

Comparison of Blue and Fin Whale Behavior and Group Characteristics in the Southern California Bight (SCB) 2008-2012

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Cow-calf fin whales. Baleen whale behaviors were tracked for extended periods with video both above and through the water from altitude 1500 ft & radial distance 1 km to avoid disturbing whale behavior. Photo by Lori Mazzuca / Permit No. 14451

ABSTRACT

Baseline undisturbed behavior and social patterns of blue (*Balaenoptera musculus*) and fin whales (*B. physalus*) are not well described and are needed to identify and understand potential effects of anthropogenic activities in the SCB. In 2008-2012, 72,467 km of aerial line transect and focal-follow effort was conducted in the SCB. Initially observed location, group size, behavior state, heading, and minimum and maximum inter-individual dispersal distance were recorded. Focal groups were circled for 10-60+ minutes and videotaped from outside the plane's sound cone to avoid disturbance. A total of 122 fin whale sightings (208 individuals) and 65 blue whale sightings (104 individuals) were made. Behavior, occurrence and distribution were related to season, location, bathymetry, and time of day. Blue whales were seen only from summer-fall and concentrated primarily close to shore (< 10 km). Fin whales were seen year-round up to 70 km from shore. Both species were associated with steep slopes. During summer, blues (n=61) were more common than fins (n=50); in fall, fins (n=73) were significantly more common than blues (n=4). Mean group size was 1.6 for blues and 1.9 for fins. Blues swam significantly farther apart (12.6 body lengths [BL]) than fins (5.1 BL). Initially observed behavior was usually travel for both blues (80%) and fins (92%). Mill was more common for blues (20%) than fins (7%). Surface-activity was only seen among fins (1%). Both species socialized (touched) in fall but not summer; foraging occurred summer-fall. No significant relationships were found for headings. Dive/respiration/behavioral event rates were also collected. Data represent the most extensive record of systematic undisturbed behavior on these species in and the SCB, including social interactions not previously documented in this region.



Zoomed-in high-definition (HD) photos and video of blue whales were taken at 1500 ft altitude & 1 km distance. Photographs from aircraft allowed differentiation of individuals using natural markings. Photo by Lori Mazzuca / Permit No. 14451

METHODS



From 2008-2010, > 72,647 km of line transect & focal behavior surveys were conducted from a twin-engine Partenavia aircraft by 2 observers and 1 recorder during the summer and fall off Southern California.

- Line-transect methodology used to survey at 1000 ft altitude & 100 kt.
- Sightings were circled to confirm species/group size/composition via photos as needed/feasible.
- Scan sampling methodology (Altmann 1974) was used to determine behavior state, heading (magnetic), and dispersal between individuals by watching the sighting for 20-45 sec or longer if needed.

BEHAVIOR STATE DEFINITIONS**

Mill - >50% of group swimming with no obvious consistent orientation (non-directional) characterized by asynchronous headings, circling, changes in speed, and no surface activity. Includes foraging and feeding behaviors.

