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Results of Aerial Surveys Conducted in Conjunction with US Navy Training Exercises off Southern California 2008/2009

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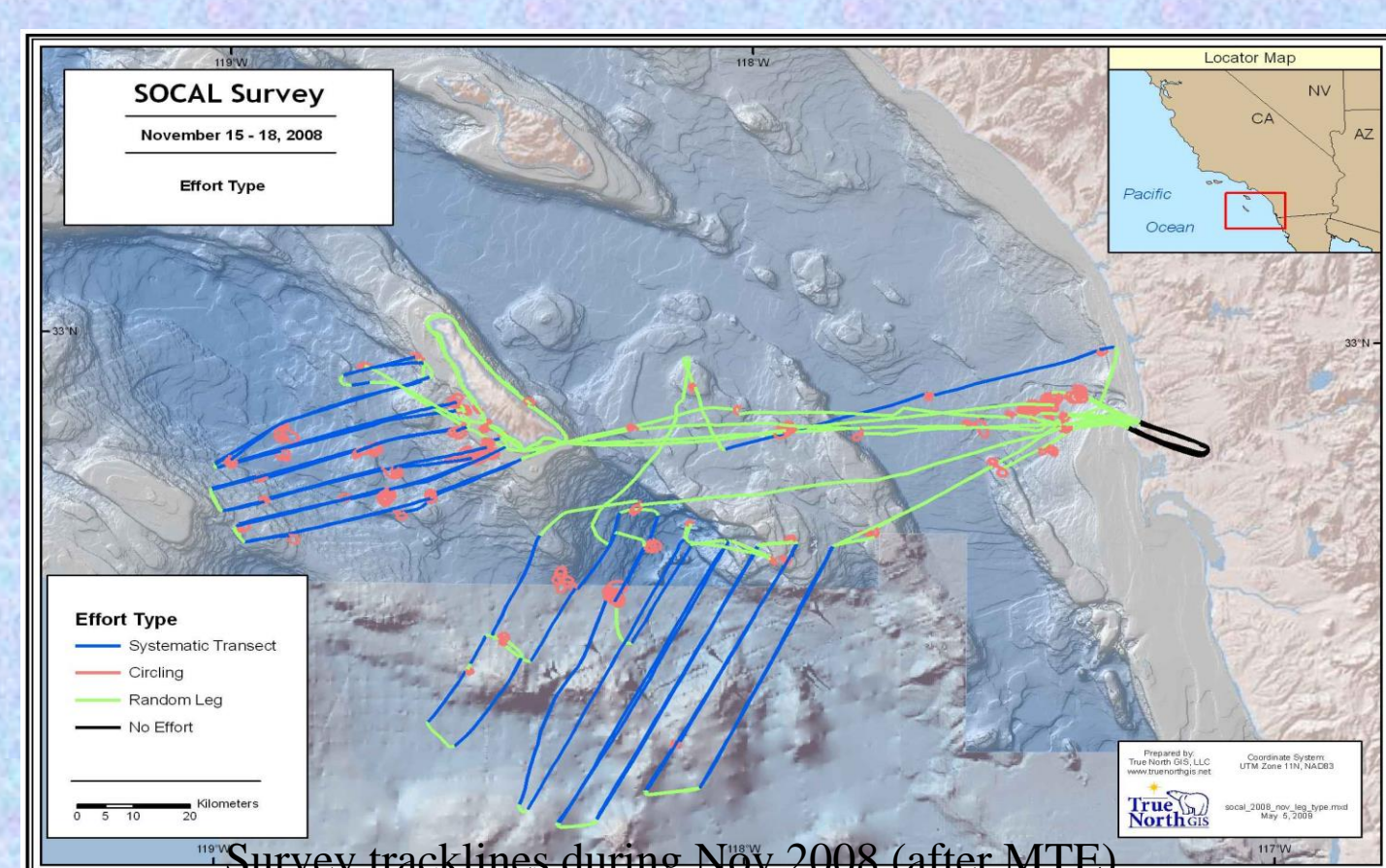
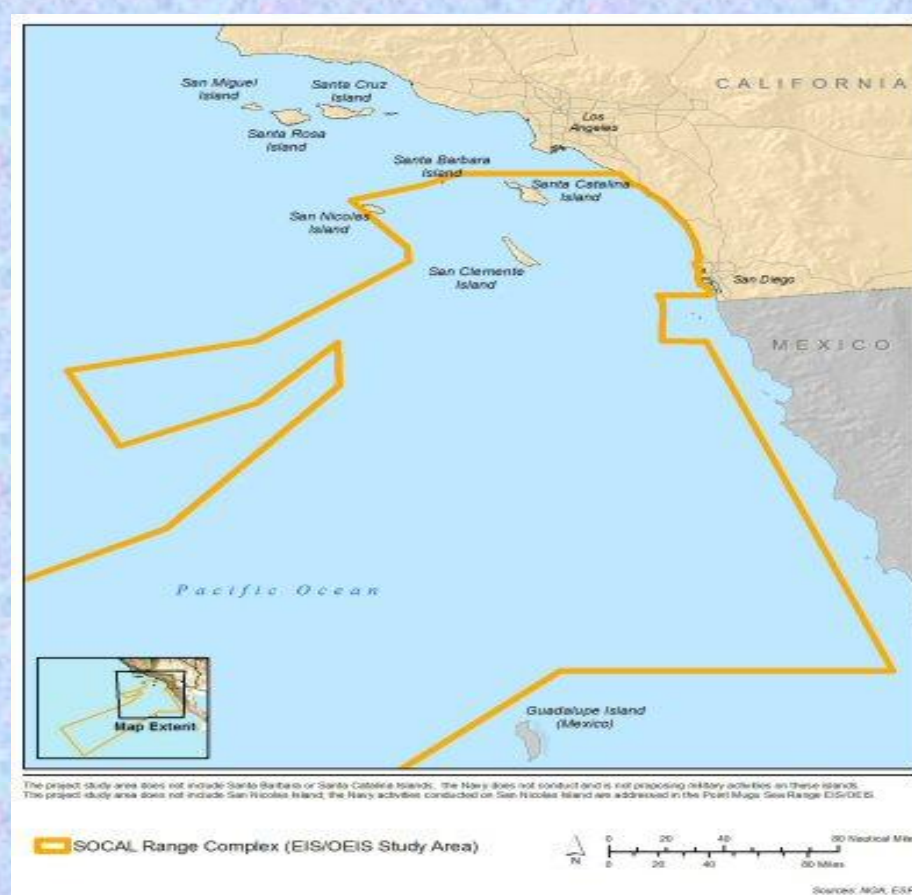
Section 1. Abstract

