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**TWO NEW FRESHWATER CLINGFISHES OF THE
GENUS *GOBIESOX* FROM SOUTHERN MEXICO**

BY JOHN C. BRIGGS AND ROBERT RUSH MILLER

THE discovery of two new species of *Gobiesox* in the freshwater streams of the Pacific drainage area of southern México brings the number of known species in this genus to 28 and helps to clarify further the extent of evolutionary radiation shown by this group in the Eastern Pacific region. Of additional interest is the fact that these are the fifth and sixth known freshwater species in the family Gobiesocidae. All six freshwater forms belong in *Gobiesox* and are considered to be more primitive than the marine members of this genus.

The presence of one of these new species (*Gobiesox fluviatilis*) high up in a major river system in association with three primary freshwater-fish families is of unusual zoogeographic interest. Heretofore, the freshwater clingfishes were thought to comprise a typical part of the complementary freshwater fish fauna of the American tropics (forms which have recently invaded small streams that are not part of a major system so that there is little or no competition from members of the primary or secondary freshwater-fish fauna).

The characteristic external morphology shows that both new species are referable to *Gobiesox*. This conclusion is supported by radiographs (Pl. II) which reveal the presence of diagnostic skeletal features typical of this genus. These may be compared with a similar radiograph of a specimen of *Gobiesox nudus* (Linnaeus) (Pl. II), the most primitive form in this group. Of particular importance are the pelvis and the distal postcleithral elements which form the bony supports for the disc. These may be seen in the area between the pectoral fins at the mid-anterior part of the body. Aside from the difference in numbers of vertebrae, the osteology of the three species as seen in the radiographs is virtually identical.

The species are described following the uniform plan and sequence previously adopted (Briggs, 1955) for this order of fishes. The various

counts and measurements were also taken in the manner described in that work.

The following abbreviations are used under the accounts of species in the text: ANSP, Academy of Natural Sciences of Philadelphia; CNHM, Chicago Natural History Museum; SU, Natural History Museum, Stanford University; UMMZ, Museum of Zoology, University of Michigan; USNM, United States National Museum; UBC, University of British Columbia.

***Gobiesox fluviatilis*, new species**

(Pls. I-II)

Gobiesox adustus (*non* Jordan and Gilbert). Pellegrin, 1901: 206 (Río Chapalagana, streams about Tepic; Río Grande de Santiago; habitat; common name). Regan, 1906-08: 4 (name only; after Pellegrin). Alvarez, 1950: 109 (characters in key).

DIAGNOSIS.—A species of *Gobiesox* with poor development of papillae on head. Margin of upper lip smooth. Dorsal origin much closer to caudal base than to upper end of pectoral base. Color in preservative heavily mottled on dorsal side with extensive vermiculations on head. Anus well in front of dorsal origin and a little closer to rear margin of disc than to anal-fin origin. In small to medium-sized specimens (24.2–53.7 mm. in standard length), head length is 2.7 (2.7–2.8) in standard length. Each part of disc-region C bears 4 (3–5) longitudinal rows of papillae; there are 5 (5–6) rows across the width of disc-region A. Fleshy pad on pectoral base conspicuous, with a free posterior margin extending from lowest part of pectoral base dorsally as far as 8th (6–9) ray. Dorsal rays, 10 (9–10); anal rays, 8 (7–9); pectoral rays, 22 (21–23); and caudal rays, 10 (9–10).

DESCRIPTION.—Body moderately depressed; depth 5.7 (5.4–6.4) in standard length. Caudal peduncle short, least depth 1.1 (1.0–1.2) in its length. Head of medium length and width, 2.7 (2.6–2.8) and 3.1 (2.9–3.3) in standard length. Eye 1.1 (0.9–1.3) in bony interorbital space and 5.4 (5.1–6.0) in head. Snout shallow and slightly rounded in lateral outline, 3.1 (2.9–3.3) in head length. Posterior nostril tubular and located in front of anterior edge of eye; anterior nostril tubular and provided with a large, bilobed, dermal flap extending from its posterior margin. Teeth of lower jaw in a single row, the front 4 to 6 pairs well-compressed incisors with rounded edges. These followed on each side by 2 to 4 weakly-developed canines. Teeth at front of upper jaw slightly compressed, with rounded tips. Behind the

outer row, a deep patch of smaller, conical teeth. A row of very weak canines at each side of this jaw also. Seven (6–8) shallow, pointed rakers on the posteriormost gill arch.

All papillae on head shallow, lobe-like structures, none on upper lip margin and none on snout above center of premaxillary groove. Upper attachment of gill membrane opposite 4th (3–4) pectoral ray. Subopercular spine well developed and hidden by the skin of the opercular region. Dorsal-caudal distance may extend forward as far as middle of pectoral fin; postdorsal-caudal distance 1.2 (1.1–1.3) in dorsal length. Length of disc 2.8 (2.7–3.1) in standard length. Depressed tip of anal fin does not extend nearly as far as a vertical line from caudal base. There are 30 (29–31) vertebrae.

