Vol. 84, No. 9, pp. 65–72 30 June 1971

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

NEOCLINUS NUDUS, NEW SCALELESS CLINID FISH FROM TAIWAN WITH A KEY TO *NEOCLINUS*[1]

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The purpose of this report is to describe a new species of *Neoclinus* that we encountered while investigating the osteology of the family Clinidae. The new species is noteworthy for its lack of scales, a character shared in the Clinidae only with five of the six species of *Stathmonotus* Bean (subfamily Labrisominae), a tropical American genus of questionable clinid affinities, and with the South African *Clinoporus biporosus* (Gilchrist and Thompson) (subfamily Clininae).

Hubbs (1953) revised *Neoclinus*. He recognized four species: *stephensae*, *uninotatus*, and *blanchardi*, all known only from California (including Baja California), and *bryope*, known only from Japan. Stephens (1961) extended the range of *N. bryope* to include Okinawa. We regrettably report that a specimen of *Neoclinus* collected from Korean waters and deposited at the University of Michigan Museum of Zoology was lost in the mail in transit to us. This specimen represented a third western Pacific species or a range extension of one of the known species.

Neoclinus nudus new species
(Fig. 1)

Holotype: United States National Museum of Natural History, Division of Fishes USNM No. 205217, ♂, 50.0 mm standard length (SL), col-

[1] This study was supported by a grant (SG3372153) from the Smithsonian Research Foundation, V. G. Springer principal investigator.

TABLE 1. Counts and measurements (in mm) of holotype and paratypes of *Neoclinus nudus*.

	Holotype	Paratypes									
	♂	♀	♂	♂	♂	♂	♂	♀	♂	♀	♀
Dorsal fin	XXV-17	XXV-16	XXVI-17	XXV-17	XXVI-17	XXVI-17	XXV-17	XXV-16	XXVI-16	XXV-17	XXV-17
Anal fin	II-29	II-28	II-29	II-29	II-29	II-29	II-29	II-28	II-29	II-29	II-29
Pectoral fin	13/13	14/14	14/14	14/14	14/14	14/14	14/14	14/14	14/14	15/15	15/14
Pelvic fin	I-3	I-3	I-3	I-3	I-3	I-3	I-3	I-3	I-3	I-3	I-3
Caudal fin (segmented rays)	13	13	13	13	13	13	13	13	13	12	13
Lateral line pores (unpaired–paired–unpaired)	1–13–1	0–12–1	1–12–1	2–15–2	2–13–1	2–11–1	0–13–1	0–10–1	1–12–1	0–9–1	0–13–1
Standard length	50.0	50.1	48.9	48.1	47.0	47.2	46.8	48.3	44.0	40.8	40.7
Head length	10.1	10.0	10.0	10.2	9.8	9.9	9.8	9.9	9.6	8.9	8.9
Head width	6.0	5.5	5.0	4.8	4.9	5.0	5.5	5.2	4.8	4.5	4.7
Head depth	5.7	5.5	5.5	6.0	5.8	5.6	5.8	5.9	5.2	4.8	5.1
Upper jaw length	5.0	5.2	5.2	5.8	5.2	5.2	5.2	5.0	5.0	4.6	4.5
Interorbital width	1.2	1.0	1.2	1.0	0.9	0.8	0.9	0.9	0.8	0.8	0.8
Eye diameter	2.5	2.3	2.3	2.4	2.2	2.2	2.1	2.3	2.0	2.1	1.9
Snout length	1.5	1.8	1.8	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.6
Predorsal length	6.5	6.3	7.0	6.9	6.9	6.7	7.0	7.2	6.7	6.5	6.5
Preanal length	20.0	20.5	18.9	18.0	18.9	18.2	18.1	19.9	17.2	16.8	16.8
Peduncle depth	3.2	3.1	3.2	2.8	2.9	3.0	2.8	2.8	2.8	2.8	2.4
Peduncle length	1.8	2.2	2.8	2.5	2.3	2.6	2.0	2.4	2.2	2.2	2.4
Longest pectoral ray	6.5	5.3	5.9	6.0	6.6	5.0	5.9	5.2	5.6	5.2	5.2
Longest pelvic ray	4.5	4.4	4.5	4.2	4.6	4.5	4.6	4.3	4.1	4.2	3.9
Longest dorsal spine	4.2	4.4	4.5	4.5	4.2	4.7	4.2	4.4	4.0	3.4	3.9

lected by V. G. Springer *et al.* from a cove just southwest of Yeh-liu, northern Taiwan, 25°12'N, 121°41'E, at a depth of about 4 m, 18 May 1968, original field number VGS68-27.

