 1 and 2 indicate aerial survey days when MTES-associated MFAS were operating in SOCAL. This activity occurred on five of the seven July 2010 survey days, including the first survey date of July 27. During the September survey, MTES-associated MFAS were operating on only two days.

### Effort

#### 27 July – 3 August 2010

A total of 18.1 hr of flight time and 3125 km (1688 nm) of effort occurred during the July 2010 SOCAL aerial survey between aircraft "wheels up" off the ground to "wheels down" when the plane landed (Table 1 and Table 3). Surveys were flown on seven days from July 27 to August 3; no survey occurred on August 31 due to aircraft mechanical repair needs. Most (74% of 14.3 hr) effort occurred with the fixed-wing aircraft on four days (July 29-31, August 2-3). The remaining 26% (5.1 hr) occurred from the helicopter on the first two survey days (July 27-28). Overall, most (50%) of the total 3125 km of effort involved circling sightings for focal follows and/or species identification. This was followed by transit (21%) and systematic line-transect (19%) (Table 4). Beaufort sea state rating (Bf) ranged from 2-6 during the July survey. Bf 3 predominated (16%) followed by Bf 2 (12%) (Figure 2). July and August 2010 had an unusually high number of days with a heavy low marine fog layer over the SOCAL. During the survey period, heavy fog typically persisted through the morning until early afternoon and returned in early evening. Even in the middle of the day, when the marine layer sometimes lifted, the ceiling was low (approximately 1000-2000 ft).

Effort occurred in SOAR west of San Clemente Island only on July 30 and was limited to the two northernmost survey lines due to low clouds and to avoid airspace conflicts with Navy activities as directed by Navy personnel (Table 1, Table 4). Remaining effort occurred in NAOPA. Helicopter effort occurred in coastal areas usually within ~15 km of the coastline and ~60 km from San Diego. Helicopter effort was focused there because the range of this aircraft with four personnel onboard was about 2.7 hr, and the hourly cost to operate it was about 2.5 times higher than the cost of the Partenavia fixed-wing plane.

#### 24 – 28 September 2010

A total of 28.6 hr of flight time and 5314 km (2871 nm) of effort occurred during the September 2010 SOCAL aerial survey ("wheels up" to "wheels down") (Table 2 and Table 4). Surveys were flown on six days from September 23 - 28. Overall, most (44%) of the total 5314 km of effort involved transiting between the airport and survey grid locations. This was followed by systematic line-transect (27%) and circling effort (26%) (Table 4). Beaufort sea state ranged from 1-5 during the September survey. Bf 2 predominated (53%) followed by Bf 3 (31%) (Figure 3).

Effort occurred in SOAR on four days with the remaining two days occurring in NAOPA (September 26 and 27). Effort was coordinated with the BRS study on 26-28 September and included conducting mini-transects on the NW corner of SOAR to help the BRS locate sightings (see Table 2 for details).

### Sightings

#### July 2010

A total of 86 sightings of ~11,090 individual marine mammals were observed in July 2010 (Table 5). Of the total 86 sightings, 78% were identified to species (n = 27) or genus (n = 40 common dolphin sp.). Not all sightings were identified to species because there was not always time to fly off course to identify and circle sightings. Rather, the priorities were to conduct focal follows on priority species and/or to reach and conduct a full survey in SOAR which required a full tank of fuel to complete (i.e., there was not enough fuel to circle species seen en route to or from the airport and SOAR).

Seven different marine mammal species were identified. Sightings included two baleen whale species (blue and fin whales), four dolphin species (bottlenose, short- and long-beaked common, Risso's), and one pinniped species (California sea lion). Overall, the common dolphin was the most frequently identified species genus (47% or 40 of 86 total groups) followed by the blue whale (21% or 18 groups). In terms of number of individuals seen, the common dolphin was also the most abundant (n = ~9354 or 84% of the total ~11,090 individuals seen).

#### September 2010

A total of 252 sightings of ~37, 874 individual marine mammals were observed in September 2010 (Table 6). Of the total 252 sightings, 35% were identified to species (n = 89) or genus (n = 124 common dolphin sp.). Not all sightings were identified to species as described above.

Nine different marine mammal species were identified. Sightings included three baleen whale species (Bryde's, minke and possibly sei whales), three dolphin species (long-beaked common, bottlenose and Risso's), and two pinniped species (California sea lion and northern elephant seal). Overall, the common dolphin was the most frequently identified species genus (49% or 124 of 252 total groups) followed by the California sea lion (28% or 71 groups). In terms of number of individuals seen, the common dolphin was also the most abundant ( $n = \sim$ 34,127 or 90% of the total ~37, 874 individuals seen).



Figure 2. All track lines and sightings made during aerial monitoring surveys in SOCAL July 27 – August 3, 2010.



Figure 3. All track lines and sightings made during aerial monitoring surveys in SOCAL September 23 – 28, 2010.

Date 2010	Flight	Platform	Location	Time Lift Off	Time Landed	Total Flight Time	Total "On Effort" Observ	MTE- assoc. MFAS?	Survey Notes	
27-Jul	1	Helicopter Bell 206	Coastal NAOPA	14:01	16:35	2:34	1:20	Yes	Assessing effectiveness of helicopter as platform for focal behavioral observations with Bernd Würsig. Flew <3 nm from coast. Heavy morning fog/low clouds. Ceilings 1400-1600 ft, fog/heavy overcast. Conducted focal near San Diego on feeding blue and fin whales, observed frequent defecation.	
28-Jul	1	Helicopter Bell 206	Coastal NAOPA	13:37	16:08	2:31	1:36	No	Assessing effectiveness of helicopter as platform for focal behavioral observations with Bernd Würsig. Flew <15 km from coast south to Mexican border. Heavy fog/low clouds in morning delayed departure to afternoon when ceiling was 1400-1500 ft/heavy overcast. Conducted focal on feeding blue and fin whales again in same area as yesterday.	
29-Jul	1	Partenavia OBS	NAOPA (SOAR fogged in)	14:29	16:39	2:11	0:30	Yes	Flew Partenavia Observer. Heavy fog/low clouds delayed departure until afternoon. Conducted focal on feeding blue and fin whales again in same area as yesterday.	
30-Jul	1	Partenavia OBS	N SOAR	13:45	16:05	2:20	1:11	No	N SOAR range open, flew over cloud cover to San Clemente then dropped and flew two N SOAR lines, flew over cloud cover return trip.	
31-Jul	1	Partenavia OBS	S NAOPA (SOAR fogged in)	14:27	18:27	4:00	3:22	Yes	Heavy fog/low clouds delayed departure until afternoon. Focal on blue whales in NAOPA; SOAR fogged in/ inaccessible.	
1-Aug	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No flight. Aircraft grounded due to mechanical issues	
2-Aug	1	Partenavia OBS	Central NAOPA	14:45	17:52	3:07	2:37	Yes	Mechanic fixed plane by 1 pm. Flew N NAOPA lines. Focal on blue whales.	
3-Aug	1	Partenavia OBS	N NAOPA	15:27	18:07	2:40	1:40	Yes	Extra unscheduled survey day in NAOPA. Heavy fog/low clo delayed departure until afternoon. Low clouds all day limited ability to do an effective focal.	
Totals						19:23	12:16			

Table 1. Aerial survey flight times, total hours (hh:mm) by date, and survey area during the July 2010 SOCAL aerial survey.

Date 2010	Flight	Platform	Location	Time Lift Off	Time Landed	Total Flight Time	Total "On Effort" Observ	MTE- assoc. MFAS?	Survey Notes
23-Sep	0	Partenavia OBS	n/a	14:10	14:12	0:02	n/a	n/a	Upon take-off pilot decided to land again to redistribute weight in plane.
23-Sep	1	Partenavia OBS	S NAOPA	14:20	17:33	3:13	3:06	Yes	Completed 4 southernmost NAOPA lines, relatively few sightings compared to previous surveys.
24-Sep	1	Partenavia OBS	N SOAR	11:42	14:57	3:15	3:10	No	First survey flight flew straight to N SOAR did 4 N legs at SOAR then flew back; fog near shore on way in morning, no observing until partway through transit. Focal on blue whale and common dolphins. Saw many bait balls today and N elephant seal and common dolphins feeding on bait balls.
24-Sep	2	Partenavia OBS	Coastal NAOPA	16:05	17:41	1:36	1:46	No	Flew N about 10 nm from shore, hit Bf 5, then turned back and headed S about 5 nm offshore and went in. Saw many feeding common dolphins and bait balls.
25-Sep	1	Partenavia OBS	NE SOAR	10:19	13:37	3:18	3:13	No	Headed straight out to T2 in NE SOAR where BRS vessel was this morning; did not circle any groups on way out to save fuel for coordination with BRS and to maximize time on SOAR. Flew 4 northernmost SOAR transect lines. Bf 2 most of day. Unusually high number of common dolphins seen feeding, also bait balls seen.
26-Sep	1	Partenavia OBS	N SOAR	10:35	14:18	3:43	3:36	No	Flew straight to N SOAR since BRS vessel restricted to N SOAR. Communications with BRS requested that we help them relocate Cuvier's beaked whales. We circled at 1+ km from BRS' Cascadia tag boat looking for Cuvier's with them. Then we flew mini N-S transect lines in NW SOAR to look for other sightings that we reported to BRS vessel which was still busy with Cuvier's.
26-Sep	2	Partenavia OBS	Coastal NAOPA	15:24	17:25	2:01	1:54	No	Headed N parallel to shore by about 8 nm, did focals on unusual synchronized foraging behavior by common dolphins seen frequently only this survey period. Flew 2 NAOPA lines
27-Sep	1	Partenavia OBS	N SOAR	9:38	13:34	3:56	3:49	Yes	Flew straight over to N SOAR Line 1 flew this line E to W then talked to BRS and they asked us to help them find whales just N of SOAR Range in NW corner and to locate a beaked whale so we flew there and flew improvised systematic lines 1 nm apart paralleling SOAR lines and 3 nm long; saw 3 minkes and BRS had seen 2 minkes earlier this morning. Did focals on 2 groups of Risso's before and after seeing BRS vessel may have been same group check photos. VERY HOT in plane today, 95 degrees. Focal on Risso's dolphins and minke whales.
27-Sep	2	Partenavia OBS	W NAOPA	14:37	16:32	1:55	1:48	Yes	Headed W on NAOPA Line 4 to SCI then headed N along underwater drop off to try and locate sightings for BRS since they can't be on SOAR tomorrow. Focal on common dolphins.

Table 2. Aerial survey flight times, total hours (hh:mm) by date, and survey area during the September 2010 SOCAL aerial survey.

Date 2010	Flight	Platform	Location	Time Lift Off	Time Landed	Total Flight Time	Total "On Effort" Observ	MTE- assoc. MFAS?	Survey Notes
28-Sep	1	Partenavia OBS	Coastal NAOPA	8:44	11:02	2:18	2:11	No	Headed N with goal to meet BRS in SC Basin and help them locate animals; however, airspace ended up being restricted so could not meet them to the W. Refueled at Oxnard.
28-Sep	2	Partenavia OBS	N NAOPA	11:55	15:14	3:19	3:12	No	Took off from Oxnard airport and did two lines in NAOPA; did focal on 3 sei/Bryde's whales lunge feeding (unusual sighting and behavior).
Totals						28:34	27:45		

Leg Type	Leg Type Definition					
Systematic	Pre-determined line-transect legs located in SOAR, NAOPA and FLETA HOT					
Random	Short lines connecting longer systematic lines					
Transiting	lying between the airport and the survey grid locations					
Navy-Directed Transiting	Flying off intended course as directed by Navy during a survey to avoid Navy activities					
Circling	Flying clockwise circles around sightings to verify species and group size via photography and/or to conduct focal behavioral sessions with videography as possible					
Circumnavigating Coast	Flying parallel to SCI coastline approximately 0.5 km offshore to search for potential strandings					
Fog Effort	Transiting above fog layer with limited or no visibility to water					

Table 3. Definitions of leg types flown during the July and September 2010 aerial surveys.

Table 4.	Summary of	of aerial survey	effort (km	and nm) by	leg type	during the	July and Se	ptember 2010 s	urveys.1/
						··· ㅋ··.			

		July 2010		September 2010			
Leg Type	Total km flown	Total nm Flown	Total hrs Flown	Total km Flown	Total nm Flown	Total hrs Flown	
Systematic	592	320	3	1428	771	7.5	
Random	111	60	0.5 164		89	1	
Transiting	654	353	3.8	2345	1267	10.6	
Navy-Directed Transiting	0	0	0	0	0	0	
Circling	1549	836	10	1377	744	7.9	
Circumnavigating Coast	0	0	0	0	0	0	
Fog Effort	220	119	0.9	0	0	0	
TOTAL	3125	1688	18.1	5314	2871	27.0	

<sup>1/</sup> Excludes flying over land t o and from airport to water's edge.

Table 5.	Summary of marin	e mammal sight	ings by specie	s during the	July SOCAL	2010 aerial	surveys.	Sightings
organized	l in order of frequen	cy observed start	ing with those	seen most con	mmonly.			

Species (Common Name)	Scientific Name	Total No. of Sightings	Total Estimated No. Individuals
Common Dolphin sp.	Delphinus sp.	40	9,354
Blue Whale	Balaenoptera musculus	18	44
Unidentified Dolphin	Delphinidae sp.	17	1,392
Fin Whale	Balaenoptera physalus	4	7
Common Bottlenose Dolphin	Tursiops truncatus	3	62
Unidentified Small Dolphin	Delphinidae sp.	2	220
California Sea Lion	Zalophus californianus	1	2
Risso's Dolphin	Grampus griseus	1	9
Totals		86	11,090

Table 6. Summary of marine mammal sightings by species during the September SOCAL 2010 aerial surveys.

Species Identification	Scientific Name	Total No. of Sightings	Total Estimated No. Individuals
Common Dolphin sp.	Delphinus sp.	124	34,136
California Sea Lion	Zalophus californianus	71	194
Unidentified Dolphin	Delphinidae sp.	32	3,380
Risso's Dolphin	Grampus griseus	6	74
Common Bottlenose Dolphin	Tursiops truncatus	4	48
Northern Elephant Seal	Mirounga angustirostris	3	22
Unidentified Marine Mammal	Cetacea or Pinnipedia	2	9
Unidentified Baleen Whale	Balaenoptera sp.	2	2
Unidentified Medium Marine Mammal	Cetacea or Pinnipedia	2	1
Long-beaked Common Dolphin	Delphinus capensis	1	9
Minke Whale	Balaenoptera acutorostrata	1	3
Bryde's/Sei Whale	Balaenoptera borealis/ edeni	1	3
Cuvier's Beaked Whale	Ziphius cavirostris	1	2
Bryde's Whale	Balaenoptera brydei/edeni	1	1
Unidentified Small Marine Mammal	Cetacea or Pinnipedia	1	1
Totals		252	37,874

## Sighting Encounter Rates

Sighting encounter rates are tabulated in several tables, due to their large sizes. Tables B-1 and B-2 compare sighting rates based on combined systematic, random and transit effort (i.e., point-to-point linear effort) during the November 2009 and May and July 2010 SOCAL aerial surveys. (See Smultea and Lomac-MacNair 2010 for other results of the November 2009 SOCAL aerial survey.) Sighting rates based on the number of *groups* sighted per km, per nm and per hour (i.e., number of sightings) are shown separately in Table B-1; the number of *individuals* sighted per unit effort is displayed in Table B-2. Sighting rates by survey effort type are provided in Tables B-3 and B-4, respectively. (See Table 3 for definitions and total km and nm of effort types.) Sighting rates were similar across systematic effort for the three survey months, but differed for transit and random effort.

The overall numbers of sightings per unit effort were similar across November, May and July. However, the sighting rate based on number of individuals was about three times higher in November than May and twice as high in July as May. September was roughly 3 times higher than July and more than 7 times higher than May.

# Table 7. Notable differences in the seasonal sighting encounter rates of marine mammal species during the May, July and September 2010 aerial surveys in SOCAL.

#### Species and Description

During July 2010 only, sighting rates were highest for common dolphins and blue whales based on both number of groups and individuals per km and hr. Other species were seen at considerably lower sighting rates due to fewer sightings per unit effort.

Sighting rates of Risso's dolphins were remarkably higher in May than in November and July, with May being the highest (n=432).

Sighting rates for individual common dolphins were roughly three times higher in July and November vs. May. In September, sighting rates for common dolphins were almost four times higher than July.

Blue whale sighting rates were also highest in July, were considerably lower for May and were absent during the September survey.

Pacific white-sided dolphins and California sea lions were absent or virtually absent in July as expected (Carretta et al. 2000).

Bottlenose dolphins were not seen in November.

Fin whale sighting rates were similar across May and July but none were seen in September survey.

Minke whales were last sighted in July 2009 and November, each with one sighting. Sightings for September were three individuals.

Bryde's whales were only seen during two of the eight surveys, October 2008 and September, each with one individual sighting. A sei/Bryde's whale sighting (n=3 individuals in one group) only occurred in September; two other surveys, November 2008 and July 2009, had possible fin or sei sightings.

Sightings rates for California sea lions in September were roughly 100 times higher than July due to the fact that they were absent or virtually absent in July.

Northern elephant seals were absent in all surveys except one individual sighting in November 2008 and September. Sighting rates for individual Northern elephant seals for September were roughly 20 times greater than the single sighting in November 2008.

In July, overall sighting rates were about two to four times higher during transit vs. random and systematic effort. This was believed to have been an artifact of flying over a known area of marine mammal concentration near San Diego and La Jolla every day en route to and from Montgomery Airport. In contrast, systematic and random effort included large areas where we have found marine mammal densities to be relatively low.

