

Behavioral ecology of Risso's dolphins (*Grampus griseus*) in the Southern California Bight based on aerial focal follows

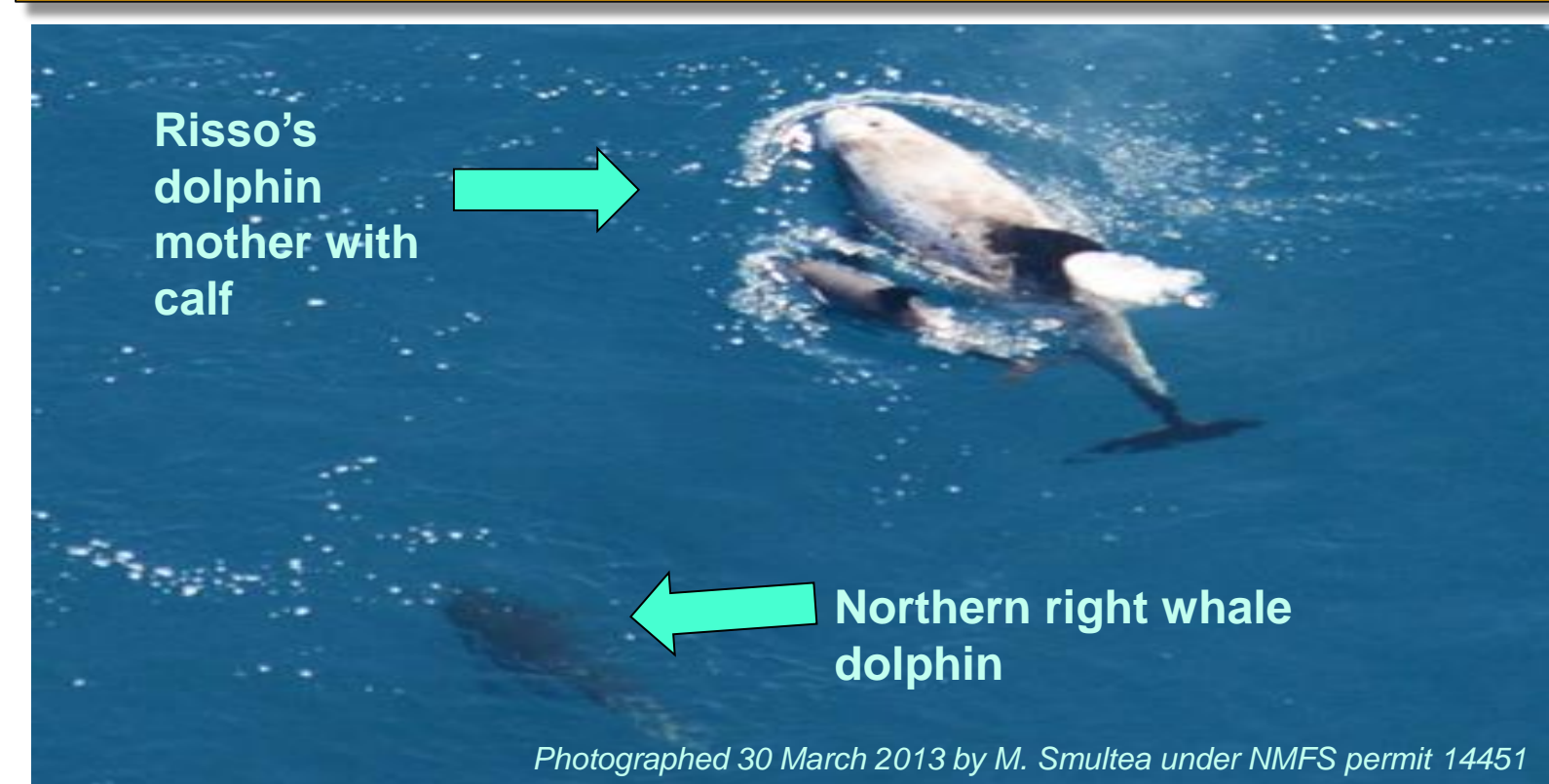


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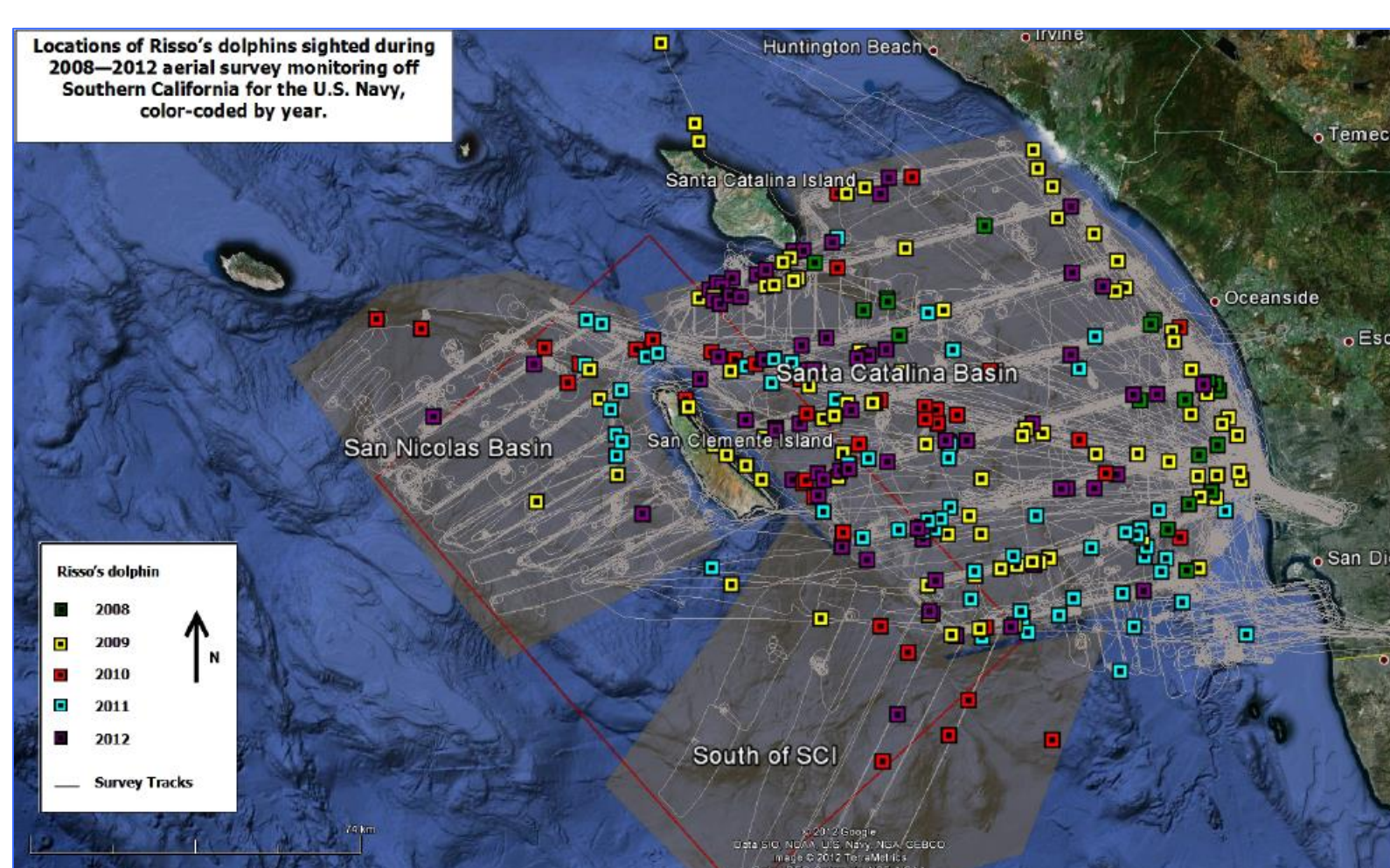
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aerial surveys Southern California METHODS 2008 - 2012



Risso's dolphin mother/calf pair (upper right) with a N right whale dolphin (left) that circled the Risso's pair numerous times (videotaped). 6% of Risso's dolphin groups were associated with another species, primarily bottlenose dolphins but also N right whale, common, and Pacific white-sided dolphins, sperm whales (Smultea et al. 2014), and CA sea lions.



