

# NAZCA BOOBY *SULA GRANTI* AND BREWSTER'S BROWN BOOBY *SULA LEUCOGASTER BREWSTERI* IN THE HAWAIIAN ISLANDS AND JOHNSTON AND PALMYRA ATOLLS

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## SUMMARY

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Nazca Booby (*Sula granti*) and Brewster's Brown Booby (*S. leucogaster brewsteri*) are tropical sulids that normally occur only in the eastern Pacific Ocean. In this paper, we report on recent observations of Nazca Booby and Brewster's Brown Booby in the Hawaiian Islands, including the first apparent nesting records, and we summarize other occurrences of these taxa in the Hawaiian Islands and Johnston and Palmyra Atolls. Genetic research has shown significant population structure between Brown Boobies in the eastern and central Pacific, but little population structure in Masked Boobies (*S. dactylatra*), indicating that the Eastern Pacific Basin has served as a dispersal barrier in Brown Boobies but not in Masked Boobies. Recent observations of brown-headed male Brown Boobies from the central Pacific nesting on Isla San Benedicto near Mexico indicate that some eastward dispersal is now occurring. The observations of Nazca and Brewster's Brown Boobies nesting in the Hawaiian Islands and on Johnston Atoll indicate that dispersal across the Eastern Pacific Basin is occurring in both directions.

Key words: Brewster's Brown Booby, dispersal, Nazca Booby, nesting records, *Sula granti*, *Sula leucogaster brewsteri*

## INTRODUCTION

Nazca Booby *Sula granti* and Brewster's Brown Booby *S. leucogaster brewsteri* normally occur only in the tropical eastern Pacific Ocean. In this paper we report on an observation of a Nazca Booby in 2006 and six observations of Brewster's Brown Boobies in the Hawaiian Islands from 1997–2006, including the first apparent breeding records of Nazca Booby and Brewster's Brown Booby from the Hawaiian Islands, and we summarize other occurrences of these taxa in the Hawaiian Islands and Johnston and Palmyra Atolls.

The Nazca Booby was recently split from the more widespread Masked Booby *S. dactylatra* based on morphology and genetic differences (Pitman & Jehl 1998, Friesen *et al.* 2002). The Nazca Booby differs from Masked Booby in having an orange (male) or coral-red (female) rather than a yellow bill, white central tail feathers, and khaki-gray instead of light olive-colored legs (Pitman & Jehl 1998). Nazca Booby breeding colonies are located primarily on islands of the Nazca Plate, including the Revillagigedo Islands, Mexico; Clipperton and Malpelo islands, Colombia; and Galapagos and La Plata islands, Ecuador (Pitman & Jehl 1998), with a recent record from the Lobos de Afuera islands, Peru (Figueroa 2004).

The Brown Booby is a pantropical species with four or more subspecies based primarily on plumage color (Nelson 1978, del Hoyo *et al.* 1992, Schreiber & Norton 2002). Brown Boobies *S. l. plotus* from the Indian Ocean east to the central Pacific have dark brown heads in both sexes. In the eastern Pacific, male Brown

Boobies have paler heads, but the extent of pale coloration varies geographically. Male Brown Boobies in the Gulf of California and off the western coast of Mexico south to the Revillagigedo Islands have a whitish head and a pale silvery upper neck. They were formerly considered a separate species called Brewster's Booby, but are now considered a subspecies *S. l. brewsteri* (del Hoyo *et al.* 1992, Schreiber & Norton 2002). Birds with a pale grayish



**Fig. 1.** Nazca Booby *Sula granti* (on right) paired with a Masked Booby *S. dactylatra* and incubating two eggs in a nest on Moku Manu off the eastern coast of Oahu, 28 February 2006. Photo by E. VanderWerf.

forecrown *S. l. etesiaca* occur on islands off Central America and Colombia (Harrison 1983, Schreiber & Norton 2002). The palest form, in which the entire head and neck are white in males, breeds on Clipperton Island and is sometimes referred to as *S. l. nesiotis* (Pitman & Balance 2002, Schreiber & Norton 2002).