In September, overall marine mammal sighting rates were about two to three times higher during transit vs. random and systematic effort. Systematic effort for September 2010 was much higher than those of the three other survey months. During random effort, individual sighting rates were five to seven times lower during May vs. November, July and September, most evidently for dolphins. For transit effort, individual sighting rates were at least five times higher during July and September vs. May and November. There was less difference across survey months for group sighting rates. See Smultea et al. (2010) for further discussion of sighting rates during SCI circumnavigation effort, this effort type did not occur in September 2010.

### Distribution

#### July Effort Distribution

In July 2010, three (July 27-29) of the seven survey days were dedicated to opportunistic focal observations and did not entail systematic search effort (see Table 3). The remaining four days were line-transect survey effort: three days in NAOPA and one day in SOAR. Although access to SOAR was permitted by the Navy on two days from 10:00-15:00, fog precluded this effort except for the afternoon of July 30th on the two northernmost lines of SOAR. NAOPA and SOAR transect lines were the same as those followed in November 2009 and May 2010 (Smultea and Lomac-MacNair 2010, Smultea et al. 2010).

#### July Sighting Distribution

Relatively high numbers of blue whales (n = 18 sightings) were seen during July 2010, similar to the July 2009 survey (see Smultea et al. 2009b). On five of seven survey days 3-6 blue whales were consistently seen in the same small area ~5 km (~2 nm) west of La Jolla near a large buoy (Figure 2 and Figure 4, Appendix A). This apparent concentration may be partially biased because we flew over this area every day en route to and from Montgomery Airport. However, 92% of all blue whale groups were seen within 15 km (8 nm) of the mainland coast, despite considerable effort further offshore, indicating that blue whales prefer coastal SOCAL waters. All four fin whale sightings were within 10 km (5 nm) of the mainland near San Diego. Blue and fin whales were also observed in this coastal area during previous surveys (see Smultea et al. 2009a,b, Smultea and Lomac-MacNair 2010, Smultea et al. 2010). The location coincides with the drop-off of the coastal underwater shelf topography.

Dolphin distribution was concentrated in coastal areas: 80% of 40 common dolphins, 86% of 19 unidentified dolphin, and 100% of 3 common bottlenose dolphin groups were within 20 km (10 nm) of the mainland (Figure 7). (Notably, most of the unidentified dolphins are believed to have been common dolphins based on relatively large group sizes and frequent surface-active behavior we have found to be characteristic of this species per other surveys). However, this observed distribution was partially biased by concentrated effort near San Diego while en route to and from the airport and during opportunistic focal follows on blue and fin whales. Only 11 (17%) of the total 63 dolphin groups were seen over 20 km from shore despite considerable line-transect effort farther offshore. Although only one Risso's dolphin group was seen (just north of SCI), it was the farthest offshore sighting. Similarly, an apparent inshore-common-dolphin and offshore-Risso's-dolphin distributional segregation was seen during May 2010 (see Smultea et al. 2010). In general, similar to May 2010 (Smultea et al. 2010), common and unidentified dolphins were fairly evenly distributed along the mainland coastline and did not appear to be strongly associated with any bathymetric features except the continental shelf. Further examination of photos may allow differentiation of short- and long-beaked dolphins and potential associated differences in distribution. No dolphins were seen along the two northernmost survey lines in SOAR.

Only one pinniped sighting, a California sea lion, was seen during the July 2010 survey and occurred close to the San Diego coast (Figure 6). This was the fewest pinniped sightings made during any of the total seven SOCAL aerial surveys we have done (see Smultea et al. 2009a, b, Smultea and Lomac-MacNair 2010, Smultea et al. 2010). This is

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attributed to very little effort near SCI where they are known to concentrate, and to the late summer season when their numbers in SOCAL are reduced as many individuals have migrated farther north to feed (Jefferson et al. 2008, DoN 2009).

#### September Effort Distribution

In September 2010, four (September 24, 26-28) of the six survey days were dedicated to opportunistic focal observations and did not entail systematic search effort. The remaining two days were line-transect survey effort: one day in NAOPA and one day in SOAR. NAOPA and SOAR transect lines were the same as those followed in November 2009, May 2010 and July 2010 (Smultea and Lomac-MacNair 2010, Smultea et al. 2010).

#### September Sighting Distribution

Relatively few whales were seen during September 2010 (n = 6 sightings), similar to the May 2010 survey. The two Cuvier's beaked whales, one Bryde's whale, and three minke whales were seen in the far northwestern corner of SOAR (Figure 8); in comparison, during October 2008, November 2008 and May 2010, whales (mostly baleen whales) were seen relatively frequently in this small area, but appeared to concentrate between SW SCI and Tanner Bank to the west (see Smultea et al. 2009a, Smultea et al. 2010). In November 2008, another small concentration of whale sightings occurred ~20 km NW of San Diego directly W of Montgomery Field where the survey aircraft crossed nearly daily during transits to survey areas. This area encompassed the La Jolla and Scripps canyons; in contrast, only one whale was seen here in October 2008 and three whales in September 2010 (Smultea et al. 2009a). Blue whales were not seen during the September survey.

Dolphin distribution was not concentrated in coastal areas like it was during the July 2010 survey. Common dolphins were concentrated in coastal areas but also seen on transect lines heading out to SOAR (Figure 10). Forty-two percent of 125 common dolphins, 86% of 32 unidentified dolphin, and 50% of 4 common bottlenose dolphin groups were within 20 km (10 nm) of the mainland (Figure 10). Only 11 (17%) of the total 167 dolphin groups were seen over 20 km from shore despite considerable line-transect effort farther offshore. Dolphin sightings during September were more evenly distributed throughout the SOCAL range compared to July. Only one group of Risso's dolphin was seen in July (n = 9) compared to the six groups seen in September (n = 74) and these sightings mainly occurred within the SOAR range.

High numbers of California sea lions (n = 71 sightings) were seen during the September 2010 survey and occurred west of San Clemente Island within the SOAR range (Figure 9). This was the highest number of pinniped sightings made during any of the eight SOCAL aerial surveys we have done (see Smultea et al. 2009a, b, Smultea and Lomac-MacNair 2010, Smultea et al. 2010).



Figure 4. Whale sightings made during aerial survey monitoring in the SOCAL survey area July 27 – August 3, 2010.



Figure 5. Dolphin sightings made during aerial survey monitoring in the SOCAL survey area July 27 – August 3, 2010.



Figure 6. Whale and unidentified marine mammal sightings made during aerial survey monitoring in the SOCAL survey area September 23-28, 2010.



Figure 7. Pinniped sightings made during aerial survey monitoring in the SOCAL survey area September 23-28, 2010.



Figure 8. Dolphin sightings made during aerial survey monitoring in the SOCAL survey area September 23-28, 2010.

### General Behavior

Common dolphins and blue whales had sample sizes considered large enough (n = 40 and 18, respectively) to warrant summarizing initially observed behavior state, heading, and estimated mean dispersal distance between individuals. Common dolphins were most frequently observed in surface-active behavior states and travel (6, top panel). This behavior is consistent with that observed during our past six aerial surveys (Smultea et al. 2009a,b, Smultea and Lomac-MacNair 2010, Smultea et al. 2010). Travel speed was predominantly medium to fast. Common dolphins were most frequently observed headed southwest to west; this was the same predominant heading observed for common dolphins during June and July 2009 (Smultea et al. 2009). Inter-individual spacing (i.e., dispersal) for common dolphins was nearly always 1-3 body lengths (97% of 38 groups), consistent with our past six aerial surveys.

### Focal Follows

Focal follow effort was emphasized more during the July and September 2010 aerial surveys compared to previous aerial surveys which more equally distributed line-transect and focal-follow effort. This shift in study focus resulted from a shift in the Navy's Statement of Work to concentrate on collecting baseline behavioral data relative to the need per the M3P to assess potential effects of MFAS exposure on marine mammals and sea turtles (DoN 2009). The shift was also related to increased interest by NMFS in the latter topic.

As during previous surveys since summer 2009, the goal was to conduct focal follows with video for at least 10 min with Risso's dolphins and up to 60 min with ESA-listed whales such as blue and fin whales. Shorter focal follows involving circling of animals to photo-verify species occurred for 5-9 min.

A total of 19 focal follows at least 5 min long totaling 553 minutes (9 hr 13 min) occurred during the July 2010 survey Five (26%) of the 19 focals occurred from the helicopter and totaled 194 min (3 hr 14 min). The remaining 74% (n = 14) occurred from the airplane and totaled 359 minutes (5 hr 59 min). Most (68%) of the total 19 focals were at least 10 min long.

During the July 2010 survey, all nine of the blue whale focals were over 10 min long and four were over 1 hour long. Video was taken on eight of the nine blue whale focal groups. In addition to common dolphin sp., focal follows occurred with Risso's dolphins, two minke whale groups, sei whales, large groups of California sea lions, and two unidentified baleen whales. Only eight of 17 common dolphin focals lasted over 10 min, six of which included video; the remaining seven common dolphin focals involved only circling of the group to verify species by taking photos. However, further preliminary detail on observed behaviors is provided in the Appendices and in the description below.

During the September 2010 survey, a total of 16 focal follows at least 5 min long totaling 274 minutes (4 hr 34 min) was conducted. Most (56%) of the total 16 focals were at least 10 min long. Over half (56% or 9) of the 17 focals were common dolphin sp. Focal sessions occurred more frequently with common dolphins than during previous surveys because they engaged in synchronized swimming and foraging behaviors in groups of twos and threes, and this behavior had not previously been seen; unusually high numbers of bait balls were also seen during the surveys.

### Unusual Observations

Summarized below are unusual encounters and associated made during the July and September surveys. These encounters are included because they are considered rare based on previous efforts, and/or there are few if any available data or literature on such observations. Notably, the prolonged overhead view from the helicopter circling overhead outside the predicted Snell's Cone sound radius of the aircraft allowed a "bird's eye view" of the animals both above and below the surface without affecting their behavior in a noticeable manner. In particular, videotaping from the helicopter allowed us to keep the animals within view for longer periods than from the airplane given that the helicopter can circle safely at slower speeds. The animals were circled at a radial distance of approximately 1 km and an altitude of 1200-1500 ft.

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Date in 2010	Species	Description
27 July	Blue Whale Mother and Calf #1	A mother and calf (young-of-the-year) blue whale pair was circled from 15:24-16:24. We have rarely seen blue whale calves during our seven SOCAL aerial surveys. Video was taken on this pair from 15:51-16:24. The interesting aspect of this encounter was that the calf appeared to be nursing from the mother based on review of the video. After a series of surfacings and blows, the calf dove below the mother who was at the time visible below the water surface. The pair appeared to rest/float just below the water surface for a short period with the calf oriented towards the mother's ventral surface as the mother appeared to roll on her side.
28 July	Blue-Fin Whale Interaction	We circled a loose grouping of blue and fin whales, and gathered data on surfacing/respiration and inter-individual spacing (i.e., dispersal) parameters of traveling blue whales, yet to be analyzed. Our last behavioral description/video sequence of the day was for a scene of 8 min 24 sec in the afternoon from 15:45:54 – 15:54:18. Observations were hampered a bit by glare and thus the inability to stay with focal animals in parts of the circles around them. There were three blue and three fin whales. At least five of them, probably all six with one underwater, were as close as one whale body length (BL) from each other during part of one circling by the plane. All the whales were traveling, but brief social interactions were noted among the three fin whales. It is possible, but not presently demonstrated, that there were at least brief social interactions among the fin and blue whales, i.e., between species. One particularly interesting observation stands out. It lasted for only 24 seconds. We linked descriptions of the behaviors with 8 still shots pulled off video, in order as AA29, then A39 through G53. These numbers refer to arbitrary seconds into the 6th minute of the scene as described below. The encounter described involved feeding blue and fin whales focused around a bait ball of presumably euphausiid prey. This encounter appeared to involve inter-specific social interactions and/or potential competition for food.
2 August	Blue Whale Mother and Calf #2	A blue whale mother and calf and another adult were circled from the airplane from 16:56 to 17:28. A total of 38 min of video was taken. The calf was more active at the surface than we have previously seen among blue whales in SOCAL. All three whales breached, and the calf breached and rolled at the surface on multiple occasions as recorded on video. In one episode, the mother lunged and breached followed by the calf breaching and lunging five times and then the pair dove. A third adult then lunged twice and breached. The calf resurfaced and continued breaching numerous times as the mother was observed traveling below the water surface nearby.
24 September	Bryde's Whale	At 13:56:15, a single Bryde's whale was seen. Initially, this whale was not identified to species; however, subsequent examination of photographs showed three prominent rostral ridges and species was confirmed by Dr. Tom Jefferson. The Bryde's whale had only been seen once before during the October 2008 SOCAL aerial monitoring survey.
25 September	Northern Elephant Seal	We circled a group of five northern elephant seals at 11:55:00 for $\sim$ 3 minutes. The seals stayed near or at the surface through the entire sighting. Northern elephant seals had not been identified during any other of the previous seven SOCAL Marine Species Monitoring Plan (SMSPM) aerial surveys, except in November 2008 (1 group, 1 individual).
26 September	Cuvier's Beaked	At 12:00 a group of two Cuvier's beaked whales was seen blowing at the surface and traveling slowly in the opposite direction from the Cascadia Research Collective rigid-

#### Table 8. Unusual and relatively rare observations made during the July and September 2010 SOCAL aerial surveys.

Date in 2010	Species	Description
	Whale	hulled inflatable research boat that was ~25 m away. We circled them at 1 to 1.5 km (0.5 to 0.8 nm) radius to not interfere with the whales (well outside Snell's cone, at 304 m (1000 ft) altitude). Dr. Brandon Southall had asked us to aid in sighting cetaceans for their ongoing SOCAL Behavioral Response Study (BRS), in particular helping to resight the Cuvier's beaked whales. Other sightings of Cuvier's beaked whale occurred during the July 09 (1 group, 4 individuals) and November 09 (2 groups, 6 individuals) SOCAL aerial monitoring surveys.
28 September	Sei/Bryde's Whale	Initially seen mostly underwater as it fluked up, a sei or Bryde's whale was seen at 9:41:30. We circled the sighting and subsequently saw three whales in the group. We watched for $\sim$ 30 minutes while the whales sporadically lunge fed including on their sides (see report cover photograph). Photographs of this sighting were taken and were reviewed by Dr. Tom Jefferson who confirmed the whales were either sei or Bryde's whales, based primarily on the lack of white on the right jaw, body length, head shape, body coloration, and the possibility of three rostral ridges on the head. Additional photograph angles may have allowed species differentiation based on dorsal shape and size and the rostral ridges

## Photographs and Video

Lists of photographs and video are presented in Appendix D and Appendix E. Note that the video is based on start and stop times, and focal animals are not always in view and videotaped; the video was typically kept on between surfacings to record ancillary information. The count of photographs is a raw count and has not been filtered in detail to identify usefulness of photographs to identify species, calves, etc. The latter tasks are time consuming and were outside the scope of this contract.

About 2900 digital photographs and ~4.3 hours of HD video were taken during July 2010. Approximately 17% of the photos were taken from the helicopter with the remaining 83% taken from the fixed-wing Partenavia airplane. Approximately 41% of the video was made from the helicopter on two days vs. 59% from the airplane in five days.

A preliminary total of  $\sim$ 741 digital photographs and  $\sim$ 2.4 hours of HD video were taken during September 2010. The helicopter was not used during the September survey, 100% of the photos were taken from the fixed-wing Partenavia airplane.

## Section 4 Discussion

## Comparison of Airplane vs. Helicopter Platforms

For the first time during our seven SOCAL aerial surveys, for the July 2010 survey we used a Bell 206 helicopter as a platform from which to conduct behavioral observations. We did this to ascertain the relative utility of this platform vs. the fixed-wing Partenavia we have used for previous surveys. Table 7 summarizes our comparison.

### Aerial Survey Collaboration with Other Researchers

During July, it was not logistically feasible to collaborate in real-time with other marine mammal researchers in the SOCAL range during our July survey to our knowledge, as they were not conducting field studies in the same area simultaneously. However, upon request, we provided a list of our blue whale sightings to J. Calambokidis (JC) of

Cascadia Research Collective (CRC) that included the dates, times, numbers, and locations of our blue whale sightings. During our survey, JC was simultaneously conducting small-vessel surveys for blue whales in the Santa Barbara Channel area. He requested our data because he was scheduled to conduct small-vessel surveys in the SOCAL in early August and September as part of the BRS led by Dr. Brandon Southall and funded by N45 and Office of Naval Research Funds. Our sighting data have been shared with researchers from UC San Diego/Scripps Institute of Oceanography, CRC, the Navy's Marine Mammal Research Program (e.g., Dr. Dave Morretti), and other Office of Naval Research and N45-funded studies, including the BRS.

Shared data of interest that we have collected include locations and photographs of blue and fin whales and Risso's dolphins. In particular, baseline behavioral and distribution data we have collected on these and other species is of relevance to the BRS program. In fall 2010, the BRS program began conducting playback sound studies to some of species to assess potential behavioral responses. Thus, our baseline behavioral data provide a substantial source for comparison of typical behavior of these species. Few published data are available on the behavior of any of the marine mammals species inhabiting the SOCAL with the exception of coastal bottlenose dolphins (e.g., Defran et al. 1999), gray whales (e.g., Punt and Wade 2010), and more recently, a few tagged individual Cuvier's whales (e.g., Falcone et al. 2009a, b).

