Aerial Survey Monitoring for Marine Mammals off Southern California in Conjunction with US Navy Major Training Events 2008-2010

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Twin-engine Partenavia - SOCAL

Oct / Nov 2008 **June / July 2009** **Nov 2009** **May 2010** **July 2010** **Sept 2010**

SOCAL Navy Monitoring GOALS

① Monitor for dead / injured / distressed animals

② Monitor behavior ***Before – During – After*** MF sonar exposure

③ Locate animals exposed to MF sonar

④ Provide daily "snapshots" of species presence/absence, distribution, group sizes, general behavior in/outside of active Navy Exercise area

⑤ Establish baseline

Surveys:

BEFORE, DURING, AFTER Navy Mid-Frequency Sonar Exercises

Methods:

Baseline for Comparison of Sonar Effects

(1) Focal behavior sessions
(2) Abundance line transects
(3) “Snapshot” point sampling

Protocol:

- Handheld GPS
- Canon HD still camera
  - 400 + mm lens

- 2 observers
- Recorder
- Pilot

Using Cutting Edge Technology

- iTouch / iPhone / iPad
- Custom Software
- GIS

Focal Behavior Follows:

- Circle 10 – 60+ min
- HD Sony Video camcorder
- Behavioral software
  - Biospectator Go
  - Noldus
- Netbook
- Scan and continuous sampling

Advantages of Video:


3
1
2
bw
>


1
3
2
>
bw


>
3
2
bw


3
2


3
2
(1)


3
2
(1)

Focal Behavior: Priority Species

Risso's Dolphins: behavior rarely described

- Large sample size / Common to abundant year round
- Highly visible below / at surface
- Long surface periods
- Deep-diver: SURROGATE SPECIES per Navy Monitoring Plan

ESA species:

Blue, Fin, Humpback, Sei! Bryde's!

SOCAL Aerial Surveys Oct 17-21, 2008
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Blue Whales

Blue Whale

Bryde's Whale

Fin Whales (mom/calf)

Why Aerial Surveys for Sonar Mitigation in SOCAL?

(1) Focal Animal Behavior

- Generate baseline behavior for one or more species when focals conducted before/after Navy sonar exercises
- Detect abnormal behavior on range by comparing species within and outside Naval exercise areas
- Eliminate plane as effect on behavior observed (hard to measure what normal is from boat or tagged animal)

(2) Transects – detect potential sonar effects

- Snapshot BEFORE DURING AFTER sonar
  - Presence / absence?
  - Abundance / density
  - Group size / cohesion
- BASELINE behavior vs. sonar period
  - Travel direction (flee?)
  - Unusual behaviors
- Potential photo-ID - residency?
- Strandings

What are advantages of aerial surveys?

- Snapshot of SOAR range in 1 day
- Data on vocalizing AND non-vocalizing animals
- Detect dead animals over large area
- Cost-effective for data return rate in SOCAL

Aerial Surveys

- Multi platform surveys
- Ground truth acoustic detections
  - Social behavior
- Baseline behavior
  - BRS study
  - Tagged whales
- Photo ID? Catalogs
- Radio track tagged animals

Aerial Photo-ID for novel species

- Cuvier's beaked whale

- Killer Whale

17 Nov 2008: Dead Blue Whale

- Contacted NMFS & Janigers
- Also saw & reported a fin whale entangled in buoy and line

San Clemente Island:
Shoreline Stranding Surveys

- Many pinnipeds, mostly CA sea lions
- 1 dead CA SL seen on 2 days
- <1 hr to circle San Clemente Island

Can Aerial Methods Address NMFS Monitoring Plan Questions?

NMFS NMMP Question	Boat	Aerial	Shore (coastal only)	PAM	MFAS Vessel Observers	Tagging
What are MFAS RLs near animals?	X	**X**	(X)	X	X	X
Does geographical redistribution occur? How long?	X	**X?**	(X)	X?		X
What are behavioral responses vs RLs: MFAS & Explosions?	X?	**X**	(X)	X	X	X
Does Navy mitig. avoid Level A Take?	X?	**X?**			X?	

