

Re-sighting Histories of Dart-Attached Tags in Cuvier's Beaked Whales (*Ziphius cavirostris*) and Fin Whales (*Balaenoptera physalus*) in the Eastern Pacific Ocean



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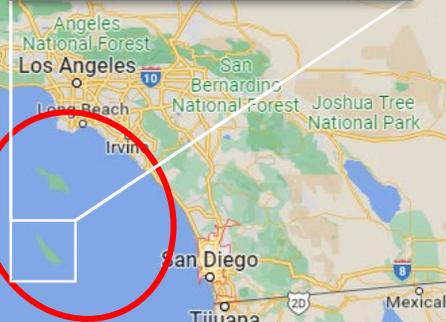
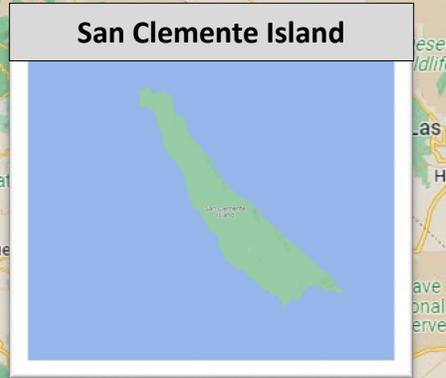
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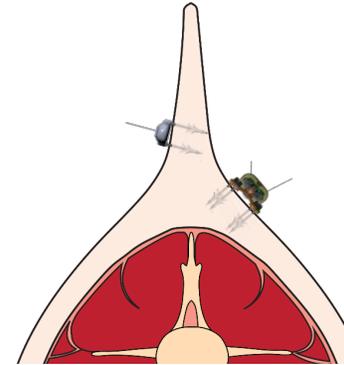
³Comisión Nacional de Áreas Naturales Protegidas, Ensenada, Baja California, Mexico



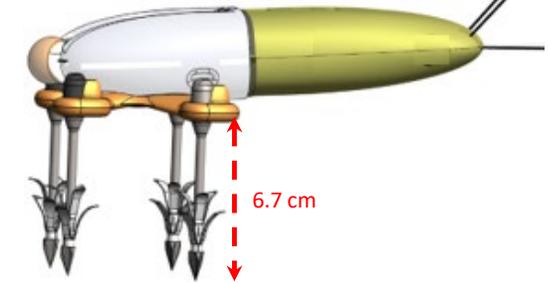
Tag Summaries 2008-2022



LIMPET tag, 2 darts



SMRT tag, 4 darts

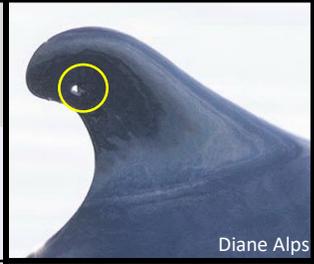


- Tagging efforts began off US West Coast (USA) in August 2008- concentrated in Southern California (area circled in red), but also occasionally off Central California and Washington state.
- Tagging efforts began off Guadalupe Island, BCS, Mexico (IG) in October 2018.

# of Darts	Tag Type	Tagged Fin Whales (n=#)	Tagged Cuvier's Beaked Whales (n=#)	Total (n=#)
2	LIMPET	81	44	125
4	Lander II/SMRT	5	18	23
	Total # of Tags	86	62	148

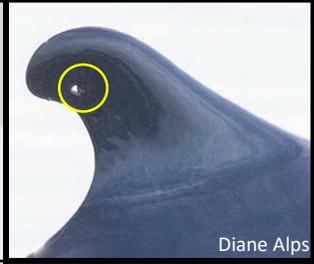


Tag Site Scar Types

Example	Description	Example	Description
	<p>Circle(s)-Large</p> <p>Individual dart attachment scars not discernable- more of a small area of scarring</p>	 <p style="text-align: right; font-size: small;">Diane Alps</p>	<p>Hole(s)</p> <p>Hole left by at least one dart</p>
 <p style="text-align: right; font-size: small;">Dale Frink</p>	<p>Circle(s)-Small</p> <p>Scars are only visible at their attachment sites with no tearing or rubbing</p>	 <p style="text-align: right; font-size: small;">Ryan Lawler</p>	<p>Notch(es)</p> <p>Notch left by at least one dart</p>
	<p>Circle(s)-Tear</p> <p>Small scars at attachment sites with minor tearing around the dart sites</p>		<p>Scrape(s)-Large</p> <p>Linear scars at attachment sites caused by tag moving at least a tag width</p>
 <p style="text-align: right; font-size: small;">Craig Heyslip/OSU</p>	<p>Imperceptible</p> <p>No sign of tag scar on attachment side or past scars no longer visible</p>		<p>Twist(s)</p> <p>Scrapes likely caused by pivoting of tag around one of the darts</p>