Aircraft Type	Partenavia P68-C	Partenavia P68-OBS ("Observer")	Helicopter		
Plane Tail Numbers/Models	300LK and 32K (P68c)no glass nose	6602L ("Observer" with glass nose)	Bell 206 LIII		
Maximum Range	4.5 hr (if remove 100 lbs. of cargo/person would have 5.5 hourse.g., equipmt? Smaller observers?)	4.0 hr (if remove 100 lbs. of cargo/person would have 5.0 hourse.g., equipmt? Smaller observers?)	2.6 hr		
Approx Cost per Hr	\$550	\$550	\$1450/hr		
Slowest Safe Apprx. Circling Speed	80 kt	80 kt	~45 -50 kt		
	<ul> <li>small porthole (~5 inches diameter) in co- pilot seat but difficult to use/requires some contortion;</li> <li>middle seats have bubble windows (bad for</li> </ul>	• same as for P68-C;	<ul> <li>large (12 x 12 inch) sliding windows in co- pilot and two rear seats;</li> <li>large concerns windows provide better view</li> </ul>		
Windows	<ul> <li>photo/video /binocs due to distortion);</li> <li>during future IDIQ surveys 2 pilots will be required and thus co-pilot seat will not be available for biological observers;</li> </ul>	<ul><li>glass nose increases visibility in front seats;</li><li>has belly window</li></ul>	than Partenavias in rear of aircraft		
	<ul> <li>rear 3rd bench windows have small opening but exhaust fumes distort this view that is easily blocked by cowling/wing when plane turns;</li> <li>has belly window</li> </ul>				
	• 300 LK is best range aircraft of Partenavias	• Easier for pilot to spot and circle sightings than other Partenavias due to glass nose	• Floats allow offshore surveys;		
Advantages	• big tires allow more weight to be carried	• can drop sonobuoy from belly window	• Large open windows allow good view and excellent photo/video conditions;		
Ŭ	• can drop sonobuoy from belly window		• slower circle speed allows longer/better view of whales to video/photo;		
			• easier for pilot to keep animals in view;		
	• no glass nose;	• shorter range than other Partenavia;	• Expense is nearly 3x that of Partenavia;		
	• only co-pilot seat small porthole opens;	• bubble windows distort image;	• Short range (about half that of Partenavias)		
Disadvantages	• cost and time (FAA approval) to remove/replace window);	• only small porthole opens in front and rear seats;	• SOAR SOCAL range is too far to survey unless helicopter & crew/observers stationed and fueled on San Clemente Isld;		
	• bubble windows distort image;	• bubble windows distort image;	• requires more maintenance than fixed wings		

Table 9. Comparison of Aircraft Platforms to Collect Behavioral Data on Marine Mammals.

Aircraft Type	Partenavia P68-C	Partenavia P68-OBS ("Observer")	Helicopter
	• cowlings partially block view especially in rear 3rd seat;	• cowlings partially block view especially in rear 3rd seat;	
	• rear 3rd seat view distorted by exhaust fumes	<ul> <li>rear 3rd seat view distorted by exhaust fumes;</li> <li>cost and time (FAA approval) to remove/replace windows</li> </ul>	
Potential Improvements/ Mitigation?	Could remove bubble center seat windows and replace with opening windows or no window(s)	same as other Partenavia	if use helo on standby on SCI could potentially share/cut costs; Aspen flies both this helo and the partenavias
When Used for Navy Surveys	SOCAL Nov 08, June/July 09, Nov 09, May 10	Oct 2008, July 2010	Jul-10

					Survey				
	October	November	June	July	November	May	July	September	Total
Survey Dates	17-21 Oct 2008	15-18 Nov 2008	5-11 June 2009	20-29 July 2009	18-23 Nov 2009	13-18 May	27 July-3 Aug	23-28 Sept 2010	7 surveys: May, June, July, Oct, Nov
No. Days Flown	5	4	6	9	6	6	7	6	49
Major Training Exercise (MTE) Before, During or After Survey?	Before/During	After	After	After	During/After	During	During/After	During/After	During, Before or After
Total Flight Hr (Wheels up/down)	28	21	30	34	28	29	18	28	216
Total Observation Effort (km) (excl. poor weather, over	4563 km	3838 km	6140 km	6500 km	4823 km	4891 km	3125 km	3918 km	37,798
land)	(2464 nm)	(2072 nm)	(3315 nm)	(3510 nm)	(2604 nm)	(2641 nm)	(1688 nm)	(2116 nm)	20,410
No. Navy- directed Survey Changes (appox)	9	7	12	10	3	1	0	0	42
No. Coastline Surveys for Strandings (San Clemente Isld)	0	2	1	0	1	1	0	0	5
No. Groups Seen	115	185	161	240	93	152	86	252	1,284
Estim. No. Individuals	12,587	5732	9489	22,719	12,826	5,453	11,090	37,874	117,770
Mean Group Size	109.4	31	58.9	94.7	137.9	35.9	131.3	150.3	85.6
No. Dead Sightings	0	3 (2 CA sea lions, 1 blue whale)	0	2 (2 prob. CA sea lions)	0	0	0	0	5
No. Species	9	9	11	10	10	9	5	9	16

#### Table 10. Summary of SOCAL Marine Mammal Aerial Surveys.

	Survey								
	October	November	June	July	November	May	July	September	Total
No. Focal Groups Circled 5-9 min	22	20	24	37	14	10	6	6	139
No. Extended Focal Groups Circled >10 min	5	7	7	8	10	20	13	10	80
Longest Focal Follow Duration	29 min (Fin whale)	60 min (Fin whale)	48 min (Fin whale)	38 min (Long- beaked common dolphin)	40 min ( <i>Killer</i> whale)	144 min (Fin whale)	59 min (Blue whale)	45 min (Bryde's Whale)	144 min.
No. Photos Taken	1050	1280	1099	2301	2203	1350	2900	741	12,924
Estimated Usable Video (min)	53	41	83	50	90	334	373	142	1166

# Section 5 Conclusions and Recommendations

## Survey Highlights

- Dr. Bernd Würsig of the Marine Mammal Research Program at Texas A&M University joined our field team in May, July and September 2010 to provide expert review and critique of our behavioral study approach and protocol, and to assist us in the field. Dr. Würsig provided a positive review of our protocol and helped us further refine our field and post-field analysis and summary techniques. He also provided the write-up and photos for the blue-fin whale focal follow as summarized above under *Unusual Observations*. He also was critical in providing an expert opinion on the utility of the helicopter as a platform for conducting extended focal follows with video.
- We successfully used the Bell 206 helicopter in July 2010 to conduct behavioral focal follow observations of priority cetacean species. We concluded that this platform is advantageous over the Partenavia for taking video and obtaining detailed behavioral data, while the Partenavia is better suited for conducting line-transect surveys (see Table 7 and subsection that follows). This is because the helicopter can fly slower circles (45 -50 kts) that allows for a better, longer view, with less interruption by glare (on sunny days) within the focal circle view. Especially important is that the helicopter can circle in a manner that keeps it approximately equal distance from the focal animal(s) throughout the circle, unlike the strong oblong pattern necessitated by the circling of a fixed wing (i.e., the Partenavia's slowest safe circling speed is approximately 80 kt). The helicopter we used also has larger photo-capable windows and less cramped space than the Partenavia, facilitating inherently better photos, both still and video. The disadvantage of the helicopter we used is its reduced range (2.6 hr vs. 4.5 hr for Partenavia) and its increased expense (almost three times the hourly cost of the Partenavia).

- We concluded and recommend that the (Partenavia) fixed-wing plane is best when the primary goal is to collect line-transect data, and the (Bell 206) helicopter is better when detailed behavioral work is warranted. Given the higher cost of the latter, we recommend judicious occasional but then dedicated use of a helicopter for behavioral focal follows. Given that behavioral data is currently a primary focus of the SOCAL monitoring per Navy input, we recommend that the helicopter be used to the maximum extent practicable during these surveys. Using both platforms during one survey as we did during July 2010 is one feasible approach. Another possible approach is to use the helicopter separately for focal sessions and the Partenavia separately for line transects. Perhaps the ideal approach would be to use both simultaneously to gather both types of data on a survey. The latter approach should be attempted to assess the utility of collecting simultaneous density/abundance/distribution data from the Partenavia while at the same time collecting extended focal follows including video from the helicopter.
- As summarized in Appendix D-1 the July 2010 aerial survey contributed the second highest number (n = 13) of focal behavioral observations at least 10 min long relative to our previous six SOCAL aerial surveys, with only the May 2010 such sample size being larger (n = 20). This again was because we had shifted our primary focus to extended focal follows.
- The July 2010 survey contributed the highest number of blue whale focal follow sessions of any of the previous six SOCAL surveys as summarized in the text. This is important in providing critical baseline behavioral data on this ESA-listed, "Priority" species of special concern with respect to the Navy's SOCAL monitoring plan.
- The combined SOCAL aerial data from 2008-2010 represent the largest and most recent, concentrated such survey effort within the SOCAL (Table 10). Our surveys also are the first behavioral-focused aircraft-based studies conducted in the SOCAL, and are the first such studies conducted on numerous species (e.g., Risso's dolphin, common dolphin, blue whale, Pacific white-sided dolphin, etc.). Given the current and increasing focus by NMFS and the Navy on assessing behavioral responses of marine mammals to MFAS activities, our data fill a unique niche and currently represent considerable sample sizes that are essential to provide adequate and relevant comparative baseline data to assess such effects.
- Funding has not been available to analyze the detailed behavior of cetacean groups we have observed in the SOCAL. It is critical that these data be further analyzed to assess and evaluate their results and utility relative to the goals of the Navy's SOCAL and other marine mammal monitoring plans. It is also critical that these data will also be analyzed relative to estimated received sound levels of MFAS, as applicable, and will provide baseline non-MFAS exposure data for comparison purposes for monitoring and other studies (e.g., the BRS study—see following subsection).
- The July, September and previous six aerial surveys contribute to building recent seasonal and year-round baseline data for the SOCAL marine mammals as directed under the SOCAL M3P.
- Behavioral trends reported herein are generally consistent with the six previous aerial surveys for common, Risso's and bottlenose dolphins as well as blue and fin whales.
- Results consistently show that blue whales and Risso's dolphins tend to remain within view of the aircraft observers at or below the surface for the longest periods compared to other SOCAL marine mammal species observed. This is in part related to the light, white body coloration and scarring of Risso's dolphins that makes them relatively easy to track from the aircraft at and below the surface, even at altitudes of 1500 feet and radial distances of 1 km at which focal behavioral follows are typically conducted.
- Other recommendations to improve data collection techniques, analyses, interpretations, and applications are the same as those provided in the previous SOCAL 2008-2009 aerial survey reports (Smultea et al. 2009a,b, Smultea and Lomac-MacNair 2010).

# Section 6 Acknowledgements

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### Appendix A. List of Sightings

Sighting Date	Sighting Time	Common Name	Species	Best Count	Longitude	Latitude
07/27/2010	14:09:01	Blue Whale	Balaenoptera musculus	4	-117.32050	32.89900
07/27/2010	14:16:15	Common Bottlenose Dolphin	Tursiops truncatus	50	-117.31067	32.92833
07/27/2010	14:47:30	Fin Whale	Balaenoptera physalus	1	-117.33550	32.93383
07/27/2010	15:23:46	Common Dolphin sp.	undifferentiated Delphinus	400	-117.37233	32.82733
07/27/2010	15:24:19	Blue Whale	Balaenoptera musculus	6	-117.37883	32.82867
07/27/2010	16:21:15	Fin Whale	Balaenoptera physalus	2	-117.38783	32.83817
07/28/2010	13:43:11	Common Bottlenose Dolphin	Tursiops truncatus	6	-117.28067	32.88150
07/28/2010	13:46:21	Blue Whale	Balaenoptera musculus	3	-117.31550	32.93283
07/28/2010	14:06:22	Unidentified Small Dolphin	unidentified Delphinidae	20	-117.30483	32.92500
07/28/2010	14:40:04	Blue Whale	Balaenoptera musculus	1	-117.38767	33.01400
07/28/2010	14:42:26	Blue Whale	Balaenoptera musculus	1	-117.38783	33.05750
07/28/2010	14:44:00	Common Bottlenose Dolphin	Tursiops truncatus	6	-117.40000	33.08383
07/28/2010	14:56:06	Common Dolphin sp.	undifferentiated Delphinus	400	-117.46033	33.18500
07/28/2010	15:13:48	Common Dolphin sp.	undifferentiated Delphinus	60	-117.48517	33.08583
07/28/2010	15:16:50	Common Dolphin sp.	undifferentiated Delphinus	600	-117.47383	33.02833
07/28/2010	15:31:50	Unidentified Small Dolphin	unidentified Delphinidae	200	-117.34750	32.72617
07/28/2010	15:44:38	Common Dolphin sp.	undifferentiated Delphinus	200	-117.35150	32.62367
07/28/2010	15:45:58	Blue Whale	Balaenoptera musculus	5	-117.34600	32.64333
07/28/2010	15:45:58	Fin Whale	Balaenoptera physalus	3	-117.34717	32.64533
07/29/2010	14:37:26	Blue Whale	Balaenoptera musculus	2	-117.36200	32.75583
07/29/2010	15:50:41	Common Dolphin sp.	undifferentiated Delphinus	380	-117.38033	33.04883
07/29/2010	16:05:57	Common Dolphin sp.	undifferentiated Delphinus	110	-117.47383	33.15700
07/29/2010	16:13:49	Common Dolphin sp.	undifferentiated Delphinus	40	-117.46250	33.07517
07/29/2010	16:14:22	Blue Whale	Balaenoptera musculus	1	-117.45033	33.05783
07/29/2010	16:15:16	Common Dolphin sp.	undifferentiated Delphinus	60	-117.43617	33.03717
07/29/2010	16:19:58	Blue Whale	Balaenoptera musculus	3	-117.34733	32.92300
07/30/2010	15:08:36	Risso's Dolphin	Grampus griseus	9	-118.65333	33.11183
07/31/2010	14:31:55	Common Dolphin sp.	undifferentiated Delphinus	600	-117.28500	32.86100
07/31/2010	14:35:46	Common Dolphin sp.	undifferentiated Delphinus	100	-117.35683	32.76233
07/31/2010	14:36:31	Blue Whale	Balaenoptera musculus	6	-117.36700	32.73800
07/31/2010	15:44:29	Common Dolphin sp.	undifferentiated Delphinus	100	-117.54267	32.66533
07/31/2010	15:50:33	Common Dolphin sp.	undifferentiated Delphinus	200	-117.74500	32.63283

### Table A-1. Sightings during SOCAL 2010 July aerial monitoring surveys off San Diego, California.

Sighting Date	Sighting Time	Common Name	Species	Best Count	Longitude	Latitude
07/31/2010	16:07:24	Common Dolphin sp.	undifferentiated Delphinus	60	-117.65483	32.74817
07/31/2010	16:21:53	Unidentified Dolphin	unidentified Delphinidae	25	-117.42633	32.81583
07/31/2010	16:32:32	Common Dolphin sp.	undifferentiated Delphinus	12	-117.36683	32.89733
07/31/2010	16:46:05	Common Dolphin sp.	undifferentiated Delphinus	110	-117.53317	32.90317
07/31/2010	17:22:26	Common Dolphin sp.	undifferentiated Delphinus	15	-117.74033	32.97783
07/31/2010	17:30:45	Unidentified Dolphin	unidentified Delphinidae	1	-117.57950	33.01517
07/31/2010	17:33:13	Common Dolphin sp.	undifferentiated Delphinus	125	-117.54183	33.02150
07/31/2010	17:37:33	Common Dolphin sp.	undifferentiated Delphinus	40	-117.50417	33.03033
07/31/2010	17:41:12	Common Dolphin sp.	undifferentiated Delphinus	450	-117.38017	33.05467
07/31/2010	17:41:32	Blue Whale	Balaenoptera musculus	1	-117.36817	33.05667
07/31/2010	17:41:32	Fin Whale	Balaenoptera physalus	1	-117.36817	33.05667
07/31/2010	18:20:41	Unidentified Dolphin	unidentified Delphinidae	90	-117.27733	32.87600
08/02/2010	14:49:42	California Sea Lion	Zalophus californianus	2	-117.26233	32.86100
08/02/2010	14:51:25	Blue Whale	Balaenoptera musculus	2	-117.28417	32.90717
08/02/2010	14:53:04	Blue Whale	Balaenoptera musculus	1	-117.30517	32.91217
08/02/2010	14:53:04	Common Dolphin sp.	undifferentiated Delphinus	300	-117.30517	32.91217
08/02/2010	15:02:45	Common Dolphin sp.	undifferentiated Delphinus	40	-117.32167	32.98350
08/02/2010	15:03:33	Common Dolphin sp.	undifferentiated Delphinus	35	-117.33500	33.00733
08/02/2010	15:09:36	Unidentified Dolphin	unidentified Delphinidae	75	-117.42733	33.12800
08/02/2010	15:15:32	Unidentified Dolphin	unidentified Delphinidae	120	-117.63100	33.12217
08/02/2010	15:55:32	Blue Whale	Balaenoptera musculus	2	-117.92983	33.18833
08/02/2010	16:47:54	Unidentified Dolphin	unidentified Delphinidae	200	-117.58817	33.26650
08/02/2010	16:48:19	Common Dolphin sp.	undifferentiated Delphinus	55	-117.59067	33.27883
08/02/2010	16:53:12	Common Dolphin sp.	undifferentiated Delphinus	175	-117.59717	33.28233
08/02/2010	16:56:05	Blue Whale	Balaenoptera musculus	2	-117.62500	33.31483
08/02/2010	17:19:09	Common Dolphin sp.	undifferentiated Delphinus	75	-117.61433	33.33083
08/02/2010	17:29:49	Unidentified Dolphin	unidentified Delphinidae	50	-117.56150	33.27050
08/02/2010	17:32:21	Common Dolphin sp.	undifferentiated Delphinus	250	-117.50200	33.20567
08/02/2010	17:33:57	Common Dolphin sp.	undifferentiated Delphinus	70	-117.48283	33.16583
08/02/2010	17:36:39	Unidentified Dolphin	unidentified Delphinidae	125	-117.42833	33.09400
08/02/2010	17:37:31	Unidentified Dolphin	unidentified Delphinidae	50	-117.41050	33.07317
08/03/2010	15:32:41	Common Dolphin sp.	undifferentiated Delphinus	*	-117.28583	32.89717
08/03/2010	15:33:39	Blue Whale	Balaenoptera musculus	1	-117.29900	32.92717
08/03/2010	15:35:22	Common Dolphin sp.	undifferentiated Delphinus	25	-117.30533	32.93200
08/03/2010	15:36:42	Common Dolphin sp.	undifferentiated Delphinus	40	-117.33000	32.96767
08/03/2010	15:42:06	Common Dolphin sp.	undifferentiated Delphinus	1000	-117.44150	33.11417
08/03/2010	15:52:18	Common Dolphin sp.	undifferentiated Delphinus	*	-117.50950	33.19333
08/03/2010	15:55:05	Common Dolphin sp.	undifferentiated Delphinus	600	-117.50883	33.21533

