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IS CALORAMPHUS FULIGINOSUS (AVES) A CAPITONID?

Summary — The skull of *Caloramphus fuliginosus* is compared with that of other Capitonids and Bucconids and it is found to share some significant features diagnostic of one or the other of these families. It is therefore suggested that *Caloramphus* fills to some extent the gap between the Capitonids and the Bucconids and that it deserves separate subfamily status within the Capitonids. The separation between the Galbuloidea and Capitonoidea may be not as clear as it is mantained by Storer.

Riassunto — Caloramphus fuliginosus (*uccelli*) è un Capitonide? Il confronto fra il cranio di Caloramphus fuliginosus e quello di molte specie di Bucconidi e di Capitonidi mostra che Caloramphus possiede un curioso miscuglio di caratteristiche proprie dell'una o dell'altra famiglia. Si propone quindi di considerare Caloramphus come appartenente ad una sottofamiglia distinta nell'ambito dei Capitonidae. La distinzione sostenuta da Storer fra le superfamiglie Galbuloidea e Capitonoidea potrebbe essere soggetta a revisione.

INTRODUCTION

The order Piciformes is traditionally divided into six families (WETMORE, 1951; MAYR & AMADON, 1951), which are grouped as follows in recent classification (STORER, 1960):



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Caloramphus fuliginosus (TEMMINK, 1830) has always been considered as belonging to the Capitonidae, though in a somewhat isolated position, mainly because of its dull plumage, which contrasts with the usually brightly coloured Barbets. This paper is concerned with the osteology of the palatine region of this species, as it shows some significant features. Comparison is made only with the other Capitonidae and with the Bucconidae, though in the preparation of the paper a number of species of the Picidae, Galbulidae and Indicatoridae have been examined.

The Capitonidae are middle sized birds, from sparrow to larger than trush-sized, usually bright coloured with a dominance of black, reds, greens. Most species live in tropical Africa and Asia, but a few occur also in tropical America. As a whole the family numbers, including *Caloramphus*, 78 species grouped in 13 genera. The Bucconidae, 33 species belonging to 10 genera, are instead dull coloured birds, and their range is limited to South America; their size is not significantly different from that of Capitonids.

MATERIALS AND METHODS

As a whole we have used as comparative material the skulls of 22 species of Capitonidae representative of 9 genera and those of 11 species of Bucconidae representative of 8 genera.

Thus only two genera of Barbets and 1 of Puffbirds have not been examined. A list of the species examined is added as an appendix. Fresh material has not been available and we had only some alcohol preserved specimens of Barbets and none of *Caloramphus*. Therefore the results of the present investigation must be taken as preliminary, and we hope to extend them as soon as more complete material becomes available.

Description of evidence

Caloramphus is a monotypic genus ranging in Java and Borneo and this may explain the difficulty to obtain material.

In the Capitonidae the skull has normal overall proportions even if the beak is very strong and massive. There is a typical dorsal hinge-line. This mesokinetic joint passes between the nasals and the frontal as far as it may be judged from the conditions occurring



Fig. 1 - Lybius torquatus,

in *Lybius* (fig. 1), but it must be stressed that no developmental stages have been studied. The prefrontals and lacrimals are always fused to the skull.

The external nares are basically holorhinous, but secondary ossification in membrane has been found to occur in the nares of all genera except in *Lybius, Capito* (which may be primitive) (fig. 2) and in *Caloramphus* (fig. 3).

Such secondary ossification may almost entirely obliterate the external nares or subdivide them into two opening, an anterior and a posterior one (fig. 4, 5, 6). A condition intermediate between that of *Lybius* and the more common one obtains in *Gymnobucco* and *Buccanodon*, where the nares are uncompletely subdivided in some individuals (*Buccanodon duchallui*, *Gymnobucco bonapartei*) or the caudal opening of the external nares may become obliterated in some individuals (*Gymnobucco peli*). The fore opening, which is always present points dorsally and in some species decidely towards the tip of the beak, that is away from the olfactory region (fig. 6).

The nasal septum is more or less ossified, according the different species, but it is never completely bony. Its ossification occours in two ways: either as a thin lamella growing downwards from the whole of the nasal process of the premaxilla, or as a lamella growing backwards from the massive body of the premaxillary. In the first case which is more common, the septal lamella does not reach down to touch the maxillo-palatines, while in the second case the septum reaches to the maxillo-palatines.

