

# RED-BILLED TROPICBIRD *PHAETHON AETHEREUS* OCCURRENCE PATTERNS IN THE STATE OF VERACRUZ, GULF OF MEXICO: POSSIBLE CAUSES AND IMPLICATIONS

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## SUMMARY

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The Red-billed Tropicbird *Phaethon aethereus* is considered a pantropical species, but its local distribution is far from well documented. In the Gulf of Mexico the species has thus far been reported only in the northern region. Here we report seven sightings at the mouth of the Jamapa River, Veracruz State, Mexico. These constitute the second to eighth sightings of this species in eastern Mexican waters and the first for this state. The bird in each sighting seemed to be in good condition, and we present an assessment of potential prey in the area based on previous studies of the diet of the species. Of interest, tropicbird sightings were in an area characterized by a salt-wedge estuary, and this is not the first time this association has been noted, indicating that use of this habitat or at least coastal habitats in general may not be unusual for the species.

Keywords: Gulf of Mexico, *Phaethon aethereus*, Red-billed Tropicbird, salt-wedge estuary, Mexico

## RESUMEN

El ave del trópico de pico rojo *Phaethon aethereus* se considera una especie pantropical, pero su distribución aún no está bien documentada. Hasta ahora, en el Golfo de México, la especie ha sido reportada sólo en la región norte. En este trabajo informamos de siete avistamientos de ave del trópico de pico rojo en la desembocadura del Río Jamapa, en el estado de Veracruz, México. Estos constituyen del segundo al octavo avistamientos de esta especie en aguas orientales mexicanas, y el primero para este Estado. Cada vez que fue observada, el ave parecía en buenas condiciones, y presentamos una lista de especies de peces que pueden ser presas potenciales de esta ave, con base en estudios previos de su dieta. Es interesante que el ave se observó siempre en un estero de cuña salada, asociación que no es observada por primera vez, por lo que el uso de este tipo de hábitat, o de hábitats costeros, puede ser más común para esta especie de lo que anteriormente se creía.

## INTRODUCTION

In Mexico, the Red-billed Tropicbird *Phaethon aethereus* is common, breeding along the west coast on islands of the eastern North Pacific Ocean and Gulf of California (AOU 1998). However, little information is available about the species on the eastern coast of Mexico (Lowery & Newman 1954, Duncan & Havard 1980, Gallardo *et al.* 2009). The latter reference mentions the Red-billed Tropicbird, but only based on records from the northern Gulf of Mexico and Cuba, and Duncan & Harvard (1980) report that this species had not been recorded in the Gulf of Mexico at that time. There is one recent record from the Mexican east coast at Barra de Ostiones, Tamaulipas, México, 12–18 May 2005, when the species was seen in an estuary a few kilometers inland (Gómez de Silva 2005). While systematic observations have been carried out in the species' eastern Pacific range (Spear & Ainley 2005a, b), in the western Atlantic/Gulf of Mexico region, records seem to be the result of casual encounters (Nisbet *et al.* 2013).

Tropicbirds are relatively high flyers and forage by plunge-diving. Their mobility makes them well adapted to feeding over tropical

and subtropical marine waters that are relatively poor in nutrients and exhibit patchy prey, but the Red-billed Tropicbird also forages in temperate water regions, such as the Gulf of California, where ocean fronts and upwelling areas with very high productivity exist (Anderson 1983, Alvarez-Borrego 2002). They have been found to feed on small invertebrates, such as squid and pelagic crabs, but mostly on small fish such as sardines, anchovies, flyingfish, halfbeaks, silversides, jacks, mojarras, and mackerels 90–182 mm in length in the Gulf of California (Castillo-Guerrero *et al.* 2011; see tables for scientific names of fishes).

Here we report seven sightings of Red-billed Tropicbirds in a fluvial area adjacent to the port of Veracruz, Mexico, in the central western coast of the Gulf of Mexico.

## STUDY AREA

All sightings occurred at or close to the small pier of the Instituto de Ciencias Marinas y Pesquerías, Universidad Veracruzana (19°05'59.7"N, 96°06'31.4"W), which is located inland, on the shore of the Jamapa River, 1 km from the river mouth, in Veracruz

State (Municipio de Boca del Río). The lower part of the Jamapa River behaves as a salt-wedge estuary, where the presence or absence of the salt intrusion depends mainly on the level of river discharge (Perales & Sanay 2011). The Jamapa River discharges into a bay limited, both north and south, by a coral reef.