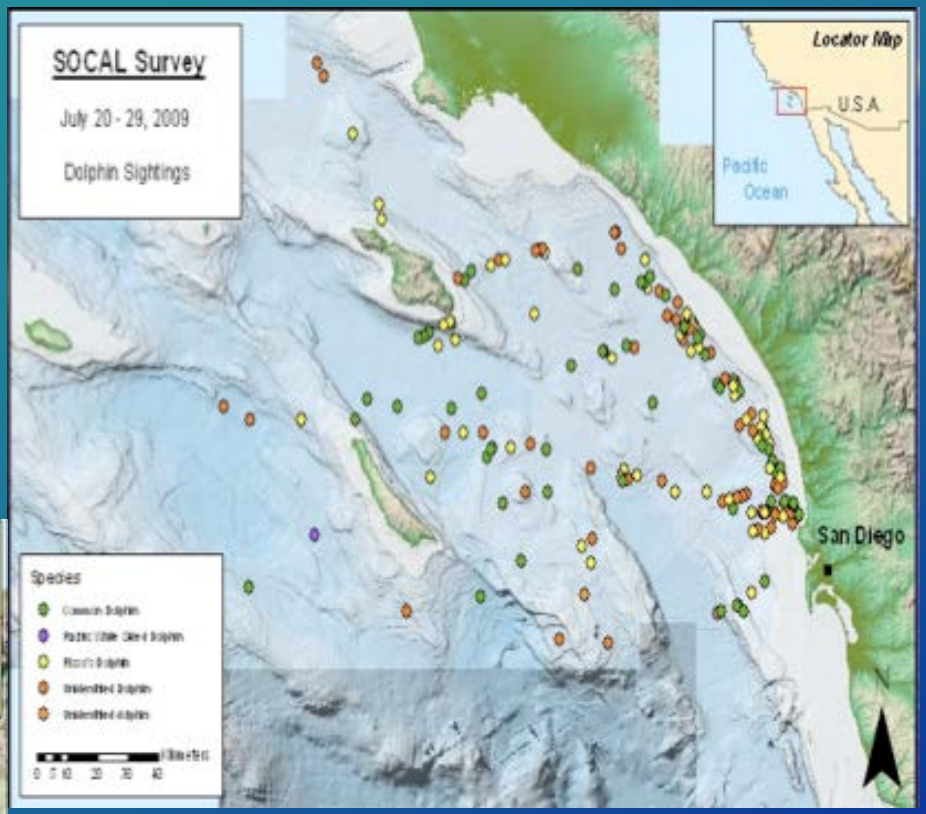
SOCAL Preliminary Results:

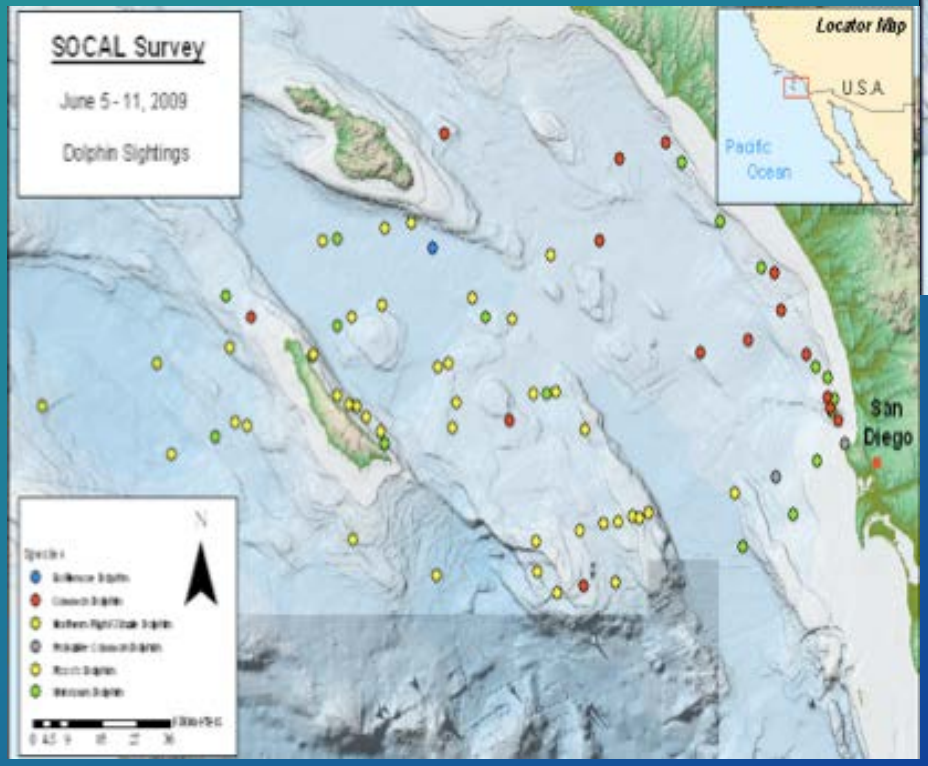
- Largest most recent data
- # Sighting highest of all Navy ranges
  - Abundance some species
- 10 Cuvier's beaked whales – KEY species of concern – 5 photographed, photo-ID?
- Photographed rare whales (*publication in prep*)
  - 4 Bryde's
  - 4 Sei
  - 2 offshore killer whale groups (n=67)
- Sightings before / during / after sonar exercises
- Seasonal species diversity and abundance
- Behavioral & distribution differences

Table 1. Summary of SOCAL Aerial Surveys

Parameter	2008		2009			TOTAL
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	3838 km	6140 km	6500 km	4823 km	**25,864 km**
	(2464 nm)	(2072 nm)	(3315 nm)	(3510 nm)	(2604 nm)	**13,965 nm**
No. Navy-directed Survey Changes (appox)	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. 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**

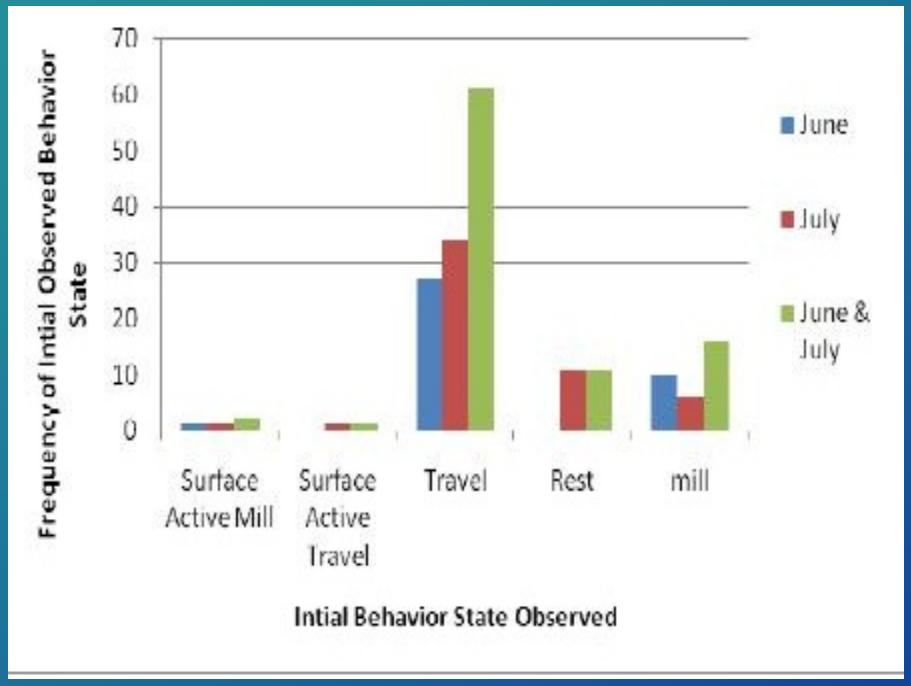
June and July 2009: Dolphin sightings in the SoCal aerial survey study area

