

## BREEDING OF THE ASHY STORM-PETREL IN CENTRAL MENDOCINO COUNTY, CALIFORNIA

HARRY R. CARTER, MICHAEL W. PARKER, JOSH S. KOEPKE, and DARRELL L. WHITWORTH, California Institute of Environmental Studies, 3408 Whaler Avenue, Davis, California 95616; carterhr@shaw.ca (HRC contact address: Carter Biological Consulting, 1015 Hampshire Road, Victoria, British Columbia V8S 4S8, Canada)

**ABSTRACT:** In August 2012, we confirmed breeding by an estimated 50 pairs of Ashy Storm-Petrels (*Oceanodroma homochroa*) at four nearshore rocks (Franklin Smith Rock, Wharf Rocks, Casket Rock, and Stillwell Point Rock) along the central coast of Mendocino County, California. Nesting in this region at the northern end of the species' range was first discovered in 1926, when four eggs were collected by Franklin J. Smith on nearshore rocks and preserved in private collections but not published. Ashy Storm-Petrel colonies were not detected north of Marin County during major surveys of seabird colonies in 1969, 1979–1980, or 1989, but specific efforts to detect storm-petrels were made at only a few rocks. In 2012, we did not find Ashy Storm-Petrels breeding north of Stillwell Point Rock (39.3° N), which appears to be the current northern limit of the species' breeding range.

Bird Rock, Marin County, California, has been reported by most recent sources to be the northernmost (38.2° N) breeding colony of the Ashy Storm-Petrel (*Oceanodroma homochroa*) (Ainley and Osborne 1972, Sowls et al. 1980, Ainley et al. 1990, Carter et al. 1992, Ainley 1995; see Figure 1 and Table 1 for locations of storm-petrel colonies in northern California). Ashy Storm-Petrels were not found breeding farther north in California during major seabird surveys in 1969 (Osborne 1969, Osborne and Reynolds 1971), 1979, 1980 (Sowls et al. 1980), and 1989 (Carter et al. 1992). However, Carter et al. (2008) reported two clutches of the Ashy Storm-Petrel from central Mendocino County, California, obtained on 26 June 1926 by egg collector Franklin Jonas Smith (WFVZ 17096 and 163093; Table 2). Smith was a well-known collector, especially of storm-petrels, in Humboldt and Del Norte counties. Carter et al. (2008) considered these egg records to be valid for establishing the northern end of the known breeding range at about Caspar, Mendocino County (39.4° N). During the U.S. Fish and Wildlife Service's (2013) review of the Ashy Storm-Petrel's status and consideration for its listing as an endangered species, one key feature of the breeding range remained unclear: does the Ashy Storm-Petrel still nest in Mendocino County or had loss of colonies at the northern end of the range resulted in nesting only as far north as Bird Rock, Marin County? To resolve this question, we searched for storm-petrel nests on nearshore rocks in Mendocino County in 2012. In addition, we re-examined the records from 1926 and related literature to verify the specimens' authenticity and reassessed data from surveys of seabird colonies from 1969 to 1989 to better describe search efforts and associated literature.

### METHODS

In August and September 2012, we searched for nests of the Ashy Storm-Petrel and other crevice-nesting seabirds on 23 nearshore rocks, located

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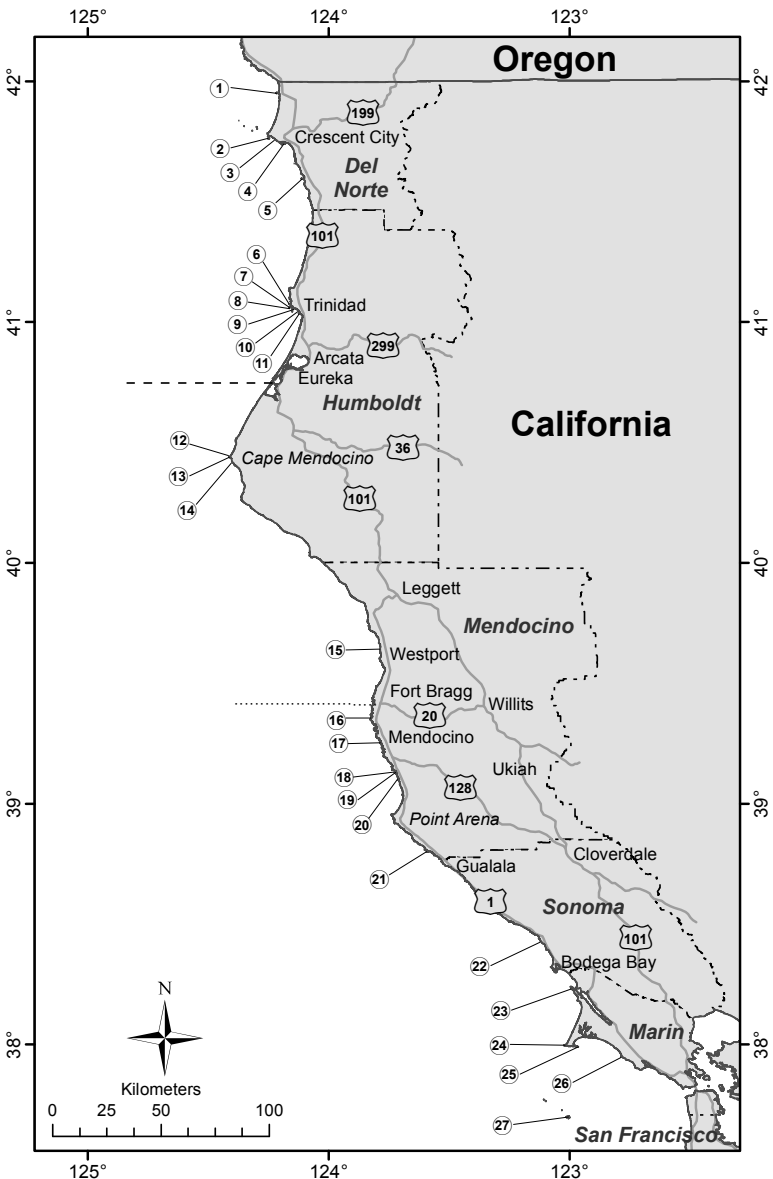