Numerical modeling indicates that circulation over the adjacent continental shelf is mainly wind-induced, such that during winter the circulation is downcoast (north to south), with cool low-salinity water derived from the rivers of the northern Gulf of Mexico (Mississippi and Atchafalaya) advected westward along the Louisiana-Texas shelf and then southward along the Tamaulipas-Veracruz shelf (Zavala-Hidalgo *et al.* 2003). The low river discharge and wind-induced downwelling events during winter in the Jamapa River area enhance the salt water intrusion, causing it to reach its maximum at that time of year.

As is characteristic of coral reef regions (Choat & Bellwood 1991, Robertson 1998, Bellwood & Hughes 2001, Bellwood & Wainwright 2002), the area has a high diversity of fishes (Chavez & Beaver 2007).

## METHODS

Observations of the tropicbirds were casual and unexpected, and mostly constrained to the vicinity of the institute. Upon discovery, observers focused on noting behavior, location and general condition, and took photographs when possible.

As one aspect of sightings was that individuals remained for long periods in the study area, the coastal area fish abundance and diversity, as potential prey, were assessed by C.M. using 11 fish samplings at

a sandy beach called Mata de Uva, 8 km south of the Veracruz Reef, between September 2009 and August 2011. Each sampling consisted of a single haul of a beach seine net (750 m long, 3 m wide, mesh size 3½ in. at lateral wings and ¾ in. at the cod-end). The total catch of each haul was separated and identified at the species level. We compared findings to known prey of Red-billed Tropicbirds.

## RESULTS

### Sightings

Seven sightings of a Red-billed Tropicbird (possibly the same individual for the first six sightings, due to the proximity of sightings in space and time) were recorded in 2012 (Table 1). All sightings were close to the mouth of the Jamapa River. The sightings of 5 January and 3, 10 and 27 February were made by L.J.I. from a bridge locally known as Puente Jamapa (19°05'59"N, 96°06'42"W). Low-resolution images of this individual are posted at: [http://www.flickr.com/photos/observando\\_aves/sets/72157633447629275](http://www.flickr.com/photos/observando_aves/sets/72157633447629275). The sightings of 13 and 15 February and 15 November, by E.V. (and confirmed by M.A.L. for the first sighting), occurred close to the small pier of the Instituto de Ciencias Marinas y Pesquerías. On both 13 February and 15 November, the tropicbirds, seen from land, flew over the river for about five minutes, and thereafter departed to sea. The sighting on 15 February was made from a skiff near the pier by C.A.-C. and photographed by H.A.C.-V. (Fig. 1). All of the Red-billed Tropicbirds that we report here seemed healthy and in good condition, exhibiting vigorous flight, in contrast with most other reports in other Atlantic regions of individuals far from their regular distribution area, where birds were found emaciated or dead. If the first six sightings were of the same individual, then it remained in the area for two months; or if the sightings were of multiple individuals, they remained present for days at a time.

### Potential food items

All the fish families, and several genera, such as *Opisthonema*, *Hemiramphus*, *Decapterus*, *Oligoplites*, and *Gerres*, that have been reported as part of the diet of this tropicbird species are present in the study area, and the sizes of the specimens caught were appropriate for this seabird (Table 2, Fig. 2) (Diamond 1975, 1983, Tershy & Breese 1997, Castillo-Guerrero *et al.* 2011). According to our analysis of relative abundances of the fish species present

**TABLE 1**  
Sightings of Red-billed Tropicbirds near the mouth of the Jamapa River, Veracruz State (Municipio Boca del Río), Mexico, in 2012

Date (all in 2012)	Time (local)	Location	Observer	Photo (P) or video (V) available
5 January	13h40–13h50	19°05'59"N 96°06'42"W	L.J.I.	P <sup>a</sup>
3 February	08h30	19°05'59"N 96°06'42"W	L.J.I.	
10 February	14h28	19°05'59"N 96°06'42"W	L.J.I.	P <sup>a</sup>
13 February	10h30	19°05'59.7"N 96°06'31.4"W	E.V., M.A.L.	
15 February	08h27	19°05'59.7"N 96°06'31.4"W	C.A.-C., A.C.-V.	P <sup>b</sup>
27 February	10h55–11h01	19°05'59"N 96°06'42"W	L.J.I.	P <sup>a</sup> , V
15 November	13h55	19°05'59.7"N 96°06'31.4"W	E.V.	

<sup>a</sup> Photos available at: [http://www.flickr.com/photos/observando\\_aves/sets/72157633447629275](http://www.flickr.com/photos/observando_aves/sets/72157633447629275), also <http://youtu.be/asFvUbsGYmw>.