Aerial surveys were conducted to monitor marine mammals/sea turtles (MM/ST) **before, during and after** US Navy (Navy) 2008-09 major training events (MTEs) involving mid-frequency active sonar (MFAS) in offshore waters of Southern California. Five surveys were conducted in fall/summer 2008-09 to collect **baseline data** and **monitor potential effects**, if any, from MTEs on marine mammals by conducting **line-transect, focal behavioral sampling and shoreline stranding surveys**. A total of 25,864 km (~140 hr) of observation effort occurred: 8401 km in Oct/Nov 08, 12,640 km in June/July 09 and 4823 km in Nov 09. Effort consisted of 38% systematic line transect, 38% random transect and 24% circling (focal follow/photo species verification). Beaufort 2-3 predominated. A total of 794 marine mammal sightings of ~63,353 individuals were recorded. Three pinniped, 7 dolphin and 6 whale species were identified, including Cuvier's beaked whales, killer whales and a rare Bryde's whale. Most sightings identified to species were short-beaked common dolphins (N=5321 indiv) followed by Risso's dolphins (N=2250) and long-beaked common dolphins (N=1587). Risso's dolphins were most common in June/July 09 (N=1480 indiv). Killer whales (N=67) were seen twice, only in Nov 09. Four dead pinnipeds and a dead subadult male blue whale with fishing line around its peduncle were seen in Nov 08, and a live fin whale dragging a buoy was seen in June 09. Focal follows of up to 60+ min occurred with 9 cetacean species and included extended video of blue, fin, humpback and killer whale as well as Risso's dolphin behavior at and below the water surface. MFAS transmission times were unknown to observers, but future analyses of observations vs. estimated received sound levels are planned. Marine mammals were seen in the area before, during and immediately after MTEs. Distributions were concentrated along underwater ridges and mounts, coastal waters, and other areas of bathymetric relief. Sample sizes stratified by species were too small for statistical comparison but contribute to a growing pooled database for this region.