## OBSERVATIONS

On 28 February 2006, EV, JE and HE observed an adult Nazca Booby on Moku Manu, a small islet located off the eastern coast of Oahu. The bird had an orange bill with a slightly concave culmen and white central tail feathers, which are characteristic of the Nazca Booby (Fig. 1, Pitman & Jehl 1998). The legs were grayish-green and not very different in color from those of nearby Masked Boobies (Fig. 1). The Nazca Booby was paired with a Masked Booby and was incubating a nest with two eggs (Fig. 1). No vocalizations by the bird were noticed, but based on the orange color of the bill, it may have been a male. EV and JE returned to Moku Manu on 16 October 2006 (nearly 8 months later) and searched for the Nazca Booby but did not see it. There was no juvenile where the nest had been, but a chick from an egg laid in February would have fledged well before October.

On 15 and 21 March 1997, BB and A. Pairis observed an adult Brown Booby with a whitish head and pale upper neck standing on a rocky ledge at the western shoreline of Laysan Island. On 28 June, A. Pairis observed a similarly-colored Brown Booby with another Brown Booby on a dead *Tournefortia* tree. No photos were taken. All three observations were in the same area and likely were of the same bird.

From 15 April to 23 July 1998, an adult male Brown Booby with a white head, pale grayish neck, and blue facial skin was observed on



**Fig. 2.** Male Brewster's Brown Booby *Sula leucogaster brewsteri* (front) attending a nest with an egg and nestling on Laysan Island, 22 June 1998. Photo by B. Becker.

the western side of Laysan Island by BB, B. Byrd and D. Dick. It was observed mounting a female Brown Booby on 25 and 29 April, and on 4 May, the male was sitting on a nest at the vegetation edge near the beach berm. The nest was alternately attended by the male and the female. On 17 June, a naked hatchling and an egg were observed with the male attending the nest, and photographs were taken on 22 June (Fig. 2). By 8 July, only a single chick was present with the adult male. At least one of the adults was on the nest through 23 July when the field camp was disbanded. The nestling was at least 36 days old when observations ended.

In 1999, there were three sightings of a light-headed, pale-necked Brown Booby on Laysan. BB observed one on 25 April standing with six other Brown Boobies on the rocky ledge in the same area where one was seen in 1997 and 1998, and again on 2 May standing on a rocky ledge at the southern shore of the island. On 8 June, P. Bertilsson-Friedman observed one on the southeast side of the island. No photographs were taken.

Another nesting by a Brewster's Brown Booby was observed on Lisianski Island by P. Bertilsson-Friedman on 18 April 2000. A pale-headed and light-necked Brown Booby was sighted 15 days earlier on 3 April by BB, and was likely the same bird. No further observations were documented.

A male Brown Booby with a white head and pale grayish neck was observed by JE and HE on Kure Atoll on 4 and 16 June 2006 (Fig. 3).

On 16 October 2006, EV and JE observed an adult Brown Booby with a whitish head and upper neck and a pale grayish bill on



**Fig. 3.** Male Brewster's Brown Booby *Sula leucogaster brewsteri* on Kure Atoll, 16 June 2006. Photo by H. Eijzenga.

**TABLE 1**  
Summary of Nazca Booby *Sula granti* records in the Hawaiian Islands

Year	Location	Observations	Observer	Source
2005	Tern Island, FFS	21 Jul + 2 weeks thereafter, 13 Oct. Possibly female based on bill color.	L. Takahashi, USFWS	Sightings db, pers. comm.
2006	Moku Manu, Oahu	28 Feb. Paired with a Masked Booby and incubating 2 eggs.	E. VanderWerf, J. and H. Eijzenga	This paper
2007–2008	Tern Island, FFS	Sporadically in much of 2007 through Mar 2008. Photos by I. Jones, 13 Mar.	E. Conrad, I. Jones, B. Erickson, D. Zabriskie, S. Luecht	Pers. comm.

FFS = French Frigate Shoals; USFWS = US Fish and Wildlife Service; db = database.

Moku Manu. The bird was standing on a rock among other Brown Boobies and Red-footed Boobies *S. sula*, but took flight before it could be photographed.

