Distribution and demographics of Cuvier's beaked whales and fin whales in the Southern California Bight

Annual Report for Calendar Year 2018
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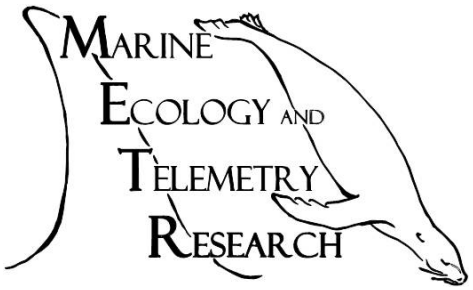

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14. ABSTRACT
The Southern California Offshore Complex (SOCAL) is one of the US Navy's most active training areas, particularly concerning the use of Mid-Frequency Active Sonar (MFAS). Much of SOCAL lies within the Southern California Bight, a productive oceanographic region that hosts a wide variety of marine species. As part of an ongoing study of the distribution and demographics of several marine mammal species within SOCAL, we conducted 10 days of survey effort from 5 January 2018 to 20 November 2018, specifically focusing on the Southern California Anti-submarine Warfare Range (SOAR). The primary goal of these surveys was sighting, photographing, and collecting biopsy samples from Cuvier's beaked whales and fin whales. With combined effort from ancillary projects funded by the US Navy's Living Marine Resources program, we had 263 sightings of cetaceans and one sea turtle sighting, including 35 sightings of an estimated 88 Cuvier's beaked whales and 35 sightings of 53 fin whales. Based on initial photo-identification, 23 individual Cuvier's beaked whales sighted in 2018 have been previously sighted in SOCAL, with sighting histories of several individuals spanning more than 10 years. We deployed five tags - two MK10a on a Risso's dolphin and Baird's beaked whale and three Lander2 tags on Cuvier's beaked whales. Twenty-two genetic samples were collected, including two from Cuvier's beaked whales and 9 from fin whales. Continued focus on photo-identification and biopsy sampling of Cuvier's beaked whales and fin whales will help elucidate population structure for these species, an important element of any management and mitigation strategies.

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Summary

The Southern California Range Complex (SOCAL) is one of the US Navy's most active training areas, particularly concerning the use of Mid-Frequency Active Sonar (MFAS). Much of SOCAL lies within the Southern California Bight, a productive oceanographic region that hosts a wide variety of marine species. As part of an ongoing study of the distribution and demographics of several marine mammal species within SOCAL, we conducted 10 days of survey effort from 5 January 2018 to 20 November 2018, specifically focusing on the Southern California Anti-submarine Warfare Range (SOAR). The primary goal of these surveys was sighting, photographing, and collecting biopsy samples from Cuvier's beaked whales and fin whales. With combined effort from ancillary projects funded by the US Navy's Living Marine Resources program, we had 263 sightings of cetaceans and one sea turtle sighting, including 35 sightings of an estimated 88 Cuvier's beaked whales and 35 sightings of 53 fin whales. Based on initial photo-identification, 23 individual Cuvier's beaked whales sighted in 2018 have been previously sighted in SOCAL, with sighting histories of several individuals spanning more than 10 years. We deployed five tags - two MK10a on a Risso's dolphin and Baird's beaked whale and three Lander2 tags on Cuvier's beaked whales. Twenty-two genetic samples were collected, including two from Cuvier's beaked whales and 9 from fin whales. Continued focus on photo-identification and biopsy sampling of Cuvier's beaked whales and fin whales will help elucidate population structure for these species, an important element of any management and mitigation strategies.

Introduction

The US Navy manages SOCAL, a collection of near shore and offshore training areas which includes much of the navigable water from Santa Barbara Island, CA, to northern Baja California, Mexico, extending several hundred miles to the west. It is among the most heavily used tactical training areas in the world, and is used for a variety of aerial, surface, and subsurface exercises. The Southern California Offshore Range (SCORE) is a subset of complexes within SOCAL centered on San Clemente Island, and managed via the Range Operation Center (ROC) on North Island. It includes the Southern California Anti-submarine Warfare Range (SOAR), a focal area for exercises involving MFAS within the San Nicolas Basin (Figure 1). Through its N45 and LMR programs, and in more recent years the US Pacific Fleet, the US Navy has funded directed studies on species assemblages, distribution and demographics, foraging ecology, and behavioral responses to MFAS of marine mammals on and around SOAR since 2006 (Falcone & Schorr 2014). In the beginning, the primary objective of these surveys was to provide visual verification of acoustic marine mammal detections on the SOAR hydrophone array in conjunction with the Marine Mammal Monitoring on Navy Ranges (M3R) program (Moretti et al. 2006). These studies documented a high diversity of species on SOAR year-round, though with some seasonal fluctuations in diversity and density (Falcone & Schorr 2014). Photo-ID studies of both Cuvier's beaked whales and fin whales were initiated to better understand the structure of these poorly-known populations. As the surveys progressed, a major goal became the deployment of dive-reporting satellite tags to study both the distribution and diving behavior of both these species, and also to assess any changes associated with MFAS use.

Both satellite tagging and photo-ID data from these studies have indicated high site fidelity within the Southern California Bight for several species, including Cuvier's beaked whales on SOAR and fin whales in the greater Southern California Bight (Falcone et al. 2009, 2017, Schorr et al. 2014, Scales et al. 2017). Both findings were somewhat unexpected. Fin whales were believed to range broadly along the US West Coast with no population substructure, and individual Cuvier's beaked whale were not expected to preferentially use SOAR, as this species, and beaked whales in general, have been documented to strand in association with MFAS in other regions of the world (Cox et al. 2006, D'Amico et al. 2009). Therefore, understanding the ecology, behavior, and population dynamics of these two populations in a region of such intense Navy training is critical to effective management, including realistic estimation of takes. It can also provide an important comparison to unexposed populations in other regions.

Navy Benefits

Long-term studies using photo-identification and genetics to elucidate population size, structure, and trends can provide a particularly robust basis for assessing population-level impacts. Demographic data, including the age-sex class structure of the population, often provide insights into cumulative impacts on long-lived species that might not show up in acoustic or visual density data (e.g. Whitehead & Gero 2015). A recent ONR-supported analysis (Moore et al. 2017) determined that a long-term photo-identification provided the best power to detect an actual decline in the Cuvier's beaked whale population at SOAR if one were occurring, and Booth et al. (2017) suggest photo-identification and biopsy are critical tools for monitoring populations. Further, there are specific inputs to Population Consequences of Disturbance (PCoD) models, currently being developed for beaked whales at SOAR and other Navy ranges, which can only be derived from individual life history data. Therefore, this project specifically supports the continuation of ongoing photo-identification and biopsy data collection for

Cuvier's beaked whales as well as fin whales with the goal of providing robust data for monitoring the health of these two populations.

Methods

Surveys were conducted using a 7.5m rigid-hulled inflatable boat (RHIB), powered by two outboard motors and equipped with a raised bow pulpit. The RHIB was launched from a shore base each morning and surveyed throughout daylight hours as conditions permitted. Surveys focused on SOAR were based at Wilson Cove on the northeast side of San Clemente Island. The RHIB was initially launched at Dana Point at the start of the survey period and remained moored in Wilson Cove for a period of 7-14 days, or until poor weather or conflicting range operations prevented further surveys at SOAR. When SOAR was available for our use, staff from the Naval Undersea Warfare Center's (NUWC) M3R program would monitor hydrophones from the Range Operations Center on North Island in San Diego and direct the RHIB via radio or satellite phone into areas where marine mammal vocalizations were detected. While the RHIB could be directed towards any vocalizations for visual verification, they were preferentially directed to those likely to be beaked whales when conditions were suitable for working with these species (typically winds at Beaufort 3 or less). In general, detections classified as small odontocetes were bypassed in favor of those from beaked or baleen whales.

Each time a group of cetaceans was encountered, the species, time, latitude, longitude, group size and composition, and overall behavioral state were recorded. For encounters with beaked whales, detailed records of surfacing patterns were also collected for as long as contact with the group was maintained. Photographs were taken for species verification where questionable, and for individual identification for species where this methodology is being employed during this study or by collaborators (beaked, fin, blue, humpback, minke, and killer whales; bottlenose and Risso's dolphins). Remote tissue biopsies were collected from species of interest both to this study (beaked and fin whales), and also on behalf of collaborators at the Southwest Fisheries Science Center (SWFSC) for use in ongoing assessments of offshore populations and stress hormone analyses. Additionally, a limited number of satellite tags were deployed on species which regularly inhabit the training range and which may be impacted by training activities in order to provide additional information on distribution, behavior, and overlap with Navy activities.

The tags deployed under this project were of the Low Impact Minimally Percutaneous External-electronics Transmitter (LIMPET) SPLASH10-A design (Andrews et al. 2008, Schorr et al. 2014). Maps indicating the movement data from Lander-II tags deployed under a Living Marine Resources (LMR) funded project are included here as well. Sighting data were collected using a custom-built Access (Microsoft, Redmond, WA) database with integrated GPS. Individual identification photographs of fin whales and beaked whales were processed and compared using methods described in Falcone and Schorr (2014) to build photographic sighting histories.

Additional surveys in 2018 were conducted as part of an LMR-funded project. Survey effort for Fleet and LMR are summarized separately and sighting data and photo-ID sections are combined.

Results and Discussion:

Survey effort and sightings

A total of 10 daily surveys were conducted for this project in four different months of 2018, with most survey effort occurring within SOAR (Table 1, Figure 1). An additional 35 daily surveys in six different months were conducted within the same general area for an ancillary project (Table 2, Figure 2).

Table 1. Summary of Fleet-supported survey effort by day, January 2018-November 2018. *"Total" for Species is the number of unique confirmed species identified throughout the study, and thus not a summation across days.

Date	Effort (Hr)	Distance (Nmi)	Number of Sightings	Number of Species	Biopsies Collected	Tags Deployed
1/5/2018	9.2	77.4	7	3	0	0
1/6/2018	9.3	82.9	12	5	1	0
3/28/2018	3.3	53.4	5	0	0	0
3/29/2018	11.2	96.9	7	6	0	0
3/30/2018	11.4	90.8	10	3	1	1
3/31/2018	10.9	85.7	10	5	1	1
4/1/2018	6.8	65.0	9	3	0	0
4/3/2018	8.3	76.2	10	5	2	0
4/4/2018	3.0	52.3	2	1	0	0
11/20/2018	10.8	103	6	3	0	1
Total:10	**84.1**	**783.6**	**78**	**12**	**5**	**3**

Table 2. Summary of ancillary survey effort by day, January 2018-November 2018. "Total" for Species is the number of unique confirmed species identified throughout the study, and thus not a summation across days.

