

## LETTERS

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### DOCUMENTING OCCURRENCE AND RATES OF SPRADDLE-LEG IN AMERICAN KESTREL NESTLINGS WITHIN A NEST BOX MONITORING NETWORK

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Winter, migration, and breeding surveys indicate widespread declines of American Kestrels (*Falco sparverius*; Farmer and Smith 2009, McClure et al. 2017). Suspected drivers of declines include degradation of habitat, direct mortality, and impaired reproduction due to contaminants, including insecticides and anticoagulant rodenticides in the environment, and the loss of natural nest cavities (McClure et al. 2017, Rattner et al. 2020). Documented causes of nestling mortality include the loss of a parent, predation, cannibalism (Bortolotti et al. 1991), and high loads of ectoparasites (Lesko and Smallwood 2012). We report on the frequency of “spraddle-leg,” a mortality source that is well known in the poultry and bird-fancier sectors but minimally documented in wild nestling American Kestrels. Spraddle-leg is a condition that results in malformed legs, which impairs movement and fledging of affected individuals, and is often associated with inadequate nest-site substrate. Given that kestrel declines have catalyzed the creation and expansion of many nest box monitoring networks that are operated by various groups, including private citizens, research labs in academia, and other conservation groups, we feel it important to spotlight this phenomenon and ensure those working toward the recovery and conservation of kestrels and other cavity-nesting species via management of nest box networks take steps to provide sites that enhance success of these species. We also call for a collaborative approach among kestrel researchers to better document this issue.

Since 2014, HawkWatch International and its team of community scientists have monitored an average of 100 nesting kestrel pairs per year within a network of 500+ nest boxes and non-box nesting locations in Utah as part of an ongoing demographic study. During this time, we identified six separate broods in which at least one nestling presented with a condition causing both legs to splay

laterally from the body, resulting in the nestlings being unable to stand, perch, or jump (Fig. 1A). Between 2017 and 2021, we observed seven spraddle-legged nestlings (four males, two females, and one unknown sex) from six nest boxes (occurring in <0.35% of 2241 nestlings and in <1% of 767 nesting attempts from 2014–2021). Siblings of spraddle-legged nestlings fledged from five of the six nest boxes, and one brood included two siblings with spraddle-leg. A spraddle-legged nestling was the only individual in a brood in only one case. Unfortunately, we know the breeding history for only one pair of adults that produced spraddle-legged young. This pair successfully raised a healthy brood of three nestlings in 2018 before having a brood in 2019, in which one of two nestlings was spraddle-legged. None of the seven spraddle-legged nestlings fledged, and all presumably died from starvation or other causes 15–30 d after hatch.

Our observations fit the description of conditions called “splay-leg” or spraddle leg; as well as angular or rotational limb deformities (Worell 2012). Suspected etiologies for spraddle-leg in captive birds vary from a slippery floor surface during the nestling period to deficiencies in calcium and Vitamin D (Harcourt-Brown 2002). Leg deformities in nestlings may also result from maternal dietary deficiencies and are often seen in the last nestling to hatch in a clutch of eggs (Harcourt-Brown 2002). Such malformations in the legs are typically associated with the tibiotarsus but can occur in the femur or tarsometatarsus (Worell 2012). Spraddle-leg is most often documented in nestling poultry, Psittaciformes, Rock Pigeons (*Columba livia*), and doves (Pierson and Hester 1982, Worell 2012, Mangus et al. 2021) but can also be found in groups such as ratites, storks, and cranes (Reece et al. 1992). We found only two anecdotal reports of spraddle-leg in wild raptors (Peregrine Falcon [*Falco peregrinus*] and Harris’s Hawk [*Parabuteo unicinctus*]). Such abnormalities may go unnoticed if nest visits are infrequent because dead nestlings may be consumed by adults, trampled by their brood mates, or expelled from the nest. Additionally, necropsies may not

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Figure 1. American Kestrel nestlings from Utah and Idaho, USA, with spraddle-leg: (A) two nestlings that were unable to stand, photographed during the banding process; (B) two examples of nest boxes with bare floors and spraddle-legged nestlings. Photo on the left by Anjolene Hunt.

be standard practice in some nest monitoring programs, so sources of nestling mortality often remain unknown.

Like many researchers maintaining nest box programs, we line the boxes with 3–5 cm of material (e.g., mulch) at the beginning of the season. However, images collected at two nest boxes during nest monitoring showed that the area beneath the eggs lacked substrate, and bare wood was likely the primary floor substrate at the time of hatching (Fig. 1B). To prevent spraddle-leg, pigeon fanciers recommend creating an artificial nest bowl from mud or a soft cloth to avoid a slick surface beneath the eggs (Kabir 2018). The role cavity substrate may have played in the leg anomalies we observed is unknown. However, kestrels and

other cavity- or scrape-nesting species may be more susceptible to spraddle-leg if lack of substrate is a leading cause. A blood sample from one nestling with spraddle-leg tested negative for anticoagulant rodenticides. Unfortunately, we did not perform necropsies on the spraddle-legged birds found in our study system but doing so in the future to determine whether the femur heads are fused to or disarticulated from the acetabula would be informative.

We are aware of several other cases of spraddle-leg in American Kestrels. Researchers in southwestern Idaho documented a single male nestling presenting the same leg malformation in 2021 (A. Hunt pers. comm.). This nestling was the sole nestling in the nest and died in the

nest box. Multiple spraddle-legged nestlings were documented in a brood in northern Utah (P. Richards pers. comm.) and those individuals were taken to a rehabilitation center. A spraddle-legged nestling was documented among a brood of three from a nest box with substrate in Pennsylvania, this individual died while its two siblings fledged successfully (J.-F. Therrien pers. comm.).

Although there is little evidence to suggest that spraddle-leg is a significant threat to kestrel populations, a better understanding of its prevalence could be useful to the raptor research community as we attempt to understand the range of issues this species faces. Moreover, if a lack of appropriate nest substrate is the source of the spraddle-leg cases we observed, this report should serve as a notice to those studying or managing kestrels and other cavity nesters (e.g., screech-owls, Northern Saw-whet Owls [*Aegolius acadicus*], Barn Owls [*Tyto alba*]) via nest box networks that regular maintenance is important to ensure that nest boxes serve as the conservation tool they are intended to be and not as an added (albeit low) source of nestling mortality. We suggest lining nest boxes with 5–8 cm of mulch to prevent bare wood at the bottom of the nest box. Lightweight wood shavings or rodent bedding should be avoided because they can easily become dislodged by the wind or removed by European Starlings (*Sturnus vulgaris*). Additionally, we recommend leaving used substrate in boxes between seasons to reduce the chances of eggs or nestlings resting on bare wood. Furthermore, we recommend a collaborative approach within the American Kestrel research community to better understand the prevalence of spraddle-leg and its causes. Doing this effectively requires a central location to document observations of spraddle-legged nestlings, and nest conditions (e.g., substrate, brood, etc.). To that end, we invite researchers to provide their observations through the following form: <https://form.jotform.com/HawkWatchInternational/spraddle-legged-raptors>.

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