

SECOND RECORD OF BRYAN'S SHEARWATER *PUFFINUS BRYANI* FROM MIDWAY ATOLL, WITH NOTES ON HABITAT SELECTION, VOCALIZATIONS AND AT-SEA DISTRIBUTION

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Submitted 27 September 2011, accepted 8 October 2013

SUMMARY

PYLE, P., DAVID, R., EILERTS, B.D., AMERSON, A.B., BORKER, A. & MCKOWN, M. 2014. Second record of Bryan's Shearwater *Puffinus bryani* from Midway Atoll, with notes on habitat selection, vocalizations and at-sea distribution. *Marine Ornithology* 42: 5–8.

Little is known about the conservation requirements of Bryan's Shearwater *Puffinus bryani*, first described in 2011 based on a specimen collected in February 1963 near an area containing concrete rubble at Midway Atoll. Here we document a second Bryan's Shearwater observed on Midway during the winters of 1990/91 and 1991/92. It was vocalizing from a 0.5–0.7 m crevice within an accumulation of artificial concrete and coral rubble. Recent winter specimens of Bryan's Shearwaters from the Bonin (Ogasawara) Islands, Japan, were also collected in areas with rocky crevices, possibly burrows they co-utilize with summer-breeding Bulwer's Petrels *Bulweria bulwerii*. This habitat is not found naturally on low-lying atolls in the Northwestern Hawaiian Islands; however, it does occur on Nihoa and Necker Islands, where Bulwer's Petrels breed abundantly. Digitized video and vocalization recordings from 1991 on Midway, detailed here and available at <http://www.birdpop.net/index.php/en/brys>, are currently being used to locate breeding Bryan's Shearwaters in the Bonin Islands. Similar monitoring should be considered for Nihoa and Necker Islands. None of five at-sea records of small shearwaters in the central and eastern North Pacific Ocean can be confirmed as Bryan's Shearwater; thus, nothing is currently known of its life history or requirements at-sea.

Key words: breeding habitat, conservation, *Puffinus bryani*, taxonomy, vocalizations

INTRODUCTION

A new species of Procellariiforme, Bryan's Shearwater *Puffinus bryani*, was described by Pyle *et al.* (2011) based on a specimen collected by one of us (ABA) on 18 February 1963 on Midway Atoll, Northwestern Hawaiian Islands. At the time it was described, its breeding location was unknown, but subsequent documentation of specimens from the Bonin (Ogasawara) Islands, Japan, indicates that breeding likely occurs during winter in these islands (Kawakami *et al.* 2012). Given the infrequency of records, it is undoubtedly a rare bird (Pyle *et al.* 2011), and additional information on its natural history and breeding requirements is needed to promote its conservation (Kawakami *et al.* 2012).

Here we document a second Bryan's Shearwater from Midway Atoll, recorded during the winters of 1990/91 and 1991/92. We describe the habitat in which the shearwater was found and provide a detailed analysis of its vocalizations. We also provide more detail on the circumstances, location and habitat in which the first (type) specimen was collected in 1963, and we review at-sea records of small shearwaters in the central and eastern North Pacific Ocean, as these may pertain to the pelagic distribution and foraging habitat of this species. The information we provide is applicable to the taxonomy, future monitoring and conservation of Bryan's Shearwater.

RESULTS

The second Bryan's Shearwater from Midway Atoll was initially heard vocalizing from a crevice by US Fish and Wildlife Service (USFWS) personnel (D. Williamson, *in litt.*) on unspecified dates in December 1990 and January 1991. The location was at the extreme east-northeast corner of Sand Island (Fig. 1). It was not heard again until an unspecified date in early to mid-December 1991, when the same vocalizations were heard from the same vicinity by USFWS personnel. On 17 December 1991, two of us (RD and BDE) audiotaped the vocalizations, captured the bird, and videotaped and photographed it before returning it to the crevice. It was heard again by USFWS personnel calling from the same crevice on 1 January 1992 (M. Naughton, E. Flint, *in litt.*), the last documented observation. The shearwater was vocalizing from an accumulation of artificial concrete and coral rubble installed to shore up a metal retaining wall (Fig. 2A). The bird was captured and returned from a crevice about 0.5–0.7 m below the surface and against the metal wall. Video of the shearwater, burrow and surrounding habitat, can be viewed at <http://www.birdpop.net/index.php/en/brys>.

