NOTES ON THE DISTRIBUTION OF SOME PUERTO RICAN BIRDS AND ON THE COURTSHIP BEHAVIOR OF WHITE-TAILED TROPICBIRDS

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In the course of studies on wintering Royal Terns (*Thalasseus maximus*) in Puerto Rico from 18–28 January 1969, we secured information on the distribution and behavior of several species. Wetmore (1916, 1927), Danforth (1936 and others), and more recently, McCandless (1958), and Leopold (1963) have provided the major faunal-list treatments; Robertson (1962) discussed an adjacent and faunally inseparable Virgin Islands, and Recher and Recher (1966) the birds of Luquillo National Forest, Puerto Rico. Bond (1956 and supplements, 1961) treats the whole West Indies, including of course Puerto Rico. But significant contributions to the knowledge of the distribution of Puerto Rican birds are still possible, and descriptions of the behavior and ecology, especially of endemic species and genera, have only just begun.

SPECIES ACCOUNTS

White-tailed Tropicbird. *Phaethon lepturus.* In Puerto Rico this species breeds at a few locations where limestone cliffs drop into the Atlantic Ocean. The sea cliffs at Guajataca, 102 km W of San Juan on route 2, are probably the most easily reached breeding site, and allow unparalleled ease of observation. We spent part of 26 and 27 January watching tropicbird display flights there, although peak numbers were not due until February (McCandless, pers. comm.). Assuming that the same birds were frequently returning to the cliff face, we estimated a total of 12–25, with nine in view at one time. Stonehouse (1962) says that newly returned birds rarely remain at the cliff face more than a few hours, so our estimate may be low.

Most birds travelled singly or in groups of two or three, and we did not see any land on the cliffs. This may have been due to the early stage of the breeding cycle or to our presence on the cliff tops, because shortly after we returned to our car they came much closer and flew directly over the grassy top of the cliff. While we were observing, courting pairs usually remained fairly close to the cliff for about 5 min, then, either drifting away from one another or staying together, wandered out over the water, often out of sight. None fished while we saw them.

Displaying was completely aerial, and was usually initiated when one (the male?) overtook and flew above another (the female?). If he succeeded in sustaining her attention, he would begin calling tern-like *kack-kack* or *creek-creek*, coupled with an exaggerated body posture. The tail was dropped from the normal longitudinal body axis to about 40–45° below the horizontal, sometimes at the peak of the display reaching well beyond the vertical, perhaps as much as 70° below its normal position. At the same time, the normal, light, shallow, fluttery wingbeats that went no more than about 20° above and below the horizontal, changed to a slow beat during which the wings never went below the horizontal and often seemed to touch vertically. The body was usually arched upward and the head and bill pointed downward as the male inched closer to the female. At this point, if the female gave no response, the male either drifted away, immediately resuming normal flight and body posture, or began displaying all over again. If the female did respond (whether posturally or vocally was unclear from our limited observations), the male then dropped his wings downward about 35° below the horizontal, holding them in that position while gliding downward in a very large, shallow spiral, lasting, however, no more than about 10 sec. The female also held her wings downward, gliding with the male, but usually held this position a much shorter time. This may be explained by the early stage of the courtship/breeding cycle, where the female has not been sufficiently aroused by repeated male courtship stimuli; later in the season her rigid-wing flight would probably be longer in duration. (See Brattstrom and Howell 1956 and van Tets 1965 for a description of the display flights of *Ph. aethereus*).

The display groups usually involved two birds, but frequently a third joined, acting as another male trying to gain the attention of the female, but drifting away rather quickly if there was no response. Often a second male would try to interest a female who had just left another male without responding; the second male was then often successful in eliciting a display response. Sometimes even more birds joined a pair or trio, usually breaking up soon into additional pairs or trios and drifting apart from the others. On one occasion a third bird attempted to join a pair flying along after a display flight. The male chased the intruder almost to the water surface (several hundred feet below), and then rejoined the female, which had continued slowly flying ahead during the chase.