Section 2. Introduction

In support of the Navy's **Marine Species Monitoring Plan** in the Southern California Range Complex (SOCAL) (DoN 2009), Smultea Environmental Sciences (SES) and Marine Mammal Research Consultants (MMRC) conducted five aerial surveys in fall/summer 08-09 to monitor MM/ST near the Navy's Southern California Anti-submarine Warfare Range (SOAR) W of San Clemente Island (SCI). Surveys addressed Navy Marine Mammal Monitoring Program requirements to monitor occurrence and behavior relative to MTEs per NMFS and Navy SOCAL Environmental Impact Statement (DoN 2008?) requirements.

Our **mission** was to document locations and behavior of MM/ST **before, during and after MTEs**. Since we were not informed as to the status of MFAS transmissions, we were not tasked with performing analyses concerning their effects. We attended pre-survey planning meetings with Navy personnel and other local researchers to safely conduct, coordinate, develop and assess approaches to address monitoring requirements including identification of priority species.



Section 3. Methods

Monitoring occurred in conjunction with Joint Task Force Exercise (JTTFEX) and Composite Training Unit Exercise (COMPTUEX) MTEs. Three biologists and 1 pilot flew surveys in a twin engine/fixed-wing Partenavia Observer. Data were collected using newly developed iTouch/iPhone hardware and software. Photographs/video were used to verify species/document behavior. Five surveys occurred: two **during** an MTE (17-21 Oct 2008 and 5-11 June 2009), two **after** (15-18 Nov 2008 & 20-29 July 2009) and one **during and after** (18-23 Nov 2009). Notably, sea turtles are unlikely to occur in SOCAL (reviewed in DoN 2009) and were not seen. Survey locations sometimes varied due to air-safety concerns but were concentrated as possible W of near San Clemente Island.

PRIMARY MONITORING GOALS

- Monitor presence, occurrence, numbers and locations of MM/ST species **before, during and after** MTEs to identify potential changes in **behavior, orientation, location, distribution, and relative abundance** relative to Navy MFAS training activities;
- Search for potential stranded, injured or behaviorally stressed animals;
- Obtain sighting locations so that MFAS sound level exposures can be estimated post-survey;
- Assess the feasibility of monitoring near- and sub-surface tracking and behavior of MM from the survey plane using focal follow methods supported by videography;

SURVEY MODES

1. **SEARCH** = line-transect and random surveys to collect initial sighting, location, and behavior information;
2. **VERIFY** = subsequent circling and photographing to verify species, estimate group size, and calf presence
3. **FOCAL FOLLOW** = circle for focal behavioral sessions at ~365-455 m (1200-1500 ft) altitude and ~0.5-1.0 km (0.3-0.5 nm) radial distance on **priority species** (endangered species, beaked & killer whales, Risso's dolphins)