Sighting Date	Sighting Time	Common Name	Species	Best Count	Longitude	Latitude
08/03/2010	15:57:43	Common Dolphin sp.	undifferentiated Delphinus	100	-117.57017	33.25683
08/03/2010	15:59:00	Common Dolphin sp.	undifferentiated Delphinus	*	-117.56967	33.25833
08/03/2010	16:02:29	Common Dolphin sp.	undifferentiated Delphinus	1100	-117.61367	33.29600
08/03/2010	16:04:07	Common Dolphin sp.	undifferentiated Delphinus	350	-117.64617	33.33267
08/03/2010	16:06:11	Common Dolphin sp.	undifferentiated Delphinus	400	-117.69683	33.37000
08/03/2010	16:07:32	Common Dolphin sp.	undifferentiated Delphinus	250	-117.73617	33.36600
08/03/2010	16:23:44	Common Dolphin sp.	undifferentiated Delphinus	300	-118.25333	33.25083
08/03/2010	16:47:03	Unidentified Dolphin	unidentified Delphinidae	125	-118.23733	33.33900
08/03/2010	16:59:54	Unidentified Dolphin	unidentified Delphinidae	70	-117.90867	33.45633
08/03/2010	17:03:26	Unidentified Dolphin	unidentified Delphinidae	140	-117.78983	33.45400
08/03/2010	17:07:10	Unidentified Dolphin	unidentified Delphinidae	50	-117.76483	33.43317
08/03/2010	17:07:38	Unidentified Dolphin	unidentified Delphinidae	200	-117.75267	33.42233
08/03/2010	17:09:21	Unidentified Dolphin	unidentified Delphinidae	*	-117.71100	33.38367
08/03/2010	17:10:52	Unidentified Dolphin	unidentified Delphinidae	25	-117.67233	33.35183
08/03/2010	17:12:01	Unidentified Dolphin	unidentified Delphinidae	35	-117.64167	33.32767
08/03/2010	17:14:31	Common Dolphin sp.	undifferentiated Delphinus	7	-117.58017	33.26983
08/03/2010	17:18:17	Unidentified Dolphin	unidentified Delphinidae	11	-117.55650	33.25067
08/03/2010	17:26:16	Unidentified Dolphin	unidentified Delphinidae	*	-117.39117	33.05417
08/03/2010	17:27:28	Common Dolphin sp.	undifferentiated Delphinus	120	-117.37450	33.01917
08/03/2010	17:31:06	Blue Whale	Balaenoptera musculus	1	-117.31867	32.91200
08/03/2010	17:34:51	Blue Whale	Balaenoptera musculus	2	-117.31967	32.92117

\* Individual animal counts for these sightings are pending further survey data analysis.

Table A-2.	Sightings	during	SOCAL	2010 Se	ptember	aerial	monitoring	survey	s off San	Diego.	California	
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Sighting Date	Sighting Time	Common Name	Species	Best Count	Latitude	Longitude
9/23/2010	15:11:00	Common Dolphin sp.	undifferentiated delphinus	25	32.768	-117.575333
9/23/2010	15:29:00	Common Dolphin sp.	undifferentiated delphinus	6	32.92483333	-117.405500
9/23/2010	15:54:10	Unidentified Medium Marine Mammal	unidentified marine mammal	1	32.7905	-118.012000
9/23/2010	16:07:25	Common Dolphin sp.	undifferentiated delphinus	15	32.81333333	-118.231500
9/23/2010	16:08:30	California Sea Lion	Zalophus californianus	1	32.81683333	-118.217000
9/23/2010	16:16:17	Common Dolphin sp.	undifferentiated delphinus	60	32.87733333	-118.247333
9/23/2010	16:30:00	Common Dolphin sp.	undifferentiated delphinus	700	32.90483333	-118.113667
9/23/2010	16:54:22	Common Dolphin sp.	undifferentiated delphinus	600	33.017	-117.326500
9/23/2010	16:57:00	Common Bottlenose Dolphin	Tursiops truncatus	2	32.9515	-117.309500
9/23/2010	16:59:08	Common Dolphin sp.	undifferentiated delphinus	80	32.899666667	-117.316000
9/23/2010	17:09:16	Common Dolphin sp.	undifferentiated delphinus	200	32.65516667	-117.303833

Sighting Date	Sighting Time	Common Name	Species	Best Count	Latitude	Longitude
9/23/2010	17:09:55	Common Dolphin sp.	undifferentiated delphinus	300	32.64183333	-117.291333
9/23/2010	17:15:00	Common Bottlenose Dolphin	Tursiops truncatus	3	32.5535	-117.253833
9/23/2010	17:21:23	Common Dolphin sp.	undifferentiated delphinus	315	32.70166667	-117.341333
9/23/2010	17:24:33	Common Dolphin sp.	undifferentiated delphinus	40	32.787	-117.363667
9/24/2010	12:02:47	Unidentified Medium Marine Mammal	unidentified marine mammal	1	33.003333333	-117.995667
9/24/2010	12:08:00	Unidentified Dolphin	unidentified Delphinidae	250	33.04516667	-118.207667
9/24/2010	12:09:26	Common Dolphin sp.	undifferentiated delphinus	100	33.05783333	-118.271333
9/24/2010	12:09:55	Unidentified Dolphin	unidentified Delphinidae	1000	33.06233333	-118.297167
9/24/2010	12:17:40	Common Bottlenose Dolphin	Tursiops truncatus	25	33.12833333	-118.622000
9/24/2010	12:21:08	California Sea Lion	Zalophus californianus	1	33.167	-118.804500
9/24/2010	12:28:21	Common Dolphin sp.	undifferentiated delphinus	375	33.08733333	-119.006167
9/24/2010	12:36:32	Unidentified Marine Mammal	unidentified marine mammal	4	33.03216667	-119.110167
9/24/2010	12:36:47	California Sea Lion	Zalophus californianus	2	33.02883333	-119.118000
9/24/2010	12:38:15	Common Dolphin sp.	undifferentiated delphinus	75	33.018	-119.135667
9/24/2010	12:39:06	Common Dolphin sp.	undifferentiated delphinus	70	32.999	-119.169500
9/24/2010	12:39:50	Common Dolphin sp.	undifferentiated delphinus	125	32.9915	-119.183000
9/24/2010	12:40:17	California Sea Lion	Zalophus californianus	30	32.9785	-119.206333
9/24/2010	12:40:27	Unidentified Dolphin	unidentified Delphinidae	4	32.9785	-119.206333
9/24/2010	12:42:19	California Sea Lion	Zalophus californianus	4	32.94633333	-119.247167
9/24/2010	12:42:56	California Sea Lion	Zalophus californianus	*	32.93216667	-119.235667
9/24/2010	12:43:02	California Sea Lion	Zalophus californianus	3	32.93216667	-119.235667
9/24/2010	12:43:34	California Sea Lion	Zalophus californianus	1	32.93216667	-119.235667
9/24/2010	12:43:57	California Sea Lion	Zalophus californianus	1	32.91366667	-119.220167
9/24/2010	12:44:16	Common Dolphin sp.	undifferentiated delphinus	*	32.902	-119.210500
9/24/2010	12:49:01	California Sea Lion	Zalophus californianus	1	32.916	-119.183167
9/24/2010	12:50:01	California Sea Lion	Zalophus californianus	2	32.93133333	-119.158667
9/24/2010	12:50:10	California Sea Lion	Zalophus californianus	*	32.93133333	-119.158667
9/24/2010	12:51:18	Unidentified Marine Mammal	unidentified marine mammal	5	32.952	-119.123667
9/24/2010	12:57:07	Northern Elephant Seal	Mirounga angustirostris	5	32.96733333	-119.124333
9/24/2010	13:06:27	California Sea Lion	Zalophus californianus	*	33.0025	-119.034333
9/24/2010	13:08:27	California Sea Lion	Zalophus californianus	1	33.02966667	-118.983667
9/24/2010	13:12:26	California Sea Lion	Zalophus californianus	1	33.09316667	-118.866500
9/24/2010	13:14:21	California Sea Lion	Zalophus californianus	2	33.12266667	-118.814667
9/24/2010	13:22:00	California Sea Lion	Zalophus californianus	1	33.08183333	-118.740500
9/24/2010	13:23:18	California Sea Lion	Zalophus californianus	2	33.060666667	-118.781167
9/24/2010	13:25:22	Common Dolphin sp.	undifferentiated delphinus	2	33.02566667	-118.845833
9/24/2010	13:31:24	California Sea Lion	Zalophus californianus	25	33.00816667	-118.887667

Sighting Date	Sighting Time	Common Name	Species	Best Count	Latitude	Longitude
9/24/2010	13:34:44	California Sea Lion	Zalophus californianus	4	32.956	-118.984167
9/24/2010	13:42:13	Unidentified Baleen Whale	unidentified balaenopterid	1	32.8385	-119.149000
9/24/2010	13:48:48	California Sea Lion	Zalophus californianus	1	32.806	-119.116000
9/24/2010	13:48:51	California Sea Lion	Zalophus californianus	1	32.806	-119.116000
9/24/2010	13:51:48	California Sea Lion	Zalophus californianus	2	32.84883333	-119.044000
9/24/2010	13:51:58	California Sea Lion	Zalophus californianus	1	32.85666667	-119.030667
9/24/2010	13:52:10	California Sea Lion	Zalophus californianus	1	32.85666667	-119.030667
9/24/2010	13:52:39	California Sea Lion	Zalophus californianus	1	32.86683333	-119.013167
9/24/2010	13:52:42	California Sea Lion	Zalophus californianus	1	32.86683333	-119.013167
9/24/2010	13:53:17	California Sea Lion	Zalophus californianus	2	32.86683333	-119.013167
9/24/2010	13:53:54	California Sea Lion	Zalophus californianus	2	32.88083333	-118.988000
9/24/2010	13:54:54	California Sea Lion	Zalophus californianus	1	32.90366667	-118.948500
9/24/2010	13:55:04	California Sea Lion	Zalophus californianus	2	32.90366667	-118.948500
9/24/2010	13:55:43	California Sea Lion	Zalophus californianus	4	32.917	-118.925000
9/24/2010	13:56:13	Bryde's Whale	Balaenoptera brydei/edeni	1	32.917	-118.925000
9/24/2010	14:03:00	California Sea Lion	Zalophus californianus	1	33.004666667	-118.768500
9/24/2010	14:03:36	California Sea Lion	Zalophus californianus	1	33.01616667	-118.749000
9/24/2010	14:03:46	California Sea Lion	Zalophus californianus	1	33.01616667	-118.749000
9/24/2010	14:05:24	California Sea Lion	Zalophus californianus	*	33.0445	-118.695500
9/24/2010	14:05:54	California Sea Lion	Zalophus californianus	*	33.04416667	-118.687333
9/24/2010	14:07:31	California Sea Lion	Zalophus californianus	*	33.03616667	-118.622000
9/24/2010	14:07:56	California Sea Lion	Zalophus californianus	*	33.03616667	-118.622000
9/24/2010	14:16:30	Common Dolphin sp.	undifferentiated delphinus	250	32.99216667	-118.317833
9/24/2010	14:22:43	Risso's Dolphin	Grampus griseus	2	32.994666667	-118.277833
9/24/2010	14:22:44	Unidentified Dolphin	unidentified Delphinidae	15	32.994666667	-118.277833
9/24/2010	14:27:21	Common Dolphin sp.	undifferentiated delphinus	300	32.97266667	-118.192000
9/24/2010	14:30:22	Unidentified Dolphin	unidentified Delphinidae	5	32.95833333	-118.087000
9/24/2010	14:31:15	California Sea Lion	Zalophus californianus	1	32.95366667	-118.054667
9/24/2010	14:31:42	California Sea Lion	Zalophus californianus	1	32.95366667	-118.054667
9/24/2010	14:33:05	Common Dolphin sp.	undifferentiated delphinus	400	32.9475	-118.002833
9/24/2010	14:33:11	Common Dolphin sp.	undifferentiated delphinus	400	32.9435	-117.977833
9/24/2010	14:37:26	Common Dolphin sp.	undifferentiated delphinus	50	32.9225	-117.834000
9/24/2010	14:38:13	Common Dolphin sp.	undifferentiated delphinus	200	32.91816667	-117.808167
9/24/2010	14:39:09	Common Dolphin sp.	undifferentiated delphinus	6	32.91383333	-117.777833
9/24/2010	14:42:26	California Sea Lion	Zalophus californianus	1	32.89666667	-117.658167
9/24/2010	16:11:00	Common Dolphin sp.	undifferentiated delphinus	400	32.912	-117.347500
9/24/2010	16:16:00	Common Dolphin sp.	undifferentiated delphinus	100	33.02083333	-117.489333

Sighting Date	Sighting Time	Common Name	Species	Best Count	Latitude	Longitude
9/24/2010	16:18:00	Common Dolphin sp.	undifferentiated delphinus	*	33.03483333	-117.494333
9/24/2010	16:21:00	Common Dolphin sp.	undifferentiated delphinus	30	33.068666667	-117.542167
9/24/2010	16:22:00	Common Dolphin sp.	undifferentiated delphinus	200	33.084	-117.567500
9/24/2010	16:37:00	Common Dolphin sp.	undifferentiated delphinus	300	33.35766667	-117.915333
9/24/2010	16:59:00	Common Dolphin sp.	undifferentiated delphinus	40	33.41233333	-117.861000
9/24/2010	17:05:00	Unidentified Dolphin	unidentified Delphinidae	150	33.38366667	-117.807167
9/24/2010	17:09:00	Common Dolphin sp.	undifferentiated delphinus	300	33.3095	-117.683000
9/24/2010	17:12:00	Common Dolphin sp.	undifferentiated delphinus	300	33.30233333	-117.659000
9/24/2010	17:13:00	Long-Beaked Common Dolphin	Delphinus capensis	9	33.28483333	-117.628167
9/24/2010	17:18:00	Common Dolphin sp.	undifferentiated delphinus	300	33.24483333	-117.577500
9/24/2010	17:21:00	Common Dolphin sp.	undifferentiated delphinus	75	33.18416667	-117.490833
9/24/2010	17:25:00	Common Dolphin sp.	undifferentiated delphinus	70	33.13866667	-117.452667
9/25/2010	10:33:00	Common Dolphin sp.	undifferentiated delphinus	700	32.945	-117.678500
9/25/2010	10:33:01	Risso's Dolphin	Grampus griseus	10	32.945	-117.678500
9/25/2010	10:39:01	Unidentified Dolphin	unidentified Delphinidae	19	32.98733333	-117.890833
9/25/2010	10:44:50	Common Dolphin sp.	undifferentiated delphinus	20	33.02883333	-118.097167
9/25/2010	10:54:00	Unidentified Dolphin	unidentified Delphinidae	75	33.0935	-118.425667
9/25/2010	11:01:00	Common Dolphin sp.	undifferentiated delphinus	350	33.14233333	-118.676333
9/25/2010	11:07:00	California Sea Lion	Zalophus californianus	1	33.15266667	-118.887333
9/25/2010	11:07:10	Common Dolphin sp.	undifferentiated delphinus	1100	33.15266667	-118.887333
9/25/2010	11:09:00	Unidentified Dolphin	unidentified Delphinidae	400	33.14433333	-118.938667
9/25/2010	11:18:00	Common Dolphin sp.	undifferentiated delphinus	15	33.05016667	-119.078167
9/25/2010	11:38:00	California Sea Lion	Zalophus californianus	1	33.095	-118.865000
9/25/2010	11:40:00	Common Dolphin sp.	undifferentiated delphinus	100	33.126666667	-118.807667
9/25/2010	11:47:00	Common Dolphin sp.	undifferentiated delphinus	400	33.126	-118.697500
9/25/2010	11:55:00	Northern Elephant Seal	Mirounga angustirostris	11	33.02966667	-118.848333
9/25/2010	12:03:00	Northern Elephant Seal	Mirounga angustirostris	6	32.96183333	-118.973000
9/25/2010	12:17:00	California Sea Lion	Zalophus californianus	35	32.85616667	-119.038167
9/25/2010	12:30:00	California Sea Lion	Zalophus californianus	2	33.0245	-118.735000
9/25/2010	12:33:00	Common Dolphin sp.	undifferentiated delphinus	1200	33.05166667	-118.628667
9/25/2010	12:41:00	Common Dolphin sp.	undifferentiated delphinus	1600	33.09733333	-118.330667
9/25/2010	12:52:00	Common Dolphin sp.	undifferentiated delphinus	150	33.155	-118.082333
9/25/2010	13:02:00	Common Dolphin sp.	undifferentiated delphinus	110	33.19183333	-117.921333
9/25/2010	13:02:10	Unidentified Dolphin	unidentified Delphinidae	50	33.19183333	-117.921333
9/25/2010	13:06:00	Common Dolphin sp.	undifferentiated delphinus	100	33.201	-117.882333
9/25/2010	13:22:00	Common Dolphin sp.	undifferentiated delphinus	75	33.06433333	-117.384000
9/25/2010	13:24:00	Common Dolphin sp.	undifferentiated delphinus	200	33.0615	-117.360000