These display flights are in many respects like those of some terns (especially *Thalasseus maximus*) but differ in at least two major respects: no fish is carried by either tropicbird, and there is no upward spiral of the pair. The pairs and trios are also similar to the tern courting groups of three (probably two males and a female). Our observations should be read in conjunction with the comments of van Tets (1965), noting particularly those characters of morphology, breeding biology, and behavior wherein *Phaethon* is anomalous among the Pelecaniformes.

One striking morphological feature we observed was that frequently the upper bird of a pair had beautiful salmon-pink central rectrices, sometimes brighter than those typical (of museum specimens) of *Ph. rubricauda.* Usually the bill of such birds was also a deep coral-orange. Contrariwise, the lower bird usually but not always had plain white central rectrices and a yellow bill. Stonehouse (1962) found that these differences had a high sexual correlation, the pinker birds being males, behaviorally, the whiter ones, females. This supports our conclusions about the sexes of the upper and lower birds. Unlike Stonehouse, we did not see any pink-*bodied* birds, but his birds belonged to *P. l. ascensionis*, while those on Puerto Rico should be *P. l. catesbyi.*

Red-footed Booby. *Sula sula.* McCandless (1958) states that this species only occasionally visits the west coast of Puerto Rico, although it is an abundant breeder on Desecheo and Mona Islands, about 20 and 40 mi, respectively, W of Puerto Rico. Leopold (pers. comm.) did not know of any records from the mainland of Puerto Rico, calling the species very pelagic.

B. and J. Trimble saw three in the white phase diving into the water off the beach at Estremada on 19 January 1968, recorded here for the first time; this may be the first definite record from the mainland of Puerto Rico. It was with some surprise then that we saw about 10 (dark phase adults or immatures) flying eastward below the sea cliffs at Guajataca on 26 January. But on the following morning, along a 10-mile stretch of beach east of Arecibo (along route 684), Red-footed Boobies were moving past at the rate of about 25–30 per min when first observed at 09:45, slackening to about 5–10 per min at Arecibo Lighthouse at 10:45. Approximately one in 15, or about 7 per cent, were white-phase adults. No more than 10 Brown Boobies (*Sula leucogaster*) were seen with them, and one large immature was probably a Masked Booby (*Sula dactylatra*). We estimated that no fewer than 300–400 red-foots passed by in that hour. In addition to those moving past, there was one feeding flock of about 100 at Punta Palmas Altas, and when we got to Guajataca at about 12:00, there was another flock of about 90 feeding actively in the waters below the cliffs. Of these, 17 were white-phase adults. These numbers suggest a major movement, perhaps forced near shore by the very strong NE winds that blew with heavy rains all the day before and which were still out of the NE at about 30 mph that day, although under clear skies. We do not know the dates of breeding colony activity on Mona or Desecheo, so cannot relate these movements to those populations. However, recent monkey introductions on Desecheo have apparently disrupted the seabird colonies there (McCandless, Kepler, pers. comm.). At any rate, the Red-footed Booby is probably not as rare near the coast of Puerto Rico as was previously suspected, due in no small measure to the almost total lack of observation from promontories, especially after bad weather.

Stilt Sandpiper. *Micropalama himantopus*. Along the SW Puerto Rican coast where numerous shallow water mangrove lagoons occur, this seems to be one of the most common wintering shorebirds, occurring in sizable flocks. Sample counts by the writers, C. and K. Kepler, et al., were: 33 on 22–23 January at Guanica State Forest lagoons (next to Copamarina Hotel); 100+ in one flock and another scattered 100+ on 23–24 January near Cabo Rojo lighthouse, the extreme SW point in Puerto Rico. These numbers make it likely that Stilt Sandpiper flocks regularly winter there, having been overlooked in the past.

Ring-billed Gull. *Larus delawarensis*. Bond (1961) lists it as a vagrant in the West Indies except in Cuba, but Leopold (1963) notes that it "has occurred in San Juan harbor each March, at least since 1960," although no specimen has been taken. We saw it regularly there 20–28 January, with a maximum count of 12+ on the former date. Three were adults, and the rest in varying stages of immaturity. We did not see this species anywhere else in Puerto Rico, but its occurrence, at least in San Juan harbor, is not restricted to March. (We did not see any Herring Gulls, *L. argentatus*, which are supposed to be far more regular there.)