Figure 1. Known and suspected storm-petrel colonies in northern California. Numbers correspond with colonies summarized in Table 1. Dashed line, southern limit of breeding by the Fork-tailed Storm-Petrel; dotted line, northern limit of breeding by the Ashy Storm-Petrel. Leach's Storm-Petrel breeds throughout this region.

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**Table 1** Known and Suspected Colonies of the Ashy, Leach's, and Fork-tailed Storm-Petrels in northern California<sup>a</sup>

Map no. <sup>b</sup>	Colony name	County <sup>c</sup>	Fork-tailed Storm-Petrel	Leach's Storm-Petrel	Ashy Storm-Petrel
1	Prince Island	DN	—	P	—
2	Castle Rock	DN	X	X	—
3	Tolowa Rocks	DN	X	P	—
4	Whaler Island <sup>d</sup>	DN	HX	HX	—
5	False Klamath Rock	DN	?	?	—
6	Green Rock	HU	X	X	—
7	Flatiron Rock	HU	X	X	—
8	Blank Rock	HU	X	X	—
9	Prisoner's Rock	HU	X	X	—
10	Trinidad Bay Rocks <sup>e</sup>	HU	HX	X	—
11	Little River Rock	HU	X	X	—
12	False Cape Rocks	HU	?	?	?
13	Sugarloaf Island	HU	?	?	?
14	Steamboat Rock	HU	?	?	?
15	Westport Rocks <sup>f</sup>	ME	?	X	—
16	Caspar Anchorage to Point Cabrillo (Subcolony 03 or "Caspar-Point Cabrillo Rock") <sup>g</sup>	ME	—	—	HX
17	Schoolhouse Creek to Albion River (Subcolony 07 or "Stillwell Point Rock")	ME	—	—	X
18	Casket Rock	ME	—	—	X
19	Wharf Rocks (Subcolony B or west rock)	ME	—	—	X
20	Bonee Cliffs (Subcolony 12A or "Franklin Smith Rock")	ME	—	—	X
21	Fish Rocks <sup>h</sup>	ME	—	HX	—
22	Gull Rock	SO	—	X	—
23	Bird Rock	MA	—	—	X
24	Point Reyes Headlands	MA	—	—	P
25	Chimney Rock	MA	—	—	P
26	Double Point Rocks	MA	—	—	X
27	South Farallon Islands	SF	P	X	X

<sup>a</sup>Sources: Osborne (1972), SOWLS et al. (1980); CARTER et al. (1992, 2008), this study. Codes: X, breeding; HX, historical breeding; P, present; ?, major islands not surveyed; —, no evidence of breeding.

<sup>b</sup>See Figure 1 for general locations; see CARTER et al. (1992) for detailed locations of colonies and subcolonies.

<sup>c</sup>DN, Del Norte; HU, Humboldt; ME, Mendocino; SO, Sonoma; MA, Marin; SF, San Francisco.

<sup>d</sup>Colony lost after 1939 when island connected to mainland with a breakwater (see Osborne 1972).

<sup>e</sup>Leach's Storm-Petrels bred on at least 3 rocks within this colony in 1989, including Split Rock, Button Rock, and Tepona Rock. Fork-tailed Storm-Petrels were not detected in 1980 (SOWLS et al. 1980) or 1989 (CARTER et al. 1992) but one nest was found on Tepona Rock in 1965 (Osborne 1972).

<sup>f</sup>Storm-petrel burrows present in 1989; species not determined but assumed to be Leach's Storm-Petrel.

<sup>g</sup>This colony and subcolony best fit the 1926 egg record location described as "Caspar, Calif. Pt. Cabrillo" (see Table 2 and text).

<sup>h</sup>Breeding in 1980 but no birds present in 1989 (see text).

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**Table 2** Ashy Storm-Petrel Eggs Collected by Franklin J. Smith in Mendocino County, California, on 20 June 1926

Record no.	Locality	Nest description	Current rock name <sup>a</sup>	Incubation	Specimen no.
1	"Mendocino, California"	"Nest placed in a plant root in a burrow lined at its end with fine dry grass. On Bird rock on the Pacific ocean near Greenwood."	Casket Rock	Fresh	WFVZ 17096
2	"Mendocino, California"	"Nest in a crevice of a rock one foot in, built of a few bits of grass and feathers from the bird. On bird rock on the Pacific Ocean near Little River."	Stillwell Point Rock	Fresh	MVZ 4559
3	"Caspar, Calif. Pt. Cabrillo"	"Nest between boulders, built of weed stalks and feathers from the bird. On rocky sea coast by the Pacific Ocean. A gray type species small."	Caspar-Point Rock	Fresh	WFVZ 163093
4	"Mendocino, California"	"Nest placed in a crevice of rock in about a foot, egg laid on bare rock supported by a few chips. On bird rock on the Pacific ocean off the Mendocino coast."	Unknown	Slight	OMNH E2646

<sup>a</sup>Most likely rock given vague description, based on various considerations (see text).

within the boundaries of 14 recognized seabird colonies, along 54 km of the central Mendocino County coast (Appendix 1). Thirteen rocks within nine colonies lie between White Rock and Mendocino, and 10 rocks within five colonies lie between Mendocino and Kibesillah Rock. See Carter et al. (1992) for detailed maps of all colonies and subcolonies examined. We had originally intended to examine Westport Rocks, but high winds and large swells prevented travel north of Kibesillah Rock on 23 September. Surveys were limited to boat-based visual assessments at four relatively large rocks in three of the same 14 colonies where potential nesting habitat was inaccessible by climbing. All other rocks we examined briefly from the boat and do not consider them suitable for Ashy Storm-Petrel nesting. All rocks with nest searches or visually examined are located within the California Coastal National Monument, managed by the Bureau of Land Management (BLM).