Date	Effort (Hr)	Distance (Nmi)	Number of Sightings	Number of Species	Biopsies Collected	Tags Deployed
1/3/2018	2.4	51.7	3	1	0	0
1/4/2018	12.0	90.5	12	4	1	0
1/7/2018	10.0	80.5	8	5	1	0
1/8/2018	3.4	34.1	2	1	0	0
1/11/2018	10.4	84.0	3	2	0	0
1/12/2018	10.1	90.9	6	3	0	0
1/13/2018	11.8	95.7	3	1	0	1
1/14/2018	10.8	90.5	8	3	0	0
1/15/2018	9.4	93.7	2	2	0	0
1/16/2018	2.1	51.9	3	1	0	0
1/21/2018	10.0	185.0	0	0	0	0
4/2/2018	6.7	90.4	11	5	0	0
4/6/2018	7.7	143.0	0	0	0	0
5/24/2018	2.9	53.2	0	0	0	0
5/25/2018	7.6	80.0	6	2	0	0
5/27/2018	7.5	66.9	8	2	1	0
5/28/2018	9.0	82.8	12	5	3	0
5/29/2018	10.7	100.0	10	5	0	0
5/30/2018	13.0	119.0	15	5	5	0
6/1/2018	7.8	79.7	7	4	2	0
6/2/2018	8.3	74.9	2	0	0	0
6/3/2018	8.7	106.6	2	1	1	0
7/18/2018	3.3	54.5	2	1	0	0
7/19/2018	11.8	92.2	6	5	0	1
7/20/2018	14.0	111.0	8	2	0	0
7/21/2018	10.1	86.7	2	2	0	0
7/23/2018	2.5	52.0	2	0	0	0
11/12/2018	2.9	52.3	1	0	0	0
11/14/2018	9.7	87.8	7	2	0	0
11/15/2018	10.1	106.0	7	3	0	0
11/16/2018	11.0	107.0	7	5	1	0
11/17/2018	11.2	85.4	9	3	0	0
11/18/2018	11.9	106.0	6	3	1	0
11/19/2018	12.2	90.9	5	3	1	0
11/21/2018	2.1	51.8	1	0	0	0
Total: 35	**294.9**	**3028.6**	**186**	**13**	**17**	**2**

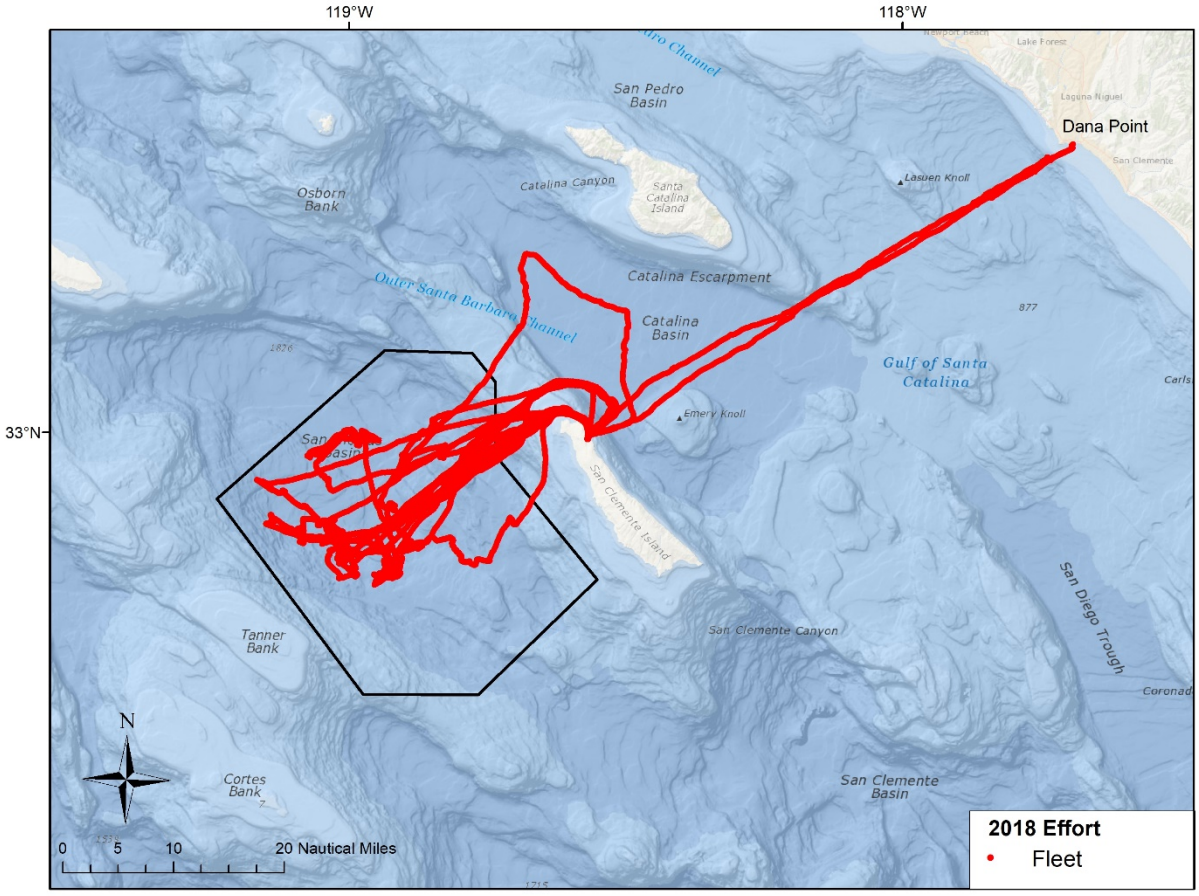

Figure 1. Vessel track lines from Fleet surveys conducted from 5 January 2018 through 20 November 2018. The black polygon west of San Clemente Island is the SOAR range boundary.

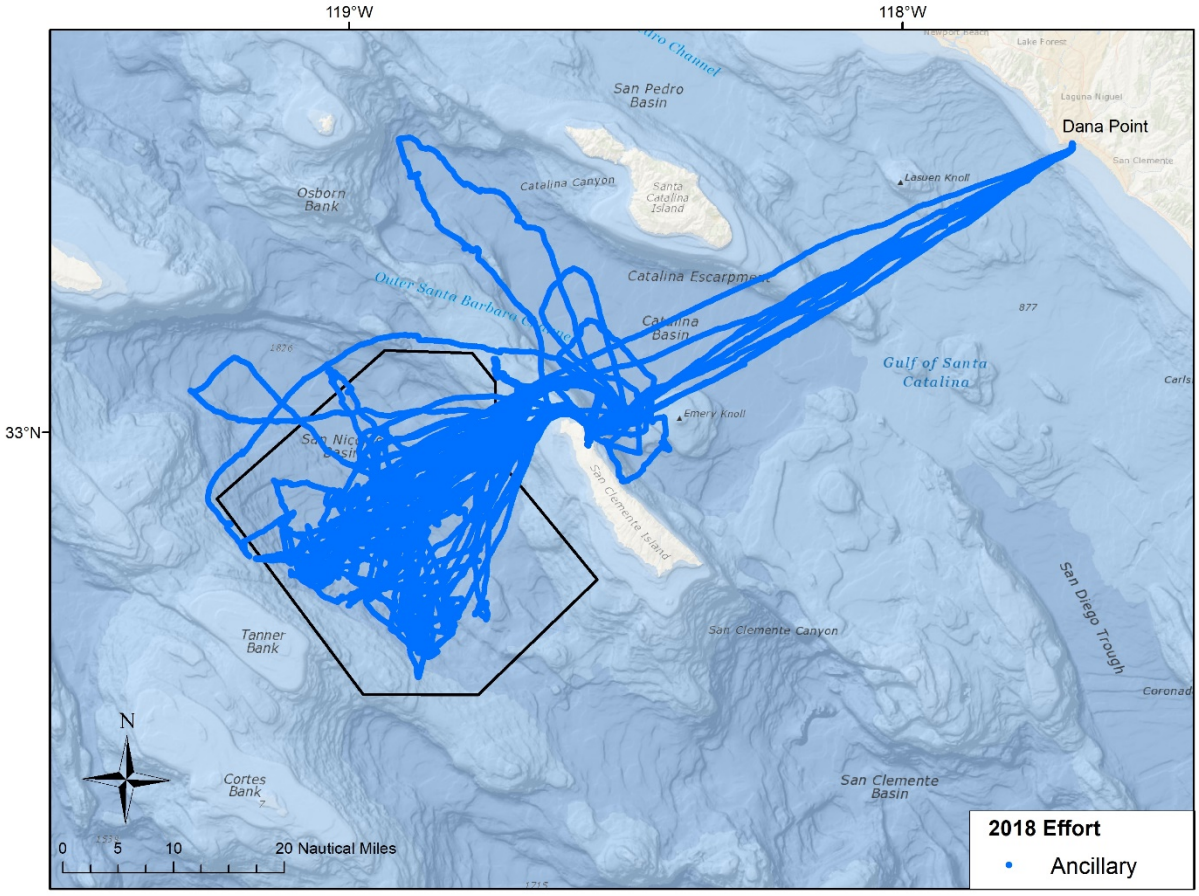

Figure 2. Vessel track lines from ancillary surveys conducted 3 January 2018 through 21 November 2018. The black polygon west of San Clemente Island is the SOAR range boundary.

During survey effort in 2018, 263 sightings of thirteen cetacean species were recorded, along with one sighting of a juvenile loggerhead turtle (Figure 3, Table 1, 2, Appendix I). Cuvier's beaked whales were sighted the deep waters of the San Nicolas Basin, to the west of San Clemente Island, in all months when effort was undertaken. One sighting of three individuals occurred just to the north of the island in January. This group was sighted in shallow waters (720 m), on the shelf edge of Catalina Basin (Table 3, Figure 4). Fin whales were sighted all around the island in all months of effort (Table 4, Figure 4).

