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## TWO EELS OF THE GENUS *SYNAPHOBRANCHUS* FROM THE GULF OF MEXICO

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Nine eels of the genus *Synaphobranchus* were included in a collection of fishes made by an expedition aboard the United States Fish and Wildlife Service Research Vessel *Oregon* in the Gulf of Mexico during 1952 (Station 640, 355–475 fathoms). Later work in 1955 in approximately the same area but in the considerably greater depth of 1150–1200 fathoms resulted in the capture of four additional specimens (Station 1303). All of these eels were provisionally identified as *S. kaupi* Johnson, 1862, and the four from Station 1303 were listed as such by Grey (1956, pp. 93, 146). As I was engaged in a study of New Zealand Synaphobranchidae, Mrs. Grey kindly sent me comparative material from *Oregon* Station 640. These specimens proved to be a new species, described below. Three specimens from Station 1303, have been examined. They are not *S. kaupi* but *S. brevidorsalis* Günther, 1887, and represent the first record of this species for the Atlantic.

The original description of *S. brevidorsalis* lacks data that have gained importance with the increased knowledge of the genus, and it is for this reason, as well as for the fact that the *Oregon* specimens are the first known from the Atlantic, that a somewhat detailed account of *S. brevidorsalis* is given below. The description also permits a more complete comparison with the new species. It is possible that some of the earlier Atlantic records of *S. pinnatus* Günther, 1870, or of *S. kaupi*, may actually have been based on specimens of *S. brevidorsalis*. It is now known that both *S. kaupi* and *S. affinis* Günther, 1877, have been at times reported under the abandoned name, *S. pinnatus*.

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The material which forms the basis of this account has been lent from the collection of fishes of Chicago Natural History Museum through the kindness and interest of Mrs. Marion Grey, Division of Fishes. I am greatly indebted to the Museum for permission to describe the material and for help in other ways. Comparative material, in the form of four specimens of *S. affinis* from the collection of fishes of the Department of Zoology, Victoria University of Wellington, New Zealand, was also available in the preparation of this account. My thanks also go to Professor L. R. Richardson of this Department for his continued guidance and assistance and to Mr. J. Graydon for the preparation of X-ray photographs.

**Synaphobranchus oregoni**, new species. Figure 66.

*Type*.—United States National Museum no. 185605, trawled from the Gulf of Mexico on September 19, 1952, Oregon Station 640, Lat. 29° 01' N., Long. 88° 24' W., 355–475 fathoms. Mature female, 380 mm. total length.

*Paratypes*.—Eight specimens, 313–506 mm. total length, CNHM 47911, collected with the type.

*Description*.—Proportional measurements in percentages of total length for type and paratypes (in parentheses): Standard length 97.5 (97.3–98.5); head 13.9 (13.1–14.0); snout 4.7 (4.2–4.7); eye (length) 2.1 (1.8–2.2); interorbital (including soft parts) 2.1 (1.9–2.4); gape 7.9 (7.2–7.9); postorbital 7.4 (6.9–8.7); branchial aperture 0.8 (0.6–1.9); pectoral 6.6 (4.9–6.7); predorsal 34.5 (33.6–40.0); preanal 27.4 (25.3–30.4); depth at anal origin 6.8 (5.7–7.5).

Vertebrae 143 (143–145). Lateral line pores before vent 30 (31–33). Pectoral rays 14 (14–15).

Body moderately elongate, not greatly compressed anterior to vent but progressively more compressed along caudal region; greatest depth of body about 2.0 times in head and uniform from level of pectoral fin to a point well past vent. Head not large but gape long. Abdomen rather short, about 7.7 times in total length. Pectoral fin moderately developed. Median fins fleshy, with fin-rays conspicuous only at the edges.

Scales present over most of the surface excepting snout, lower jaws, and fins. Each scale subangular to rounded in outline and embedded in a shallow depression covered by an extremely thin, pigmented epidermis—thus the scales arranged in a rather “paving-stone” manner and not in the regular “basket-weave” pattern seen in *S. kaupi* and *S. affinis*.