COLORATION.—In alcohol, the dorsal and lateral surfaces are well supplied with blackish pigment over a light yellow ground color. On the dorsum of the body there are many spots and irregular blotches. These become well-defined vermiculations toward the head. On the sides, the pigment sometimes is coalesced into an ill-defined, midlateral stripe. From the dorsal aspect, four vague bars can be seen, two in front of the dorsal fin and the other two just behind it. There is a conspicuous black spot at the anterior edge of the dorsal fin. The caudal fin has a distinct light vertical line across its middle and a light margin.

In life, the ground color is tan, the bars greenish brown, and the vermiculations rust colored. The smallest specimens were much the darkest.

RELATIONSHIP.—The compressed, incisor-like teeth at the front of the upper jaw, the tubular posterior nostril, and the postdorsal-caudal distance of 1.2 (1.1–1.3) in dorsal length are characters which serve to indicate a relationship closer to *Gobiesox nudus* than to any other member of the genus.

Although the variation in the measurement of head length into standard length in this new species (2.6–2.8) overlaps the range previously given (Briggs, 1955: 94) for *Gobiesox nudus* (2.2–2.6), a clear-cut separation is possible when specimens of comparable size are considered. In four examples of *G. nudus* ranging from 30.6 to 43.1 mm. in standard length, the head length is 2.5 (2.4–2.6) in standard length. In 19 specimens of *G. fluviatilis*, 24.2–53.7 mm., the head is 2.7 (2.7–2.8) in standard length. Since a relative enlargement of the head with increased age is a common ontogenetic event in this family of fishes, larger specimens may be expected to produce different, although

still contrasting, measurements. For example, a 58.8 mm. specimen of *G. fluviatilis* has a head length of 2.6 in standard length, but a 67.2 mm. *G. nudus* has a markedly larger head measuring 2.3 in standard length.

A second, dependable characteristic for the separation of these two species is that of the color pattern. *G. nudus* is punctulated and mottled with brown or black, but does not demonstrate the well-defined vermiculations on the head or the narrow, light, vertical line across the caudal fin.

Finally, there is a non-overlapping difference in the total number of vertebrae, with 29 to 31 found in radiographs of 16 specimens of *G. fluviatilis* and but 25 to 26 in 14 examples of *G. nudus*.

ECOLOGY AND ZOOGEOGRAPHY.—Our material of this species was secured in two mountain streams at elevations of 2850 and 3250 feet. At the lower station, Barranca de Barranquitas (crossed by highway 15 between Tepic and Guadalajara), *G. fluviatilis* inhabits an arroyo averaging 15 feet wide with some pools to 30 feet wide and depths to 2 1/2 feet during the dry season (collections made in February and March). This exposed stream is tributary to Río Grande de Santiago which, above Lago Chapala, is called the Río Lerma (Fig. 1). About a mile below the highway bridge, the stream enters a narrow canyon with vertical walls up to 100 feet high. The species was taken only on shallow rocky riffles in moderate current by setting a 12-foot "common sense" seine and driving from above through the loose rocks. Water was 66°F. and the air 74° F. at noon on February 27; it was 78° F. (air 88°F.) at 4:30 P.M. on March 26. The species was most readily taken on riffles having a moderate gradient, and especially near the heads of long pools. Nearly five hours of effort were required to obtain the 19 specimens. Associates here were the sucker, *Moxostoma austrinum austrinum* (Robins and Raney, 1957: 308), which was abundant, and a goodeid, "*Characodon*" *eiseni* Rutter (only one secured in 1955, none in 1957).

The largest individual collected came from near the mouth of the Río Verde, a major tributary of the Río Grande de Santiago east of Guadalajara and well below the barrier falls at Juanacatlán, just north of Lago Chapala (Fig. 1). About a half-mile above its mouth the Río Verde divides (in the dry season) into a broad series of steep-gradient, rocky riffles (Pl. IV) from which it falls abruptly into a long, boulder-strewn pool. The short riffles are entirely exposed to the sun, with much green algae clinging to the rocks. The one adult was taken from

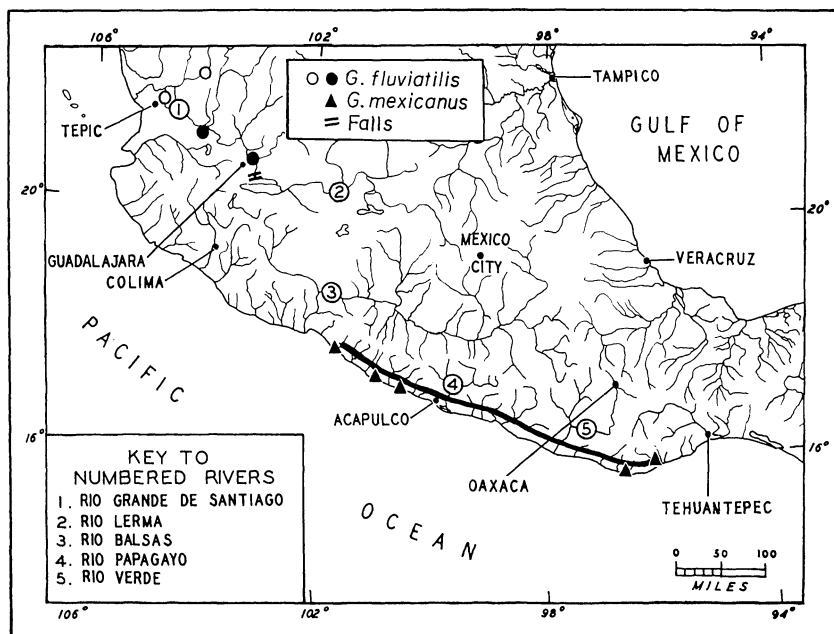


FIG. 1. Record stations showing the distribution of *Gobiesox fluviatilis* and *Gobiesox mexicanus* in southern México. The open circles are literature records for *G. fluviatilis*; the heavy black line encloses the range of *G. mexicanus*.