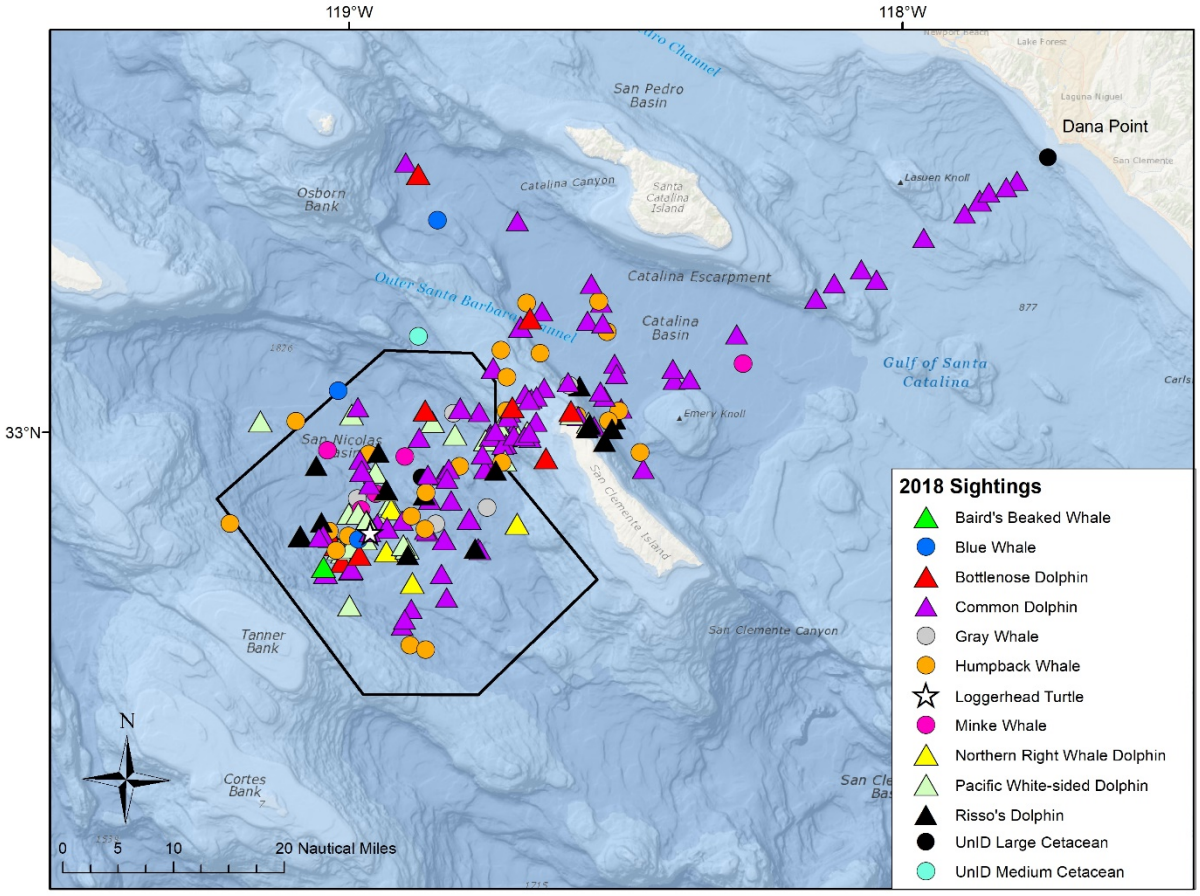

Figure 3. Sighting locations of cetacean (except Cuvier's beaked whales and fin whales) and sea turtle sightings by species from surveys conducted in 2018. The black polygon west of San Clemente Island is the SOAR range boundary.

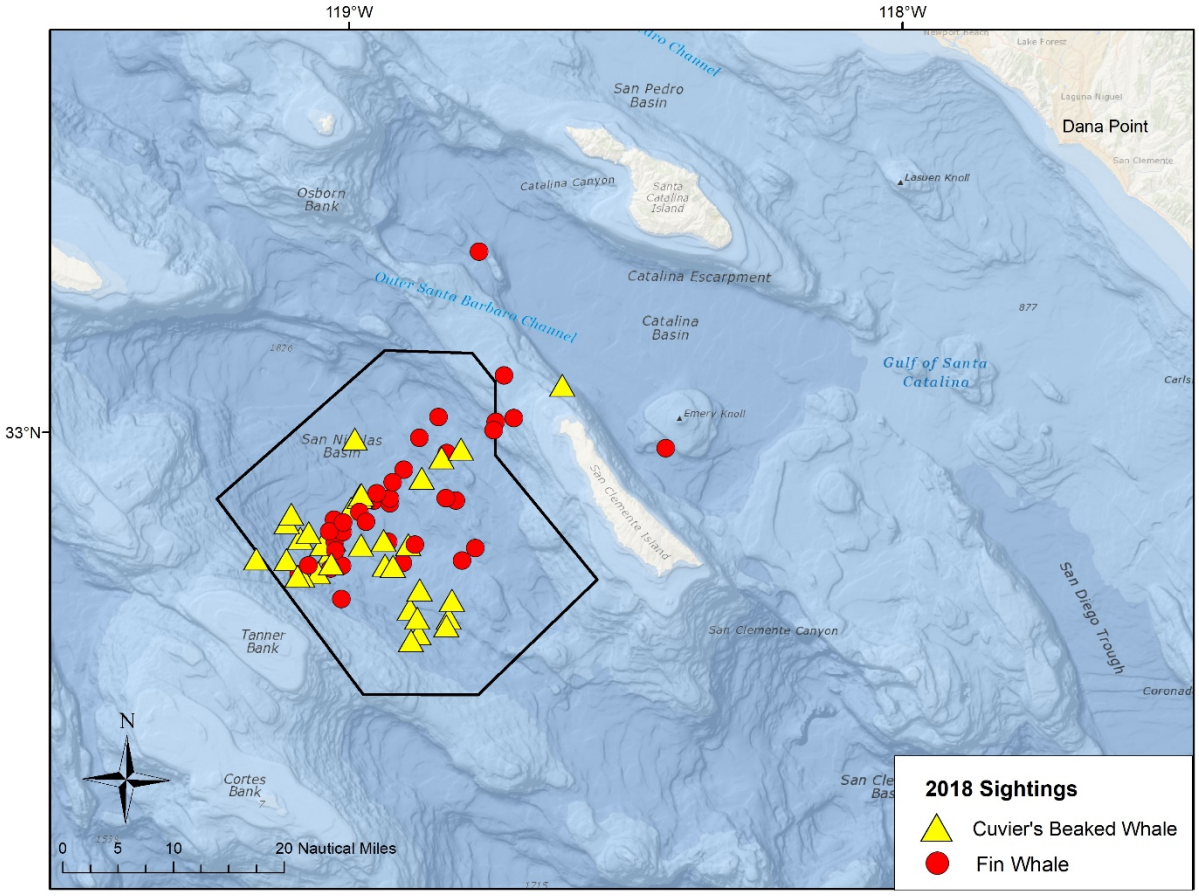

Figure 4. Cuvier's beaked whales and fin whale sightings from surveys conducted in 2018. The black polygon west of San Clemente Island is the SOAR range boundary.

Table 3. Details of Cuvier's beaked whale sightings in 2018.

Date	Sighting	Est. Group Size	Num Calves	Actual IDs	Biopsies Collected	Tags Deployed
1/4/2018	12	1	0	1	0	0
1/4/2018	6	3	0	3	0	0
1/4/2018	8	5	0	5	0	0
1/4/2018	9	5	0	5	0	0
1/5/2018	4	3	0	3	0	0
1/5/2018	5	2	0	2	0	0
1/6/2018	3	1	0	0	0	0
1/7/2018	8	3	0	4	0	0
1/11/2018	2	1	0	1	0	0
1/13/2018	2	3	0	3	0	1
1/13/2018	3	4	0	4	0	0
1/14/2018	6	3	0	2	0	0
1/15/2018	1	2	0	0	0	0
3/29/2018	5	5	0	5	0	0
3/30/2018	2	1	0	0	0	0
3/30/2018	8	2	0	2	0	1
3/31/2018	3	5	0	5	1	1
4/1/2018	3	3	0	2	0	0
4/3/2018	1	2	0	2	0	0
7/19/2018	3	3	0	3	0	0
7/20/2018	2	2	0	2	0	0
7/20/2018	3	2	1	2	0	0
7/20/2018	4	1	0	1	0	0
7/20/2018	5	1	0	1	0	0
7/20/2018	6	1	0	1	0	0
11/15/2018	2	3	0	3	0	0
11/16/2018	3	2	0	0	0	0
11/17/2018	5	5	0	5	0	0
11/17/2018	6	1	0	1	0	0
11/18/2018	2	2	0	2	0	0
11/18/2018	3	1	0	1	0	0
11/18/2018	6	3	0	3	0	0
11/19/2018	2	3	0	3	1	0
11/19/2018	5	2	0	2	0	0
11/20/2018	4	2	0	2	0	0
Total: 35		**88**	**1**	**81**	**2**	**3**

Table 4. Details of fin whale sightings in 2018.

Date	Sighting	Est. Group Size	Num Calves	Actual ID's	Biopsies Collected	Tags Deployed
1/4/2018	11	2	0	0	0	0
1/4/2018	4	3	0	3	1	0
1/4/2018	5	1	0	0	0	0
1/6/2018	10	1	0	1	0	0
1/6/2018	6	2	0	2	0	0
1/6/2018	7	2	0	2	1	0
1/7/2018	7	1	0	1	0	0
3/29/2018	3	2	0	2	0	0
3/31/2018	4	1	0	0	0	0
3/31/2018	5	1	0	1	0	0
3/31/2018	6	1	0	1	1	0
3/31/2018	8	4	0	2	0	0
4/1/2018	2	1	0	1	0	0
4/3/2018	2	2	0	0	0	0
4/3/2018	4	2	0	2	1	0
5/27/2018	8	1	0	1	0	0
5/28/2018	11	1	0	0	0	0
5/28/2018	3	3	1	3	0	0
5/29/2018	2	1	0	1	0	0
5/30/2018	10	1	0	1	0	0
5/30/2018	11	1	1	0	0	0
5/30/2018	14	1	0	1	0	0
5/30/2018	3	1	0	1	0	0
5/30/2018	7	2	0	2	0	0
5/30/2018	8	1	0	0	1	0
5/30/2018	9	1	0	1	0	0
6/1/2018	3	2	0	2	2	0
6/3/2018	1	1	0	1	1	0
6/3/2018	2	2	1	2	0	0
7/20/2018	8	1	0	1	0	0
11/14/2018	6	1	0	1	0	0
11/16/2018	6	2	0	1	1	0
11/17/2018	7	2	0	2	0	0
11/17/2018	9	1	0	1	0	0
11/18/2018	5	1	0	1	0	0
Total: 35		**53**	**3**	**41**	**9**	**0**

Cuvier's beaked whales

Cuvier's beaked whales were encountered during all field efforts, with the largest number of sightings in January and November. In the 379 hours of combined effort, 35 sightings totaling 88 whales were made, for an average of one sighting per 10.8 hours of effort. Median group size was two, with a range of one to five individuals. Photo-IDs and biopsy samples collected during all efforts are summarized in Table *3*.