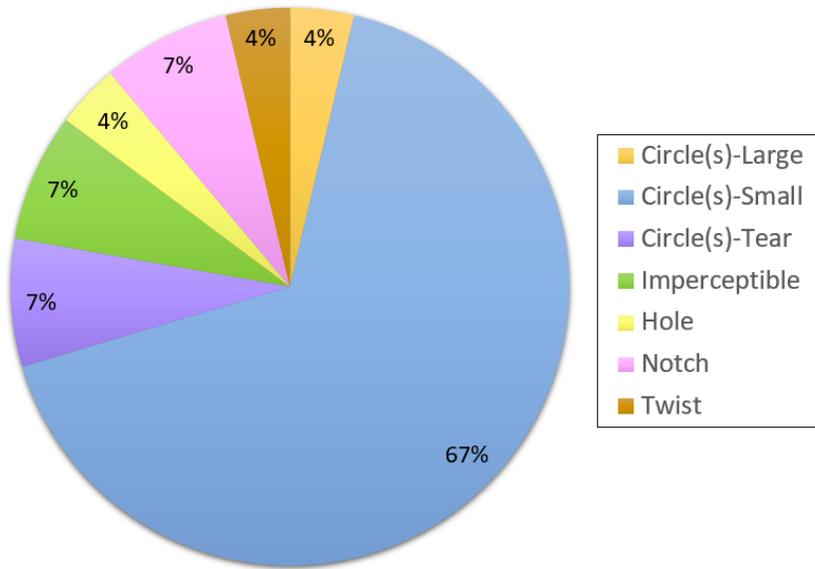
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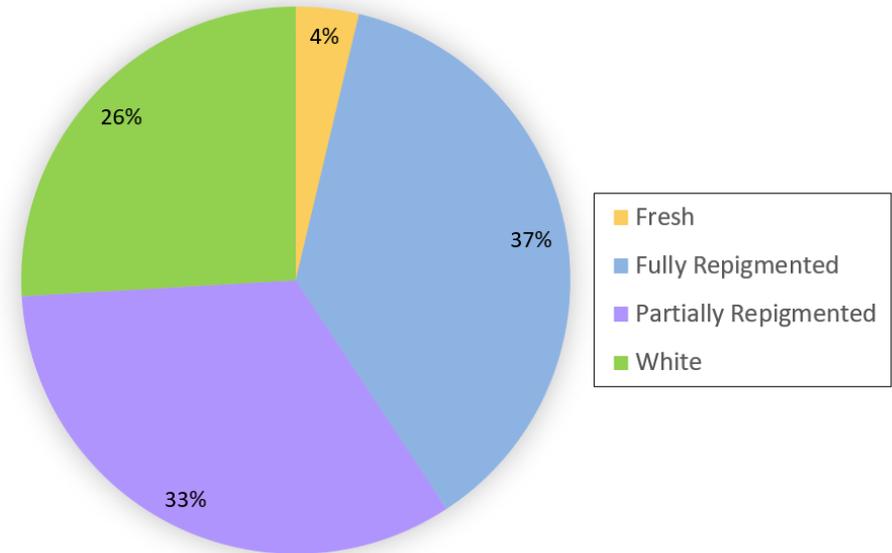


Results-Tag Side at Last Sighting

Tag Site Area at Last Re-sighting



Tag Site Repigmentation at Last Re-sighting



- 27 tagged sites were photographed with good quality images at their last re-sighting (5 additional sites were re-sighted with tags on thus excluded from analysis).
- 67% of these exhibited healing with small circular scarring localized to the dart attachment sites.
- Most of tag sites scored exhibited partial or full repigmentation.



Persistent Wounds: ZcID-42



- First whale tagged in this study- LIMPET-SPOT5 (2 dart attachment) on 8/3/2008.
- Re-sighted 1/14/2012 exhibiting a persistently unhealed wound with a dart shaft as well as remnants of the other dart protruding from the skin.
- Re-sighted in 2016 and 2018 with superficial scars, exhibiting similar wound healing to whales without obvious protruding dart pieces post-detachment.



Conclusions

- Most of the tag sites have healed during these individuals' re-sighting periods.
- These observations suggest the lasting impacts of dart tags are likely minimal, as intended, even for tags that require more darts.
- The minimal impacts to these individuals support the continued use of dart attached tags because the valuable information they provide far exceed the effects.



Acknowledgments

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- **Office of Naval Research**
- **US Pacific Fleet**



Supporting Organizations/Individuals

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- **Wildlife Computers**
- **3rd Fleet**
 - Jenny Marshall and CDR Holly Hart
- Frank and Jane Falcone
- Peg and Rob Roy
- **Citizen Science Contributors and Whale Watch Groups**



Key Personnel

- **Marine Ecology & Telemetry Research**
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 - Dave Moretti
- **OCDM-Guadalupe Project**
 - Christian Torres
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 - Diana Lopez
 - Daniel Martinez
 - Jasivi Arcos Diaz
 - Jay Barlow
 - Nancy DiMarzio
 - Dave Moretti
- **Calvin University**
 - DeRuiter Students

Leveraged Projects

- **Pacific Fleet:**
 - Beaked whale demographics through photo-ID and biopsy.
- **ONR:**
 - SMRT tag development
 - Zc comparative site assessment/Isla Guadalupe
 - Zc PCoD
- **ESTCP:**
 - Sonar detector/GPS LIMPET
- **Calvin University:**
 - Open-source tag calibration and analysis tools

Tagging Permits Numbers	
14245	21163
15330	540-1811
16111	SGPA/DGVS/07105/12
16163	SGPA/DGVS/00374/20
20465	

