

NOTES

NESTING OF FORSTER'S TERN IN A TROPICAL COASTAL LAGOON, CUYUTLÁN, COLIMA, MEXICO

ERIC MELLINK, Departamento de Biología de la Conservación, División de Biología Experimental y Aplicada, Centro de Investigación Científica y de Educación Superior de Ensenada, Baja California, Mexico (U.S. mailing address: CICESE, P. O. Box 434844, San Diego, California 92143-4844); emellink@cicese.mx

MÓNICA RIOJAS-LÓPEZ, Departamento de Ecología, Centro Universitario de Ciencias Biológicas y Agropecuarias, Universidad de Guadalajara, Guadalajara, Jalisco, Mexico

Forster's Tern (*Sterna forsteri*) nests mostly from central Canada to the central United States and has scattered colonies along both coasts of North America, south to northern Baja California along the west coast and to northern Tamaulipas along the east coast (Palacios and Alfaro 1991, Howell and Webb 1995, AOU 1998, McNicholl et al. 2001, Molina and Garrett 2001). In much of Mexico, Forster's Tern is a common winter resident (Howell and Webb 1995, AOU 1998). During 2005, while doing field work on gulls and terns nesting in Laguna Cuyutlán, Colima, Mexico, we discovered 10 pairs of Forster's Terns nesting.

Laguna Cuyutlán is a large coastal lagoon (35 km long, 7200 hectares), oriented southeast-northwest and bordered by thickets of mangrove (Mellink and de la Riva 2005). The lagoon is surrounded by tamarind, mango, and lime orchards, and by some pasturelands. The urban area of the city of Manzanillo lies at its northwestern end. In the northwestern section of the lagoon, a number of dredge-spoil islands give evidence of past dredging in that area. The deeper parts of the northwestern and middle sections of the lagoon are heavily fished, while the extensive shallows along the southeastern shores are used for salt extraction (Mellink and de la Riva 2005).

The southeastern shore of the middle section of the lagoon is very shallow and dotted with small, muddy islets a few meters wide and from a few tens of meters to over 100 meters long. These islets are covered largely with *Batis* and *Salicornia* (Mellink and de la Riva 2005). It was on three such islets that Foster's Terns were nesting. All nests examined were made of dead stems of those two plant species, built on bare ground, but adjacent to the vegetation. Sixteen eggs measured 41.89 ± 1.63 mm long and 29.63 ± 0.97 mm wide (mean \pm standard deviation).

On 14 May, through a spotting scope, we detected five Forster's Terns in incubation position on the first islet ($19^{\circ} 00' 25''$ N $104^{\circ} 10' 49''$ W). Two other terns performed defensive dives on us. We identified the species by bill coloration, long forked tail, and harsh voice. Photographs we took were later confirmed by Philip Unitt. On one occasion all the adults that seemed to be on nests took flight, apparently in response to the sound of a trailer truck on the nearby highway. The terns landed less than a minute later in the same places from which they had come, strengthening our suspicion that they were nesting. We could not examine the nests directly at that time because access was hindered by a low water level (<10 cm) and soft muddy bottoms.

On 23 May an adult flew over the colony with a fish in its bill but failed to land after several passes. There were two chicks less than a week old (on the basis of plumage coloration and size) begging for food on the ground. At this time, with adequate footwear, we were able to inspect the colony directly. We found five nests with eggs: three nests contained three eggs each, one contained two eggs, and one contained one egg. The two chicks were hiding among the vegetation away from their nest, and they might have been from the nest with one egg, which was close to them. At

NOTES

least three Laughing Gulls (*Larus atricilla*) were on nests in the same area, one very close to the Forster's Terns. Also on 23 May we found a second islet with incubating Forster's Terns (19° 00' 27" N 104° 10' 32" W). From a distance, three adults appeared to be on nests, but we could find only two nests: one contained three eggs, the other, one egg. There was a chick less than a week old that could have belonged to the latter nest.

On 3 June we monitored the islets by using a spotting scope. On the first islet there were three adults incubating, and two nests clearly visible were empty. We saw one chick between 3 and 4 weeks old, but there could have been more. On islet 2 we observed one adult in incubating position, one standing, and one chick between 1 and 2 weeks old. On this date we found a third islet north of and very close to islet 1. On it were another three adults in incubating position. We did not visit this islet.

On 2 July the water level had risen about 30 cm above the level on our previous visit, as a result of the spring tides of 22–23 June, and the Forster's Terns' nesting islets were under water. We did not see any Forster's Terns in the area, but because the chicks are able to swim at a very early age, we suspect that those not yet able to fly swam to nearby higher islets.

