

NESTING HABITAT AND NUMBERS OF PERUVIAN TERNS AT FIVE BREEDING SITES IN THE CENTRAL-SOUTHERN COAST OF PERU

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Hábitat de nidificación y números de Gaviotines Peruanos en cinco sitios de reproducción en la costa centro-sur del Perú.

Key words: Conservation, desert, nesting habitat, Peruvian Tern, predation, *Sternula lorata*.

INTRODUCTION

With less than 12 breeding sites reported (Galarza 1968, Hughes 1970, Guerra-Correa 2003) since the first nest discovered in 1920 by Murphy (1936), and a global estimated population of 1000–2500 individuals (Birdlife International 2008), the Peruvian Tern (*Sternula lorata*) is one of the world's rarest seabirds. Its breeding range is confined to the coast of Peru and northern Chile, an area strongly influenced by the Humboldt Current (Murphy 1936, Johnson 1967). Unlike any other seabird of this region, Peruvian Terns

nest in open, unprotected areas of the desert plain, usually 1–2 km inland (Murphy 1936, Johnson 1967, Vilina 1998), where they are exposed to terrestrial predators. To counteract high levels of predation, Peruvian Terns nest in small loosely aggregated groups in a homogeneous habitat where nests are difficult to detect (Murphy 1936, Vilina 1998). Although well-suited for living in the desert environments, Peruvian Terns are facing new threats as a consequence of human development and expansion into coastal areas, especially in the last three decades. Because of its small population size and patchy distribution, the Peruvian Tern is listed as globally endangered by the IUCN red list (Birdlife International 2008). In Chile, this species has been recently officially classified as endangered (Diario Oficial de la República de Chile N°

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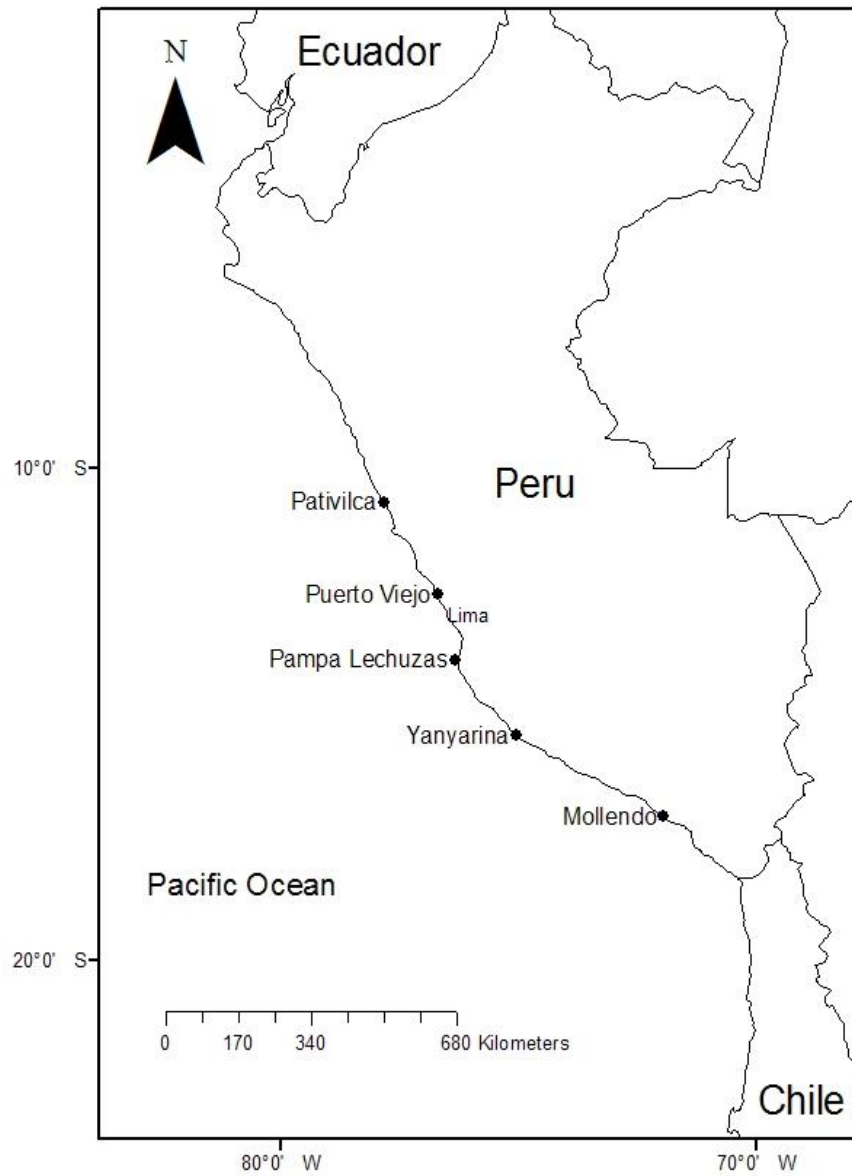


FIG. 1. Known breeding sites of Peruvian Terns (*Sternula lorata*) in Peru between 1970 and 2000.