Sampling Methods

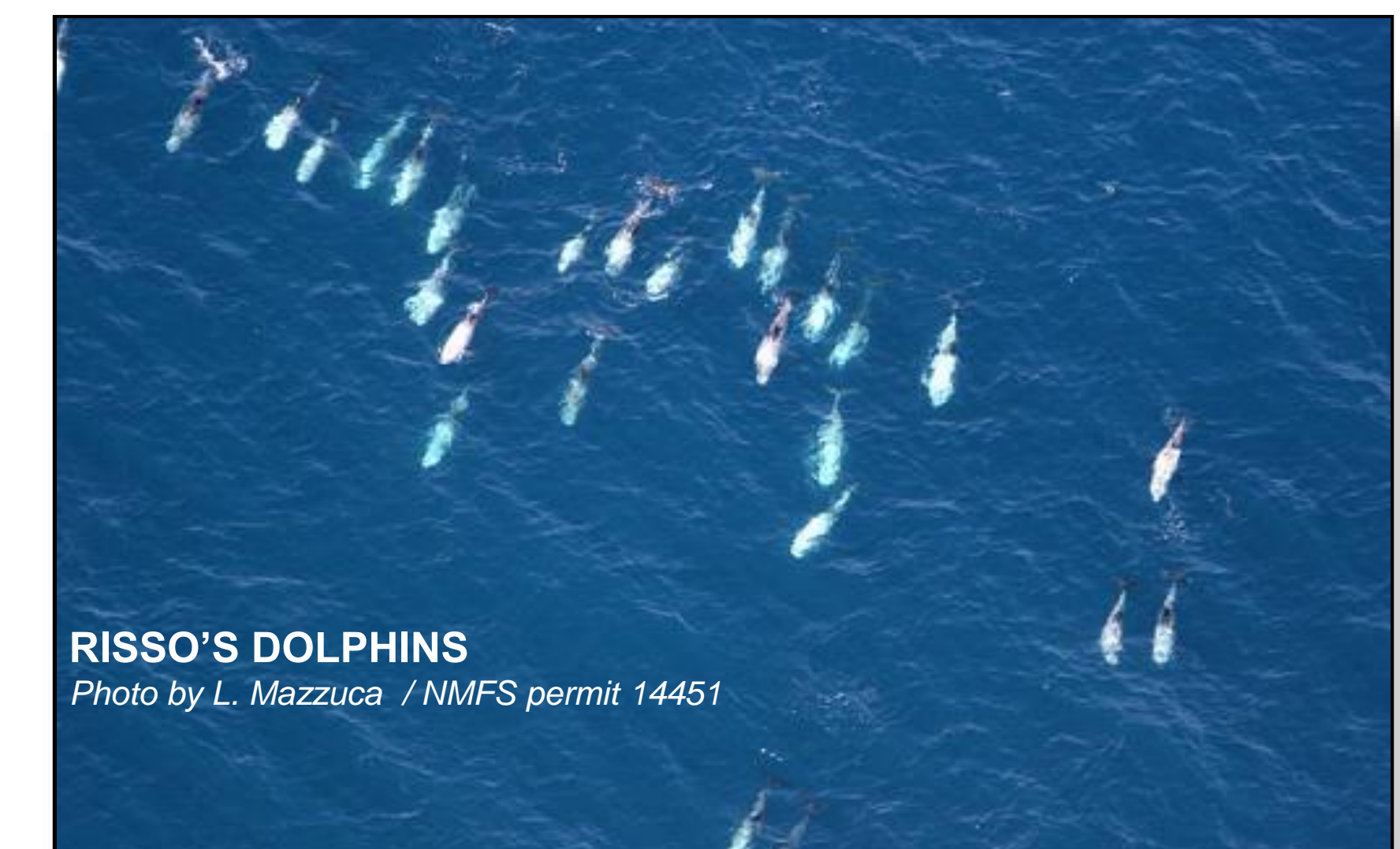
- Systematic line-transect with focal follows
- Modified "point sampling" (5-30 sec)
- Record "First-observed"
 - Behavior state, behavior transitions
 - Maximum dispersal distance ("cohesion index")
 - Directional changes
- Circle sightings
 - Group size / calf presence