## DISCUSSION

There are three records of the Nazca Booby in the Hawaiian Islands, including the one reported here (Table 1). The other two records are from Tern Island, French Frigate Shoals, where a single bird was first observed and photographed on 21 July 2005. Based on

the coral-pink bill color, the bird may have been a female. A single Nazca Booby was seen again at Tern Island on 13 October 2005 and sporadically throughout much of 2007 and early 2008. All the reports from Tern Island were likely of the same individual and thus may constitute a single occurrence over a three-year period, although no reports were available from 2006. The apparent nesting on Moku Manu in 2006 is the first reported breeding attempt by a Nazca Booby in the central Pacific.

There are approximately 23 records of Brewster's Brown Boobies in the Hawaiian Islands and in Johnston and Palmyra Atolls in which

TABLE 2

Summary of Brewster's Brown Booby *Sula leucogaster brewsteri* records in the Hawaiian Islands and Johnston and Palmyra Atolls

Year	Location	Observations	Observer	Source
1955	Nuupia Ponds, Oahu	18 Jun.	R.L. Pyle	Sightings db
1984	Sand Island, Johnston Atoll	29 Jul. Photo of adult male with downy chick by D. O'Daniel.	R.W. Schreiber, D. O'Daniel	Sightings db
1994	Laysan	10 Sep, in group of 25 Brown Boobies	Adams & Nevins 1994	
1996	Palmyra	No details available.	H.D. Pratt, K. Kepler, E. Flint	Pers. comm., Sightings db
1996	Laysan	14 May. Photos.	J. Adams, NMFS	Pers. comm.
1997	Laysan	15 and 21 Mar, 28 Jun.	B. Becker, A. Pairis, NMFS	This paper
1997	Laysan	Oct 16. Gray head and neck, whitish-gray bill	Muller, USFWS	Sightings db
1997	Lisianski	1 Apr–1 Jun. One male. 7 Jun. Two males soliciting Brown Booby females. Photos.	J. Adams, H. Nevins, NMFS	Pers. comm.
1998	Laysan	24–25 Feb.	C. Depkin, USFWS	Sightings db
1998	Laysan	15 Apr–23 Jul. Male paired with Brown Booby and incubating a chick. Photos.	B. Becker, B. Byrd, D. Dick, NMFS	This paper
1998	Lisianski	22 Mar–9 Jul.	A. Pairis, C. Cornish, NMFS	Pers. comm.
1999	Laysan	25 Apr–8 Jun.	B. Becker, P. Bertilsson-Friedman, NMFS	This paper
1999	Lisianski	18 Mar - 20 Jul. Photos.	A. Pairis, L. Gibson, NMFS	Sightings db, HRBP 1363
2000	Laysan	30 Jun and 3 Jul.	D. Dick, NMFS	Pers. comm.
2000	Lisianski	3, 18 Apr. On nest 18 Apr.	B. Becker, P. Bertilsson-Friedman, NMFS	This paper
2001	Eastern Island, Midway	30 Jan, 6, 9, 13 Feb.	Small, USFWS	Sightings db
2001	Kahoolawe	9, 17, 22 May. Seen flying from shore.	L. Tanino	Sightings db
2003	Tern Island, FFS	29 Jan-12 Feb. Two seen together on 12 Feb.	Sprague, Eggleston, USFWS	Sightings db
2003	Lisianski	10 Apr. Photos.	S. Oates, NMFS	Pers. comm.
2006	Kure	4–16 Jun.	J. and H. Eijzenga	This paper
2006	Moku Manu, Oahu	16 Oct.	E. VanderWerf, J. Eijzenga	This paper
2007–2008	Tern Island, La Perouse Pinnacles, FFS	August at La Perouse, sporadically during fall and winter at Tern Island.	S. Farry, NMFS, E. Conrad, I. Jones, B. Erickson, D. Zabriskie, S. Luecht	Pers. comm.
2007–2008	Laysan	Sep 2007 to 7 Mar 2008. Two birds on 29 Sep and 20 Oct.	B. Becker, NMFS	This paper

db = database; NMFS = National Marine Fisheries Service; USFWS = US Fish and Wildlife Service; HRBP = Hawaii rare bird photo in Sightings database; FFS = French Frigate Shoals.



the bird was either photographed or described in sufficient detail to allow conclusive identification (Table 2). Some birds were seen sporadically over extended periods of time, so some observations could have been of the same individuals. Three records have involved breeding attempts, on Johnston Atoll in 1984, Laysan in 1998 and Lisianski in 2000 (Table 2).