Identification photographs collected in 2018 have undergone preliminary reconciliation and comparison to our historical catalog. This included 75 daily identifications of an estimated 59 individuals, though the total number of unique individuals is likely to decrease when identifications of insufficient quality are removed in final processing. Individual whales were sighted on as many as three different days within the year. Thus far, 23 of these individuals have been sighted previously in Southern California, and several of these whales now have histories spanning more than 10 years, with up to 9 separate encounters (Table 5). While this year is likely to add roughly twenty new individuals to the catalog, it is increasingly clear that SOAR is home to a highly resident population segment.

Only one young calf was sighted in 2018, associated with a female with no prior sighting history. However, five adult females with a prior calving history were sighted in 2018 without a calf in attendance, contributing to a growing body of calving interval data from this population. One mother-calf pair (IDs 187 and 205) was sighted together on three different days in 2018 for their third year running, bringing their joint history to 6 sightings over 3.5 years. This represents our most complete record of calf dependency for whales in this population. These data are particularly difficult to come by, because if calves are not sighted repeatedly in attendance with their mother, it is virtually impossible to link sightings of young calves to independent juveniles, given the changes in pigmentation and markings that occur in the early years of life.

Typical with any long-term monitoring program, to make meaningful conclusions, data collected in one year or from one project needs to be pooled with data collected on the same species from all associated projects in order to obtain the maximum sample size. Data products from this study effort was added to previous data collected for analyses in a variety of other efforts. For 2018, this includes an ONR technical report summarizing demographic and vital rate data derived from an objective method of aging and sexing Cuvier's beaked whales from photographs (Moore et al. 2017), and a manuscript detailing a mark-recapture assessment of abundance and survival rates that is in final stages of preparation, and slated for submission to a journal in early 2019. An additional project funded by ONR launched in 2018 at Isla Guadalupe, Mexico to assess diving behavior and demographics of beaked whales as a possible comparative site for the San Nicolas Basin, a critical element for population monitoring (e.g. Booth et al. 2017).

Two biopsy samples were collected from Cuvier's in 2018. One was determined to be female and the second is awaiting analysis.

Table 5. Summarized sighting histories for individual Cuvier's beaked whales identified in 2018 and any previous year.

ID	First Sighting	Last Sighting	Encounters	Year Span
5	10/23/2007	11/17/2018	4	11
8	10/23/2007	3/31/2018	4	10
32	8/2/2008	1/13/2018	9	10
39	8/3/2008	11/15/2018	4	10
42	8/3/2008	11/19/2018	6	10
46	8/3/2008	1/5/2018	5	9
56	10/24/2008	7/20/2018	4	10
81	6/28/2010	1/4/2018	4	8
103	5/2/2011	11/20/2018	9	8
104	7/23/2011	11/17/2018	5	7
105	7/23/2011	1/4/2018	6	7
128	3/30/2013	11/17/2018	2	6
132	3/30/2013	4/1/2018	8	5
147	1/4/2014	3/31/2018	2	4
152	1/7/2014	1/13/2018	3	4
175	1/7/2015	11/18/2018	2	4
187	1/9/2015	11/15/2018	8	4
191	10/5/2014	1/4/2018	6	3
205	4/5/2016	11/15/2018	6	3
206	4/6/2016	3/29/2018	2	2
214	4/7/2017	1/4/2018	3	1
218	7/24/2017	4/3/2018	2	1
226	4/4/2017	3/31/2018	2	1

Fin whales

Fin whales were sighted more frequently during surveys this year than in the previous two years combined; we had 35 sightings in 2018 (Figure 4, Table 6, Appendix 1) versus 23 in 2016 and 2017. It was proposed that the low sightings in 2016 and early 2017 were due to El Niño conditions (Schorr et al. 2018). As is generally the case, photo-ID data for fin whales is heavily augmented by opportunistic contributions from citizen science. These contributions can be quite large, and often come to us late in the calendar year after which they are collected, thus we typically report fin whale photo-ID results from the previous data collection year (in this case, 2017). We increased our outreach to whale watch entities and other researchers likely to encounter fin whales, and this yielded many more photographs, including expanded coverage from outside Southern California. For example, in late November 2018 we received our first contribution from the HappyWhale program (https://happywhale.com/home) which totaled nearly 600 images of fin whales contributed by citizen scientists from Western Baja California to British Columbia, 2014-2018.

Images from HappyWhale collected prior to 2018 were combined with our own 2017 identifications (n = 44) and other opportunistic 2017 contributions for a total of 461 identifications, which are through preliminary reconciliation and comparison though results are not yet finalized. These identifications represented an estimated 214 unique individuals that were photographed an average of 2.1 times each. Twelve individuals were photographed more than five times (max = 40 times), demonstrating the power of citizen science data to dramatically augment sighting histories of whales with long residency times near populous areas. Of these 214 individuals, 53 were found in the catalog, including all but one of the twelve whales that were sighted extensively in the current image set (which included some images from earlier years, but mostly 2017). All high-residency whales were sighted off Southern California. The summarized sighting histories of 37 fin whales sighted in 2017 and any prior year are provided in Table 6. Thirty-four of these whales have been sighted exclusively in Southern California. Three have been sighted in both Southern and Central California, though sampling outside Southern California remains much more limited.

Nine biopsy samples were collected from fin whales in 2018. All but one sample (collected in late November) have been genetically-sexed, with four determined to be male and the remaining four, female.

Table 6. Summarized annual sightings histories for fin whales sighted in 2017 and any previous year.

ID	Total Years Sighted	First Year	Last Year	Year Span
85	5	2003	2017	14
108	3	2003	2017	14
284	2	2009	2017	8
291	4	2009	2017	8
307	5	2009	2017	8
308	5	2009	2017	8
323	6	2009	2017	8
324	3	2009	2017	8
326	7	2009	2017	8
351	7	2010	2017	7
353	8	2010	2017	7
354	9	2009	2017	8
368	6	2010	2017	7
380	8	2010	2017	7
387	3	2010	2017	7
398	3	2010	2017	7
430	6	2011	2017	6
456	5	2012	2017	5
457	2	2012	2017	5
458	3	2008	2017	9
459	5	2012	2017	5
462	5	2012	2017	5
467	2	2012	2017	5
511	5	2012	2017	5
512	6	2012	2017	5
573	3	2013	2017	4
590	3	2013	2017	4
598	4	2013	2017	4
600	3	2013	2017	4
630	4	2013	2017	4
763	2	2014	2017	3
791	2	2015	2017	2
897	2	2014	2017	3
905	2	2014	2017	3
918	3	2015	2017	2
977	2	2016	2017	1
992	2	2016	2017	1

Tag deployments

Satellite tags are deployed as part of this project to help elucidate additional information on animal movement, habitat use, documenting time spent on the SCORE range, and assess behavior and possible behavioral changes associated with training exercises. While photo-ID and biopsy are the primary focus of this work, satellite telemetry provides an additional tool for understanding the populations which occur at SCORE. The tags deployed as part of this effort are being analyzed with tag data from additional projects (e.g. Schorr et al. 2014, Falcone et al. 2017, Scales et al. 2017) in order to provide greater context, and therefore, only basic summary information is provided here.

Two satellite tags purchased by this contract have been deployed during 2018, one each on a Baird's beaked whale and Risso's dolphin. Transmission durations ranged from 7-8 days (Table 7, Figure 5, Figure 6). Three tags, purchased under a different contract, were deployed on Cuvier's beaked whales during 2018. Transmission durations ranged from 5-19 days (Table 7, Figure 7, Figure 8, and Figure 9).

Table 7. Details on satellite tags deployed during these efforts (note, Cuvier's beaked whale tags were deployed under a project funded by the LMR program).

Tag ID	Species	Tag Type	Date	Trans. Dur. (days)
Zica-20180113-173188	Cuvier's Beaked Whale	Lander2	1/13/2018	5.7
Zica-20180330- 173188	Cuvier's Beaked Whale	Lander2	3/30/3018	19.3
Zica-20180331- 173187	Cuvier's Beaked Whale	Lander2	3/31/2018	5.6
Bba-20180719-144036	Baird's Beaked Whale	Mk10-A	7/19/2018	6.5
Gg-20181120-98368	Risso's Dolphin	Mk10-A	11/20/2018	7.5

Consistent with previous tag deployments on Baird's beaked whales (MarEcoTel, unpublished data, and Stimpert et al. 2014), the Baird's tagged during this project moved quickly through the SOAR range and continued moving north and out of SOCAL (Figure 5). Baird's beaked whales have been photographically identified on three different occasions in three different years while on the SOAR range. All sightings occurred during summer months (July, August, and September), suggesting that this may be a time when Baird's beaked whales are migrating through the area. Comparisons of photographs taken between the encounters will need to be made to determine if there were any of the same individuals.

