Cetacean Monitoring in the Mariana Islands Range Complex, 2017

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The data from these surveys is used to assess the distribution, stock structure, and movements of cetaceans within the study area. This report includes a summary of the most recent visual surveys that were conducted in the “winter” (February) and “summer” (May) of 2017.

Small-boat visual surveys were conducted off Saipan during 11–22 February 2017. A total of 499 km of trackline was surveyed during 6 days. Beaufort sea states ranged from 4–5 (70%, 348 km); dominant swell heights were 4–8 ft (86%, 427 km). Survey efforts focused on shallow waters (< 300 m). There were 26 encounters with four cetacean species including humpback whales (n=13), short-finned pilot whales (Globicephala macrorhynchus; n=1), bottlenose dolphins (Tursiops truncatus; n=3), and spinner dolphins (Stenella longirostris; n=9). Three of the 13 humpback whale encounters were competitive groups. There were two mother-calf pairs, one of which one was accompanied by an escort. Fluke...
images were collected from 19 individuals. Biopsy samples were collected from 12 individuals, including the two moms. The humpback whale encounters were on Marpi Reef, CK Reef, or off the northwest side of Saipan. Most of the encounters were over water depths <100 m. A group of 35 short-finned pilot whales was encountered on Marpi Reef during a humpback whale encounter. The encounter location was 16 km from shore and in 62-m deep water. More than 1,500 photos and one biopsy sample were collected, and a single location-only (SPOT5) satellite tag was deployed during the encounter. Bottlenose dolphins were sighted off Saipan, one of which was on Marpi Reef and was a part of a mixed-species encounter with humpbacks and pilot whales. Bottlenose dolphins were in groups of 2–8 individuals. The median depth of the encounter locations was 306 m; median distance from shore was 5.4 km. Spinner dolphins were encountered off the west side of Saipan and on Marpi Reef. All spinner dolphin encounters were over water depths <100 m, and group sizes ranged between 25–110 individuals. Only one green sea turtle (Chelonia mydas) was observed.

Small-boat visual surveys were conducted in the waters surrounding Saipan, Tinian, and Guam on 19 days during 6–25 May 2017. A total of 1,548 km of trackline was surveyed and most was in Beaufort sea states of 3–5 (95%, 1,467 km) and swell heights of 0–4 ft (91%, 1,412 km). Twelve cetacean groups were encountered during the summer small-boat survey, resulting in the collection of approximately 6,000 photos, 16 biopsy samples, and the deployment of 4 satellite tags. Cetacean encounters included bottlenose dolphin (n=2), spinner dolphin (n=7), and melon-headed whale (Peponocephala electra; n=1), Bryde’s whale (Balaenoptera edeni; n=1), and a single unidentified beaked whale. Spinner dolphins were the most frequently encountered species. All encounters were in depths <100 m and were within 1 km of the shore. Group size was 29–60 individuals. More than 3,100 photos were collected for photo-ID. A large group of approximately 400 melon-headed whales was encountered off Guam. The bottom depth of the encounter location was 903 m, and the distance from shore was 2.6 km. Approximately 5,000 photos were collected for photo-id, and 12 biopsy samples were collected for genetic analysis. Two location-only (SPOT5) satellite tags were deployed to investigate individual movements and spatial use. Bottlenose dolphins were encountered twice off Saipan during the small-boat surveys. The depths of the encounter locations were 30 m and 459 m, and the distances from shore were 5.7 km and 9.9 km. Group sizes were 5–6 individuals. More than 400 photos were collected for photo-ID, and 4 biopsy samples were collected for genetic analysis. Two satellite tags (1 SPOT5, 1 SPLASH10) were deployed. A single Bryde’s whale was encountered 16.7 km off the west side of Saipan in 1,183-m deep water. More than 200 photos were collected. An unidentified beaked whale was encountered off Guam. No photos were collected during the encounter and as a result, species could not be determined. The bottom depth of the encounter location was 1,815 m, and the distance from shore was 6.5 km. A total of 35 sea turtles were observed; 16 were identified as green sea turtles. The rest were not identified to species.