The shearwater was small and showed plumage and soft-part characters very similar to the type specimen and those from the Bonin Islands (Pyle *et al.* 2011, Kawakami *et al.* 2012), including dark slate upperparts, white in the face extending

above the eye, largely white underparts and underwing, and dark undertail coverts with white tips on some lateral feathers (Fig. 3., <http://www.birdpop.net/index.php/en/brys>). These characteristics are unique to Bryan's Shearwater and confirm the identification (Pyle *et al.* 2011).

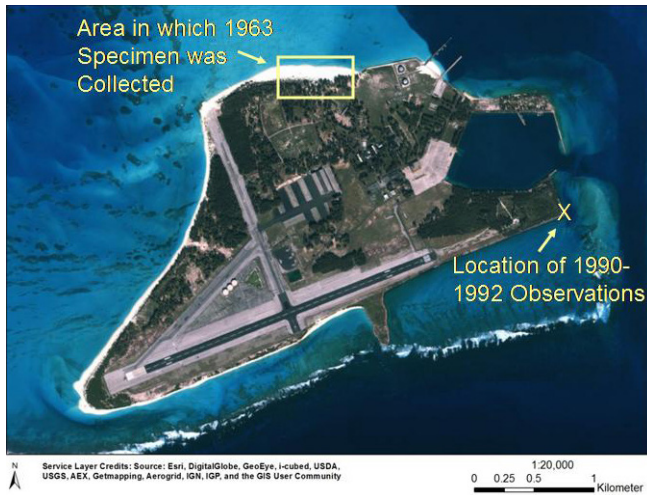


Fig. 1. Observation locations of Bryan's Shearwaters on Sand Island, Midway Atoll, in 1963 and 1990–1992.

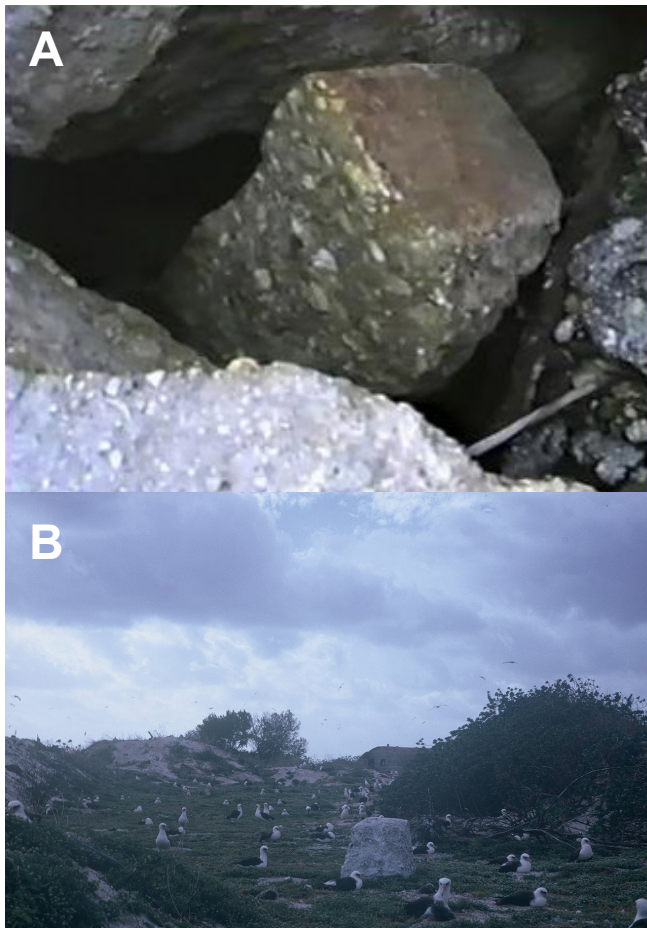


Fig. 2. Crevice in which Bryan's Shearwater was observed in 1990–1992 (A), and habitat in which Bryan's Shearwater specimen was collected in 1963 (B). Photos: Reginald David (A) and A. Binion Amerson (B).



Fig. 3. Bryan's Shearwater, Midway Atoll, 17 December 1991. Photos: Reginald David.

