ERRATUM

This erratum refers to an article published in Marine Ornithology 35 (2007), pages 81–84. The title of the paper by ERIC A. VANDERWERF & LINDSAY C. YOUNG should read:

THE RED-BILLED TROPICBIRD *PHAETHON AETHEREUS* IN HAWAII, WITH NOTES ON INTERSPECIFIC BEHAVIOR OF TROPICBIRDS

The scientific name of the species was incorrect owing to an editorial error. The editors regret any inconvenience caused by the error.

THE RED-BILLED TROPICBIRD *PHAETHON RUBRICAUDA* IN HAWAII, WITH NOTES ON INTERSPECIFIC BEHAVIOR OF TROPICBIRDS

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Two of the world's three tropicbird species (Fig. 1) are regular breeders in the Hawaiian Islands. The Red-tailed Tropicbird *Phaethon rubricauda* is more common in the Northwestern Hawaiian Islands; the White-tailed Tropicbird *P. lepturus* is more common in the main Hawaiian Islands (Harrison 1990). Red-billed Tropicbirds *P. aethereus* visit the Hawaiian Islands on rare occasions. In the Pacific, the species nests on rocky islands in the Gulf of California and west of Mexico, south to the Galápagos Islands (Howell & Webb 1995, Spear & Ainley 2005a). It also nests in the Caribbean, the Cape Verde Islands and several islands in the South Atlantic, and in the northwestern Indian Ocean (del Hoyo *et al.* 1992). The present paper reports on two recent observations of Red-billed Tropicbirds on Oahu, summarizes information about previous occurrences of Red-billed Tropicbirds in the Hawaiian Islands, examines climatic data for patterns of occurrence and describes interspecific behavior of tropicbirds.

On 3 March 2006 at 07h45, Michael Walther of Oahu Nature Tours observed a Red-billed Tropicbird flying near a nesting colony of Red-tailed Tropicbirds near Halona Point on the southeastern coast of Oahu. The bird landed in a small cavity in a rocky cliff and flew out about 10 minutes later. It was present again at 12h45 and was observed for the next 90 minutes, visiting the same cavity several times, flying amongst Red-tailed Tropicbirds and landing on a cliff ledge, where a nesting Red-tailed Tropicbird was incubating. The Red-billed Tropicbird was present again on 4 March at 08h20 and 5 March from 15h00 to 16h30 when we visited the site. The bird was observed regularly in this area by many people during the remainder of March, all of April, and much of May. It was seen more sporadically in May (although fewer observers were looking for it at that time), and it was last seen on 29 May.

On 8 January 2007, a Red-billed Tropicbird was seen again near Halona Point, Oahu. It was seen sporadically during the remainder of January, but was not reported in February or March. On 2 and 3 April 2007, we saw a Red-billed Tropicbird again at Halona Point, sitting 50 cm away from an incubating Red-tailed Tropicbird. On 4 April 2007, we captured a Red-billed Tropicbird by hand as it rested in a small cave, and we placed a metal bird band on its left leg. The right tail streamer of this bird was growing in and was about one quarter the length of the left tail streamer. The bird we saw on 2 and 3 April 2007 had two full-length tail streamers, indicating that it was a different bird. On 5 April 2007, the bird with the two long tail streamers was present again, and on 9 April 2007, we saw two Red-billed Tropicbirds simultaneously. Both birds were flying with groups of Red-tailed Tropicbirds and attempting to court with them, but were ignored. The two Red-billeds did not associate with each other and did not approach one another closer than about 30 m.

On 10 April 2007, we captured the bird with two long tail streamers and banded it on the right leg so that it could easily be distinguished from the first banded bird. The bird banded on the right leg was seen several times in late April and early May, and both birds were seen simultaneously again on 16 May 2007. On this occasion they called to each other several times and briefly flew parallel only a few meters apart.

