

Cuvier's beaked whales of Guadalupe Island:

A possible resident population in a "natural laboratory" of México



Jennifer S. Trickey¹, Gustavo Cárdenas-Hinojosa^{2,3}, Lorenzo Rojas-Bracho², Andrea Bonilla-Garzón⁴, and Sergio Martínez-Aguilar⁴

¹ Scripps Institution of Oceanography, UCSD, La Jolla, CA, 92093

² Coordinación de Investigación y Conservación de Mamíferos, Instituto Nacional de Ecología y Cambio Climático - SEMARNAT. CICESE, Ensenada, B.C. México

³ Departamento de Biología de la Conservación, Centro de Investigación Científica y Educación Superior de Ensenada, Ensenada, B. C. México

⁴ Programa de Investigación de Mamíferos Marinos. Universidad Autónoma de Baja California Sur, La Paz, B.C.S. México

BACKGROUND

Cuvier's beaked whale (*Ziphius cavirostris*) is one of the most abundant and widespread species of beaked whale in the world, but its natural history remains very poorly understood. However, opportunistic sightings at Guadalupe Island, México from 2006-2008 and a pilot study undertaken there in 2009 revealed an exceptionally high encounter rate of Cuvier's beaked whales, as well as the presence of several mother-calf pairs, suggesting that this remote location could be an important breeding and feeding ground for this species (Cárdenas-Hinojosa *et al.* 2015). Located 150 miles west of Baja California, Guadalupe Island represents a "natural laboratory" due to its low levels of human disturbance and protection as a Biosphere Reserve, and is a unique opportunity to study a rarely seen species in a relatively pristine environment.



Figure 1. The survey platforms. (A) R/V Martin Sheen, an 81' sailboat belonging to the Sea Shepherd Conservation Society. (B) "Micks", a panga owned by CONANP. (C) A shore-based observation point equipped with a theodolite for animal tracking.

METHODS

Research expeditions to Guadalupe Island were conducted aboard the R/V Martin Sheen (Figure 1A) in October 2016, May 2017, and November 2017, while field efforts in September 2017 were undertaken from a panga (Figure 1B). Visual surveys for Cuvier's beaked whales (Figure 2A) were conducted to document the local abundance and distribution of this species, and pictures of individual whales were added to an existing photo-ID catalog. When possible, skin and blubber samples were collected via crossbow biopsy sampling (Figure 3A,B). At various times throughout the study period, acoustic recorders (Figure 3C,D) were deployed in both moored and drifting buoy configurations to monitor the echolocation activity of animals in the study area.

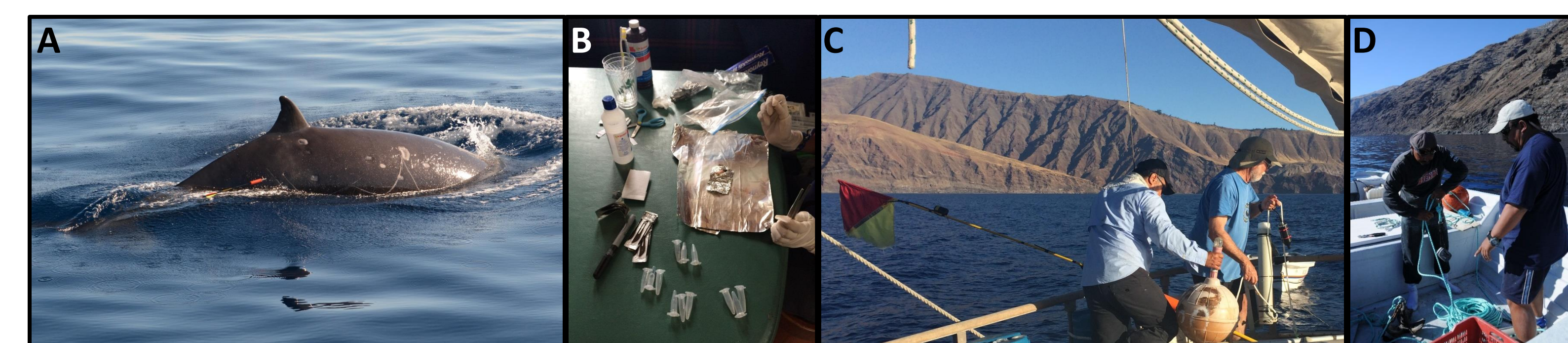


Figure 3. Research methods. (A) Biopsy sampling via crossbow and (B) tissue sample preservation. Deployments of (C) a drifting buoy mounted with two types of acoustic recorders (C-POD, SoundTrap) and (D) an anchored C-POD mooring.