Sighting Date	Sighting Time	Common Name	Species	Best Count	Latitude	Longitude
9/25/2010	13:28:00	Unidentified Dolphin	unidentified Delphinidae	40	32.966	-117.311500
9/25/2010	13:29:00	Unidentified Dolphin	unidentified Delphinidae	8	32.93416667	-117.306167
9/26/2010	10:46:19	Unidentified Dolphin	unidentified Delphinidae	1	32.945	-117.550333
9/26/2010	10:50:32	Unidentified Dolphin	unidentified Delphinidae	30	32.97	-117.728667
9/26/2010	10:52:21	Common Dolphin sp.	undifferentiated delphinus	20	32.98166667	-117.803000
9/26/2010	10:53:36	Common Dolphin sp.	undifferentiated delphinus	40	32.9915	-117.849333
9/26/2010	10:55:25	Common Dolphin sp.	undifferentiated delphinus	125	33.0055	-117.923333
9/26/2010	11:02:57	Common Dolphin sp.	undifferentiated delphinus	200	33.06416667	-118.220667
9/26/2010	11:04:57	Unidentified Dolphin	unidentified Delphinidae	20	33.078	-118.301000
9/26/2010	11:09:15	Unidentified Dolphin	unidentified Delphinidae	2	33.10983333	-118.475833
9/26/2010	11:11:08	Common Dolphin sp.	undifferentiated delphinus	200	33.12466667	-118.549667
9/26/2010	11:11:30	Common Dolphin sp.	undifferentiated delphinus	60	33.12683333	-118.563333
9/26/2010	11:12:56	Common Dolphin sp.	undifferentiated delphinus	400	33.138	-118.625000
9/26/2010	12:00:00	Cuvier's Beaked Whale	Ziphius cavirostris	2	32.84183333	-119.150333
9/26/2010	12:43:14	California Sea Lion	Zalophus californianus	1	32.9795	-119.189667
9/26/2010	12:58:16	Unidentified Dolphin	unidentified Delphinidae	15	32.94583333	-119.254167
9/26/2010	13:13:30	Common Dolphin sp.	undifferentiated delphinus	1000	33.175	-118.846500
9/26/2010	13:43:17	California Sea Lion	Zalophus californianus	2	33.1685	-118.685333
9/26/2010	13:47:47	Common Dolphin sp.	undifferentiated delphinus	75	33.11733333	-118.487500
9/26/2010	13:59:01	Unidentified Dolphin	unidentified Delphinidae	24	33.01716667	-117.969500
9/26/2010	14:01:53	Unidentified Dolphin	unidentified Delphinidae	150	32.9765	-117.842167
9/26/2010	14:02:34	Common Dolphin sp.	undifferentiated delphinus	50	32.966666667	-117.812167
9/26/2010	14:09:11	Common Dolphin sp.	undifferentiated delphinus	250	32.88683333	-117.504333
9/26/2010	14:10:10	Common Dolphin sp.	undifferentiated delphinus	550	32.87683333	-117.458167
9/26/2010	15:35:00	Unidentified Dolphin	unidentified Delphinidae	70	33.03066667	-117.436667
9/26/2010	15:36:00	Unidentified Dolphin	unidentified Delphinidae	4	33.0565	-117.458500
9/26/2010	15:37:55	Common Dolphin sp.	undifferentiated delphinus	190	33.09633333	-117.513833
9/26/2010	15:47:00	Common Dolphin sp.	undifferentiated delphinus	100	33.32066667	-117.697167
9/26/2010	15:48:21	Common Dolphin sp.	undifferentiated delphinus	90	33.357	-117.722333
9/26/2010	16:01:01	Common Dolphin sp.	undifferentiated delphinus	450	33.374	-118.032500
9/26/2010	16:10:39	Common Dolphin sp.	undifferentiated delphinus	75	33.41466667	-118.014667
9/26/2010	16:19:29	Unidentified Dolphin	unidentified Delphinidae	125	33.2675	-118.302667
9/26/2010	16:53:35	Common Dolphin sp.	undifferentiated delphinus	400	33.129	-117.421500
9/27/2010	9:45:00	Unidentified Dolphin	unidentified Delphinidae	50	32.8965	-117.326667
9/27/2010	9:54:58	Common Dolphin sp.	undifferentiated <i>delphinus</i>	2100	32.959	-117.788500
9/27/2010	9:55:00	Common Dolphin sp.	undifferentiated delphinus	550	32.959	-117.788500
9/27/2010	9:56:00	Common Dolphin sp.	undifferentiated delphinus	200	32.96633333	-117.834833

Sighting Date	Sighting Time	Common Name	Species	Best Count	Latitude	Longitude
9/27/2010	9:57:00	Common Dolphin sp.	undifferentiated delphinus	150	32.97383333	-117.880833
9/27/2010	10:05:25	Unidentified Dolphin	unidentified Delphinidae	60	33.069666667	-118.257833
9/27/2010	10:06:29	Common Dolphin sp.	undifferentiated delphinus	2200	33.09116667	-118.294667
9/27/2010	10:11:14	California Sea Lion	Zalophus californianus	2	33.13433333	-118.497667
9/27/2010	10:17:19	Common Dolphin sp.	undifferentiated delphinus	250	33.17733333	-118.755667
9/27/2010	10:18:06	Common Dolphin sp.	undifferentiated delphinus	200	33.18233333	-118.785333
9/27/2010	10:19:22	Common Dolphin sp.	undifferentiated delphinus	25	33.18016667	-118.828833
9/27/2010	10:24:46	California Sea Lion	Zalophus californianus	1	33.09483333	-118.994500
9/27/2010	10:25:51	Common Dolphin sp.	undifferentiated delphinus	50	33.07866667	-119.025000
9/27/2010	10:46:42	California Sea Lion	Zalophus californianus	1	33.1285	-119.207667
9/27/2010	10:47:00	California Sea Lion	Zalophus californianus	1	33.137	-119.213167
9/27/2010	10:48:12	Risso's Dolphin	Grampus griseus	30	33.165	-119.227667
9/27/2010	11:15:41	California Sea Lion	Zalophus californianus	2	33.06183333	- 119.368833
9/27/2010	11:16:55	California Sea Lion	Zalophus californianus	2	33.08083333	- 119.343167
9/27/2010	11:23:30	Unidentified Small Marine Mammal	unidentified marine mammal	1	33.04083333	- 119.299500
9/27/2010	11:27:28	California Sea Lion	Zalophus californianus	1	33.039	- 119.274000
9/27/2010	11:29:58	California Sea Lion	Zalophus californianus	1	33.06883333	- 119.214667
9/27/2010	11:35:46	California Sea Lion	Zalophus californianus	1	33.00183333	- 119.233000
9/27/2010	11:36:10	California Sea Lion	Zalophus californianus	1	33.01183333	- 119.223833
9/27/2010	11:37:18	California Sea Lion	Zalophus californianus	1	33.03616667	- 119.204167
9/27/2010	11:38:11	California Sea Lion	Zalophus californianus	1	33.04566667	- 119.183667
9/27/2010	11:50:24	California Sea Lion	Zalophus californianus	1	33.05833333	-119.233000
9/27/2010	11:51:24	California Sea Lion	Zalophus californianus	2	33.03733333	-119.252667
9/27/2010	11:52:01	California Sea Lion	Zalophus californianus	1	33.023	-119.264500
9/27/2010	11:55:13	Minke Whale	Balaenoptera acutorostrata	3	33.01866667	-119.326833
9/27/2010	12:00:00	California Sea Lion	Zalophus californianus	1	33.0155	-119.318667
9/27/2010	12:11:00	California Sea Lion	Zalophus californianus	1	33.05766667	-119.317333
9/27/2010	12:12:00	California Sea Lion	Zalophus californianus	5	33.037	-119.338167
9/27/2010	12:16:18	California Sea Lion	Zalophus californianus	2	33.118	-119.279333
9/27/2010	12:16:59	California Sea Lion	Zalophus californianus	1	33.13	-119.264333
9/27/2010	12:19:27	California Sea Lion	Zalophus californianus	1	33.148666667	-119.191833
9/27/2010	12:21:15	Risso's Dolphin	Grampus griseus	8	33.148	-119.128500
9/27/2010	12:45:15	Common Dolphin sp.	undifferentiated delphinus	100	33.16266667	-118.900000
9/27/2010	12:56:51	California Sea Lion	Zalophus californianus	4	33.08283333	-118.429167

Sighting Date	Sighting Time	Common Name	Species	Best Count	Latitude	Longitude
9/27/2010	13:00:21	Common Dolphin sp.	undifferentiated delphinus	350	33.10783333	-118.288000
9/27/2010	13:01:00	Common Dolphin sp.	undifferentiated delphinus	40	33.11133333	-118.260167
9/27/2010	13:04:40	Common Dolphin sp.	undifferentiated delphinus	605	33.145	-118.109167
9/27/2010	13:11:46	Common Dolphin sp.	undifferentiated delphinus	180	33.20033333	-117.813833
9/27/2010	13:13:10	Common Dolphin sp.	undifferentiated delphinus	40	33.21533333	-117.750167
9/27/2010	13:16:44	Common Dolphin sp.	undifferentiated delphinus	55	33.253	-117.597167
9/27/2010	13:17:49	Common Dolphin sp.	undifferentiated delphinus	450	33.24783333	-117.547167
9/27/2010	13:22:00	Unidentified Dolphin	unidentified Delphinidae	100	33.13216667	-117.432000
9/27/2010	13:24:00	Common Dolphin sp.	undifferentiated delphinus	300	33.0705	-117.389667
9/27/2010	13:25:00	Common Dolphin sp.	undifferentiated delphinus	850	33.03883333	-117.369167
9/27/2010	13:27:01	Unidentified Dolphin	unidentified Delphinidae	250	32.973	-117.333667
9/27/2010	13:28:20	Common Dolphin sp.	undifferentiated delphinus	750	32.92783333	-117.313167
9/27/2010	14:46:46	Common Dolphin sp.	undifferentiated delphinus	650	32.905	-117.288667
9/27/2010	14:48:20	Common Dolphin sp.	undifferentiated delphinus	125	32.9535	-117.319167
9/27/2010	14:50:13	Common Dolphin sp.	undifferentiated delphinus	50	33.00716667	-117.353000
9/27/2010	14:50:35	Common Dolphin sp.	undifferentiated delphinus	350	33.02116667	-117.362500
9/27/2010	14:51:30	Common Dolphin sp.	undifferentiated delphinus	75	33.044	-117.378000
9/27/2010	14:52:48	Common Dolphin sp.	undifferentiated delphinus	60	33.05033333	-117.417833
9/27/2010	14:57:14	Common Dolphin sp.	undifferentiated delphinus	12	33.01916667	-117.560333
9/27/2010	14:57:25	Common Dolphin sp.	undifferentiated delphinus	275	33.018	-117.566000
9/27/2010	15:01:05	Common Dolphin sp.	undifferentiated delphinus	40	33.01166667	-117.609667
9/27/2010	15:01:45	Common Dolphin sp.	undifferentiated delphinus	90	33.00683333	-117.630667
9/27/2010	15:02:30	Common Dolphin sp.	undifferentiated delphinus	135	33.0015	-117.652667
9/27/2010	15:17:17	Common Dolphin sp.	undifferentiated delphinus	30	32.98616667	-117.717500
9/27/2010	15:19:42	Common Dolphin sp.	undifferentiated delphinus	50	32.97366667	-117.785667
9/27/2010	15:27:44	Common Dolphin sp.	undifferentiated delphinus	1299	32.92566667	-118.025000
9/27/2010	15:27:53	Common Dolphin sp.	undifferentiated delphinus	70	32.92566667	-118.025000
9/27/2010	16:15:54	Unidentified Dolphin	unidentified Delphinidae	25	32.98366667	-117.551500
9/27/2010	16:19:51	Common Dolphin sp.	undifferentiated delphinus	505	33.0105	-117.426667
9/27/2010	16:24:24	Common Dolphin sp.	undifferentiated delphinus	450	32.9305	-117.318167
9/28/2010	8:49:00	Unidentified Dolphin	unidentified Delphinidae	1	32.88266667	-117.298333
9/28/2010	8:55:00	Unidentified Baleen Whale	unidentified balaenopterid	1	33.033	-117.442500
9/28/2010	8:58:27	Common Dolphin sp.	undifferentiated delphinus	600	33.04166667	-117.446333
9/28/2010	9:32:59	Common Dolphin sp.	undifferentiated delphinus	150	33.1005	-117.519333
9/28/2010	9:41:30	Sei/Bryde's Whale	Balaenoptera borealis/edeni/brydei	3	33.27733333	-117.796000
9/28/2010	10:00:00	Unidentified Dolphin	unidentified Delphinidae	500	33.31366667	-117.798000

Sighting Date	Sighting Time	Common Name	Species	Best Count	Latitude	Longitude
9/28/2010	10:27:45	Unidentified Dolphin	unidentified Delphinidae	8	33.42816667	-117.996833
9/28/2010	11:58:52	Unidentified Dolphin	unidentified Delphinidae	8	34.16033333	-119.328667
9/28/2010	12:20:37	Common Dolphin sp.	undifferentiated delphinus	100	34.038	-119.159833
9/28/2010	12:47:14	Common Dolphin sp.	undifferentiated delphinus	10	33.62366667	-118.260500
9/28/2010	12:53:20	Common Dolphin sp.	undifferentiated delphinus	80	33.54316667	-118.032833
9/28/2010	12:55:07	Common Dolphin sp.	undifferentiated delphinus	400	33.5205	-117.961500
9/28/2010	13:17:57	Unidentified Dolphin	unidentified Delphinidae	50	33.446666667	-117.950000
9/28/2010	13:19:28	Common Dolphin sp.	undifferentiated delphinus	15	33.43733333	-118.001167
9/28/2010	13:20:50	Risso's Dolphin	Grampus griseus	25	33.429	-118.045333
9/28/2010	13:47:13	Common Dolphin sp.	undifferentiated delphinus	75	33.41966667	-118.108500
9/28/2010	13:50:13	Risso's Dolphin	Grampus griseus	1	33.4	-118.209667
9/28/2010	13:56:02	Common Dolphin sp.	undifferentiated delphinus	15	33.31833333	-118.226167
9/28/2010	13:58:04	Common Dolphin sp.	undifferentiated delphinus	25	33.2915	-118.286333
9/28/2010	14:01:58	Common Dolphin sp.	undifferentiated delphinus	200	33.248666667	-118.404167
9/28/2010	14:14:27	Common Dolphin sp.	undifferentiated delphinus	60	33.229	-118.367500
9/28/2010	14:17:54	Common Dolphin sp.	undifferentiated delphinus	100	33.256	-118.250333
9/28/2010	14:19:26	Common Bottlenose Dolphin	Tursiops truncatus	18	33.267	-118.201833
9/28/2010	14:26:26	California Sea Lion	undifferentiated delphinus	40	33.25916667	-118.213167
9/28/2010	14:43:30	Common Dolphin sp.	undifferentiated delphinus	12	33.34166667	-117.854167
9/28/2010	14:46:46	Common Dolphin sp.	undifferentiated delphinus	42	33.36466667	-117.739500
9/28/2010	14:54:18	Common Dolphin sp.	undifferentiated delphinus	750	33.248666667	-117.541833
9/28/2010	15:06:25	Common Dolphin sp.	undifferentiated delphinus	5	32.93133333	-117.316167
9/28/2010	15:07:35	Common Dolphin sp.	undifferentiated delphinus	550	32.899	-117.298833

# Appendix B. Sighting Rates

		N	Jov-09			N	lay-10	-			[ul-10			Sep-10		
Species (Common Name)	Total No. of Sightings	Sightings/km	Sightings/nm	Sightings/hr	Total No. of Sightings	Sightings/km	Sightings/nm	Sightings/hr	Total No. of Sightings	Sightings/km	Sightings/nm	Sightings/hr	Total No. of Sightings	Sightings /km	Sightings /nm	Sightings /hr
Whales	-											-			-	
Blue Whale	0	0	0	0	2	0.0007	0.001	0.072	18	0.0058	0.026	0.99	0	0	0	0
Fin Whale	5	0.001	0.003	0.19	2	0.0007	0.001	0.072	4	0.0013	0.0024	0.22	0	0	0	0
Sei Whale	0	0	0	0	0	0	0	0	0	0	0	0	1	0.0003	0.0005	0.05
Bryde's Whale	0	0	0	0	0	0	0	0	0	0	0	0	1	0.0003	0.0005	0.05
Minke Whale`	1	0.0003	0.0005	0.037	1	0.0004	0.0007	0.036	0	0	0	0	1	0.0003	0.0005	0.05
Unidentified Baleen Whale	0	0	0	0	0	0	0	0	0	0	0	0	1	0.0003	0.0005	0.05
Unidentified Large Whale	1	0.0003	0.0005	0.037	1	0.0004	0.0007	0.036	0	0	0	0	0	0	0	0
Unidentified Medium Whale	1	0.0003	0.0005	0.037	0	0	0	0	0	0	0	0	0	0	0	0
Dolphins																
Killer Whale	2	0.0006	0.001	0.075	0	0	0	0	0	0	0	0	0	0	0	0
Cuvier's Beaked Whale	2	0.0006	0.001	0.075	0	0	0	0	0	0	0	0	1	0.0003	0.0005	0.05
Risso's Dolphin	5	0.001	0.003	0.19	28	0.14	0.02	1.011	1	0.00032	0.00059	0.06	6	0.002	0.003	0.32
Common Dolphin sp.	25	0.007	0.013	0.94	15	1.27	0.01	0.54	40	0.013	0.024	2.21	125	0.032	0.06	6.6
Common Bottlenose Dolphin	0	0	0	0	9	0.98	0.006	0.32	3	0.00096	0.0018	0.17	4	0.001	0.002	0.21
Pacific White-sided Dolphin	6	0.002	0.003	0.22	2	0.03	0.001	0.072	0	0	0	0	0	0	0	0
Unidentified Dolphin	6	0.002	0.003	0.22	10	0.27	0.007	0.361	17	0.0054	0.01	0.94	32	0.008	0.015	1.7
Unidentified Small Dolphin	2	0.0006	0.001	0.075	4	0.17	0.003	0.14	2	0.00064	0.0012	0.11	0	0	0	0
Pinnipeds																
California Sea Lion	19	0.006	0.01	0.71	22	0.02	0.016	0.79	1	0.00032	0.00059	0.06	71	0.018	0.034	3.7
Harbor Seal	0	0	0	0	1	0.0007	0.0007	0.036	0	0	0	0	0	0	0	0
Northern Elephant Seal	0	0	0	0	0	0	0	0	0	0	0	0	3	0.0008	0.0014	0.16
Unidentified Pinniped	4	0.001	0.002	0.15	2	0.0007	0.001	0.072	0	0	0	0	0	0	0	0
Unidentified Marine Mammal	1	0.0003	0.0005	0.037	1	0.0004	0.0007	0.036	0	0	0	0	2	0.0005	0.0009	0.11
Unidentified Small Marine Mammal	1	0.0003	0.0005	0.037	2	0.0007	0.001	0.072	0	0	0	0	1	0.0003	0.0005	0.05
Unidentified Medium Marine Mammal	0	0	0	0	0	0	0	0	0	0	0	0	2	0.0005	0.0009	0.11
Overall Marine Mammal	81	0.02	0.04	3.034	102	0.04	0.073	3.68	86	0.028	0.051	4.75	252	0.065	0.12	13.3

### Appendix Table B- 1. Sighting rates of marine mammal groups by species during the November 2009, May 2010, July 2010, and September 2010 SOCAL aerial surveys during systematic, random and transit effort.

