# Additional Surveys for Ashy Storm-Petrels at Alcatraz Island, California, in September 2016

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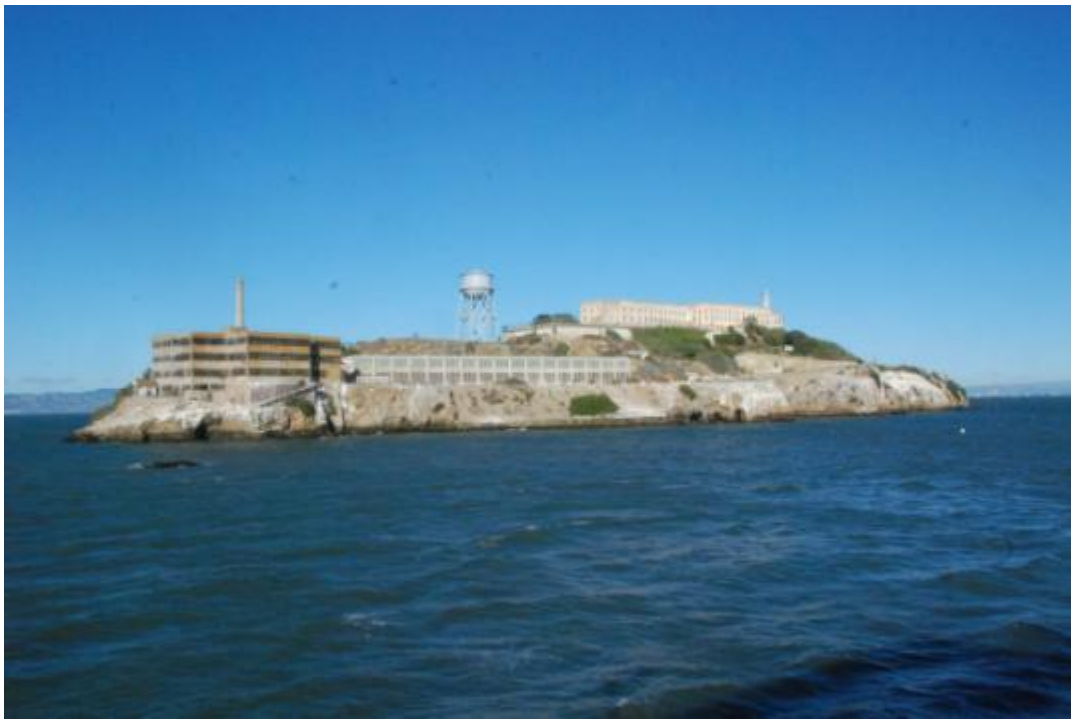

*Alcatraz Island, showing the northwestern cliffs associated with possible Ashy Storm-Petrel nesting habitats (Photo by M.W. Parker, 13 August 2015)*

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## Executive Summary

Preliminary surveys for breeding Ashy Storm-Petrels (*Oceanodroma homochroa*) at Alcatraz Island, California, were conducted by the California Institute of Environmental Studies and the National Park Service in August 2015. Two complete nights of mist-net captures were conducted near the tops of the cliffs on the southwest side in mid-August during the main breeding season; no storm-petrels were captured, heard or seen near the mist net. However, the low level of capture effort at only one accessible location was not sufficient to preclude the possibility of storm-petrels nesting at Alcatraz. In September 2016, we conducted nest searches in natural and artificial habitats and one night of mist-net capture in order to finalize the current status of the Ashy Storm-Petrel at Alcatraz.

On 7 September 2016, we documented many suitable nesting crevices for Ashy Storm-Petrels at Alcatraz, particularly among Seawall Planters along the southwestern cliffs (located adjacent to two large rubble piles) as well as within one of the major concrete rubble piles (Apartments 'B' and 'C' – on the southwest side of the Parade Ground area). However, only a few suitable nesting crevices were found on the lower cliffs when accessed by boat on 9 September. On the night of 7-8 September 2016, no storm-petrels were captured, heard or seen near the mist-net. During nest searches no storm-petrels, eggs or egg shell fragments were found in suitable nesting habitat. However, rubble piles had many very deep crevices which we could not explore due to safety concerns. In addition, no scent of storm-petrels, a frequently-used method to alert researchers to the presence of storm-petrels, detected in any of the suitable crevices found. Overall, we found no indication that storm-petrels were nesting on or visiting Alcatraz. Based on surveys in 2015 and 2016, we surmise that it is unlikely that Ashy Storm-Petrels are currently nesting at Alcatraz, despite suitable nesting crevices available at the island.