38.723:10, 2007), but in Peru it has been arbitrarily recognized as vulnerable (Diario Oficial El Peruano, DS N°034-2004-AG, 2004). Thus, any current information on their distribution, numbers, habitat and threats is

valuable for a better understanding of its conservation status.

This paper compiles information on nesting habitat, numbers and potential threats of Peruvian Terns at five breeding sites along the

central-southern Peruvian coast from data collected during the 1970s and 1990s.

STUDY SITES

The location of study sites are given in Figure 1. The observer identity, frequency of visits, survey dates and area prospected in each study site is as follows:

Puerto Viejo ($12^{\circ}34'30''S$, $76^{\circ}42'36''W$, 70 km south of the city of Lima). Data collected by MAP during weekly visits from October to March between 1969 and 1975. Terns nested in a 15-ha sandy beach, 2/3 km long with rocky cliffs at each end and fresh water lagoons on the back.

Mollendo ($17^{\circ}04'12''S$, $71^{\circ}58'12''W$, 2–3 km south of the city of Mollendo). MAP compiled data from personal correspondence with the late R. A. Hughes who did at least monthly surveys between 1969 and 1980 on a beach south of the city of Mollendo. The tern nesting area was located 8–10 km northwest of the wetlands of Mejía.

Paitivilca ($10^{\circ}41'6''S$, $77^{\circ}49'30''W$, 160 km northwest of Lima). MAP compiled data from verbal communication with the late M. Koepcke on 26 January 1970, who collected a small Peruvian Tern chick. The location of this site was described as a beach near the fortress of Paramonga.

Pampa Lechuzas ($13^{\circ}53'24''S$, $76^{\circ}19'48''W$, Peninsula of Paracas). Data collected by AB and CBZ on 19–21 January 1996, 28–29 January 1996, 28 December 1996, 26 November 1997, 15–30 December 1997, and 5 January 2000 in an area of 7 ha. Pampa Lechuzas is a big plateau at sea level located in the southern part of the Paracas Peninsula, 1.5 km northwest of the fishing village of Lagunillas. The area is devoid of vegetation and the substrate is firm

sand, gravel and salt crust. The plateau has an area of approximately 600 ha (2 x 3 km), and is surrounded to the north and east with 100–200 m hills. This site had been suggested as a possible nesting area (Murphy 1936), but no active nest was found before 1996.

Yanyarina ($15^{\circ}26'42''$, $75^{\circ}03'18''W$, 16 km south of the town of Marcona). Data collected by CBZ and AB on 11 November 1997, 13 December 1997, and 13 December 2000 in an area of 3 ha. It is located 2–3 km southeast of Tres Hermanas, a Peruvian Tern nesting site described by Galarza (1968). Because of the close proximity of these two sites, we believe that they are part of the same tern nesting area. This place is a big plateau stretching 4 km along the coastline and 1 km inland. The plateau extends 6 km further north, but we limited our search from Punta Tres Hermanas to Playa Yanyarina.

METHODS

For all locations, one to three researchers walked random transects during 4–6 h to locate as many nests as possible. All individuals (adults and juveniles) present during our visits were counted with the aid of binoculars. Only nests with eggs and chicks were considered active. The presence of predators, footprints, disturbance associated with human activities and a general description of the habitat was recorded for all breeding sites.

Peruvian Tern nests were difficult to detect due to their nesting habits and the physical characteristics of the breeding sites (e.g., low density, large areas, habitat homogeneity). The search effort in Pampa Lechuzas and Yanyarina may have not been enough to cover the whole nesting area. Thus, the results presented in this paper must be interpreted with caution as we do believe that the number of nests found under these conditions may have been underestimated. The first nest was

TABLE 1. Minimum and maximum number of active nests (with eggs or chicks) and individuals (adults and juveniles) of Peruvian Terns (*Sternula lorata*) at five locations in the southern-central coast of Peru. Counts were undertaken during the breeding season (October-February). Question marks indicate that no data were available.

Location	Surveyed area (ha)	Study period	Minimum and maximum number of nests	Minimum and maximum number of individuals
Puerto Viejo	15	1969-1975	0-6	4-40
Mollendo	?	1969-1980	0-30	?
Pampa Lechuzas	7	1996, 1997, 2000	2-7	1-5
Yanyarina	3	1997, 2000	2-5	2-70
Pativilca	?	1970	1-?	?

usually found by chance or by following flying terns that landed close to their nests.