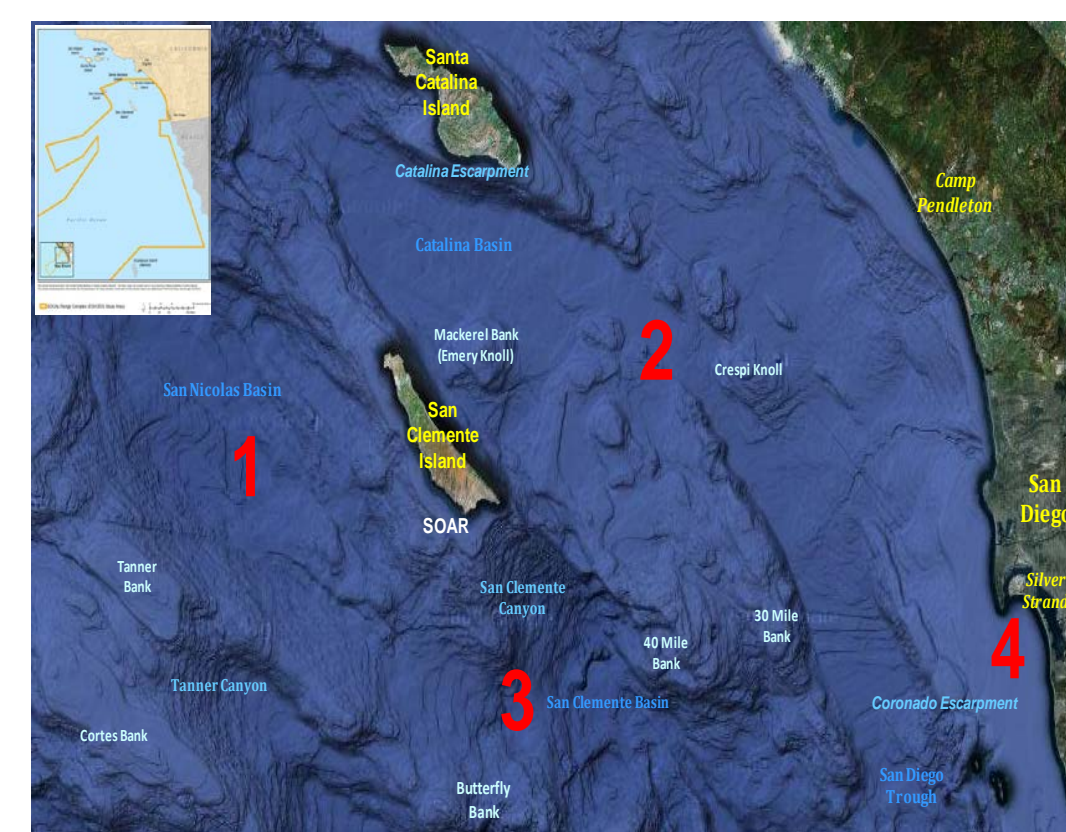
Rest - >50% of group exhibiting little or no forward movement (<1 km/hr, no wake) remaining at the surface in the same location or drifting.

Surface-Active Travel - While traveling, occurrence of aerial behavior that creates a conspicuous splash (e.g., all head, tail, pectoral fin, and leaping behavioral events) while traveling.

Travel - directed point-to-point synchronized movement by >50% of group that creates a wake or white water trail

Social - individuals touching (a modifier for any of the behavior states above)

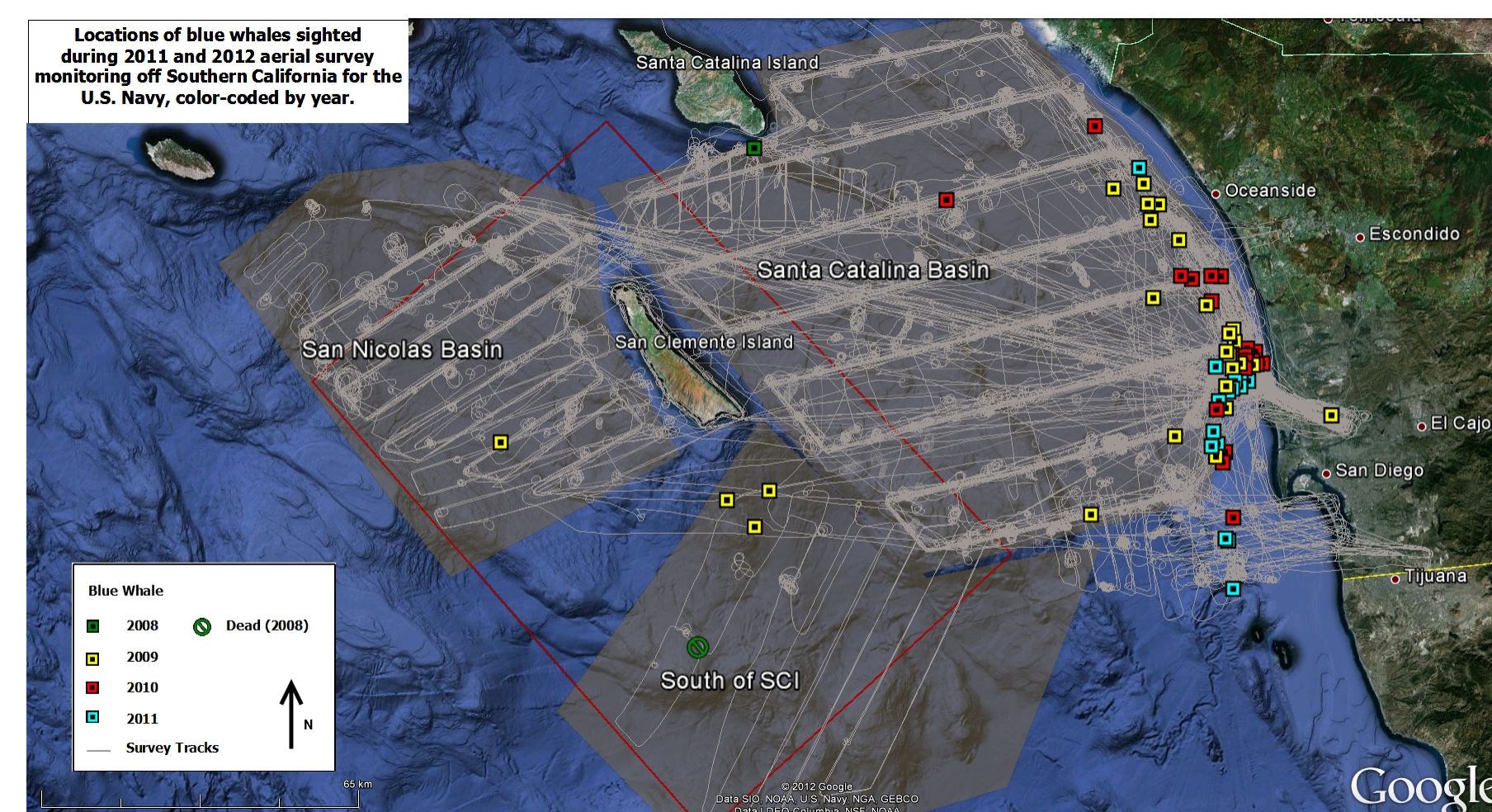
**Developed based on: Bauer (1986), Shane (1990), Smultea (1991) and Perrin et al. (2008).



