

# PROCEEDINGS

OF THE

GENERAL MEETINGS FOR SCIENTIFIC BUSINESS

OF THE

# ZOOLOGICAL SOCIETY

## OF LONDON.

1933, ~~pp. 543-1122,~~

WITH 29 ~~PLATES~~ 150 ~~TEXT-FIGURES~~ MAP,  
AND INDEX ~~TO PAGES~~ 543-1122.

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PRINTED FOR THE SOCIETY,  
SOLD AT ITS HOUSE IN REGENT'S PARK.

LONDON:  
MESSRS. LONGMANS, GREEN, AND CO.  
PATERNOSTER ROW,

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RED LION COURT, FLEET STREET, E.C. 4.



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John Bale, Scam & Darnelsson, 134 London.

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30. A Revision of the Chaetodont Fishes of the Subfamily *Pomacanthinae*.  
By A. FRASER-BRUNNER, F.Z.S.

[Received March 21, 1933 : read May 23, 1933.]

(Plate I.\* ; Text-figures 1-29.)

The fishes of the family Chaetodontidae are usually divided into two subfamilies, the *Chaetodontinae*, or Butterfly-fishes †, and the *Pomacanthinae*, or Angel-fishes. From a study of the few skeletons at my disposal there does not seem to be any important osteological character on which this arrangement can be based; but as the members of the *Pomacanthinae* form an easily recognizable group by reason of the strong armature of the preoperculum, including a large spine which is always present at the angle, it seems advisable to retain the usual arrangement and to consider the fishes dealt with in the present paper as a homogeneous group distinct from the *Chaetodontinae*.

The Angel-fishes have attracted attention from early times on account of their striking form and coloration, and most of the species are well known in collections, but it is quite clear that their morphology has been very imperfectly understood. They have not been studied collectively since the publication of volume ii. of Günther's 'Catalogue of Fishes' (1860), in which their arrangement is mainly artificial. At the commencement of the present investigation it became evident that too much importance had previously been attached to colour, number of dorsal spines, and elongation of the vertical fins, none of which have any great morphological value.

Hitherto it has been customary to regard the *Pomacanthinae* as containing two genera—one, *Pomacanthus*, including two Atlantic forms, and one Pacific species called by Gill *Pomacanthodes zonipectus*, and the other *Holacanthus*,

\* For explanation of the Plate, see p. 599.

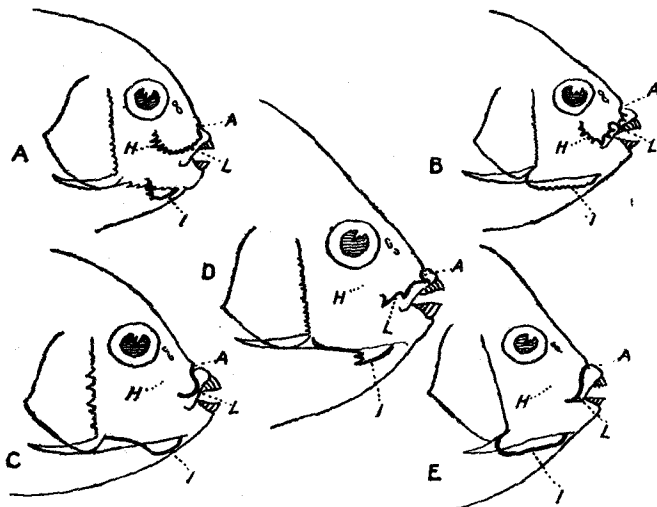
† The *Chaetodontinae* have been fully dealt with by Ahl (Archiv. für Naturg. Heft v. 1923),  
Proc. Zool. Soc.—1933,

including all the remaining species. The two Atlantic species of *Pomacanthus* have nine or ten dorsal spines; while the Pacific *P. zonipectus* has eleven; the species of *Holacanthus* were said to have twelve to fifteen spines, and upon this distinction the two genera were based.

Authors from time to time have attempted to divide *Holacanthus* into smaller groups, but since the characters they used were found to have little value the earlier arrangement has prevailed until the present time. In the work now presented this is found to be quite artificial.

Upon studying the group in a collective manner it becomes evident that at least seven genera are represented. The old genus, *Holacanthus*, falls into several clearly natural groups, one of which, corresponding to *Acanthochætodon* of Bleeker, is shown to be generically identical with *Pomacanthus*. I find that eleven dorsal spines may occur in *Acanthochætodon*, and as there is no

Text-figure 1.