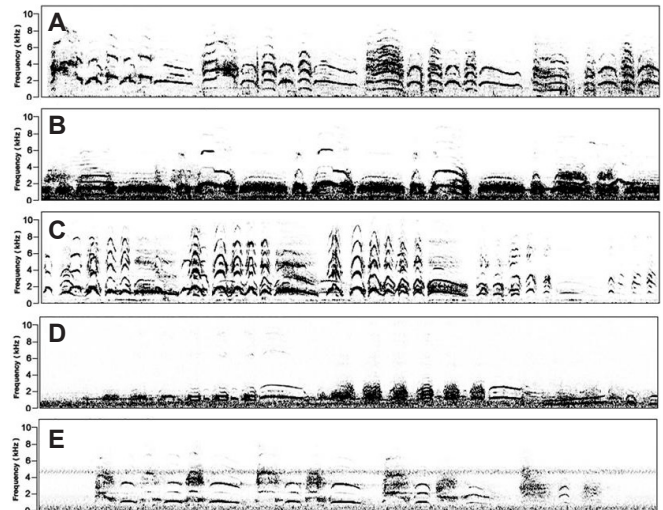


Fig. 4. Spectrograms of Bryan's Shearwater *Puffinus bryani* (A, Midway Atoll, this paper), Boyd's Shearwater *P. boydi* (B, Cape Verde islands, M. Robb, pers. comm.), Barolo Shearwater *P. baroli* (C, Azores islands, M. Robb, pers. comm.), Little Shearwater *P. assimilis haurakiensis* (D, Burgess Island, C. Gaskin, pers. comm.) and Newell's Shearwater *P. newelli* (E, Kaua'i island, A. Raine, pers. comm.). Digital audio representations of these calls can be found at <http://www.birdpop.net/index.php/en/brys> (spectrograms created with WildSpectra).

The recorded vocalizations of the Bryan's Shearwater consist of a series of five to nine call phrases repeated over approximately 7 s. The most typical call phrase contains six cadenced, high-pitched call notes, repeated over a course of approximately 1 s (Fig. 4A, Table 1). Phrases begin with a high-pitched, noisy note and fall and rise consistently through the length of the phrase (Table 2). The higher pitch and longer duration of some of the notes indicate that the captured shearwater was most likely a male (Robb *et al.* 2008; M. Robb, pers. comm.). The vocalizations are generally similar to those of other small shearwaters, with call structure, tempo and rhythm resembling those of Newell's Shearwater *P. newelli* more than those of phenotypically similar small shearwaters including *P. boydi*, *P. baroli* and *P. assimilis* (Fig. 4, <http://www.birdpop.net/index.php/en/brys>). This may support molecular taxonomic evidence placing Bryan's Shearwater in a clade that includes Newell's but not these other shearwaters (Pyle *et al.* 2011).

The type specimen of Bryan's Shearwater collected in 1963 was an individual found atop a sand dune, not in a burrow as reported by Pyle *et al.* (2011). The area in which it was collected was near the northernmost reach of Sand Island, along its central north coast (Fig. 1). At the time of collection, the sand dunes provided a barrier between the beach and an inland protected area that was vegetated with *Scaevola sericea* bushes and contained wooden structures and concrete debris (Fig. 2B). Based on the habitat in which the second bird was found, the 1963 bird was likely prospecting the general area when found atop the sand dune.

TABLE 1
Characteristics of Bryan's Shearwater calls recorded on Midway Atoll

Parameter	Mean	SD	n
Calls			
Call length (s)	6.94	0.77	5
Notes per call	33.00	2.00	5
Notes/s (call)	4.55	0.25	5
Phrases			
Phrases per call	6.80	0.84	5
Phrase length (s)	1.07	0.32	32
Notes per phrase	5.13	1.72	32
Notes/s (phrase)	4.79	0.74	32