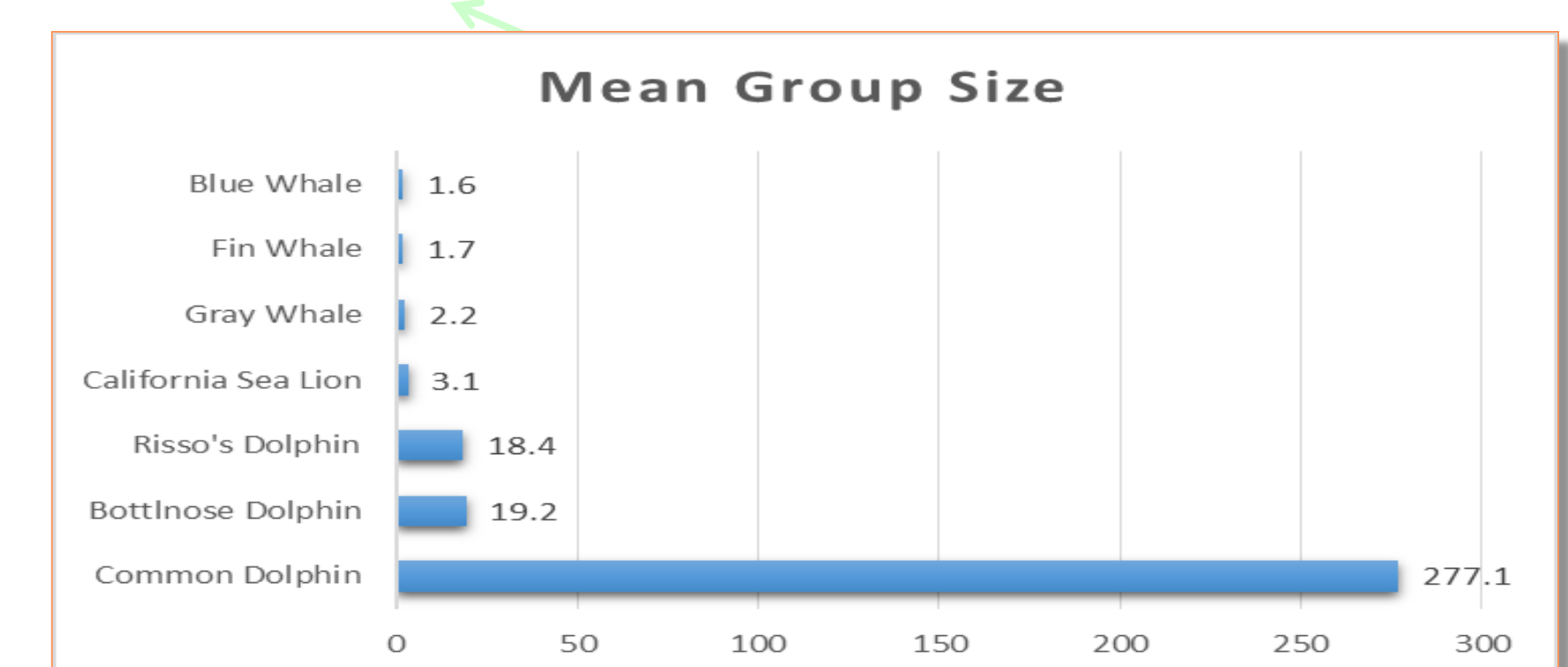
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ABSTRACT