On 9 September 2016, after examining the lower cliff habitat at Alcatraz, we assessed other potential habitats for storm-petrel nesting (mainly nearshore rocks and islets) along the north side of the entrance to San Francisco Bay (Appendix 1). We identified the presence of storm-petrels on one small rock that we refer to as "Kirby Cove Rock" just west of the Golden Gate Bridge, based on scent and deep suitable crevices. Using playback vocalizations, we elicited a response from an Ashy Storm-Petrel located within a crevice that was too deep and angled to see to the end. This information strongly suggests that Ashy Storm-Petrels breed at this rock and may breed at other nearby rocks and cliffs. This is the first confirmed documentation of Ashy Storm-Petrels breeding within the Golden Gate National Recreation Area.

## Introduction

The Ashy Storm-Petrel (*Oceanodroma homochroa*) is nearly endemic to California with only small numbers also breeding in northwestern Baja California, Mexico. Many concerns have been expressed about habitat degradation, declines, poor reproduction, and high mortality at certain colonies (see summaries in Carter et al. 2008, Parker 2016). The global population is less than 20,000 individuals, with >95% at 5 breeding population centers (South Farallon Islands, San Miguel Island, Santa Barbara Island, NE Santa Cruz Island and NW Santa Cruz Island) (Ainley 1995; Carter et al. 2016). These population centers receive some level of protection from certain

threats and some have been subject to restoration actions. Much less is known about the status of small colonies outside of population centers, due to insufficient surveys and monitoring.

The breeding distribution in the "Northern California" population (defined as breeding within Mendocino, Sonoma, Marin, San Francisco, and San Mateo counties) is not well known, except at the South Farallon Islands. Ashy Storm-Petrels nest in small rock crevices and enter and depart from these crevices only at night, making small breeding colonies on nearshore rocks difficult to detect. Surveys of seabird colonies were conducted throughout this region in 1979-80 (Sowls et al. 1980) and 1989 (Carter et al. 1992) but many rocks and islands were not landed upon to search for storm-petrels breeding in rock crevices because of limited time and funding. By 1989, the only known colonies of Ashy Storm-Petrels in this region were at the South Farallon Islands (discovered in the late 19$^{th}$ century) and Bird Rock off Tomales Point (discovered in 1969) (Ainley and Osborne 1973; Carter et al. 1992, 2008, 2015a). In 2001, breeding was discovered at Stormy Stack (Whitworth et al. 2002). In 2012-2015, the status of the Bird Rock and Stormy Stack colonies was further assessed (Carter et al. 2012, Henderson et al. 2014, Becker et al. 2016). In 2012, breeding in Mendocino County was re-discovered with additional surveys at many accessible rocks, after historical egg records from 1926 had been uncovered (Carter et al. 2008, 2015a). Additional surveys in 1996-1997 in Monterey County also had resulted in the discovery of breeding Ashy Storm-Petrels on several small rocks within the Hurricane-Castle Rocks complex (McChesney et al. 2000). Clearly, more surveys are needed on rocks along the mainland coast of northern California to identify, monitor, and protect Ashy Storm-Petrel breeding colonies. Smaller nearshore colonies likely have very different habitat types and conservation issues (especially in terms of predation at the colony) compared with the larger offshore South Farallon Islands. Smaller colonies often can be more susceptible to loss from various factors than larger colonies. Loss of any colony should be avoided because colonies may not be re-established for many decades or longer, especially if a species remains at relatively low population levels.

After the discovery of a dead storm-petrel (probably Ashy) on the Parade Ground at Alcatraz Island in August 2014, the National Park Service (NPS) funded a proposal submitted by the California Institute of Environmental Studies (CIES) to conduct limited mist-net captures of Ashy Storm-Petrels at Alcatraz in August 2015. No storm-petrels were captured, heard or seen on Alcatraz as a result of this work (Carter et al 2015b). However, nest searches in several large rubble piles located on the Parade Ground, at the top of the cliffs (accessible by climbing over the Seawall Planter) and in lower cliffs close to the ocean (accessible by drop off from a small boat) were not permitted by NPS in 2015. In light of not detecting any storm-petrels during limited mist-net efforts in 2015, NPS funded CIES to conduct one additional night of mist-net captures, as well as limited nest searches of rubble piles, potential crevice habitat along the W/SW cliffs that were safely accessible without climbing equipment from nearby pathways, and a round-island investigation of potential nesting habitat on the lower portions of cliffs accessible only by boat, also safely reachable without climbing equipment.