Black-headed Gull. *Larus ridibundus*. On the San Juan harbor mangrove flats on 21 January we found one Black-headed Gull. We returned the next day and counted three, two adults in winter plumage, and one "subadult" (i.e., with a tail band but with adult mantle, bill, and feet) and we showed them to Leopold later that day. On 26 January Frank Wadsworth, his son, and Leopold succeeded in collecting one of these birds, but were unable to retrieve it once shot. Several were present during the week, and on 28 January we again found three, this time all subadults. Thus the minimal total of Black-headed Gulls present in San Juan harbor was two adults and three subadults. These are the second records for Puerto Rico for this species (see Leopold 1963:84), which has been collected elsewhere in the West Indies (Bond 1956 and supplements).

The origin of the present birds is open to question, since one Barbados and one Mexican specimen were banded in Prussia (see Erskine 1963). On the other hand the species is also spreading down the Atlantic coast, presumably being seeded by Icelandic colonies, whence banded birds have been collected in the Maritime Provinces (Erskine, op. cit., who discusses coastal eastern North American records up to 1963). Because the present birds were in the company of certain North American migrants (or vagrants, as the case may be), one is tempted to assume they came down the eastern North American coast. The question is moot unless and until banded birds are collected in Puerto Rico. In any event, regardless of its origin, this species too is likely to prove regular in Puerto Rico and probably elsewhere in the West Indies.

Franklin's Gull. *Larus pipixcan*. On the San Juan harbor mangrove flats we found at least five Franklin's Gulls in company with several other gull and tern species. First seen on 21 January, they were still present on 28 January. Two were adults in winter plumage with almost complete hoods and pronounced white "eyerings," and three were gray-mantled but tail-banded "subadults," comparable in body size, shape, mantle color, and bill size to the adults they accompanied. All five were seen in direct comparison with *L. atricilla* and *L. ridibundus* on all occasions, and we showed them to Leopold on 22 January. This appears to be the first record for Puerto Rico and only the second for the West Indies (Bond 1961), but the numbers involved suggest more than a casual occurrence. As with *delawarensis*, but unlike *ridibundus* (q.v.), there is no question of the geographical origin of this species. Observers should carefully scrutinize all groups of *atricilla* for this species. A possibly undescribed qualitative field mark distinguishing "subadult" *pipixcan* from *atricilla* may be the white neck separating the dusky hood from the gray mantle in *pipixcan*. In *atricilla*, the entire area from the occiput to the rump is uniformly dark gray or dusky. The absence of the tail band on the outermost rectrices in *pipixcan* but not in *atricilla* is also a qualitative character, but one very difficult to see. "Sub-adults" of the two species can be most difficult to separate, but adults are easy if seen at all well because of *pipixcan*'s distinctive wing primary pattern.

Gull-billed Tern. *Gelichelidon nilotica*. Leopold (1963) and McCandless (1958) do not record it as wintering. From 21 to 28 January 1969 there were up to five present in San Juan harbor, in direct comparison with Sandwich Terns (*Thalasseus sandvicensis*), Common Terns (*Sterna hirundo*), and Forster's Terns.

Forster's Tern. *Sterna forsteri*. These were seen in San Juan harbor, where from 21 to 28 January there were up to six in winter plumage, and also in Mayaguez harbor, where on 26 January there were at least four. On both occasions direct comparison was available with Common and Sandwich Terns, and in San Juan harbor, also with Gull-billed Terns.

These appear to be the first occurrences of this species in Puerto Rico, and perhaps the easternmost in the Caribbean. Bond (1961) lists only occasional records from the Bahamas and Cuba, but a small flock of five has been seen at least once in Kingston harbor, Jamaica, on 11 November 1966 (W. Houston and T. H. Davis, pers. comm.). It should be looked for elsewhere in Puerto Rico and on other West Indies islands, as these numbers indicate more than casual occurrence.