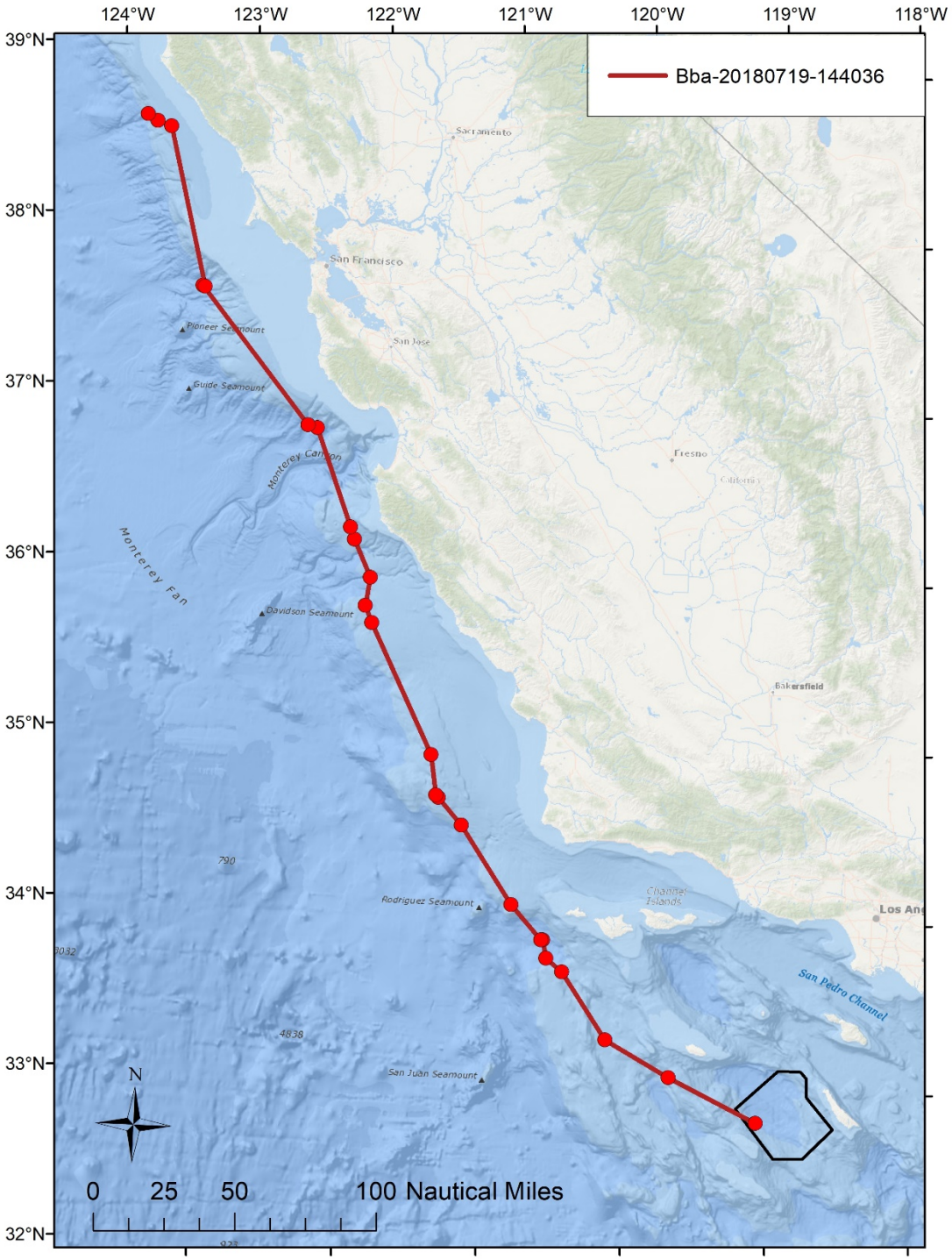

Figure 5. Filtered tracklines of a satellite tagged Baird's beaked whale during the 2018 monitoring effort.

Similar to previous Risso's deployments, the individual tagged in 2018 (Figure 6) did not remain in the deep waters of the San Nicolas Basin for long, in this case returning to more near-shore waters

surrounding Catalina Island shortly after tagging. Movement and dive data collected from this tagged individual will be combined with previous Risso's dolphin deployments for a manuscript submission in 2019.

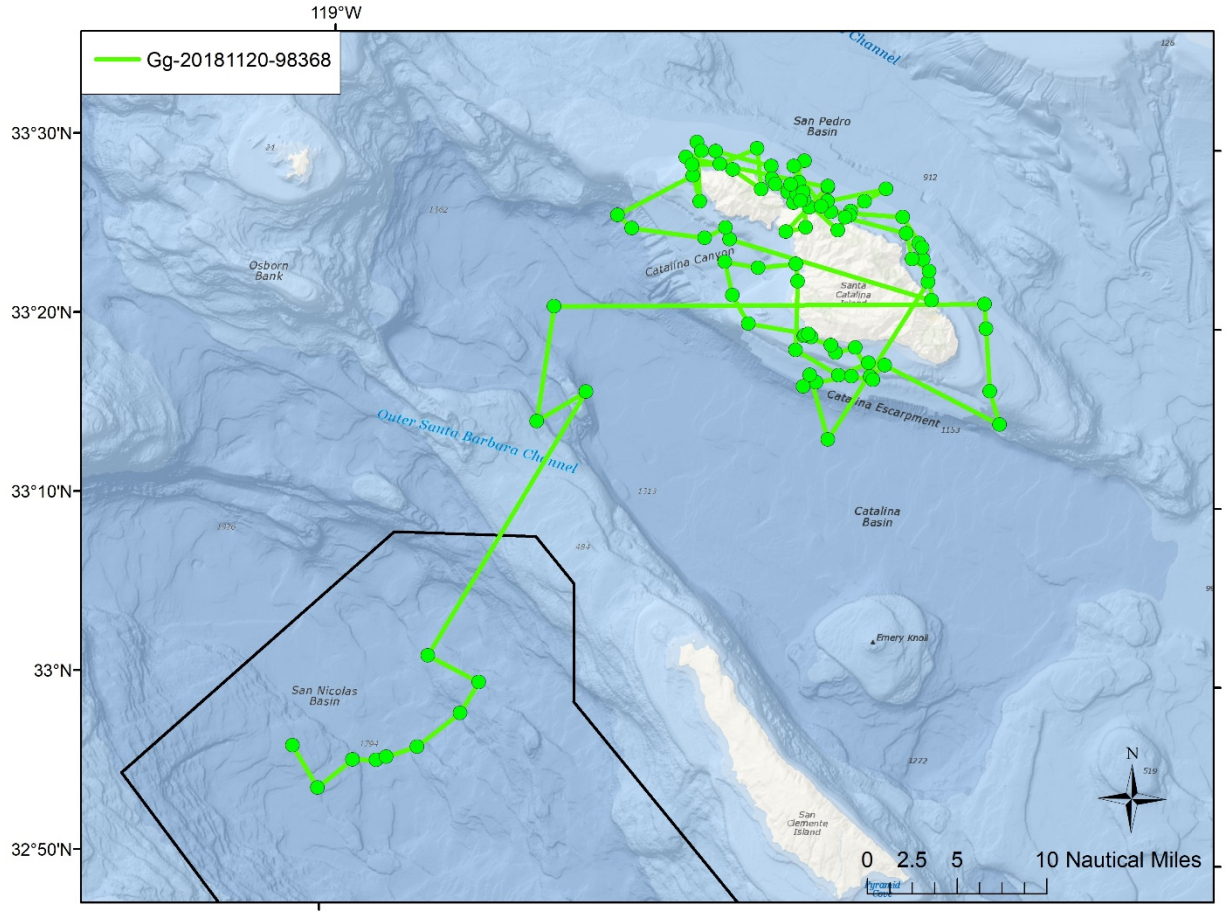

Figure 6. Filtered tracklines of a satellite tagged Risso's dolphin during the 2018 monitoring effort.

While deployments were relatively short for the beaked whales tagged with Lander II tags (maximum deployment duration designed to be 19 days), movements for two individuals were mainly constrained to the SOAR range (Figure 7, Figure 8), with one individual moving north into the Santa Cruz Basin before returning to the San Nicolas Basin (Figure 9).

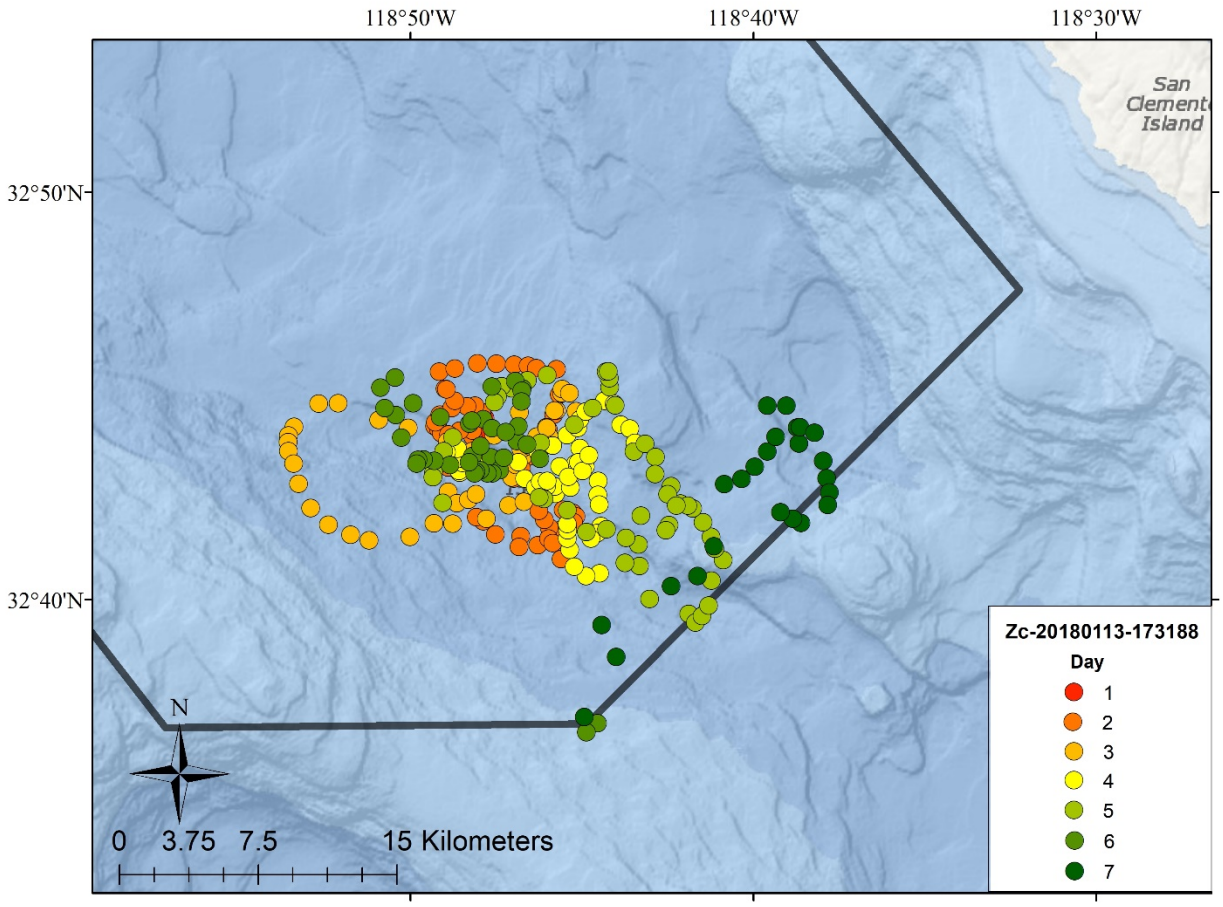

Figure 7. GPS locations of a Cuvier's beaked whale tagged on 13 January 2018 during LMR-funded field effort, colored by day from deployment.

