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Rhamdia reddelli, new species, the first blind pimelodid catfish from Middle America, with a key to the Mexican species

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Abstract. A new blind, depigmented catfish is described and illustrated from Cueva del Nacimiento del Río San Antonio, Oaxaca, México, and compared with its closest relative, *Rhamdia laticauda.* It resembles that species in having strong, retrorse serrae on the pectoral spine, and a shallowly notched caudal fin, but differs in the longer head, longer adipose fin, larger cephalic sensory pores, and longer and more numerous gill rakers (11–16 vs. 9–12). The karyotype (2n = 58) of the new species and a key to described Mexican species are given. A list of nominal and misidentified Mexican species is presented and *R. laticauda, R. parryi,* and *R. guatemalensis* are illustrated.

Resumen. Una nueva especie de bagre anoftalmo y depigmentado de la familia Pimelodidae se describe de la Cueva del Nacimiento del Río San Antonio, Oaxaca, México. Se distingue de *Rhamdia laticauda,* especie estrechamente relacionada a ella, por la cabeza más grande y larga, la aleta adiposa más larga, poros cefálicas más grandes, y por la lóngitud y el número de las branquispinas (11–16 vs. 9–12). El número de las cromosomas (2n = 58), claves para la determinación de los especies de *Rhamdia,* y illustraciones de *R. laticauda, R. parryi,* y *R. guatemalensis* se presentan, y las especies describidas de México se listan.

Heresay reports of blind catfish from Mexico and Central America have persisted since before the turn of the century. As yet, however, the only described eyeless species from this region has been *Prietella phreatophila* Carranza (1954), from northeastern Mexico, a member of the Nearctic family Ictaluridae (6 genera, nearly 40 species). Troglobitic species apparently have evolved at least three times in this family (Lundberg 1982; Reddell 1981:243–244, gives many references to *Prietella*). The Neotropical catfish family Pimelodidae is much larger (about 56 genera and 290 species according to Nelson 1984) but, thus far, only three blind species have been described (see Thines 1955, for references). Two of these are from São Paulo, Brazil (*Pimelodella kronei* and *Caecorhamdella brasiliensis*), the third from Trinidad (*Rhamdia urichi*). A cave population with the eye variably reduced was described recently from Belize as *Rhamdia laticauda typhla* (Greenfield et al. 1983).

For many years it was common practice to assign cavernicolous fishes to distinct genera even though they typically differed from their epigean relatives only in lacking eyes and being depigmented. That viewpoint has changed markedly in recent years (*see* discussions by Roberts and Stewart 1976, and Banister and Bunni 1980) and a number of blind fishes originally placed in monotypic genera have been reassigned to their more widespread surface relatives. In proposing the genus *Caecorhamdia* for *Rhamdia urichi,* Norman (1926) wrote that his genus differed from *Rhamdia* only in lacking eyes and that *C. urichi* was "almost identical" with *Rhamdia quelen,* the type species of *Rhamdia.* Mees (1974:152, 160) agreed, placed *Caecorhamdia* in synonymy with *Rhamdia,* and designated Norman's species as *Rhamdia quelen urichi.* Haseman (1911:325) stated that *Typhlobagrus kronei* is indistinguishable from *Pimelodella lateristrigata,* except for the loss of sight, and recommended that the cave form be relegated to subspecific status.

FIGURE 1. *Rhamdia reddelli*. A, Holotype (♂?), UMMZ 211164, 98.5 mm SL.

Catfishes have anatomical, physiological, and behavioral characteristics that preadapt them to life in darkness (e.g., well developed organs of taste and touch, nocturnal activity, crevice-seeking habits). It is not surprising, therefore, that about 40 percent (17 of 38 species) of the blind fishes that inhabit fresh water are siluroids. Among the five genera of pimelodids inhabiting Middle America, only *Rhamdia* is widely distributed and evolutionarily successful (Bailey and Miller, 1979). The Mexican and Central American representatives of this genus are under review by Reeve M. Bailey and myself; some of our conclusions receive advance notice in this paper.