We focused our searches in the general vicinities of vague past records and on the largest nearshore rocks with the greatest amounts of apparently suitable nesting habitat (i.e., containing crevices with the potential for storm-petrel nests) that were accessible to researchers without technical climbing equipment. To avoid disturbance, our searches took place in August and September when surface-nesting seabirds had completed breeding. At this time, wind and swells often are lower, allowing easier and safer access to rocks. Experienced personnel were dropped off from a small inflatable boat and examined crevices suitable for nests with small hand-held flashlights. In most cases, crevices were shallow and could be inspected entirely with the flashlight. In a few cases, however, crevices were too deep to be inspected completely. In the future, use of a long burrow scope may improve searches

in some deeper crevices, although some crevices are too deep or too awkward to be examined with most if not all scopes.

On 27 and 28 August, we surveyed nearshore rocks between White Rock and the town of Mendocino. In late August at the South Farallon Islands and Bird Rock, chicks are being reared at most nests (although a few adults can still be incubating) and no chicks have fledged yet (Ainley and Osborne 1972, Ainley et al. 1990, Carter et al. 1992, unpubl. data). At this time of the season, the egg laying has ended and the maximum number of nests is occupied, barring extensive failures, which increases the probability of finding active nests. In 1926, Smith had collected two egg sets near Elk and Little River (Table 2). On 22 and 23 September, we surveyed nearshore rocks between the town of Mendocino and Kibesillah Rock. In this latter area, nearshore rocks with potential habitat are located in two discrete areas south of the Noyo River and north of Ten Mile River. Between MacKerricker State Park and Fort Bragg, these areas are separated by 15 km of coastline without suitable crevices. At this later time, some or many chicks have fledged at the South Farallon Islands and Bird Rock. Fewer nests are occupied, but eggshells, dead chicks, or late chicks should still be visible in nest crevices. We considered the probability of detecting nests to be slightly lower than in late August but still relatively high. Smith had collected one egg set south of the Noyo River near Caspar (Point Cabrillo; Table 2). In 1989 Carter et al. (1992) had also noted burrow-nesting storm-petrels (likely Leach's Storm-Petrel, *O. leucorhoa*) at Westport Rocks, about 7 km north of Kibesillah Rock (Figure 1). We did not examine rocks within the "Goat Island Area" colony, including Goat Island in Mendocino Headlands State Park and nearby rocks within the California Coastal National Monument, but these rocks had been surveyed in 1979, 1980, and 1989 (see below).

Prior to nest searches in 2012, we examined museum databases available through [www.ornisnet.org](http://www.ornisnet.org) to identify all specimens of the Ashy Storm-Petrel, both eggs and skins, taken in Mendocino County. After our 2012 survey, we also collated information from 1969–1989 surveys and summarized information on storm-petrels in northern California available through a literature search.

## RESULTS

### 2012 Surveys in Central Mendocino County

We found evidence of nesting storm-petrels on four rocks (locations 17–20) between White Rock and the town of Mendocino (Table 1; Figure 1; Appendix 1), including the following colonies and subcolonies: Bonee Cliffs (subcolony 12A; "Franklin Smith Rock"; 39.1021° N, 123.7122° W), Wharf Rocks (subcolony B; west rock; 39.1308° N, 123.7244° W), Casket Rock (39.1306° N, 123.7270° W), and Schoolhouse Creek to Albion Cove (subcolony 05; "Stillwell Point Rock"; 39.2546° N, 123.7870° W). On none of the 23 rocks searched did we find evidence of breeding by nocturnal alcids. At Franklin Smith Rock (Figure 2), we observed a large downy storm-petrel chick (not identifiable to species; Figure 3) in a crevice and 12 dead storm-petrels in a deep fissure. Three mummified adult Ashy Storm-Petrels could



Figure 2. Overview of Franklin Smith Rock (southwest-facing side), 27 August 2012.

*Photo by M. W. Parker*

be removed; they were completely dried and dead for more than one year and likely for several years. One was missing its head, another part of the breast, suggesting predation. All three lacked the white rump of Leach's Storm-Petrel, and the head and neck of two had the ashy gray feathers of the Ashy Storm-Petrel (Figure 4). We named this rock "Franklin Smith Rock" because the eggs Smith collected led to our searches in 2012 and discovery of breeding on this rock, which lacked a distinct name. At Wharf Rocks (west rock), we retrieved one recently dead unidentified storm-petrel chick (partly downy and partly feathered) from a crevice. It was photographed but too decomposed to be preserved as a specimen. At Casket Rock, we observed an unidentified downy storm-petrel chick and eggshell in a large crevice, but could not retrieve them. Likewise, at Stillwell Point Rock, we also found an unidentified, probably downy, storm-petrel chick in a crevice but could



Figure 3. Large downy unidentified storm-petrel chick found in a crevice on Franklin Smith Rock, 27 August 2012.

*Photo by M. W. Parker*



Figure 4. Head of a mummified adult Ashy Storm-Petrel obtained at Franklin Smith Rock, 12 November 2014.

