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### NOTES ON PLUMAGE MATURATION IN THE RED-TAILED TROPICBIRD

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The Red-tailed Tropicbird (*Phaethon rubricauda*) is the most pelagic of the three species of tropicbirds. It ranges throughout the tropical Pacific and Indian oceans, nesting on islands. Young birds fledge alone, possibly with some postfledging parental care (Ainley et al. 1986), and most do not return to land for at least two years. During that time they wander, usually as single birds, well away from the sight of most observers. Most individuals return to breed at an age of 2–7 years. Although breeding at an age as young as 9 months, in a “near-adult like plumage,” has been reported (Schreiber and Schreiber 1993), we question this and wonder if the bird was older than suspected when banded the year before (see below). The majority of birds return by the age of 4 years, but those that reportedly return to breeding islands at 2 years of age (presumably in second basic plumage) are in almost full adult plumage (Schreiber and Schreiber 1993), and little is known about the species’ predefinitive molts and plumages. This uncertainty is compounded by year-round breeding in many populations, meaning that molts and plumages may not follow regular, season-based cycles at the population level. Individuals may undergo prebasic molts at intervals of less than one year (e.g., if a breeding attempt failed) or more than one year (e.g., if a breeding attempt was prolonged or skipped).

During March and April of 2006 LeValley was fortunate to sail from La Paz, Baja California, Mexico, to Tahiti on board the sailing vessel *Seafever*. During that cruise he encountered a number of immature Red-tailed Tropicbirds. The photographs reproduced here illustrate some of the characteristics of immature birds at various stages of plumage maturation.

Our assessment of plumage states and molt cycles follows Pyle (in press), in which information on Red-tailed Tropicbird molts and plumages was gathered through extensive specimen examination and field observations by Pyle. Red-tailed Tropicbirds appear to lack prealternate molts, with adults having only a single prebasic molt per cycle. Specimen evidence implies that a limited to partial preformative molt of some head and body feathers may occur during the bird’s first year, well before commencement of the second prebasic molt, but this needs confirmation. It is possible that the Red-tailed and other tropicbirds lack any molt in their first year after fledging and thus follow the “simple basic strategy” (Howell et al. 2003).

Identification of adult tropicbirds by the pattern of their primaries, primary coverts, and secondaries is well understood (e.g., Harrison 1983). At all ages, the Red-tailed Tropicbird has essentially all white primaries and secondaries; only the shafts of the outer primaries are dark. All three species of tropicbirds begin life with a barred and spotted juvenal (= first basic) body plumage. Identification of younger tropicbirds in barred plumage, like the one featured on this issue’s back cover, can be more challenging but is readily accomplished by noting the amount and position of black in the primaries and primary coverts. In comparison to the bird on the back cover, juveniles of both the Red-billed (*P. aethereus*) and White-tailed (*P. lepturus*) tropicbirds show more extensive black in the juvenal primaries. In the Red-billed Tropicbird the primary coverts are largely black as well, helping to distinguish it from the White-tailed Tropicbird, in which the juvenal primary coverts are white.

Red-tailed Tropicbirds leave the nest in juvenal plumage, which is heavily barred on

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the upperparts. The bill and legs are dark grayish, almost black. A thick black mark appears in front of the eye, curving down to the base of the bill. A smaller black spot is behind the eye. The outer primaries have black shafts, the inner primaries have gray shafts, and the secondaries are essentially white. Primaries 9, 8, and 7 have black marks along the shaft near the tip (tropicbirds, like all Pelecaniformes, have 10 functional primaries), whereas in adults these feathers lack bold black shafts and marks. Tail feathers are white with black tips. The juvenal central tail feathers are only 1–4 cm longer than the other rectrices and have two black spots near the tip (Pyle in press). The underparts are almost all white with diffuse smudging on the sides and lower flanks.

The featured photo on the back cover of this issue was taken on 9 April 2006 at 13° 31.4' N, 119° 11.0' W, at least 600 nautical miles from the nearest possible breeding site on San Benedicto Island in the Revillagigedo Islands (breeding suspected, Howell and Webb 1990) and over 1700 nautical miles from known nesting sites in either Hawaii or the Marquesas Islands, French Polynesia.

Because the Red-tailed Tropicbird can breed year round, the age of this individual is difficult to determine, but of note is the pattern of barring on the body feathers, the combination of the paired elongated central tail feathers, and the dark bill. The aspect of this bird resembles juvenal plumage, including most of the back and scapular feathers. Note, however, that the feather barring is not as heavy as it is in juvenal plumage, especially on later-replaced feathers such as the greater coverts and uppertail coverts (on many of which it is absent altogether). This distinction suggests that the upperpart feathers and wing coverts have been replaced at least once, during either a preformative molt or the second prebasic molt (see above). In addition, close inspection reveals that primaries 7–10 are worn and juvenal and that the inner primaries (1–5) appear new and are thus of the second basic plumage. Primary 6 appears to be missing or growing as part of molt. Since tropicbirds are among the many large birds that exhibit *staffelmauser* (a strategy in which one wave of molt in the primaries and secondaries begins before the preceding has been completed) this bird may not complete the current prebasic wave of molt before starting its next prebasic molt (Pyle 2006). The elongated central tail feathers (which have a distinct pinkish cast) are also of the second basic plumage and in combination with the dark bill suggest the bird is approximately one year old. The two central rectrices are approximately the same length, indicating that they may be growing simultaneously, unlike the adult's elongated central tail feathers, which are molted alternately (Viet and Jones 2004).