The Red-billed Tropicbirds interacted frequently in 2006 and 2007 with Red-tailed Tropicbirds nesting in the area, and probably were attracted by their presence. In 2006, the Red-billed also briefly flew alongside single White-tailed Tropicbirds that occasionally flew past. The Red-billed Tropicbirds often attempted to participate in courtship displays with Red-tailed Tropicbirds by swooping past pairs or groups of displaying Red-taileds, but they did not perform the characteristic wheeling flight display of the Red-taileds and gave strident, screeching calls that were very different from the clucking calls of the Red-taileds. Courting Red-taileds sometimes tolerated the presence of a Red-billed in their midst, but on several occasions pairs or groups of courting Red-taileds dispersed upon the arrival of a Red-billed (Fig. 2). In 2006 and 2007, each of the Red-billed Tropicbirds frequently landed on ledges and in small rock cavities less than one meter from nesting Red-tailed Tropicbirds and vocalized. It was not clear if the Red-billeds were acting aggressively and attempting to take over the nest site, attempting to court with the Red-tailed or just being curious, but the Red-taileds usually responded defensively by raising their wings, erecting their feathers (Fig. 3) and giving harsh screams that were different from the clucking calls used during courtship displays and to greet mates. On one occasion in 2006, an incubating Red-tailed left its nest and egg after the Red-billed sat near it and vocalized for approximately 15 minutes. The Red-billed looked curiously at the unattended egg, but did not approach it and left immediately afterwards. The egg disappeared from this nest within two weeks, and eggs in two other nests visited repeatedly by the Red-billed also disappeared. In 2007, an egg was broken in the nest visited most often by Red-billeds, and each Red-billed sat in the nest cavity at different times after that nest failed.

Tropicbirds are known to engage in serious fights during competition for nesting sites (del Hoyo *et al.* 1992, Schreiber & Schreiber 1993), and Diamond (1975) speculated that interference from White-tailed Tropicbirds may have been a cause of nest failure in Red-tailed Tropicbirds on Aldabra Atoll in the Indian Ocean. We observed no physical aggression between Red-billed and Red-tailed Tropicbirds, but it seems possible that some nest failures in 2006 and 2007 were caused by Red-billed Tropicbirds through intentional damage, incidental damage from jostling during altercations or rapid departure by incubating birds, or overheating of eggs caused by lack of attendance.

There are 19 records of Red-billed Tropicbirds in the Hawaiian Islands in which the bird was either photographed or described in sufficient detail to allow conclusive identification (Table 1). All records are of adults, and all occurred in association with nesting Red-tailed Tropicbirds. This is a surprisingly large number of records considering how rarely the species has been observed at sea in the central Pacific. Red-billed Tropicbirds have been recorded up to 3000 km west of the Galápagos islands [117°W, 3°N (Spear *et al.* 2001)], but during 1186 days of observation from 1980 to 1995, Spear & Ainley (2005a) observed no Red-billed Tropicbirds near the Hawaiian Islands, and all individuals observed were within 1684 km of the Galápagos Islands and the American continents.

Fig. 1. Red-tailed Phaethon rubricauda (top), Red-billed P. aethereus (center), and White-tailed P. lepturus (bottom) Tropicbirds in southeastern Oahu. Photos by Eric VanderWerf.

Most records within the Hawaiian Islands are from Kilauea Point, Kauai (seven records) and French Frigate Shoals (five records), but those higher frequencies of occurrence may partly reflect the large numbers of skilled observers at the two locations. Several birds were observed for weeks or months at the same location and were reported to spend considerable time near nesting Red-tailed Tropicbirds. On Tern Island in French Frigate Shoals, a bird, possibly the same individual, returned at roughly the same season (late January to February) each year from 1989 to 1992, although apparently no reports were received in 1990. The bird was banded in 1992 so that it could be identified in future years, but it was not seen again. A similar pattern occurred at Kilauea Point, where a bird was seen from February to mid-June during 1998–2000 and again in 2002. The only records of two birds are from Johnston Atoll on 9 April 1957 (Moynihan 1957) and Oahu in 2007. One bird on Johnston Atoll was

Fig. 2. Red-billed Tropicbird Phaethon aethereus (center) disrupting the courtship display of a pair of Red-tailed Tropicbirds P. rubricauda. Photo by Eric VanderWerf.

Fig. 3. Red-billed Tropicbird Phaethon aethereus (front) eliciting defensive behavior from an incubating Red-tailed Tropicbird P. rubricauda. Photo by Eric VanderWerf.

observed sitting next to an unattended Red-tailed Tropicbird chick on several occasions (Amerson & Shelton 1976).

The bird on Johnston Atoll in 1969 was captured, banded, photographed and measured, and was identified as *P. a. mesonauta* based on the measurements (Amerson & Shelton 1976). Two specimens have been collected, both females, on Nihoa in 1923 and on East Island, French Frigate Shoals, in 1968. The bird from French Frigate Shoals was identified as *P. a. mesonauta* (Clapp & Woodward 1968). No other individuals in Hawaii have been identified to subspecies, but *mesonauta* is by far the most likely, because it is the only one of the three subspecies known to occur regularly in the Pacific (del Hoyo *et al.* 1992).