Form of preorbital and interopercular bones in: A, *Centropyge*; B, *Genicanthus*; C, *Pygoplites*; D, *Holacanthus*; E, other genera.

A, anterior, L, lower, H, hind margins of preorbital; I, interoperculum.

other distinction between that group and *P. zonipectus* these must be united to form a well-defined Pacific subgenus of *Pomacanthus*—*Pomacanthodes* Gill—having eleven to fourteen dorsal spines instead of nine or ten as in the two Atlantic species. The number of dorsal spines, however, is not of primary importance, and reference to the key to the genera shows that these fishes form a perfectly clear-cut group apart from this character.

It may be as well to explain here some of the characters used in the definition of the genera of *Pomacanthinae*. The form of the lateral line has been consistently overlooked in this group previously, but its abrupt termination at the end of the soft dorsal fin or its completeness is a valuable aid to the distinction of genera; thus, in the two genera belonging to the "small-scaled" group it will be seen that one has a complete lateral line and the other an incomplete one—an immediate distinction.

The form of the preorbital and interoperculum (the variations of which are shown in text-fig. 1) prove to be of some value in defining genera. The preorbital normally has three edges, referred to throughout this paper as the anterior, lower, and hind margins. In two genera, *Centropyge* and *Genicanthus*, the hind margin is quite free from the cheek, so that an instrument may be passed beneath it. This is a somewhat specialized condition, a membrane being developed beneath the bone to keep it in place but allow of a degree of movement. In the other genera this edge is more or less covered by the skin of the cheek. Rarely, as in *Pygoplites*, the lower edge is very convex, giving a false impression that the hind margin is free. In other cases there is no evident angle between the anterior and lower margins, the two forming one curved or even straight edge.

A modification of the preorbital is in each case accompanied by a peculiarity of the interoperculum. Thus, in the generalized type—that is, with fixed unarmed preorbital—the interoperculum is a large oblong bone without spines, extending from the isthmus to the suboperculum. In *Pygoplites* it is emarginate, a very narrow posterior limb just reaching the suboperculum; in *Holacanthus*, where the preorbital is armed with spines, the lower edge of the interoperculum has a rounded anterior lobe bearing spines, divided by a notch from the posterior part, which is rather narrow and extends to the suboperculum. *Centropyge*, with the preorbital free behind and usually strongly armed, is peculiar in having a small interoperculum, anteriorly placed and not reaching the suboperculum.

In all the genera with large scales those on the cheek are equal and regularly arranged, except in *Heteropyge*, in which they are unequal and irregular, like those on the body of a *Pomacanthus*. This new genus is further distinguished by its complete lateral line and the extraordinary length of the pelvic fins.

The form of the scales on the body is of importance within genera, especially in *Pomacanthus*. Frequent reference will be found to "auxiliaries." By this term is meant small scales occurring on the bases of larger ones, playing no part in the actual covering of the body (text-fig. 2). They must not be confused with the small functional scales appearing in conjunction with larger ones when the squamation is described as "unequal." In some species of *Pomacanthus* the scales may be unequal and auxiliaries also be present.

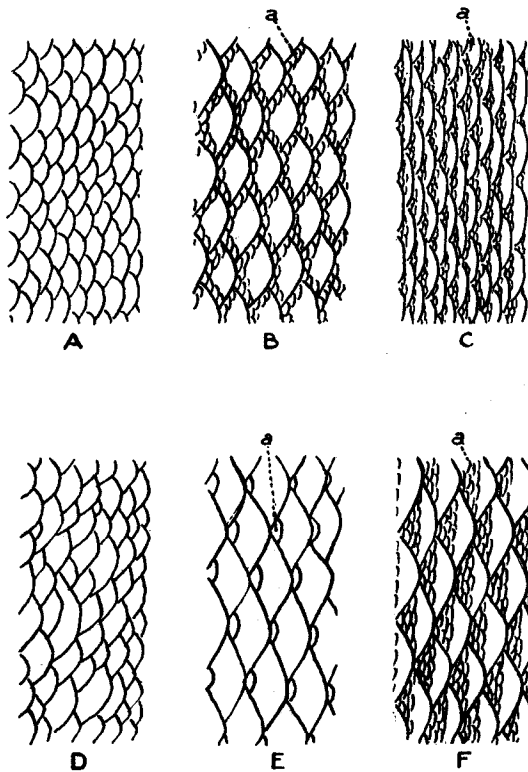
In the course of this survey some interesting points have arisen regarding the development of certain members of the group, especially in the genus *Pomacanthus*. It has long been known that the young of the American forms are quite unlike the adults in coloration, being black, with transverse white stripes. I am now able to demonstrate that this is also a feature in the development of the six species of *Acanthochætodon*, here united with *Pomacanthus*; and, as it does not appear elsewhere in the group, it seems to me to afford a further proof that these fishes form a natural genus. The case which appears to be of the greatest interest is that of *P. imperator*, which proves to be the adult form of the little black and white fish hitherto called *Holacanthus nicobariensis*. The colour-changes with age are probably more marked in this species than in any other fish. Each of the other species proves to have a young form hitherto considered as a distinct species, and in only one instance have I been unable to study actual examples of the immature fish.

