RECORDS OF WHITE TERN *GYGIS ALBA* IN PANAMA AND POTENTIAL CONNECTIONS TO EL NIÑO EVENTS

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ABSTRACT

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In Panama, the White Tern *Gygis alba* is a vagrant seabird that has been reported very rarely. Its first record was in 1983, during a very strong El Niño Southern Oscillation (ENSO) event that generated a massive invasion of unusual seabirds from South America into the Panama Bay. Unlike other vagrant seabirds, the White Tern remained unrecorded again until 2016. This note reports the second, and first confirmed, occurrence of White Tern to Panama, along with separate confirmed sightings in 2019. We briefly review these records and their potential connections to ENSO events.

Key words: El Niño Southern Oscillation, ENSO, White Tern, *Gygis alba*, Panama

Vagrant species refer to species that have historically occurred in certain zones only a few times (Angehr & Dean 2010). They often attract a great deal of attention from bird specialists because the rareness of their occurrences makes it difficult to understand which factors might have contributed to their vagrancy (Thorup *et al*. 2012). In Panama, more than 80 bird species are considered vagrants, and most of them are shorebirds and seabirds, such as the White Tern *Gygis alba*. It has been suggested that the occurrence of this species

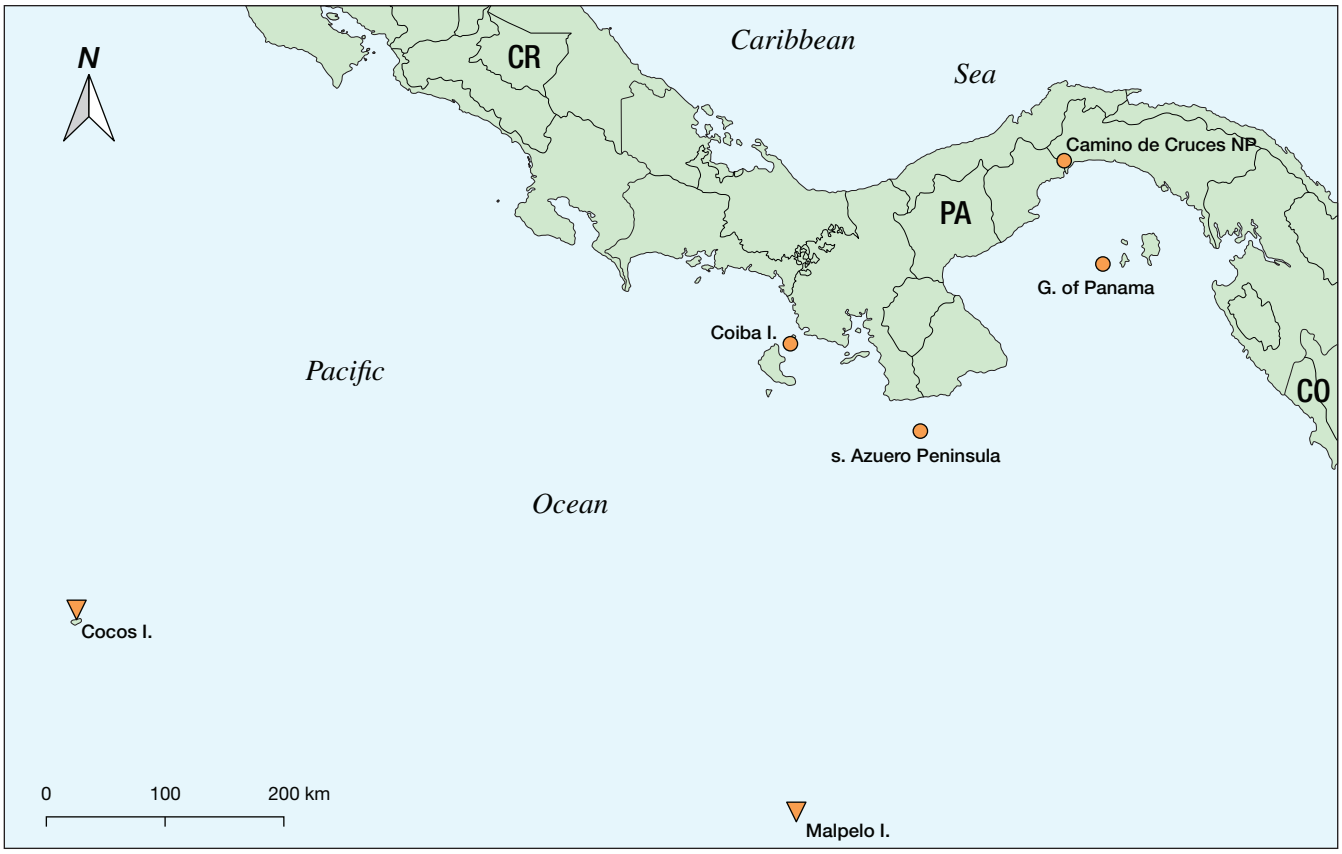

Fig. 1. Pacific region of southern Central and northern South America indicating breeding sites (orange downward triangles) and vagrant records (orange circles) of White Tern in Panama. CR, PA, and CO stand for Costa Rica, Panama, and Colombia, respectively.