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Head not appreciably differentiated from trunk, about 7.5 times in total length, sharply conical, angle of jaw not conspicuous. Snout moderately short, 3.0 times in head, projecting only slightly in advance of lower jaw. Jaws strongly developed, mouth essentially terminal. Gape contained about 1.7 times in length of head and extending behind eye for a distance equal to just less than length of eye. Free lips absent. Tongue feebly differentiated on floor of mouth.

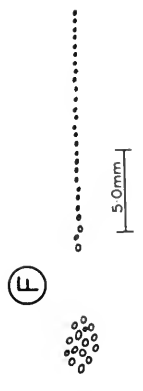
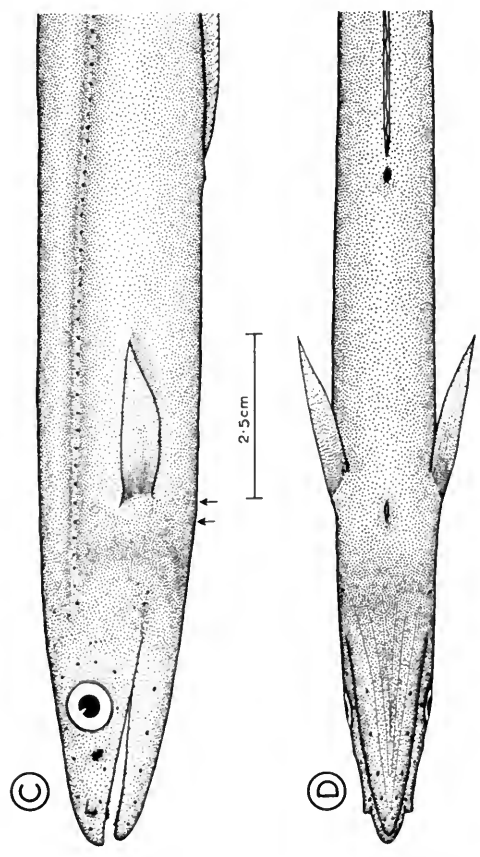
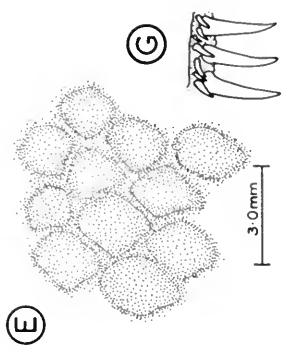
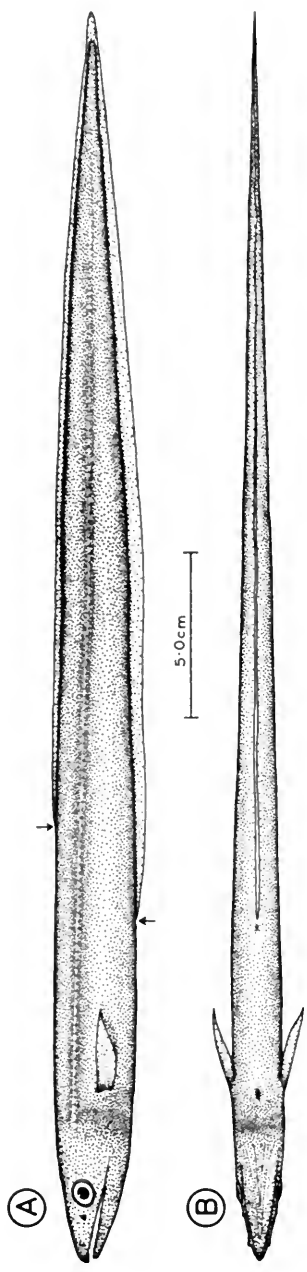
Tooth-bearing bones consisting of maxilla, premaxillo-ethmoid, vomer, and dentary. Teeth on maxilla on a dentigerous area equal in length to two-thirds of this bone; distributed anteriorly in two longitudinal rows which become cardiform posteriorly; inner or medial row consisting of large teeth, the anterior ones equal to a scale in length but the posterior ones progressively becoming much smaller; the most lateral row consisting of small teeth which tend to be directed outwards. Teeth on dentary similar in size and distribution at all points to those on maxilla but the dentigerous area considerably longer. Teeth on the median bones of roof of mouth grouped into two distinct sets which are separated by a naked area equal in length to the anterior patch; this anterior, or premaxillo-ethmoid patch, longitudinally oval, short, equal in length to nearly one-sixth of the maxillary series, and consisting of about 10 recurved, irregularly arranged teeth, each appreciably larger than the largest on the maxilla and thus exceeding the length of a scale. Posterior (vomerine) set of teeth very elongate, equal to about 4.2 times the length of the premaxillo-ethmoid patch; dentigerous area of vomer extending to a point level with posterior margin of eye. Vomerine teeth uniserial and generally smaller than those on the premaxillo-ethmoid but with the anterior two or three teeth of this uniserial row somewhat larger than the remainder.