*Photo by M. W. Parker*

not reach it. We believe all four of these chicks to be Ashy Storm-Petrels because of the adults found on Franklin Smith Rock, all four nests were located in crevices, Ashy Storm-Petrels nest almost exclusively in crevices, and the Ashy Storm-Petrel eggs collected in June 1926 in the same area, at least two of them likely from the same rocks (see later). When the eggs were collected, the adults likely were incubating, and some or all adults were probably examined in the hand.

On the basis of the apparent number of suitable nest crevices (visible and not visible) on these rocks, and assuming that eggs may be laid in 25–50% of them (see Carter et al. 1992), we roughly estimated 20, 10, 10, and 10 pairs of Ashy Storm-Petrels at Franklin Smith Rock, Wharf Rocks, Casket Rock, and Stillwell Point Rock, respectively. We suspect storm-petrels nested undetected on several other rocks with abundant suitable crevices that we searched in September 2012, after most chicks should have fledged, especially Arch of the Navarro, Newport Rocks, and Kibesillah Rock (Appendix 1). We detected the odor of storm-petrels in suitable crevices at Kibesillah Rock. In addition, Ashy Storm-Petrels may have nested on certain inaccessible large rocks that we visually examined from the boat. For the entire region of the central Mendocino coast between White Rock and Kibesillah Rock, we estimated between 50 and 100 breeding pairs of Ashy Storm-Petrels.

#### 1926 Specimen Records of Ashy Storm-Petrel Eggs in Mendocino

In addition to the two collected eggs (WFWZ 17096 and 163093; Table 2) of the Ashy Storm-Petrel from Mendocino County reported earlier (Carter et al. 2008), we located two more from Mendocino County collected by Franklin J. Smith on the same date (20 June) in 1926 (MVZ 4559, OMNH E2646; Table 2). No other storm-petrel egg specimens for Mendocino County were found. We considered all four eggs to be Ashy Storm-Petrel eggs because (1) the identification was indicated as positive for all four, implying that an incubating adult was present at the time of collection, (2) the collection date matches the Ashy Storm-Petrel's normal season of

incubation at the South Farallon Islands (Ainley et al. 1990, Ainley 1995), and (3) all four nests were found in natural cavities typically used by Ashy Storm-Petrels (two nests in rock crevices, one between boulders, and one in a "burrow" located in a plant root that we suspect had not been excavated). With the rediscovery of breeding Ashy Storm-Petrels in central Mendocino County in 2012, little doubt remains about these four historical specimens' identification. As noted by Carter et al. (2008), Smith was quite experienced with Leach's and Fork-tailed Storm-Petrels and most likely could also identify incubating Ashy Storm-Petrels. Smith and other naturalists (G. D. Atwell, C. I. Clay, J. M. Davis, W. L. Dawson, J. S. Dixon, J. T. Fraser, A. B. Howell, R. R. Talmadge, and L. Zerlang) explored and collected at nearshore rocks in Humboldt and Del Norte counties for nesting storm-petrels and alcids between 1910 and 1947 (Clay 1916, 1925, Loomis 1918, Howell 1920, Dawson 1923, Osborne 1972).

Franklin Smith, Wharf, and Casket rocks all fit the general locality description for record 1 in Table 2 (WFVZ 17,096), although Casket Rock seems most likely to be the collection location. All three rocks are climbable, have suitable nesting habitats, and are near the town of Elk (formerly known as Greenwood). Gunderson Rock also lies 0.2 km from the creek mouth but is likely not the site of this egg's collection because it cannot be climbed without technical equipment. Wharf Rocks and Casket Rock are closest (0.6–0.9 km) to the mouth of Greenwood Creek at the town of Elk. Franklin Smith Rock is located 2.7 km south of Greenwood Creek, but it is much closer (0.3 km) to the mouth of the Elk River, making it less likely. In 1890, Wharf Rocks were connected to the mainland by a log-loading wharf, which burned down in 1938. We suspect past access by mammalian predators and disturbance caused by human activities on the wharf may have resulted in little or no breeding by Ashy Storm-Petrels during this period, making it less likely. In 2012, suitable crevices were absent on the north sides of these rocks (Appendix 1), which may have been altered to some degree during wharf construction.

As measured from the beach at Van Damme State Park, Van Damme Rock and Stillwell Point Rock lie 0.5 km southwest and 2.1 km south of Little River, respectively. Both rocks are climbable and fit the general locality description for record 2 in Table 2 (MVZ 4559). Even though an Ashy Storm-Petrel with a brood patch was captured in a mist net at Van Damme Rock in 1989, suitable crevices were not found there 1979–1980, 1989 and 2012 (Sowls et al. 1980, Carter et al. 1992, this study). Stillwell Point Rock is most likely the collection location. The Ashy Storm-Petrel captured at Van Damme Rock in 1989 may have bred at nearby Stillwell Point Rock (1.4 km south) but may have been attracted to headlamps or vocalizations broadcast during mist netting at Van Damme Rock. We did not find other rocks in this area with suitable habitats.

We did not find any evidence of Ashy Storm-Petrels breeding near Caspar or Point Cabrillo in 2012. One rock about 0.7 km south of the beach at Caspar Anchorage near Point Cabrillo (subcolony 03; "Caspar–Point Cabrillo Rock"; 39.3573° N, 123.8246° W) may best fit the vague description of the locality of record 3 in Table 2 (WFVZ 163093). Several other rocks in this area have suitable nesting habitat, but some appear to be connected to shore

at low tides, allowing access by mammalian predators. Natural changes to nearshore rocks in this area also may have occurred since 1926, especially as a result of earthquakes, which could have removed or created limited suitable nesting habitats. The locality of record 4 in Table 2 (OMNH E2646) was very poorly described, but we presume it was from the same general area of the central Mendocino County coast as the other three specimens.