in Panama has been associated with a climatic anomaly (Ridgley & Gwynne 1989). However, this pelagic seabird is widely distributed throughout tropical and sub-tropical waters, from the Indian Ocean to the South Pacific and Atlantic Oceans. In southern Mesoamerica and northern South America, breeding pairs reside in large numbers in wooded oceanic islands (Fig. 1), such as Cocos Island in Costa Rica (Montoya 2008, Garrigues & Dean 2014) or Malpelo in Colombia, where, since 1985, they have gradually become common breeding residents (Pitman *et al*. 1995, López-Victoria & Estela 2006). White Terns do not appear to breed in the Galapagos Islands (Wiedenfeld 2006). There is no record of large breeding or transient groups in Panamanian archipelagos, especially in the highly productive Gulf of Panama (Angehr & Kushlan 2007), one of the most visited and heavily monitored migratory hotspots (Kauffman 2012). Nonetheless, there have been four records of the White Tern in Panama in variable abundances, in different years and geographic areas (Fig. 1). We briefly review these records and their potential connections to El Niño Southern Oscillation (ENSO) events.

The first sighting of White Tern in Panama was reported in June 1983 by N.G. Smith (Ridgely & Gwynne 1989). The record consisted of two individuals flying offshore in the Bay of Panama, approximately 10 km from the Pacora River estuary (08°56′24″N, 079°17′16″W). No details on species identification were provided. To the best of our knowledge, the second, and first confirmed occurrence, of White Tern occurred in September 2016 (this study). A dying individual was found around 07h30 in the Camino de Cruces National Park, north of Panama City (09°01′11″N,