## Methods

### Overall Field Plan & Schedule

On 16 October 2014, Carter and Seher conducted a preliminary scoping survey of potential nesting habitats for Ashy Storm-Petrels at Alcatraz that identified apparently suitable crevices in two large rubble piles beside the Parade Ground, and possible suitable crevices at the top of the cliffs in rock walls on the south side of the island, under buildings on the north side, and in lower cliffs close to the ocean on the south side. In 2015, NPS permission was not obtained for searching these habitats, due to concerns about: (1) disturbance to nesting Brandt's Cormorants (*Phalacrocorax penicillatus*), Western Gulls (*Larus occidentalis*) and other nesting birds (e.g., Black-crowned Night Herons *Nycticorax nycticorax* and Snowy Egrets *Egretta thula*); (2) working safely on cliffs; and (3) potential collapse of the rubble piles if disturbed. In 2016, permission was granted for CIES to examine some of these habitats and inspect potential nest crevices, using small hand-held flashlights (with bright halogen bulbs) to illuminate dark crevices. Areas searched had to be safely accessed without climbing equipment, after other seabirds and waterbirds had completed breeding (to prevent disturbance) but still within the Ashy Storm-Petrel breeding season. Based on timing of breeding at the South Farallon Islands (Ainley et al. 1990) and Bird Rock and Stormy Stack (Becker et al. 2016), most Ashy Storm-Petrels have chicks in early September but little or no fledging has occurred. Survey work was targeted for early September 2016. Scheduling adjustments were made to: (1) avoid the night of 6 September when night repairs to the wharf were underway; and (2) conduct on-island nest searches in late afternoon/early evening on 7 September to avoid any potential concerns by members of the public touring Alcatraz.

### Nest searches

On 7 September 2016, Parker and Carter checked the edges of the 4 rubble piles from nearby paths and the Parade Ground but we did not enter any spaces under the rubble or stand on top of rubble that might have collapsed. The top of 4 sections of the cliffs were reached by Parker, with careful climbing over small rock walls and walking slowly along the dirt along the outer bases of these walls, occasionally stepping up to crevices on secure rock walls. Some rock wall areas were found to be less secure and were not climbed upon. Carter recorded field notes from the top of the walls to allow Parker to concentrate on safe climbing and inspecting crevices. When possible, we made counts of crevice sites where apparent suitable storm-petrel nesting habitat was located; however, counts of crevice sites within the rubble piles were impossible to determine as the jumbled mix of materials made it difficult to identify specific nest sites to count. Some areas, particularly within the rubble piles and along cliff areas, could not be accessed safely and when possible we noted if possible crevice habitat existed but did not provide an estimate of the number of crevice sites.

On 9 September 2016, Carter and Parker circumnavigated the island in a small inflatable boat powered by a 20 hp outboard engine to inspect all habitats and attempt to access potential nest crevices. We launched the inflatable boat at Fort Baker. Two lower cliff areas close to the ocean were accessed by Parker through drop off from the boat by Carter: (1) on the east side of the island, just northwest of the boat dock area; and (2) on the west side of the island, below and north of the bird blind area. Parker climbed up solid rock areas to possible crevices and returned to the boat; some areas had loose rocks and were not climbed. Boat work at Alcatraz occurred in

the morning, in order to avoid stronger winds that can occur on San Francisco Bay in the afternoon.

**Mist-Net Captures**

On the night of 7-8 September 2016, mist-net capture efforts were conducted at Alcatraz by M. Parker, H. Carter and V. Seher from 20:43 to 02:00 h (PDT). A single nylon mist-net (70 dernier, 2 ply, 30 mm mesh size, 2.6 m high x 9 m long) was used for capturing storm-petrels on the top of the cliffs on the SW side of the island (Figure 1). The net was set up perpendicular to the shoreline in the center of a ~6 m wide cement walkway. A 1 m high rock wall, with good crevice sites, occurred on the seaward side of the net and Rubble Pile #3 on the landward side. The net was located near potential crevices in the rubble pile and in a different section of the rock walls than when conducting mist-net captures in 2015 (Figure 1). In a section of Apartment 'B' and 'C' (Rubble Pile #3), there was a small open vent (~40 cm wide x ~20 cm high) in a cement wall that accessed a large open underground crawl space adjacent of the capture site (Figure 2). This cavernous area could not be properly inspected during nest searches but we felt that birds flying into or exiting from this area may be caught in the mist-net. A portable CD player broadcasting Ashy Storm-Petrel vocalizations recorded at the South Farallon Islands by D.G. Ainley was placed on the ground at the center of the mist-net to attract storm-petrels to the net site (Carter et al. 1992). The protocol for handling any birds caught was as follows:

(1) a U.S. Geological Survey (USGS) stainless steel leg band (size 1B) was applied;

(2) the single medial brood patch was scored, using the following system:

| | |
|---|---|
| 0 | no brood patch |
| 1 | 5-50% defeathered |
| 1+ | 50-95% defeathered |
| 2 | bare unvascularized |
| 3 | bare vascularized |
| 3+ | bare with a few blood-filled papillae |
| 4 | 5-50% refeathered |
| 4+ | 50-95% refeathered |
| 5 | refeathered but patch visible |

(3) culmen and tarsus lengths were measured, with dial calipers;

(4) flat wing and tail lengths were measured, with a 30 cm metal ruler;

(5) body weight was measured, by placing the bird in a mesh-topped holding bag, using a 100 g handheld Pesola scale, and subtracting the bag weight; and

(6) digital photographs were taken.