The palatal complex shows a remarkable variability in the development of the maxillo-palatine process: these may be separate, as in *Trachyphonus darnaudi*, or partly and even entirely fused as (with individual variations) in *Megalaema franklini*, *Megalaema asiatica* and *Megalaema corti*, joined by syndesmosis as in *Megalaema zeylandica*, or entirely fused as in all the other species studied.

The maxillo-palatines themselves are somewhat variable, being more or less leaf-shaped and cranio-caudally elongated in some genera (ex. g. *Magalaema*), but are generally rather short and inflate. They have a constant and peculiar feature, except in *Caloramphus*, that is a tiny process by which they articulate syndesmotically with the horn of the vomer (fig. 1 b; 2 b, d; 4 b; 5 b; 6 b).

This last bone is most peculiar in the Capitonidae, *Caloramphus* being the only and notable exception, in that it is forked at



Fig. 2 - Capito niger.



Fig. 3 - Caloramphus fuliginosus.



Fig. 4 - Psilopogon pyrolophus,



Fig. 5 - Semnornis ramphastinus,



Fig. 6 - Megalaema virens.

its fore end. Actually the vomer is always an Y shaped bone (figs. 1 b; 2 b, d; 4 b; 5 b; 6 b) and the branches of the Y articolate with the maxillo-palatines. Its caudal end is variable; it may be short as in *Lybius* and about against the fused palatines and pterygoids, it may be longer and intrude between the palatines and keep them separate as in *Semnornis*, it may be forked caudally and either fuse as in *Megalaema*, or articulate as in *Psilopogon*, with the pterygoid. This condition is interesting as is proves once more how artificial is the distinction of the palatine patterns: the Capitonids, indeed are at the same time either schizo- or desmognathic and, because of the pterygo-vomerine contact, are dromaeognathic.

The maxillarikes and the premaxillary are not particularly notable and the anterior palatine fenestra is always well developped and opens into the nasal cavity, except again in *Caloramphus*, where it is practically completely covered but the extensive, fused, maxillo-palatines.

The palatines have a movable articulation with the maxillaries. There is, again, a difference between *Caloramphus* and the other Capitonids as in these the joint is quite far forwards, somewhat oblique $(^1)$ and follows the line of the joint between the palatine and the maxillary, while in *Caloramphus* the flex line is somewhat more caudal, transverse and clearly cuts through the palatine.

The palatal flex line is dissociated, as the zygomatic arches flex much more caudally than the palatines, but this is general in the Piciformes and the implications of this arrangement for cranial kinesis will be discussed in another paper.

The palatines of the Capitonidae are notable also for their medial margin: caudally the palatines are unmovably joined together along the midline; they are fused in such genera as *Psilopogon* and *Megalaema*, or partly fused and partly united by syndesmosis as in *Lybius* (where, however, the fused forepart may be the result of the fusion with the palatines of the « tails » of the vomer and their subsequent breaking off the body of this bone). The palatine

⁽¹⁾ It must be remembered that the fore palatine flex line, which occurs in all the birds with a kinetic skull and which do not have a pterygo-palatine diarthrosis, is the result of the flatness of the palatine which joins with the maxillary as a thin horizontal lamella. This may be simply flexible or be movably articulated with the maxillary or, lastly, the palatine may fuse with the maxillary and then its fore end may break of at the flex line and an articulation may develop.

has a perpendicular crista which is produced forwards into a point. The points of the cristae of the two palatines may approach each other more or less towards the midline; they touch or almost so each other in some species, such as *Lybius torquatus* (fig. 1 b) or remain widely separated as, for instance, in *Semnornis ramphastinus* (fig. 5 b). The two points, when they touch each other, meet below the vomer (fig. 1 b, 4 b, 5 b).

The pterygoid is normally fused with the palatine, however in some species (*Lybius vieilloti, Megalaema haematocephala, Pogoniulus atroflavus*) a small emipterygoid becomes detached at the fore end of the pterygoid, well above the palatine. There is no trace of the basipterygoid articulation and the quadrate has no specially notable feature.

The lower jaw is generally articulated such a way that it can not open except when the quadrates are rotated forwards, however there are differences between the various species and this point will be discussed in a forthcoming paper on cranial kinesis.

The Bucconidae show some significant differences to the Capitonids within the frameworks of a common pattern (fig. 7, 8).