Paratypes: USNM No. 205218, 10 specimens collected with the holotype (one paratype cleared and stained).

Diagnosis: Body lacking scales, 15 or fewer pairs of lateral line pores; no nape cirri; 6–7 pairs of multifid orbital cirri arranged in an outer and inner row, each row usually of 3 cirri; interorbital region with well-developed pair of longitudinal ridges; series of 4 pores along ventral edge of orbit; head small, more than 4.5 in SL; third pelvic ray only slightly shorter than second.

Description: The counts and measurements of the holotype and paratypes are presented in Table 1. The cranial pore counts used here are cited in Stephens (1970). Preoperculomandibular series: middorsal commissural pore present, 5 occipital, 4–6 temporal, 7–9 preopercular, 6 mandibular, 1–2 postorbital. Supra-orbital series: 3–4 frontal, 1 nasal. Infraorbital series: 6 postorbital, 6 suborbital. Lateral line series: 0–2 unpaired + 9–15 paired + 1–2 unpaired.

Upper jaw with 18 teeth on each side in outer row, anteriorly 8 moderate to large teeth, posterolaterally 10 smaller teeth; 2 lateral bands of minute teeth posterior and medial to outer row. Lower jaw with 7 anteromedial large teeth in outer row, eighth tooth a moderately developed canine, 8–10 posterolateral teeth; subcircular patch of small (but not minute) teeth posteromedial to posterolateral teeth; subcircular patch bordered posteriorly by somewhat enlarged row of about 7–8 teeth. Vomer with 4–7 small teeth. Palatine with 9–10 teeth in single row. Gill rakers of first arch 5–7 + 10–13 = 15–20. Vertebrae 13–14 + 33–35 = 47–48.

Dorsal fin low, not or slightly incised between last spine and first ray; rays usually longer than posterior spines; fin rounded posteriorly; proximal third of last ray bound by membrane to peduncle. Anal fin spines shorter than rays; rays subequal in length but last four becoming shorter; proximal fourth of last ray bound by membrane to peduncle. Caudal fin rounded. Pectoral fin slightly pointed, middle four rays longest, membrane incised between lower four elements. Pelvic fin with middle ray longest, anterior ray shortest, membrane incised between anterior two rays; spine short, bound to first ray, visible only in dissection. Cirri: 6–7 orbital cirri in two relatively parallel longitudinal rows, 3 in outer row at margin of orbit, 3–4 in inner row; cirri multifid, bushlike, with common base; cirri never longer than orbit, usually about half orbital diameter; no sexual dimorphism in cirrus length; single multifid nasal cirrus about equal in length to orbital cirri.

Color in alcohol: Male: head and anterior region of body to posterior tip of pectoral dark brown to almost black, indistinctly marked. Circumorbital region and edge of preopercle slightly paler. Branchiostegal membrane mottled and darker. About 6–7 indistinct black bars along dorsal fin base, sometimes weakly coalescing with dark mid-longitudinal

band; about 10 dorso-ventral pairs of whitish blotches border band, each pair sometimes faintly joining across band; ventral member of each pair about twice size of dorsal member. Venter dark brown, remainder of body brown to tan. Dorsal fin black anteriorly but generally unpigmented posterior to level of anus except that faint, indistinct brown bars may be present. Distal edge of anal fin black on anterior 4–7 elements; fin membrane unpigmented posteriorly but some melanophores along fin elements. Faint brown blotch on base of caudal fin. Some dark pigment on caudal and pectoral fin rays. Pelvic fins black. Orbital cirri dusted with melanophores; nasal cirrus unpigmented. Female: similar to male except head and body paler in color. Body bands consist primarily of large (larger anteriorly) brown blotches below midline, weakly connected dorsally to dorsal bars and continuing ventrally to base of anal fin. Each bar occasionally completely paired. Fins generally with less pigment than in males.