## Results

### Mist-net Captures

*7-8 September*

No storm-petrels were captured, heard, or observed during mistnetting on this single night of effort in 2016. Winds were 10-15 kn throughout the night. Fog was present at the netting site from 23:43 until ~01:50 but lifted at that time. While foggy, visibility was reduced to as little as 100 m. The CD player performed well throughout the night. Ambient light levels were fairly high and similar to 2015 mistnetting, until the arrival of the fog. Light sources included bright lights from a sports field in the San Francisco marina area along with many city and bridge lights. The net was fairly visible due to direct illumination from these sources. If storm-petrels were present, we would have expected some net avoidance and reduced capture rates. We could not determine if the relatively high ambient light levels were a deterrent to Ashy Storm-Petrels for visiting Alcatraz. Similar to 2015, Western Gulls (*Larus occidentalis*) were seen hovering overhead and on the seaward side of the night for the first 1-2 hours the net was open and the CD player turned on. A maximum of 10 gulls were seen hovering in the area of the net. Only occasional observations of gulls were seen throughout the night in the netting site area. We consider the presence of large number of breeding Western Gulls, known predators of Ashy Storm-Petrels at the South Farallon Islands (Ainley et al. 1974), may be a deterrent to storm-petrels visiting Alcatraz.

### Nest Searches

*7 September*

Nest searching began in the rubble piles and island edge areas located on the Parade Ground area at 17:15 (Figure 3). No storm-petrel adults, chicks, eggs, eggshell fragments or odor were detected in any of our searches. We searched a total of four rubble piles: Officer's Quarters 72-75 (Rubble Pile #1) (Figure 4), Officer's Quarter's-Duplex (Rubble Pile #2) (Figure 5) and Apartment A (Rubble Pile #4)(no figure) were void of any storm-petrel crevice habitat, although Rubble Pile #4 was partly covered with vegetation and could not be completely viewed. Apartments 'B' and 'C' (Rubble Pile #3) contained numerous potential storm-petrel nesting crevices identified within several deep, wide spaces that occurred among the debris, composed mainly of broken cement walls, plywood, wooden boards, and roofing materials (Figure 6 and Table 1). Some of these areas within Apartments 'B' and 'C' had deep cavernous areas that could not be safely searched. We estimate that approximately 10-20% of this rubble pile was unsearchable due to safety concerns. Four cliff edge areas were safely accessible and searched. We counted a minimum of 36 "good" crevice nest sites within the debris of the rubble piles and man-made rock walls in these areas (Table 1). We defined a "good" crevice site as a site within the rock wall that was over 10 inches deep with a flat bottom and a potential nest spot or chamber. Nest searching ended at 18:50.

*9 September*

At 07:34, Carter and Parker launched an inflatable boat at Fort Baker and began transit to Alcatraz. While in route to Alcatraz, Needles Rock was searched for storm-petrel nest sites from 07:37 – 07:48 (Appendix 1). We arrived at Alcatraz at 08:01, made contact with Seher at the island. We began to circumnavigate the island at 08:03 heading northwest from the boat dock area (Figure 7). A small number of inaccessible crevices were observed and two landings were conducted to investigate potential storm-petrel nest sites (Table 1). No storm-petrel adults,

chicks, eggs, eggshell fragments or odor were detected in any of our searches. We estimated an additional 27 crevice sites based on our boat survey work. Few natural crevices were identified and a majority of the sites were within man-made habitats such as rock walls or holes that held supports for the Sentry Catwalk around the edge of the island (Figures 8 and 9).

*Total Potential Storm-Petrel Nest Sites*

Based on our on-island and boat survey nest searches we estimate that a minimum of 63 potential storm-petrel nest sites occur at Alcatraz. A majority of these potential nest sites occur in man-made habitats or structures that inadvertently create suitable nesting habitat for storm-petrels.