Cayenne Tern. *Thalasseus eurygnatha*. The nearest breeding colony of this form is on islands in the vicinity of Curaçao, only ca. 450 air miles from the Puerto Rican south coast. In spite of this short distance (for a tern), *eurygnatha* rarely seems to wander north of its breeding grounds off the Venezuelan coast. It had previously been recorded in only one location in the West Indies, in San Juan harbor, but no specimens were taken (Leopold 1963:46). On 26 January we found a winter-plumaged adult in the company of Royal, Sandwich, Forster's, and Common Terns in Mayaguez harbor. It stayed almost exclusively with the Sandwich Terns, and remained close to one particular individual, flying and landing with it. Telescopic examination showed that this Sandwich Tern had, in addition to the normal yellow tip of *sandvicensis*, a 4–5 × 2–3 mm yellow patch midway along the tomium, extending onto both mandibles. The Cayenne Tern seemed "typical" in all visible respects. At one point the Cayenne Tern began to display to the Sandwich Tern, briefly giving the head-up/wings-extended/crest-raised posture of courting *Thalasseus*. No response came from the Sandwich and the display was not repeated.

Junge and Voous (1955) and Ansingh et al. (1960) describe a colony of *Thalasseus* terns on Curaçao where *eurygnatha* and *sandvicensis* seemed to be interbreeding. Some adults in this colony showed remarkable combinations of the soft parts colors usually restricted to either *eurygnatha* or *sandvicensis*. Some of the variant types of "*sandvicensis*" bills had yellow patches along their length, very similar to that shown by the bird accompanying the *eurygnatha* we saw in Mayaguez. It is not unlikely that both birds came from the general area of Curaçao, and that they were probably already, or just about to be, paired (cf. Lind 1963 for comments on pair formation in *sandvicensis*). The situation in the Curaçao colonies is very complex, and we will discuss elsewhere the taxonomic relationship between *eurygnatha* and *sandvicensis*.

Caspian Tern. (*Hydroprogne caspia*). One seen in San Juan harbor 21–26 January by the writers and Leopold, had a dusky tip to the bill, which seems to be a characteristic of yearlings (pers. obs.). It sat with and fed with Royal and Sandwich Terns, its usual companions in eastern North America. This seems to be the first recorded occurrence for Puerto Rico, and the easternmost in the West Indies. Bond (1961) calls it a "visitant to the Greater Antilles. . . where it occurs during all seasons." It is probably uncommon if at all regular in Puerto Rico.

Caribbean Elaenia. (*Elaenia martinica*). At the time of Leopold's checklist (1963) this elaenia was unknown from the mainland of Puerto Rico. Schwartz and Klinikowski (1963) recorded the first specimen from NE Puerto Rico, some 15 mi. E of San Juan. This was in the vicinity of Loiza Altea, and Daly (pers. comm.) saw one there on 21 May 1966. But the above authors commented that it still might simply have been a vagrant from Vieques Island, ca. 8 mi. at its closest point to Puerto Rico proper (in the Roosevelt Roads area), or from Culebra, some 20 mi. E of the mainland of Puerto Rico (Cabo San Juan); it is well established in both places. In 1965, Lanyon (1966) discovered calling individuals in the extreme SW corner of Puerto Rico, in Guanica State Forest, and recorded their vocalizations for specific confirmation. We do not know of any other Puerto Rican records, and we unsuccessfully listened and looked for the species in Guanica Forest on 22, 23, and 25 January. McCandless (pers. comm.) suggests that they may either be silent or absent from Guanica until late April, May, and June.

We were therefore surprised, on 28 January, to find a number singing on the ground of the Cabo San Juan lighthouse, the extreme NE projection of Puerto Rico. We photographed several, since we did not have facilities for collecting or netting. A brief survey of the area revealed at least 14 singing birds (males?) and two pairs came rapidly to whistled imitations of two of their calls. After 2–3 min they no longer responded. The numbers involved suggest that *E. martinica* is now well-established as a breeder on the mainland of extreme NE Puerto Rico, but specimens should be taken to verify specific identification there, and the species looked for west and south of that location. Its status at Guanica is uncertain, although it would not be surprising to find that the species does breed there and at various places immediately along the coast between Guanica and Cabo San Juan. If this is the case, Vieques Island is the most probable source of the colonizing individuals, since it is close offshore between the two known mainland stations.

