

Osteology and Relationships of the Eel *Diastobranchus capensis* (Pisces, Synphobranchidae)¹

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ABSTRACT: An osteological comparison of *Diastobranchus* (using its single species *D. capensis* Barnard, 1923, known only from the Southern Ocean) with other synphobranchoid eels shows that it is intermediate between *Synphobranchus* and *Ilyophis* (Synphobranchidae). The Simenchelyidae is more generalized, whereas the Dysommidae contain the more specialized of the Synphobranchoidi.

THE EEL FAMILIES Synphobranchidae, Dysommidae, and Simenchelyidae form a natural group which Robins and Robins (1970) regard as a superfamily (Synphobranchoidae) and Castle (1974) regards as a suborder (Synphobranchoidi). The families have, in common, fused frontal bones and telescopic-eyed larvae (Castle 1974). The Simenchelyidae contains but the single genus and species *Simenchelys parasiticus* Gill, 1879, studied comprehensively by Jacquet (1920). The other two families are much larger but even so their systematics are relatively well known through recent studies (Synphobranchidae: Castle 1964, Robins 1971; Dysommidae: Robins and Robins 1970, Castle, in press).

The value of osteology in determining relationships in the eels has been demonstrated (Congridae: Asano 1962, Smith 1971) and it is likely that this discipline will prove equally useful for other eel families, in particular the notoriously complex and diverse Ophichthidae and Muraenidae. In comparison with other major groups of eels the osteology of the synphobranchoids, except *Histiobranchus* Gill, 1883, and *Diastobranchus* Barnard, 1923, is also well known. *Histiobranchus* is currently under study (Catherine H. Robins, personal communication), and this paper illustrates and briefly discusses the osteology of *Diastobranchus* from its single species *D. capensis* Barnard, 1923. This species is known from the continental slope of southern Australasia and

South Africa; therefore, the genus is much more restricted in its distribution than are most other genera of synphobranchoids. *D. capensis* is probably not rare in these areas but specimens infrequently come to hand for study since collections on the bottom at about 1,000 m, where it seems to occur most abundantly, are seldom made. Amongst the synphobranchoids *D. capensis* is the largest, reaching 120 cm.

For this study a specimen of *D. capensis*, 896 mm total length (collected on 17 September 1956 off Kaikoura, New Zealand, in 990 m by longline), was macerated in 5-percent hydrogen peroxide as a skeletal preparation. Eight other specimens 856-1,227 mm total lengths, listed in Castle (1961) and now in the collection of the National Museum, Wellington, were studied through radiographs.

The Synphobranchoidi consist of forms that differ markedly from one another. The Synphobranchidae itself has scales and contains *Synphobranchus* and *Histiobranchus* with branchial apertures united beneath the throat; *Ilyophis* Gilbert, 1892, with these structures ventral, horizontal, but quite separate; and *Diastobranchus* with ventrolateral, oblique, branchial apertures. The Dysommidae (including now the Nettodaridae and Dysomminidae [Robins and Robins 1970]) lacks scales and has ventral, separate, branchial apertures. Both of these families have a relatively large mouth and a vertical or backwardly oblique hyomandibula. The Simenchelyidae also has scales and separate, ventrolateral, branchial apertures, but has a terminal, transverse mouth and a forwardly oblique hyomandibula.