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Mission

The Pacific Islands Fisheries Science Center’s (PIFSC) Cetacean Research Program (CRP) has been conducting visual surveys of cetaceans in the waters surrounding Guam and the Commonwealth of the Northern Mariana Islands (CNMI) as part of an ongoing effort to develop a record of cetacean occurrence in the region. Visual surveys have been conducted aboard small boats (7.6–12.2 m) since 2010 off the southernmost islands of the Mariana Archipelago (Guam, Rota, Saipan, Tinian, and Aguijan). These surveys include the collection of photographs for individual identification, tissue samples for genetic analysis of population structure, and the deployment of satellite tags for assessment of individual movements throughout the broader region. These surveys are conducted in partnership with the Commander, U.S. Pacific Fleet Environmental Readiness Division. Data sets from the small-boat survey efforts are used to evaluate the distribution, stock structure, and movements of cetaceans within the study area. This report includes a summary of the most recent visual surveys that were conducted in the “winter” (February) and “summer” (May) of 2017.

Methods

Field Methods

Winter Visual Surveys

Non-systematic visual surveys, with a primary focus on humpback whales (*Megaptera novaeangliae*), were conducted aboard a 12.2-m sport-fisher (*Sea Hunter*) with a flying bridge and twin-diesel inboard engines during February 2017. Survey efforts focused on shallow waters (<200 m) offshore of Saipan, particularly Chalan Kanoa (CK) and Marpi Reefs, where humpback whales were expected based on known breeding and calving habitat in other locations (Herman and Antinoja, 1977; Frankel et al., 1995), as well as our previous humpback whale surveys off Saipan (Hill et al., 2016a, b, 2017). The survey vessel traveled at a speed of 15–19 km/h, depending on sea conditions. Four observers scanned for marine mammals with unaided eye, collectively searching 360 degrees around the vessel. Each cetacean group sighted was approached for species confirmation, group-size estimates, and photo-identification. Biopsy sampling was planned for humpback whales and all other non-stenellid species. Opportunistic satellite tagging was planned for all species excluding stenellid dolphins. Photo-identification, biopsy sampling, and satellite tagging protocols were the same as those described by Hill et al. (2014, 2015). During small-boat surveys, the occurrences, locations, and size of turtles were recorded, but photos and biological samples were not collected.

Summer Visual Surveys

During May 2017, non-systematic visual surveys for cetaceans were conducted from small vessels off Saipan, Tinian, and Guam. Surveys off Saipan and Tinian were conducted using
Sea Hunter and a 7.9-m Regulator (Regulator) with twin 4-stroke outboard engines, while those off Guam were conducted aboard an 8.3 m-Phoenix Marina (Ten27) with flying bridge and twin diesel inboard engines. Visual survey effort and vessel tracks were spread out from day to day to ensure broad survey coverage over a wide range of depths. Weather and sea conditions also dictated the direction and scope of the survey effort. The survey vessels traveled at a speed of 15–26 km/h, depending on the size of the vessel and sea conditions. Four to six observers scanned for marine mammals with unaided eye, collectively searching 360 degrees around the vessel.

All cetacean groups sighted were approached for species confirmation, group size estimates, and photo-identification. Biopsy sampling and satellite tagging operations were planned during encounters with all cetacean species except stenellid dolphins. Photo-identification, biopsy, and satellite tagging protocols were the same as those described by Hill et al. (2014, 2015). Occurrences, locations, and sizes of turtles were recorded, but photos and biological samples were not collected.

**Data Processing and Analyses**

**Visual Surveys and Encounters**

Visual survey and encounter data were analyzed for effort and encounter location depths and encounter location distance from shore using the same methods and bathymetry data as those described in Hill et al. (2014, 2016b).