## Discussion

Based on survey efforts in 2015 (Carter et al. 2015b) and 2016 (this report), we concluded that Ashy Storm-Petrels do not currently breed at Alcatraz, although apparently suitable nest crevices were identified. Detecting breeding Ashy Storm-Petrels at small colonies in northern California is difficult because: (1) mist-net capture effort may not detect presence when breeding occurs in small numbers as adults may not visit the nest each night during the breeding season (Ainley 1995); and (2) nest searches are difficult to perform safely without the use of climbing equipment and can result in potential nesting habitat remaining unsearched (Carter et al. 2015b). We believe our efforts in 2015 and 2016 were sufficient to have detected nesting Ashy Storm-Petrels at Alcatraz even if they were nesting in small numbers. We found an adequate amount of apparent suitable habitat in the vicinity of the Parade Ground within man-made habitats but did not detect any storm-petrels. Ashy Storm-Petrels are known to nest within man-made (artificial) habitats, particularly within rock walls at Southeast Farallon Island, which have been used since the late 19$^{th}$ century (Carter et al. 2008). We are confident that if this species was nesting or regularly visiting Alcatraz that we would have, at a minimum, detected storm-petrel odor during our nest searches. However, we may not have detected this species if (1) birds were present earlier in the year but not in August or September (e.g., through nest failure or stopping visitation); (2) birds were present on other nights than when mist-net capture efforts occurred; or (3) birds bred in areas inaccessible to us during our nest search efforts. Finally, our lack of detecting storm-petrel activity at Alcatraz does not preclude the species from nesting at this location in the future and does not tell us if nesting occurred or did not occur in the past. Massive alteration of natural habitats at Alcatraz has occurred since the mid 19$^{th}$ century, including covering the top of the island first with a citadel and then prison buildings, along with cement pads around these buildings, as well as modifying many parts of the cliffs to make them unscalable. However, apparently suitable habitat does exist in rock walls, possibly in rubble pile #3, and in a few small parts of the cliffs. In addition, breeding at a rock in the Golden Gate Recreation Area occurs within 6 km (Appendix 1) and the next nearest known colony is Stormy Stack in the southern Point Reyes National Seashore, 34 km northwest (Becker et al. 2016). Small numbers of Ashy Storm-Petrels also have been observed within San Francisco Bay periodically (P. Capitolo, pers. comm.). Conducting periodic nest searches every 3-5 years within Rubble Pile #3 and along the suitable edge habitat may help to identify if and when Ashy Storm-Petrels begin to nest at Alcatraz.

As far as the dead probable Ashy Storm-Petrel found on the Parade Ground in 2014 is concerned, it appears that this bird was killed by a predator in outer San Francisco Bay and brought to the island by the predator, possibly a Western Gull which nest on the Parade Ground

during the summer. While this reason for the occurrence of this individual at Alcatraz was suspected initially, proper management of this island required definite knowledge of the status of this rare species and whether or not any actions were needed to protect nesting areas. Even though Ashy Storm-Petrels were not detected at Alcatraz in 2015-2016 and no actions are needed to protect this species at the island, we recommend that: (1) if possible, large holes in rubble pile #3 should be covered with wire mesh to prevent use by other seabirds, waterbirds and owls which may be trapped inside or have collapses which harm or kill birds; and (2) some portions of rock walls on the south side should be reinforced to prevent their collapse in the near future but retaining suitable crevices for Ashy Storm-Petrels whenever possible. If a rock wall needs to be replaced, artificial nesting habitat suitable for Ashy Storm-Petrels should be included.

## Acknowledgements

We greatly appreciate the field and logistic assistance provided by NPS, particularly providing sleeping facilities and transportation to/from the island on 7-8 September. F. Gress and J. Brenner (CIES) provided administrative assistance for this project. Although this research was approved by NPS, it also was conducted under a Scientific Collection Permit from the California Department of Fish and Wildlife, with assistance from E. Burkett (Permit # SC-1044).

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Figure 1. Google Earth image of Alcatraz Island showing locations of mist-net capture sites in 2015 and 2016.

Figure 2. Setting up mist-net for capture efforts (Photo by M.W. Parker, 7 September 2016). The seaward edge of Apartments ‘B’ and ‘C’ (Rubble Pile #3) is out of view immediately to the left side of this photo. The Oakland-San Francisco Bay Bridge can be seen in the background. H.R. Carter is seen in the photo.


Figure 3. Google Earth image of Alcatraz Island showing: (1) location of four rubble piles located within the Parade Ground area; and (2) four edge areas searched along the cliff tops in 2016.

Figure 4. Officers' Quarters 72-75 (Rubble Pile #1) located on the northeastern edge of the Parade Ground on Alcatraz Island (Photo by M.W. Parker 7 September 2016). Note the lack of openings within the concrete debris. No storm-petrel habitat was found in this rubble pile.

Figure 5. Officers' Quarters-Duplex (Rubble Pile #2) located along the western edge of the Parade Ground appeared to have been largely removed with only crumbled rock mixed with dirt remaining and partly covered with vegetation. (Photo by M.W. Parker 7 September 2016). No crevice-type habitat was present.

Figure 6. Apartments ‘B’ and ‘C’ (Rubble Pile #3) as viewed from the seaward side looking toward the northwest (Photo taken by M.W. Parker 7 September 2016). This rubble pile contained apparent suitable storm-petrel nesting habitat throughout the debris although no signs of storm-petrel nesting were detected.