Osteologically the synphobranchoids differ

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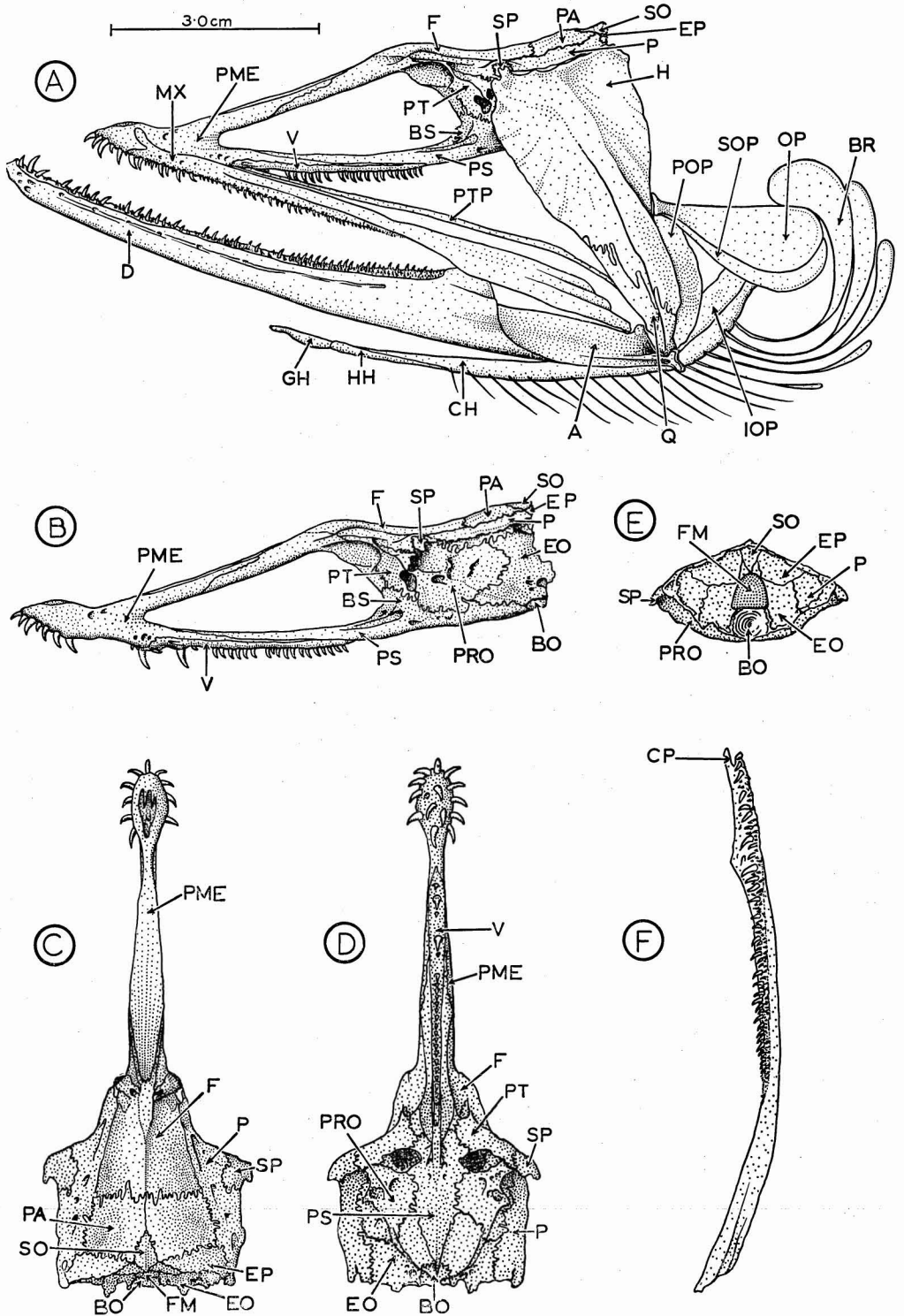


Fig. 1. For legend see facing page.

from other eels in having fused frontals, although this character needs further appraisal. In the branchial skeleton the third hypobranchials are posteriorly directed and cartilaginous, and the lower pharyngeal tooth-plates are multiple early in ontogeny, becoming fused later (Nelson 1966). *Diastobranchus* conforms with other synphobranchoids in these features (Figure 1C; Figure 2A: HB₃; Figure 2B: HB₃; Figure 2C). For *Synphobranchus affinis*, Robins (1971) reported only a third pair of pharyngobranchials and upper tooth-plates consisting of two pairs, in contrast to Nelson (1966) who illustrated a small second pair of pharyngobranchials and four pairs of upper tooth-plates for the same species. *D. capensis* is exactly similar to *S. affinis* as described by Robins. I did not observe a fourth median basibranchial, whether ossified or cartilaginous, in *D. capensis*. I could not determine the division between ceratohyal and epihyal, but I assume that the epihyal is the curved upper portion of this element.