The eyes of *Rhamdia* are normally small and of secondary importance in their life. Field observations in Honduras by Carr and Giovannoli (1950) of *Rhamdia brachycephala* indicate that this species (a synonym of *R. cabrerai*—*see* below) is "exclusively cavernicolous and thigmotactic" in its swift-water habitat.

The troglobitic species described below differs from its epigean relatives in many features other than depigmentation and loss of eyes. It may be known as:

Rhamdia reddelli new species
Figures 1–3

Synonymy.—*Rhamdia* new species—LeGrande, 1981:42 (chromosome and arm numbers, based on UMMZ 199016). Reddell, 1981:244–245 (mentioned; type locality mapped).

Holotype.—UMMZ 211164, a male? 98.5 mm SL, Cueva del Nacimiento del Río San Antonio, ca. 9 km SW of Acatlán, Oaxaca, on Atlantic slope of eastern Mexico; collected by James R. Reddell and Andy G. Grubbs, 2 January 1977.

Paratypes.—All specimens are from same locality as holotype. UMMZ 199016 (2 specimens: 39 and 70 mm), A. G. Grubbs, M. Cossey, and T. Byrd, 8 January 1976, shipped alive to Ann Arbor (larger individual karyotyped); UMMZ 211165 (6 specimens: 51.5–94.2 mm), taken with the holotype; UMMZ 211166 (77.1 mm), R. Mitchell and L. Faulkenberry, 7 January 1977. AMNH 38216 (98.2 mm), J. Reddell, D. and M. H. McKenzie, S. Murphy, 26 December 1972; AMNH 38217 (4 specimens: 36.7–90.5 mm), same collectors and date; AMNH 38218 (2 specimens: 68.5, 69.5 mm), same collectors, 9 March 1973.

Diagnosis.—A species of *Rhamdia* with a broad, moderately depressed skull in adult, long head, very weak and short occipital process, almost no pigmentation, and lacking eyes (a tiny eye spot occurs in a 37-mm specimen). Related to *R. laticauda* which it resembles in the strong, retrorse serrae on the posterior edge of the pectoral spine and in the shallowly notched caudal fin. From *R. laticauda* and its closest relatives (*see* below) it differs in having: (1) a much longer head and adipose fin, (2) cavernous sensory head pores (especially on chin), and (3) longer and more numerous gill rakers