Figure 7. Google Earth of Alcatraz Island, showing trackline (blue line), waypoints (numbers with flag icons) and two landing locations for boat survey conducted on 9 September 2016.

Figure 8. Man-made rock wall below the Incinerator on the west end of Alcatraz Island with limited potential crevice nesting habitat for Ashy Storm-Petrels that was not searched (Photo by M.W. Parker 9 September 2016). Numerous man-made rock or brick walls occur at the perimeter of Alcatraz. However, limited storm-petrel nesting habitat occurs in these walls (as the building materials are packed together tightly with little to no space for nesting) and many walls cannot be safely examined without climbing equipment.


Figure 9. Large square holes on the southwest side of Alcatraz Island that held support beams for the Sentry Catwalk that circled the island in the past (Photo by M.W. Parker 9 September 2016). These holes could potentially support crevice nesting seabirds such as Ashy Storm-Petrels, but they were larger than a typical crevice and may have allowed access by Western Gulls. Use of safety climbing equipment would be needed to investigate these holes and exact measurements of hole dimensions were not made.

Table 1. Crevice counts at Alcatraz Island on 7 September 2016 (on-island) and 9 September 2016 (via boat).

| Area | Estimated Number of Apparently Suitable Crevices | Notes |
|---|---|---|
| **On-island Survey Results** | | |
| Officers' Quarters 72-75 (Rubble Pile #1) | 0 | Compacted rubble and heavily vegetated – no crevice habitat |
| Officers' Quarters-Duplex (Rubble Pile #2) | 0 | Compacted rubble, no crevice habitat |
| Apartments 'B' and 'C' (Rubble Pile #3) | 10 | Several areas with possible crevices including: (a) 30′ deep x 6-10′ wide with some flat areas amongst the rubble with up to 5 possible suitable crevice habitat; (b) 20′ deep area with slanted concrete floor with up to 5 possible crevice sites; (c) Small entrance to basement crawl space; 3′ wide x 1′ high – stuffed with plastic sheet and no crevices; (d) 20′ deep x 3′ wide x 6′ high; can see a door jam; no crevices but deep areas can't be seen so possible crevices but no way of confirming; (e) Open room through a small vent; room was 15′ deep x 6′ wide x 4′ high; jumbled floor of concrete blocks and other materials; no crevices evident however, this area could provide nesting habitat similar to cave habitat that Ashy Storm-Petrels use in Channel Islands - numerous nesting sites could be contained in this area with access through the small vent. |
| Edge – Area #1 | 8 | Several good sites occurred in rock wall where some erosion of materials has occurred |
| Edge – Area #2 | 1 | 1 crevice with suitable habitat |
| Edge – Area #3 | 12 | Sites occurred in rock wall where some erosion of materials has occurred. Only a portion of the area could be searched as lower, steeper sections could not be searched without protective gear; this is the best suitable habitat for Ashy Storm-Petrels observed on Alcatraz |
| Edge – Area #4 | 5 | Similar to Edge Area #3 some suitable crevices occurred in eroded rock wall. |

| Area | Estimated Number of Apparently Suitable Crevices | Notes |
|---|---|---|
| **Boat Survey Results** | | |
| Landing Area #1 | 5 | Good suitable crevices occurred northwest of boat dock area |
| Cave – NE point of Alcatraz | 0 | Wet bottom cave; no habitat |
| Small Cave – Waypoint #6 | 0 | Wet bottom; no habitat; small block wall built at top of cave entrance that blocks entry into cave itself |
| Waypoint #7 | 7 | Holes from old walkway; unable to look inside but assume they provide suitable habitat for ASSP nesting |
| Waypoint #8 | 0 | Cement pillars lying down; no obvious habitat within this area |
| Waypoint #9 | 1 | 3 small caves with wet bottom and no habitat; 1 crevice with guano - unable to investigate without climbing gear assume site has suitable ASSP nesting habitat |
| Waypoint #10 | 0 | Brick wall – no visible crevice habitat as viewed from boat |
| Waypoint #11 | 0 | Solid rock wall without visible crevice habitat as viewed from boat; this area is below the 2015 mist-netting location |
| Landing #2 | 4 | Attempted to climb to 4 large holes (former supports?); rock too loose unable to investigate |
| Waypoint #12 | 10 | Estimated number of crevices from boat; cement wall in the area of the corm blind is eroded underneath and creating possible crevice habitat for nesting ASSP |
| Waypoints #13 and #14 | 0 | Area within Edge Areas 1-4; unable to determine if additional habitat occurs below areas searched while on the island; no additional sites added but potential does exist for some additional sites in this area |
| **TOTAL (on-island and boat combined)** | **63** | Estimated number of potential crevices at Alcatraz in searched areas only; additional habitat may be present in portions of the island not searched. |

# Appendix 1

## Nesting of the Ashy Storm-Petrel at the Marin Headlands

On 9 September 2016, in addition to assessing habitat at Alcatraz Island, CIES (Carter and Parker) took advantage of calm seas and light winds to assess nearshore rocks and islets on the north side of the entrance to San Francisco Bay for storm-petrel nesting habitat from an inflatable boat. These habitats were located within the Golden Gate National Recreation Area (hereafter GGNRA). This work resulted in the discovery of nesting Ashy Storm-Petrels in this area, as described below.