the loose rocks in the manner described above. Here the current was swift, the water greenish, and the temperature 73°F. (air 84°F.) at 4 P.M. on March 3. The average width of the Río Verde was estimated to be 80 feet, and the maximum depth of the pool below the riffles was over 6 feet. Associated with *Gobiesox fluviatilis* here were a minnow, *Hybopsis alta* (Jordan) (in pool just below riffles), *Moxostoma a. austrinum* (on riffles and in pool), a species of catfish (*Ictalurus*) in the deeper parts of the pool, *Poeciliopsis infans* (Woolman) (a poeciliid taken only in a quiet side channel), and an atherinid, *Thyrinops crystallina* (Jordan and Culver) (near riffle mouths).

What must be the same species was recorded by Pellegrin (1901: 206), as *Gobiesox adustus* Jordan and Gilbert, from Río Chapalagana (a northern tributary of the Río Grande de Santiago), with the following remark: "Il est commun dans les rivières torrentueuses avoisinant Tépico, et on le recontre aussi dans le Río Grande de Santiago." Unfortunately, his specimens are apparently lost.

Although there is much yet to be learned about the precise distribution of *Gobiesox fluviatilis*, we regard it as significant that none of the records of its occurrence are from the Río Lerma drainage. The barrier falls in the Río Grande de Santiago at Juanacatlán evidently were formed prior to the invasion of this river by a clingfish, thus preventing *G. fluviatilis* from penetrating into the realm of the highly distinctive Lerma fauna (Meek, 1904: xxxix-xli, xlix, and map; Regan, 1906-08: xxviii and Map 2).

For reasons previously given (Briggs, 1955: 95), *Gobiesox nudus* is considered the most primitive member of the genus. Although widespread in the lower parts of freshwater streams draining into the western tropical Atlantic, it has not been taken in México and, perhaps, does not occur this far north on the mainland of Middle America. There is, therefore, a wide geographical gap between the range of this species and its close relative, *G. fluviatilis*.

Since *Gobiesox* is thought to have originated in the Eastern Pacific, it is entirely possible that *G. nudus*, or an immediate ancestor, was once widespread in the Pacific drainage area of the American tropics. It could have been driven out of most of this area by the more advanced freshwater species such as *G. juradoensis* Fowler, *G. potamius* Briggs, and *G. mexicanus*, new species. In this case, *G. fluviatilis* may represent a relict population (derived from *G. nudus* or an immediate ancestor) which has survived in an area not yet penetrated by a better adapted competitor.

Certainly the most remarkable and interesting aspect of the discovery of this species is its occurrence, and apparently successful competition, with representatives of three primary freshwater-fish families—the Cyprinidae, Catostomidae, and Ictaluridae. As far as known, the other five freshwater clingfishes have a typical “complementary” type of distribution (see p. 1), suggesting that they are unable to compete with the primary (and secondary?) freshwater fishes of the major river systems.

There is one notable and perhaps ecologically fundamental difference in the case of *Gobiesox fluviatilis*. The competition in this instance—as far as the primary fishes are concerned—is comprised of *temperate* instead of tropical freshwater fish families. One can imagine that such species might be easier for a *Gobiesox* to associate with than the cichlids, characins, armored catfishes, and other families of the large Neotropical rivers. Either this, or *G. fluviatilis* has picked a

special ecological niche for itself which has not been discovered by its close relatives.

DERIVATION OF NAME.—Named from the Latin *fluviatilis* meaning “of a river.”

HOLOTYPE.—UMMZ 177314, 53.7 mm. in standard length, collected by R. R. and M. Miller from Barranca de Barranquitas below Barranquitas, Jalisco, 69 miles by highway 15 southeast of Tepic, Nayarit, on February 27, 1957.

PARATYPES.—UMMZ 177315, 12 specimens, 26.7–34.7 mm. in standard length; SU 53206, one, 39.4 mm.; USNM 179686, one, 39.1 mm.; CNHM 62807, one, 38.7 mm.; ANSP 91025, one, 35.7 mm.; and UBC 59–650, one, 36.3 mm. All of the foregoing collected with the holotype. UMMZ 172233, one, 24.2 mm. in standard length, from the same locality, but taken by R. R. Miller and J. T. Greenbank on March 26, 1955. UMMZ 177316, one, 58.8 mm. in standard length, from the Río Verde near its mouth in the Río Grande de Santiago, about 18 miles east of Guadalajara, Jalisco, collected by R. R. and M. Miller on March 2, 1957.