RESULTS

Puerto Viejo. Peripheral nests were found 100-200 m from the high tide line. The sandy beach was covered either with seashells or broken cane. Small brackish lagoons were

surrounded by shrubby vegetation several meters behind the nesting area. This vegetation was primarily the grass (*Distichlis spicata*) and the glasswort (*Salicornia* sp.), a succulent-leaved plant that grows flat on the sand. These two plants occasionally provided refuge and shade to chicks. The Peregrine Falcon (*Falco peregrinus*) was mobbed and escorted by the terns in some occasions

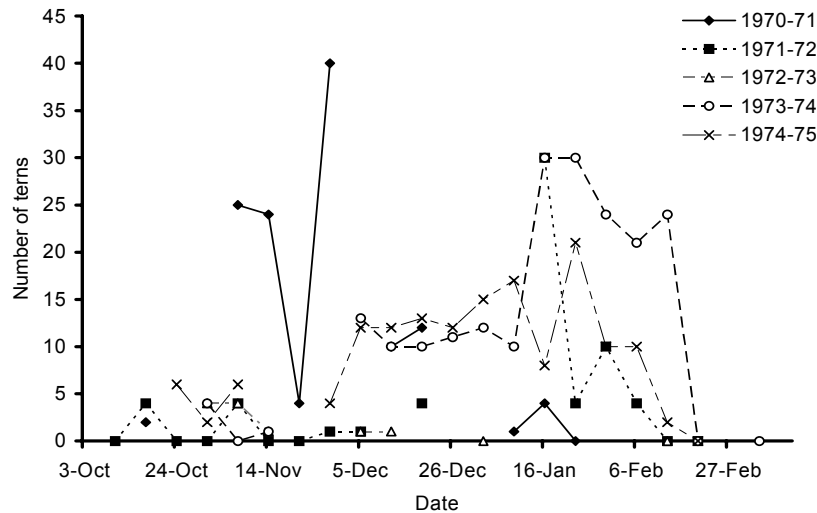


FIG. 2. Weekly variation in the number of adult Peruvian Terns (*Sternula lorata*) at Puerto Viejo, Peru, between 1970 and 1975.

until it left the area. Footprints of foxes (*Pseudalopex* spp.) and domestic dogs (*Canis familiaris*) were common in the terns' breeding site. The site was abandoned in 1977, when urban development started in nearby areas. The maximum number of active nests varied from two in 1970–71 to six in 1973–74 (Table 1). Birds were absent during 1972–73 El Niño. The maximum number of adults counted at once either flying or resting on the beach ranged from 4 in December 1971 to 40 in December 1970 (Table 1). Weekly counts between October and March showed that the highest number of terns usually occurred in January (Fig. 2), with the exception of 1970–71 when the maximum number of terns was recorded during the first week of December. Post-breeding dispersal to unknown areas occurred between March and September.

Mollendo. Terns nested on sandy beaches close to the shore in a strip immediately behind a belt of glasswort, which thrived along the beaches above the normal high-watermark. The Band-tailed Gull (*Larus belcheri*), the Andean fox (*Pseudalopex culpaeus*), the Molina's hog-nosed skunk (*Conopatus chinga*) and the feral cat (*Felis catus*) attacked Peruvian Terns on some occasions. The nesting sites in Mollendo were abandoned in 1978 due to human disturbance. Birds did not breed during 1972–73 El Niño. The number of active nests decreased from 30 in 1970–71 to 10 in 1973–74 (Table 1). Very few pairs were seen in 1975 and no terns were seen breeding from 1978 onwards. In every year, individuals left the breeding area by the end of February and returned in late August.

Pativilca. On 26 January 1970, a chick was captured approximately 50 m from the shore on a sandy beach covered with broken cane, pebbles and seashells. It is unknown whether this locality is still a nesting area.

Pampa Lechuzas. Peripheral nests were found usually 1–2 km from the shores of Lagunillas. Some nests were associated with tire tracks, scattered stones or colorful broken glass. Footprints of foxes and dogs were very common in the area. Nest numbers in Pampa Lechuzas were difficult to estimate owing to the homogeneity of the area, its large extension and the high inter-nest distance. A maximum of seven active nests in an area of approximately 7 ha was recorded in 1995–96. The maximum number of terns observed flying in the colony was five adults.

Yanyarina. The habitat and landscape is very similar to that of Pampa Lechuzas with terns nesting > 0.5 km inland. On 13 December 1997, we found two nests of the Snowy Plover (*Charadrius alexandrinus*) with three eggs each in the nesting area used by the terns. Footprints of foxes were common and, approximately 500 m away from the tern nesting area, there was a fisherman living in a small cabin with six free-ranging dogs. The maximum number of five nests was recorded in November 1997 within an area of approximately 3 ha. On December 2000, we observed a flock of approximately 70 adults resting in the same area.