**Satellite Telemetry**

The same methods as those described in Hill et al. (2014, 2015) were used to process and analyze the satellite tag location data related to depth and distance from shore. The data included in these analyses were derived from satellite tags deployed during the 2017 small-boat effort.

**Photo-Identification**

Photo processing and analysis was continued to add to existing individual photo-identification catalogs, and protocols were identical to those described in Hill et al. (2014).

**Results**

**Visual Surveys and Encounters**

**Winter**

Small-boat visual surveys were conducted off Saipan during 11–22 February 2017. A total of 499 km of trackline was surveyed over six days (Table 1, Fig. 1). Beaufort sea states along much of the on-effort trackline ranged from 4–5 (70%, 348 km) and dominant swell heights were 4–8 ft (86%, 427 km) (Fig. 2). Most of the on-effort time (81%, 33 h) was spent over water depths 0–300 m (Fig. 3).
During the small-boat visual surveys, there were 26 encounters with four cetacean species including humpback whales, short-finned pilot whales (*Globicephala macrorhynchus*), bottlenose dolphins (*Tursiops truncatus*), and spinner dolphins (*Stenella longirostris*) (Table 2, Fig. 1).

There were 13 humpback whale encounters, three of which were with competitive groups. There were two mother-calf pairs, one of which one was accompanied by an escort. Fluke images were collected from 19 individuals. Biopsy samples (n=14) were collected from 12 individuals, including the two moms. The humpback whale encounters were on Marpi Reef, CK Reef, or off the northwest side of Saipan between the two reefs (Fig. 1). Most of the encounters were over water depths <100 m, but three were in depths >200 m (Table 2, Fig. 3).

A group of 35 short-finned pilot whales was encountered on Marpi Reef during a humpback whale encounter (Table 2, Fig. 1). The encounter location was 16 km from shore and in 62 m deep water. More than 1,500 photos and one biopsy sample were collected, and a single satellite tag was deployed during the encounter (Table 3, Fig. 4).

There were three bottlenose dolphin encounters off Saipan, one of which was on Marpi Reef and was a part of a mixed species encounter with humpbacks and pilot whales. The best group size estimates for bottlenose dolphin groups were 2–8 individuals (Table 2). The median depth of the encounter locations was 306 m, and the median distance from shore was 5.4 km.

Spinner dolphins were encountered off the west side of Saipan and on Marpi Reef. All spinner dolphin encounters (n=9) were over water depths <100 m, and group sizes ranged between 25–110 individuals (Table 2).

Only one green sea turtle (*Chelonia mydas*) was observed during the February small-boat cetacean surveys (Table 4). Sea turtle sighting data were provided to the PIFSC Marine Turtle Biology and Assessment Program (MTBAP).

Summer

Small-boat visual surveys were conducted in the waters surrounding Saipan, Tinian, and Guam on 19 days during 6–25 May 2017 (Table 1, Fig. 5). A total of 1,548 km of trackline was surveyed and most was in Beaufort sea states of 3–5 (95%, 1,467 km) and swell heights of 0–4 ft (91%, 1,412 km) (Table 1, Fig. 6). Approximately 22% (20.1 h) of the total effort time was spent inside of the 100-m depth contour (Fig. 7). Similar survey effort was made across depth bins of 101–500 m (21.9 h). A third of the total effort (27.6 h) was spent over water depths 501–900 m. Effort was lowest and reduced gradually over depths of 1,300–2,400 m (Fig. 7).

Twelve cetacean groups were encountered during the summer small-boat survey, resulting in the collection of approximately 6,000 photos, 16 biopsy samples, and the
deployment of 4 satellite tags (Table 5). All but one of the cetacean groups were identified to species. The confirmed species include bottlenose dolphin, spinner dolphin, melon-headed whale (*Peponocephala electra*), and Bryde’s whale (*Balaenoptera edeni*). The other group was an unidentified beaked whale.