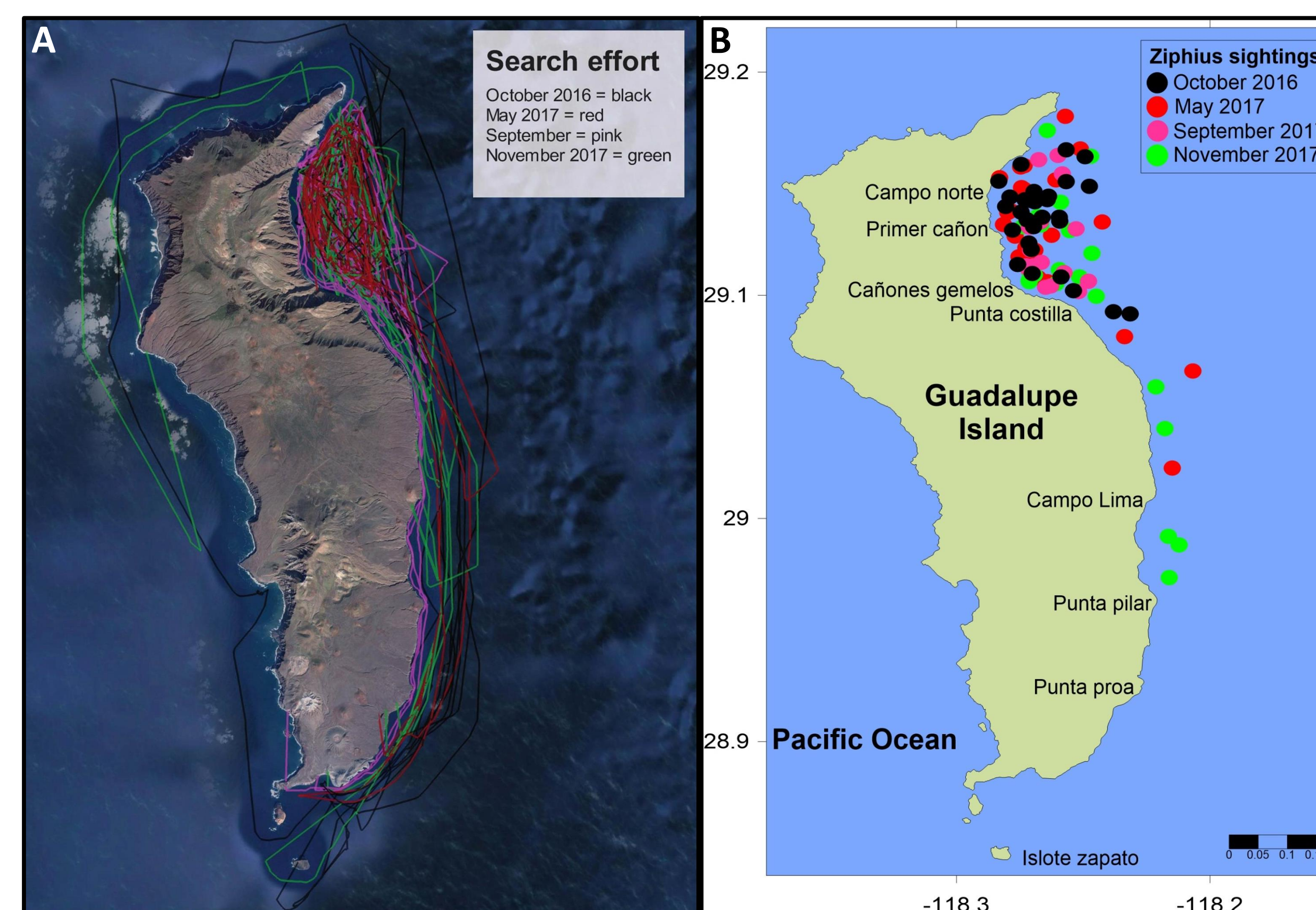


Figure 2. Guadalupe Island study area. (A) Tracklines of visual survey effort and (B) sightings of Cuvier's beaked whales plotted for all four expeditions.