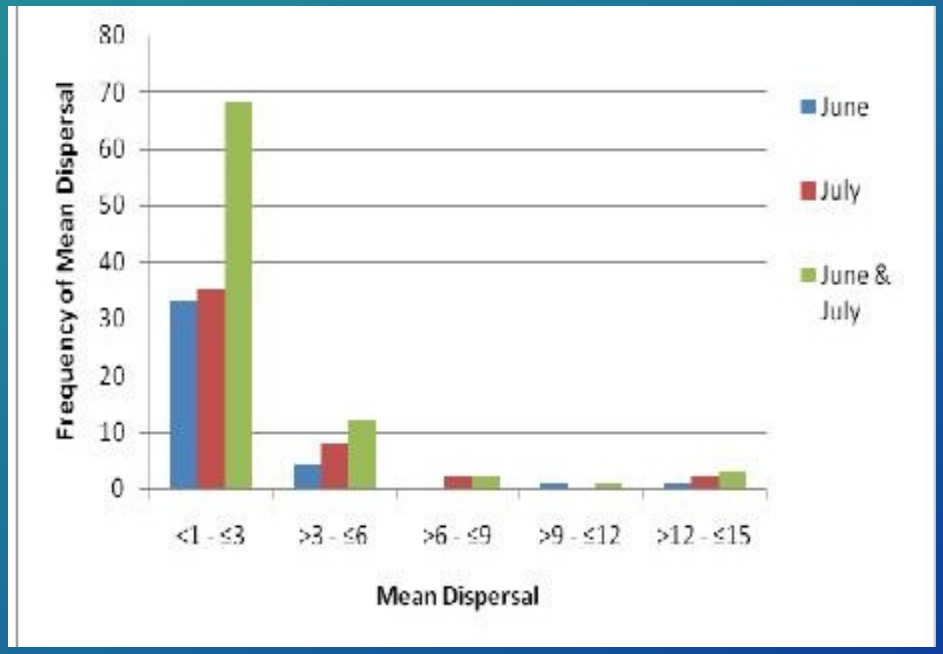




Behavior of Risso's Dolphins:

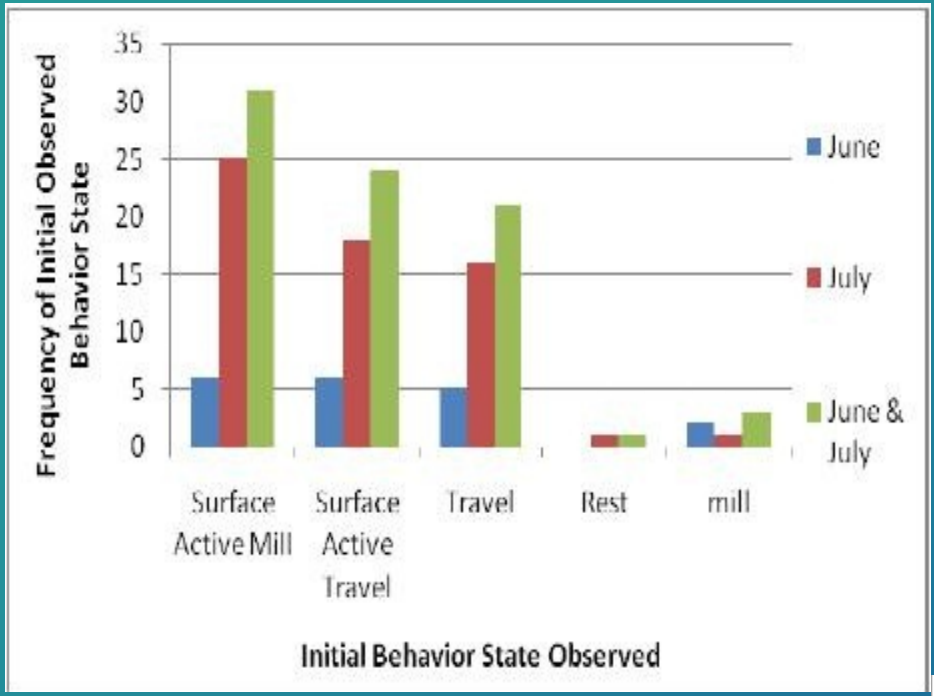
June and July SOCAL 2009 surveys

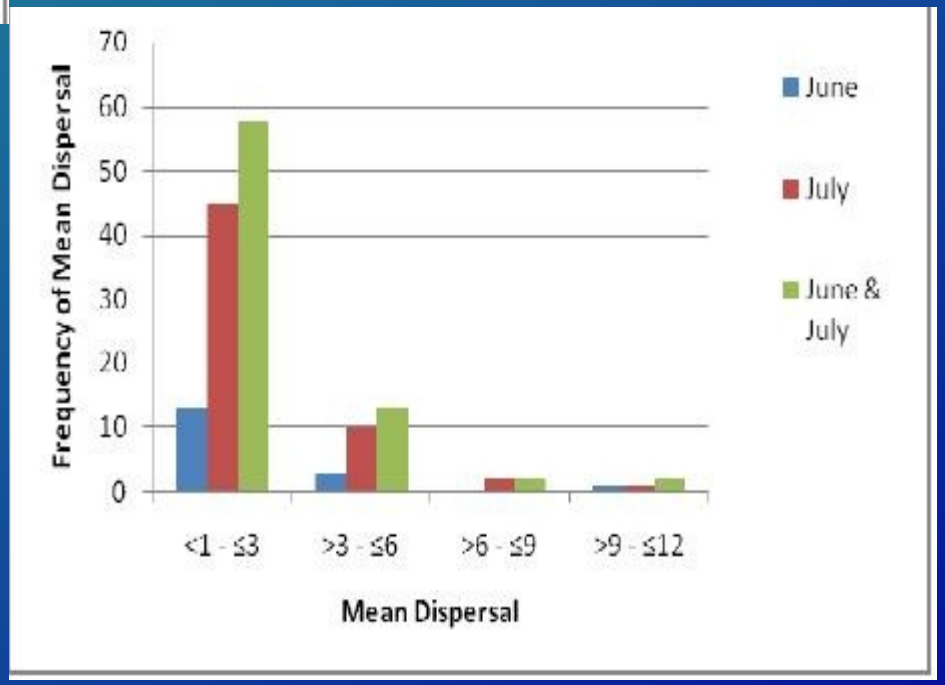




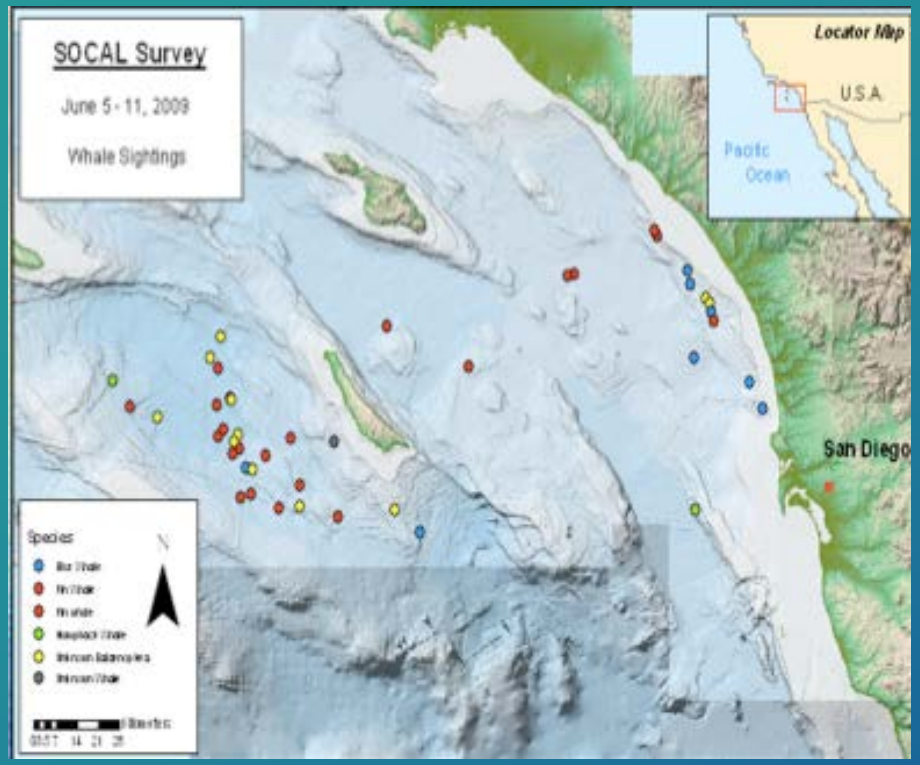
Behavior of Common Dolphins:

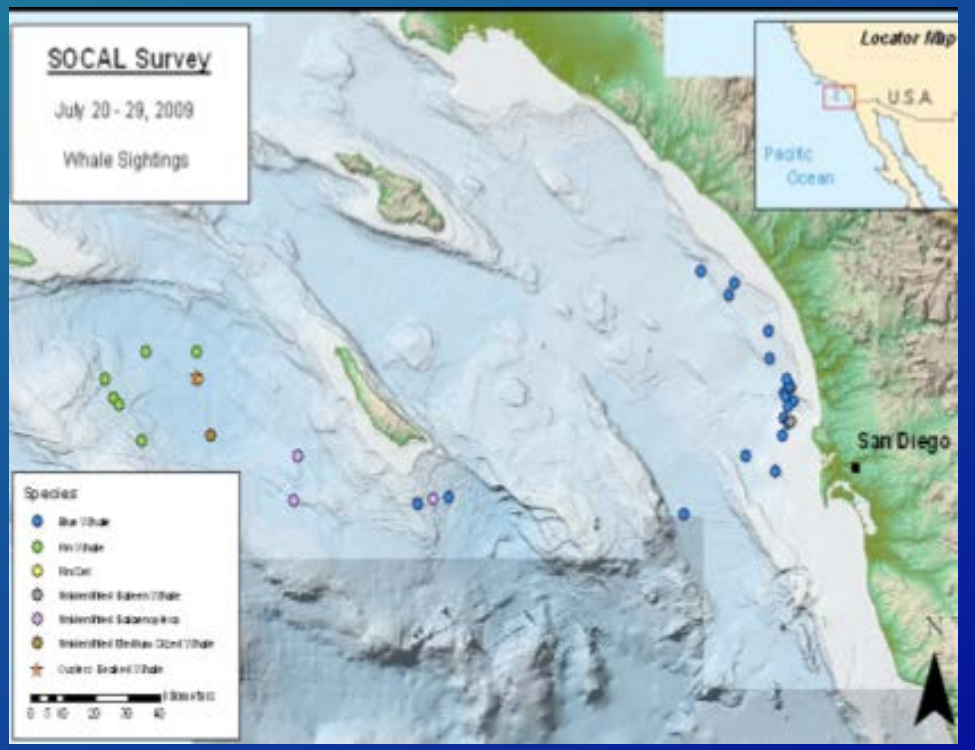
June and July SOCAL 2009





June and July 2009: Whale sightings in the SOCAL aerial survey study area





2008-10 Navy Aerial Surveys in SOCAL and HAWAII

Parameter	SOCAL	HAWAII	Total
Survey Dates	Oct/Nov 2008, June/July/Nov 2009, May, July, Sept 2010	Aug 08, Feb/Aug 2009	
No. Surveys	8	3	**9**
No. of Survey Days	42	15	**51**
Effort (km)	33,880 km done	NA	**NA**
Effort (hr)	188 hr	87 hr	**254 hr**
SIGHTING RATE (# indiv/hr)	416	4	**210**
# Species seen	16	4	**20**
# Individuals	79,896	332	**69,799**
Mean Beaufort sea state	2.5	6	**4.25**

Future work:

- Complete Sept 2010 data analysis
- Continue aerial surveys (Winter 2010-2011)
- Begin video behavioral analysis
  - Further investigate possible sonar disturbances
  - Better understand Risso's dolphin behavior and other species
- Compare real time data collection to videos using behavior software

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Questions?