Spinner dolphins were the most frequently encountered species (*n* = 7) (Tables 5–6; Fig. 5a–b). All encounters were in depths <100 m and were within 1 km of shore (Table 6). Group sizes ranged 29–60 individuals. More than 3,100 photos were collected for photo-id.

A large group of approximately 400 melon-headed whales was encountered off Guam (Table 5, Fig. 5a). The depth of the encounter location was 903 m, and the distance from shore was 2.6 km (Tables 5–6). Approximately 5,000 photos were collected for photo-id, and 12 biopsy samples were collected for genetic analysis. Two satellite tags were deployed to investigate individual movements and spatial use (Table 3, Fig. 8).

Bottlenose dolphins were encountered twice off Saipan during the small-boat surveys (Table 5, Fig. 5b). The depths of the encounter locations were 30 m and 459 m, and the distances from shore were 5.7 km and 9.9 km (Table 6). Group sizes were 5–6 individuals. More than 400 photos were collected for photo-id, and four biopsy samples were collected for genetic analysis. Two satellite tags were deployed to investigate individual movements and spatial use (Table 3, Fig. 9).

A single Bryde’s whale was encountered 16.7 km off the west side of Saipan in 1,183 m deep water (Table 5, Fig. 5b). More than 200 photos were collected.

An unidentified beaked whale was encountered off Guam (Table 5, Fig. 5a). No photos were collected during the encounter and, as a result, species could not be determined. The depth of the encounter location was 1,815 m, and the distance from shore was 6.5 km.

A total of 35 sea turtles were observed during the 2017 summer (May) small-boat surveys; 16 were identified as green sea turtles (Table 4). The rest were not identified to species. Sea turtle sighting data were provided to the PIFSC MTBAP.

**Satellite Telemetry**

During 2017, satellite tags were deployed on one short-finned pilot whale, two bottlenose dolphins, and two melon-headed whales (Table 3, Figs. 4, 8–9). A location-only (SPOT5) satellite tag was deployed on an adult short-finned pilot whale off Saipan (at Marpi Reef) on 11 February. The tag transmitted for 27.4 d during which the whale traveled north as far as Pagan before heading southeast to the Mariana Trench (Fig. 4). The whale zig-zagged south along the Trench until the tag stopped transmitting on 9 March. The median depth of the satellite tag locations was 4,369 m, and the median distance to shore was 151 km.
Two location-only (SPOT5) satellite tags were deployed on melon-headed whales off Guam in May 2017. One of the tags transmitted only a single location. The second tag transmitted for 1.8 d during which the whale moved off the southwest side of Guam (Fig. 8). A total of 17 locations from both tags remained after the Douglas Argos filtering (DAF) process. The median depth of the DAF locations was 1,379 m, and the median distance from shore was 22.7 km (Table 3).

Two satellite tags (1 SPOT5, 1 SPLASH10) were deployed on bottlenose dolphins during 2 encounters off Saipan during the May small-boat surveys (Table 3). Tag durations were 7.9 d and 13.2 d. A total of 276 DAF locations were obtained. Although the dolphins were not tagged during the same encounter, they appeared to travel together for several days. They spent six days moving off the west sides of Saipan and Tinian and north to Marpi Reef before traveling north-northwest to East Diamante, a submarine volcano, where one of the individuals spent another six days (Fig. 9). The second tag stopped transmitting on 1 June; the first day at East Diamante. The median depth for the DAF locations was 574 m, and the median distance from shore was 14.8 km. The maximum dive depth recorded on the SPLASH10 tag was 347 m with the maximum dive duration of 12 min.

**Photo-Identification**


During the 2017 winter (February) small-boat surveys, photos were collected during 13 encounters with humpback whales, including fluke images from 19 individuals. The photo-id catalog now contains 35 non-calf individuals for which there are fluke images from 24 individuals. In 2017, three individuals were re-sighted from previous years. One individual was first seen in 2007. The second individual was first seen in 2015, and the third individual was first seen in 2016 with a calf.

