A REVIEW OF THE FAMILY CENTROPOMIDAE (PISCES, PERCIFORMES): AN APPENDIX

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NIPHON SPINOSUS

WHEN preparing my recent review of the centropomid fishes (Greenwood, 1976) I overlooked a relevant paper by Rivas & Cook (1968) on the relationships of the 'percichthyid' fish *Niphon spinosus* Cuv. These authors disagree with Gosline's (1966) placement of this species in the Percichthyidae and consider that it is more closely related to the centropomid genus *Lates*, as represented by the species *L. calcarifer*. Indeed, they go so far as to suggest that the monotypic genus *Niphon* should be placed in the Centropomidae rather than in the Percichthyidae.

Rivas & Cook (1968) reached this conclusion after comparing 22 characters (9 external osteological features, 7 characters of the squamation and 6 miscellaneous ones) in *Lates calcarifer* (Bloch), *Niphon spinosus* Cuv. and *Percichthys melanops* Girard. The degree of relationship among the three species is expressed as an index for each character, and for each of the three groups of characters the indices are summed to give an overall level of similarity. Thus, for the external osteological features the index for *Lates* and *Niphon* is 13 and that for *Niphon* and *Percichthys* is 1; for the scale characters the indices are 11 and 2 respectively, and for the miscellaneous characters 8 and 1 respectively.

Unfortunately Rivas & Cook do not seem aware that 20 of the 22 characters, or character states, employed in their analysis are shared either with several members of the family Serranidae or with other members of the Percichthyidae (both families *sensu* Gosline, 1966) in such a way that the indices of relationship are rendered meaningless. That is to say, on these characters *Niphon* could just as well be related to members of the Serranidae or to percichthyids other than *Percichthys*. (It is clear that Rivas & Cook (1968 : 202) do not consider Gosline's Percichthyidae to be a natural assemblage, but they offer no suggestions as to the affinities of the several genera embodied in Gosline's (1966) concept of the family.) To further complicate the issue, some of the characters present in *Lates* are absent or differently developed in non-latine tribes of the Centropomidae (*sensu* Greenwood, 1976), and these departures from the latine 'type' are not taken into account by Rivas & Cook. For example, there are no ventral spines on the horizontal arm of the preoperculum in *Psammoperca*, no opercular spine is present in any *Centropomus* species, and some members of that genus are without a noticeably enlarged spine at the posterior angle of the preoperculum (or the spine may be absent altogether, as in *C. undecimalis* (Bloch), see fig. 10c in Fraser, 1968). Again, in *Centropomus* the anterior end of the swimbladder is not bilobed (see Fraser, 1968 ; Greenwood, 1976), although in several species a pair of horn-like projections, sometimes of considerable length, are developed

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at the anterior end (Greenwood, 1976). Rivas & Cook (1968 : 203), however, state that the bladder is bilobed in *Centropomus* (no species named) and thus it is like that in *Lates* and *Niphon* but not *Percichthys*, an observation with which I would disagree.

In brief, 20 of the 22 characters considered by Rivas & Cook (1968) cannot be used to establish a closer relationship between *Niphon spinosus* and the centropomids than between *Niphon* and the taxa placed by Gosline (1966) in the Serranidae, Grammistidae and the Percichthyidae. Most of the characters used by Rivas & Cook seem to be symplesiomorph ones, and the five apomorphic ones are too widely distributed amongst related taxa in the basal percoid radiation to be of value in this context.

Rivas & Cook (1968 : 203) also think that most of the characters used by Gosline (1966) in his table contrasting the Serranidae and Percichthyidae (few of which characters were used by Rivas & Cook) '. . . indicate closer relationship of *Niphon* with the Centropomidae than with the Percichthyidae'. On the basis of my analysis of centropomid features (Greenwood, 1976) I would consider these characters to have about the same value as those used by Rivas & Cook (1968), and thus certainly not indicative of a close phyletic relationship between *Niphon* and the centropomids.

