

Cranial osteology of Tawny and Steppe Eagles *Aquila rapax* and *A. nipalensis*

by Storrs L. Olson

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Although the Tawny Eagle *Aquila rapax* and Steppe Eagle *A. nipalensis* are now often treated as subspecies of a single species (*A. rapax*), Clark (1992) recently presented a convincing analysis of plumage, external morphology, distribution and habits, from which he concluded that these are two very distinct species, as they were regarded by most writers in the first half of this century and before.

One of the significant differences in the two species noted by Clark is the greater width of the gape in *A. nipalensis*. With this in mind, I thought it would be of interest to investigate to what degree the underlying skull structure would reflect this difference and might otherwise support Clark's conclusion. Several skeletons of *A. rapax* were immediately at hand but locating one of *A. nipalensis* proved something of a task because the world inventory of avian skeletons (Wood & Schnell 1986) includes both species under *A. rapax*. This provides a good example of the manner in which information is only lost by unsubstantiated lumping of species-level taxa.

After considerable correspondence, I was able to locate and examine a single skull and mandible of *A. nipalensis* (UMMZ 215418), from an individual taken in Turkmenistan, on the eastern shore of the Caspian Sea, which was compared with 5 individuals of *A. rapax*.

The skull in *A. nipalensis* is not only decidedly larger but also more elongate, so that the interorbital bridge is proportionately narrower than in *A. rapax* (Fig. 1). The bill is much more elongate and laterally compressed in *A. nipalensis*. Presumably in accordance with this, the maxillopalatines are larger and longer as well. The interorbital septum in *A. nipalensis* is thick and impervious, whereas in *A. rapax* (and all other specimens of *Aquila* examined) the septum is very thin and has a large oval fenestra (Fig. 2). In lateral view, the braincase in *A. nipalensis* is seen to be longer and the temporal fossa greatly enlarged relative to that of *A. rapax*, so that M. adductor mandibulae is much more extensive both anteroposteriorly and dorsally.

In dorsal view, the mandible (Fig. 1) of *A. nipalensis* is correspondingly larger and longer than in *A. rapax*. Furthermore, the rami are bowed in a very distinctive manner that must be responsible for the differences in the gape of these two species noted by Clark.

The preceding differences in cranial osteology between *A. rapax* and *A. nipalensis* fully corroborate Clark's view that these are perfectly distinct species. I know of no instance in which differences of this magnitude occur in conspecific populations of Accipitridae. In fact, the opposite is much more frequently the case—taxa that are universally acknowledged to be good species may show very little difference in cranial osteology.