Photos of short-finned pilot whales encountered at Marpi Reef in February 2017 have gone through preliminary processing and some initial matching. A few individuals have been matched to those from a group that had only been seen once before in 2012 off Aguijan (Hill et al., in review).

Photos from the summer effort are awaiting processing and matching. Processing and analysis of melon-headed whale, bottlenose dolphin, and spinner dolphin photos from previous years are in still in progress.
Discussion

The 2017 winter and summer small-boat surveys off Saipan, Tinian, and Guam represent a continuation of the collaborative effort between the PIFSC’s CRP and the U.S. Navy towards a better understanding of the occurrence and distribution of cetaceans in waters off the southernmost islands of the Mariana Archipelago.

The NMFS (PIFSC) is responsible for the assessment of marine mammal stocks in the Exclusive Economic Zone (EEZ) waters of Guam and the CNMI. The U.S. Navy is mandated by Letters of Authorization and Biological Opinions issued under the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) to monitor cetacean presence within the Mariana Islands Training and Testing study area. We discuss the preliminary results from the 2017 cetacean surveys in an effort toward answering questions presented within the U.S. Navy’s monitoring plan below.

During the May 2017 visual surveys, the overall encounter rate (0.78 encounters/100 km effort; Table 6) was lower than all previous surveys that were not humpback whale focused. The overall encounter rate for 2010-2016 was 1.40 encounters/100 km effort (excluding within day re-sights). The sea state conditions may have contributed to the lower encounter occurrence during the May 2017 surveys. Most of the survey effort (81%) was in Beaufort sea states 4–5, which was higher than any previous (non-humpback whale focused) survey.

1. **What species of beaked whales and other odontocetes occur around Guam and Saipan?**

   In May 2017, there was a single unidentified beaked whale encounter off Guam. The encounter location’s (Fig. 5a) distance from shore (6.5 km) and depth (1,815 m) were similar to beaked whale encounters in previous years (Hill et al. 2014, 2015, 2017). Blainville’s and Cuvier’s beaked whales are the only two visually confirmed species we have encountered during small-boat surveys. A third unidentified beaked whale species is known to occur within the region based on acoustic data. We have had a number of unidentified Mesoplodon encounters.

   Habitat use (depth and distance from shore) and encounter rates reveal varying patterns for species occurring around Guam, Rota, Saipan, Tinian, and Aguijan. Patterns of habitat use by some odontocetes (e.g., spinner dolphins, bottlenose dolphins) evident from the 2017 visual surveys were similar to those described in previous years by Hill et al. (2014, 2015, 2016b, 2017), while new information emerged for other species (e.g., short-finned pilot whales).
Spinner dolphins were once again the most frequently encountered species during the May 2017 visual surveys (n=7; 0.45 encounters/100 km effort) and were found in similar locations as previous years (Hill et al. 2014, 2015, 2016b, 2017; Table 6, Fig. 5a–b). They were also encountered 9 times during the February 2017 surveys in locations 80–200 m from previous encounter locations (May–September in 2011–2016), which suggests they may use these areas year-round. All 2017 encounter locations were in water depths <100 m, and those that were not on Marpi Reef were within 1 km from shore (Tables 2, 5–6).

Bottlenose dolphins were encountered a total of 5 times during the February and May 2017 small-boat surveys. Encounter locations had similar depths (30–615 m) and were at similar distances from shore (4.7–15.9 km) (Tables 2, 5–6, Figs. 1, 5a–b) as those in previous years (Hill et al. 2014, 2015, 2016b, 2017). All of the 2017 bottlenose dolphin encounters were off Saipan, including one offshore encounter at Marpi Reef during which the dolphins were interacting with humpback whales and short-finned pilot whales.