#### Smith's 1926 Search for Breeding Storm-Petrels in Mendocino County

With only four egg specimens and lacking Smith's field notes from Mendocino County in 1926, we collated pieces of information to clarify circumstances related to his collecting trip that helped authenticate his records. By 1910, Smith was aware that storm-petrels had been reported breeding in Mendocino County. As noted on the data card for a Leach's Storm-Petrel egg, collected on 3 June 1910 at Prisoner's Rock, Humboldt County (WFVZ 138680), Smith had consulted Emerson (1906), who had described the range of his proposed Belding's Storm-Petrel as "North Pacific Coast, from Vancouver Island to northern California. Breeds on the coast of Oregon (Wm. Finley), and Mendocino County, California (W. H. Dall)." However, it is not clear whether Smith knew of Dall's (1874:278) original description of storm-petrels breeding in Mendocino County, contained within an account of Leach's Storm-Petrel in the western Aleutian Islands, Alaska: "This [Leach's Storm-Petrel], and the next species [Fork-tailed Storm-Petrel], have the habit, when handled, of disgorging a reddish, oily fluid, of strong and disagreeable musky smell; and one can tell, by the odor of the burrow alone, whether it is tenanted by a petrel, or one of the *Alcidae*. From this habit, the petrels (of which species I am not certain, but think it to be this one [Leach's Storm-Petrel]) which breed off the coast of Mendocino County, California, have received there the name of 'Musk Birds.'"

This vague reference was the first report of any storm-petrel species breeding in California, but Dall's source for this statement is not known. Visits by ornithologists to the Mendocino coast are not known prior to 1874, but many settlers arrived in the 1850s (Palmer 1880). Ashy and Leach's Storm-Petrels were first recorded breeding at the South Farallon Islands in 1886 and 1896, respectively (Ingersoll 1886, Loomis 1896), though adult Ashy Storm-Petrels had been obtained there between 1859 and 1862 (Coues 1864, Gruber 1884; USNM 13725, 21444, and 24279). Baird et al. (1884) also cited Dall's Mendocino County information under Leach's Storm-Petrel, but Smith may not have read this source. Harris (1974) later suggested that Emerson (1906) had mistakenly reported storm-petrels breeding in Humboldt or Del Norte counties as from Mendocino County, but he clearly was not aware of Ashy Storm-Petrel eggs collected from Mendocino County in 1926 and may not have read Dall (1874).

By 1926, Smith was very knowledgeable about crevice-nesting and burrow-nesting Leach's and Fork-tailed Storm-Petrels breeding on nearshore rocks in Humboldt and Del Norte counties. However, he apparently did not have Ashy Storm-Petrel eggs in his collection prior to 1926, according to an unpublished list (dated "1926") at the WFVZ in Smith's handwriting of the 270 species and subspecies of birds then in his collection (R. Corado

unpubl. data). Smith likely was intrigued to search for storm-petrel nests on nearshore rocks along the Mendocino County coast to document which species bred in this area, as noted by Emerson (1906). He apparently made a special trip from Eureka to Mendocino County in 1926, shortly after highways from Humboldt County had been built. All four Ashy Storm-Petrel eggs were collected on 26 June at three localities on the central Mendocino coast (i.e., Greenwood, Little River, and Caspar) where redwood mill towns were established in the 1850s. He likely reached the nearshore rocks with a row boat or a small boat powered by an outboard engine and may have accessed Wharf Rocks directly from the wharf.

#### Egg Specimen Transfers after 1926

To investigate why Mendocino eggs of the Ashy Storm-Petrel were not mentioned in pre-2008 summaries, we collated information about post-collecting transfers of the 1926 specimens. Smith usually did not publish his specimen records and at first apparently retained the Mendocino eggs in his private collection. One Mendocino egg (MVZ 4559) was sold or traded within seven years after collection, apparently to another Eureka collector, John M. Davis, who also had collected Leach's and Fork-tailed Storm-Petrels in Humboldt County from 1916 to 1925. This egg was included in a lot of 420 sets of bird eggs donated in 1934 to the Museum of Vertebrate Zoology (MVZ accession 4313) by William B. Davis. Grinnell and Miller (1944) did not mention this MVZ specimen, even though Grinnell likely had examined it because he was the museum's director and had personally handled the accession of Davis's collection. Another Mendocino egg (OMNH E2646) apparently was already in the collection of George W. Morse when he gave the original collection of 11,000 eggs and associated records to the city of Tulsa (Park Department), Oklahoma, in 1933 (T. Yuri pers. comm.). This collection, including the Ashy Storm-Petrel egg, was accessioned by the OMNH in 2001. Smith likely sold this egg to Morse between 1926 and 1933.

Smith died in 1942, and his bird collection was inherited by his sister Jane L. Smith. Upon her death in 1959, she left the collection to Smith's field companion, E. L. Ziegler (WVZ collector biographies; R. Corado unpubl. data). Smith's collection was eventually accessioned at WVZ, but R. Corado (pers. comm.) could not determine the method and date of accession. Both Mendocino eggs currently located in the WVZ (WVZ 17096 and 163093) apparently never left Smith's private collection.