Location of the aerial survey monitoring areas (Areas 1, 2 and 3) and underwater topographic features within the Navy's Southern California Range Complex (SOCAL) west of San Diego, CA.



Fin whale mother-calf pair following a group of over 1,000 northern right whale dolphins (*Lisiodelphis borealis*) for ~1 hr. Dolphins bow rode off the whales' heads and the calf chased the dolphin tails.



Sighting locations of blue whales during aerial survey monitoring off Southern California summer and fall 2008-2012. Blues whales were seen mostly inshore of San Clemente Island, while fin whales were most common west of the island. Blue whales were most concentrated within about 5-10 nm of shore near San Diego. Fins and blues were also seen together in loose feeding aggregation that included interspecific competition for bait balls.

RESULTS ***

SIGHTING NUMBERS & SEASONAL BEHAVIORS (based on 11,845 km of summer and 12,891 km of fall survey effort ^{1/})

SPECIES & SEASON	Mill	Rest	Surface - Active Travel	Travel	Unknown Behavior	TOTAL # Individuals	# Indiv. per 1000 km ^{1/}
Blue whale	19		3	60	2	84	1.98
Fall				2		2	0.08
Summer	19		3	58	2	82	4.05
Fin Whale	5	1	3	75	2	86	2.06
Fall			1	30		31	1.24
Summer	5	1	2	44	2	55	2.95

Number of individuals observed during fall and summer in each behavior state when first seen. In summer, blues were more common than fins, but in fall, fins were significantly more common than blues. Surface active behavior was rarely seen and milling (presumed feeding) occurred primarily during summer.