Short-finned pilot whales were encountered on Marpi Reef during the February humpback whale surveys. The distance from shore (16.1 km) of the encounter location was similar to those of previous encounters, but the depth (62 m) was much shallower (Hill et al. 2014, 2015, 2017). The preliminary photo-id data from the February 2017 group indicate that these individuals have not been seen repeatedly in previous years but were seen on only one other occasion in 2012. The satellite tag location data from the February 2017 satellite-tagged individual (141699) varied from previously tagged short-finned pilot whales. The median distance from shore of the tag locations from previously tagged individuals was 13.2 km (Hill et al., in review), but that of tag 141699 was 151 km (Table 3). In addition, none of the previously tagged individuals went further north than Anatahan. Tag 141699 transmitted locations from Pagan approximately 200 km north of Anatahan (Fig. 4). The median depth of tag locations from previously tagged short-finned pilot whales was 952 m, while that of tag 141699 was 4,369 m (Table 3). The photo-id and satellite tag data suggest that the population of short-finned pilot whales in the Marianas may include groups of individuals that are associated within the southern portion of the archipelago, as well as those that are intermittent visitors to the nearshore waters of Guam, Rota, Saipan, and Tinian.

3. **What is the seasonal occurrence of baleen whales around Guam, Saipan, Tinian, and Rota?**

This was the third year that the observer team has encountered baleen whales during our small-boat surveys in the Marianas. The team specifically conducted surveys during February 2017 to coincide with the known seasonal occurrence of humpback whales off Saipan and Tinian based on the 2015 and 2016 small-boat surveys, an encounter during a 2007 shipboard survey (Fulling et al. 2011), acoustic records (Oleson et al. 2015, Hill et al. 2016a,
Fulling et al. 2011), and anecdotal reports. The encounter rate with humpback whales during the 2017 small boat surveys was similar to those of 2015 and 2016, but more adult whales were present; resulting in the contribution of an additional 18 individuals to the photo-identification catalog, which now has 35 non-calf individuals.

A Bryde’s whale was encountered in May 2017. All previous sightings of Bryde’s whales during PIFSC small-boat surveys were also during summer months. Bryde’s whale was the only other baleen whale species observed across all years of the PIFSC small-boat effort.

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References


Table 1: Effort summaries for 2017 Marianas winter (February) and summer (May) small-boat surveys for cetaceans.

<table>
<thead>
<tr>
<th>Local Date (2017)</th>
<th>Location</th>
<th>Vessel</th>
<th>Survey Description</th>
<th>On Effort Time</th>
<th>On Effort Distance (km)</th>
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<td>11-Feb</td>
<td>CNMI-Saipan/Marpi Reef</td>
<td>Sea Hunter</td>
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<td>CNMI-Saipan</td>
<td>Sea Hunter</td>
<td>Saipan west loop to CK Reef south then north to Saipan northern tip and back</td>
<td>7:30</td>
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<td>Sea Hunter</td>
<td>Saipan west side loop.</td>
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<td>35.4</td>
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<td>Saipan west loop north then to CK Reef</td>
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<td>Regulator</td>
<td>Saipan-Tinian west loop</td>
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<td>Regulator</td>
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Winter: 41:14 499.2
Summer: 93:16 1547.6
Table 2: Details of the cetacean encounters during the 2017 Marianas winter (February) small-boat surveys off Saipan. YOY - young of the year.

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<th>Common Name</th>
<th>Local Time (UTC +10)</th>
<th>Location</th>
<th>Latitude (N)</th>
<th>Longitude (E)</th>
<th>Depth (m)</th>
<th>Shore Distance (km)</th>
<th>Beaufort</th>
<th>Swell Height (ft)</th>
<th>Total Best</th>
<th>YOY Best</th>
<th>Neonate Best</th>
<th>Behavior</th>
<th># Photos</th>
<th># Biopsy Samples</th>
<th># Tags</th>
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<td>Swell Height (ft)</td>
<td>Total Best</td>
<td>YOY Best</td>
<td>Neonate Best</td>
<td>Behavior</td>
<td># Photos</td>
<td># Biopsy Samples</td>
<td># Tags</td>
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Table 3: Summary of satellite tags deployed on cetaceans during small-boat surveys in February 2017 (off Saipan) and in May 2017 (off Saipan, Tinian, and Guam). The satellite tag deployment information and summary of depth and distance to shore for the Douglas ARGOS filtered (DAF) tag locations are listed by species and tag ID.

