SEVERE BILL DEFORMITY OF AN AMERICAN KESTREL WINTERING IN CALIFORNIA

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During a recent survey for West Nile virus in wild birds around the Sonny Bono Salton Sea National Wildlife Refuge, Imperial County, California (Dusek et al. 2010), we captured a female American Kestrel (*Falco sparverius*) with a severe bill deformity (Figure 1). The kestrel was captured on 9 March 2006, at 08:45, approximately 0.25 km south of the intersection of Wiest and Lindsey roads (33° 08′ 42′ N, 115° 26′ 59′ W) and 6 km east-northeast of Calipatria. It was caught on a bal-chatri trap baited with a domestic mouse (Berger and Mueller 1959), as were all the 208 kestrels captured during this study. The bird was initially perched on a high transmission line

Figure 1. Adult female American Kestrel with missing maxilla, captured on 9 March 2006 in Imperial County, California; (a), View from the right side of head; (b) view from right side forward; (c) view from overhead, left side of head; (d) view from left side of head.

Photos by R. J. Dusek

running along Wiest Road and was caught within 10 minutes of our setting the trap. In examining the bird, we observed that the maxilla beyond the cere was missing. The upper bill structure from the palatine process, which included part of the maxilla, the entire premaxilla, and the external rhamphotheca (the hardened keratin layer covering the premaxilla) was missing rostral to the bird's cere and nares (Threlfall 1968, Lucas and Stettenheim 1972, Proctor and Lynch 1993). The epidermal layer of the cere appeared to have fused over the remaining area between the nares where the upper bill normally would have been. The deformation did not appear to be recent or related to our trapping, as there were no obvious abrasions or open wounds in the region surrounding the nares and oropharynx or signs of recent trauma surrounding the oropharynx area. Both nares were clearly defined, and the tongue protruded from the open oropharynx area. After completing the physical examination, measurements, and obtaining a blood sample for testing for West Nile virus, we released the kestrel at the location of capture. After its release, we monitored the kestrel's behavior for approximately 30 minutes but did not observe any additional hunting.

In March in southern California, the American Kestrel population is a mix of year-round residents and overwintering birds. On the basis of its plumage, the individual we captured was 6 months in age or older (Smallwood and Bird 2002). Thus it is not possible to determine whether this bird was hatched locally or migrated into the area. At the time of capture, other than the bill deformity, the general condition and behavior of this bird did not seem to differ from those of other kestrels we caught around this time. When compared with other females captured in March 2006, its scores for body condition (on a 1-to-5 scale, with 1 being the lowest; Iko et al. 2003) were 1 for furcular fat ($n = 62$, median value = 1) and 2 for pectoral muscle ($n = 67$, median value = 2). Its mass, however, was 100 g, lighter than that of other females (mean weight 111.8 g, standard error 1.3 g, $n = 67$) captured during this period ($t = 9.39$, $P < 0.05$). Laboratory test results for West Nile virus (following methods used by Dusek et al. 2010) indicated no active virus, but an enzyme-linked immunosorbent assay (ELISA) yielded a low virus-neutralizing antibody response (1/40 antibody titer), demonstrating previous exposure to West Nile virus.

The cause of this severe bill deformity is not obvious, as we observed no recent signs of injury to this bird. Bill deformities similar to this have been noted among falconers' and rehabilitated raptors as a result of trauma to the front of the bill (as in a collision with an object), damaging the germinal epithelium of the cere, preventing regrowth of the rhamphotheca (Altman 1992, Forbes 1996, Castro and Taylor 2001, N. Thomas pers. comm.). However, disrupted bill development and growth similar to the deformity we observed have also been noted among birds in relation to congenital defects (Castro and Taylor 2001, Wu et al. 2004), diseases of the epidermal and sinuses (McOrist et al. 1984, Gartrell et al. 2003), and exposure to toxic chemicals (Fox et al. 1991, Fernie et al. 2003).

Regardless of the circumstances that caused this deformity, the ability of this bird to survive in relatively good condition with this abnormality was surprising. Other studies noting birds with bill deformities have described behavioral changes in how the bird was able to manipulate food with its tongue and remaining bill structure, surviving over multiple years, and, in some cases, even successfully reproducing (Pomeroy 1962, Sealy 1977, Fiala 1981, Castro and Taylor 2001, Rintoul 2005). In falcons, the maxilla is sharp and hooked to tear flesh from prey, and the tomium of the maxilla is notched, possibly as an adaptation for severing the cervical spinal column of vertebrate prey (Johnsgard 1990, Smallwood and Bird 2002). Both aspects of the falcons' bill morphology are considered important for killing and ingesting captured prey, although other studies have indicated that a raptor's ability to kill prey may be more related to squeezing pressure with its foot than to the direct use of its bill (Csermely and Gaibani 1998, Csermely et al. 1998). Despite the deformity we observed, the kestrel's hunting and aggressive behavior did not seem to be impaired,

as it actively tried to capture the bait mouse within our trap. It is possible that this individual had been surviving with its deformation for some time (Murza et al. 2000), although we cannot suggest how it was able to tear apart and ingest its prey. Despite our monitoring of the bird after release, we observed no further hunting and did not encounter this bird again during the remainder of our study.

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Philip Unitt