DISCUSSION

Before the late 1960s, the plain of Pacasmayo was the only known nesting site of Peruvian Terns in Peru (Murphy 1936). During the 1970s, four sites were discovered: Puerto Viejo and Mollendo (both disappeared by late 1970s), Pativilca (it has not been visited since 1970), and Tres Hermanas-Yanyarina (Galarza 1968). In the last decade, four nesting areas have been reported: Pampa Lechuzas, Yanyarina, Paraiso (110 km northwest of Lima; A. Tello pers. com.), and Pacasmayo (100 km northwest of Trujillo; Zavalaga in press), which all together occupy a total nesting area

of 13–15 ha. Breeding locations have remained undetected because of the terns' elusive behavior and nesting habits. Furthermore, their loose breeding aggregations and the use of the desert plains on the mainland and beaches markedly contrast with the majority of seabirds of the Humboldt Current which are more gregarious, conspicuous, and nest either on guano islands (Coker 1919, Murphy 1936) or fenced headlands (Duffy *et al.* 1984). Thus, most of the Peruvian terns' breeding sites have been opportunistically discovered. Because no systematic surveys were conducted along the Peruvian desert plains, the number of nesting areas and distribution range may increase after the detection of new nesting locations in the future.

Nesting habitat. The nesting habitat differed among localities, but terns were always found either on firm sand with gravel, free of plant growth, and usually 1–2 km inland (Pampa Lechuzas and Yanyarina), or near wetlands on sandy beaches, 50–100 m from the shore, with grass and shrubby vegetation behind (Puerto Viejo) or in front the nesting area (Mollendo). In Chile, Peruvian Tern colonies have only been found in the desert plains, generally > 1 km inland (Johnson 1967, Devillers & Terschuren 1976, Vilina 1998, Guerra-Correa 2003). Our observations showed that Peruvian Terns are not strictly inland nesters as previously suggested, but can also choose sandy beaches associated with wetlands. Inland nesting by seabirds may be associated with a high density of terrestrial predators close to the shore. In Peru, Peruvian Terns nest within the foraging range of Andean foxes in the south (Jimenez & Novaro 2004) and Sechuran foxes (*Pseudalopex sechurae*) in the north (Asa & Cossíos 2004). It is unknown why these terns nest at different distances from the shore, but we speculate that the density of foxes along the coastal areas may play an important role in the choice

of the location of the nesting grounds. For instance, Damara Terns (*Sternula balaenarum*), the ecologically equivalent tern inhabiting the southwestern coast of Namibia and South Africa, nest up to 5 km inland, and the distance inland at which terns nest corresponds to a rapid decrease in black-backed jackal (*Canis mesomelas*) and brown hyena (*Hyena brunnea*) footprints, which usually patrol within 300 m of the coast (Simmons & Braine 1993).

Post-breeding dispersion and El Niño. At Mollendo and Puerto Viejo, terns left the nesting areas by the end of February and did not return until August–September. It is unknown where Peruvian Terns disperse after breeding. However, small groups have been recurrently sighted at sea in the winter/spring (2000–2005), 6–35 km offshore the port of Callao, during the course of pelagic trips guided by professional birdwatchers (G. Engblom, F. Schmitt and R. Ahlman pers. com.). These reports suggest that the Peruvian Terns is not strictly a coastal species as previously suggested (Murphy 1936, Harrison 1988), and that the absence in the mainland after breeding may be the result of a pelagic lifestyle.

Peruvian Terns skipped breeding in Puerto Viejo and Mollendo during the strong 1972–73 El Niño, and as occurs in other birds in the region, they can be negatively affected as a result of low food supply, intense rainfall and drastic change in their nesting habitat (Schreiber 2002). During the 1997–98 El Niño, hundreds of Peruvian Terns were sighted 25–200 km offshore (McKiernan *et al.* 2001), suggesting that they can widely disperse during oceanographic anomalies.

CONCLUSIONS

Peruvian Terns are one of the most threatened seabirds in Peru and Chile because their nesting areas are still exposed to displacement

and human disturbance. The impacts of coastal development and public recreation have been ignored because their breeding sites have remained undetected. Very few people are aware that these terns use the desert coastal plains for nesting. Thus, future projects for industrial and human development in coastal areas should incorporate the protection of Peruvian Tern breeding sites as part of their environmental commitments as well as the implementation of education programs to local communities. A simultaneous census of Peruvian Terns along the coast of Peru and northern Chile is recommended together with long-term projects of their breeding biology and feeding ecology.

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