#### Seabird Colony Surveys on the Mendocino County Coast from 1969 to 1989

To assist future storm-petrel surveys, we re-examined major surveys of northern California seabird colonies and associated literature to determine whether Ashy Storm-Petrels breeding in Mendocino County may have been missed during those surveys. The first seabird survey of the northern California coast was led by T. Osborne in 1969 (Osborne 1969, 1971, 1972, Osborne and Reynolds 1971, Ainley and Osborne 1972). During this survey, Ashy Storm-Petrels were first found at Bird Rock (Marin County). Little River Rock (Humboldt County) also was noted as the southernmost breeding location for Leach's and Fork-tailed Storm-Petrels north of Cape

Mendocino, but rocks along the Mendocino coast were not searched for nocturnal seabirds.

During the extensive 1979–1980 survey, only 10 rocks in five colonies in Mendocino County were examined for storm-petrel breeding; these were the only rocks checked between Little River Rock and Bird Rock (Sowls et al. 1980; unpubl. survey archive; Appendix 2). Although nests were not found, breeding by Leach's Storm-Petrel was strongly suspected at Fish Rocks, on the basis of mist-net captures, recaptures, vocalizing, and abundant deep crevices; 50 pairs were estimated. In August 1979, Wharf Rocks (where breeding was later documented in 2012) were inspected but storm-petrel "burrows" were not found and notes about suitable crevices were not made. Apparently, Sowls et al. were looking primarily for burrow-nesting Leach's and Fork-tailed Storm-Petrels, not the crevice-nesting Ashy. Ocean conditions often did not encourage landing, rocks were small and difficult to access, little evidence was found on those examined, extensive boat surveys were needed for other species because of the corrugated coastline, and disturbance of surface-nesting seabirds was avoided when possible.

During the extensive 1989 survey, eight rocks within five colonies in Mendocino County were examined for storm-petrel breeding (Carter et al. 1992; unpubl. survey archive; Appendix 3). Although Leach's Storm-Petrels were captured in mist nets in 1980, no storm-petrels were found at Fish Rocks in 1989, even though Ashy and Leach's Storm-Petrel vocalizations were broadcast during mist netting. At Westport Rocks, 25 storm-petrel burrows, assumed to belong to Leach's Storm-Petrels, were counted. None of the four rocks with breeding in 2012 were landed upon in 1989. Considerations similar to those for the 1979–1980 survey led to landing on few rocks in this region. Burrows of pocket gophers (likely Botta's Pocket Gopher, *Thomomys bottae*) were noted on Goat Island. Although herbivorous, these gophers could interfere with or prevent burrowing of Leach's Storm-Petrels in this island's thick soil. Only two other colonies were examined between Little River Rock and Bird Rock in 1989: Sugarloaf Rock in southern Humboldt County (no nesting found in a sea cave—most of this large island was not easily accessible) and Gull Rock in Sonoma County (one Leach's Storm-Petrel nest found; five pairs estimated).

## DISCUSSION

Nest searches on nearshore rocks in central Mendocino County in 2012 established the currently known northern limit of Ashy Storm-Petrel breeding at Stillwell Point Rock (39.3° N). This location is 12 km south of the northernmost historical record, likely at Caspar-Point Cabrillo Rock (39.4° N). We confirmed breeding on at least two rocks that roughly matched the descriptions of historical records. Loss of the central Mendocino County portion of the breeding range of the Ashy Storm-Petrel was not evident between 1926 and 2012, but we could not determine if the numbers of nests in this portion of the breeding range had changed. Given careful examination of three dead adult Ashy Storm-Petrels recovered on Franklin Smith Rock, validation of the eggs collected in 1926, and use of crevices at all four nest sites, we are confident that the four unidentified storm-petrel chicks were

Ashy Storm-Petrels. Future surveys, however, should confirm the species identification at all of these colonies either through brief removal of incubating adult storm-petrels from nests for careful inspection and photographs or through gathering blood or tissue samples of chicks for DNA testing, with sufficient funding and permits from BLM and other agencies.

Without earlier knowledge of breeding records in 1926, the lack of records between 1926 and 2012 is explained largely by omission during major seabird surveys in 1969, 1979–1980, and 1989. Researchers thought this region was north of the Ashy Storm-Petrel's breeding range, on the basis of the literature, the dearth of crevices suitable for nests in the small samples of rocks examined in this area in 1979–1980 and 1989, suspected breeding by Leach's Storm-Petrels at Fish Rocks in 1980 and at Westport Rocks in 1989, and little or no breeding in this area by several other burrow and crevice-nesting alcid, except the Pigeon Guillemot (*Cephus columba*). McChesney et al. (2000) also reported breeding in 1996 and 1997 of Ashy Storm-Petrels and Cassin's Auklets (*Ptychoramphus aleuticus*) on rocks along the coast of Monterey County that were not checked during earlier surveys, mainly to avoid disturbance to surface-nesting seabirds.

In 2012, we also examined rocks north of Stillwell Point Rock as far as Kibesillah Rock, including the Caspar area, but did not find evidence of breeding. North of Fort Bragg to Ten Mile River, a change in coastal geomorphology results mainly in smaller nearshore rocks with few if any crevices. We suspect that Ashy Storm-Petrels do not breed north of Point Cabrillo because suitable crevices are few. However, small numbers of Ashy Storm-Petrels nesting in suitable crevices on some rocks could have been missed in the area surveyed because surveys in this area in 2012 took place in late September after many chicks would have fledged. In addition, three major sets of nearshore rocks in southern Humboldt County off Cape Mendocino (False Cape Rocks, Sugarloaf Island, and Steamboat Rock; Figure 1) have not yet been examined closely for storm-petrel nesting. These large rocks are very difficult to access without technical rock-climbing equipment, but in 1989 they appeared to have habitats for all three species of storm-petrels (Carter and Parker pers. obs.). With the exception of False Klamath Rock, which still needs to be examined, however, nearshore rocks from Little River Rock north to the Oregon border have been well examined for storm-petrels, and Ashy Storm-Petrels do not breed in this region (Osborne 1972, Harris 1974, SOWLS et al. 1980, Carter et al. 1992).

