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Finless Snake-eels of the Genus *Cirricaecula* (Anguilliformes: Ophichthidae), with the Description of *C. macdowelli* from Taiwan

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Abstract A new finless snake-eel, *Cirricaecula macdowelli*, is described on the basis of a specimen trawled at 30–50 m from the Formosa Straits. It is distinguished from its only congener, *C. johnsoni* from the Marshall Islands, by having more vertebrae and fewer labial cirri.

The finless sand-eels of the snake-eel family Ophichthidae, tribe Sphagebranchini, are nearly devoid of useful characters for their identification. They spend the majority if not all of their adult life buried in the substratum, are rarely captured, and then so nearly only by using ichthyocides or by dredging or trawling. Little is known of their biology and life history, but their abundance at certain locations suggests that they play a meaningful role in interstitial ecology.

The species of *Cirricaecula* are the rarest among these finless eels. The type species, *C. johnsoni*, was described from four specimens collected at low tide in approximately 2 m of water off the sandy edge of an oceanic atoll in the Marshall Islands (Schultz, 1953). Although such a habitat has been collected numerous times throughout the central Pacific and elsewhere, to our knowledge, *C. johnsoni* has not been subsequently discovered (Randall, 1986; Randall and Randall, 1987). A single specimen of a quite different species of *Cirricaecula* was captured by trawl in the Formosa Straits in 1972. We are unaware of additional specimens of this curious eel and we therefore describe this specimen as a new species. The authors have benefitted in recent years from the generosity of Michael McDowell, tour operator and bon vivant, who has taken us to remote outposts in search of rare specimens. We take pleasure in naming this eel after him.

Measurements are straight-line, made either with a 300 mm ruler with 0.5 mm gradations (for total length, trunk length, and tail length) and recorded to the nearest 0.5 mm, or with dial calipers (all other measurements) and recorded to the nearest 0.1 mm. Body length comprises head and trunk lengths. Head length is measured from the snout tip to the posterodorsal margin of the gill opening; trunk length is taken from the end of the head to mid-anus. Vertebral counts (which include the hypural) are taken from radiographs. The holotype and only known specimen is deposited in the fish collection of the California Academy of Sciences (CAS), San Francisco. Other specimens examined are in the fish collections of the Field Museum of Natural History (FMNH), Chicago, and the National Museum of Natural History (USNM), Washington, D. C.

Cirricaecula Schultz

(New Japanese name: Hige-umihebi-zoku)

Cirricaecula Schultz, 1953: 49 (type species *Cirricaecula johnsoni* by original designation).

Diagnosis. Characters common to the species of *Cirricaecula* are as follows. Body elongate, cylindrical, pointed at both ends and entirely finless. Head and trunk about equal to tail. Snout pointed, depressed and broad dorsally, overhanging lower jaw, its underside flattened and grooved. Upper lip with conspicuous cirri. Eyes small to moderate in size. Anterior nostrils within a tube, the posterior nostrils open into the mouth. Gill openings ventral, with a thin medial membrane, and converge forward, their isthmus narrow. Head pores are developed and numerous, including four preopercular pores and five pores in supratemporal canal. Teeth are pointed and uniserial on the jaws and vomer, intermaxillary teeth are the largest and separated from those of the vomer

by a gap. Body coloration in life and in preservative uniformly pale.

Remarks. The species of *Ichthyapus*, *Apterichtus*, and *Cirricaecula* comprise the only entirely finless ophichthids and are within the tribe Sphagebranchini, subfamily Ophichthinae, of the family Ophichthidae (sensu McCosker, 1977). The species of *Cirricaecula* are separable from other sphagebranchins in the following manner:

Artificial Key to the Genera of Finless Ophichthines and the Species of *Cirricaecula*