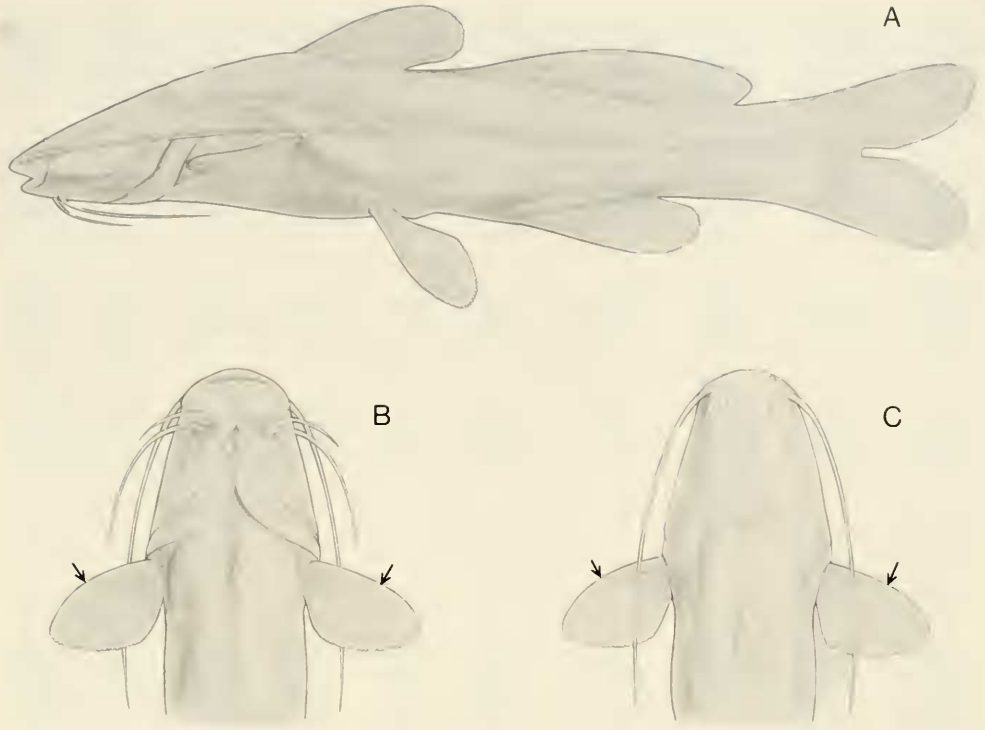

FIGURE 2. *Rhamdia reddelli*. Lateral (A), ventral (B), and dorsal (C) views of paratype, AMNH 38216, 98.2 mm SL. Arrows indicate tips of pectoral spines. The fork of the caudal fin is too deep as drawn.

(11–16 vs. 9–12 on first arch). Head enters SL 3.25–3.75 times (vs. 4.0–5.5) and the depressed dorsal fin overlaps the adipose fin.

Description.—Body form and color pattern are indicated in Figures 1–2. Proportional measurements are presented in Table 1. Meristic data (based on 16 fish) follow. Gill rakers were counted on the first (right) arch, with numbers for upper and lower limbs recorded separately (raker at angle included in lower-limb count). Vertebral counts are post-Weberian, with separation of precaudal and caudal counts where possible (5 vertebrae comprise the Weberian complex). Dorsal fin invariably I,6, the spine soft and flexible as typical of *Rhamdia*; anal rays 13 or 14 (anterior rudiments difficult to see); pectoral rays I,10 or I,11, usually I,10 (22 of 30 counts); pelvic rays invariably 6; principal caudal rays 17–19 (16–18 branched). Gill rakers long, slender, 3+8 to 4+12, total 11(2), 12(0), 13(5), 14(6), 15(1), 16(1). Vertebrae: precaudal, 7 or 8, caudal, 29–32, total 37–39. The number of posterior serrae on the pectoral spine varies with size, from 6–6 in a 36.7-mm SL specimen to 15–14 in a 90.5-mm SL specimen. In the larger fish the serrae are triangular, with very broad bases, and, except proximally, there is no gap between individual serrae as in *Rhamdia laticauda* and closest relatives (*R. parryi, R. salvini, R. cabrerai*[1]). The pectoral spine is gently curved in adults but in specimens less than 70 mm SL it is straight and there are gaps between the individual serrae. There are no serrae on the anterior edge of the spine, which is essentially smooth.

The maxillary barbel is generally longer than in *R. laticauda* and much longer than in *R. parryi, R. salvini,* or *R. cabrerai,* but it is shorter than in *R. guatemalensis* which belongs to a different species group. It may extend backward almost as far as the tip of the depressed dorsal fin and well beyond the origin of the adipose fin, but in some

[1] Meek (1906) named this fish for Señor Cabrera but spelled the patronym *cabrerae*. It is here corrected.

