

AMERICAN MUSEUM NOVITATES

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CITY OF NEW YORK APRIL 27, 1954 NUMBER 1655

Review of the Deep-Sea Fishes of the Genus *Asquamiceps* Zugmayer, With Descriptions of Two New Species¹

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The definition of the genus *Asquamiceps*, as here understood, is fully expressed in the key to the genera of the Alepocephalidae previously published by the author (Parr, 1951, pp. 4-7). The genus was first introduced by Zugmayer (1911a, p. 2; 1911b, p. 10), for *A. velaris*. A second specimen was tentatively referred to *A. velaris* Zugmayer by Norman (1930, p. 267). Koefoed (1927, p. 43), using a simplified classification of the family, described a second species of *Asquamiceps* under the designation of *Alepocephalus hjorti*. Finally Fowler (1934, p. 248) added a third species, *Asquamiceps longmani*, for which he introduced a separate subgenus, *Megalepocephalus*.

Up to the present the literature thus records only four specimens of *Asquamiceps*, referred to three different species, and it seems evident that the genus must represent an assembly of very rare species. Actually no species is known from more than a single specimen of unquestionable identity. The supposed second specimen of *A. velaris* (Norman, 1930) is herein described as a new species, *A. indagatio*, and a specimen from the "Dana" collection is made the type of a fifth species, *A. pacificus*, new species. The author has also had opportunity to examine the types, and only known specimens, of the three species previously described.

The genus has already been divided into two subgenera with the introduction of subgenus *Megalepocephalus* by Fowler (1934). The new species *pacificus*, herein described, makes a further subdivision desirable

¹ Papers from the "Dana" Oceanographical Collections, Number 39.

in order to maintain sharp and easily determined subgeneric distinctions. A third subgenus, *Perioceps*, is therefore introduced for this species.

The proportion between the distance from the snout to the preopercle and the length of the lower jaw, and the backward extent of the upper jaws below the orbits, are features by which the genus falls into two well-separated groups, easily determined almost regardless of the condition of the specimen. One of these groups combines the two subgenera *Asquamiceps* and *Perioceps*. *Perioceps*, however, is probably closer to *Megalepocephalus* than to *Asquamiceps*, which latter seems to occupy a position somewhat apart from the rest, as indicated particularly by its small, scarcely imbricated, rather adherent scales and its externally almost invisible lateral line, and by having only four pyloric caeca. In the other two subgenera the squamation has the peculiarly irregular appearance so well illustrated in Koefoed's figure of *A. hjorti*, with very elongate, widely overlapping, deciduous scales and a very distinct lateral line. While this difference in squamation is probably more significant than the other differences within the genus, it is of less practical value for identification owing to the deciduousness of the squamation of the *Perioceps* type.

Although *Perioceps* groups itself with *Megalepocephalus* in regard to squamation and pyloric caeca, its separation from the latter by the proportions of the jaws and anterior part of the head is further confirmed by such features as the extremely large head and extremely short distance from ventrals to anal fin, and by other characteristics.

The scarcity of material makes it impossible to find direct evidence of the prevailing rates of change in proportions with growth. Lacking an opportunity to compare specimens of the same species, one may try to assess the probable rates of change in proportions by seeking a coefficient of change that will reduce to a minimum the differences between related species in regard to such basic characteristics as do not seem to be involved in their specific differences (see also Parr, 1949, pp. 52-55).

Using this procedure we find both the over-all length of the head and the distance from snout to top of preopercle of *A. velaris* and *A. indagation* (= *A. velaris* Norman), expressed as per cent of L (length without caudal fin), joined by the coefficient of $-.017 L$. This coefficient also gives expressions fitting the lengths of the snouts of these two species with deviations of less than $\pm .1$ per cent of L, and the lengths of the lower jaws with deviations of less than $\pm .25$ per cent of L.

Another related pair is formed by *longmani* and *hjorti*. The coefficient of $-.017 L$ joins both the upper and lower jaws of these two species with perfect fits, leaving deviations of only $\pm .02 L$ per cent of L, or less. The same coefficient fits the diameters of their orbits and the distances from

snout to the tops of the preopercles with deviations of $\pm .3$ per cent of L, or less.