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<th>Longitude (E)</th>
<th>Duration (d)</th>
<th>No. DAF Locations</th>
<th>Median Depth (m) (min-max)</th>
<th>Median Shore Distance (km) (min-max)</th>
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<td>Melon-headed whales</td>
<td>SPOTS</td>
<td>Guam</td>
<td>5/12/2017 10:42</td>
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<td>569 (61-3715)</td>
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Table 4: Sea turtle sightings during the 2017 Marianas winter (February) small-boat cetacean surveys off Saipan and summer (May) small-boat cetacean surveys off Saipan, Tinian, and Guam.

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<th>Local Time (GMT +10)</th>
<th>Location</th>
<th>Latitude (N)</th>
<th>Longitude (E)</th>
<th>Description</th>
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</tr>
<tr>
<td>6-May</td>
<td>11:10</td>
<td>Guam</td>
<td>13.39646</td>
<td>144.6535</td>
<td>Green Turtle-med (1.5-2.5 ft)</td>
</tr>
<tr>
<td>6-May</td>
<td>13:01</td>
<td>Guam</td>
<td>13.4816</td>
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<td>Green Turtle-med (1.5-2.5 ft)</td>
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<td>Guam</td>
<td>13.5125</td>
<td>144.79093</td>
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<td>Turtle-large (&gt;2.5 ft)</td>
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<td>Guam</td>
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<td>144.64265</td>
<td>Green Turtle-large (&gt;2.5 ft)</td>
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<td>Guam</td>
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<td>144.65795</td>
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</tr>
<tr>
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<td>Guam</td>
<td>13.41032</td>
<td>144.65017</td>
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<tr>
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<td>11:04</td>
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<td>144.64651</td>
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</tr>
<tr>
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<td>145.6968</td>
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<tr>
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<tr>
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<td>145.68623</td>
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<tr>
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<tr>
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Table 5: Details of the cetacean encounters during the 2017 Marianas summer (May) small-boat surveys off Saipan, Tinian, and Guam.

<table>
<thead>
<tr>
<th>Local Date</th>
<th>Sighting</th>
<th>Common Name</th>
<th>Local Time (UTC +10)</th>
<th>Location</th>
<th>Latitude (N)</th>
<th>Longitude (E)</th>
<th>Depth (m)</th>
<th>Shore Distance (km)</th>
<th>Beaufort</th>
<th>Swell Height (ft)</th>
<th>Total Best</th>
<th>YOY Best</th>
<th>Neonate Best</th>
<th>Behavior</th>
<th># Photos</th>
<th># Biopsy Samples</th>
<th># Tags</th>
</tr>
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<tbody>
<tr>
<td>6-May 1</td>
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<td>boat approach/bow ride rest/log</td>
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<td>4</td>
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<td>Bryde's whale</td>
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<td>145.5395</td>
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<td>16.7</td>
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<td>mill boat approach/bow ride</td>
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<tr>
<td>Local Date</td>
<td>Sighting</td>
<td>Common Name</td>
<td>Local Time</td>
<td>Location</td>
<td>Latitude (N)</td>
<td>Longitude (E)</td>
<td>Depth (m)</td>
<td>Shore Distance (km)</td>
<td>Beaufort</td>
<td>Swell Height (ft)</td>
<td>Total Best</td>
<td>YOY Best</td>
<td>Neonate Best</td>
<td>Behavior</td>
<td># Photos</td>
<td># Biopsy Samples</td>
<td># Tags</td>
</tr>
<tr>
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<td>3</td>
<td>1</td>
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</tbody>
</table>
Table 6: Species encounter summary including encounter rate (No. encounters/100 km effort), depth (m) and distance from shore (km) for 2017 Marianas summer (May) small-boat cetacean surveys (1,548 km survey distance) off Saipan, Tinian, and Guam. Includes total encounters and overall encounter rates across all survey years (2010–2017) for species encountered during summer 2017 surveys off Saipan, Tinian and Guam (20,583 km total survey distance).