^{1/} based on line-transect, random, and transit point-to-point survey legs

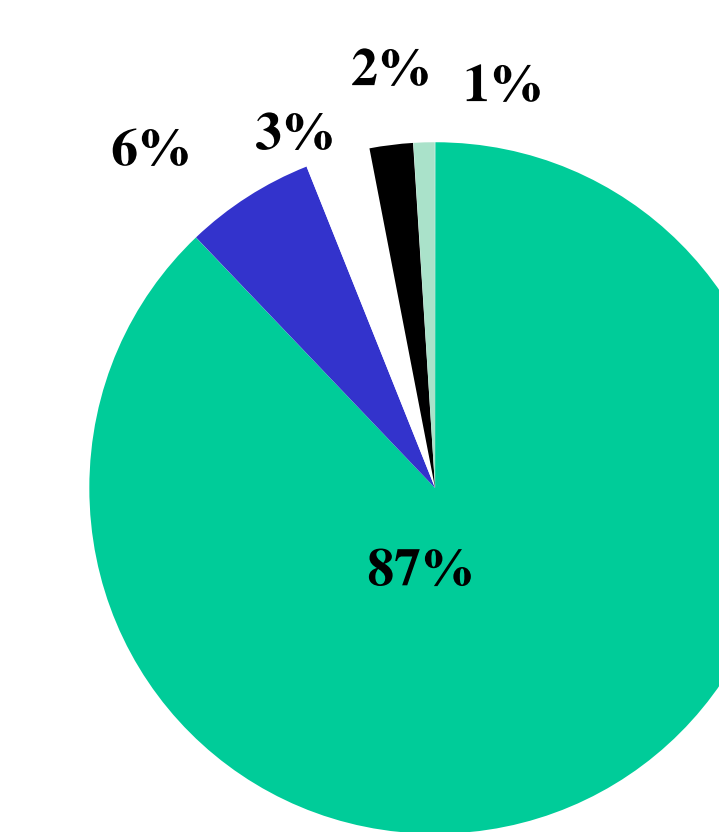
GROUP CHARACTERISTICS

	Blue Whale	Fin Whale
# Groups (Sightings)	65	122
Mean group size (SD)	1.6 (± 0.4)	1.9 (± 0.2)
Mean dispersal distance (# body lengths) between individuals (SD)	12.6 (± 4.6)	5.1 (± 8.7)
Mean heading (degrees magnetic) (SD)	203° (± 35)	189° (± 33)

- Blue and fin whales had a similar mean group size of about 2 animals.
- However, inter-individual spacing between blue whales was farther than between fin whales.
- During **summer**, blues were most frequently (26%) seen headed S (south), while fin whales were most commonly headed SSW (26%) or WNW (26%).
- During **fall**, fin whales were headed mostly NE (38%) or WSW (38%); the only 2 blues seen in fall were headed inshore (E).

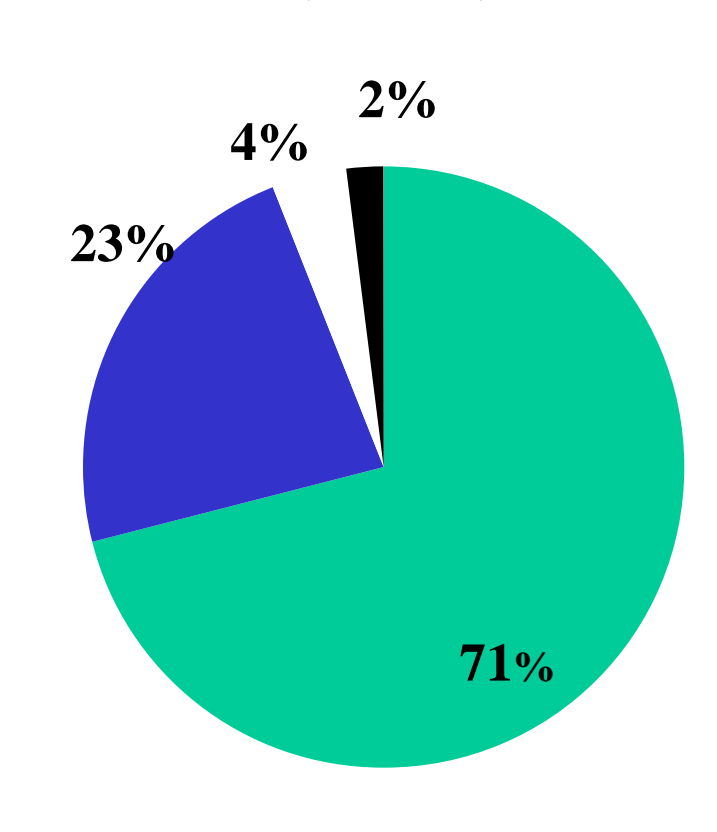
*** See Smultea and Bacon 2012 for full study results.