		Ν	Nov-09			May	r-10			Jul	-10			Sep	-10	
Species (Common Name)	Total # Indiv	Indiv/km	Indiv/nm	Indiv./hr	Total # Indiv.	Indiv./km	indiv./nm	indiv./hr	Total # Individuals	indiv./km	indiv./nm	indiv./hr	Total # Individuals	indiv./km	indiv./nm	indiv./hr
Whales																
Blue Whale	0	0	0	0	2	0.0007	0.001	0.14	44	0.014	0.026	2.43	0	0	0	0
Fin Whale	9	0.003	0.005	0.64	4	0.002	0.003	0.29	7	0.0022	0.0041	0.39	0	0	0	0
Sei Whale	0	0	0	0	0	0	0	0	0	0	0	0	3	0.0008	0.0014	0.16
Bryde's Whale	0	0	0	0	0	0	0	0	0	0	0	0	1	0.0003	0.0005	0.05
Minke whale`	1	0.003	0.0005	0.07	1	0.0004	0.0007	0.71	0	0	0	0	3	0.0008	0.0014	0.16
Unidentified Baleen Whale	0	0	0	0	0	0	0	0	0	0	0	0	2	0.0005	0.0009	0.11
Unidentified Large Whale	1	0.003	0.0005	0.07	1	0.0004	0.0007	0.71	0	0	0	0	0	0	0	0
Unidentified Medium Whale	1	0.003	0.0005	0.07	0	0	0	0	0	0	0	0	0	0	0	0
Dolphins					_											
Killer Whale	67	0	0.04	4.79	0	0	0	0	0	0	0	0	0	0	0	0
Cuvier's Beaked Whale	6	0.002	0.003	0.43	0	0	0	0	0	0	0	0	2	0.0005	0.0009	0.11
Risso's Dolphin	167	0.05	0.09	11.93	373	0.14	0.27	26.64	9	0.0029	0.0053	0.5	74	0.019	0.035	3.89
Common Dolphin sp.	11891	3.45	6.4	849.36	3300	1.27	2.36	235.71	9154	2.99	5.54	505.75	34136	8.83	16.34	1796.6
Common Bottlenose Dolphin	0	0	0	0	255	0.98	0.18	18.21	62	0.02	0.037	3.43	48	0.012	0.023	2.53
Pacific White-sided Dolphin	274	0.08	0.15	19.57	81	0.03	0.06	5.79	0	0	0	0	0	0	0	0
Unidentified Dolphin	27	0.08	0.01	1.93	689	0.27	0.49	49.21	1392	0.45	0.82	76.91	3380	0.87	1.62	177.9
Unidentified Small Dolphin	45	0.01	0.02	3.21	429	0.17	0.31	30.64	220	0.07	0.13	12.15	0	0	0	0
Pinnipeds			-							-		-		-		
California Sea Lion	83	0.02	0.04	5.93	58	0.02	0.04	4.14	2	0.00064	0.0012	0.11	194	0.05	0.09	10.21
Harbor Seal	0	0	0	0	2	0.0007	0.001	0.14	0	0	0	0	0	0	0	0
Northern Elephant Seal	0	0	0	0	0	0	0	0	0	0	0	0	22	0.006	0.011	1.16
Unidentified Pinniped	4	0.001	0.002	0.29	2	0.0007	0.001	0.14	0	0	0	0	0	0	0	0
Unidentified Marine Mammal	1	0.0003	0.0005	0.07	10	0.004	0.007	0.71	0	0	0	0	9	0.002	0.004	0.47
Unidentified Small Marine Mammal	1	0.0003	0.0005	0.07	2	0.0007	0.001	0.14	0	0	0	0	1	0.0003	0.0005	0.05
Unidentified Medium Marine Mammal	0	0	0	0	0	0	0	0	0	0	0	0	1	0.0003	0.0005	0.05
Overall Marine Mammal	12578	3.65	6.77	898.43	5209	2.01	3.72	372.07	11090	3.55	6.57	612.71	37874	9.79	18.13	1993.4

Appendix Table B- 2. Sighting rates of individual marine mammals by species during the November 2009, May, July 2010 and September 2010 SOCAL aerial surveys during systematic, random and trans

sit	effort.

					Nov	7 18-23, 2009						May	13-18, 2010					July	27- Augu	ıst 3, 2010					Septe	ember 2	3-28, 2010		
Effort Type	Species Group	T ot al St gs	Total km	Total nm	Total hr	Sighting/ km	Sighting/ nm	Sighting/ hr	Total Stgs	Total km	Total nm	Total hr	Sighting/ km	Sighting/ nm	Sighting/ hr	Total Stgs	Total km	Total nm	Total hr	Sighting /km	Sighting /nm	Sighti ng/hr	Total Stgs	Total km	Total nm	To tal hr	Sightin g/km	Sightin g/nm	Sighting /hr
	Whales	6				0.003	0.006	0.73	4				0.003	0.006	0.5509	1				0.002	0.003	0.33	1				0.0007	0.0013	0.133
Systematic	Dolphins	21	1700	067	0.25	0.012	0.022	2.55	29	1269	COE	7.26	0.023	0.042	3.9939	13				0.022	0.041	4.33	49				0.034	0.064	6.533
Systematic	Pinnipeds	17	1790	907	0.23	0.009	0.018	2.06	13	1206	065	/.20	0.01	0.019	1.7904	0	592	319.68	3	0	0	0	49	1428	771	7.5	0.034	0.064	6.533
	All MM	46				0.026	0.048	5.58	46				0.036	0.067	6.3351	14				0.024	0.044	4.67	99				0.069	0.128	13.2
	Whales	0				0	0	0	1				0.003	0.005	0.4768	0				0	0	0	2				0.012	0.022	2
Random	Dolphins	4	669	361	1 72	0.006	0.011	2.33	10	370	200	2.1	0.027	0.05	4.76821	3		<b>7</b> 0.04		0.027	0.050	6.00	7				0.043	0.079	7
Kandom	Pinnipeds	3	007	501	1.72	0.004	0.008	1.75	1	570	200	2.1	0.003	0.005	0.4768	0	111	59.94	0.5	0	0	0	9	164	89	1	0.055	0.101	9
	All MM	7				0.01	0.019	4.08	12				0.032	0.06	5.7219	3				0.027	0.050	6.00	18				0.182	0.54	18
	Whales	2				0.002	0.004	0.54	1				0.001	0.002	0.2206	16				0.018	0.034	4.21	2				0.0009	0.0016	0.1923
Transit	Dolphins	23	083	531	3 73	0.023	0.043	6.17	29	956	516	4 53	0.03	0.056	6.3971	42				0.048	0.089	11.05	109				0.0477	0.0883	10.5
Transit	Pinnipeds	3	705	551	5.75	0.003	0.006	0.81	12	750	510	4.55	0.013	0.023	2.6471	1	874	471.96	3.8	0.001	0.002	0.26	11	2286	1234	10. 4	0.0048	0.0089	1.058
	All MM	28				0.028	0.053	7.51	42				0.044	0.081	9.2647	59				0.068	0.125	15.53	122				0.0533	0.099	11.73
	Whales	0				0	0	0	0				0	0	0	5				0.003	0.006	0.50	1				0.02	0.037	3.33
Circling	Dolphins	1	1335	721	72	0.001	0.001	0.14	0	2125	1147	12 91	0	0	0	5	1540	00444	10	0.003	0.006	0.50	2				0.04	0.074	6.66
Chroning	Pinnipeds	0	1555	/21	7.2	0	0	0	0	2125	1117	12.71	0	0	0	0	1549	836.46	10	0	0	0	5	50	27	0.3	0.1	0.185	16.66
	All MM	1				0.001	0.001	0.14	0				0	0	0	10				0.006	0.012	1.00	8				0.16	0.297	26.66
	Whales	0				0	0	0	0				0	0	0	0				0	0	0	0				0	0	0
Circumnavigating San Clemente	Dolphins	2	120	65	0.21	0.017	0.031	9.33	3	83	45	0.48	0.036	0.067	6.2791	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Island	Pinnipeds	5	120	05	0.21	0	0	23.32	37	05	-15	0.40	0.446	0.826	77.4419	0	Ŭ	Ū	Ū	0	0	0	0	0	0		0	0	0
	All MM	7				0.058	0.108	32.64	40				0.482	0.893	83.7209	0				0	0	0	0				0	0	0
	Whales	0				0	0	0	0				0	0	0	0				0	0	0	0				0	0	0
Navy-directed	Dolphins	1	137	74	0.63	0.007	0.014	1.58	7	91	49	0 39	0.077	0.142	17.7465	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transiting	Pinnipeds	4	1.57	77	0.05	0	0	6.34	3	<i>7</i> 1	77	0.57	0.033	0.061	7.6056	0		0	0	0	0	0	0	Ŭ	0		0	0	0
	All MM	5				0.036	0.068	7.92	10				0.11	0.204	25.3521	0				0	0	0	0				0	0	0

#### Appendix Table B- 3. Sighting rates of marine mammal (MM) groups by effort type during the November 2009, May 2010, July 2010 and September 2010 SOCAL aerial surveys.

				N	Jov 18-	23, 2009						May 13	-18, 2010					July 27	- Aug	ust 3, 2010					Septe	mber	23-28, 2010		
Effort Type	Species Group	Total Indiv	Tota 1 km	Tota 1 nm	Tota 1 hr	Indiv / km	Indiv/ nm	Indiv/ hr	Total Indiv	Total km	Total nm	Tot al hr	Indiv/k m	Individu al/nm	Individual /hr	Total Animals	Total km	Total nm	To tal hr	Individ ual/km	Individu al/nm	Individ ual/hr	Total Animals	Total km	Total nm	To tal hr	Individ ual/km	Individu al/nm	Individ ual/hr
	Whales	4				0.002	0.0041	0.48	6				0.0047	0.0088	0.83	2				0.003	0.006	0.67	1				0.0007	0.0013	0.1333
	Dolphins	3823	4=00	0.47		2.14	3.95	463.5	3080		105	= = (	2.43	4.5	424.18	1841				3.110	5.759	613.67	10119		771	7.5	7.09	13.12	1349.2
Systematic	Pinnipeds	8	1790	967	8.25	0.004 5	0.0083	0.97	20	1268	685	7.26	0.016	0.029	2.75	0	592	319.68	3	0.000	0.000	0.00	151	1428			0.106	0.196	20.133
	All MM	3835				2.14	3.97	464.96	3106				2.45	4.53	427.76	1843				3.113	5.765	614.33	10271				7.19	13.32	1369.5
	Whales	8				0.012	0.022	4.66	1				0.0027	0.005	0.477	0				0.000	0.000	0.00	4				0.024	0.045	4
Bandom	Dolphins	8207	660	361	1 72	12.27	22.73	4785.42	582	370	200	2.1	1.57	2.91	277.51	162				1.459	2.703	324.00	685	164	89	1	4.177	7.697	685
Kandoin	Pinnipeds	77	009	301	1./2	0.12	0.21	44.9	25	370	200	2.1	0.068	0.125	11.92	0	111	59.94	0.5	0.000	0.000	0.00	13				0.079	0.146	13
	All MM	8292				12.39	22.97	4834.99	608				1.64	3.04	289.91	162				1.459	2.703	324.00	702				4.28	7.89	702
	Whales	2				0.002	0.0038	0.54	1				0.001	0.0019	0.22	42				0.048	0.089	11.05	4				0.002	0.003	0.385
Transit	Dolphins	3835	0.02	521	2 72	3.9	7.22	1029.22	1465	056	516	4 5 2	1.53	2.84	323.16	8564				9.799	18.146	2253.68	26065	2286	1234	10. 4	11.4	21.12	2506.25
Tansit	Pinnipeds	3	265	551	5.75	0.003	0.0056	0.81	18	930	510	4.55	0.019	0.035	3.97	2	874	471.96	3.8	0.002	0.004	0.53	10				0.004	0.008	0.96
	All MM	28				0.028	0.0527	7.51	1495				1.56	2.9	329.78	8608				9.849	18.239	2265.26	26079				11.4	21.13	2507.6
	Whales	0				0	0	0	0				0	0	0	7				0.005	0.008	0.70	2				0.04	0.074	6.66
Circling	Dolphins	150	1225	721	7.2	0.11	0.2	20.84	0	2125	1147	12.9	0	0	0	470				0.303	0.562	47.00	900	50	27	0.3	18	33.33	3000
Circing	Pinnipeds	0	1555	/ 21	1.2	0	0	0	0	2123	114/	1	0	0	0	0	1549	836.46	10	0.000	0.000	0.00	48				0.96	1.77	160
	All MM	150				0.11	0.2	20.84	0				0	0	0	477				0.308	0.570	47.70	950				19	35.19	3166.7
C	Whales	0				0	0	0	0				0	0	0	0				0	0	0	0				0	0	0
igating San	Dolphins	50	120	65	0.21	0.42	0.77	233.16	53	93	45	0.48	0.64	1.18	110.93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clemente Island	Pinnipeds	35	120	05	0.21	0.29	0.54	163.21	96	05	45	0.40	1.16	2.13	200.93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1014114	All MM	85				0.71	1.31	396.37	149				1.8	3.31	311.86	0				0	0	0	0				0	0	0
	Whales	0				0	0	0	0				0	0	0	0				0	0	0	0				0	0	0
Navy-	Dolphins	447	137	74	0.63	3.26	6.041	707.96	90	01	40	0.30	0.99	1.84	228.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transiting	Pinnipeds	2	137	/4	0.03	0.015	0.027	3.17	5	21	47	0.59	0.055	0.1	12.68	0	U	U	U	0	0	0	0	0	U	U	0	0	0
	All MM	449				3.28	6.068	711.13	95				1.044	1.94	240.85	0				0	0	0	0				0	0	0

#### Appendix Table B- 4. Sighting rates of individual marine mammals (MM) by effort type during the November 2009, May 2010, July 2010 and September 2010 SOCAL aerial surveys.