A comparison of Figures 1 and 2 with those for various synphobranchs given by Robins (1971) reveals that within the Synphobranchidae *Diastobranchus* is osteologically intermediate between *Synphobranchus* (in particular *S. kaupi* Johnson, 1862) and *Ilyopbis brunneus* Gilbert, 1892. I have examined radiographs of specimens of *Histiobranchus bathybius* (Günther, 1877) and *H. bruuni* Castle, 1964, that show that *Histiobranchus* is closely similar to *Synphobranchus*, but its exact position relative to the other genera cannot be established until a detailed osteological study is made.

There are differences in the nature and degree of development of the ossifications of the cephalic sensory canal in the various

synphobranchoid genera as illustrated by Robins and Robins (1970) and Robins (1971). It was not possible to obtain a cleared and stained preparation of these structures in this study. However, it is apparent from the development of the pores on the head that the cephalic sensory system is most complete in the synphobranchids (including *Diastobranchus*) but less so in the dysommids (Robins and Robins 1970). On the other hand, the dysommids have the integument of the snout and lower jaw thrown into folds or plicae of varying complexity. Except for *Ilyopbis*, in which they are inconspicuous, snout plicae are absent in synphobranchids.

A feature of *Diastobranchus* as compared with other synphobranchids is the relatively long, straight pterygoid, which extends completely between the quadrate and the neurocranium. It is reduced and curved in *Synphobranchus* and *Ilyopbis*. The hypohyal is long and slender rather than short and cylindrical as in *Synphobranchus* and *Ilyopbis*. There are two hypurals, as in *Ilyopbis*, each carrying about eight caudal rays. The caudal skeleton of *Synphobranchus* is further subdivided (Robins 1971). Synphobranchoids have relatively many caudal rays, a feature which is identifiable in the leptocephalus. Although *Diastobranchus* is more similar externally to *Ilyopbis* in having separate, ventrolateral, branchial apertures, its osteological characters show that it is more closely related to *Synphobranchus* and *Histiobranchus*. *Ilyopbis* approaches the dysommids, in particular *Atractodenchelys* Robins & Robins, 1970. Overall, the dysommids may be regarded as the more advanced of the synphobranchoid eels, whereas the Simenchelyidae, despite the reduced mouth and presumed specialized habits, is the least so.

FIGURE 1. *Diastobranchus capensis* cranium (from adult, 896 mm total length). A, lateral view of cranium and branchial apparatus; B, lateral view of neurocranium; C, dorsal view of cranium; D, ventral view of cranium; E, posterior view of neurocranium; F, ventral view of maxilla.

ABBREVIATIONS: A, articular; BO, basioccipital; BR, branchiostegal ray; BS, basisphenoid; CH, ceratohyal; CP, clamping process of maxilla; D, dentary; EO, exoccipital; EP, epiotic; F, frontal; FM, foramen magnum; GH, glossohyal; H, hyomandibula; HH, hypohyal; IOP, interoperculum; MX, maxilla; OP, operculum; P, pterotic; PA, parietal; PME, premaxillary-ethmoid; POP, preoperculum; PRO, prootic; PS, parasphenoid; PT, pterosphenoid; PTP, pterygoid; Q, quadrate; SO, supraoccipital; SOP, suboperculum; SP, sphenotic; V, vomer.