<sup>b</sup> Fig. 1, this study.



**Fig. 1.** Red-billed Tropicbird found at the Rio Jamapa waters, ca. 1 km from the mouth of the river in salt-wedge estuarine conditions, on 15 March 2012. Photo by H.A. Cabrera-Valenzuela.

TABLE 2

Known and potential prey of the Red-billed Tropicbird, including those identified at least to the generic level, found in the study area

Prey	Mean total length in cm $\pm$ SD (N)	Region	Reference
<b>CEPHALOPODS</b>			
<i>Loliolopsis diomedea</i>	9.3 (17)	Farallón de San Ignacio	2
unidentified squid	-	San Pedro Martir Island	1
( <i>Theuthide</i> sp.) <sup>a</sup>	-	SAV	3
<b>CRUSTACEANS</b>			
<i>Pleuroncodes planipes</i>	-	Farallón de San Ignacio	2
<b>FISHES</b>			
<b>Engraulidae</b>			
( <i>Anchoa hepsetus</i> )	11.9 $\pm$ 1.5 (104)	SAV	3
( <i>Cetengraulis edentulous</i> )	12.9 $\pm$ 3.4 (47)	SAV	3
<b>Clupeidae</b>			
( <i>Harengula jaguana</i> )	12.0 $\pm$ 2.3 (103)	SAV	3
<i>Opisthonema libertate</i>	-	Farallón de San Ignacio	2
		San Pedro Martir Island	1
( <i>Opisthonema oglinum</i> )	15.7 $\pm$ 5.1 (49)	SAV	3
( <i>Sardinella aurita</i> )	15.9 $\pm$ 2.0 (7)	SAV	3
( <i>Bervoortia gunteri</i> )	21.9 $\pm$ 1.43 (5)	SAV	3
( <i>Dorosoma petenense</i> )	21.5 (1)	SAV	3
<b>Exocoetidae</b>			
<i>Fodiator acutus</i>	16.2 (18)	Farallón de San Ignacio	2
<i>Hirundichthys</i> sp.	13.2 (2)	Farallón de San Ignacio	2
<i>Parexocoetus brachypterus</i>	21.4 (1)	Farallón de San Ignacio	2
<i>Cypselurus callopterus</i>	-	Farallón de San Ignacio	2
<b>Hemiramphidae</b>			
<i>Oxyporhamphus mictropterus</i>	-	Farallón de San Ignacio	2
<i>Hemiramphus saltator</i>	18.1 (5)	Farallón de San Ignacio	2
( <i>Hemiramphus brasiliensis</i> )	32.0 $\pm$ 5.4 (151)	SAV	3
( <i>Hyporhamphus unifasciatus</i> )	22.3 $\pm$ 2.7 (29)	SAV	3
<b>Carangidae</b>			
( <i>Caranx crysos</i> )	17.7 $\pm$ 3.4 (93)	SAV	3
( <i>Caranx hippos</i> )	13.1 $\pm$ 5.0 (43)	SAV	3
( <i>Caranx latus</i> )	11.8 $\pm$ 3.5 (52)	SAV	3
( <i>Chloroscombrus chrysurus</i> )	12.7 $\pm$ 4.2 (83)	SAV	3
<i>Decapterus macarellus</i>	-	Farallón de San Ignacio	2
( <i>Decapterus punctatus</i> )	15.4 $\pm$ 0.7 (39)	SAV	3
( <i>Hemicaranx amblyrhynchus</i> )	21.9 $\pm$ 6.1 (33)	SAV	3
( <i>Selar crumenophthalmus</i> )	16.3 $\pm$ 3.3 (18)	SAV	3
( <i>Selene brownie</i> )	10.0 $\pm$ 4.1 (93)	SAV	3
( <i>Selene vomer</i> )	9.5 $\pm$ 8.3 (4)	SAV	3
<i>Oligoplites refulgens</i>	14.5 (2)	Farallón de San Ignacio	2
( <i>Oligoplites saurus</i> )	20.7 $\pm$ 3.1 (59)	SAV	3
<b>Gerreidae</b>			
( <i>Diapterus auratus</i> )	14.2 $\pm$ 1.4 (87)	SAV	3
( <i>Eucinostomus argenteus</i> )	12.3 $\pm$ 1.5 (56)	SAV	3
( <i>Eucinostomus melanopterus</i> )	12.8 $\pm$ 1.5 (68)	SAV	3
( <i>Euguerres plumier</i> )	20.5 $\pm$ 0.6 (2)	SAV	3
( <i>Gerres cinereus</i> )	20.6 $\pm$ 0.5 (3)	SAV	3
<i>Gerres</i> sp.	13.2 (1)	Farallón de San Ignacio	2
<b>Scombridae</b>			
<i>Scomber</i> sp.	-	Farallón de San Ignacio	2
<i>Scomber</i> sp.	-	San Pedro Martir Island	1
( <i>Scomberomorus cavalla</i> )	26.6 $\pm$ 8.3 (36)	SAV	3
( <i>Scomberomorus maculatus</i> )	34.7 $\pm$ 6.8 (42)	SAV	3