***Gobiesox mexicanus*, new species**

(Pls. II–III)

DIAGNOSIS.—A species of *Gobiesox* with poor development of papillae on head. Margin of upper lip smooth. Lower jaw with second row of teeth. Dorsal origin much closer to caudal base than to upper end of pectoral base. Color in preservative blackish on dorsal side with four broad, light crossbars. Anus well in front of dorsal origin and much closer to rear margin of disc than to anal-fin origin. Eye 1.2 (0.8–1.5) in bony interorbital space and 5.0 (3.7–6.0) in head. Each part of disc-region C bears 5 (5–6) longitudinal rows of papillae; there are 7 (6–8) rows across the width of disc-region A. Fleishy pad on pectoral base conspicuous, with a free posterior margin extending from lowest part of pectoral base dorsally as far as 10th (9–11) ray. Dorsal rays, 9 (9–10); anal rays 7 (6–8); pectoral rays, 23 (22–24); and caudal rays, 11 (10–12).

DESCRIPTION.—Body moderately depressed, depth 5.1 (4.7–5.6) in standard length. Caudal peduncle short, least depth 1.1 (1.0–1.2) in its length. Head well depressed and long, length 2.5 (2.4–2.7) and width 2.8 (2.6–2.9) in standard length. Snout shallow and slightly

rounded in lateral outline, 3.1 (3.0–3.2) in head length. Posterior nostril non-tubular and located just in front of anterior edge of eye; anterior nostril tubular and provided with a large, bilobed, dermal flap extending from its posterior margin. Teeth of lower jaw in 2 rows, those of the outer row much the larger, the front 4 to 6 pairs highly compressed incisors with flat edges. These followed on each side by 3 or 4 less compressed incisors with more rounded tips. These in turn followed by a row of poorly developed canines (the largest of the five specimens examined, the holotype, 68.8 mm. in standard length, possesses a continuous series of 8 pairs of highly compressed incisors extending across the entire anterior part of the lower jaw). The second row in lower jaw consists of a few irregularly placed, small, conical teeth. Teeth at front of upper jaw noticeably compressed, with rounded tips. Behind the outer row a shallow patch of much smaller, conical teeth. A row of very weak canines at each side of this jaw also. Eight shallow, pointed rakers on the posteriormost gill arch.

All papillae on head shallow, lobe-like structures, none on upper-lip margin and none on snout above center of premaxillary groove. Upper attachment of gill membrane opposite 5th (4–7) pectoral ray. Subopercular spine well developed and protrudes from skin of opercular region under a slight pressure. Dorsal-caudal distance extends forward to a point near distal end of pectoral fin; postdorsal-caudal distance 1.3 (1.0–1.5) in dorsal length. Length of disc 2.7 (2.6–2.7) in standard length. Depressed tip of anal fin does not extend nearly as far as a vertical line from caudal base. Eleven specimens have 26 (1) or 27 (10) vertebrae.

COLORATION.—In alcohol, the dorsal and lateral surfaces are mottled, blackish, with three broad, light, crossbars on the posterior part of body behind pectoral origin and with an additional light area extending across the head between the eyes and over the cheeks. There is a distinct black spot at the anterior base of the dorsal fin. The caudal fin is dark at the base and distally, but quite pale in the center. All fins possess a moderate degree of dark pigmentation. With the exception of a few melanophores along the edges, the ventral surface of the body is translucent and almost colorless. The life colors of the holotype were carefully noted: the ground color is olive-green spotted with rusty brown; the cross-saddles are yellow-bronze, contrasting sharply with the olive-green back and sides; the margins of the ventral disc (where papillose) are deep yellow, the rest of the venter watery

yellow to nearly white. At Río Copalita, a smaller adult than the holotype had the light bars on the back ivory to greenish tan, with rust-colored wavy lines running through them; the dark crossbars were dark brown.

RELATIONSHIP.—As might be expected from its geographic location, this new species is most closely related to *Gobiesox potamius*, described from the Río Turrubares, Pacific drainage, Costa Rica. The affinity of *G. mexicanus* to *G. potamius* is emphasized through the sharing of three important characteristics which heretofore helped separate *G. potamius* from the other known members of the genus—the noticeably compressed teeth at the front of the upper jaw, the three pale crossbars on the posterior part of the body, and the non-tubular posterior nostrils.

On the other hand, the material so far available shows *G. mexicanus* to be a well-defined species which differs from *G. potamius* in the following respects: the presence of a second row of small teeth in the lower jaw where none appears in *G. potamius*, 22 to 24 pectoral rays instead of 21, a lower gill-membrane attachment, a longer snout, a deeper body, and a slightly smaller disc.

ECOLOGY AND ZOOGEOGRAPHY.—All specimens of this species were taken in lowland coastal streams with elevations generally between 50 and 200 feet, except for one station in Oaxaca (Río Copalita) where the altitude was estimated to be 700 feet. These are sizable rivers (Pl. IV), averaging between 50 and 100 feet in width with depths from $3\frac{1}{2}$ to over 6 feet, and moderate to swift current. Rocks and large boulders are characteristic, with long pools consisting mostly of sand and gravel with silt in some. All are exposed to the sun. Aquatic vegetation consisted of sparse to abundant green algae on the rocky riffles, a long filamentous aquatic attached to rocks, and *Pistia* locally common at the stream margin of one station. *Gobiesox mexicanus* was obtained only on rocky riffles, the smaller individuals in the shallower sections of lower gradient and the larger ones from the swift portions with rather steep gradient near the pool heads. They were captured in the manner described for *G. fluviatilis*. Water temperatures varied (in March of 1957 and 1959) from 82° to 92° F. when air temperatures ranged from 85° to 94° F. The water was clear at all stations.