Glossy Cowbird. *Molothrus bonariensis*. The spread of this species into Puerto Rico from Vieques Island and the Virgin Islands has been discussed by Grayce (1957), McCandless (1958), Biaggi (1963), and Leopold (1963). A singing male at Guanica State Forest on 25 January may represent the furthest penetration known from the initial entry point, probably at Cabo San Juan in extreme NE Puerto Rico. M. Gochfeld (pers. comm.) recorded at least 250 with over 1000 grackles at Guajataca on 29 January 1965, indicating that the spread to western Puerto Rico is several years old.

SUMMARY

Distributional data based on sight records reported here include, among others, the first or second mainland Puerto Rico occurrences of the following species: Red-footed Booby; Black-headed and Franklin's Gulls; Forster's, Cayenne, and Caspian Terns; and what seems to be the first mainland Puerto Rico (breeding?) colony of Caribbean Elaenia involving more than one or two pairs. Incidental behavioral observations are reported for several species, including description of the aerial courtship displays of White-tailed Tropicbird, still unstudied in detail.

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NOTES ON SAGE THRASHER NESTLINGS IN COLORADO

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Some information on the growth and development of nestling Sage Thrashers (*Oreoscoptes montanus*) was obtained incidental to a study by the Bureau of Sport Fisheries and Wildlife on the use of sagebrush by wildlife in Gunnison County, Colorado. Ten nests, four in 1964 and six in 1965, were studied, and data gathered on 11 nestlings in three of them. One 1964 nest (A) contained two nestlings; and two 1965 nests, contained four (B) and five nestlings (C). The nestlings in nests A and B were weighed and measured daily from the time of hatching until they left the nest. Those in nest C were weighed and measured on only the fifth day (tables 1 and 2) to determine if daily manipulation had any effect on growth and time of fledging.

Weights and measurements of nestlings were taken between 05:00 and 07:00. All measurements were made with a dial caliper; weights were taken with a triple beam balance sensitive to 0.1 g.

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Nesting materials, construction, and placement were similar to those described by Gilman (1907), Dawson (1923:728–729), Bailey (1928:561), Linsdale (1938), Bent (1948), Headstrom (1951), Jewett et al. (1953), and Bailey and Niedrach (1965).

Nests measured in this study averaged somewhat larger than those listed by Headstrom (1951). The top outside diameter of the bowl averaged 7.2 (6–9) inches, the inside top diameter, 4.4 (3½–5½) inches, and the inside depth, 3.1 (2¼–3½) inches. Headstrom (1951) listed an average outside diameter of 5.6 inches, inside diameter of 3.5 inches, and inside depth of 2 inches.

Incubation apparently began on the day before the last egg was laid, for one nestling in each nest hatched one day after the others. Eggs were not all hatched at the same time of day. One nest contained only eggs at 06:00; at 18:30 three of the five eggs had hatched. The next morning at 06:00 a fourth egg had hatched. The nestling was still damp and very weak, indicating that only a short time had elapsed since its emergence.

At the time of hatching, nestling movements were limited to defecation, feeding responses, and uncontrolled wiggling. The tomia and ricti were creamy white, and the inside mouth lining was yellowish to yellow-orange. The nestlings' eyes were closed at the time of hatching but did not appear to be sealed.

Nestling Sage Thrashers are typically altricial. At hatching the sparse down on the capital, spinal, caudal, femoral, and alar pterylae was dark bluish-brown. The color of the down and the dark brown pigment of the skin blended well with the nest material.

Weights and measurements are given in tables 1 and 2. With one exception, weighing began when nestlings were at least 15 hr old. The weight of one nestling that appeared to be 1 hr of age was 8.5 per cent of the average weight of two adult females (table 1).

The nestlings remained in the nest for about 11 days, despite the handling required to gather these data. The five nestlings in nest C left the nest between the eleventh and thirteenth day. Slight growth differences, perhaps related to disturbances, were noted