Anterior nostril placed at level of anterior tip of premaxillo-ethmoid patch of teeth, directed anteriorly and from the dorsal aspect appearing to be mounted on a short tube attached along half its length. Posterior nostril without an external tube but with a raised rim, and placed well in advance of eye. Anterior and posterior nostrils separated by a distance equal to diameter of eye. Eye large, subcircular, about 3.5 times in postorbital length. Interorbital width, including soft parts, about equal to length of eye.

Branchial apertures ventral, horizontal, nearly confluent at the surface as though forming a common aperture but separated distinctly within; just anterior to pectoral fin and, in the type, their length subequal to the pupil or just greater than half the length of

FIG. 66. *Synaphobranchus oregoni*, new species; type, 380 mm. total length. A, lateral view; B, ventral view; C, lateral view of head and abdomen; D, ventral view of head and abdomen; E, scale pattern as seen just above the mid-lateral level; F, arrangement of premaxillo-ethmoid (left) and vomerine teeth; G, lateral view of representative maxillary teeth (same scale as E).

Arrows indicate origins of dorsal and anal fins and extent of branchial apertures.



the eye. Vent not protruding into profile; at end of anterior third of body.

Dorsal fin low, originating at a point behind level of vent, just greater than length of snout; reaching its maximum height halfway along its length, where it is equal to one-eighth of depth of body at this point. Anal fin originating immediately behind vent, greater in height than dorsal, its greatest height contained more than three times in depth of body at this point. Caudal fin not clearly distinct from posterior tips of dorsal and anal fins; total complete caudal rays about 16. Pectoral fin elongate-oval, the axial rays slightly above middle of fin, and attenuated; fully formed pectoral rays 15.

Lateral line canal conspicuous on posterior region of head, arising high on head and not reaching the mid-lateral level until halfway along caudal region. Pores distinct along head and trunk, numbering 26 before level of vent; less conspicuous along caudal region. Cephalic sensory pores also distinct around eye and nostrils, along jaws and just posterior to angle of mouth. Two groups of many extremely fine mucous pores present on dorso-lateral and lateral surfaces of head between eye and origin of lateral line proper, and just above angle of mouth.

Color in alcohol light pink, with head, fins and lateral line dark grayish-brown; abdomen gray.

**Synaphobranchus brevidorsalis** Günther, 1887. Figure 67, A-E.

*Synaphobranchus brevidorsalis* Günther, 1887, Rep. Sci. Res. Voy. Challenger, Zool., 22: 255.

*Synaphobranchus jenkinsi* Jordan and Snyder, 1901, Proc. U. S. Nat. Mus., 23: 845.

*Synaphobranchus brevidorsalis* Brauer, 1906, Wiss. Ergebn. Deutschen Tiefsee Exp. Valdivia, 15, (1), p. 134; 1908, op. cit., 15, (2), p. 160; Weber, 1913, Monogr. Siboga Exp., 57: 55; Weber and de Beaufort, 1916, Fishes Indo-Austr. Arch., 3: 335; Norman and Trewavas, 1939, Ann. Mag. Nat. Hist., (11), 3: 358; Matsubara and Ochiai, 1951, Jap. Jour. Ichth., 1: 251.