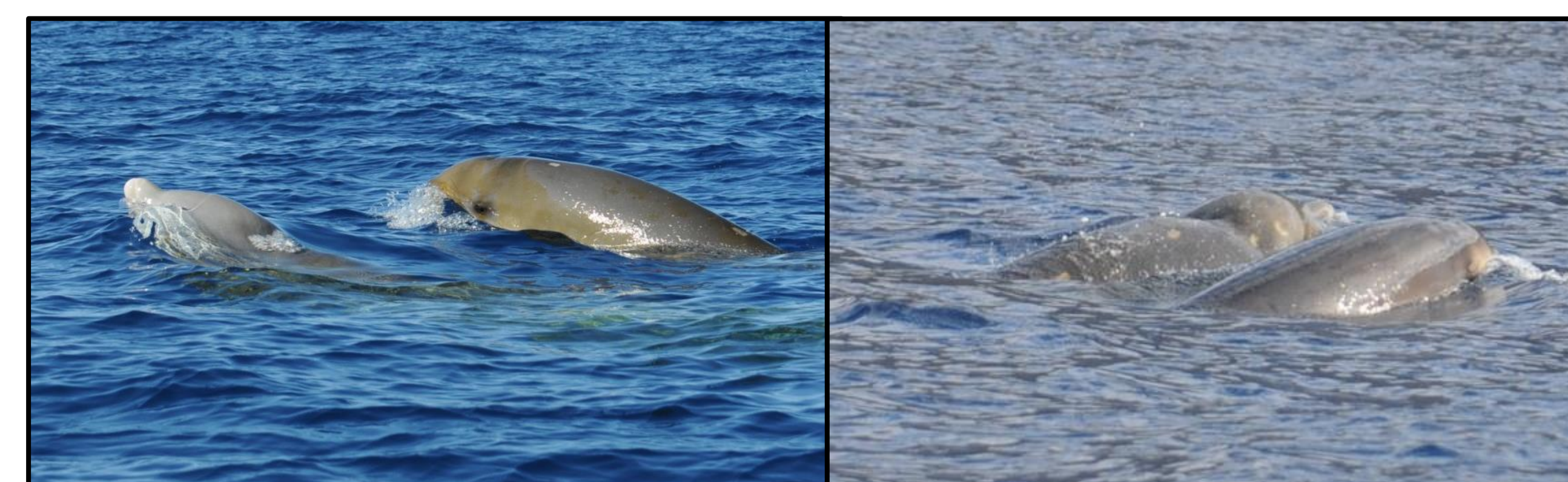


Figure 5. Two different mother-calf pairs encountered in May 2017.

Table 1. Summary of Cuvier's beaked whale survey data collected on four expeditions. Values for group size are given as means with ranges in parentheses. *Four of the October 2016 sightings and nine of the September 2017 sightings were sighted from the shore station, and were not included in calculations of encounter rate.

Expedition	Number of sightings	Encounter rate (groups/hour)	Group size	Number of biopsies	Search effort (hours)	Search effort (km)
Oct 2016	33*	0.40	2.65 (1-6)	5	71.2	651.4
May 2017	24	0.22	3.08 (1-7)	8	85.6	576
Sep 2017	25*	0.42	3.63 (1-7)	9	37.5	339.5
Nov 2017	22	0.38	3.27 (1-7)	0	57.4	433.81

FUTURE WORK

Photo-ID data will be used to examine social structure and association patterns, and pictures of the 69 individual whales identified at Guadalupe Island will also be compared to the Cuvier's beaked whale catalog of the Southern California Bight to assess potential regional movements and connectivity between these two populations. Tissue biopsy samples will be analyzed for genetics and stable isotopes. The passive acoustic recordings collected with C-PODs and a SoundTrap device will be used to assess the relative presence and distribution of echolocating odontocetes in the sampled areas.

RESULTS

A total of 104 sightings of Cuvier's beaked whales were documented during the four field expeditions, and 22 biopsy samples were collected (Table 1, Figure 2B). The photo-ID catalog now contains data from 2006-2017 and includes 69 individual whales. Preliminary photo-ID analysis suggests a degree of long-term site fidelity and potential residency, as there were recaptures of 33 whales across various time scales. The longest recapture period was over 10 years (Figure 4, Zcav008). Another whale (Zcav016) has been resighted 12 times in the 8 years since it was first photographed. Numerous mother-calf pairs were observed over the study period (Figure 5); one breeding female (Zcav022) was first photographed in October 2016 while pregnant, and was then resighted with the same calf several times throughout the 2017 field efforts.