Associates are those characteristic of lowland, tropical streams in southern México. Species most commonly taken with *Gobiesox* were the gobies, *Sicydium multipunctatum* (Regan) and *Gobiomorus*

polylepis Ginsburg (see Miller, 1959), the mullet, *Agonostomus monticola* (Bancroft), a pipefish, *Pseudophallus starksi* (Jordan and Culver), and a flatfish, *Trinectes fonsecensis* (Günther). A few secondary freshwater fishes (*Mollienesia*, *Poeciliopsis*) were obtained in the same streams, but no primary species are known from this part of México.

With the possible exception of the two genera of poeciliids, the above-listed species complex can be said to comprise a "complementary" freshwater-fish fauna as defined by Myers (1949: 319).

The southernmost locality which produced *Gobiesox mexicanus* was the Río Copalita, which enters the western end of the Gulf of Tehuantepec (Fig. 1). It is likely that the species closely approaches its eastern limit here, but its range westward from Acapulco is still to be determined; its presently known distribution extends over nearly 400 miles of the Mexican coastal plain.

DERIVATION OF NAME.—Called *mexicanus*, for México, because this species is probably confined to that country.

HOLOTYPE.—UMMZ 177318, 68.8 mm. in standard length, collected by R. R. and M. Miller from the Río Coyuquilla, 60 miles by road southeast of Zihuatenejo, Guerrero, on March 21, 1957.

PARATYPES.—UMMZ 177317, two specimens, 53.4 and 17.5 mm. in standard length, from Río de Ixtapa, about 10 miles by road northwest of Zihuatenejo, Guerrero. SU 53205, one, 24.3 mm. in standard length, from the same locality. The foregoing were taken on March 20, 1957. UMMZ 177319, one, 44.5 mm. in standard length, from the Río Tecpán at Tecpán, about 55 airline miles west-northwest of Acapulco, Guerrero, March 21, 1957. All of the above paratypes were collected by R. R. and M. Miller.

UMMZ 177320, one, 48.4 mm.; USNM 179687, one, 44.0 mm.; CNHM 62808, one, 21.2 mm.; ANSP 91026, one, 20.5 mm.; and UBC 59-651, one, 19.3 mm. in standard length—all collected by R. R. Miller and R. J. Schultz from the Río Tonameca, 12 miles by road west of Puerto Angel, Oaxaca, on March 1, 1959. UMMZ 177321, one, 29.0 mm. in standard length, collected by Miller and Schultz from the Río Copalita, a coastal stream which enters the western end of the Gulf of Tehuantepec about 27 miles by road east of Pochutla, Oaxaca, on March 2, 1959.

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LITERATURE CITED

- ALVAREZ, JOSÉ
1950 Claves para la determinación de especies en los peces de las aguas continentales Mexicanas. Secretaria de Marina, México, 1950: 1-144, Figs. 1-16.
- BRIGGS, JOHN C.
1955 A monograph of the clingfishes (order Xenopterygii). Stanford Ichthyol. Bull., 6: 1-224, Figs. 1-114, Dendrograms 1-5, Maps 1-15.
- MEEK, SETH EUGENE
1904 The fresh-water fishes of Mexico north of the Isthmus of Tehuantepec. Field Col. Mus., 93 (Zool. Ser., Publ. 5): i-lxiii, 1-252, Figs. 1-72, Pls. 1-17, 1 map.
- MILLER, ROBERT RUSH
1959 Variation, distribution, and relationships of the Mexican eleotrid fish *Gobiomorus polylepis*. Occ. Pap. Mus. Zool. Univ. Mich., 607: 1-11, Fig. 1, Pl. 1.
- MYERS, GEORGE S.
1949 Salt-tolerance of fresh-water fish groups in relation to zoogeographical problems. Bijdragen tot de Dierkunde, 28: 315-322.
- PELLEGRIN, JAQUES
1901 Poissons recueillis par M. L. Diguët dans l'état de Jalisco, Mexique. Bull. Mus. Hist. Nat. Paris, 7: 204-207.
- REGAN, C. TATE
1906-08 Pisces. In: Biologia Centrali-Americana, 8: i-xxxiii, 1-203, 12 figs., Maps 1-2, Pls. 1-26 (119 figs.).
- ROBINS, C. RICHARD, AND EDWARD C. RANEY
1957 The systematic status of the suckers of the genus *Moxostoma* from Texas, New Mexico and Mexico. Tulane Stud. Zool., 5 (12): 291-318, Figs. 1-12.