<table>
<thead>
<tr>
<th>Species</th>
<th>No. Species Encounters (Total 2010–2017*)</th>
<th>Encounters/ 100km Effort (Overall 2010–2017*)</th>
<th>Best Group Size Estimate (min-max)</th>
<th>Median Depth (m) (min-max)</th>
<th>Median Shore Distance (km) (min-max)</th>
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<tbody>
<tr>
<td>Spinner dolphin</td>
<td>7 (129)</td>
<td>0.45 (0.63)</td>
<td>29-60</td>
<td>15 (10-61)</td>
<td>0.4 (0.2-0.6)</td>
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<tr>
<td>Bottlenose dolphin</td>
<td>2 (29)</td>
<td>0.13 (0.14)</td>
<td>5-6</td>
<td>244 (30-459)</td>
<td>7.8 (5.7-9.9)</td>
</tr>
<tr>
<td>Bryde's whale</td>
<td>1 (4)</td>
<td>0.06 (0.02)</td>
<td>1</td>
<td>1183</td>
<td>16.7</td>
</tr>
<tr>
<td>Melon-headed whale</td>
<td>1 (3)</td>
<td>0.06 (0.01)</td>
<td>380</td>
<td>903</td>
<td>2.6</td>
</tr>
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<td>Unid. beaked whale</td>
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<td>0.06 (0.01)</td>
<td>1</td>
<td>1815</td>
<td>6.5</td>
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<tr>
<td><strong>Total:</strong></td>
<td><strong>12 (278)</strong></td>
<td><strong>0.78 (1.35)</strong></td>
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</tr>
</tbody>
</table>

*2015-2017 winter efforts not included in calculations because the effort targeted humpback whales. Same-day resights not included.
Figures

Figure 1: Tracklines and cetacean encounter locations during the 2017 Marianas winter (February) small-boat surveys off Saipan.
Figure 2: Effort by (A) Beaufort sea state and (B) swell height (ft) during the 2017 Marianas winter (February) small-boat cetacean surveys off Saipan.
Figure 3: Effort and encounters by depth during the 2017 Marianas winter (February) small-boat cetacean surveys off Saipan. Survey efforts were focused on shallow waters (< 200 m) where humpback whales were expected based on known breeding and calving habitat in other locations (Herman and Antinoja, 1977; Frankel et al., 1995).
Figure 4: Douglas Argos Filtered locations and track for a satellite tag (141699) deployed on short-finned pilot whale off Saipan (11 February) during small-boat cetacean surveys off Saipan. Duration of the tag was 27.4 d.
Figure 5: Tracklines and cetacean encounter locations during the 2017 Marianas summer (May) small-boat surveys off Guam (A; 701 km trackline) and Saipan and Tinian (B; 847 km trackline).
Figure 6: Effort by (A) Beaufort sea state and (B) swell height (ft) during the 2017 Marianas summer (May) small-boat cetacean surveys off Saipan, Tinian, and Guam.
Figure 7: Effort and encounters by depth during the 2017 Marianas summer (May) small-boat cetacean surveys off Saipan, Tinian, and Guam.
Figure 8: Douglas Argos Filtered locations and tracks for a satellite tag (141706) deployed on a melon-headed whale off Guam (12 May) during small-boat cetacean surveys. Duration of the tag was 1.8 d. A second satellite tag (141707) was deployed but it transmitted only one location near the encounter location and is therefore not depicted here.
Figure 9: Douglas Argos Filtered locations and tracks for satellite tags (169421 and 141698) deployed on bottlenose dolphins off Saipan (25 May) during small-boat cetacean surveys. Durations of the tags were 7.9 d and 13.2 d.