The length of the snout in *hjorti* precisely fits the expression (12.65-.017 L) used for *velaris* and *indagatio* (see above).

With the use of $-.017$ L, the orbits of the new species, *pacificus*, and *longmani* might be fitted with an expression giving deviations of only $\pm .2$ per cent of L, but *hjorti* would deviate from this expression by $-.7$ per cent of L.

When all these comparisons are taken into account, and in the absence of direct evidence from a single species, the assumption of coefficients of change approximating $-.017$ L would seem to form the most reasonable basis for comparison of the species. It should also be borne in mind that this figure has been so chosen as to minimize the possible differences between the species by joining as many as possible of their proportions in expressions using the same coefficient.

Apart from the orbits, the new species exceeds the maximum proportions of any of the others by 1.3 (snout) to 4 (head) per cent of L, on the basis of a coefficient of $-.017$ L.

It should be noted that when regression equations are used on such limited material as that available of *Asquamiceps*, they are used only in a purely descriptive sense, referring merely to the material actually at hand. When the heads of subgenus *Asquamiceps* are said to be (48 $-.017$ L) per cent of L, that means merely that the relative lengths of the heads in the two specimens and species examined, of 90 and 160 mm. L, both fall upon the line so defined and is only another way of saying: head 46.4 per cent of L at 90 mm., 45.2 per cent at 160 mm. Being purely descriptive, the expression must be continuously modified as new material becomes available, just as the ranges of variations expressed in more customary terms are modified, until enough is known about all species to establish true limits and norms on a reliable basis. The important advantage of the expressions here used is that they enable us to say, for instance, that the relative length of the head of *A. hjorti* (46.2 per cent of L at 200 mm.) does not fall on the same line as the relative lengths of the heads measured in subgenus *Asquamiceps*, in spite of the fact that it falls within the range of the proportions of the latter when these proportions are stated without reference to the size of the specimens. The use of such provisional and purely descriptive expressions has proved absolutely essential for the differentiation of species in the larger alepocephalid genera, notably *Alepocephalus* itself.

The genus is represented in all oceans by species of moderate size up to 200 mm. L.

KEY TO THE SUBGENERA AND SPECIES OF *Asquamiceps*

- A. Distance from snout to top of preopercle more than 3 per cent of L longer than lower jaw. Upper jaw ends well in advance of vertical from posterior margin of orbit, its length being less than the combined length of snout and orbit.
1. Heads relatively moderate, about (48 - .017 L) per cent of L. Interorbital width only 13-15 per cent of the length of the head, and not more than two-thirds of the diameter of the orbit. Lateral line very indistinct. Only four pyloric caeca. Only 15-17 gillrakers in outer arch. Only about 16-17 scales in a transverse count Subgenus *Asquamiceps* (Zugmayer, 1911)
 - a. Only five branchiostegals. Orbits equivalent to about (13 - .017 L) per cent of L; upper jaws to about (18 - .017 L) per cent. Interorbital width at 160 mm. L somewhat less than 60 per cent of diameter of orbit. More than 70 scales in a longitudinal series *Asquamiceps* (*Asquamiceps*) *velaris* Zugmayer, 1911
 - b. Six branchiostegals. Orbits equivalent to less than (12 - .017 L) per cent of L, upper jaws to less than (17 - .017 L) per cent. Interorbital width already at 90 mm. L more than 60 per cent of diameter of orbit. About 65 scales in a longitudinal series *Asquamiceps* (*Asquamiceps*) *indagatio*, new species
 2. Heads very large, equivalent to more than (52 - .017 L) per cent of L. Interorbital width more than 20 (about 22) per cent of the length of the head, and conspicuously greater than the diameter of the orbit. Lateral line very distinct. About eight pyloric caeca. About 25 gillrakers in outer arch. About 24-26 scales in transverse count *Perioiceps*, new subgenus
 *Asquamiceps* (*Perioiceps*) *pacificus*, new species
- B. Distance from snout to top of preopercle less than 1 per cent of L longer than lower jaw. Upper jaw reaches approximately to the vertical from the posterior margin of the orbit, its length being slightly greater than the combined length of snout and orbit. Interorbital width about 19-22 per cent of the length of head, and considerably greater than the diameter of the orbit.¹ At least six pyloric caeca. Twenty to 26 gillrakers in outer arch. More than 20 scales in a transverse count Subgenus *Megalepocephalus* Fowler, 1934
1. Only about 22 scales in transverse count. Premaxillaries well developed, with a vizer-like lateral lamella along the middle. Six (+ ?) pyloric caeca. Gillrakers fairly long, about 5.2 per cent of L, about 13-15 in lower limb of first arch *Asquamiceps* (*Megalepocephalus*) *longmani* Fowler, 1934
 2. About 30 scales in transverse count. Premaxillaries possibly rudimentary. Ten pyloric caeca. Gillrakers very long, about 7 per cent of L, about 18 in lower limb of first arch *Asquamiceps* (*Megalepocephalus*) *hjorti* (Koefoed, 1927)