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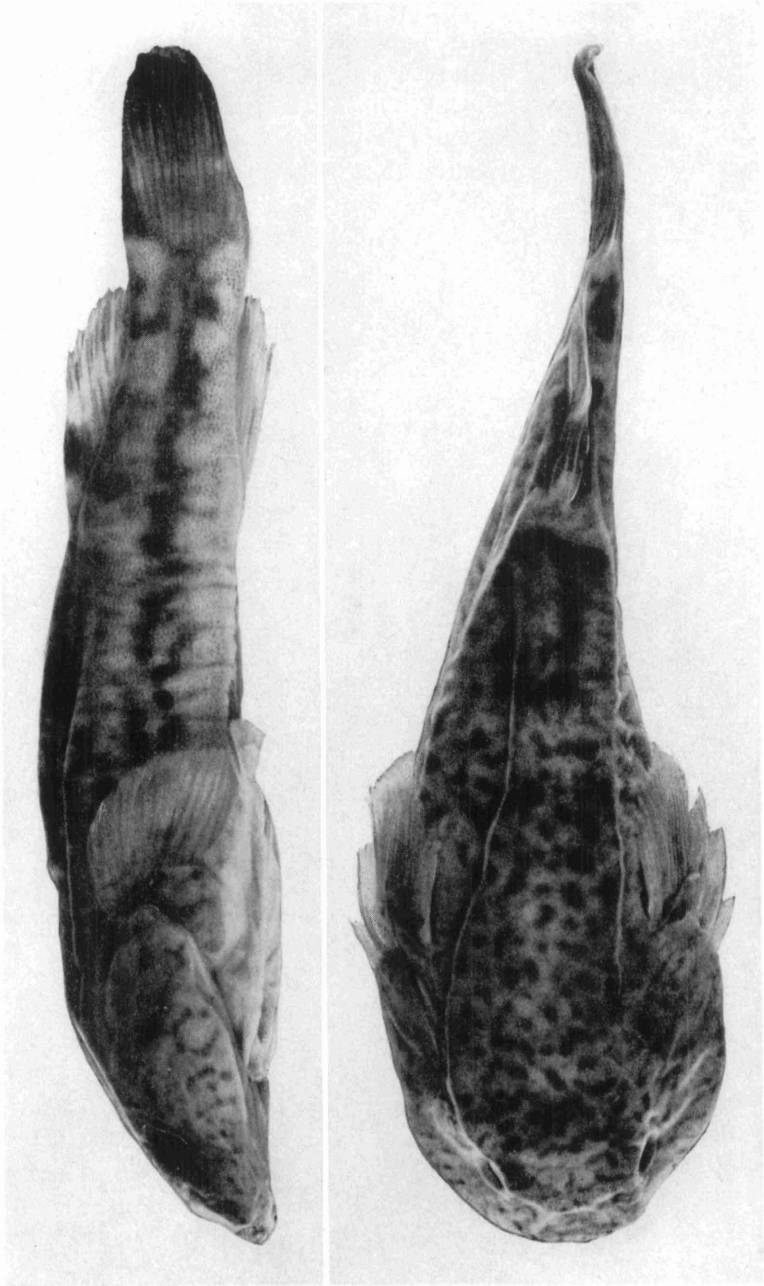


PLATE I

Lateral and dorsal view of holotype of *Gobiesox fluviatilis*, UMMZ 177317, 53 mm. long, from Barranca de Barranquitas, Jalisco.