Red-billed Tropicbirds disperse widely and may wander up to 1500 km from nesting areas (del Hoyo *et al.* 1992), but Hawaii

TABLE 1
Summary of Red-billed Tropicbird *Phaethon rubricauda* records in the Hawaiian Islands

Year	Location	Observations	ENSO [a]	References
1923	Nihoa	15 Jun–Immature female collected by A. Wetmore, specimen USNM 300997	0	Clapp & Woodward (1968), Clapp *et al.* (1977)
1957	Johnston Atoll	6–10 Apr Second bird reported 9 Apr	+	Moynihan (1957)
1968	East Island, FFS	15 Jun–Adult female collected, specimen USNM 544878	0	Amerson (1971)
1969	Johnston Atoll	11 Apr, 21 May, 7–28 Jun	+	Amerson & Shelton (1976)
1983	Kilauea Point, Kauai	6–7 Apr	++	Sightings Database [b]
1989	Tern Island, FFS	23, 29 Jan	– –	Sightings Database [b]
1989	Kilauea Point, Kauai	6 May	–	Sightings Database [b]
1990	Kilauea Point, Kauai	31 Jan	0	Sightings Database [b]
1991	Tern Island, FFS	21 Feb	0	Sightings Database [b]
1991	Hawaii Island	28 Mar	0	Sightings Database [b]
1992	Tern Island, FFS	17–21 Feb	++	Sightings Database [b]
1998	Kilauea Point, Kauai	26 Feb to mid-May	++	Sightings Database [b]
1999	Kilauea Point, Kauai	Mar–May	– –	Sightings Database [b]
1999–2000	Tern Island, FFS	30 Nov–9 Jan	– –	Sightings Database [b] Pyle (2001)
2000	Kilauea Point, Kauai	Feb–18 Apr and mid-June	– –	Sightings Database [b]
2002	Kilauea Point, Kauai	21 Mar mid-June	0	Sightings Database [b]
2006	Halona Point, Oahu	3 Mar–29 May	0	Present paper
2007	Halona Point, Oahu	8 Jan–16 May	0	Present paper
2007	Nihoa	16–25 Mar	0	I. Jones, C. Rowland, C. Swenson (pers. comm.)

[a] El Niño Southern Oscillation (ENSO) score based on the Bivariate ENSO Time Series index calculated by the National Oceanic and Atmospheric Administration Climate Diagnostics Center (Smith & Sardeshmukh 2000). + = weak El Niño event ($0.5 < x < 1.0$); – = weak La Niña event ($-1.0 < x < -0.5$); ++ = strong El Niño event ($x > 1.0$); – – = strong La Niña event ($x < -1.0$); 0 = neutral conditions ($-0.5 < x < 0.5$).

[b] Electronic database containing more than 90 000 bird sightings. Occurrence and status of birds in Hawaii project at 31 August 2006. Honolulu: Bishop Museum.

ENSO = El Niño Southern Oscillation; FFS = French Frigate Shoals; USNM = US National Museum of Natural History.

is more than 4300 km from the nearest colonies off Mexico; the chain is thought to be outside the usual range of these birds (Pitman 1986). However, their distribution and movements at sea may vary with fluctuations in oceanographic and climatic patterns (Ballance *et al.* 2006). Spear & Ainley (2005b) found that tropicbird densities were significantly lower in the eastern Pacific during El Niño than during Neutral and La Niña conditions, but also that the effect of El Niño conditions varied seasonally and between different current systems. The individuals that have visited Hawaii may be true vagrants that are off-course, or they may represent the fringe of a somewhat atypical distribution that occurs when ocean conditions bring the birds' preferred prey species closer to the Hawaiian Archipelago. Equal numbers of records have occurred in years with El Niño and La Niña conditions (Table 1), based on the Bivariant El Niño Southern Oscillation (ENSO) Time Series, which combines sea surface temperature data and Southern Oscillation Index pressure data (Smith & Sardeshmukh 2000). Although no clear association is evident between the Hawaiian records and ENSO patterns, other oceanographic patterns may be better indicators of conditions relevant to tropicbirds. Numerous Red-billed Tropicbirds were reported off California in the fall of 2005 (Dinsmore 2006), an influx that may have been associated with peculiar, non-ENSO oceanographic patterns in the eastern Pacific that also produced other unusual seabird records (Pyle 2006). Careful documentation of unusual seabirds, such as Red-billed Tropicbirds in Hawaii, can help improve our understanding of seabird ecology and climatic conditions that affect their distribution.

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