The caudal fin skeleton (Fig. 1) in *Niphon spinosus* (a feature not used by Rivas & Cook) provides few characters of value in determining relationships. There are 3 epurals (as in some centropomids), 2 uroneurals very closely applied to one another and apparently fused basally (some centropomids have 2 uroneurals but these are clearly distinct, see Greenwood, 1976), and the anterior uroneural is drawn out and expanded basally so that, with its partner of the opposite side, it forms a steeply

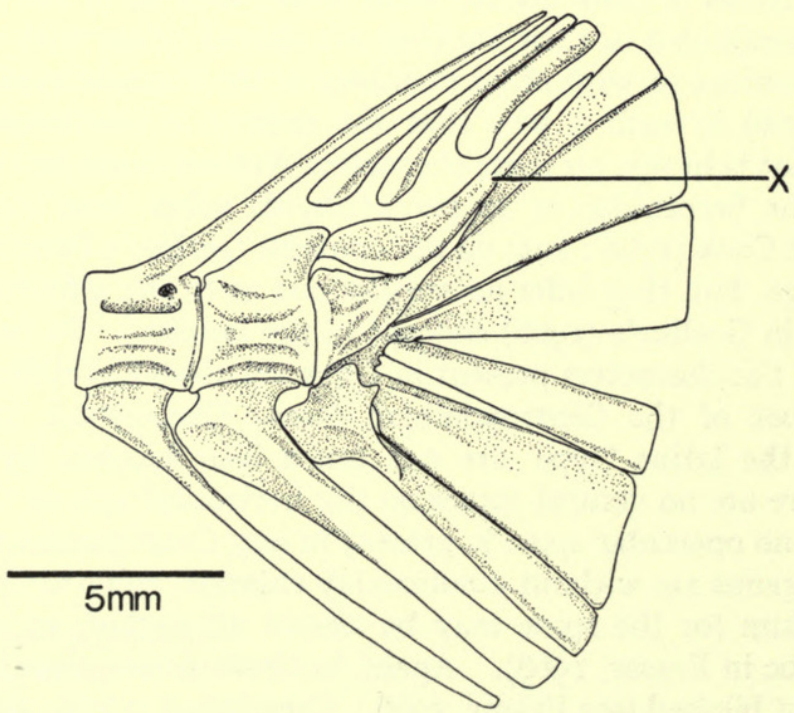

FIG. 1. Caudal fin skeleton of *Niphon spinosus* (specimen 156 mm standard length, BMNH reg. no. 1879.5.14:144, Yokohama). × : point at which the two uroneurals apparently fuse.

pitched roof over the neural groove on the fused first ural and preural centra. In one specimen (*c.* 135 mm standard length) the expanded portion of the uroneurals is closely applied ventrally to the underlying centrum, but in a larger fish (156 mm S.L.) there is a slight gap between the bones. The neural spine of the second ural centrum (U_2) is short but greatly expanded ; posteriorly it articulates with the front margin of the expanded uroneurals. In all these features the caudal skeleton is virtually identical with that in the 'percichthyids' I have examined (*Percalates, Lateolabrax, Ctenolabrax*) or which were mentioned by Gosline (1966) ; it also approaches the condition found in *Centropomus* amongst the Centropomidae (see Fraser, 1968 ; also personal observations) although in that genus the first uroneural is not so markedly expanded. However, the presence of 3 epurals and 2 uroneurals is certainly a plesiomorphous condition, and an expanded antero-basal part of the first uroneural is likewise primitive, judging from its widespread occurrence amongst basal neoteleostean fishes as well as in the basal percoids (see figures in Rosen, 1973 and Monod, 1968 respectively). The caudal skeleton in centropomids, other than *Centropomus*, shows more derived features.

The two exceptional characters used in Rivas & Cook's (1966) analysis (see above) which are not shared by the Centropomidae on the one hand and the Serranidae and Percichthyidae on the other, are the extension of the lateral line beyond the caudal base, and the presence of an expanded, blade-like neural spine on the second abdominal vertebra.