Rare sighting of Bryde's whale identified by diagnostic 3 median rostral ridges



Cow-calf fin whales



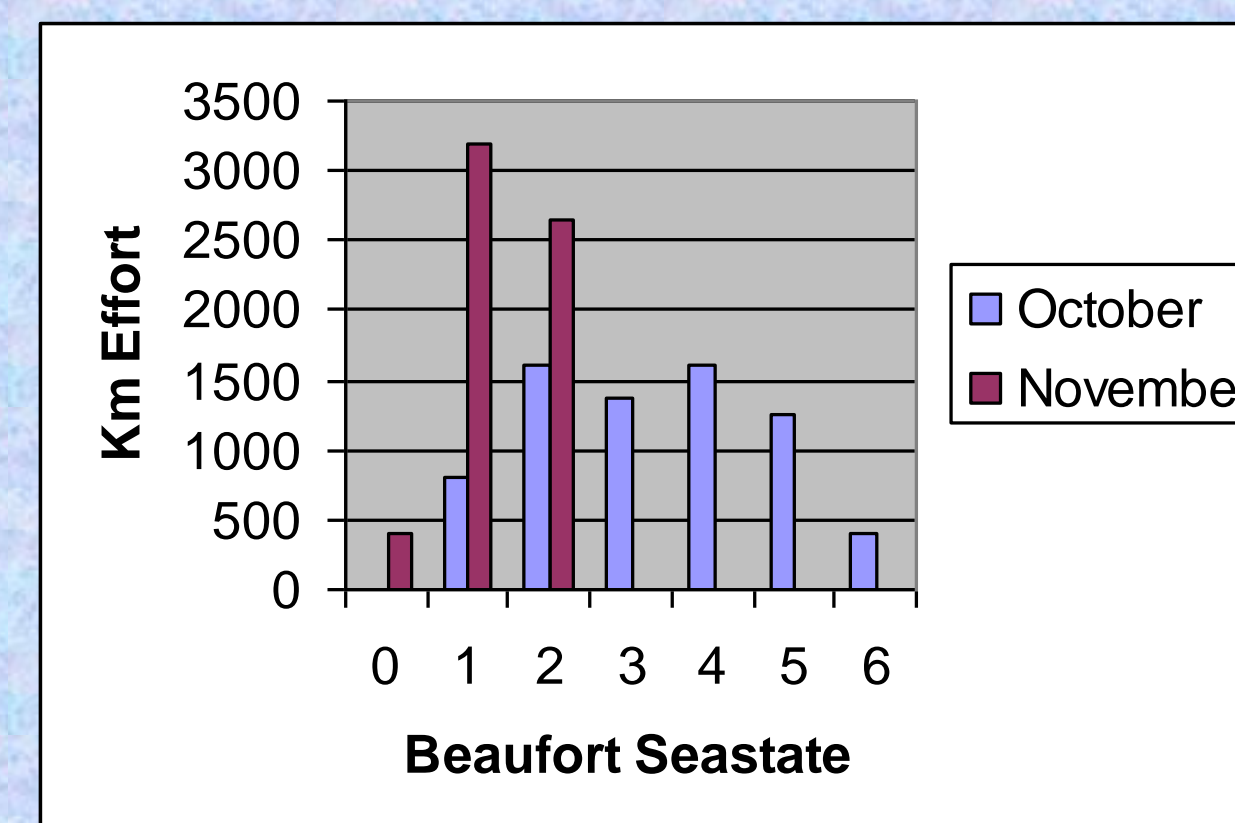
Killer whales



Risso's dolphins



Survey aircraft was a Partenavia P68-C twin engine chartered from Aspen Helicopters in Oxnard, CA.



Comparison of sea state—Oct vs. Nov SOCAL surveys. Beaufort sea state conditions were far superior during Nov vs. Oct.

Section 4. Results

EFFORT & SIGHTINGS

5 aerial surveys conducted in SOCAL:

- 27,644 km (14,927 nm) of observation effort
- 794 groups of marine mammals and ~ 63,353 individuals
- 16 species (13 cetaceans and 3 pinnipeds)

HIGHLIGHTS

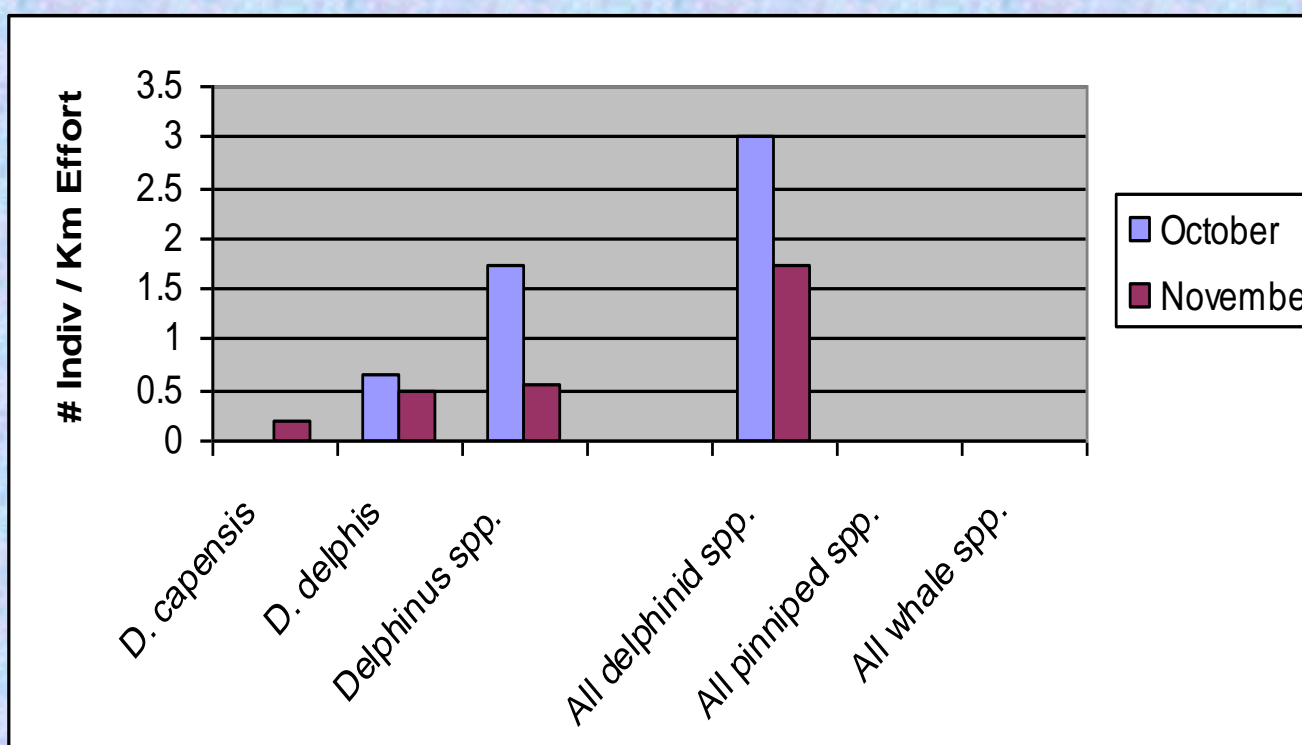
- 10 Cuvier's beaked whales -- 5 photographed; Rare sighting of single Bryde's whale photo-documented Oct 08
- Risso's dolphins more common in June/July 08 vs. Oct/Nov, contrary to trends described by Carretta et al. (2000) for same region. Sighting rates: June/July 08 (11.1 indiv/km, n= 93 groups) & Oct/Nov (3.0 indiv/km, n= 24 groups). We saw 66% of all Risso's in summer
- 2 killer whales groups (N=67 indiv) seen Nov 09, considered rare on Navy range; photographs taken of calf apparently nursing & a juvenile male with erect penis
- Up to 4 different cetacean species seen in a ~5 km² area of SOAR W of SCI in July 09: > 5 fin whales, 1 minke whale, ~4 Cuvier's beaked whales and possible Bryde's/sei whale

