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Is angel wing syndrome overlooked in passerine birds?

Är änglavingar en förbisedd deformitet bland tättingar?

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Angel wing syndrome is a rotational deformity of the carpometacarpus that results in a dorsolateral rotation of the primary wing feathers. As the syndrome affects flight ability the survival of affected birds should be low. Here we present two observations of passerine birds with deformed wings, and discuss whether they could be examples of angel wing syndrome and that the syndrome in general may be overlooked.

Keywords: primary feather | valgus rotation | wild birds | wing deformity

Introduction

On 26 January 2023, while on the way to Mayodia Pass (28°14′28.0″N, 95°55′54.8″E), Mishmi Hilla area, Arunachal Pradesh, India, one of the authors (SJ) observed a Eurasian jay *Garrulus glandarius* with some aberration in the right wing, where some wing feathers seemed to be drooping down (Figure 1). A couple of photos were taken, but only of the right wing; the left wing was noticed as normal at that time. On 16 February 2024, SJ was out birdwatching at the Conservation Education Centre of Bombay Natural History Society (19°09′46.9″N, 72°53′31.8″E), Goregaon, Mumbai, India. An orange-headed thrush *Geokichla citrina* caught attention because of the unusual feathers found on the right wing (Figure 2). However, the left wing seemed to be normal. A few photographs were taken and this brought to the mind the Eurasian jay with somewhat similar condition seen about a year earlier. Later on, during an interaction with GM and GPS, the nature of the unusual feathers jutting out of the right wing in case of both the birds was discussed and it was identified as similar to what is commonly known as the angel wing syndrome.

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FIGURE 1. Eurasian Jay *Garrulus glandarius* with wing deformity on the right side.
– Nötskrika *Garrulus glandarius* med deformitet i högervingen.

This is a condition caused by a valgus (outward) rotational deformity of the carpometacarpus (modified wrist bones) resulting in a dorsolateral rotation of the primary wing feathers (Smith 1997, Zsivanovits et al. 2006). Angel wings can be visually categorized as slight, medium, or severe according to the degree of projection of the primary feathers away from the body (< 30°, 30°–60°, and > 60°, respectively; Lin et al. 2016) and can occur both unilaterally and bilaterally (Zsivanovits et al. 2006).

Angel wing is predominantly reported in waterfowl, both wild and captive, and seems most common in larger species such as geese and swans (family Anatidae; Olsen 1994, Smith 1997). Some other cases of angel wing are known from pelicans *Pelicanus* sp. (Drew and Kreeger 1986); some parrots (order

FIGURE 2. Orange-headed Thrush *Geokichla citrina* with wing deformity on the right side.
– Orangehuvad trast *Geokichla citrina* med deformitet i högervingen.

Psittaciformes) like budgerigar *Melopsittacus undulatus*, macaws, and conures (Coles et al. 1998); bustards (family Otididae; Naldo 1998); cormorants (family Phalacrocoracidae; Kuiken 1999); some raptor and owl fledglings such as northern goshawks *Accipiter gentilis*, a gyrfalcon × peregrine falcon hybrid *Falco rusticolus* × *F. peregrinus* hybrid and snowy owls *Bubo scandiacus* (Zsivanovits et al. 2006); and masked boobies *Sula dactylatra* (Pitman et al. 2012).

As per Wade (2022), the causes of angel wing syndrome are likely multifactorial and include increased intake of high-energy food, rapid growth, and genetic disorders. As regards food, high levels of protein and carbohydrates and/or altered calcium to phosphorus ratio as well as deficiencies in vitamin D3, vitamin E, and manganese have been pointed out as important culprits (Wade 2022). Moreover, problems during incubation and hatching, such as excessive heat during the early growth period, and restricted exercise may contribute (Wade 2022).

Expert opinion on the present cases

If a bird is captive, the diagnosis of angel wing syndrome is based on the clinical presentation and a physical examination. Radiographic examination can confirm a bone deformity. However, this is not possible in the case of wild birds unless they are captured. In our cases, the only way to confirm the angel wing was a careful examination of the available photographs.

We shared the photos with several experts, including veterinary practitioners (for full qualifications and affiliations, see Acknowledgements), to hear their expert opinion:

- Jennifer Graham (*in litt.*, message dated 13 June 2024) said, "I agree this looks like angel wing syndrome. Though it is hard to say with certainty without examining the birds directly but this appearance is typical with the condition."
- Ashutosh Singh (*in litt.*, email dated 13 June 2024) thought that it could be angel wing syndrome but he needed a video (to see the bird activity) for confirmation.
- Robert Pitman (*in litt.*, email dated 13 June 2024) said the condition of the birds looks like the angel wing observed in the masked boobies and brown boobies *Sula leucogaster* that he and his team studied on Clipperton Island.
- Petra Zsivanovits (*in litt.*, email dated 14 June 2024) said, "Judging from the photos, I do agree that angel wing syndrome is the first differential diagnosis that comes to mind. To be certain, at least a clinical examination if not diagnostic imaging could exclude other reasons such as trauma. Having said that, it very much looks like angel wing."
- Zalmir S. Cubas (*in litt.*, email dated 15 June 2024), however, thought that the condition could be a result of osteoarticular deformation in the nest or trauma because angel wing generally occurs in birds with long and heavy wings, such as swans.
- Raj Raghav (*in litt.*, email dated 15 June 2024) said, "The birds in the photos appear to suffer from angel wing syndrome. The only other possibility is that there was mechanical trauma to the carpal joint during growth leading to the condition. Either way it is an interesting observation and something that needs to be reported in scientific literature."
- Thijs Kuiken (*in litt.*, email dated 17 June 2024) said, "Based on the photos, angel wing syndrome should be considered in the list of possible diagnoses, but I cannot confirm it as angel wing just based on these photos. For example, physical trauma would need to be excluded as a possible cause. To be sure about this, clinical examination of the affected birds would be necessary, although I understand this is not feasible with most free-living birds."
- Yanqun Huang (*in litt.*, email dated 19 June 2024) said, "From the photos you provided, this appears to be the birds with a slight form of angel wing."
- Heike Weber (*in litt.*, email dated 21 June 2024) thought that, in case of the Eurasian jay, the condition may not be the classic angel wing syndrome, but could just as well be a healed fracture, tendon damage or a feather malformation. The orange-headed thrush, on the other hand, he thought could more likely be an angel wing, but that it is extremely difficult to determine from photos as other causes are also possible.
- Laura Wade (*in litt.*, email dated 28 June 2024) opined that the Eurasian jay certainly had a carpal (wrist) defect, and that it is possible it could be angel wing syndrome but a direct physical examination would be the proper way to confirm if it is a

rotational deformation and not a fracture or muscle/tendon injury. For the orange-headed thrush, she wrote that it does have some rotated secondary feathers but the proximal portion or the carpus appears to be in line with the body, and that there could be damage to the feather follicles or a twist in the distal aspect of the metacarpal.

Discussion

Based on the photographs, the majority of external experts thought the condition is visually similar to the angel wing syndrome but stressed that other reasons cannot be ruled out without diagnostic imaging or clinical examination. To the best of our knowledge, no condition similar to angel wing has previously been reported in either Eurasian jay or orange-headed thrush (or for that matter in any other jay or thrush). An important question to ask is whether angel wing syndrome occurs naturally in passerine birds, and whether it goes underdiagnosed.

In larger waterfowl, where the syndrome is most commonly reported, the occurrence is linked to poor nutritional value food, often provided by well-meaning humans, e.g. in city parks. Severe cases of angel wing syndrome result in loss of flight ability, which for most species is detrimental for survival. In the present case, the two birds seemed to behave normally, and perhaps the flight ability was significantly retained, allowing the birds to survive. It should be noted that both locations receive significant human traffic (tourists and birdwatchers), and there is a possibility that the birds had access to food items discarded or intentionally left by humans. An alternative hypothesis is that trauma or some other injury could have resulted in the observed deformities.

We believe that angel wing syndrome could be underdiagnosed in passerines because even if a wing deformity that looks like angel wing is observed, it will go undiagnosed because of difficulties in capturing the birds for further examination, especially when the observation is made by birdwatchers. Also, the preponderance of this condition in large birds in captivity, may make one think that it may be highly unlikely to occur in passerines in the wild. The expert opinions presented here were not unanimous, and many experts stressed that clinical examination is needed, yet several also said that the syndrome could not been ruled out.

With this note, we would like to invite all ornithologists to be on the lookout for putative cases of angel wing syndrome in wild passerines and other birds not traditionally known to develop this condition.

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Svensk sammanfattning

Änglavingar är en deformitet hos fåglar där vingens handpennor pekar utåt på grund av en vridning i en av vingens leder (carpometacarpus). Änglavingar är främst dokumenterat hos vattenlevande fåglar, i synnerhet gäss och svanar (familj Anatidae). Orsakerna tros vara multifaktoriella: näringsobalanser, snabb tillväxt, genetiska faktorer, samt miljömässiga påverkan under uppväxten. Graden av deformitet varierar, där svåra deformiteter innebär att fågeln tappar flygförmågan och troligen har väldigt låg överlevnad. Sådana fåglar påträffas oftast i stadsmiljöer där fåglar matas av allmänheten.

I januari 2023 observerades en nötskrika *Garrulus glandarius* med vingdeformitet i Arunachal Pradesh, Indien, och i februari 2024 en orangehuvad trast *Geokichla citrina* med liknande avvikelse i Mumbai. I båda fallen var det primärt högervingen som visade en onormal fjäderställning, medan vänstervingen verkade normal. Bilder togs och jämfördes, vilket ledde till misstanke om att det rörde sig om fåglar med änglavingsdeformitet.

Det finns väldigt få dokumenterade fall av änglavingar hos tättingar, så vi konsulterade flera experter och bad om deras åsikt. Flera experter ansåg att bilderna visade vissa tecken på änglavingsdeformitet, men betonade att en säker diagnos kräver fysisk undersökning eller röntgen – något som är svårt att genomföra på vilda fåglar. Några experter föreslog alternativa orsaker som trauma eller fjädermissbildning.

Det finns inga tidigare rapporter om änglavingar i dessa arter, och väldigt få bland tättingar över huvud taget, vilket väcker frågan om syndromet kan förekomma naturligt hos tättingar och vara underdiagnostiserat. Vi uppmanar därför ornitologer att vara uppmärksamma på liknande fall i fält.

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