A similar phenomenon occurs to a lesser degree in some species of *Holacanthus*, but here the black and white coloration is lost at a very early age, specimens of 100 mm. differing from the adult only in the presence of an ocular band and traces of blue transverse stripes; this, coupled with the fact that

*Holacanthus* is more specialized structurally, I take as an indication that this genus may be derived from *Pomacanthus*-like stock.

Another point which becomes evident is that any given developmental stage does not correspond with a definite size. Thus, where I have been able to examine a good series, two may be exactly alike in pattern but be of widely different lengths, while, on the other hand, two fishes of the same length may represent well-separated stages in pattern development. It may be assumed from this that while growth-rate is determined by local conditions pattern development is entirely dependent on age.

Text-figure 2.



Scale formation in: A, *Pomacanthus imperator*; B, *P. annularis*; C, *P. striatus*; D, *P. semicirculatus*; E, *Holacanthus tricolor*; F, *H. ciliaris*.  
a, auxiliaries.

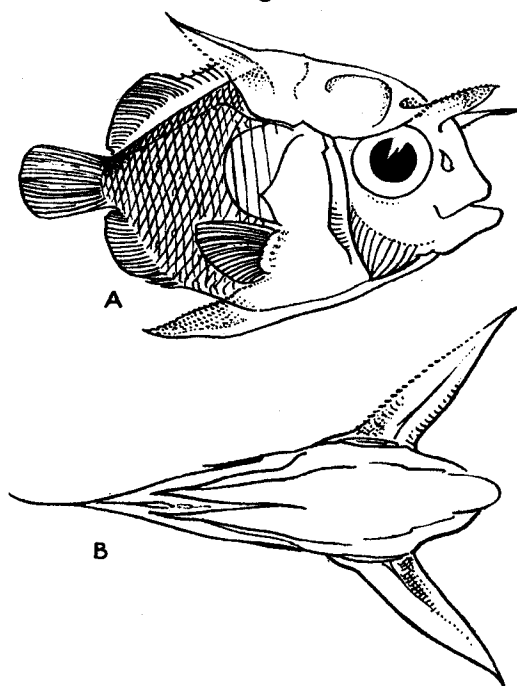
Very young examples appear to be rare. The specimen illustrated (text-fig. 3) shows that something approaching the *Tholichthys* stage of the *Chaetodontinae* occur at any rate in *Pomacanthus*.

The probable affinities of the various genera are indicated in the accompanying diagram (text-fig. 4), as it was not found practicable to show them clearly in the key.

This report is based principally on the material in the British Museum (Natural History), in which all but five of the known species are represented. A list of the specimens in the collection is included. Brevity has been considered essential in the descriptions, only those characters deemed most



Text-figure 3.



*Tholichthys* stage of *Pomacanthus* sp. from the South Atlantic.

Text-figure 4.

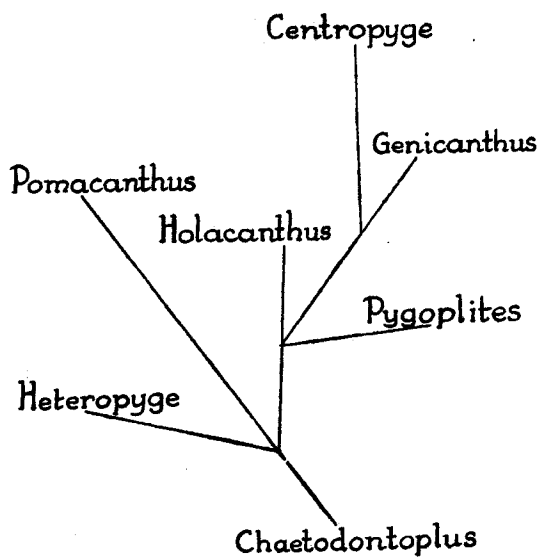


Diagram illustrating probable affinities of the genera of *Pomacanthinae*.