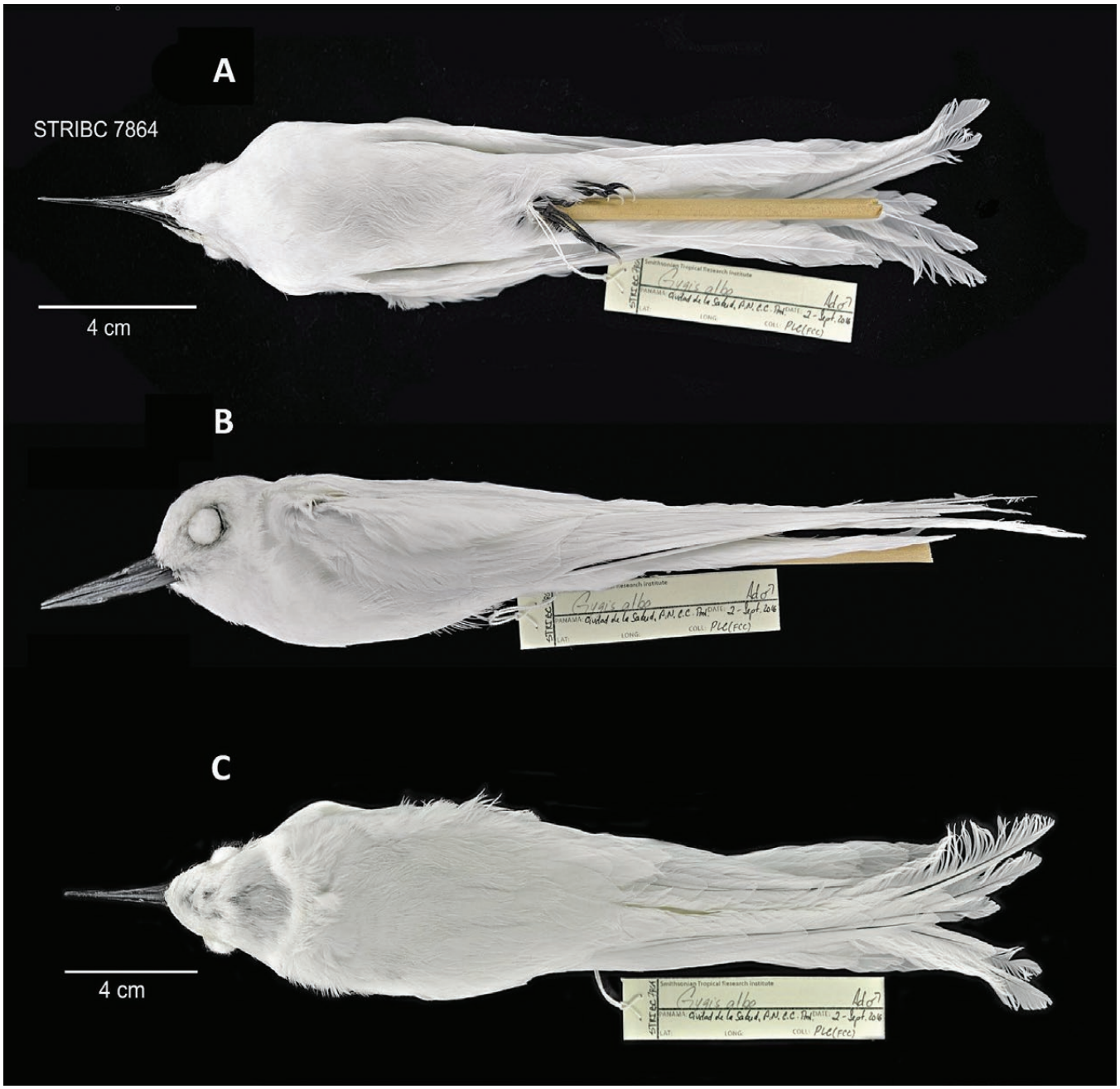

Fig. 2. Ventral (A), lateral (B), and dorsal (C) views of the specimen STRIBC-7864, prepared as study round-skin (Photo: E. Domínguez, Smithsonian Tropical Research Institute).

079°34′47″W). The bird was extremely exhausted and died a few hours later despite some attempts to keep it alive (S. Pinto pers. comm.). The specimen was donated to the Smithsonian Tropical Research Institute bird collection (STRIBC7864), where it was dissected, examined, and prepared as a study round-skin (Winker 2000) by PLC (Fig. 2). The species was identified based on a completely white plumage, a slightly forked tail (Fig. 2A, C), and a slightly recurved bluish-black bill (Fig. 2B). It was an adult male having a 100% ossified skull, no molt, and fully developed testes (left teste: 1.2 × 3.1 mm). The internal anatomy appeared healthy and was without bruises, lacerations, or broken bones. However, the mass was 59 g (though the stomach was empty), which was remarkably lower than mass averages previously reported for this species (Dunning 1993, Spear & Ainley 1999). The last two occurrences of White Tern were independently recorded in 2019, distant from the Gulf of Panama (Fig. 1). Gouraud (2019) recorded five individuals (one photographed) offshore of the southwestern Azuero Peninsula (06°58′24.9″N, 080°40′04.4″W) on 30 September 2019. The individual was correctly identified according to the pictures published on eBird (Sullivan *et al*. 2009). Brinkhuizen (2019) recorded an individual near Coiba Island on 21 December 2019. Although pictures were not provided, the observer gave an accurate species description.