There have been five reports of Little Shearwater *P. assimilis* in the North Pacific Ocean that may have been Bryan's Shearwaters, as the two species are similar in appearance, and identification criteria for Bryan's Shearwaters were unknown at the time. However, a review of these records reveals none that can be confirmed as Bryan's Shearwater. A specimen of a Procellariiforme collected in the Marshall Islands in 1964 was initially identified as a Little Shearwater (Amerson 1969) but has been re-identified as a Stejneger's Petrel *Pterodroma longirostris* (Clapp 1984). Little Shearwaters reported 12 October 1997 in the Gulf of Alaska (Day 2006) and 29 October 2003 off Monterey, California (CBRC 2007), were of individuals with white undertail coverts, excluding Bryan's Shearwater for these records. Small shearwaters reported 26 August 1996 near Kodiak Island in the Gulf of Alaska (Day 2006) and 25 August 2010 near the Hawaiian Islands (M. Force, *in litt.*) were not described in enough detail to identify them to species. Thus, the only confirmed at-sea record of Bryan's Shearwater to date is of one photographed 15 September 2009 near the Bonin Islands (Chikara 2009), possibly in transit. Therefore, nothing is currently known of the at-sea range or ecological foraging requirements of Bryan's Shearwater.

DISCUSSION

The habitat in which the two Bryan's Shearwaters were found on Midway Atoll accord with that in which four of six specimens were found in the Bonin Islands (Kawakami *et al.* 2012), consisting of rocky areas covered in some places by dense vegetation. One of the six Bonin specimens was found in a shallow crevice on a rocky cliff where Bulwer's Petrels *Bulweria bulwerii* breed in summer. The Bryan's Shearwater documented in 1991 on Midway was in a crevice located 0.5–0.7 m deep in rocky habitat, suggesting that this might be typical breeding habitat for the species. This habitat is not natural on Midway, which, without human alteration, would consist solely of sandy substrates and low vegetation, as is typical of atolls in the Northwestern Hawaiian Islands (Amerson 1971, Woodward 1972). While it is possible that Bryan's Shearwaters may also breed in burrows or under dense *Scaevola* bushes, the lack of any other records during extensive biological investigation on Midway and other low-lying atolls in the Northwestern Hawaiian Islands during the 1960s (Amerson 1971, Woodward 1972) indicates that they do not breed regularly on these atolls (Pyle *et al.* 2011).

Copies of the vocalizations of the Bryan's Shearwater from 1991 are available at <http://www.birdpop.net/index.php/en/brys>. Recorded and digitized vocalizations such as these are of great value for automated acoustic surveys to monitor presence and abundance of seabirds in remote locations (Buxton & Jones 2012), and for the conservation of seabirds (Croxall *et al.* 2012). Passive acoustic sensors are currently being deployed in the Bonin Islands and on

TABLE 2
Measurements of Bryan's Shearwater note parameters (from call phrases containing six notes)

Parameter	Note 1		Note 2		Note 3		Note 4		Note 5		Note 6	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Note length (s)	0.28	(0.02)	0.14	(0.01)	0.12	(0.01)	0.13	(0.01)	0.11	(0.01)	0.35	(0.01)
Peak frequency (Hz)	3 101	(457)	2 256	(876)	2 955	(819)	2 078	(607)	2 961	(698)	1 943	(579)
Harmonic interval (Hz)	1 598	(1 284)	1 898	(433)	1 534	(641)	1 882	(421)	1 594	(658)	1 781	(450)
	n = 15		n = 16		n = 16		n = 16		n = 16		n = 16	

Midway Atoll to monitor Bryan's Shearwaters and other breeding seabird species. Rocky habitats in the Northwestern Hawaiian Islands, such as those on Nihoa and Necker Islands (Clapp & Kridler 1977, Clapp *et al.* 1977), may provide more suitable breeding habitat for Bryan's Shearwater. Bryan's Shearwaters most likely breed in winter (Pyle *et al.* 2011, Kawakami *et al.* 2012, this paper), and they may co-utilize breeding sites of Bulwer's Petrels at Nihoa, Necker, or other Hawaiian islands on which Bulwer's Petrels breed abundantly in summer. Listening devices should be considered on these islands to monitor for Bryan's Shearwaters. We also encourage researchers at sea in the Pacific to be aware of and look for Bryan's Shearwaters, so that more can be learned about their foraging requirements.

ACKNOWLEDGEMENTS

We thank United States Fish and Wildlife Service personnel, including Don Williamson, Beth Flint and Maura Naughton, for first detecting the Bryan's Shearwater in 1990 and for information regarding its presence. We thank Abram Fleishman and Christopher Tarango for help with call measurements; Chris Gaskin, Magnus Robb, Nick Holmes, and Andre Raine for assistance with and permission to exhibit shearwater recordings; and Joanna Wu for help with Figure 1. This is publication 468 of the Institute for Bird Populations.

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