Rivas & Cook (1968 : table 3) give an affinity index to *Lates* and *Niphon* because, according to them, in these species but not in *Percichthys* the lateral line '. . . extends beyond the caudal base'. I would disagree with their decision because in *Niphon* only about 3 or 4 pore-bearing scales extend posteriorly beyond the level of the hypural–caudal fin ray junction, and even then none extends onto the caudal fin membrane. In all centropomids bar one (*Lates* (*Luciolates*) *stappersi* (Blgr.)) the lateral line scales extend to the posterior margin of the caudal fin (see Greenwood, 1976 : 48). The condition of the lateral line in *Lates stappersi* is clearly a derivative of the usual tripartite *Lates* type and cannot thus be used to invalidate the argument that the lateral line extends to the caudal fin margin in centropomids. The condition of the lateral line in *Niphon spinosus* is, in fact, exactly like that in *Percalates colonorum* (Günth.) and *Lateolabrax japonicus* (Cuv.), two species which Gosline (1966) included in the Percichthyidae, and also like that in at least some serranids as well (e.g. in the genus *Epinephalus*). *Niphon spinosus* then certainly does not have a centropomid-like caudal extension of the lateral line, although the lateral line does extend 2 or 3 scales further posteriorly than it does in *Percichthys trucha* (Val.), and 6 scales further than in the specimens of *P. melanops* I have examined (where the lateral line pore-scales do not even extend to the level of the hypural-fin ray joints).

Rivas & Cook (1968) do not consider the blade-like expansion of the second neural spine in Centropomidae (Gosline, 1966 ; Greenwood, 1976) to be of diagnostic value since in their opinion '. . . the expansion is only a matter of degree . . .'. Be that as it may (and several of the characters used in their tables are, as they admit, also ones of degree), there is still a trenchant difference between the shape of this neural spine in all centropomids and its shape in the Serranidae and other basal percoids

(personal observations, see also Gosline, 1966, and Greenwood, 1976). Thus, I do not consider that Rivas & Cook (1966) have provided any evidence to weaken or destroy the value of an extended lateral line and an expanded second neural spine, when taken in combination, as diagnostic autapomorphous characters for the family Centropomidae (see also discussion in Greenwood, 1976 : 10–11 & 62–71).

Since *Niphon* shows neither of the principal diagnostic features of the Centropomidae, and because none of the characters adduced by Rivas & Cook (1968) to show its closer affinity with that family than with the Percichthyidae is in fact a true shared specialization, there are no grounds for placing *Niphon spinosus* in the Centropomidae.

The difficulties of establishing phyletic relationships amongst the basal percoids is well demonstrated by Rivas & Cook's paper, as it was by Gosline's (1966) attempt to clarify serranid–percichthyid interrelationships. These difficulties are not much reduced when phyletic rather than phenetic principles of classification are applied to the task, although some progress has been made (see Rosen, 1973 ; Greenwood, 1976). For the moment, *Niphon* will have to be retained in the heterogeneous and aphyletic assemblage of serranid–percichthyid species. If certain characters apparent in this generic complex do later prove to be reliable phyletic indicators, then I suspect that, contrary to the views of Rivas & Cook (1968), *Niphon* will prove to have as its nearest relatives at least some, if not all of those taxa included by Gosline (1966) in his Percichthyidae.

CENTROPOMIDAE

Since my review of the Centropomidae was published (Greenwood, 1976), I have found in it one error of fact and two *lapsi* that can now be corrected :

Dorsal and anal fin skeletons. On page 45, when describing the dorsal and anal fin skeleton in *Lates*, it is said that except for *Lates* (*Luciolates*) *stappersi*, no *Lates* species has distinct medial radials supporting the branched dorsal fin rays. This latter statement is wrong, as recently prepared dissections and alizarin transparencies have shown. In all *Lates* species discrete medial radials are present in the posterior 5 to 8 pterygiophores. In this respect both *Lates* and *Psammoperca* differ from *Centropomus*, where all the medial radials are fused with their respective proximal pterygiophores. The condition in *Centropomus* is the derived one, that in *Lates* and *Psammoperca* the plesiomorphous one (which, incidentally, is also the condition in at least the four genera of Gosline's (1966) Percichthyidae which I have examined (*Percichthys*, *Percilia*, *Roccus* and *Niphon*) ; the Serranidae, on the other hand, have the fused, apomorphic, condition seen in *Centropomus*).

Branchial skeleton of *Lates* (page 37). When describing the upper pharyngeal dentition it is said that there is a cup-shaped tooth-plate fitting closely around the fourth *epibranchial* ; the latter bone is, of course, the fourth pharyngobranchial.

Definition of the subfamily Centropominae (page 76), ornamentation of the opercular series. It is the *preoperculum* and not the operculum that has three or four enlarged spines at its posterior angle.

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