Habitat: All the specimens were taken in a single collection in a relatively narrow U-shaped cove. The eastern and western boundaries of the cove were rocky; the southern end was cobbly. There was much encrusted rock and algae on the bottom of the cove, but very little coral. The specimens were taken from a depth of approximately 4 m and came from a single rock in the middle portion of the cove. Although several collections were made in the same cove on different days before and after the day the specimens were obtained, no other specimens of *Neoclinus* were taken or observed. Another clinid, *Clinus xanthosoma* Bleeker, was common in the algae along the rocky shores of the cove.

Comparisons and discussion: Neoclinus nudus differs from all other species of *Neoclinus* in completely lacking scales. Reduced scalation is, however, a characteristic of the genus; the degree of squamation appearing superficially more similar to that of the Clininae than the Labrisominae. It is interesting that the specimens of *N. bryope* from Okinawa, a locality intermediate between Japan and Taiwan, appear to be less scaled than those from Japan (Stephens, 1961). *Neoclinus nudus* also has the fewest lateral line pore pairs in the genus and the most numerous orbital cirri. *Neoclinus nudus* seems to form a natural group with *N. bryope* of Japan and *N. stephensae* from California. All three are small (to 100 mm) species showing no obvious morphological sexual dimorphism and all three inhabit rocky substrata. The other species group includes the larger (to 280 mm) species, *N. blanchardi* and *N. uninotatus*, which show well-developed morphological sexual dimorphism (Hubbs, 1953) and are residents of sand, shell, and mud wall habitats. The following key to the species includes data from California specimens recently collected by Stephens *et al.* (1970).

Key to the species of *Neoclinus*

1. Head length 3.5–3.8 in SL; gill-rakers 12–14; orbital cirri simple or multifid on distal ½; adults greater than 100 mm SL; pectoral rays modally 15 (13–16); usually more than 20 pairs

of lateral line pores (Table 2); upper jaw 2.5–6.5 in SL (less than 5.1 in sexually mature specimens). Sexual dimorphism present in predorsal length, median fin heights, body depth, orbital cirrus length and upper jaw length 2

Head length 4.2–5.3 in SL; gill-rakers 14–20 (rarely 14); orbital cirri multifid from base; adults rarely attaining 90 mm SL (adults mature at about 40 mm); pectoral rays modally 14 (12–15); usually less than 20 pairs of lateral line pores (Table 2), *bryope* occasionally has 20–21; upper jaw 6.8–9.5 in SL; morphological sexual dimorphism absent 3

2. One ocellus anteriorly on dorsal fin, none between dorsal spines 5–9, anteriormost orbital cirrus multifid at tip, longer than orbit; adult upper jaw length 5.0–5.8 in SL ..... *N. uninotatus* Hubbs 1953, Monterey, California to northern Baja California

Two ocelli on dorsal fin, one anteriorly, second between dorsal spines 5–9; all orbital cirri simple, shorter than orbit; adult upper jaw length 2.5–4.5 in SL ..... *N. blanchardi* Girard 1858, San Francisco, California, to northern Baja California

3. Scales present on body; head moderately large 4.2–4.5 in SL; usually more than 14 pairs of lateral line pores; 3–4 orbital cirri in single row above eye 4

Scales absent; head small 4.5–5.1 in SL; usually less than 14 pairs of lateral line pores; 5–7 orbital cirri in two parallel rows (see Fig. 1) ..... *N. nudus* new species, Taiwan

4. No dorsal fin ocellus; nape cirri present; 3 pairs of multifid orbital cirri; modally 16 (14–18) pairs of lateral line pores; upper jaw more than 7 in SL ..... *N. stephensae* Hubbs 1953, Pt. Conception to Baja California

Dorsal fin ocellus present; no nape cirri; usually 4 (3–4) pairs of multifid orbital cirri; modally 20 (18–21) pairs of lateral line pores; upper jaw 6.0–6.8 in SL ..... *N. bryope* (Jordan and Snyder 1903), Japan and Riu Kiu Islands

There is considerable overlap in counts of all meristic characters of all the species except counts of the paired lateral line pores. The greatest range for all meristic characters is exhibited by *N. stephensae* but this species is represented by the largest number of specimens and the ranges may reflect this. In the following tabulation the range and mean are presented for each count (for *N. nudus* see Table 1): *N. stephensae* (59 specimens), total dorsal fin elements 40–45 (42.2), dorsal fin spines 23–27 (25.1), dorsal fin rays 14–19 (17.0), anal fin rays 27–33 (30.3), pectoral fin rays 13–15 (14.1); *N. bryope* (32 specimens), total dorsal fin elements 40–44 (42.4), dorsal fin spines 24–27 (25.2), dorsal fin rays 16–19 (17.3), anal fin rays 28–32 (30.3), pectoral fin rays 13–15 (14.0); *N. uninotatus* (20 specimens), total dorsal fin elements 40–43 (42.3),

TABLE 2. Frequency distributions of number of pairs of lateral line pores in *Neoclinus*.