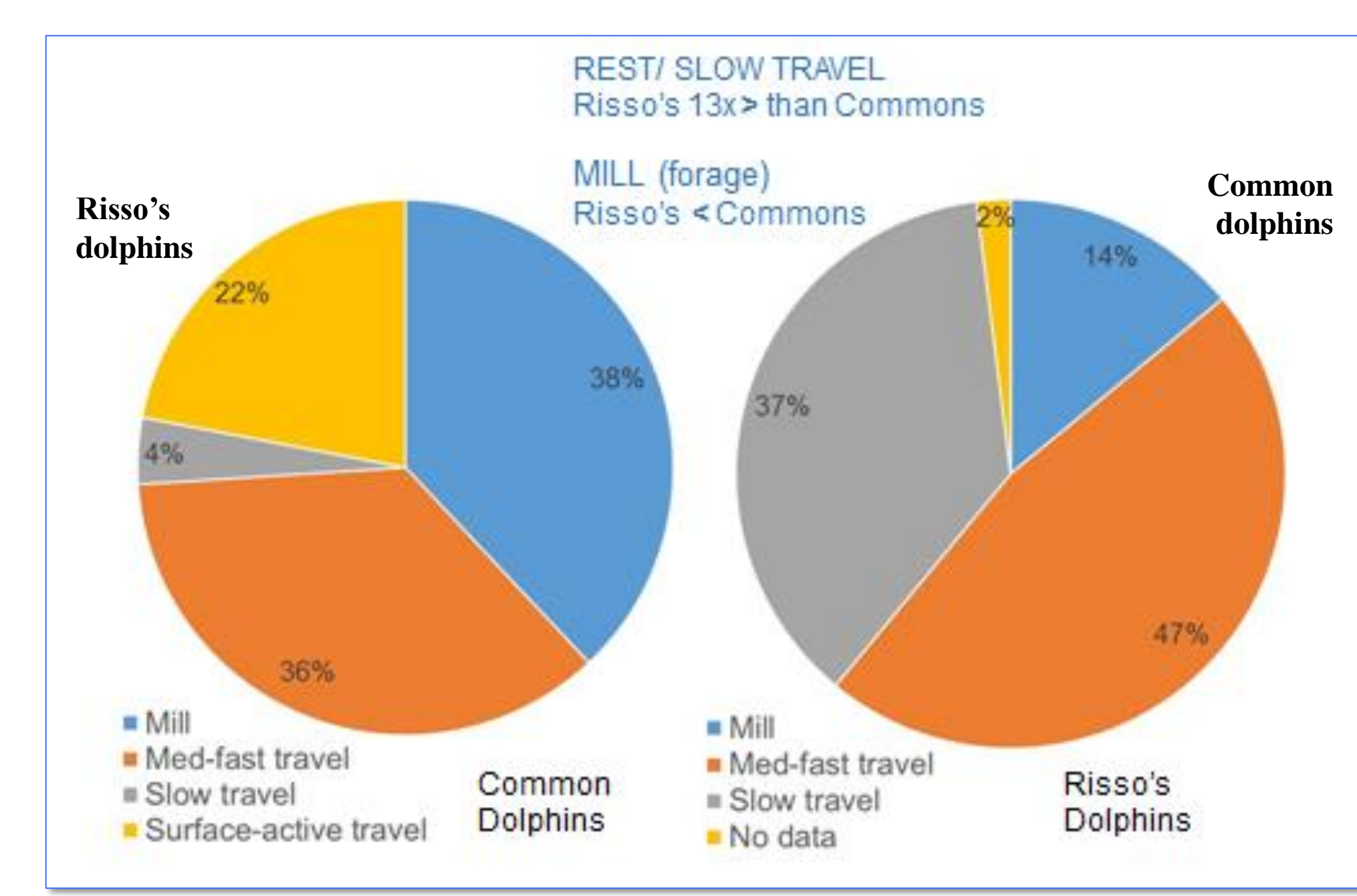
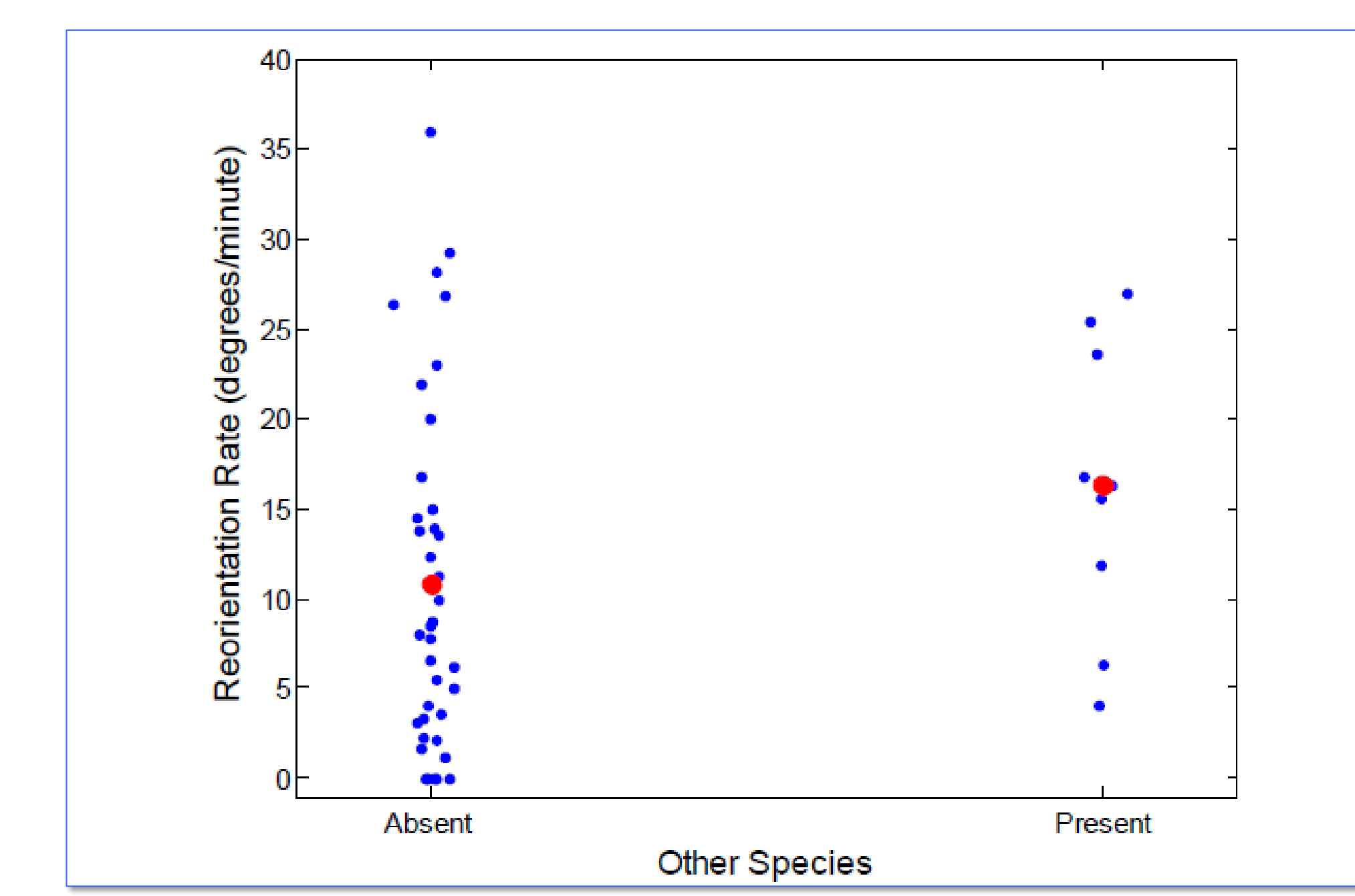
Fifteen aerial surveys (72,647 km, 86 days) occurred in the Southern California Bight October 2008 - April 2012, spanning January-November, funded by the U.S. Navy as part of their marine mammal monitoring program. **Behavior of cetaceans in this region is poorly known, particularly for Risso's dolphins, and previous published surveys are >12 years old.** Our surveys conducted focal follows of high priority species, including Risso's, and involved circling and video recording outside the plane's sound transmission range. Risso's were the third most common species ($n=286$ groups, ~5,384 individuals), with the most focal follows ($n=51$ groups), averaging 21.6 min (SD ± 12.9). Risso's showed preferential use of steep underwater drop-offs. Risso's were significantly more likely to slow travel/rest than other species, with 60% of time spent in this state, 33% spent in medium/fast travel, 7% spent milling. Preponderance of slow travel/resting likely reflects Risso's nocturnal foraging habits. Milling behavior increased across the year, while slow travel decreased, possibly related to changes in prey and/or reproduction timing. Milling and slow travel/rest increased with distance from shore and time of day, likely related to regional underwater topography and prey behavior/distribution. Mean group size was 18.4 (SD ± 16.40 , range 1-120). Mean maximum dispersal distance between dolphins within groups was 6.7 body lengths—significantly higher than more closely spaced, smaller-sized common dolphins. Group size was significantly higher when other species and calves were present (reduced predation risk?), increasing across the year. Maximum dispersal distance also increased significantly across the year and with water depth, but decreased with time of day. 6% of Risso's groups included the presence of another marine mammal species (bottlenose dolphin, blue whale, sperm whale, N right whale dolphin). Risso's tended to have higher reorientation rates when other species were present, possibly due to social interaction, avoidance, or competition. Transitions from one behavior state to another were infrequent and were more common in groups with calves. Later in the day, Risso's were less likely to transition from traveling to another state. **In summary, the behavior of Risso's dolphins was significantly affected by calf presence, time of day, time of year, presence of other species, and water depth.** The tendency toward slow travel/rest during the day and being visible from the aircraft above/below the surface for relatively long periods makes this species a good candidate for studying potential reactions to Navy mid-frequency active sonar. Observations from aircraft facilitate a unique bird's eye view on spacing and social interactions of individuals, not possible from the low-vantage perspective of other platforms.