1a. Upper lip without a row of obvious cirri 3
1b. Upper lip with numerous, obvious cirri 2
2a. Snout with 11–14 cirri along each side of upper lip; total vertebrae 117–119 .... *C. johnsoni* Schultz, 1953
2b. Snout with 4 cirri along each side of upper lip; total vertebrae 127 ....*C. macdowelli* sp. nov.
3a. Posterior nostril opening inside mouth, with or without a flap; anterior nostril not tubular; eye small or minute ....*Ichthyapus* de Barneville, 1847
3b. Posterior nostril opening outside mouth, with a flap; anterior nostril tubular; eye moderately developed .....*Apterichtus* Dumeril, 1806

Cirricaecula johnsoni Schultz
(New Japanese name: Hige-umihebi)

Cirricaecula johnsoni Schultz, 1953: 50, figs. 11h, 12.

Material. Holotype: USNM 141188, 402 mm TL, collected using rotenone on an ocean-side shallow water rock and sand reef, ca. 2 m, from Marshall Islands, Rongerik Atoll, Bock Island, 27 June 1946. Paratypes: all collected with the holotype, now USNM 141189, 353 mm and 325 mm TL (cleared and stained), and FMNH 62581, 333 mm TL.

Diagnosis. An elongate, cylindrical finless species of *Cirricaecula*, with the following unique combination of characters: head 9.7–10.0% of TL; tail 50–52% of TL; body depth 2.8–3.4% of TL; eye 0.3–0.4% of TL; 11–14 cirri along upper lip, becoming smaller posteriorly; 117–119 total vertebrae; and coloration pale in preservative, somewhat translucent in life.

Remarks. We have examined all of the known specimens of this species and have relied on Schultz's description and our own measurements. To our knowledge, it has neither been identified from subsequent collections made in the Marshall Islands nor has it been reported from elsewhere. The osteology of *C. johnsoni* was described by McCosker (1977: 67).

Cirricaecula macdowelli sp. nov.
(New Japanese name: Mikei-umihebi)
(Figs. 1–2)

Material. Holotype: CAS 15599, 228 mm TL. Taiwan, Formosa Strait, south of Formosa Banks to P'enghu Ch'untao (Pescadores) Island, trawled in 30–50 m by F. B. Steiner on 5 May 1972.

Diagnosis. An elongate cylindrical species of *Cirricaecula* with the following unique combination of characters: head 10.3% of TL; tail 49% of TL; body depth 2.7% of TL; eye 6.0% of head length and 0.6% of TL; 4 pendulous cirri along lip between snout and eye; 127 total vertebrae, 60 preanal; and coloration in preservative tan, paler ventrally, head and trunk pores within brown spots.

Description. *Counts and measurements (in mm).* —TL 228; head length 23.5; trunk length 93.5; tail length 111; body depth at gill openings 6.25; body width at gill opening 5.25; body depth at anus 6.0; body width at anus 5.0; gill opening length 2.5; isthmus width 0.7; snout 3.9; tip of snout to rictus of jaw 8.1; tip of snout to tip of lower jaw 2.9; eye diameter 1.4; interorbital distance 1.7. Total vertebrae 127; preanal vertebrae 60. Total right lateral-line pores 124; 8 pores in branchial region; 62 preanal lateral-line pores.

Body elongate, cylindrical throughout its length; its depth behind gill openings 35 in TL, slightly tapering posteriorly to a sharp finless point. Head and trunk 1.9 and head 9.7 in TL. All fins absent. Snout conical, acute when viewed from above; flat on its underside. Snout not grooved along its posteroventral midline. Lower jaw included, does not reach posterior base of tubular anterior nostrils. Posterior nostrils not obvious, in upper lip and covered by a flap. Lips with 4 pendulous barbels on each