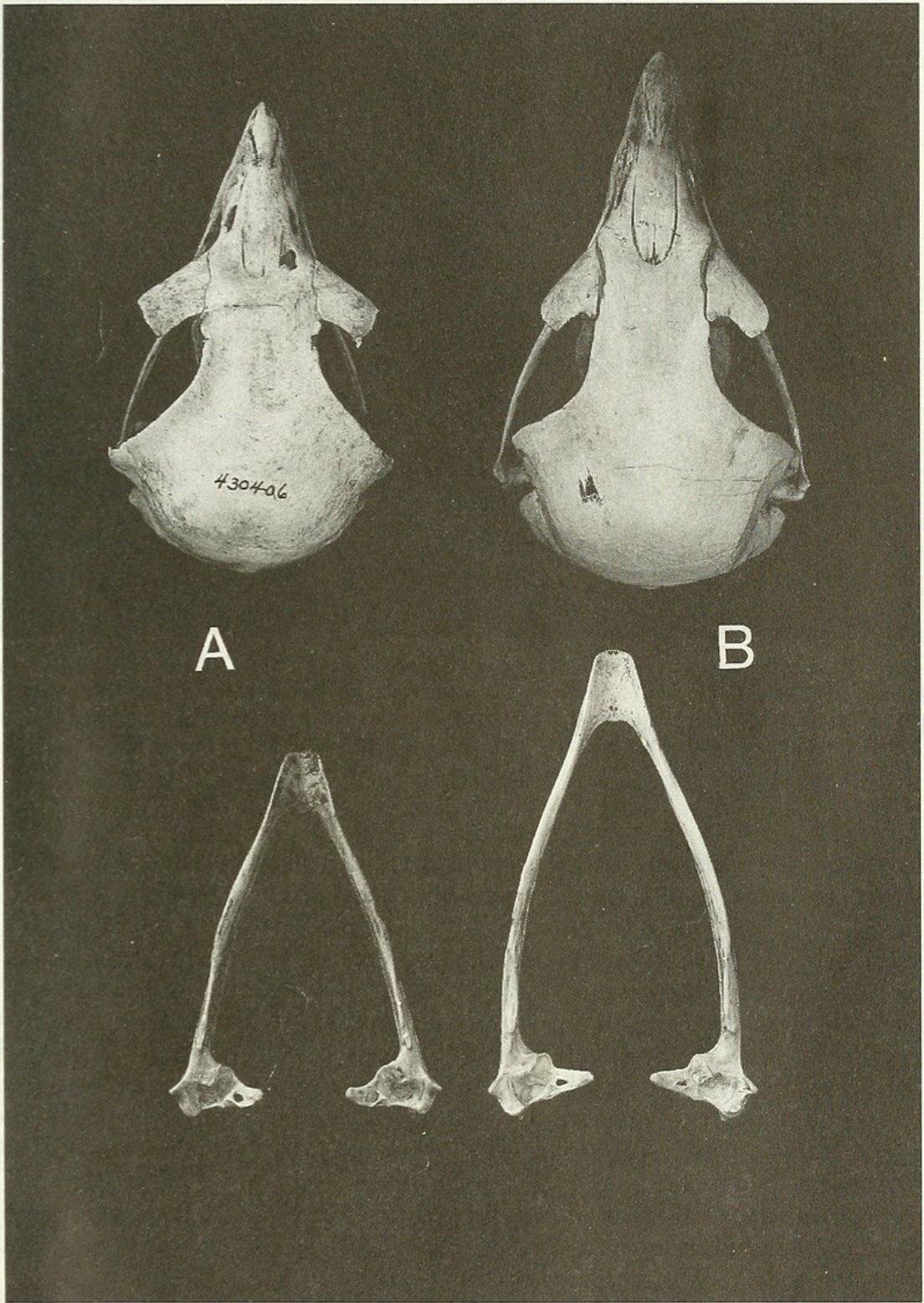


Figure 1. Dorsal view of skulls (above) and mandibles (below): A, *Aquila rapax* (USNM 430406); B, *Aquila nipalensis* (UMMZ 215418).

The morphological and behavioral differences between *A. rapax* and *A. nipalensis* were so impressive to Clark that he considered (pers. comm.) that they might not even be particularly closely related. I found one distinctive character shared by these two species, however, that seems to indicate that they are indeed sister-species, as further