CONCLUSIONS

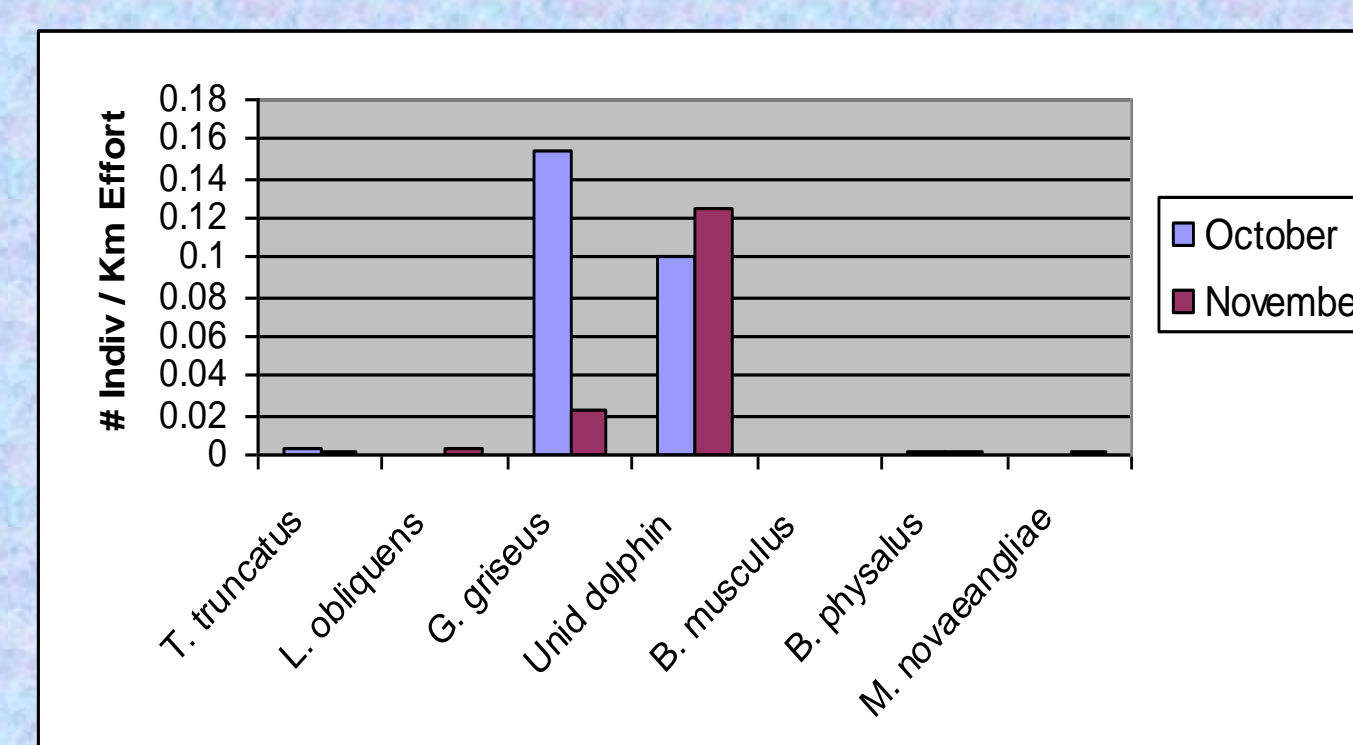
- Marine mammals seen before, during and after MTEs on Navy range. *Naval training has been conducted within SOCAL for > 40 years, and marine mammals are also known to (e.g., Carretta et al. 2000; DoN 2009) and continue to be abundant there.*
- Some species more suitable for focal behavioral follows (e.g., Risso's dolphins, whales) than others (e.g., large common dolphin groups)
- Focal follows of suitable/high priority species, provide **behavioral** data for **baseline & before/during/after MFAS**
- Aerial surveys useful in locating & documenting dead/stranded/entangled marine mammals: 6 occasions reported immediately to Navy, who contacted NMFS. Causes of death unknown:
 - 1 dead floating male blue whale ~50 km S of SCI: rope draped over penis / tail stock attached to 2 buoys, sharks nearby
 - 4 dead floating California sea lions seen near SCI Nov 08 & July 09
 - 1 live fin whale dragging long rope & buoy

