

The Axial Osteology of the Goby, *Quisquilius eugenius* (Jordan and Evermann)

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Quisquilius eugenius is a common inhabitant of the intertidal and sublittoral zones in tropical and subtropical waters. A series of specimens were collected from the intertidal zone in 1964 from Okinawa Islands. This paper deals with the description of the axial skeleton of this species.

Some 15 specimens ranging in size from 21 to 50 mm in standard length were fixed in formalin and then transferred to 70% ethyl alcohol for storage. The specimens were then prepared for skeletal analysis by staining them *in toto* with alizarine red (Hollister, 1934).

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Osteology of the axial skeleton

The axial skeleton comprises the vertebrae and ribs, the pterygiophores of the median fins and the caudal skeleton.

Vertebrae.—The vertebrae, including the urostyle, numbered 26 in all cases. Böhlke and Robins (1960) reported 26 as the vertebrae count for a closely related species *Q. hipoliti*. The first haemal arch appeared at the 11th vertebra. This means that there are ten abdominal vertebrae leaving the rest to be classed as caudal vertebrae. The centrum of the first vertebra is shorter than those immediately following. The length of the centra in the abdominal region is uniform with a slight decrease in length caudad beginning

with the second or third caudal vertebrae.

Dorso-laterally on each centrum, except for the last two vertebrae, thin sheets of bone, extend posteriorly from the bases of the neural arches. These sheets appear to be weaker caudally. They extend beyond the posterior end of the centrum but do not come into contact with the next neural spine. Ventrolaterally on the centrum, thin sheets of bone form wedges between the convex ends. On the caudal vertebrae they extend from the bases of haemal arches. These thin sheets of bone add rigidity to the centra (Dineen and Stokely, 1954).

The neural arches are complete on all but the last three vertebrae. The neural spines are well developed and appear on all neural arches becoming progressively smaller. These interdigitate with the proximal pterygiophores (interneurals), the first which appears posterior to the neural spines of the third vertebrae. Postzygapophyses appear in all vertebrae except the first three and last three.

Caudal skeleton.—One vertebra in conjunction with the urostyle acts in support of the caudal fin (Fig. 1). The antepenultimate vertebra varies little from the rest of the caudal vertebrae. The neural and haemal spines are laterally flattened and blunt. The penultimate vertebra has the neural spine reduced to a broad, laterally flattened sheet of bone which lacks a neural arch (Eural 1). The haemal arch of the penultimate vertebra is reduced in size. A long thin sheet of bone (Hypural 1) is fused to the haemapophyses ventral to the haemal arch. The anterior edge of this thin sheet of bone has a knob-

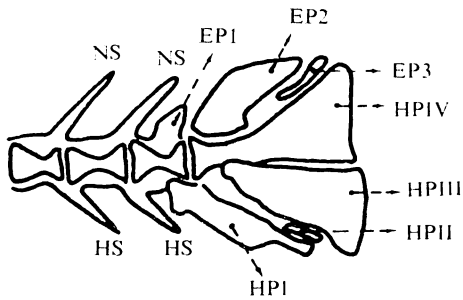


Fig. 1. Diagrammatic aspect of caudal skeleton of *Quisquilius eugenius*. EP 1-3, first (1), second (2) and third (3) epurals; HP I-IV, first (I), second (II), third (III) and fourth (IV) hypurals; HS, haemal spine; NS, neural spine.

like projection which extends beyond the haemaphyses and the area of its fusion. The posterior end extends almost to the posterior end of hypural II. The urostyle represents the anterior segment of the centrum and is continued caudad as a short, slightly upturned vestige. No elongate urostyle process exists. According to Whitehouse (1910) an elongate urostyle process represents a low degree of specialization. The urostyle is fused with hypurals III and IV. The epurals 2 and 3 remain separate from the urostyle or hypural IV. Epural 3 possibly represents a proximal pterygiophore. The fin has 17 segmented branched rays.

As Gosline (1961) pointed out, the trend of progressive simplification that takes place in percoid derivation appears primarily brought about by a fusion of parts such as the urostyle with hypurals and the fusion of uroneurals. The fusion of the urostyle with hypurals III and IV has taken place in this gobioid fish.

Ribs. Excluding the first and second vertebrae, ribs are associated with all visceral vertebrae. Ribs become progressively weaker caudad but are of about uniform length. Eight pairs of haemal ribs articulate with parapophyses on the third through the tenth vertebrae. Epipleurals appear on the first through the 12th vertebrae and articulate with the postero-dorsal surfaces of the parapophy-

ses. The epipleurals are fairly uniform in length and appear to vary in number with larger specimens having as many as 13 pairs. All small specimens examined had at least 12 pairs of epipleurals.

Dorsal fin.—The total number of dorsal rays regardless of size and structure varied from 17 to 18. Branched rays numbered 11 in all specimens. The first ray of the second dorsal is unbranched and therefore technically a spine. The degree of branching did not appear to increase with increases in fish size.

The number of pterygiophores in the dorsal fin was found to be 17 to 18 with the dorsal end of the pterygiophore fitting under the base of the dorsal ray. The shape of the pterygiophore could best be described as hockey stick-shaped. The proximal end of the first two pterygiophores lie posterior to the third neural spine. The distal fourth of each bone projects posteriorly to a cartilaginous articulation with a distal pterygiophore. These ossifications were better developed under the central part of the fin. Either posterior or anterior of the central portion, the ossifications became smaller, but were present on all pterygiophores.

Anal fin.—The structure is essentially the same as for the dorsal fin. Numbers of branched rays varied from 9 to 10. Koumans (1953) reported 8 to 9 rays and evidently only counted the principle rays. The number of pterygiophores was 9 in all cases. The anal fin begins just ventral to the base of the second most anterior haemal spine.

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ベンケイハゼ *Quisquilius eugenius* (Jordan and Evermann) の中軸骨格 C.R. Johnson

沖縄産ベンケイハゼ約 15 個体 (体長 21-50 mm) について、中軸骨格、すなわちとくに尾骨 (Fig. 1) を含む脊椎骨、肋骨および不對鱗担鰭骨の構造を骨学的に観察した結果の概要を述べた。

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