References: 1. Tershy & Breese 1997; 2. Castillo-Guerrero *et al.* 2011; 3. Velarde *et al.* 2014 (this study).

SAV = Sistema Arrecifal Veracruzano (Veracruz Reef System); SD = standard deviation.

<sup>a</sup> Fish species in parentheses occur in the study area and are considered potential prey of the Tropicbird because they fall within the size range and prey type identified for this seabird species elsewhere.

in the samplings, potential prey species known in the diet of Red-billed Tropicbirds, at least at the generic level, were either almost constantly present and abundant (e.g. *Harengula jaguana*, *Anchoa hepsetus*) or, alternatively, abundant during certain periods of the year (e.g. *Chloroscombrus chrysurus*, *Sardinella aurita*; Table 2).

### Jamapa River conditions

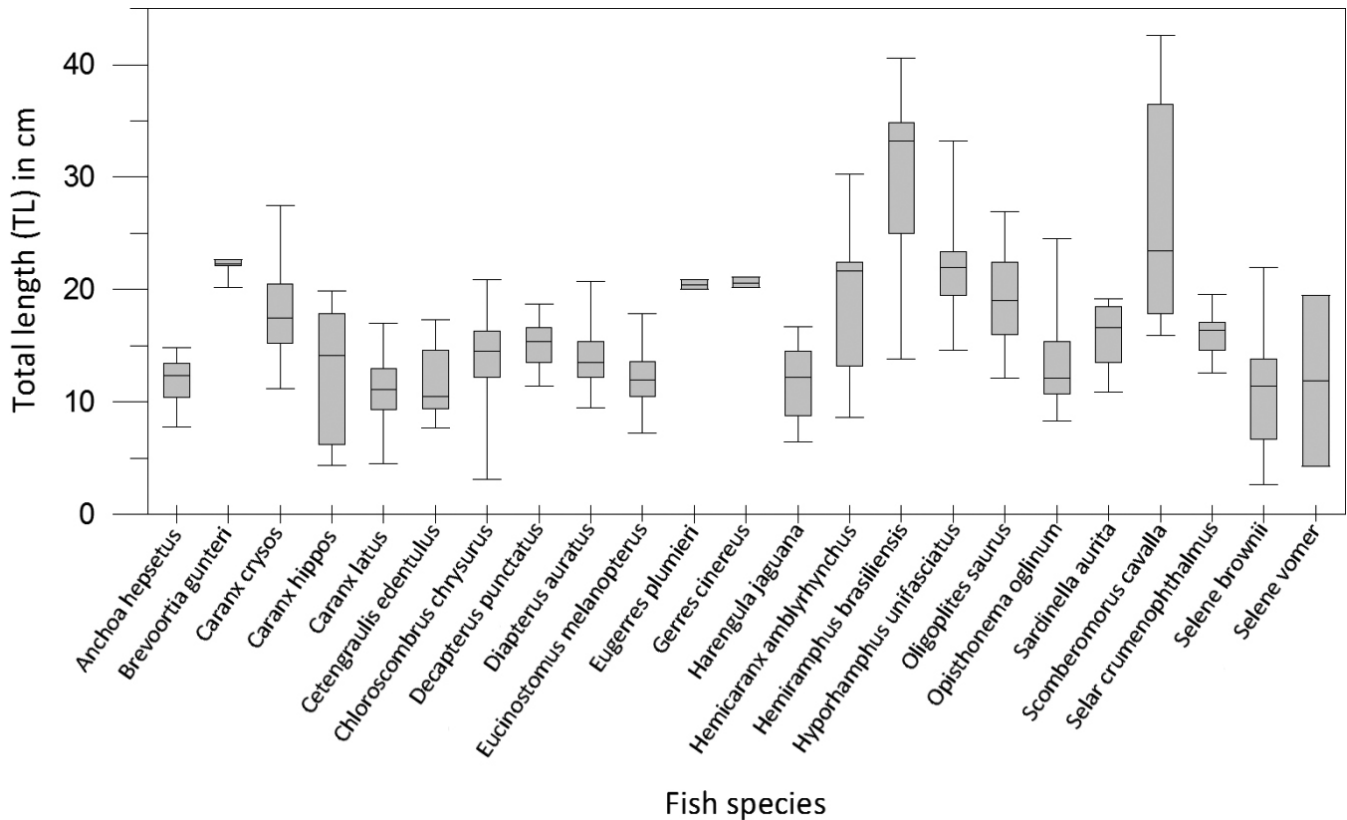
According to observations carried out by H.P. and R.S., the salt wedge in the Jamapa River can penetrate up to 9 km upriver. The estuarine section of the river has an average depth of 3 m. The depth of the interphase between the salt wedge and fresh water, considered to be at 20 psu, varies according to the river runoff, wind (force and direction), and the tidal stage. These types of interphases tend to be highly productive (Kasai *et al.* 2010) and could concentrate marine fishes (prey) based on fresh-water tolerance.