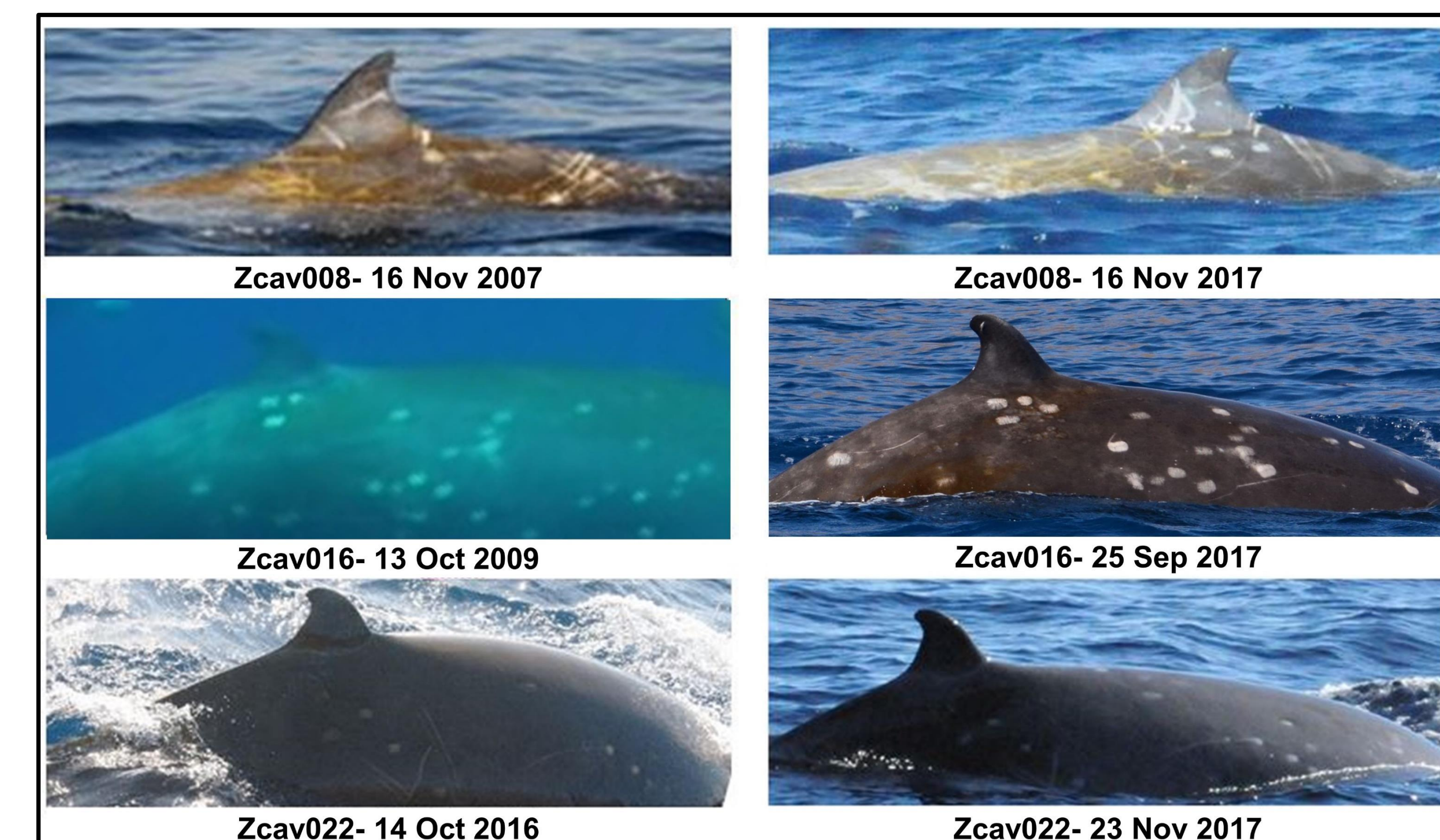


Figure 4. Examples of photo-ID recaptures for three of the animals in the catalog.

Reference

Cárdenas-Hinojosa, G., Hoyos-Padilla, M., and Rojas-Bracho, L. (2015). Occurrence of Cuvier's beaked whales (*Ziphius cavirostris*) at Guadalupe Island, Mexico, from 2006 through 2009. *Latin American Journal of Aquatic Mammals* 10:38-47.

Acknowledgments

We thank the Sea Shepherd Conservation Society, CONANP, Reserva de la Biosfera Isla Guadalupe, Ecocimati, Pelagios Kakunjá, Solmar V, Naval Mexicana Región II, and the Cooperativa de Pescadores Sociedad Cooperativa de Producción Pesquera de Participación Estatal Abuloneros y Langosteros S.C.L. for logistical support and fieldwork assistance. Funding was provided by the PADI Foundation, Marisla Foundation, International Community Foundation, and Cetacean Society International. This research was conducted under SEMARNAT permit SGPA/DGVS/09096/16.