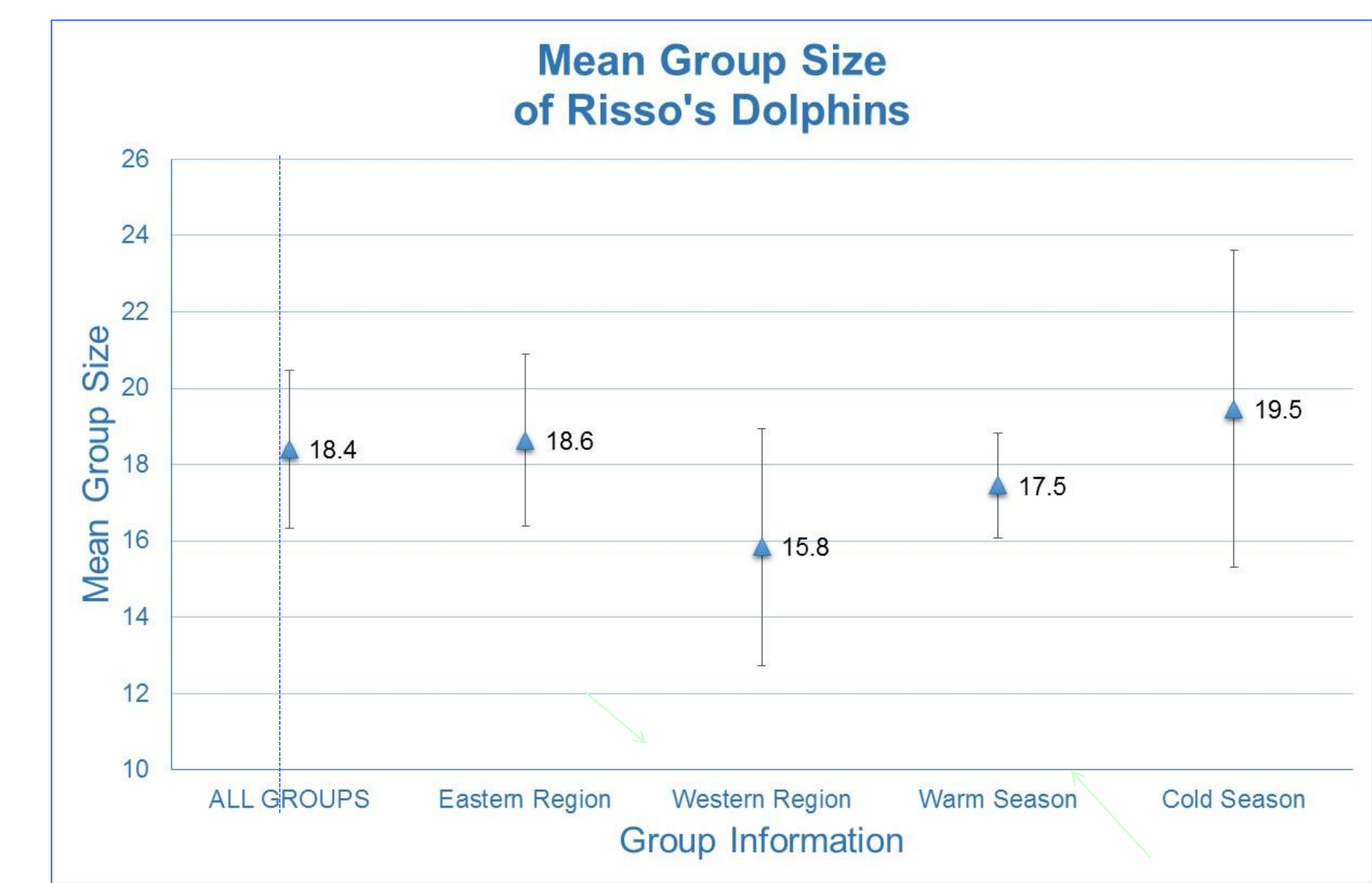
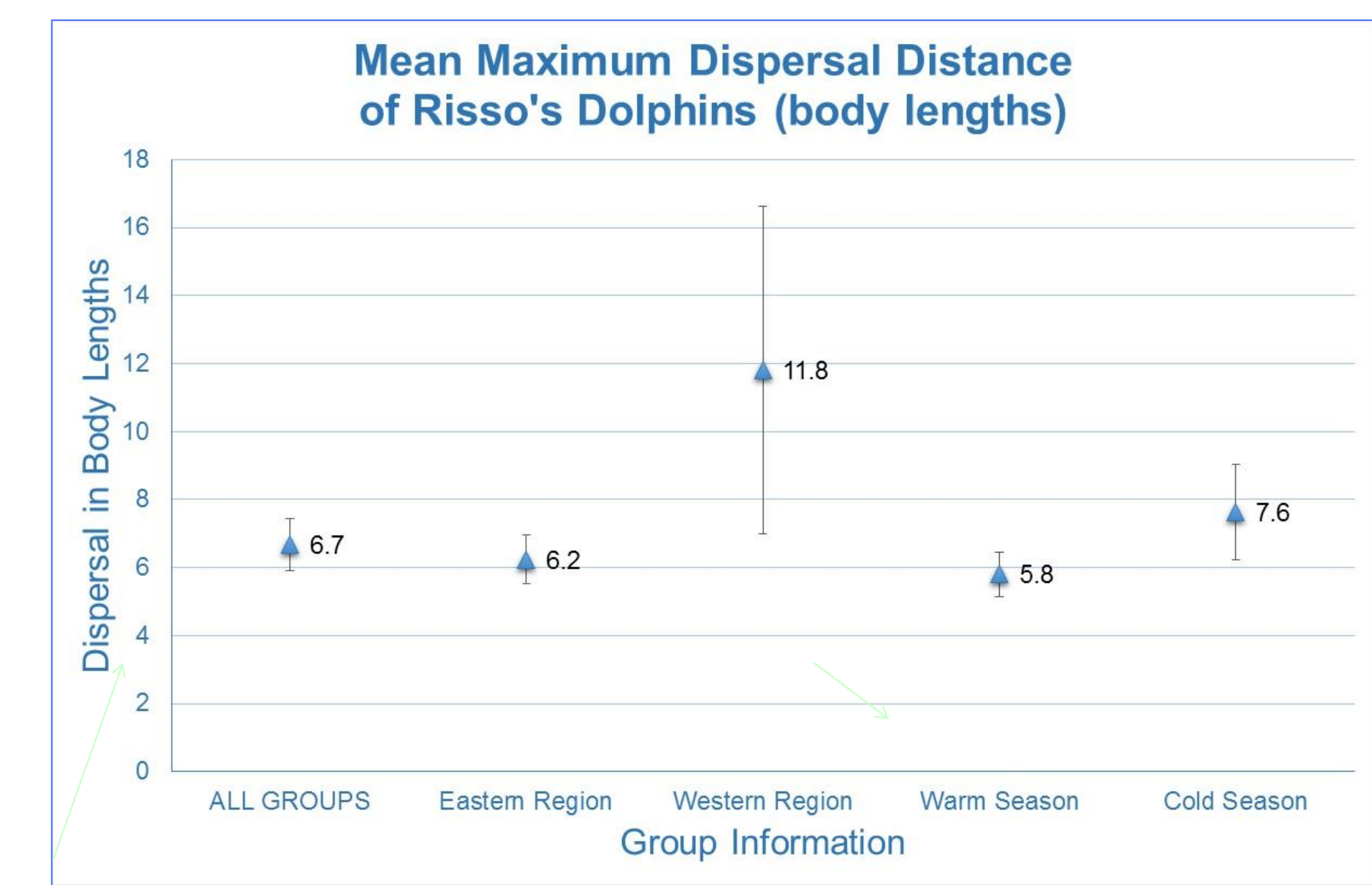
Risso's group size < Common dolphins ($p < 0.05$)



Commons closer together than Risso's ($p < 0.05$)
 Max. distance between dolphins (# body lengths):
 Commons 4.9 < 6.7 Risso's



RESULTS



- RISSO'S DOLPHINS**
- Mean group size was 18.4 (SE ± 2.1 , range 1-120)
 - Mean maximum dispersal distance 6.7 (SE ± 0.7) body lengths
 - Warm water season was May to October
 - Cold water season November to April
 - Eastern Region = the Santa Catalina Basin
 - Western Region = the San Nicolas Basin

SUMMARY

The behavior of Risso's dolphins was significantly affected by calf presence, time of day, time of year, presence of other species, and water depth.

These behaviors may be driven by prey distribution, nocturnal feeding habits, predator avoidance, and/or interaction with other species.

Risso's dolphins are commonly found, easily visible from the aerial platform, and tend to engage in slow travel/rest near the water surface during the day, making this species a good candidate for research on potential behavioral reactions to Navy mid-frequency active sonar.