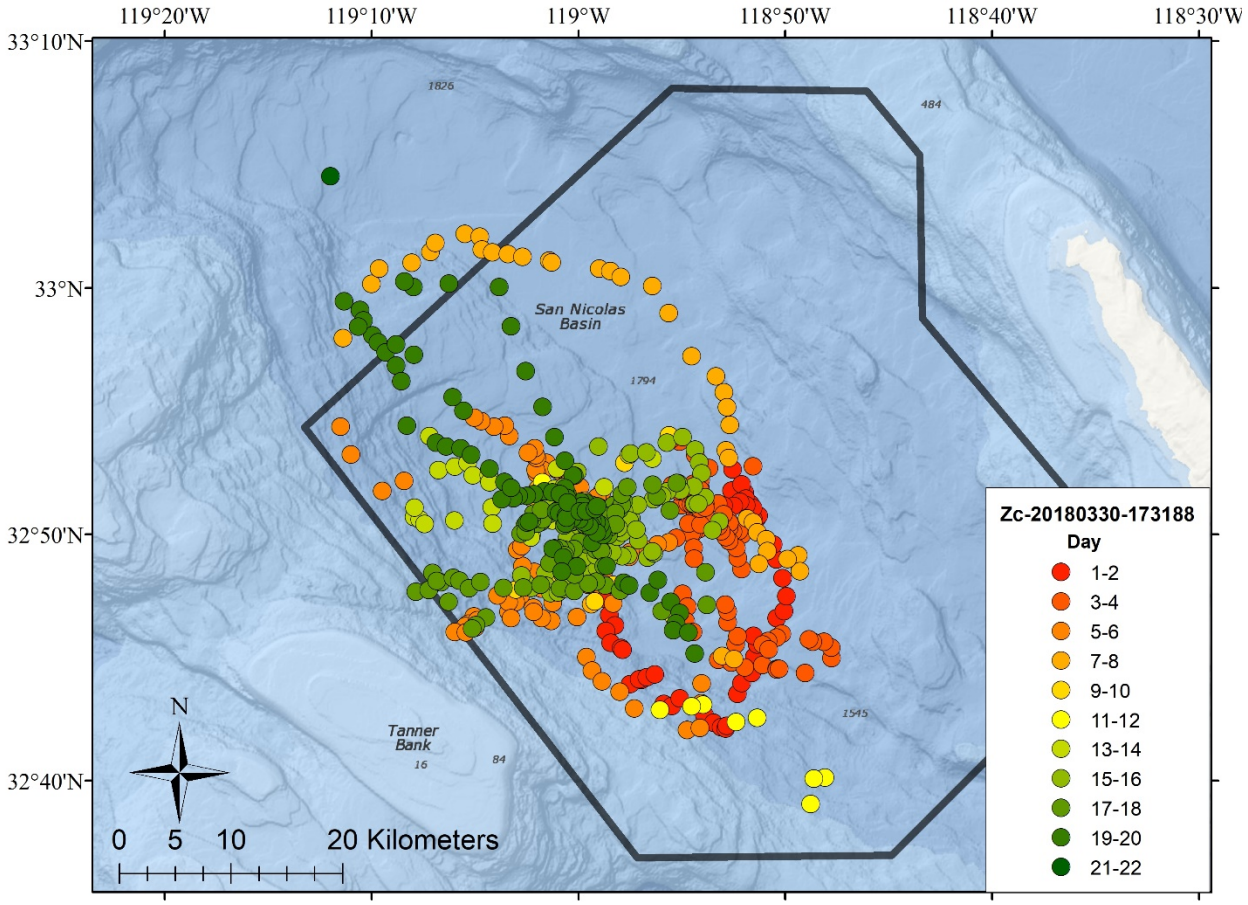

Figure 8. GPS locations of a Cuvier's beaked whale tagged on 30 March 2018 during LMR-funded field effort, colored by day from deployment.

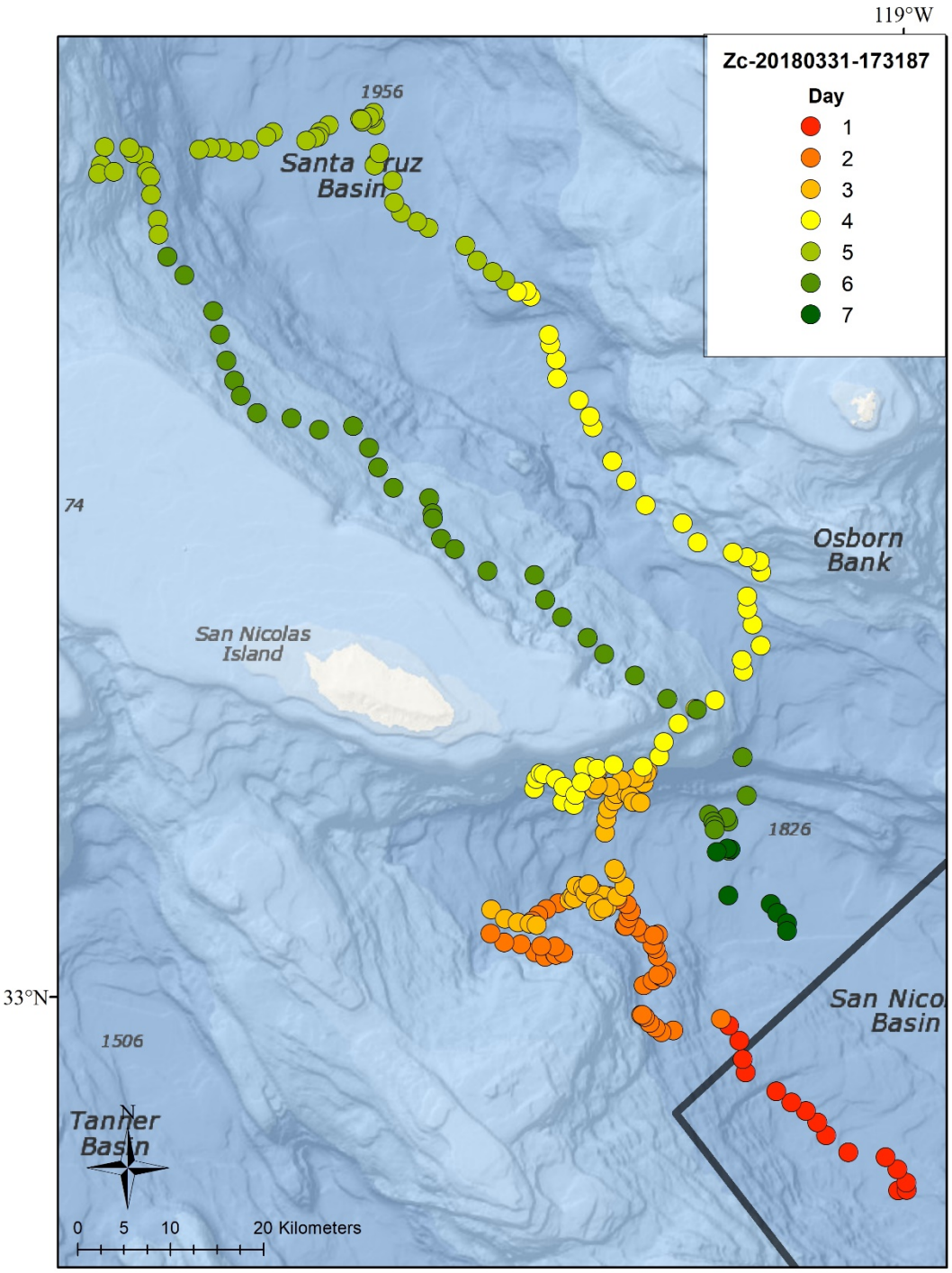

Figure 9. GPS locations of a Cuvier's beaked whale tagged on 31 March 2018 during LMR-funded field effort, colored by day from deployment.

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Appendix I. Sighting details from effort conducted in 2018, including effort from US Pacific Fleet and the Living Marine Resources Program.

Date	Common Name	Lat	Long	Group Size	Est ID's	Biopsies Collected	Tags Deployed
03-Jan-18	Delphinus species	N33 16.04	W118 04.21	350			
03-Jan-18	Delphinus species	N33 13.35	W118 09.07	45			
03-Jan-18	Risso's Dolphin	N33 02.16	W118 30.59	22			
04-Jan-18	Gray Whale	N32 54.57	W118 58.18	2			
04-Jan-18	Cuvier's Beaked Whale	N32 54.74	W118 57.92	5	2		0
04-Jan-18	Cuvier's Beaked Whale	N32 53.70	W118 58.81	3	3	0	0
04-Jan-18	Fin Whale	N32 50.68	W118 54.74	1			
04-Jan-18	Fin Whale	N32 48.81	W118 53.14	3	3	1	
04-Jan-18	Delphinus species	N32 54.59	W118 50.35	40			
04-Jan-18	Cuvier's Beaked Whale	N32 54.90	W118 57.89	1	1	0	0
04-Jan-18	Fin Whale	N32 54.41	W118 56.36	2	0		
04-Jan-18	Minke Whale	N32 55.05	W118 56.19	1	1		
04-Jan-18	Delphinus species	N33 01.51	W118 32.79	7			
04-Jan-18	Gray Whale	N32 52.42	W118 49.68	3			
04-Jan-18	Cuvier's Beaked Whale	N32 54.98	W118 57.72	5	5		
05-Jan-18	Delphinus species	N33 01.84	W118 39.04	15			
05-Jan-18	Risso's Dolphin	N33 05.15	W118 34.42	6			
05-Jan-18	Delphinus species	N33 04.92	W118 38.23	8			
05-Jan-18	Cuvier's Beaked Whale	N32 48.53	W118 54.20	2	2	0	0
05-Jan-18	Pacific White-sided Dolphin	N33 00.49	W118 40.99	10			
05-Jan-18	Pacific White-sided Dolphin	N33 01.86	W118 33.42	8			
05-Jan-18	Cuvier's Beaked Whale	N32 48.62	W118 55.03	3	3		
06-Jan-18	Cuvier's Beaked Whale	N32 50.41	W118 57.66	1			
06-Jan-18	Pacific White-sided Dolphin	N32 50.90	W118 57.19	30			
06-Jan-18	Pacific White-sided Dolphin	N33 01.68	W118 50.20	25			
06-Jan-18	Delphinus species	N33 00.20	W118 51.61	30			
06-Jan-18	Fin Whale	N33 00.19	W118 51.60	2	2	1	0
06-Jan-18	Pacific White-sided Dolphin	N32 54.18	W118 54.65	3			
06-Jan-18	Fin Whale	N32 54.18	W118 54.65	2	2	0	0
06-Jan-18	Delphinus species	N33 04.30	W118 40.27	50			
06-Jan-18	Gray Whale	N33 02.48	W118 48.00	2			
06-Jan-18	Fin Whale	N33 02.10	W118 49.58	1	1		
06-Jan-18	Delphinus species	N33 00.68	W118 43.97	70			
06-Jan-18	Northern Right Whale Dolphin	N32 49.83	W118 54.92	25			
07-Jan-18	Delphinus species	N33 00.70	W118 41.67	12			
07-Jan-18	Cuvier's Beaked Whale	N33 05.21	W118 36.32	3	2	0	0
07-Jan-18	Fin Whale	N32 54.64	W118 54.65	1	1		
07-Jan-18	Pacific White-sided Dolphin	N32 53.21	W118 59.03	5			
07-Jan-18	Northern Right Whale Dolphin	N32 53.69	W118 54.48	550	0	1	0
07-Jan-18	Pacific White-sided Dolphin	N33 00.43	W118 43.56	35			

