RADIOGRAPHIC MORPHOLOGY OF THE PELVIC LIMB OF FALCONIFORMES AND ITS TAXONOMIC IMPLICATIONS

by

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ABSTRACT

Radiography of the pelvic limb of birds of prey revealed that there is a taxonomically stable set of morphological features that differentiates hawks from falcons. The morphological features investigated in this study could be related to different forces that falcons and hawks place upon their pelvic limb whilst killing their prey. Although some of these features have been described before, none have been tabulated for a number of different species and so their significance has not been realised.

Five ossifications in soft tissues were seen in the pelvic limbs of falcons (Falco spp.) and not in hawks (Accipitridae). These were: an ossification in the medial head of m. flexor hallucis longus; an ossification of part of the tibial cartilage; an ossification in the medial ligament of the tibial cartilage; intratendinous ossifications in mm. flexor hallucis longus and flexor digitorum longus; and a sesamoid at the metatarsophalangeal junction involved in restraining the digital flexor tendons that supply digit II. Hawks had a smaller medial hypotarsal crest than falcons, a sesamoid in ansa iliofibularis, and also a fused or immobile first phalangeal joint in digit II. Further material was used to investigate the differences within the family Falconidae. A comparison was made between radiographs of live anaesthetised Falco spp. and other the other falconids (Polyborinae, Micrastur, Herpetotheres, Microhierax, and Polihierax) that were available only as museum specimens: skeletal material, skins, and whole birds preserved in spirit (alcohol). The results showed that radiography can provide significant morphological data without damage to the specimen.

KEY WORDS: Falconiformes, morphology, radiography, ossifications, hypotarsus, intratendinous ossification, sesamoid, tibial cartilage.

INTRODUCTION

The affinities between hawks and falcons, and also within the Falconidae, are based on a number of morphological characters such as moult patterns, skull features, syringeal morphology, feather lice and eggshell patterns, as well as molecular characters. These features have been described in Falconiformes by SIBLEY & AHLQUIST (1990), THIOLLAY (1994) for Accipitridae, and WHITE et al. (1994) for Falconidae.

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In the current study a taxonomically stable set of morphological differences were found in the pelvic limb of Falconidae and Accipitridae that could differentiate between the two families. These morphological differences are important taxonomically diagnostic features and are visible radiographically as well as by dissection. Although some of these features have been described before, none have been tabulated for a number of different species so their taxonomic significance has not been realised.

GOSLOW (1972) analysed the mechanics of the raptor pelvic limb. He used length-tension measurements of the major muscles, and concluded that m. flexor digitorum longus was more effective when the leg was extended and m. flexor hallucis longus was more effective at the time of flexion. He stated that these muscles are equal in size in hawks but m. flexor hallucis longus is larger in the falcons. In the falcons he observed that just prior to the initial contact with the prey (the strike) the falcons have their legs flexed and their digits extended. At the time of impact the falcons immediately flex their digits but because of their high speed the contact time is brief (GOSLOW, 1971). Goslow suggested that these two factors, the degree of flexion and the position of hallux at impact, appeared to be adaptive factors coinciding with the maximal development of m. flexor hallucis longus.

In a previous study (HARCOURT-BROWN, 1994) into the diagnosis and treatment of conditions affecting the pelvic limb of birds of prey, six Goshawks (Accipiter gentilis) and six Peregrine Falcons (Falco peregrinus) were dissected and drawn. This information was used to interpret the radiographic anatomy of normal birds of prey and then pathological radiography. The study progressed to understanding the disease process and injuries that these birds sustained whilst hunting. The study was vital for successful treatment. During the study, radiographs and dissections showed a number of non-pathological anatomical features that were different in the Peregrine Falcon when compared to the Goshawk. Some of these features had been described previously in the literature; others had not. Examination of the radiographs showed that Goshawks had a relatively small medial hypotarsal crest (female — tarsometatarsus length: 85 mm; hypotarsus length: 7.6 mm, 8% of the length of the tarsometatarsus) and in digit II, phalangeal bones I and II were joined with a fibrous union. These features are illustrated in figures 1 and 2. In comparison, Peregrine Falcons had a very well developed medial hypotarsal crest (female — tarsometatarsus length: 56.5 mm; hypotarsus length: 21 mm, 37% of the length of the tarsometatarsus) and five radiographically visible ossifications within soft tissue structures:

1. An ossification in the medial head of m. flexor hallucis longus.
2. Ossification of part of the tibial cartilage.