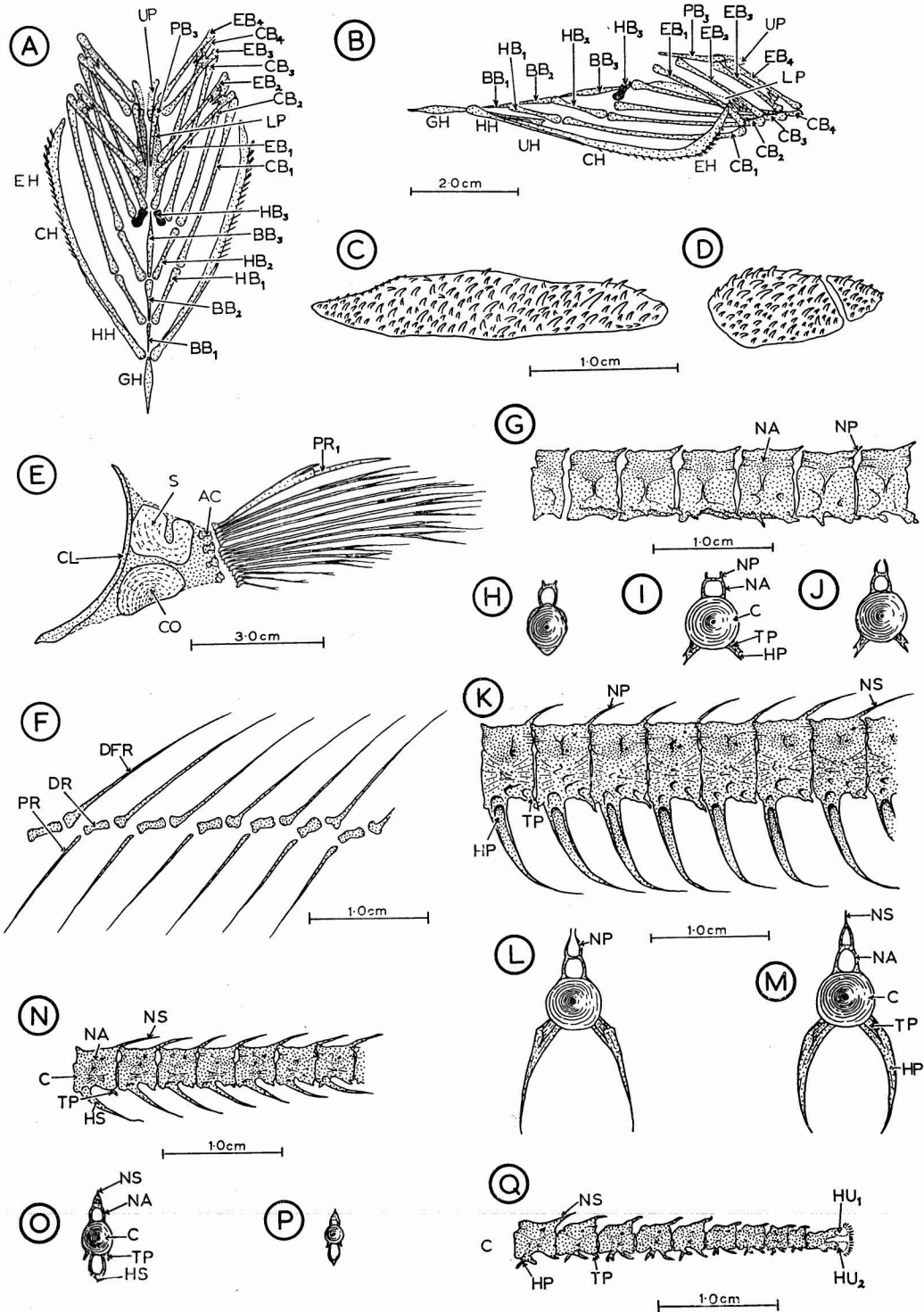


Fig. 2. For legend see facing page.

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FIGURE 2. *Diastobranchus capensis* skeleton (from adult, 896 mm total length). A, branchial skeleton, dorsal view; B, branchial skeleton, lateral view; C, lower branchial tooth-plate; D, upper branchial tooth-plate; E, pectoral girdle and fin; F, dorsal fin; G, first seven vertebrae; H-J, posterior views of first, fourth, and seventh vertebrae; K, 125th to 130th vertebrae; L-M, posterior view of 125th and 130th vertebrae; N, 150th to 156th vertebrae; O-P, posterior views of 150th and 156th vertebrae; Q, caudal vertebrae.

ABBREVIATIONS: AC, actinost; BB, basibranchial; C, centrum; CB, ceratobranchial; CH, ceratohyal; CL, cleithrum; CO, coracoid; DFR, dorsal fin ray; DR, distal radial; EB, epibranchial; EH, epihyal; GH, glossohyal; HB, hypobranchial; HH, hypohyal; HP, parapophysis; HU, hypural; LP, lower pharyngeal tooth-plate; NA, neural arch; NP, neurapophysis; NS, neural spine; PB, pharyngobranchial; PR, pectoral ray; R, radial; S, scapula; TP, transverse process; UH, urohyal; UP, upper pharyngeal tooth-plate.