07-Jan-18	Pacific White-sided Dolphin	N33 00.49	W118 42.36	5			
07-Jan-18	Humpback Whale	N33 00.46	W118 43.25	2			
08-Jan-18	Delphinus species	N33 11.08	W118 33.68	300			
08-Jan-18	Humpback Whale	N33 10.08	W118 31.57	1			
11-Jan-18	Pacific White-sided Dolphin	N32 50.17	W118 52.69	8			
11-Jan-18	Cuvier's Beaked Whale	N32 50.83	W118 55.25	1	1	0	0
11-Jan-18	Delphinus species	N32 57.59	W118 43.96	30			
12-Jan-18	Pacific White-sided Dolphin	N32 50.43	W118 53.12	35	1		
12-Jan-18	Gray Whale	N32 52.14	W118 55.77	1			
12-Jan-18	Pacific White-sided Dolphin	N32 44.86	W118 58.77	75			
12-Jan-18	Risso's Dolphin	N32 49.57	W118 52.62	28			
12-Jan-18	Pacific White-sided Dolphin	N33 00.90	W118 40.02	2			
12-Jan-18	Delphinus species	N32 52.35	W118 55.95	30			
13-Jan-18	Delphinus species	N32 43.15	W118 53.08	250			
13-Jan-18	Cuvier's Beaked Whale	N32 43.90	W118 48.10	3	3	0	1
13-Jan-18	Cuvier's Beaked Whale	N32 42.44	W118 51.29	4	4	0	0
14-Jan-18	Pacific White-sided Dolphin	N33 00.10	W118 44.47	8			
14-Jan-18	Pacific White-sided Dolphin	N32 49.67	W118 59.62	40			
14-Jan-18	Delphinus species	N32 50.27	W118 45.06	7			
14-Jan-18	Cuvier's Beaked Whale	N32 43.21	W118 48.33	3	2	0	0
14-Jan-18	Delphinus species	N32 45.75	W118 48.34	20			
14-Jan-18	Delphinus species	N33 03.92	W118 39.59	10			
14-Jan-18	Pacific White-sided Dolphin	N33 01.17	W118 42.95	2			
14-Jan-18	Gray Whale	N33 05.20	W118 35.60	2			
15-Jan-18	Cuvier's Beaked Whale	N32 44.69	W118 52.29	2	1	0	0
15-Jan-18	Gray Whale	N32 53.96	W118 44.21	1			
16-Jan-18	Delphinus species	N33 10.04	W118 17.56	25			
16-Jan-18	Long-beaked Common Dolphin	N33 22.41	W117 51.50	22			
16-Jan-18	Delphinus species	N33 05.82	W118 24.23	50			
28-Mar-18	Delphinus species	N33 23.12	W117 50.50	80			
28-Mar-18	Delphinus species	N33 14.76	W118 07.11	13			
28-Mar-18	Delphinus species	N33 06.81	W118 24.41	30			
28-Mar-18	Delphinus species	N33 03.15	W118 29.93	700			
28-Mar-18	UnID Large Cetacean	N33 26.34	W117 44.14	1			
29-Mar-18	Fin Whale	N32 49.10	W118 46.78	2	2		
29-Mar-18	Short-beaked Common Dolphin	N32 51.03	W118 48.74	150			
29-Mar-18	Bottlenose Dolphin	N32 51.08	W119 04.20	18			
29-Mar-18	Risso's Dolphin	N32 51.08	W119 04.24	1			
29-Mar-18	Northern Right Whale Dolphin	N32 52.56	W118 40.92	225			
29-Mar-18	Bottlenose Dolphin	N32 58.55	W118 37.93	20			
29-Mar-18	Cuvier's Beaked Whale	N32 50.91	W119 04.21	5	4	2	0
30-Mar-18	Risso's Dolphin	N32 51.15	W119 01.10	10	8		
30-Mar-18	Cuvier's Beaked Whale	N32 49.70	W119 00.90	2	2	2	1
30-Mar-18	Bottlenose Dolphin	N32 48.15	W118 58.73	8			
30-Mar-18	Bottlenose Dolphin	N32 50.34	W119 00.33	18			

30-Mar-18	Delphinus species	N32 56.82	W118 48.92	350			
30-Mar-18	Bottlenose Dolphin	N32 51.06	W119 01.00	17	3		
30-Mar-18	Cuvier's Beaked Whale	N32 50.84	W119 00.63	1			
30-Mar-18	Delphinus species	N33 00.41	W118 43.95	350			
30-Mar-18	Delphinus species	N32 59.77	W118 42.27	65			
30-Mar-18	Bottlenose Dolphin	N32 48.83	W118 59.69	15			
31-Mar-18	Fin Whale	N32 51.51	W118 59.64	1	1		
31-Mar-18	Fin Whale	N32 51.55	W119 01.13	4	2		
31-Mar-18	Humpback Whale	N32 51.58	W119 01.11	1			
31-Mar-18	Risso's Dolphin	N32 52.36	W119 01.95	40			
31-Mar-18	Fin Whale	N32 52.63	W119 00.61	1	1	1	
31-Mar-18	Cuvier's Beaked Whale	N32 50.41	W119 01.78	5	5	5	1
31-Mar-18	Delphinus species	N32 59.68	W118 42.59	25			
31-Mar-18	Humpback Whale	N32 58.61	W118 57.02	2			
31-Mar-18	Fin Whale	N32 50.64	W119 00.51	1			
01-Apr-18	Delphinus species	N32 54.58	W118 48.05	20			
01-Apr-18	Humpback Whale	N33 02.93	W118 30.18	4	0		
01-Apr-18	Delphinus species	N33 04.20	W118 31.72	2500			
01-Apr-18	Humpback Whale	N32 57.66	W118 47.23	2			
01-Apr-18	Humpback Whale	N33 02.00	W118 31.29	4			
01-Apr-18	Cuvier's Beaked Whale	N32 50.51	W118 52.60	3	2		
01-Apr-18	Fin Whale	N32 50.49	W118 51.89	1	1		
01-Apr-18	Delphinus species	N32 57.50	W118 44.49	7			
01-Apr-18	Delphinus species	N33 04.13	W118 39.06	55			
02-Apr-18	Delphinus species	N33 02.63	W118 45.20	350			
02-Apr-18	Humpback Whale	N33 01.47	W119 04.93	2			
02-Apr-18	Risso's Dolphin	N33 02.70	W118 51.03	5			
02-Apr-18	Delphinus species	N33 01.44	W119 08.74	60			
02-Apr-18	Bottlenose Dolphin	N33 02.70	W118 51.02	10			
02-Apr-18	Delphinus species	N33 02.62	W118 41.86	50			
02-Apr-18	Humpback Whale	N33 02.43	W118 34.68	1			
02-Apr-18	Humpback Whale	N33 02.76	W118 42.32	2			
02-Apr-18	Delphinus species	N33 02.39	W118 34.55	600			
02-Apr-18	Pacific White-sided Dolphin	N33 01.43	W119 08.75	2			
02-Apr-18	Minke Whale	N32 58.88	W119 01.46	1			
03-Apr-18	Long-beaked Common Dolphin	N33 02.94	W118 47.26	300			
03-Apr-18	Delphinus species	N33 12.73	W118 32.21	18			
03-Apr-18	Fin Whale	N32 58.84	W118 48.63	2			
03-Apr-18	Minke Whale	N32 58.47	W118 53.15	1	1		
03-Apr-18	Fin Whale	N32 57.27	W118 53.24	2	2	1	
03-Apr-18	Long-beaked Common Dolphin	N33 06.64	W118 43.79	450			
03-Apr-18	Long-beaked Common Dolphin	N33 10.43	W118 40.88	35			
03-Apr-18	Humpback Whale	N33 12.59	W118 40.29	1			
03-Apr-18	Humpback Whale	N33 12.85	W118 32.51	1			
03-Apr-18	Cuvier's Beaked Whale	N32 58.47	W118 49.17	2	2	0	0