	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N. nudus	1	1	1	3	4	–	1	–	–	–	–	–	–	–	–	–
N. stephensae	–	–	–	–	–	2	8	20	17	10	–	–	–	–	–	–
N. bryope	–	–	–	–	–	–	–	–	–	1	4	8	4	–	–	–
N. uninotatus	–	–	–	–	–	–	–	–	–	–	2	6	6	4	1	1
N. blanchardi	–	–	–	–	–	–	–	–	–	–	–	4	3	3	–	–

dorsal fin spines 23–27 (25.5), pectoral fin rays 14–16 (14.8); *N. blanchardi* (10 specimens), total dorsal fin elements 40–42 (41.4), dorsal fin spines 23–24 (24.1), dorsal fin rays 17–18 (17.3), anal fin rays 28–30 (28.9), pectoral fin rays 14–15 (14.9). The total vertebral number varied from 46–49 for the genus, 12–14 precaudals, 33–36 caudals. The variations in vertebral numbers exhibited by the species do not appear to be significantly different, but the number of specimens radiographed is small for most of the species.

Stephens (1963) noted the resemblance of *Neoclinus* to the Chaenopsidae and believed that *Neoclinus* was closest to the clinid stock that gave rise to the chaenopsids. Zoogeographically *Neoclinus* lies well removed from any of the chaenopsids, which are tropical-subtropical forms with only *Chaenopsis alepidota* occurring north of Bahia Magdalena, Baja California, the break between the temperate and tropical faunas. It is possible that *Neoclinus*, which occupies a niche (worm tubes, mollusc holes) similar to that of the chaenopsids, was replaced by the chaenopsids in the tropics. It may also be that the chaenopsids branched off from a *Neoclinus*-like stock and invaded the tropics. If the former hypothesis is true one would expect the present zoogeographical situation to exist as it is often true that the less anatomically specialized forms of a group inhabit the cooler, peripheral areas. While it is not our purpose to discuss the comparative osteology of *Neoclinus* and the Chaenopsidae, we can state that our investigations strongly indicate that the chaenopsids are a uniformly much more specialized group than is *Neoclinus*.

The close morphological similarity between *N. bryope*, *stephensae*, and *nudus* may indicate a similar ecology. The biology of *N. stephensae* is well known (Stephens *et al.*, MS). This species is strictly tubiculous, living in pholadid clam, *Lithophaga*, burrows (Stephens *et al.*, 1970). Assuming a similar situation for *N. nudus*, the loss of scales would appear to be a further specialization (Gosline, 1959) for this niche. In this respect the morphological similarity between the tube living *Neoclinus* and the tubiculous chaenopsids may represent ecological convergence.

Comparative material examined: Neoclinus bryope, Japan, USNM 71529 (30 specimens of a large series), 199523 (5), UCLA 57-23 (1); Okinawa, USNM 132808 (1), 195823 (1); *Neoclinus stephensae*, Cali-