¹This subgenus is know only from fairly large specimens, 180-200 mm. L.

Subgenus *Asquamiceps* (Zugmayer, 1911)*Asquamiceps (Asquamiceps) indagatio*, new species*Asquamiceps velaris* NORMAN, 1930, p. 267.

Orbits moderate, equivalent to about (11.7 — .017 L) per cent of L. Interorbital space narrow, but wider than in *A. velaris*. Skeletal interorbital width, at only 90 mm. L, about 6.7 per cent of L, about 14.5 per cent of head and about two-thirds (65%) of the diameter of orbit. Overall length of upper jaws equivalent to about (16.6 — .017 L) per cent of L.

The type, and only specimen, gives the following measurement and proportions: Length without caudal fin, 89.5 mm. Proportions in per cent of length without caudal: Head, 46.4 per cent. Snout, 11.2. Orbit, 10.2. Upper jaws, over all, 15.1. Length of supramaxillary, 4.7. Lower jaw, 20.7. Interorbital width, 6.7. Sphenotic width of skull, 14.5. Snout to top of preopercle, 25.7. Snout to dorsal fin, 71.5. Base of dorsal fin, 18.0. Snout to anal fin, 70.5. Base of anal fin, 19.5. Snout to pectorals, 42.5. Width of pectoral fin base, 4.5. Snout to ventrals, 59.8. Length of ventrals, 9.2. Greatest depth, 19.6. Least depth of caudal peduncle, 7.3. Longest gillraker, 6.2. Longest pyloric caecum, 5.6.

D, 16; A, 15; P, 14; V, 5; Br, 6. There are only 15 gillrakers in outer arch, nine of these on the lower limb.

About 65 scales in a longitudinal series, about eight in a transverse row from the middle septum to the origin of dorsal fin, and about seven to the origin of anal fin.

The most striking features of the type are the thin and high dorsal and ventral dermal keels. The dorsal keel begins at the nape and gradually attains a very considerable height (more than 3 per cent of L) before the dorsal fin. The ventral keel begins in the jugular region, also attains a depth of about 3 per cent of L, or more, and tapers sharply between the ventral fins, to end before the anus. There are also keels above and below the caudal peduncle. These features may be juvenile and should therefore not be given diagnostic significance unless they should prove to be present also in larger specimens.

TYPE SPECIMEN: British Museum No. 1930.1.12.1.

Discovery Station 101. South Atlantic. October 14–15, 1926. Latitudes 33°50' to 34°13' S., longitudes 16°04' to 15°49' E., 2580 meters.

Perioiceps, new subgenus

Distance from snout to top of preopercle more than 3 per cent of L longer than lower jaw. Upper jaws end well in advance of the vertical

from the posterior margin of orbit, although well behind the middle of the orbits, the over-all length of the upper jaws being somewhat less than the combined length of snout and orbit.

Heads extremely large, their length equivalent to more than (52—.017 L) per cent of L. Distance from snout to top of preopercle very long, equivalent to about (30—.017 L) per cent of L. Skeletal interorbital space very wide, distinctly wider than orbit and equal to about 11 per cent of L, or more, and to about 22 per cent of the head, at 85 mm. It has special significance to find such a wide interorbital space in a small specimen, since the interorbital width almost invariably increases relative to the orbit with increasing total length. It is also usual to find it increasing slightly relative to the length of the head and not uncommon to find it increasing also in relation to L.