South of Franklin Smith Rock to Bird Rock (i.e., southern Mendocino and Sonoma counties), surveys sufficient to reveal breeding Ashy Storm-Petrels have not been conducted. Nearshore rocks in this area generally are smaller, less abundant, and appear to have fewer crevices suitable for nesting than those along the central Mendocino County coast. Fish Rocks are the largest rocks in this area, but only Leach's Storm-Petrels were suspected of breeding in soil burrows there in 1980, and none were found in 1989 (see above).

On nearshore rocks along the Mendocino County coast, predation on storm-petrels may be common because the distance to the mainland is short. At Franklin Smith Rock in 2012, 12 dead storm-petrels in a deep crevice were difficult to explain. We suspect that a mammalian predator such as the River Otter (*Lontra canadensis*) killed storm-petrels and stashed them in

the deep crevice without eating them. River Otters occur widely along the coasts of northern California and are known predators of burrow-nesting storm-petrels (Carter et al. 1992, 2012). More work is needed to investigate predation at these colonies.

Nearshore rocks along the central Mendocino coast are difficult to land on, providing some protection from human disturbance. The BLM and the Mendocino Coast Audubon Society currently coordinate outreach to the public to discourage access to rocks in the California Coastal National Monument. Certain crevices are fragile, and care must be taken to avoid damaging them during nest searches. Several people other than researchers visited Fish Rocks during the breeding season of 1979 (Sowls et al. 1980; unpubl. survey archive). Such visitation could have contributed to the loss of breeding Leach's Storm-Petrels by 1989 through accidental crushing of crevices. Predation by the Peregrine Falcon (*Falco peregrinus*) also may have contributed. No falcons were noted at Fish Rocks in 1979 or 1980, but a falcon nest was present in 1989 (Carter et al. 1992; unpubl. survey archive).

Bright lights from the northern portion of the town of Elk illuminate the north sides of Wharf Rocks and Casket Rock (approximately 0.3–0.7 km away), although no crevices were noted on the north sides of these rocks and Ashy Storm-Petrel nests were found on the south sides. Bright lights may enhance avian predation or affect storm-petrel use of these rocks over time. An education effort to reduce bright lights may be helpful. With knowledge of the Ashy Storm-Petrel's current nesting at nearshore rocks in central Mendocino County, the BLM can develop various appropriate monitoring and conservation actions.

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**Appendix 1.** Searches for storm-petrel nests on nearshore rocks off the central Mendocino County coast, California, in August and September 2012 (see Carter et al. 1992 for locations of colonies and subcolonies). Colonies are listed from north to south order but surveys were conducted from south to north.

Kibesillah Rock, 23 Sep, 10:21–11:24. Many shallow crevices on S face (but some deep crevices in a small cave) but no odor; 1 crevice on the SE ridge-spine; 1 crevice with faint odor on N end. No nests found.

### Newport Rocks

Subcolony 02, 23 Sep, 09:50–10:13. No crevices; no nests found. Gull (sp.) wing and shorebird (sp.) wing found on top.

Subcolony 04A (west rock), 23 Sep, 11:39. No crevices; no nests found.

Subcolony 06, 23 Sep, 12:04. Possible crevices; not climbable.

Subcolony 07, 23 Sep, 12:17. Large crevice on W side; not climbable.

Mitchell Creek to Caspar, Subcolony 04, 22 Sep, 13:31–13:50. Rubble pile on rock with several crevices but much mammal scat (possibly River Otter) with crustacean remains present; no nests found.

### Caspar Anchorage to Point Cabrillo

Subcolony 01B (east rock), 22 Sep, 12:35–13:00. A few shallow crevices (5–10); a fissure with deep crevices but no odor on N side; no nests found.

Subcolony 02, 22 Sep, 12:12–12:26. A few shallow crevices (<4) present; no nests found.

Subcolony 03 (“Caspar–Point Cabrillo Rock”), 22 Sep, 11:20–12:07. Some crevices (<20); a large cave runs through the middle section with some crevices but likely wet during big seas; crevices also in rockfall on inside face of rock. No nests found.

### Point Cabrillo Lighthouse to John Peters Gulch

Subcolony 10A (west rock), 22 Sep, 10:27–10:44. A few crevices (<5).

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Subcolony 10B (east rock), 22 Sep, 09:57–10:26. A few crevices (<10) in fissures on S face; no nests found.

Subcolony 11C (east rock), 22 Sep, 08:53–09:46. A few crevices but no good potential sites; iceplant, shrubs, and other vegetation on top of rock; no nests found.

Van Damme Cove, Subcolony 03 ("Van Damme Rock"), 28 Aug, 09:05–09:59. Small numbers of crevices (<10 good potential sites). Island heavily vegetated. No nests and no odor.

### Schoolhouse Creek to Albion River

Subcolony 05 ("Stillwell Point Rock"), 28 Aug, 10:20–11:15. 1 storm-petrel chick in crevice on SSW side with crumbly rock. Not safe to climb entire area but about 20–50 crevices seen. On the rest of the western portion of the rock searched, another 10–20 good potential sites. Many crevices on the WNW part of rock.

Subcolony 08, 28 Aug, 11:23–11:25. No crevices; no nests found.

Albion Cove to Navarro River, Subcolony 06 ("Arch of the Navarro"), 27 Aug, 15:56–16:11. Some crevices (<20); no nests found and no odor.

### Devil's Basin

Subcolony 08, 27 Aug, 15:00. No crevices; no nests found.