### DISCUSSION

We believe that the first six sightings reported here could well be of the same individual, due to the proximity in time of the majority of these sightings; however, a succession of individuals may have been observed. Although this species is common in the Mexican Pacific and Gulf of California, where it breeds on several islands (Velarde & Anderson 1994, Tershy & Breese 1997, AOU 1998, Velarde *et al.* 2005), there is only one previous record of the species along the coast of eastern Mexico (Gómez de Silva 2005). Harrison (1983), in a distribution map, shows the species as occurring in the southern Gulf of Mexico during the non-breeding season, but gives no supporting references, and does not show the species in the

northern Gulf area, where it has repeatedly been reported to occur (Lockwood & Freeman 2014); Walsh-McGehee (2000) reports it to occur around the southern Caribbean, north to Panama. Second, to our knowledge, these sightings add to at least one other confirmed Red-billed Tropicbird occurring in inshore waters, that was not storm-blown (see below). The species identity of other records of tropicbirds in inshore waters is not certain (Harte & McCallum 1959, Fussell & AllenGrimes 1980, Lee & Irvin 1983).

Seabird sightings far outside their supposed distributional range are often believed to result from the birds having been blown by storms, cyclones, hurricanes or other strong wind events (Wiley & Wunderle 1993). In particular, Lee (2009) considers the Red-billed Tropicbird to be susceptible to displacements over wide areas, including up to 80 km inland (Harte & MacCallum 1959). Most of these displacements in the Gulf of Mexico region occur during the summer, when hurricanes and tropical storms are common. However, he comments that most of these displacements are only temporary if the birds are unhurt, since healthy seabirds are known to be able to return to favorite feeding areas, hundreds of kilometers away, in a matter of hours to days. In the area and date of the sightings reported herein, there were no intense storms, and the prevailing winds were north and north northwest. Thus, if occurrence was wind-aided, it is likely that the individuals came from the northern Gulf of Mexico, possibly Texas or Louisiana, but certainly does not exclude arrival from the east ([http://www.ndbc.noaa.gov/download\\_data.php?filename=verv4c2012.txt.gz&dir=data/historical/cwind/](http://www.ndbc.noaa.gov/download_data.php?filename=verv4c2012.txt.gz&dir=data/historical/cwind/); Gutierrez de Velazco & Winant 1996). Indeed, tropicbirds prefer to fly quartering the wind (Spear & Ainley 1997).



**Fig. 2.** Size ranges of fishes, in genera or families of known Red-billed Tropicbird prey, caught during beach-seine net hauls in the Veracruz Reef System.

Based on the prey types and relative abundances found in the fish samplings, the Red-billed Tropicbirds reported here were in an area where their usual prey occurs in abundance. This assumption is reinforced by the fact that the observed individuals were in good condition, in contrast to other Red-billed Tropicbird records (Post *et al.* 1998), and that one individual may have been present for two months.

The fact that these tropicbirds, as well as some others reported in the literature (Lee & Irving 1983, Gómez de Silva 2005), were observed in coastal waters was also of interest, and contrasts greatly with the general idea of this being exclusively an open-ocean species. One of the two inland sightings reported previously was at Dillon, South Carolina (cited by Lee & Irvin 1983), 80 km inland. The site, near Winyah Bay, also is a salt-wedge estuary (Patchineelam & Kjerfve 2004), some 20 km upriver from its mouth. Therefore, it appears that we may have to re-assess the supposed exclusive pelagic nature of this species' occurrence, and consider that these tropicbirds may occur regularly in coastal waters, with occurrence in estuaries not all that unusual.

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