*Synaphobranchus pinnatus* var. *brevidorsalis* Lloyd, 1909, Mem. Indian Mus., 2: 152.

*Synaphobranchus* (*Synaphobranchus*) *brevidorsalis* Norman, 1939, Sci. Rep. John Murray Exp., 7, (1), p. 45.

*Synaphobranchus kaupi* (in part) Grey, 1956, Fieldiana, Zool., 36: 146; Springer and Bullis, 1956, Spec. Sci. Rep. U. S. Dept. Int., Fish., 196: 51.

*Study material*.—Three specimens, 331–673 mm. total lengths, CNHM 64076, trawled from the Gulf of Mexico on May 26, 1955, Oregon Station 1303, Lat. 28° 47' N., Long. 87° 50' W., 1150–1200

fathoms. Also measurements kindly supplied by Mrs. Marion Grey from a fourth specimen from this station, 501 mm. total length, since returned to the U. S. Fish and Wildlife Service.

This species, described by Günther in 1887 and later recorded briefly by several authors, has always been regarded as quite distinct from *S. kaupi* and *S. affinis* mainly on the nature of the scales. However, in view of the fact that a species closely similar to *S. brevidorsalis*, namely, *S. oregoni* (see p. 388), is now known, it is considered valuable to include with this account a more detailed description of *S. brevidorsalis* than is available elsewhere.

*Description.*—Proportional measurements in percentages of total length: standard length 97.0–98.5; head 12.7–13.4; snout 3.7–4.1; eye (length) 1.5–1.9; interorbital (including soft parts) 2.4–2.5; gape 3.6–6.2; postorbital 8.2–8.5; branchial aperture 2.4–2.9; pectoral 4.8–5.0; predorsal 42.3–47.0; preanal 31.0–33.2; depth at anal origin 5.4–6.8.

Vertebrae 133. Lateral line pores before vent 34–35. Pectoral rays 14–15.

Body moderately elongate, massive in a specimen of 673 mm. total length, more slender in smaller specimens, compressed only along caudal region; greatest depth at level of vent, where it is about 2.0–2.5 in head length. Head not large and with a moderate gape. Abdomen appreciably longer than in *S. oregoni*, about 5.6 times in total length. Fins fleshy with fin rays not strongly conspicuous but obvious, especially at the edges.