Snout and jaws long, both in proportion to the head and in relation to the total length, the length of the snout being equivalent to about (14—.017 L), that of upper jaws to about (22—.017 L), and that of lower jaw to more than (26—.017 L) per cent of L. The jaws are also longer in proportion to the head than in any other specimen of *Asquamiceps*.

Orbits moderate for the genus, slightly smaller than in subgenus *Asquamiceps* both in proportion to L, being equivalent to about (11—.017 L) per cent of L, and in proportion to the heads, but slightly larger than in subgenus *Megalepocephalus* by both comparisons.

Scales elongate, widely overlapping and relatively deciduous. The narrow shape of the scales gives relatively high transverse counts without also giving high longitudinal counts, the total of the transverse counts at the origins of D and A being about 25 (24–26), while the total longitudinal count is only about 60, and the lateral line count about 40–45.

There are about eight long pyloric caeca, some occasionally divided. About 25 gillrakers in outer arch. Six branchiostegals. Center of anus approximately at the beginning of the posterior one-third of the distance from the bases of anterior ventral fin rays to the origin of anal fin.

The type, and only, species is *Asquamiceps (Perioceps) pacificus*, new species, from off the Pacific coast of Central America.

Asquamiceps (Perioceps) pacificus, new species

Head very large, equivalent to about (53—.017 L) per cent of L, or slightly more. Interorbital space very wide, skeletal width more than 11 per cent of L, about 22 per cent of head, and distinctly greater than diameter of orbit (about 115–120% of orbit). As pointed out above in the discussion of the subgenus, such a great interorbital width is especially significant in a small specimen, since the interorbital width relative to the

orbit virtually always increases with increasing size, and this is usually also true in relation to the size of the head, and often in relation to total length.

The type, and only specimen, gives the following measurement and proportions: Length without caudal fin, 85 mm. Proportions in per cent of length without caudal fin: Head (over all), 51.8 per cent. Snout, 12.5. Orbit, 9.8. Upper jaws, 20.5. Supramaxillary length, 5.5. Lower jaw, 25.3. Interorbital width, 11.4. Sphenotic width of skull, 18.2. Snout to top of preopercle, 28.6. Snout to dorsal fin, 70.5. Base of dorsal fin, 21.4. Snout to anal fin, 71.2. Base of anal fin, 19.5. Snout to pectorals, 46.3. Width of pectoral fin base, 6.5. Length of pectorals, about 9. Snout to ventrals, 62.5. Greatest depth, 25. Least depth of caudal peduncle, 7.9. Longest gillraker, 6.1. Longest pyloric caecum, 5.9.

D, $19\frac{1}{2}$; A, $17\frac{1}{2}$; P, 15; V, 6; Br, 6. There are 25 gillrakers in the outer arch, 17 of these on the lower limb.

The lateral line contains about 43 scales. About 59 transverse rows of scales above the lateral line. About 11–12 scales between lateral line and origin of dorsal fin, about 13–14 to the origin of anal fin.

Stomach slightly siphon-caecal. There are eight pyloric caeca, counted at their bases, one on one side of the pylorus and seven in a series along the intestine on the other. The third caecum divides near the base, giving a total count of nine distal diverticles.

Very sparse and extremely minute teeth in a single series in lower jaw. The specimen shows no teeth on maxillaries, but the skin at the edge has been abraded. Premaxillaries with hardened, horizontal, tooth-like plates at their anterior outer margin, which have been considerably damaged so that the details cannot be determined. Inner edge of each premaxillary (at the gape) with a single small spine, rather than tooth, near the middle, directed towards the gape, but apparently without other dentition. Vomer and palatines without teeth.

TYPE SPECIMEN: Dana Collection. Station 1208^{IV}. Taken in the Pacific off the Gulf of Panama at latitude 6° 48' N., longitude 80° 33' W. on January 16, 1922, with 3500 meters of wire out.

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