## Appendix C. Focal Follows

Date	Start Time	End Time	Duration of Focal (hr:min:sec)	Latitude	Longitude	Species	Group Size	Notes
27-Jul	14:09:01	15:16:00	1:06:59	32.54065	117.19325	Blue Whale	4	
27-Jul	15:24:19	16:24:00	0:59:41	32.49768	117.22878	Blue Whale	6	One possible young-of-the year, 2 fins joined after period of time, 6 blues and 2 fins at the surface at one time in large 800-m circle
28-Jul	13:46:21	14:32:00	0:45:39	32.5597	117.18939	Blue Whale	3	
28-Jul	14:56:06	15:05:00	0:08:54	33.10959	117.27519	Common Dolphin sp.	400	
28-Jul	15:45:58	15:59:00	0:13:02	32.38722	117.20831	Blue Whale/Fin Whale	8	3 fin whales travel together with 3 blue whales, 2 other blue whales on the outskirts about 10 and 50 body lengths away
29-Jul	14:37:26	15:39:50	1:02:24	32.45351	117.21725	Blue Whale	2	
29-Jul	15:50:41	16:02:27	0:11:46	33.03163	117.23013	Common Dolphin sp.	380	
29-Jul	16:19:58	16:31:03	0:11:05	32.55137	117.2063	Blue Whale	3	
30-Jul	15:08:36	15:28:27	0:19:51	33.06714	118.39205	Risso's Dolphin	9	
31-Jul	14:35:36	15:40:07	1:04:31	32.45747	117.21411	Common Dolphin sp.	100	
31-Jul	14:36:31	15:40:21	1:03:50	32.44289	117.22023	Blue Whale	6	
31-Jul	15:50:33	15:56:10	0:05:37	32.37979	117.44703	Common Dolphin sp.	200	

#### Table C-1. Focal follows performed during July SOCAL 2010 aerial monitoring surveys off San Diego, California.

Date	Start Time	End Time	Duration of Focal (hr:min:sec)	Latitude	Longitude	Species	Group Size	Notes
31-Jul	16:07:24	16:16:01	0:08:37	32.44972	117.38886	Common Dolphin sp.	60	
31-Jul	16:21:53	16:30:29	0:08:36	32.48956	117.25582	Unid. Dolphin	25	
31-Jul	16:46:05	16:52:28	0:06:23	32.5412	117.32314	Common Dolphin sp.	110	
31-Jul	17:41:12	18:15:06	0:33:54	33.03289	117.22819	Common Dolphin sp.	450	Fin whale in vicinity of single blue
2-Aug	16:56:05	17:28:36	0:32:31	33.19146	117.37712	Blue Whale	2	
3-Aug	15:42:06	15:49:00	0:06:54	33.07479	117.26426	Common Dolphin sp.	1000	
3-Aug	17:34:51	17:57:45	0:22:54	32.55495	117.19366	Blue Whale	2	Seen while circling the single blue whale seen earlier thus no angle; circled these 2 blues for focal session but clouds did not allow us to go any higher than 800 ft so we circled outside 1 km radial distance for short period but then determined that observations were not effective because too difficult to follow and resight whales at that low altitude due to wing getting in way and short period whales in view; seen near buoy

Number of 5 min-focals for July = 6

Number of 10-min focals for July = 13

Date	Start Time	End Time	Duration of Focal (hr:min:sec)	Latitude	Longitude	Species	Group Size	Notes
24-Sep	13:42:13	13:48:48	0:06:35	32.839	-119.149	Unidentified Baleen Whale	1	Possibly a blue whale, very light
24-Sep	14:16:30	14:22:43	0:06:13	32.992	-118.318	Common Dolphin sp.	250	Very tight ball of dolphins travel fast with birds circled at 800 ft; see behavior sheet for 5 min focal
24-Sep	16:11:00	16:16:00	0:05:00	32.912	-117.348	Common Dolphin sp.	4000	
24-Sep	16:59:00	17:05:00	0:06:00	33.412	-117.861	Common Dolphin sp.	40	At least 4 subgroups, inverted swim, bird associated
26-Sep	13:13:30	13:42:00	0:28:30	33.175	-118.847	Common Dolphin sp.	1000	Circled for about 27 min took video and photos, Bernd used video regular lens then later put on UV lens thinks it helped some cutting back on the glare for video camera he thinks he got deeper into the water in no glare part of turns
26-Sep	16:01:01	16:10:00	0:08:59	33.337	-118.033	Common Dolphin sp.	450	
26-Sep	16:53:35	17:06:13	0:12:38	33. 129	-117.422	Common Dolphin sp.	400	Many subgroups of small groups of 5 to 12 or so, foraging, milling, some surface activity
27-Sep	10:48:12	11:09:00	0:20:48	33.165	-119.228	Risso's Dolphin	30	Headed up to 1500 ft. to do behaviors, slow travel entire time, we did focals on a group of about 17 Risso's, see behavior sheet on this day; 10:50:44 we are telling R/V Sproul about location of Risso's, but they are still with 1 beaked whale sighting
27-Sep	11:55:13	12:02:00	0:06:47	33.019	-119.327	Minke Whale	3	3 small whales 1 confirmed with photo and view as minke, others are prob minkes too based on color under surface dark and size and behavior and synchrony MS LM saw chevron and white pec, Bernd got photos, Sproul saw 2 minkes this morning
27-Sep	12:21:15	12:44:00	0:22:45	33.148	-119.129	Risso's Dolphin	8	
27-Sep	15:02:30	15:14:00	0:11:30	33.002	-117.653	Common Dolphin sp.	135	doing focals w video because they are foraging and doing pirouetting circling; did focals on subgroup of about 12see video
27-Sep	15:27:44	15:56:35	0:28:51	33.926	-118.025	Common Dolphin sp.	1299	Circling for photos and behavior 1 medium-sized recreational fishing vessel is following from about 0.5 nm

Table C-2. Focal follows performed during September SOCAL 2010 aerial monitoring surveys off San Diego, California.

Date	Start Time	End Time	Duration of Focal (hr:min:sec)	Latitude	Longitude	Species	Group Size	Notes
28-Sep	8:58:27	9:32:00	0:33:33	33.042	-117.446	Common Dolphin sp.	600	Spacer anglecommons feedingphotos trying to capture pairs feeding and distance between them
28-Sep	9:41:30	10:25:00	0:43:30	33.277	-117.796	Sei/Bryde's Whale	3	Initially seen underwater and fluking up, looked like a small or med size whale; we circled it for over 30 min while the whales sporadically lunge fed, Bernd got photos of lunge feeding, got photos of head and looks like there is a secondary ridge characteristic of Brydes whales.Bernd took circled at 030 degrees declination distance to animals at 1500 ft. T. Jefferson later examined photos and determined to be a sei or Bryde's whale
28-Sep	13:20:50	13:45:00	0:24:10	33.429	-118.045	Risso's Dolphin	25	Did focals on a single Risso's for about 3+ surfacing sequences to get individual dive and blow times; BW got video, notes by LM on excel behavior sheet; was a single animal in this group, all individuals widely spread into subgroups of mostly 1-3 animals, a few subgroups of 5-10 indiv
28-Sep	14:26:26	14:34:46	0:08:20	33.259	-118.213	California Sea Lion	40	Resting at surface in tight group as we circled the bottlenose dolphins near Santa Catalina Isld; sea lions appeared to potentially react during third circling when plane passed over at about 70 degrees, some indiv diving with splash
		Total:	4:34:09					

Number of 5-min focals for September = 7

Number of 10-min focals for September = 9

## Appendix D. List of July 2010 and September 2010 Video

Video Name	Date	Video Start Time	Video End Time	Total Video (min)	Daily ID #	Species	Best Grp Size Estim	Video Notes	Taken By
SOCAL_2010July_27_SES_ Video_141025- 141438_ID01_Blue	7/27/2010	14:10:25	14:14:38	0:04:13	1	Blue Whale	4	Multiple blows, no vocals due to noise of helicopter, subsurface, 1 indiv.	BW
SOCAL_2010July_27_SES_ Video_141538- 141541_IDBoat_Boat	7/27/2010	14:15:38	14:15:41	0:00:03	Boat	Boat	1	Private sailboat only	BW
SOCAL_2010July_27_SES_ Video_141610- 141758_ID01_Bottlenose	7/27/2010	14:16:10	14:17:58	0:01:48	1	Common Bottlenose Dolphin	4	Fast travel, oriented at 350 degrees	BW
SOCAL_2010July_27_SES_ Video_141828- 141938_ID01_Bottlenose	7/27/2010	14:18:28	14:19:38	0:01:10	1	Common Bottlenose Dolphin	4	No audio, large group, fast travel	BW
SOCAL_2010July_27_SES_ Video_142206- 142658_ID01_Blue	7/27/2010	14:22:06	14:26:58	0:04:52	1	Blue Whale	4	1 indiv., below surface, multiple blows, slow travel, blew and dove	BW
SOCAL_2010July_27_SES_ Video_143839- 144109_ID01_Blue	7/27/2010	14:38:39	14:41:09	0:02:30	1	Blue Whale	4	below surface, 1 indiv., slow travel, blew and shallow dive	BW
SOCAL_2010July_27_SES_ Video_144431- 144520_ID01_Blue	7/27/2010	14:44:31	14:45:20	0:00:49	1	Blue Whale	4	1 indiv., below surface, blew and dove	BW

#### Table D-1. Videos recorded during July SOCAL 2010 aerial monitoring surveys off San Diego, California.

Video Name	Date	Video Start Time	Video End Time	Total Video (min)	Daily ID #	Species	Best Grp Size Estim	Video Notes	Taken By
SOCAL_2010July_27_SES_ Video_144703- 144815_ID03_Fin	7/27/2010	14:47:03	14:48:15	0:01:12	3	Fin Whale	1	1 indiv, below surface, surfaces blows, and dives again and seen below surface	BW
SOCAL_2010July_27_SES_ Video_145232- 145253_ID01_Blue	7/27/2010	14:52:32	14:52:53	0:00:21	1	Blue Whale	4	Flukes up and dove	BW
SOCAL_2010July_27_SES_ Video_145601- 145825_ID01_Blue	7/27/2010	14:56:01	14:58:25	0:02:24	1	Blue Whale	4	1 indiv., below surface, multiple blows, slow travel,	BW
SOCAL_2010July_27_SES_ Video_150525- 150654_ID01_Blue	7/27/2010	15:05:25	15:06:54	0:01:29	1	Blue Whale	4	1 indiv., resting below surface, multiple blows	BW
SOCAL_2010July_27_SES_ Video_150939- 151242_IDX01_Blue	7/27/2010	15:09:39	15:12:42	0:03:03	1	Blue Whale	4	multiple blows, 1 indiv., shallow dive, slow travel,	BW
SOCAL_2010July_27_SES_ Video_152454- 152516_ID05_Blue	7/27/2010	15:24:54	15:25:16	0:00:22	5	Blue Whale	6	1 indiv, subsurface, blows, arched back then flukes up and dives	BW
SOCAL_2010July_27_SES_ Video_152550- 152832_IDX05_Blue	7/27/2010	15:25:50	15:28:32	0:02:42	5	Blue Whale	6	whale scat, 2 indiv., slow travel, looks like mother calf pair	BW

Video Name	Date	Video Start Time	Video End Time	Total Video (min)	Daily ID #	Species	Best Grp Size Estim	Video Notes	Taken By
SOCAL_2010July_27_SES_ Video_153626- 154427_ID05_Blue	7/27/2010	15:36:26	15:44:27	0:08:01	5	Blue Whale	6	2 indiv., swimming towards helicopter, whale #2 reorients to the right of whale #1, whale #2 is .5 body lengths behind #1, multiple blows, dispersal is now 2 body lengths, some white water when whales submerge, slow travel, whale #1 dove, whale #2 at surface then dives, both shallow dives, whale #2 now to the left of #1, poss #2 a calf, whales side by side .5 body lengths	BW
SOCAL_2010July_27_SES_ Video_155012- 155027_ID05_Blue	7/27/2010	15:50:12	15:50:27	0:00:15	5	Blue Whale	6	Flukes and dove	BW
SOCAL_2010July_27_SES_ Video_155104- 160113_ID05_Blue	7/27/2010	15:51:04	16:01:13	0:10:09	5	Blue Whale	6	2 indiv., second 2 body lengths behind to the right, slow travel, multiple blows, traveling away from helicopter, first whale circled around and 2nd whale dove, whale #2 up, swimming behind other whale 1.5 body lengths apart, whale #1 dove, whale #2 dove, whales surface together .5 body lengths apart side by side and it is a mother-calf pair, calf dove, mother subsurface, calf just below mother both under the surface, looks like they are floating just below surface, possible nursing, looks as if mother rolled to side,	BW

Video Name	Date	Video Start Time	Video End Time	Total Video (min)	Daily ID #	Species	Best Grp Size Estim	Video Notes	Taken By
SOCAL_2010July_27_SES_ Video_160446- 160832_ID05_Blue	7/27/2010	16:04:46	16:08:32	0:03:46	5	Blue Whale	6	1 indiv. , 3 spots of scat, multiple blows, slow travel, arched back, flukes up and dove	BW
SOCAL_2010July_27_SES_ Video_161013- 161217_ID05_Blue	7/27/2010	16:10:13	16:12:17	0:02:04	5	Blue Whale	6	2 indiv., multiple blows, slow travel, front animal 4 body lengths apart, not 2 body lengths apart, the 2nd is behind to the left,	BW
SOCAL_2010July_27_SES_ Video_161740- 162107_ID05_Blue	7/27/2010	16:17:40	16:21:07	0:03:27	5	Blue Whale	6	1 indiv. subsurface, looks as if it is floating just below surface, milling, whale turns slightly on its side, arched back and dove	BW
SOCAL_2010July_27_SES_ Video_162117- 162127_IDXX_Unid	7/27/2010	16:21:17	16:21:27	0:00:10	XX	Unidentified Whale Scat		Whale scat	BW
SOCAL_2010July_27_SES_ Video_162141- 162147_IDXX_Unid	7/27/2010	16:21:41	16:21:47	0:00:06	XX	Unidentified Whale Scat		Big blob of whale scat	BW
SOCAL_2010July_28_SES_ Video_134711- 135024_ID02_Blue	7/28/2010	13:47:11	13:50:24	0:03:13	2	Blue Whale	3	cannot hear vocals, multiple blows, arched back and dove,	BW

Video Name	Date	Video Start Time	Video End Time	Total Video (min)	Daily ID #	Species	Best Grp Size Estim	Video Notes	Taken By
SOCAL_2010July_28_SES_ Video_135623- 143050_ID02_Blue	7/28/2010	13:56:23	14:30:50	0:34:27	2	Blue Whale	3	Cannot hear vocals, 1 indiv. Subsurface, multiple blows, looks like it is logging, very slow travel, arched back and a fluke, dove, arched back and shallow dive, arched back and dove, flukes, seems to be floating at surface at times, arched back, flukes and dove	BW
SOCAL_2010July_28_SES_ Video_145741- 150356_ID08_Commonsp.	7/28/2010	14:57:41	15:03:56	0:06:15	8	Common Dolphin sp.	400	Surface active milling, dispersal 1- 8, 1400 ft, angle 26, well over 100 animals, 2 groups, 1st group scattered	BW
SOCAL_2010July_28_SES_ Video_152622- 152628_IDBoat_Boat	7/28/2010	15:26:22	15:26:28	0:00:06	Boat	Boat	1	Private Boat Only	BW
SOCAL_2010July_28_SES_ Video_154558- 155422_ID13_Blue_Fin	7/28/2010	15:45:58	15:54:22	0:08:24	13	Blue Whale/Fin Whale	5 Blue 3Fin	oriented to 320, multiple blows, 3 indiv., slow travel, 3 fins, 2 blues, subsurface, blues oriented at 330, 3 animals are 1 body length apart, 3 fins and 3 blues, the fins are swimming towards a bait ball, one fin with mouth open	BW
SOCAL_2010July_29_SES_ Video_143809- 151936_ID01_Blue	7/29/2010	14:38:09	15:19:36	0:41:27	1	Blue Whale	2	2 indiv., slow travel, subsurface, multiple blows, lots of white water, vocals hard to understand, oriented at 180, angle 30 degrees, flukes, 2nd whale defecated, reoriented about 15 degrees to 210, about 1.5 body lengths apart	BW

Video Name	Date	Video Start Time	Video End Time	Total Video (min)	Daily ID #	Species	Best Grp Size Estim	Video Notes	Taken By
SOCAL_2010July_29_SES_ Video_155244- 155545_ID02_Commonsp.	7/29/2010	15:52:44	15:55:45	0:03:01	2	Common Dolphin sp.	380	800 ft., looking at subgroup, orientation 270, unidentified splash, 2 gulls over dolphin	BW
SOCAL_2010July_29_SES_ Video_155549- 155744_ID02_Commonsp.	7/29/2010	15:55:49	15:57:44	0:01:55	2	Common Dolphin sp.	380	Dispersion 1-2	BW
SOCAL_2010July_29_SES_ Video_160820- 160905_ID03_Commonsp.	7/29/2010	16:08:20	16:09:05	0:00:45	3	Common Dolphin sp.	110	Bird association	BW
SOCAL_2010July_30_SES_ Video_131258- 151332_ID01_Risso's	7/30/2010	15:12:58	15:13:32	0:00:34	1	Risso's Dolphin	9	Oriented at 2 o'clock	BW
SOCAL_2010July_30_SES_ Video_151558- 152732_ID01_Risso's	7/30/2010	15:15:58	15:27:41	0:11:43	1	Risso's Dolphin	9	line abreast, dispersal 1-2, oriented at 330, dispersal now 1-5	BW
SOCAL_2010July_31_SES_ Video_143756- 155920_ID03_Blue	7/31/2010	14:37:56	14:59:20	0:21:24	3	Blue whale	6	.5 body lengths apart, 2 indiv	MS
SOCAL_2010July_31_SES_ Video_14592- 1529163_ID03_Blue	7/31/2010	14:59:23	15:29:16	0:29:53	3	Blue Whale	6	2 indiv.	MS

Video Name	Date	Video Start Time	Video End Time	Total Video (min)	Daily ID #	Species	Best Grp Size Estim	Video Notes	Taken By
SOCAL_2010July_31_SES_ Video_153608- 153732_ID03_Blue	7/31/2010	15:36:08	15:37:32	0:01:24	3	Blue Whale	6	oriented at 300, 2 ind.,one whale fluked and the second one sounded, angle is 26	MS
SOCAL_2010July_31_SES_ Video_174437- 175548_ID22_Blue	7/31/2010	17:44:37	17:55:48	0:11:11	22	Blue Whale	1		MS
SOCAL_2010July_31_SES_ Video_175549- 181939_ID22_Blue	7/31/2010	17:55:49	18:19:39	0:23:50	22	Blue Whale	1	oriented at 150	MS
SOCAL_2010July_2August _SES_Video_155827- 163641_ID24_Blue	8/2/2010	15:58:27	16:36:41	0:38:14	24	Blue Whale	2	mother-calf pair, oriented at 210, calf rolled over, another adult blue whale 30 body lengths away, breaching, mother-calf .5 body lengths apart, calf now 5 body lengths apart from mother, calf breached, mother lunged and breached then sounded, calf breached and lunged 5 times, now mother-calf pair dove, 3 rd whale lunged twice, breached and blew, and fast travel, orientation now 300, calf lunged, angle from calf is 33 degrees, calf keeps lunging while mom underwater swimming	MS