Subcolony 09, 27 Aug, 15:15–15:28. No crevices; no nests found.

Casket Rock, 27 Aug, 12:28–13:10. 1 downy storm-petrel chick and eggshell fragment in crevice near top on S end. Many potential crevices on S top and W side. No crevices on N side.

### Wharf Rocks

Subcolony A (east rock), 27 Aug, 11:20–11:30. No crevices; not climbable.

Subcolony B (west rock), 27 Aug, 11:31–12:24. 1 dead large gawky-downy storm-petrel chick in a crack/crevice on S side of rock with 5–10 potential sites. No crevices on N side.

### Cavanaugh Cove to Gunderson Rock

Subcolony 07 (largest rock), 27 Aug, 14:10–14:30. Few crevices; no nests found and no odor.

Subcolony 08 (largest rock), 27 Aug, 13:54–14:00. Few crevices; no nests found and no odor.

Subcolony 11 ("Gunderson Rock"), 27 Aug, 11:00–11:13. Possible crevices; not climbable.

### Bonee Cliffs

Subcolony 06, 27 Aug, 10:33–10:56. No crevices; no nests found.

Subcolony 12A (west rock; "Franklin Smith Rock"), 27 Aug, 09:04–10:13. 1 large downy storm-petrel chick in crevice on S side; 12 dead adult storm-petrels, Ashy Storm-Petrels, including 3 found in deep fissure.

White Rock, 27 Aug, 08:16–08:50. Few crevices; no nests found.

**Appendix 2.** Surveys for storm-petrel colonies in Mendocino County in 1979 and 1980 (Sowls et al. 1980; unpubl. survey archive). See Carter et al. (1992) for colony and subcolony locations. Colonies are listed from north to south.

### Goat Island Area

Subcolony 01, 16 Aug 1979 and 4 Jun 1980. No sign of burrow nesters.

Subcolony 02, 16 Aug 1979. No sign of burrow nesting. 4–5 Jun 1980. No sign of burrow nesting. No storm-petrels heard (dusk–02:00).

Subcolony 03, 6/4/1980, No sign of burrow nesting.

Mendocino, 5 Jun 1980. All 3 rocks landed on. On the middle rock, 9 burrows found (3 "too deep", 4 "inaccessible"; apparently 2 were empty)

Van Damme Cove, Subcolony 03 ("Van Damme Rock"), 18 May 1979. No evi-

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dence of storm-petrel nesting. 5–6 Jun 1980. No storm-petrels heard or seen (19:00–24:00). None caught in mist net.

Wharf Rocks, Subcolony B (west rock), 16 Aug 1979. Suitable habitat but no sign of burrows.

### Fish Rocks

Subcolony 01 (west rock), 6–7 Jun 1980. 9 Leach's, all with well-developed brood patches, captured in a mist net (01:30–03:00). Much vocalizing but no burrows, although petrel odor noted in some crevices and 1 bird observed on the ground (possibly leaving a crevice). 13–14 Jul 1980, 15 Leach's captured in a mist net (23:15–04:00), 3 without a brood patch, and 1 recapture (banded at Subcolony 01 on 7 June).

Subcolony 02 (east rock), 10–11 Jul 1980. 4 Leach's captured in a mist net (01:45–03:10), all with a well-developed brood patch, including 2 recaptures (banded at Subcolony 01 on 7 June). 13–14 Jul 1980. 5 Leach's, 2 without a brood patch, captured in a mist net (11:30–03:30).

**Appendix 3.** Surveys for storm-petrel colonies in southern Humboldt, Mendocino, and Sonoma counties in 1989 (Carter et al. 1992; unpubl. survey archive). See Carter et al. (1992) for colony and subcolony locations. Colonies are listed from north to south.

Sugarloaf Island, 27 May. A cave on the SSW side investigated. No burrows in the cave but soil present. Most of the island not climbed.

### Westport Rocks

Subcolony 02, 31 Aug. 25 burrows counted but none excavated. 1 old storm-petrel egg and odor on SC02 or SC03.

Subcolony 03, 31 Aug. 10 burrows but none excavated.

### Goat Island area

Subcolony 02, 5 Aug. No storm-petrel burrows or odor.

Subcolony 08, 5–6 Aug. No storm-petrels captured in a mist net (23:40–02:10). Recorded vocalizations of Leach's (23:43–01:10) and Fork-tailed (01:10–02:10) broadcast. No storm-petrel burrows or odor.

Van Damme Cove, Subcolony 03 ("Van Damme Rock," 31 May. A few possible burrows. 5–6 Aug. 1 Ashy with a well-developed brood patch captured at 00:33 in a mist net (22:30–02:30). Recorded vocalizations of the Ashy (22:30–23:15; 00:50–02:30) and Leach's (23:15–00:50) broadcast. Only a few shallow crevices.

Schoolhouse Creek to Albion River, Subcolony 08, 31 May. No burrows or crevices.

### Fish Rocks

Subcolony 01 (west rock), 3 Jun. No burrows but many deep crevices. Much suitable soil and grass tussocks. 7–8 Aug. No storm-petrels heard or captured in a mist net (21:40–02:00). Recorded vocalizations of the Ashy (21:40–22:22) and Leach's (22:22–02:00) broadcast.

Subcolony 02 (east rock), 3 Jun. No burrows found. 17 Aug. No storm-petrels heard or captured in a mist net (21:50–01:00). Recorded vocalizations of the Ashy (21:50–23:56) and Leach's (23:56–01:00) broadcast.

Gull Rock, 5 Jun. 1 Leach's nest with adult incubating an egg in a burrow on top of the rock, along with 1 or 2 other probable burrows. Little habitat available.