➔ **Aerial Surveys (1) offer unique overhead and sub-water surface perspectives, (2) do not interfere with behavior when flown at higher altitudes and lateral distances, and (3) allow cetacean behavior to be tracked for extended periods**

➔ **Aerial Survey data can be combined with vessel and passive acoustic data to provide a "3-D" perspective**



Encounter rates of common dolphins, delphinids, pinnipeds and whale species by month.



Encounter rates of bottlenose, Pacific white-sided, and Risso's dolphins as well as blue, fin and humpback whales by month.

Table 1. Summary of Aerial Surveys

Parameter	2008		2009		TOTAL	
	Oct 17-21	Nov 15-18	June 5-11	July 20-29		
Survey Dates	Oct 17-21	Nov 15-18	June 5-11	July 20-29	Nov 18-23	5 surveys: June, July, Oct, Nov
No. Days Flown	5	4	6	9	6	30
Major Training Exercise (MTE) Before, During or After Survey?	Before/ During	After	After	After	During/ After	During, before or after
Total Flight Hr (Wheels up/down)	28	21	30	34	28	140
Total Observation Effort (km) (excl. poor weather, over land)	4563 km (2464 nm)	3838 km (2072 nm)	6140 km (3315 nm)	6500 km (3510 nm)	4823 km (2604 nm)	25,864 km (13,965 nm)
No. Navy-directed Survey Changes (approx)	9	7	12	10	3	41
No. Coastline Surveys for Strandings (San Clemente Isld)	0	2	1	0	1	4
No. Groups Seen	115	185	161	240	93	794
Estim. No. Individuals	12,587	5732	9489	22,719	12,826	63,353
Mean Group Size	109.4	31	58.9	94.7	137.9	86.4
No. Dead Sightings	0	3 (2 CA sea lions, 1 blue whale)	0	2 (2 prob. CA sea lions)	0	5
No. Species	9	9	11	10	10	16
No. Focal Groups Circled 5-9 min	22	20	24	37	14	117
No. Focal Groups Circled >10 min	5	7	7	8	10	37
Longest Focal Follow Duration	29 min (Fin whale)	60 min (Fin whale)	48 min (Fin whale)	38 min (Long-beaked common dolphin)	40 min (Killer whale)	60 min
No. Photos Taken	1050	1280	1099	2301	2203	7933
Estimated Usable Focal Video (min)	53	41	83	50	90	317

Section 5. Acknowledgements

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Section 6. References

- Carretta, J. V., M. S. Lowry, C. E. Stinchcomb, M. S. Lynn, and R. E. Cosgrove. 2000. Distribution and abundance of marine mammals at San Clemente Island and surrounding offshore waters: Results from aerial and ground surveys in 1998 and 1998. NOAA/NMFS/Southwest Fisheries Science Center Administrative Report LJ-00-02. 19 pp
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