The first Red-tailed Tropicbird that LeValley saw on the trip, portrayed in Figure 1, was also an immature. It is instructive because its bill was beginning to turn yellow, the black barring on the upperparts was less prominent, and the elongated tail feathers appeared white (likely as a result of bleaching) and of equal length. This bird also has retained the juvenal outer primaries, showing the dark tips on p7–p9. No primary molt is evident. This bird may be the same age as the bird featured on the back cover, perhaps with primary molt suspended between the newer looking p1–p6 and older-looking p7–p10, and perhaps indicating variation in the extent of barring of the second basic plumage. If the rare Red-tailed Tropicbird actually does attempt to breed at 9 months of age (see above), some brightening of the bill and loss of barred plumage could be correlated with hormonal changes related to breeding. In any case there is likely much individual variation in bill color and extent of barring at this age.

Between the first sighting and the sighting of the bird on the back cover LeValley encountered a single bird that appeared to be beginning a second round of primary molt. Shown in Figure 2, this bird had elongated tail feathers, white tips to the primaries, and a clear yellow-orange bill. Close inspection of the primaries shows that p9 and p10 are likely worn with faint vestiges of the dark shafts of juvenal primaries. This bird also appears to be missing p1 and p2, indicating the beginning of a second round of primary molt. The central tail feather (only one is evident) appears to be of either the second or third basic plumage, as would be expected in a bird that had progressed this far in primary molt. This bird could be in the vicinity of 18 to 24 months of age.

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Figure 1. Immature Red-tailed Tropicbird over the tropical Pacific Ocean, 9 April 2006. Note the dark tips to p9, p8, and p7 and mostly yellow bill.

*Photo by Ron LeValley*



Figure 2. Red-tailed Tropicbird in late second basic plumage over the tropical Pacific Ocean 9 April 2006. Note the worn and faded p9 and p10.

*Photo by Ron LeValley*

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Figure 3. Red-tailed Tropicbird in second basic plumage over the tropical Pacific Ocean 14 April 2006. Note lack of dark tips to primaries and growing p10.

*Photo by Ron LeValley*

On 14 April, at 10° 47.5' N, 123° 36.5' W, LeValley encountered a Red-tailed Tropicbird that had progressed further with its molt, plumage, and bill color, although (because of individual variation in maturation rates) it may not have been older than the bird in Figure 2. It showed distinct barring on at least the nape (Figure 3), a mostly (but not entirely) clear orange bill, and paired elongated central tail feathers. All of the primaries were pure white, and p10 seems to be still growing. Close inspection of the original photo revealed only the slightest hint of pink in the tail streamers. Like the bird in Figure 2, this bird appears to be in transition between the second and third basic plumages and probably is approaching two years of age.

Finally, Figure 4 shows an adult in full breeding plumage at Midway, Hawaii, photographed on 15 February 2001. Note the lack of barring on the body plumage, entirely white p7–p9, long (and red) streamers, and evenly colored (red) bill. This bird is at least in its third plumage cycle (and year?) and more likely is in its fourth cycle or later.

These photos imply that young Red-tailed Tropicbirds retain barring through at least the second and possibly into the third basic plumage, although the barring becomes thinner and less extensive with age. The first elongated tail streamers show some hint of reddish, but through time they can be bleached by the sun and appear almost totally white in the field. Juvenal primaries 9, 8, and 7 have black marks along the shaft at the tips, and this pattern is useful for distinguishing first-cycle birds from those in later plumages; however, beware that the black tips on p9 can wear away before the feathers are molted. The outer primaries appear to be retained until the third prebasic molt, as is typical of species following staffelmauser (Pyle 2006).

In addition, the younger plumages seem to have elongated central tail feathers of equal lengths. Viet and Jones (2004) have described a unique molt sequence in which the adults molt the elongated tail feathers alternately, at about 6-month intervals, but

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Figure 4. Breeding adult Red-tailed Tropicbird at Midway Island, Hawaii, 15 February 2001.

Photo by Ron LeValley

coinciding with their both being at full length for courting (cf. Figure 4). It appears that this alternation may begin with the second round of replacements (for the third basic plumage), as in second basic plumage the feathers appear to be equal in length.

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Back cover “Featured Photo” by © Ron LeValley of Arcata, California: Red-tailed Tropicbird (*Phaethon rubricauda*), about 400 miles southwest of the tip of Baja California, 9 April 2006.