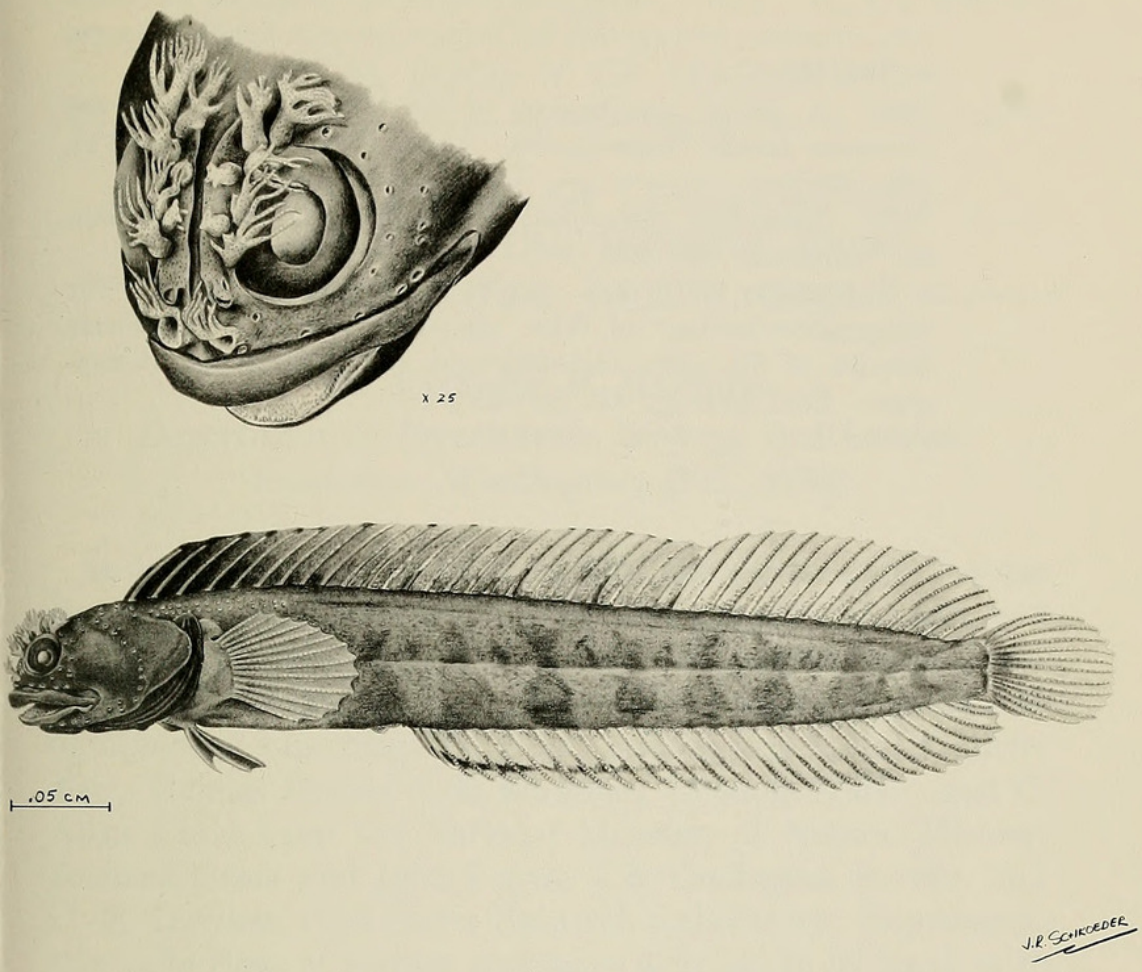

Fig. 1. Holotype of *Neoclinus nudus*, including an enlarged view of the head to show the disposition of the cirri.

fornia, Palos Verdes, Occidental College (OXY) 67-10-25 (17), OXY 68-6 (43); *Neoclinus uninotatus*, California, OXY 68-7-31 (7), OXY 69-16 (3), OXY 69-25 (2), OXY 70-7-31 (5), University of California, Los Angeles (UCLA) 51-98 (1), UCLA 51-214, UCLA 53-318, UCLA 53-236; *Neoclinus blanchardi*, California, OXY 68-7-31 (2), OXY 69-9 (1), UCLA 52-266 (1), UCLA 55-264 (1), UCLA 57-62 (1).

Literature Cited

Gosline, W. A. 1959. Mode of life, functional morphology, and classification of modern teleostean fishes. Syst. Zool. 8(3): 160–164.

Hubbs, Clark. 1953. Revision and systematic position of the blennioid fishes of the genus *Neoclinus*. Copeia 1: 11–23.

Stephens, J. S., Jr. 1961. Range extension of the temperate blennioid fish, *Neoclinus bryope*, into the tropical western Pacific. Copeia 4: 484–485.

———. 1963. A revised classification of the blennioid fishes of the American family Chaenopsidae. Univ. Calif. Publ. Zool. Vol. 168, 164 pp.

———. 1970. Seven new chaenopsid blennies from the western Atlantic. Copeia 2: 280–309.

———, R. K. Johnson, G. S. Key, and J. E. McCosker. 1970. The comparative ecology of three sympatric species of California blennies of the genus *Hypsoblennius* gill (Teleostomi, Blenniidae). Ecol. Monogr. 40: 213–233.