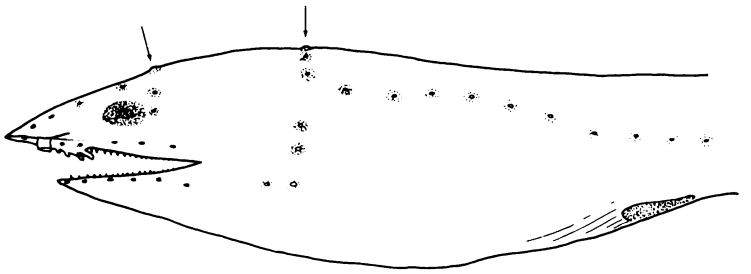

Fig. 1. Head of holotype of *Cirricaecula macdowelli*, sp. nov., CAS 15599, 228 mm TL. Arrows indicate location of interorbital and temporal pores.

side, becoming smaller posteriorly. Eye moderate in size, its center slightly behind midpoint of upper jaw. Gill openings entirely ventral and slightly converging forward, the isthmus narrow.

Head and lateral-line pores distinct and apparent (Fig. 1): 4 preopercular pores; 6 mandibular pores; 4 supraorbital pores; 6 infraorbital pores, the first before the anterior nostril, the 2nd and 3rd between the anterior and posterior nostrils; 2 postorbital pores; and single interorbital and supratemporal pores.

Teeth (Fig. 2) conical, slightly recurved, uniserial in jaws and on vomer. Lower jaw with 19–20 uniserial teeth on each side, decreasing in size posteriorly. Upper jaw with 20-21 uniserial teeth on each side, decreasing in size posteriorly, ending adjacent to the last of those of the lower jaw. A chevron of 3 larger teeth anteriorly, followed by a gap and 5 uniserial teeth on vomer.

Body coloration in preservative pale to tan, lighter ventrally. The pores of the head are surrounded by minute brown punctations, giving the appearance of brown spots.

Etymology. Named *macdowelli* in honor of Michael McDowell, diver, explorer and friend, and a noun in the genitive case.

Remarks. The species of *Cirricaecula* are separable from related finless sphagebranchins using our key. The new species is separable from its only congener, *C. johnsoni*, by having less labial cirri and more total vertebrae. As well, it has fewer vomerine and ethmoidal teeth than has *C. johnsoni* as illustrated by Schultz (1953: fig. 11h). They are very similar in general morphometry, cephalic pore pattern, gill opening condition, and snout shape. The numerous and pendulous labial cirri probably serve as a screen to prevent fine sediment from entering the mouth of this burrowing species (cf. McCosker, 1977; McCosker et al, 1989).

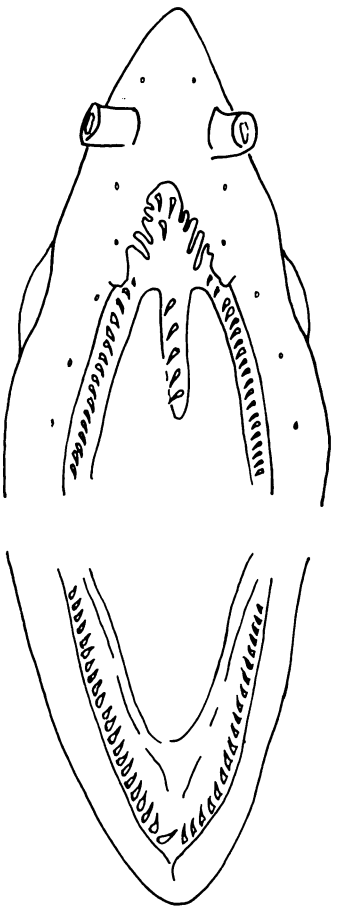

Fig. 2. Dentition of holotype of *Cirricaecula macdowelli*, sp. nov., CAS 15599, 228 mm TL.

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台湾産のウミヘビ科魚類の1新種

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鰭を全くもたないウミヘビ科の *Cirricaecula* の新種 *C. macdowelli* を，台湾海峡の水深 30–50 m でトロールにより得られた1個体に基づき記載した．本種はマーシャル諸島産の本属の唯一の既知種 *C. johnsoni* とは脊椎骨が多いこと，上唇縁辺部に発達する総状の小突起が少ないことで区別される．