Nearshore rocks and islets were visually assessed for potential storm-petrel nesting habitat from the boat. If potential suitable habitat was observed and a safe landing could be performed, Parker landed and searched the potential storm-petrel habitat using a small hand-held flashlight (with bright halogen bulbs) to illuminate any dark crevices. Counts of crevice sites were conducted when apparent suitable storm-petrel nesting habitat was located. In addition, we noted any odor of storm-petrel detected. In situations where apparent suitable storm-petrel nesting habitat was found and storm-petrel odor was detected but deep crevices could not be completely viewed, he used audio playback techniques in attempt to confirm storm-petrel presence and identify species (see Ambagis 2004). Audio playbacks consisted of recordings of Ashy Storm-Petrels made at the South Farallon Islands by D.G. Ainley (Carter et al. 1992). Playback was performed on an Apple iphone 5s.

We surveyed approximately 7.2 km of shoreline on the north side of the entrance to San Francisco Bay, along the Marin Headlands (Figure A-1). We assessed eight areas for potential storm-petrel nesting habitat (Table A-1). Surveys were limited to boat-based visual assessments at four locations without apparently suitable habitat. Four areas were examined by briefly landing on rocks. We confirmed breeding of Ashy Storm-Petrels at one nearshore rock (see below). All areas where located within the GGNRA, managed by the National Park Service.

The confirmed nesting site was at an unnamed rock that we refer to as “Kirby Cove Rock” located approximately 0.75 km west of the Golden Gate Bridge, at the east end of the Kirby Cove campground beach and approximately 25 m from shore (Waypoint 017, Figure A-1; Figure A-2). First, 3-5 potential crevice sites were found on the southwestern portion of this rock and strong storm-petrel odor was noted in one deep crevice. Using playback, vocalizations from an Ashy Storm-Petrel were elicited from deep in the narrow, slanted crack (Figure A-3). The crack/crevice was too deep to see the end of the chamber. Given the strong odor and the early September timing of the survey, the vocalizing individual likely was a large unattended chick, but we could not rule out the possibility of an incubating adult or a visiting adult. This is the first known nesting of the Ashy Storm-Petrel within the GGNRA.

Surveys sufficient to reveal breeding storm-petrels have not been conducted at many nearshore rocks along the coastlines of Sonoma, Marin, San Francisco and San Mateo counties (Carter et al. 2015a, 2016). In addition to this opportunistic survey within the GGNRA, survey work at the Point Reyes National Seashore has confirmed consistent breeding by Ashy Storm-Petrels at Bird Rock and Stormy Stack in 2011-2016 (Becker et al. 2016, unpubl. data). However, additional surveys are needed to complete survey work within the GGNRA. We recommend a boat-based assessment be conducted from Stinson Beach to Point Bonita and from Fort Point Rock (south end of Golden Gate Bridge) to Seal Rocks to determine if Ashy Storm-Petrels are breeding in these areas. This survey would provide the National Park Service with more complete knowledge of the Ashy Storm-Petrel’s current nesting distribution within the GGNRA and allow for

development of appropriate outreach, education, monitoring and conservation actions in order to promote and protect this rare species now confirmed to be breeding within the GGNRA.


Figure A-1. Google Earth image of the entrance to San Francisco Bay (northern side – Marin County), showing trackline (blue line), waypoints (numbers with flag icons) and location of confirmed Ashy Storm-Petrel breeding site at "Kirby Cove Rock".