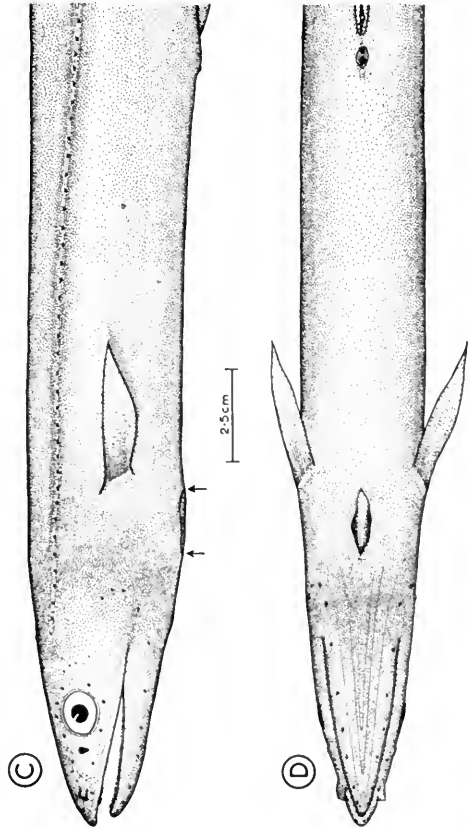
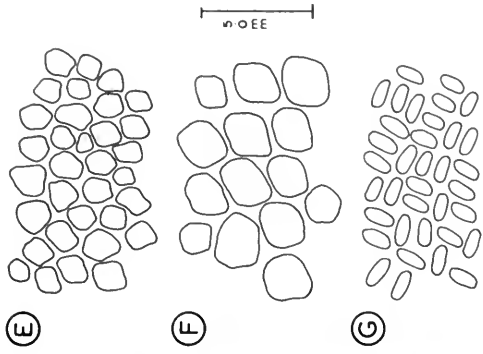
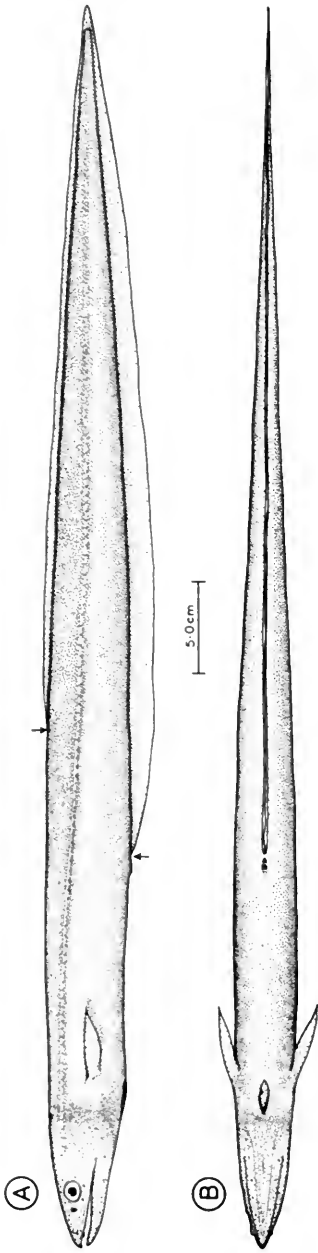
Scales present over almost entire surface except snout, lower jaws, and fins. Shape and arrangement of scales as in *S. oregoni*, but while in the latter they are about 2.0 mm.  $\times$  1.5 mm. in size, in *S. brevidorsalis* the scales are only two-thirds as large (see fig. 67, E, F).

Head not appreciably differentiated from trunk, over 7.0 times in total length, sharply conical, bony angle of jaw prominent. Snout shorter than in *S. oregoni*, 3.5–5.1 times in head, projecting only slightly in advance of lower jaw. Jaws strongly developed, mouth essentially subterminal, extending behind posterior margin of eye for a distance equal to length of eye. Gape contained about twice in length of head. Upper lip slightly more conspicuous than in *S. oregoni* but still only just separated from lateral aspect of snout. Tongue feebly differentiated on floor of mouth. Teeth and nostrils as in *S. oregoni*. Eye about 5.0 times in postorbital length. Interorbital width including soft parts about 1.5 times length of eye.

FIG. 67. *Synaphobranchus brevidorsalis* Günther, 1887; 673 mm. total length. A, lateral view; B, ventral view; C, lateral view of head and abdomen; D, ventral view of head and abdomen; E, scale pattern, *S. brevidorsalis*; F, scale pattern, *S. oregoni*; G, scale pattern, *S. affinis*.

Arrows indicate origins of dorsal and anal fins and extent of branchial apertures.





Branchial apertures ventral, horizontal, and superficially confluent at the surface but separated distinctly within; just anterior to level of pectoral fin; their length about 1.6–1.7 times the horizontal diameter of eye (appreciably longer than in *S. oregoni* but about the same length as in *S. kaupi* and *S. affinis*). Vent protruding slightly into profile; near end of anterior third of body.

Median fins as in *S. oregoni* but origin relatively more posterior as a result of the lengthened abdomen. Dorsal originating at a distance behind the vent equal to twice the length of the pectoral. Anal fin deeper than in *S. oregoni*. Caudal fin poorly developed, its dorsal and ventral edges continuous with dorsal and anal fins; total caudal rays about 16. Pectoral fin similar in form and size to that of *S. oregoni*, with 15–16 complete rays.