These observations of Nazca and Brewster's Brown Boobies in the central Pacific and nesting attempts by mixed pairs of Nazca × Masked Boobies and of *S. l. plotus* × *S. l. brewsteri* Brown Boobies have relevance to phylogeography of boobies and dispersal patterns of tropical seabirds in the Pacific. The primary barrier to dispersal of most tropical seabirds in the Pacific is the Eastern Pacific Basin, an expanse of open ocean more than 5400 km wide between the Line Islands in the central Pacific and Clipperton Atoll in the eastern Pacific (Steeves *et al.* 2005). Steeves *et al.* (2003) found that Brown Boobies showed significant genetic population structure between the eastern and central Pacific, indicating that they rarely dispersed across the Eastern Pacific Basin. In contrast, there was little genetic population structure between Masked Boobies in the eastern and central Pacific, and thus the Eastern Pacific Basin did not serve as a barrier to dispersal and gene flow in that species. These phylogeographic patterns likely reflect the behavior of each species: Brown Boobies tend to forage close to shore and near breeding colonies; Masked Boobies often forage much farther from breeding colonies (Nelson 1978, Anderson 1993).

However, recent observations of brown-headed male Brown Boobies, likely *S. l. plotus*, breeding on Isla San Benedicto near Mexico indicate some dispersal is now occurring (Pitman & Ballance 2002), leading Steeves *et al.* (2003) to conclude that the Eastern Pacific Basin was a barrier to dispersal by Brown Boobies in the past, but may no longer be an effective barrier because of geologic or oceanographic changes. The observations of Brewster's Brown Boobies breeding in the Hawaiian Islands and on Johnston Atoll support this idea and indicate that dispersal by Brown Boobies is occurring in both directions across the Eastern Pacific Basin.

In the Nazca Booby, Huyvaert & Anderson (2004) found that natal and breeding dispersal distances were usually very short, but they documented a few instances of long-distance (858–1115 km) natal dispersal eastward to islands close to South America. The recent records of Nazca Booby in the Hawaiian Islands indicate long-distance dispersal is also occurring toward the west, across the Eastern Pacific Basin.

Hybridization between Nazca and Masked Boobies has been reported only rarely. A few mixed pairs and birds with bills intermediate in color have been observed on Clipperton Island (Pitman & Jehl 1998). On Isla San Benedicto in the Revillagigedo Islands, Howell & Webb (1990) reported one mixed pair, and Pitman & Ballance (2002) observed two mixed pairs and four other adults with what appeared to be intermediate-colored bills. Interbreeding of *S. l. brewsteri* and *S. l. plotus* would be more difficult to detect visually, because only males differ in appearance between these taxa (Schreiber & Norton 2002).

The occurrence of both Nazca and Brewster's Brown Boobies on Moku Manu in 2006 was unusual, but in retrospect perhaps not completely surprising. Moku Manu supports the only breeding colony of Masked Boobies in the main Hawaiian Islands, and one of two breeding colonies of Brown Boobies in the main Hawaiian

Islands [the other is on Lehua Islet north of Niihau (VanderWerf *et al.* 2007)]. Moku Manu is closer than the Northwestern Hawaiian Islands to breeding colonies of Nazca and Brewster's Brown Boobies in the eastern Pacific and may be more likely to receive birds that disperse from the east.

Brewster's Brown Booby has been recorded more often in the central Pacific than the Nazca Booby has, which may indicate that they disperse more widely from breeding colonies than Nazca Boobies do (Huyvaert & Anderson 2004), but also may reflect the ease of identification of these two forms and their taxonomic history. Brewster's Brown Booby is relatively easy to distinguish from other Brown Boobies that usually occur in the central Pacific, and it was once considered a separate species. Thus observers may have been more likely to identify it and note its occurrence. Nazca Booby was split from Masked Booby recently, and the morphologic differences between these species are more subtle and were widely publicized only recently (Pitman & Jehl 1998). It is possible Nazca Booby has been overlooked because observers did not realize it was a distinct taxon and were not familiar with its field marks. Careful documentation of unusual seabirds, particularly nesting attempts, can increase our understanding of seabird biology and help to monitor changes in their distribution.

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