Video Name	Date	Video Start Time	Video End Time	Total Video (min)	Daily ID #	Species	Best Grp Size Estim	Video Notes	Taken By
SOCAL_2010July_2August _SES_Video_165955- 175930_ID31_Blue	8/2/2010	16:59:55	17:59:30	0:59:35	31	Blue Whale	2	2 indiv., multiple blows, speed boat in picture but not close to whales, whale #2 defecated, #2 whale fluked then dove, 50 body lengths apart, oriented at 130, first whale angle 29 degrees, 2nd whale 37 degrees,	MS
SOCAL_2010July_3August _SES_Video_173759- 180230_ID41_Blue	8/3/2010	17:37:59	17:54:27	0:16:28	41	Blue Whale	2	pair of blue whales surfaced, multiple blows, some glare, whales sounding, fluke up dive on whale #1, dispersal is one body length apart, gulls overhead, dolphins seen in water concentration on blue whale focal, 550 ft., fluke up again on whale #1, plane had to go low to get out of way of F16's, possible fin, blues surfaces, fast travel, sounded, whale #1 arch back and dive,	MS
SOCAL_2010July_3August _SES_Video_175429- 180230_ID41_Blue	8/3/2010	17:54:29	18:02:30	0:08:01	41	Blue Whale	2	One whale seen, blow, fluke up, poss fin whale seen in beginning of video, 2 blues seen again from previous video, multiple blows by each blues, video camera put down for photos, 2000 ft.	MS

Video Name	Date	Start Time	End Time	Total Video (hr::min:sec)	Daily Sighting ID	Species	Approx. Group Size	Video Notes	Taken By
SOCAL_2010Sept_23_SES_Video_161914- 162115_ID06_CommonDolphinSp.	9/23/2010	16:19:14	16:21:15	0:02:01	6	Common Dolphin sp.	60	No voice on video, bird association	MS
SOCAL_2010Sept_23_SES_Video_162118- 162244_ID06_CommonDolphinSp.	9/23/2010	16:21:18	16:22:44	0:01:26	6	Common Dolphin sp.	60	No voice on video, bird association, animals spread out, inverted lunge	MS
SOCAL_2010Sept_23_SES_Video_162252- 162416_ID06_CommonDolphinSp.	9/23/2010	16:22:52	16:24:16	0:01:24	6	Common Dolphin sp.	60	No voice on video, bird association, inverted lunge	MS
SOCAL_2010Sept_23_SES_Video_162418- 162429_ID06_CommonDolphinSp.	9/23/2010	16:24:18	16:24:29	0:00:11	6	Common Dolphin sp.	60	No voice on video, 1 individual	MS
SOCAL_2010Sept_26_SES_Video_122055- 122128_IDBoat_Boat	9/26/2010	12:20:55	12:21:28	0:00:33	Boat	Boat	1		BW
SOCAL_2010Sept_26_SES_Video_122421- 122439_IDBoat_Boat	9/26/2010	12:24:21	12:24:39	0:00:18	Boat	Boat	1	R/V Robert Gordon Sproul	BW

Table D-2. Videos recorded during September SOCAL 2010 aerial monitoring surveys off San Diego, California, based on preliminary review of video.

Video Name	Date	Start Time	End Time	Total Video (hr::min:sec)	Daily Sighting ID	Species	Approx. Group Size	Video Notes	Taken By
SOCAL_2010Sept_26_SES_Video_122955- 123021_IDBoat_Boat	9/26/2010	12:29:55	12:30:21	0:00:26	Boat	Boat	1	R/V Robert Gordon Sproul	BW
SOCAL_2010Sept_26_SES_Video_131518- 133022_ID15_CommonDolphinSp.	9/26/2010	13:15:18	13:30:22	0:15:04	15	Common Dolphin sp.	1000	voice hard to understand, 1000 to 1200 individuals, bird association, dispersion 1-2, oriented at 090, group is more longer than horizontal, dispersion is 1-5, slow travel, no behavior changes seen	BW
SOCAL_2010Sept_26_SES_Video_133347- 133845_ID15_CommonDolphinSp.	9/26/2010	13:33:47	13:38:45	0:04:58	15	Common Dolphin sp.	1000	Same group as above, oriented at 090, dispersion 1-2, slow surface active travel, bird association, group in a slight triangle shape, oriented at 080, shape is a rectangle, dispersion 1-3, birds circling above dolphin	BW
SOCAL_2010Sept_26_SES_Video_165617- 165811_ID31_CommonDolphinSp.	9/26/2010	16:56:17	16:58:11	0:01:54	31	Common Dolphin sp.	400	Animals all spread out, 80-100 individuals, calf seen,	BW

Video Name	Date	Start Time	End Time	Total Video (hr::min:sec)	Daily Sighting ID	Species	Approx. Group Size	Video Notes	Taken By
SOCAL_2010Sept_26_SES_Video_165819- 171548_ID31_CommonDolphinSp.	9/26/2010	16:58:19	17:15:48	0:17:29	31	Common Dolphin sp.	400	Animals spread out, bird association, foraging, inverted swimming, 12 subgroups, surface active milling with birds, occasional lunging, spacing 1-3, one subgroup has roughly 20 animals, spacing 1-2, traveling to 120, second subgroup- surface active milling, spacing 1-2, roughly 10 individuals, spacing 1-12, inverted swim, porpoise lunging with birds, spacing 1-15, split up into 3 groups of 5, inverted swim, sighting number 30, spacing 1-18, 3rd subgroup- surface active milling, spacing is 1-2, 5 animals in subgroup, inverting swim, lunging, porpoising, still surface active swim, birds swoop down with dolphin come to surface	BW

Video Name	Date	Start Time	End Time	Total Video (hr::min:sec)	Daily Sighting ID	Species	Approx. Group Size	Video Notes	Taken By
SOCAL_2010Sept_27_SES_Video_105235- 105354_ID16_Risso's	9/27/2010	10:52:35	10:53:54	0:01:19	16	Risso's Dolphin	30	oriented 220, spacing 1-18, one animal is 30 body lengths, another animal 60 body lengths, 17 animals, slow travel,	BW
SOCAL_2010Sept_27_SES_Video_105413- 110843_ID16_Risso's	9/27/2010	10:54:13	11:08:43	0:14:30	16	Risso's Dolphin	30	spacing is 1-15, group really spread out, few animals 100 body lengths away, slow travel, foraging, bird flying by, 2 subgroups, 19 individuals, oriented at 220, line abreast formation, slow travel, 3 animals tightly grouped, in group spacing 1-2, otherwise 15-100 body lengths apart, animals not changing behavior, animals seem to be all coming together, animals turned to the west, spacing 1-3, slow travel, possible calf	BW

Video Name	Date	Start Time	End Time	Total Video (hr::min:sec)	Daily Sighting ID	Species	Approx. Group Size	Video Notes	Taken By
SOCAL_2010Sept_27_SES_Video_122343- 124044_ID36_Risso's	9/27/2010	12:23:43	12:40:44	0:17:01	36	Risso's Dolphin	8	group of 2 trailing, with a group of 6-7 in the front, orientation 330, spacing 1-8, below surface, very tight in the front group, slow travel, 8 body lengths, orienting towards each other, spacing 1- 4, oriented at 230, one animal in lead 100 body lengths away, logging, line abreast at surface, slow travel, spacing 1-7, most of group headed towards 230, resting at surface, spacing 1-1 in subgroup	BW
SOCAL_2010Sept_27_SES_Video_150429- 151406_ID61_CommonDolphinSp.	9/27/2010	15:04:29	15:14:06	0:09:37	61	Common Dolphin sp.	135	birds on water, 1000 ft., foraging, dispersal within subgroup is 1- 2, dolphin going in 2's and 3's chasing the birds, inverted swim, lunge and then dive	BW

Video Name	Date	Start Time	End Time	Total Video (hr::min:sec)	Daily Sighting ID	Species	Approx. Group Size	Video Notes	Taken By
SOCAL_2010Sept_27_SES_Video_153115- 155635_ID65_CommonDolphinSp.	9/27/2010	15:31:15	15:56:35	0:25:20	65	Common Dolphin sp.	70	inverted swim, lunging, huge group of dolphin, roughly 1200 individuals, surface active travel, v shaped formation, orientation 350, fast travel, 1-2 spacing, boat 40 vessel lengths behind dolphins, group in front has 20 dolphins, oriented at 350, fast travel, spacing 1-2 for group in front, oblong formation, wider than long	BW
SOCAL_2010Sept_28_SES_Video_125907- 130846_ID12_CommonDolphinSp.	9/28/2010	12:59:07	13:08:46	0:09:39	12	Common Dolphin sp.	400	bird association, two animals lunging together, spacing 1-2, 4-5 subgroups, milling with birds, 3 animals inverted lunge, multiple splashes, swimming inverted, competing for food, spacing 1-3, 2 inverted, one lunge turn, birds on water, split into 2 subgroups	BW

Video Name	Date	Start Time	End Time	Total Video (hr::min:sec)	Daily Sighting ID	Species	Approx. Group Size	Video Notes	Taken By
SOCAL_2010Sept_28_SES_Video_132405- 134500_ID15_Risso's	9/28/2010	13:24:05	13:45:00	0:20:55	15	Risso's Dolphin	25	blow, blow, one animal, blow, heading is 7 o'clock, sub- surface, blow, traveling, heading towards 5 0'clock, slow travel below surface	BW

### Appendix E. Photo Log

Table E-1. List of Photographs Taken during the 27 July - 3 August 2010 Navy SOCAL Aerial Survey off San Diego, California.

Date 2010	Daily Sighting ID No.	Species Common Name	Best Group Size Estim.	Start Frame #	End Frame #	Total Photos	First Fram e Time	Last Frame Time
27-Jul	1	Blue whale	4	5	196	142	14:09	15:06
27-Jul	2	Common bottlenose dolphin	50	98	133	36	14:16	14:21
27-Jul	3	Fin whale	1	174	187	14	14:46	14:49
27-Jul	4	Common dolphin sp.	400	204	220	17	15:32	15:33
28-Jul	2	Blue whale	6	2	190	190	13:47	14:28
28-Jul	8	Common dolphin sp.	400	194	228	25	14:56	15:01
28-Jul	13	Blue/Fin whale	5/3	231	306	76	15:46	15:55
29-Jul	1	Blue whale	2	314	404	91	14:49	15:39
29-Jul	7	Blue whale	3	405	461	57	16:24	16:29
31-Jul	2	Common dolphin sp.	100	545	563	19	15:04	15:04
31-Jul	3	Blue whale	6	567	761	195	15:05	15:31
31-Jul	5	Common dolphin sp.	200	765	798	34	15:52	15:54
31-Jul	7	Common dolphin sp.	60	801	868	68	16:10	16:14
31-Jul	9	Unidentified dolphin	25	873	888	15	16:24	16:29
31-Jul	14	Common dolphin sp.	120	889	940	52	16:48	16:51
31-Jul	17	Common dolphin sp.	15	943	952	10	17:24	17:26
31-Jul	19	Common dolphin sp.	125	955	1003	49	17:34	17:36
31-Jul	22	Blue whale	1	1006	1321	310	17:53	18:13
2-Aug	2	Blue whale	2	1324	1347	24	16:57	16:59
2-Aug	8	Blue whale	2	1355	1434	80	17:57	18:27
2-Aug	10	Common dolphin sp.	55	1437	1454	18	18:50	18:50
2-Aug	11	Common dolphin sp.	125	1457	1508	52	18:53	18:55
2-Aug	12	Blue whale	2	1511	1826	302	18:56	17:28
3-Aug	7	Common dolphin sp.	1000	1657	1734	78	15:46	15:48
3-Aug	8	Common dolphin sp.		1736	1798	63	15:52	15:53
3-Aug	11	Common dolphin sp.	100	1800	1833	34	15:58	15:58
3-Aug	12	Common dolphin sp.		1835	1900	66	15:59	16:08
3-Aug	20	Common dolphin sp.	300	1902	1976	75	16:24	16:26
3-Aug	29	Common dolphin sp.	140	2003	2042	40	17:04	17:05

Date 2010	Daily Sighting ID No.	Species Common Name	Best Group Size Estim.	Start Frame #	End Frame #	Total Photos	First Fram e Time	Last Frame Time
3-Aug	36	Common dolphin sp.	7	2044	2069	26	17:14	17:16
3-Aug	40	Blue whale	1	2076	2078	3	17:33	17:34
3-Aug	41	Blue whale	2	2080	2107	28	17:34	17:34
3-Aug	39	Common dolphin sp.	120	2109	2123	15	17:39	17:41
3-Aug	41	Blue whale	2	2125	2170	46	17:42	17:43
3-Aug	39	Common dolphin sp.	120	2171	2189	19	17:44	17:47
3-Aug	41	Blue whale	2	2190	2228	39	17:48	17:51
3-Aug	41	Blue whale	2	2230	2249	20	17:54	17:54
3-Aug	41	Blue whale	2	2251	2262	12	17:55	17:56

Table E-2. List of Photos taken during the 23 - 28 September 2010 Navy SOCAL Aerial Survey off San Diego, California.

Date 2010	Daily Sighting ID No.	Species Common Name	Best Group Size Estim.	Start Frame #	End Frame #	Total Photos	First Frame Time	Last Frame Time
23-Sep	1	Common dolphin sp.	25	1	34	34	15:14	15:16
23-Sep	2	Common dolphin sp.	6	37	63	27	15:32	15:33
23-Sep	3	Unidentified marine mammal	1	67	111	45	15:55	15:57
23-Sep	4	Common dolphin sp.	15	114	144	31	16:09	16:10
23-Sep	6	Common dolphin sp.	60	147	211	65	16:17	16:19
24-Sep	7	Common dolphin sp.	700	1796	1811	16	12:30	12:32
24-Sep	23	Unidentified marine mammal	1	1812	1818	7	12:56	12:57
24-Sep	46	Bryde's whale	1	1819	1829	5	13:44	13:44
24-Sep	55	Common dolphin sp.	250	1832	1845	12	14:18	14:21
24-Sep	56	Unidentified dolphin	1	1849	1856	5	14:24	14:28
24-Sep	69-72	Common dolphin sp.	530	1857	1872	12	16:17	16:59
24-Sep	73	Common dolphin sp.	40	1871	1882	11	16:59	17:05
24-Sep	75	Common dolphin sp.	300	1884	1889	6	17:10	17:13
24-Sep	77	Common dolphin sp.	9	1890	1895	6	17:16	17:16
25-Sep	7	Common dolphin sp.	1100	1917	1920	4	11:08	11:12
25-Sep	8	Common dolphin sp.	400	54	60	6	11:09	11:11
25-Sep	11	Common dolphin sp.	100	1921	1929	9	11:41	11:43
25-Sep	11	Common dolphin sp.	100	61	64	4	11:41	11:43

Date 2010	Daily Sighting ID No.	Species Common Name	Best Group Size Estim.	Start Frame #	End Frame #	Total Photos	First Frame Time	Last Frame Time
25-Sep	12	Common dolphin sp.	400	1930	1932	3	11:48	11:49
25-Sep	13	Northern elephant seal	11	65	72	8	11:56	11:58
25-Sep	15	California sea lion	35	1938	1943	6	12:18	12:20
25-Sep	18	Common dolphin sp.	1600	78	87	10	12:43	12:44
25-Sep	19	Common dolphin sp.	150	89	92	4	12:53	12:53
25-Sep	19	Common dolphin sp.	150	1944	1955	12	12:54	12:58
25-Sep	21	Unidentified dolphin	50	1956	1966	11	13:03	13:06
25-Sep	23	Common dolphin sp.	75	1968	1972	5	13:23	13:25
25-Sep	24	Common dolphin sp.	200	94	98	5	13:24	13:24
26-Sep	15	Common dolphin sp.	1000	1987	2015	29	13:14	13:40
26-Sep	28	Common dolphin sp.	450	2021	2038	18	16:03	16:10
27-Sep	16	Risso's dolphin	5	1	6	6	10:50	11:56
27-Sep	29	Minke whale	1	7	19	13	11:56	11:57
27-Sep	58	Common dolphin sp.	275	28	34	7	14:58	15:00
27-Sep	64	Common dolphin sp.	1299	36	46	11	15:29	15:30
28-Sep	3	Common dolphin sp.	600	11	66	56	9:25	9:29
28-Sep	5	Sei/Bryde's whale	3	68	126	59	9:56	9:58
28-Sep	12	Common dolphin sp.	400	130	210	71	13:10	13:12
28-Sep	23	Common bottlenose dolphin	18	215	246	31	14:23	14:30
## Appendix F. Photos

Aerial photographs of cetaceans using a telephoto lens from the aircraft during the July and September 2010 SOCAL aerial survey monitoring effort off San Diego, California, under NMFS Permit 15369.



Photo 1. Blue whale photographed 2 August 2010 by M.A. Smultea under NMFS Permit 15369.



Photo 2: Sei/Bryde's whales photographed 28 September 2010 by B. Würsig under NMFS Permit 15369.



Photo 3: Bryde's whale photographed 24 September 2010 by B. Würsig under NMFS Permit 15369.