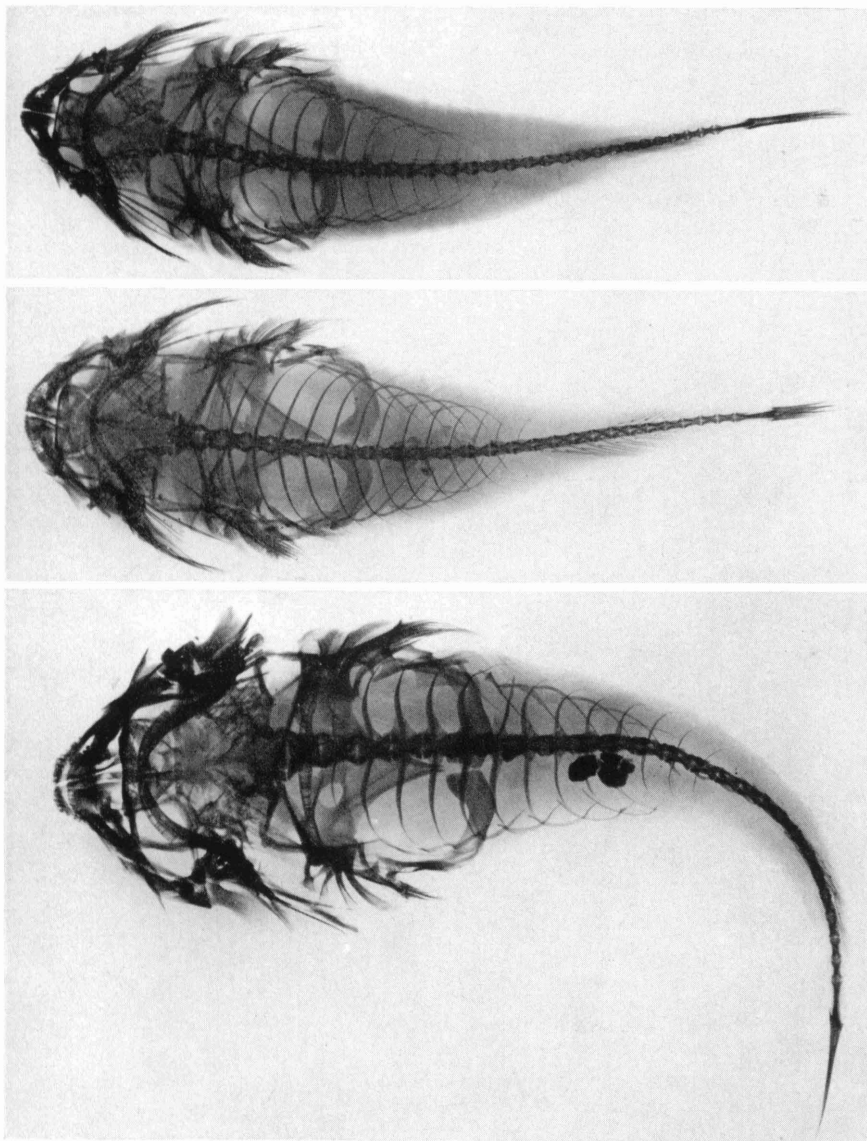


PLATE II

RADIOGRAPHS OF: Upper, *Gobiesox fluviatilis*, holotype. Middle, *Gobiesox mexicanus*, paratype, 53.4 mm., from Río de Ixtapa, near Zihuatenejo, Guerrero. Lower, *Gobiesox nudus*, CAS 17363, 67 mm., from Guibari Creek, tributary to Cricamola River, Panamá.

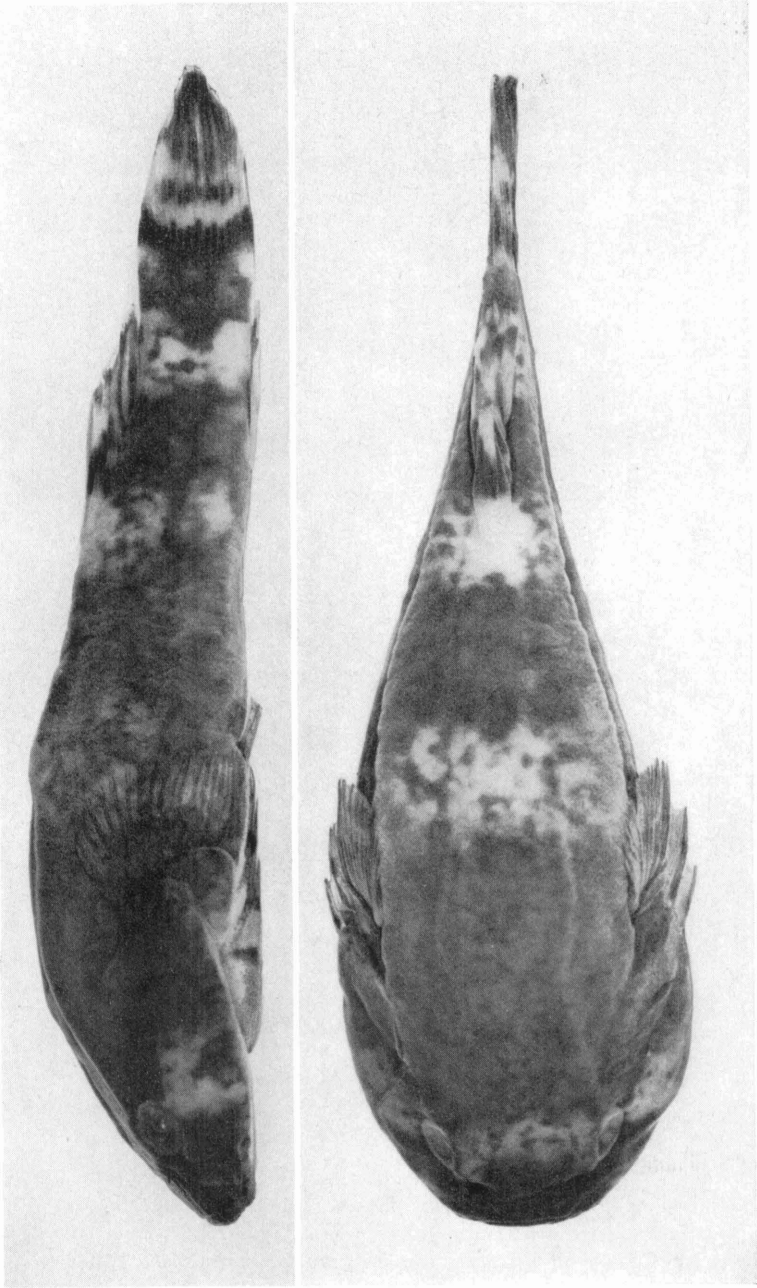


PLATE III

Lateral and dorsal view of holotype of *Gobiosox mexicanus*, UMMZ 177318, 68.8 mm. long, from Río Coyuquilla, Guerrero.