Fin Whale Behavior State (n = 86 individuals)



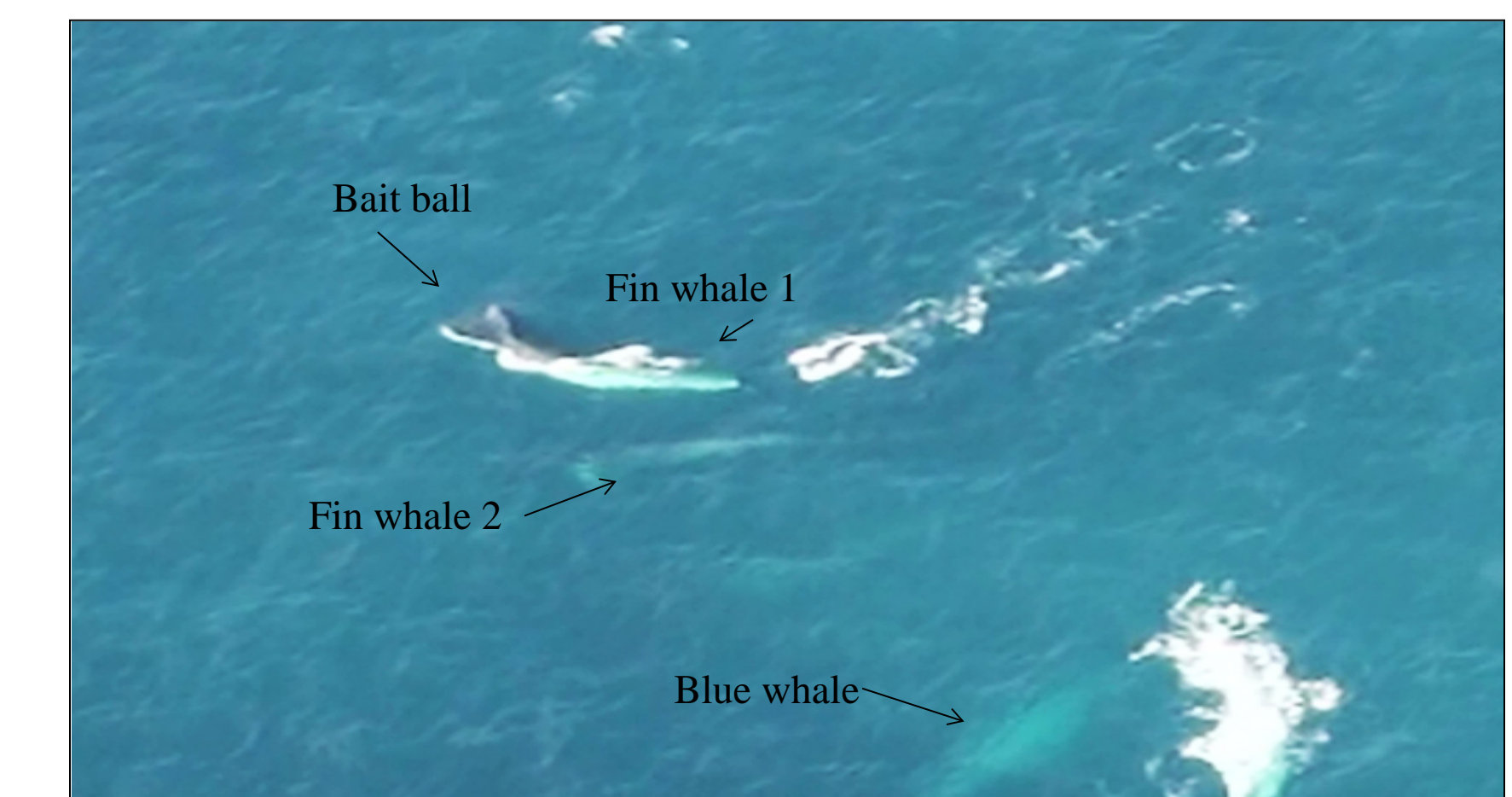
Travel
Mill
SA Travel
Unknown Behavior
Rest

Blue Whale Behavior State (n = 84)



Travel
Mill
SA Travel
Unknown Behavior

Distribution of initially-observed behavior states. Both fin and blue whales predominantly were seen traveling in point-to-point coordinated movement. However, blue whales were frequently observed milling related to feeding based on frequent fecal discharge, occasional lunge feeding and feeding bird associations.



Interspecific feeding competition. Still photo from video of fin whale lunging to left toward a bait ball with mouth agape, with another fin whale just below it and a blue whale at bottom of photo. Prior to this shot two blues and the two fins were headed toward the same bait ball. Video photo by Bernd Würsig / Permit No. 15369

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