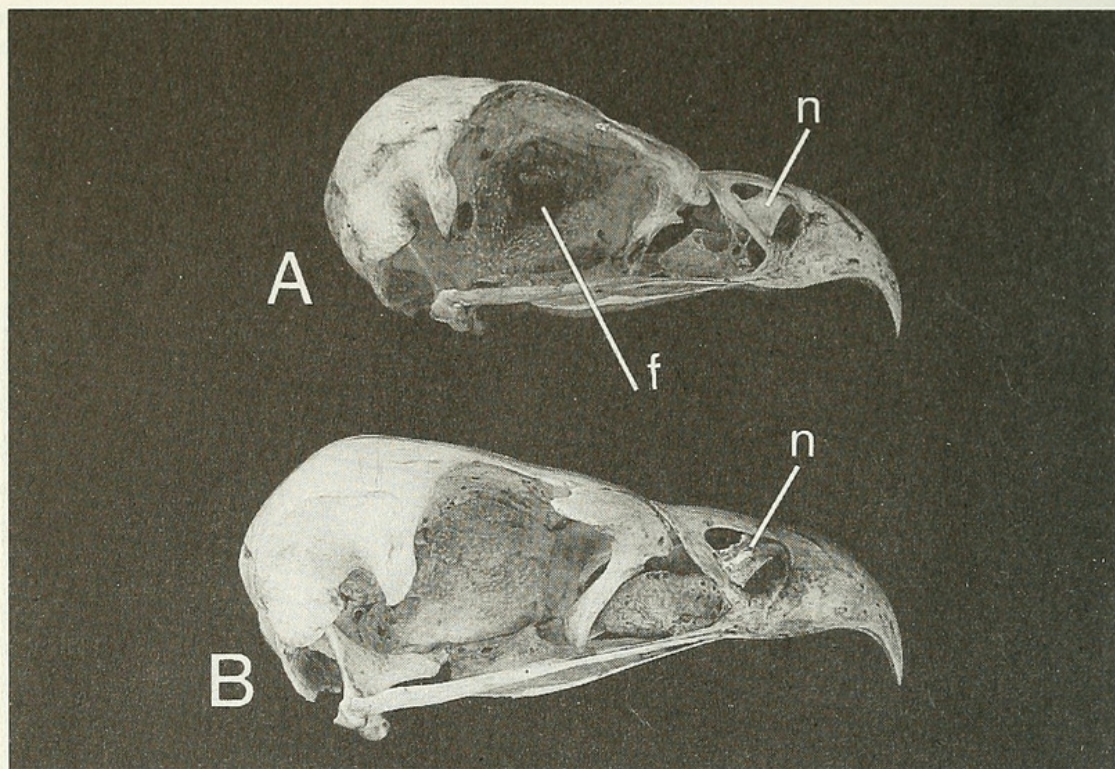


Figure 2. Right lateral view of skulls: A, *Aquila rapax* (USNM 430406); B, *Aquila nipalensis* (UMMZ 215418). Note the unique lack of a fenestra (F) in the interorbital septum of *A. nipalensis*. Among the forms of *Aquila*, the bridge of bone across the nostril (n) occurs only in these two species.

suggested by certain plumage similarities, such as the identical tail pattern in immatures. In the one specimen of *A. nipalensis* and all 5 of *A. rapax* there was a broad, solidly ossified bridge of bone across the nostril, dividing it into two smaller openings (Fig. 2). This condition was not encountered in any of the 6 other species of *Aquila* available for this study, although in 3 of 4 specimens of *A. audax* there were irregular traces of ossification at the edges of the nostrils. This bridge could well be present in a cartilaginous state in other species of *Aquila*, and perhaps in other genera as well, but it never seems to ossify except in *A. rapax* and *A. nipalensis*. Perhaps this character is not as significant, however, as the complete lack of a fenestra in the interorbital septum in *A. nipalensis*, in which respect it is unique in the genus *Aquila*. Henceforth, the Steppe Eagle, *Aquila nipalensis*, should unquestionably be given full specific rank.

Material examined. All skeletons of *Aquila* were from the collections of the National Museum of Natural History, Smithsonian Institution, except for 2 as mentioned in Acknowledgements. *A. rapax*, 5; *A. nipalensis*, 1; *A. gurneyi*, 1; *A. wahlbergi*, 1; *A. verreauxi*, 1; *A. fasciata*, 1; *A. audax*, 4; *A. chrysaetos*, 20.

Acknowledgements

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Museum of Natural History, Norman) for a skeleton of *A. rapax*; and Robert Prys-Jones for information regarding specimens in the British Museum (Tring). I am also grateful to William S. Clark for discussions and information. The photographs are by Victor E. Krantz, Smithsonian Institution.

References:

- Clark, W. S. 1992. The taxonomy of Steppe and Tawny Eagles, with criteria for separation of museum specimens and live eagles. *Bull. Brit. Orn. Cl.* 112: 150–157.
- Wood, D. S. & Schnell, G. D. 1986. *Revised World Inventory of Avian Skeletal Specimens*, 1986. American Ornithologists' Union and Oklahoma Biological Survey, Norman, Oklahoma.

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Report on three collections of birds from Liberia

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The American Museum of Natural History has recently received three collections of birds made in Liberia. M. F. Carter collected in Bong, Cape Mount and Sinoe Counties (1985–86); W. P. Cane, M. F. Carter and R. W. Dickerman collected at Greenville, Sinoe County, Juarzon [also Zuazhon on some maps], Sinoe Co. and on the Upper Dugbe River (c. 20 km SSE of Jaoudi) and at Jaoudi Town, Grand Gedeh County (1988); and M. F. Carter, A. Chapman, R. W. Dickerman and C. G. Schmitt collected in the Wonigizi Mountains, Lofa County (1990). Skeletons and liquid preserved (pickled) specimens formed major elements in each of these collections. Frozen and alcohol preserved tissues were collected in 1990.

Three notes have been published to date (Cane & Carter 1988, Dickerman 1989, 1993), and two (noted in text) are in preparation or are in press. We here report specimens that augment the distribution, status or nomenclature of the respective species in Liberia as presented by Urban *et al.* (1986), Colston & Curry-Lindahl (1986), Gatter (1988), Fry *et al.* (1988, 1992) and Keith *et al.* (1992). In the text, British Museum (Natural History) is abbreviated to BMNH; type locality is abbreviated to TL and "western" refers to populations with ranges west of the Dahomey forest gap. All Mount Nimba records are from Colston & Curry-Lindahl (1986) and that reference is usually not repeated. All measurements are in millimeters.



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