04-Apr-18	Risso's Dolphin	N33 01.32	W118 30.88	25			
04-Apr-18	Delphinus species	N33 05.88	W118 22.56	300			
25-May-18	Delphinus species	N32 51.71	W118 50.48	30			
25-May-18	Delphinus species	N32 51.87	W118 50.75	100			
25-May-18	Humpback Whale	N32 51.93	W118 50.83	2	0		
25-May-18	Risso's Dolphin	N32 55.04	W118 50.95	22	4		
25-May-18	Delphinus species	N33 02.22	W118 42.06	25			
25-May-18	Delphinus species	N32 57.43	W118 48.39	45			
27-May-18	Delphinus species	N33 14.43	W118 33.35	5			
27-May-18	Delphinus species	N33 11.85	W118 38.61	4			
27-May-18	Fin Whale	N32 59.60	W118 25.07	1	1		
27-May-18	Risso's Dolphin	N33 00.16	W118 31.65	7	7	1	0
27-May-18	Delphinus species	N33 07.20	W118 30.71	3			
27-May-18	Delphinus species	N33 06.30	W118 30.46	25			
27-May-18	Delphinus species	N32 57.71	W118 27.42	75			
27-May-18	Delphinus species	N33 10.86	W118 32.04	60			
28-May-18	Delphinus species	N33 00.94	W118 43.41	100			
28-May-18	Pacific White-sided Dolphin	N32 57.00	W118 56.23	3			
28-May-18	Northern Right Whale Dolphin	N32 55.38	W118 55.10	20			
28-May-18	Delphinus species	N32 55.41	W118 55.01	15			
28-May-18	Risso's Dolphin	N32 55.42	W118 55.00	7	4	1	0
28-May-18	Fin Whale	N33 00.99	W118 43.63	3	3	0	0
28-May-18	Delphinus species	N33 05.46	W118 35.67	35			
28-May-18	Fin Whale	N33 01.74	W118 43.43	1			
28-May-18	Delphinus species	N32 58.09	W118 57.94	90			
28-May-18	Bottlenose Dolphin	N33 03.12	W118 41.65	25	16	0	0
28-May-18	Risso's Dolphin	N32 58.79	W118 55.97	10	7	2	0
28-May-18	Pacific White-sided Dolphin	N33 00.54	W118 47.74	2			
29-May-18	Pacific White-sided Dolphin	N32 49.99	W119 00.03	5			
29-May-18	Pacific White-sided Dolphin	N33 02.22	W118 58.95	2			
29-May-18	Delphinus species	N32 50.23	W118 58.61	8			
29-May-18	Blue Whale	N33 04.32	W119 00.44	1	1	0	0
29-May-18	Pacific White-sided Dolphin	N32 50.17	W118 58.79	3			
29-May-18	Short-beaked Common Dolphin	N32 53.36	W118 57.93	20			
29-May-18	Fin Whale	N32 53.36	W118 57.92	1	1		
29-May-18	Minke Whale	N32 53.56	W118 57.75	1	1	0	0
29-May-18	Delphinus species	N33 02.87	W118 58.26	125			
29-May-18	Pacific White-sided Dolphin	N32 53.26	W118 58.02	4			
30-May-18	Fin Whale	N32 50.25	W118 45.38	1	1		
30-May-18	Fin Whale	N32 48.45	W118 59.67	1	1	0	0
30-May-18	Fin Whale	N32 47.58	W119 04.31	1	1	1	0
30-May-18	Fin Whale	N32 45.42	W118 59.67	2	1		
30-May-18	Northern Right Whale Dolphin	N32 47.01	W118 52.09	35	0	1	0
30-May-18	Delphinus species	N32 50.11	W118 44.87	90			
30-May-18	Risso's Dolphin	N32 50.25	W118 45.38	5			

30-May-18	Fin Whale	N33 02.12	W118 41.48	1	1		
30-May-18	Short-beaked Common Dolphin	N32 52.61	W118 57.13	60	2	3	0
30-May-18	Pacific White-sided Dolphin	N32 52.51	W118 57.16	25			
30-May-18	Fin Whale	N32 52.50	W118 57.17	1			
30-May-18	Fin Whale	N32 48.17	W119 00.89	1	0	0	0
30-May-18	Pacific White-sided Dolphin	N32 58.27	W118 42.36	4			
30-May-18	Delphinus species	N33 03.81	W118 39.86	70			
30-May-18	Delphinus species	N32 47.89	W118 48.96	35			
01-Jun-18	Pacific White-sided Dolphin	N33 02.61	W118 35.19	4			
01-Jun-18	Delphinus species	N33 20.02	W118 41.40	15			
01-Jun-18	Delphinus species	N33 25.18	W118 53.60	45			
01-Jun-18	Bottlenose Dolphin	N33 24.13	W118 52.22	18	16	0	0
01-Jun-18	Blue Whale	N33 19.96	W118 50.06	1	1	0	0
01-Jun-18	Fin Whale	N33 17.18	W118 45.51	2	2	2	0
01-Jun-18	Bottlenose Dolphin	N33 11.21	W118 39.89	12	9	0	0
02-Jun-18	Delphinus species	N32 55.88	W118 56.83	9			
02-Jun-18	Delphinus species	N32 52.66	W118 53.26	65			
03-Jun-18	Fin Whale	N32 54.75	W118 48.63	2	2	0	0
03-Jun-18	Fin Whale	N32 54.55	W118 47.57	1	1	1	0
18-Jul-18	Delphinus species	N33 21.18	W117 53.08	45			
18-Jul-18	Minke Whale	N33 07.36	W118 16.87	1	1	1	0
19-Jul-18	Short-beaked Common Dolphin	N32 51.17	W119 01.75	3			
19-Jul-18	Baird's Beaked Whale	N32 48.32	W119 01.65	18	12	0	1
19-Jul-18	Cuvier's Beaked Whale	N32 47.81	W119 02.24	3	3	0	0
19-Jul-18	Short-beaked Common Dolphin	N32 48.23	W118 58.65	55			
19-Jul-18	Bottlenose Dolphin	N33 02.88	W118 35.31	35			
19-Jul-18	Risso's Dolphin	N33 01.65	W118 33.32	20	12	0	1
20-Jul-18	Cuvier's Beaked Whale	N32 48.96	W119 05.63	1	1	0	0
20-Jul-18	Delphinus species	N32 50.99	W119 02.19	70			
20-Jul-18	Cuvier's Beaked Whale	N32 52.32	W119 05.69	1	1	0	0
20-Jul-18	Cuvier's Beaked Whale	N32 47.47	W119 03.91	1	1	0	0
20-Jul-18	Cuvier's Beaked Whale	N32 56.57	W118 51.28	2	2	0	0
20-Jul-18	Fin Whale	N32 55.07	W118 56.07	1	1	0	0
20-Jul-18	UnID Large Cetacean	N32 56.59	W118 51.25	1			
20-Jul-18	Cuvier's Beaked Whale	N32 59.28	W118 47.08	2	2	0	0
21-Jul-18	Risso's Dolphin	N32 49.48	W118 57.84	22	16		
21-Jul-18	Bottlenose Dolphin	N32 49.49	W118 57.83	42			
23-Jul-18	Delphinus species	N33 24.22	W117 47.47	40			
23-Jul-18	Delphinus species	N33 23.62	W117 48.61	40			
12-Nov-18	Delphinus species	N33 15.13	W118 02.53	500			
14-Nov-18	Humpback Whale	N32 58.07	W118 42.68	1			
14-Nov-18	Delphinus species	N32 44.65	W118 52.13	500			
14-Nov-18	Delphinus species	N32 43.71	W118 52.84	75			
14-Nov-18	Humpback Whale	N33 05.82	W118 42.30	3			
14-Nov-18	Fin Whale	N33 05.96	W118 42.59	1	1	0	0

14-Nov-18	Humpback Whale	N32 59.17	W118 27.83	3			
14-Nov-18	Delphinus species	N33 00.39	W118 39.65	50			
15-Nov-18	UnID Medium Cetacean	N33 09.40	W118 51.92	1			
15-Nov-18	Humpback Whale	N33 08.27	W118 42.98	3			
15-Nov-18	Humpback Whale	N33 08.04	W118 38.74	2			
15-Nov-18	Cuvier's Beaked Whale	N32 53.06	W119 05.21	3	3	0	0
15-Nov-18	Short-beaked Common Dolphin	N32 57.09	W118 57.72	1000			
15-Nov-18	Humpback Whale	N32 52.09	W119 11.79	1			
15-Nov-18	Delphinus species	N33 04.66	W118 32.18	300			
16-Nov-18	Cuvier's Beaked Whale	N32 48.94	W119 08.89	2			
16-Nov-18	Short-beaked Common Dolphin	N32 47.80	W119 01.40	22			
16-Nov-18	Risso's Dolphin	N32 57.39	W118 43.35	18			
16-Nov-18	Short-beaked Common Dolphin	N32 52.00	W118 54.90	75			
16-Nov-18	Delphinus species	N33 00.55	W118 41.42	150			
16-Nov-18	Fin Whale	N32 56.11	W118 54.40	2	1	1	0
16-Nov-18	Humpback Whale	N32 51.18	W118 59.04	2			
17-Nov-18	Fin Whale	N32 48.41	W119 03.30	1	1		
17-Nov-18	Delphinus species	N33 00.51	W118 40.29	30			
17-Nov-18	Cuvier's Beaked Whale	N32 48.63	W119 00.83	1	1	0	0
17-Nov-18	Delphinus species	N32 58.81	W118 44.78	40			
17-Nov-18	Delphinus species	N32 56.55	W118 48.54	1100			
17-Nov-18	Cuvier's Beaked Whale	N32 47.47	W119 04.43	5	5	0	0
17-Nov-18	Humpback Whale	N32 49.82	W119 00.34	3			
17-Nov-18	Fin Whale	N32 49.83	W119 00.41	2	2		
17-Nov-18	Humpback Whale	N32 55.22	W118 50.79	2			
18-Nov-18	Cuvier's Beaked Whale	N32 46.43	W118 51.28	1	1	0	0
18-Nov-18	Cuvier's Beaked Whale	N32 51.43	W119 03.32	3	3	0	0
18-Nov-18	Blue Whale	N32 50.86	W118 57.98	1	1	0	0
18-Nov-18	Cuvier's Beaked Whale	N32 43.85	W118 51.50	2	2	0	0
18-Nov-18	Delphinus species	N32 56.86	W118 50.61	2000			
18-Nov-18	Fin Whale	N32 52.38	W118 59.66	1	1	0	0
19-Nov-18	Humpback Whale	N32 41.36	W118 52.22	1			
19-Nov-18	Humpback Whale	N32 40.96	W118 50.55	1			
19-Nov-18	Cuvier's Beaked Whale	N32 41.80	W118 52.12	3	3	1	0
19-Nov-18	Short-beaked Common Dolphin	N32 52.93	W118 46.07	125			
19-Nov-18	Cuvier's Beaked Whale	N32 45.54	W118 47.79	2	2	0	0
20-Nov-18	Risso's Dolphin	N33 01.35	W118 33.55	4			
20-Nov-18	Risso's Dolphin	N32 57.48	W119 02.64	27	10	0	1
20-Nov-18	Cuvier's Beaked Whale	N33 00.03	W118 58.54	2	2	0	0
20-Nov-18	Delphinus species	N32 51.54	W118 56.73	45			
20-Nov-18	Humpback Whale	N32 53.06	W118 52.31	1			
20-Nov-18	Delphinus species	N33 00.81	W118 39.79	5			
21-Nov-18	Delphinus species	N33 18.96	W117 57.50	10			