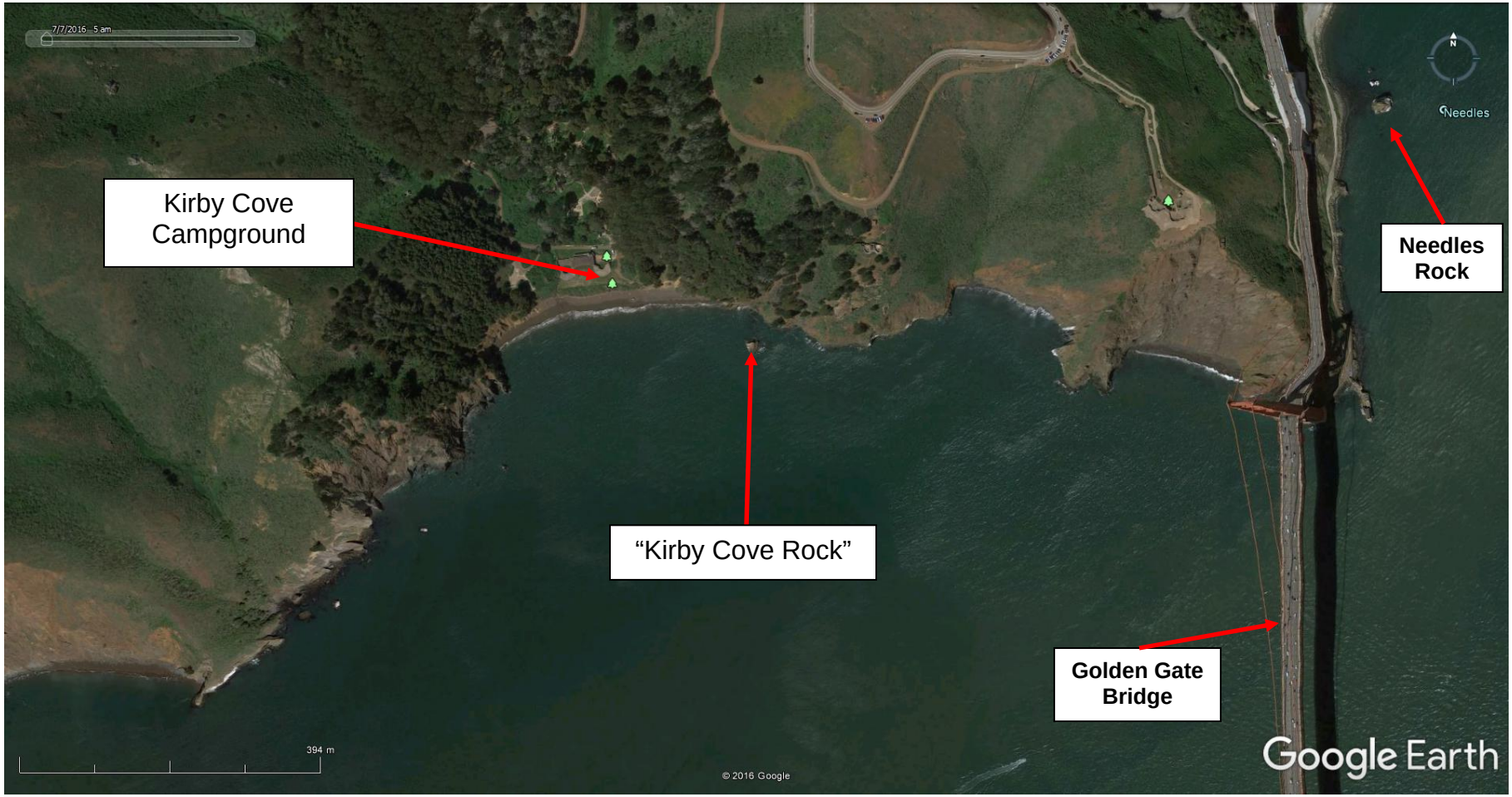

Figure A-2. Google Earth image showing location of Ashy Storm-Petrel colony found on "Kirby Cove Rock" in relation to Kirby Cove Campground, The Golden Gate Bridge and Needles Rock.


Figure A-3. “Kirby Cove Rock” (Photo taken by M.W. Parker, 9 September 2016). Photo shows how close this nearshore rock is to the mainland and identifies the location of the Ashy Storm-Petrel nest crevice.

Table A-1. Areas surveyed for breeding storm-petrels within the Golden Gate National Recreation Area on 9 September 2016.

| Area[1] | Estimated Number of Crevices | Notes |
|---|---|---|
| Needles Rocks | 0 | Landed on smaller rock, some shallow crevices but no nesting habitat; larger rock investigated from boat only – no crevice habitat visible |
| "Kirby Cove Rock"; Waypoint 017 | 3 | Small rock with suitable habitat; strong odor coming from 1 crevice in particular; playback calls broadcasted and elicited a response from crevice with strong odor; confirmed breeding site |
| Waypoint 019 | 0 | Landed on rock; no smell or crevices suitable for storm-petrel breeding |
| Waypoint 020 | 0 | Small cave; wet bottom; no visible habitat likely as observed from boat |
| Waypoint 021 | 0 | Tall rock attached to shore at low tide; landed but difficult to climb; no habitat visible while on rock but unable to search entire rock just from boat and limited climbing |
| Waypoint 022 | 0 | Cave with large entrance but no dry areas to allow for storm-petrel breeding |
| Point Bonita Rocks | 0 | No habitat visible from boats, 2 Common Murres (*Uria aalge*) roosting low on rock, one possibly oiled (small dark patch observed on breast) |
| Waypoint 023 | 0 | Rocks north of Point Bonita, no habitat visible from boat |