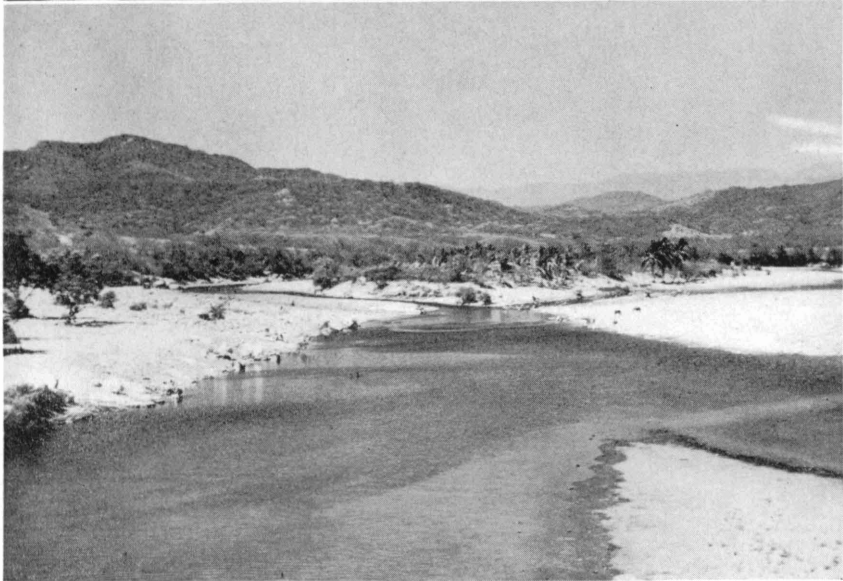
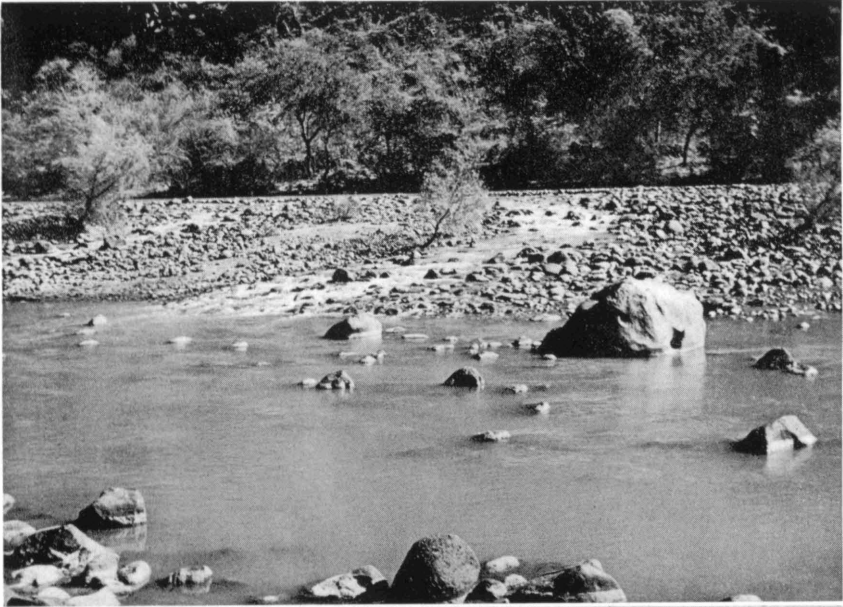


PLATE IV

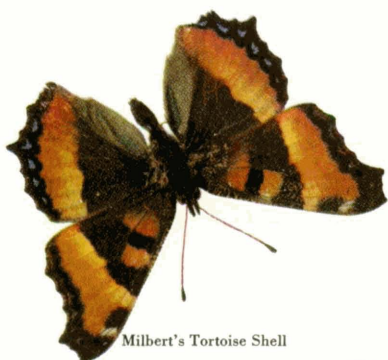
UPPER: Habitat of *Gobiesox fluviatilis*; Río Verde, about one-half mile above its mouth in Río Grande de Santiago, Jalisco, view upstream, March 2, 1957. From kodachrome by Miller.

LOWER: Habitat of *Gobiesox mexicanus*; upstream view of Río Tecpán, Tecpán, Guerrero, March 21, 1957. From kodachrome by Miller.

A REVISED ANNOTATED LIST OF THE
BUTTERFLIES

OF MICHIGAN

By Sherman Moore



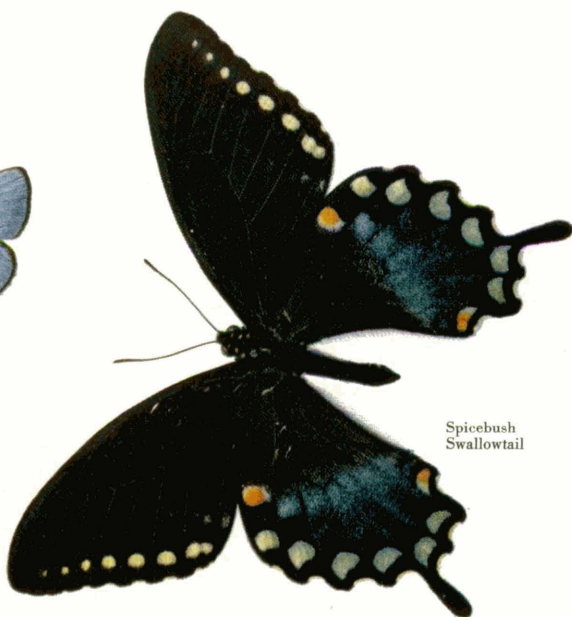
Milbert's Tortoise Shell



Dion Skipper



Silvery Blue



Spicebush
Swallowtail