Lateral line canal system as in *S. oregoni* but with 34–35 conspicuous pores before level of vent. Cephalic pores conspicuous, each raised on a low mound. Very few fine mucous pores behind eye but a number behind nostrils.

Color in alcohol pinkish, with residual brownish pigment over much of the body surface.

*Remarks.*—At present the genus *Synaphobranchus* is accepted as including two subgenera: *Histiobranchus* Gill, 1883, with the dorsal originating at the level of the pectoral fin, and including *S. (H.) infernalis* (Gill), *S. (H.) bathybius* (Gill) and *S. (H.) australis* Regan; and *Synaphobranchus* Johnson, 1862, with the dorsal commencing near the level of the vent. The latter subgenus contains all other species of the genus, including the present two. *S. (S.) brevidorsalis*, widely distributed in the Indo-Pacific, is very similar superficially to *S. (S.) kaupi*, from both the Atlantic and the Pacific, and to *S. (S.) affinis*, so far known only from the Pacific, but differs from both species in the form and arrangement of the scales. At first glance the new species, *oregoni*, is clearly set off from others by its remarkably small branchial apertures. In all synaphobranchs these apertures are median and ventral, but in preserved specimens of *oregoni* they are short, less than the length of the eye, and often only equal to the length of the pupil. In all other known species of the genus the branchial apertures equal or exceed the length of the eye. Most specimens of *oregoni* are easily separable by the size of the branchial aperture, but the species nevertheless resembles *brevidorsalis* in the form and arrangement of the scales, which are subangular to rounded in outline, never elongate-ovoidal as in *kaupi* and *affinis* and in the

species of the subgenus *Histiobranchus*, in which the length of the scale is about twice the width.

In the nine preserved specimens of *oregoni* there is considerable variation in the appearance of the external branchial apertures. These are difficult to see when they are less than the length of the pupil. In only one specimen is the common aperture large, subequal to the length of the eye and with thin, free margins. In others, where the aperture is much smaller, the free edges may be either thin or thick, as though in the latter case there has been considerable contraction, probably resulting from preservation. In spite of a range in size, expressed as a ratio of length of aperture to length of eye of 1 : 3.5 up to 1 : 1.11, the whole impression gained from the nine specimens is that the aperture in life will not exceed the length of the eye and in its normal condition obviously will be less. There is no correlation with the size of the specimen.

The separation of occasional preserved specimens of *oregoni* from *kaupi*, *affinis* and *brevidorsalis* may not always be immediately obvious solely in terms of the branchial apertures because of the great variation recorded above. However, in *kaupi* and *affinis* the scales are elongate and arranged over the greater part of the body in groups of three to four, with the groups more or less at right angles to one another, so forming the aptly named "basket-work" or patchwork pattern. In *brevidorsalis* and *oregoni* the scales are not uniform in shape; some are generally subcircular, others are rather angular, but none are elongate. In these two species, the scales are not clustered or grouped but are regularly distributed in a "paving-stone" pattern. Further, in *brevidorsalis* the scales on most parts of the body are only two-thirds the size of those of *oregoni*.

*S. oregoni* has 143 to 145 vertebrae, and the length of the abdomen is subequal to that of the head. In *S. brevidorsalis* there are about 133 vertebrae, and the abdomen is longer than the head. With regard to the point of origin of the dorsal fin, *S. oregoni* appears to fall within the range shown by *S. kaupi*. The predorsal length is appreciably less in the new species than in *S. brevidorsalis*.

The *Oregon* specimens of *brevidorsalis* were taken at 1150-1200 fathoms, a depth comparable to that of the majority of captures of this species in the Pacific, although some have been taken in lesser depths. The new species was trawled in about 400 fathoms, a depth comparatively shallow for the family and appreciably less than the general depths known for *kaupi*, *affinis*, and *brevidorsalis*. However, in consideration of the wide bathymetric range of the genus as a

whole, the depth recorded for *oregoni* is here regarded as of only limited significance.

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