The nares of the Bucconids are holorhinus, but the septum is always entierly ossified and in its caudal section appears in a transverse section as an inverted V, which branches fuse with the maxillopalatines (fig. 9). These are of variable development, but never very extensive. Desmognathism is always complete and direct. The dorsal hinge is well developped and (except in Monasa, Chelidoptera and Malacoptila) the frontolacrimal is fused to the beak, contrary to what obtains in the Capitonidae. The vomer is entirely different from that of the Capitonidae, but is identical with that of Caloramphus: it is a slightly sicle shaped vertical lamella which foretip is slightly rounded and articulates, as in Caloramphuc, with the tips of the vertical process of the palatines (fig. 8 b, d). The pterygoid is very long and reaches the foremargin of the palatine, with whichit is fused, except close at its sliding articulation with the parasphenoid, so that the forward slid is allowed by its flexibility.

Occasionally in *Monasa* one may find traces of a true basipterygoid process.

Also in the Bucconidae the lower jaw can not be lowered unless it is freeded by the forward rotation of the quadrates.



Fig. 7 - Chelidoptera tenebrosa.



Fig. 8 - Monasa nigrifrons.



Fig. 9 - Chelidoptera tenebrosa.

DISCUSSION

If we now try to summarize the evidence which we have briefly exposed we may remark that *Caloramphus* is peculiar among the Capitonids because of its Bucconid like vomer and vomero-palatine connection, while it is equally unique in the development of the maxillopolatines; however a septal bony structure reaches them as in the Bucconids, though for a limited extent and in a somewhat different way. These features are certainly of morphologic significance, though a study of the soft parts is necessary for the exact assessment of their meaning.

It may be tentatively proposed that *Caloramphus* belongs to a different evolutionary lines from the typical Capitonidae, which shares some features with the Bucconidae. A Bucconid-Galbulid-Capitonid-Indicatorid stock may have existed, the last two families (²) having early acquired the peculiar forked vomer. *Caloramphus* being however the only rapresentative in the palaeotropical area of a stock with a more ortodox lamellar vomer. Thus can be explained both its singularities and the peculiar admixture of Bucconid and Capitonid features.

This being proposed as an hypothesis for further investigation we refrain, for the moment, to stress the point, from the taxonomic standpoint, beyond the suggestion that a separate subfamily, Caloramphinae, may be proposed with the following diagnose: Aberrant bucconids provided with a vomer formed by a simple vertical lamina and articulated with the palatines both at is cranial and caudal extremities.

LIST OF SPECIES EXAMINED

Family BUCCONIDAE

Notharchus macrorhynchos (Gmelin) 1788, Bucco tamatia Gmelin 1788, Nystalus chacuru (Vieillot) 1816, Hypnelus ruficollis (Wagler) 1829, Hypnelus bicinctus (Gould) 1837, Malacoptila panamensis Lafremaye 1847, Malacoptila striata (Spix) 1824, Nonnula ruficapilla

⁽²⁾ The Indicatoridae have a forked vomer just like that of the Capitonidae.

(Tschudi) 1844, Monasa nigrifrons (Spix) 1824, Monasa morphoeus (Hahn and Küster) 1823, Chelidoptera tenebrosa (Pallas) 1782.

Family CAPITONIDAE

Capito niger (P. L. S. Müller) 1776, Semnornis ramphastinus (Jardine) 1855, Psilopogon pyrolophus S. Müller 1835, Megalaema virens (Boddaert) 1783, Magalaema franklini (Blyth) 1842, Megaalema asiatica (Latham) 1790, Megalaema oorti (S. Müller) 1835, Megalaema armillaris (Temminck) 1821, Megalaema haemacephala (P. L. S. Müller) 1776, Megalaema zeylanica (Gmelin) 1788, Gymnobucco peeli Hartlaub 1857, Gymnobucco bonapartei Hartlaub 1854, Pogoniulus bilineatus (Sundervall) 1850, Pogoniulus flavisquamatus (Verreaux and Verreaux), Pogoniulus atroflavis (Sparrman) 1798, Tricholaema hirsuta Verreaux and Verreaux 1855, Lybius vieilloti (Leach) 1815, Lybius torquatus (Dumont) 1816, Lybius guisfobalito Hermann 1783, Lybius bidentatus (Shaw) 1798, Trachyphonous darnaudi Reichenow 1891, Trachyphonous purpuratus Verreaux and Verreaux 1851, Calorampuhs fuliginosus (Temminck) 1830.

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