The vagrant records of White Tern in Panama are of ornithological interest, especially when assessing the potential role of climatic anomalies. At the time of the first record (1983), a massive occurrence of seabirds from South America, mainly Peruvian Booby *Sula variegata* and Blue-footed Booby *Sula nebouxii* (Table 1), invaded the Gulf of Panama (Smith 1990); such invasions related to ENSO have been documented for some time (e.g., Murphy 1936). According to Dayton & Tegner (1990) and Smith (1990), these rare occurrences were correlated with the loss of productivity in the Peru Current and points north during the very strong 1982/83 ENSO event. Consequently, several unusual seabirds that co-occurred, such as the White Tern, were also connected to ENSO events (Ridgely & Gwynne 1989). Coincidently, the second record of White Tern in Panama (2016) also overlapped with three other vagrant species that co-occurred during the strong 2015/16 ENSO (albeit in lower numbers), further suggesting a potential connection. Additionally, several other unusual seabirds from South America were recorded in low numbers in northern Central America during the strong 2015/16 ENSO (Van Dort 2018). However, when we compare occurrences of the White Tern and other rare visitors during years since 1983 (Table 1), the differences in recurrences and densities are noticeable. This variability may be explained by the unpredictable effect that ENSO may have on different seabird populations (Ainley *et al*. 1990, Duffy 1990, Smith 1990, Schreiber 1994). However, establishing correlations between ENSO-associated conditions (e.g., loss of the forage base) and the very few records of White Terns is difficult, complicating the understanding of these vagrant records.

TABLE 1
Abundances of vagrant species of seabirds recorded in Panama during very strong and weaker or absent ENSO events[a]

Species	Years of very strong ENSO[b]			Other years
	1982/83	1997/98	2015/16	
Sula variegata	H	–	L	–
Sula nebouxii	H	M	M	1988[c]–2019
Sula sula	L	–	–	2017–2019
Phalacrocorax bougainvillii	L	–	–	–
Gygis alba	VL	–	VL	2019
Larosterna inca	M	–	L	2010[d], 2014, and 2018
Leucophaeus modestus	–	L	–	1988[c], 2019

[a] Information on ENSO events was obtained from the National Oceanic and Atmospheric Administration (NOAA, noaa.gov)
[b] Letters represent high (H), moderate (M), low (L), and very low (VL) relative abundances reported in literature (see text), this study, and eBird records.
[c, d] Indicate years of a strong and moderate ENSO, respectively.

The last records of White Terns in Panama, in September and December 2019 (the only instance of more than one record in a single year), were distant from the Gulf of Panama and occurred in the absence of a strong ENSO. Surprisingly, eBird records also showed occurrences of White Terns in various numbers in 2018 and 2019, in different months, both offshore and on the mainland of northern Costa Rica. It is important to consider that populations of Cocos Island start wandering in September as the breeding season ends, and large groups conduct pelagic migrations (Murphy 1936, Pitman *et al.* 1995, López-Victoria & Estela 2006). This suggests that such occurrences might not be causally linked to ENSO-associated anomalies. In such scenarios, it is possible that occurrences resulted from random transient movements from relatively close oceanic islands.

Identifying the factors driving vagrant movements will increase the knowledge of a species' ecology and contribute to understanding their biogeographic patterns. Other than the possible connection to ENSO, the records of White Tern are still too sparse and geographically spread out to establish specific factors related to their vagrancy. Therefore, we encourage continued monitoring and reporting of this species off the coasts of Panama, especially if the species can gradually exploit new breeding areas, as occurred in Malpelo.

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