In 1959 Schaldach (1963) found Forster's to be the most common tern in Colima from May to September, and he speculated that the species might have bred not far from the northwestern boundary of that state. The colony that we report here is 1730 km from the closest Baja California breeding locality (Palacios and Alfaro 1991) and about 1000 km from the closest one in Tamaulipas (Howell and Webb 1995), albeit over very high, mountainous country. The northernmost confirmed colonies are at about 55° N (McNicholl et al. 2001), and therefore the known breeding distribution of Forster's Tern now spans over 36° of latitude. This is one of the largest latitudinal distributions of any coastally nesting North American tern. The Roseate Tern (*S. dougallii*) and Caspian Tern (*S. caspia*) nest over about 35° 40' and 35° of latitude, respectively, but the Common Tern (*S. hirundo*) nests over about 48° of latitude (as derived from AOU 1998).

In western North America, the few data available suggest that the species has spread outward from the interior of the United States, establishing new colonies in San Francisco Bay, California, in 1948, then south along the west coast to San Diego and northern Baja California (McNicholl et al. 2001) and north to British Columbia. Although no pertinent specimens exist in Mexican collections, Schaldach's (1963) comment opens the possibility that Forster's Terns already nested in southern Mexico several decades ago.

In Laguna Cuyutlán, Forster's Terns nest on islets that are very difficult for people to reach. Indeed, more Forster's Terns may nest in areas even more difficult of access than those we visited, as that part of the lagoon is dotted with islets that seem suitable. Furthermore, there is no incentive for people to visit these islets. We did not see any sign of predation on any of the nests, but we documented some predation in a nearby colony of Black Skimmers (*Rynchops niger*), possibly from Raccoons (*Procyon lotor*), whose tracks are common on the islets and as suggested by the way eggshells were opened. We have recorded tracks of the American Crocodile (*Crocodylus acutus*) on some of the islands, but they appeared to represent only occasional visits. If crocodiles prey on the chicks of larids, they probably target larger colonies of more gregarious species such as the Royal Tern (*Sterna maxima*) and Laughing Gull, at least from the tracks we have seen. Laughing Gulls and Gull-billed Terns (*Sterna nilotica*), which also nest in the area, are other potential predators. On the other hand, any fluctuations in the abundance of small fish could affect the Forster's Terns, as well as other bird species nesting in Laguna Cuyutlán. However, there is no information on the dynamics of the fish community or on the factors regulating local fish populations.

The nesting ecology of Forster's Terns, and of other waterbirds, in Laguna Cuyutlán is closely linked to water levels in the lagoon. Therefore, the intended dredging of the

NOTES

artificial channels that connect the lagoon to the sea, which would increase the water level permanently, is probably the major threat to them. There are three reasons for the potential higher water levels. Fisheries authorities argue that such an increase in water level is necessary to prevent fish die-offs and to enhance fishing. Current plans to construct a re-gasification terminal also include dredging the channels, to permit the entrance of large ships. Finally, the state government may be planning to construct inside the lagoon a terminal for container ships, for which dredging is also necessary.

The full significance of our record cannot be assessed currently, but the distance to the closest colony of the same species and the fact that Forster's Terns are nesting in true tropical conditions seem of great interest. Further work should be done to determine the total number of Forster's Terns breeding in Laguna Cuyutlán, as well as to determine year-to-year variations.

Jorge Luis Ramírez guided and transported us through the Laguna Cuyutlán shallows, and Jorge Aguilar Torres took us along the dredge islets of the western part of the lagoon. Field work in Laguna Cuyutlán was supported by a grant from the U.S. Fish and Wildlife Service to E. Palacios and E. Mellink, administered by PRONATURA–Mar de Cortés (La Paz office). Eduardo Palacios provided logistical support. Philip Unitt verified our tern photographs, and Richard Erickson, Robert Hamilton, and an anonymous reviewer kindly helped to improve this article. Our thanks to all of them.

LITERATURE CITED

- American Ornithologists' Union. 1998. Checklist of North American Birds, 7th ed. Am. Ornithol. Union, Washington, D.C.
- Howell, S. N. G., and Webb, S. 1995. A Guide to the Birds of Mexico and Northern Central America. Oxford Univ. Press, Oxford, England.
- McNicholl, M. K., Lowther, P. E., and Hall, J. A. 2001. Forster's Tern (*Sterna forsteri*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 595. Birds N. Am., Philadelphia.
- Mellink, E., and de la Riva, G. 2005. Non-breeding waterbirds at Laguna de Cuyutlán and associated wetlands, Colima, Mexico. *J. Field Ornithol.* 76:158–167.
- Molina, K. C., and Garrett, K. L. 2001. The breeding birds of the Cerro Prieto geothermal ponds, Mexicali Valley, Baja California, in *Birds of Baja California: Status, distribution, and taxonomy* (R. A. Erickson and S. N. G. Howell, eds.). Am. Birding Assoc. Monogr. Field Ornithol. 3:23–28.
- Palacios, E., and Alfaro, L. 1991. Breeding birds of Laguna Figueroa and La Pinta pond, Baja California, Mexico. *W. Birds* 22:27–32.
- Schaldach, W. J. 1963. The avifauna of Colima and adjacent Jalisco, Mexico. *Proc. W. Found. Vert. Zool.* 1:1–100.

Accepted 3 October 2005