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VARIATION IN THE PROCORACOID FORAMEN  
IN THE ACCIPITRIDAE

**Abstract.** — The procoracoid foramen of the coracoid is present in the great majority of genera of Accipitridae. It may be nearly or completely absent in individuals of *Circus* and *Harpagus*, the taxonomic significance of which is uncertain. The procoracoid foramen is invariably absent in the genus *Accipiter*, although the condition is still unknown in *Erythrotriorchis* and *Megatriorchis* which have sometimes been synonymized with *Accipiter*. The presence of a well developed procoracoid foramen in *Urotriorchis* suggests that this genus may not be as closely related to *Accipiter* as has been assumed.

**Riassunto.** — *Variazione nel forame procoracoideo degli Accipitridae.*

Il forame procoracoideo del coracoide è presente nella maggioranza dei generi degli Accipitridi. Esso può essere quasi o completamente assente in individui di *Circus* e di *Harpagus*, fatto dal significato tassonomico incerto. Il forame procoracoideo è invariabilmente assente nel genere *Accipiter*, sebbene tale condizione sia ancora sconosciuta per i generi *Erythrotriorchis* e *Megatriorchis*, a volte posti in sinonimia con *Accipiter*. La presenza di un forame procoracoideo ben sviluppato in *Urotriorchis* suggerisce che questo genere possa non essere così strettamente affine ad *Accipiter*, come è stato ritenuto.

Anatomical characters that may be of use in defining natural subdivisions of the large and complex family Accipitridae are much to be desired, as, for example, the fused condition of the phalanges of the inner toe (OLSON 1982). Another feature that shows significant variation in the family is the procoracoid process of the coracoid, the condition of which is worth documenting not just for systematic information but also for purposes of identification of archeological and paleontological materials.

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The typical and presumably primitive condition in the Accipitridae is to have the procoracoid process with a distinct foramen for the supracoracoideus nerve piercing the bone. This foramen was termed the « coracoid fenestra » by HOWARD (1929), who illustrated it in a specimen of Golden Eagle *Aquila chrysaetos* in which the foramen was not completely enclosed, which is exceptional (see below). Because BAUMEL (1979) used the same illustration, this feature was less appropriately termed the « incisura n. supracoracoidei » whereas the term « fenestra » or « foramen » would be preferable.

The most significant variation in the procoracoid foramen is its absence in the genera *Accipiter* and *Circus*, as noted by JOLLIE (1977), who, however, incorrectly implied that the condition varied in both genera. He also overlooked the virtual absence of the foramen in *Harpagus*. To obtain a more comprehensive survey of the distribution of this character in the family, I examined skeletons of at least one individual of each genus of Accipitridae as listed in MORONY et al. (1975), with the exception of the following genera for which no appropriate skeletal material was available: *Henicopernis*, *Chelictinia*, *Eutriorchis*, *Megatriorchis*, *Erythrotriorchis*, and *Harpyopsis*.

With the exceptions discussed below, all genera of Accipitridae possessed a distinct procoracoid foramen. In a few cases this foramen was open — that is, unossified along the medial border so that it appears as a notch or « incisura ». This was true in the only specimens of *Buteo brachyurus* and *B. hemilasius* examined (of 19 species of *Buteo*), in the only specimen of *Aquila gurneyi*, in 13 of 27 specimens of *A. chrysaetos* (of 6 species of *Aquila* examined), in 1 of 2 specimens each of *Spizastur melanoleucus*, *Lophoaelus occipitalis*, and *Spizaetus ornatus*, and 2 of 7 specimens of *Stephanoaelus coronatus*. In each of the last 4 genera the ossification of the medial border of the foramen was weak when present.

The procoracoid foramen is truly variable within the genus *Circus*, usually being either open or absent, although sometimes closed by a thread of bone. The condition varies within species and even from side to side within individuals. Such variability was observed in: *C. assimilis* (5); *C. buffoni* (1); *C. aeruginosus* (6); *C. cinereus* (3); and *C. ranivorus* (2). In 22 individuals of *C. cyaneus hudsonius*, the foramen was open and represented by a notch of variable depth in 11, and nearly or completely absent in the other 11. In the single specimen of *C. approximans gouldi* examined, the foramen was closed, whereas it was completely absent on both sides in the single available individual of *C. maurus*.

The habits and behavior of *Circus* and *Accipiter* are very different from one another, so it may be doubted that the tendency of *Circus* to lack the procoracoid foramen is indicative of affinity with *Accipiter*.

Nevertheless, because the relationships of *Circus* are uncertain and the overall osteology of these genera is rather similar, this remains a possibility. Furthermore, a recently discovered extinct fossil species of *Circus* from the Hawaiian Islands (Olson & James, MS) had evolved the wing proportions of an *Accipiter* and was presumably adapted for catching birds, as are the species of *Accipiter*. The 2 known coracoids of this species totally lack the procoracoid foramen.

In 3 specimens of *Harpagus bidentatus* (*H. diodon* was not examined), the procoracoid foramen was completely absent in both sides of one individual and in the other 2 specimens was absent on one side and present only as an indistinct notch on the other. *Harpagus* is included among the so-called kites, a heterogeneous assemblage containing some of the more primitive members of the family. As with *Circus*, the significance of the condition of the procoracoid in *Harpagus* is uncertain.

The procoracoid foramen is invariably absent without a trace in the genus *Accipiter*, a character that can practically be used to define the genus. The following species of *Accipiter* were examined (number of individuals in parentheses when greater than one): *A. gentilis* (16), *A. melanoleucus*, *A. cirrhocephalus* (6), *A. nisus* (5), *A. striatus* (55), *A. erythrocnemius* (4), *A. tachiro*, *A. minullus*, *A. fasciatus* (6), *A. henicogrammus* (2), *A. novaehollandiae*, *A. griseogularis* (11), *A. haplochrous* (9), *A. brevipes*, *A. badius* (2), *A. francesii*, *A. cooperii* (22), and *A. bicolor*.

The hawks that AMADON (1978) considered to be most closely related to *Accipiter* are the Australasian genera *Erythrotriorchis* and *Megatriorchis*, and the African genus *Urotriorchis*. On purely external characters, Amadon went so far as to synonymize the first two genera with *Accipiter*, but unfortunately there are no skeletons of either genus available to confirm their supposed affinities. Although he regarded *Urotriorchis macrourus* to be closely related to *Accipiter*, AMADON (1978: 117) considered that: « Perhaps the extremely long graduated tail of this species entitles it to continued generic separation ». The fact that this species has a well developed, intact procoracoid foramen, unlike *Accipiter*, suggests that a very close relationship between these genera would need support from other than superficial characters.

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