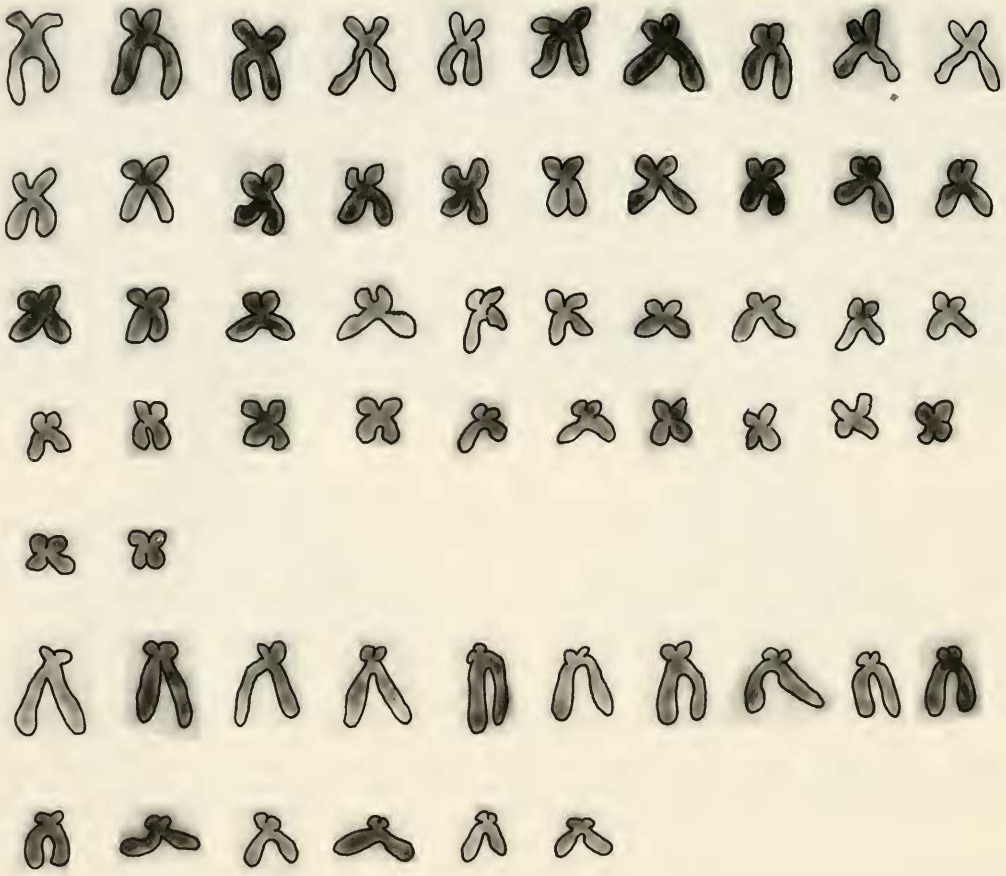

FIGURE 3. Somatic chromosomes at metaphase of female paratype, UMMZ 199016: 2n = 58, FN = 100±4 (LeGrande, 1981:42).

it does not reach beyond the middle of the depressed pectoral fin. The insertion of the pelvic fin lies before the end of the dorsal-fin base. The long adipose fin is well developed, especially posteriorly. The occipital process is very weak and short, extending less than one-fourth the distance to the dorsal-fin origin.

Alive in its natural habitat, *Rhamdia reddelli* is virtually colorless and without visible pigment. In ethyl alcohol (formalin-fixed), the holotype (Fig. 1) has fine, scattered flecks of pigment on the top and sides of the head, along the back and upper sides, and in a narrow band along the lateral line. The lower sides and entire venter are immaculate, as are all the fins except the caudal which has the interradial membranes largely dusky. The similar-sized paratype (Fig. 2) also essentially lacks pigment except for fine flecks along and below the base of the adipose fin and some duskiness on the interradial membranes of the caudal fin. Other adults (between 69 and 91 mm SL), except for one mentioned below, resemble either the holotype or the above-described paratype, or the caudal fin may be immaculate. An 81.5-mm specimen (UMMZ 211165) is more pigmented, with fine flecks extending downward to a line just above the bases of the pectoral, pelvic, and anal fins and with fine pigment grading onto the ventral surface of the caudal peduncle; the venter is otherwise immaculate. Some juveniles (3 or 4 in UMMZ 211165) are pigmented as fully as the holotype, whereas others virtually lack pigment. When kept alive for a month or more in a lighted place, fine melanophores spread over much of the body, covering the venter posterior to the anus and encroaching anteriorly onto the abdomen, with small ones developing along the rays of the paired

TABLE 1. Proportional measurements (in permillage of SL) of 12 specimens (juv.-ad.) of the types of *Rhamdia reddelli*. The data for the holotype are included in the summary. Figures in parentheses are number of specimens when fewer than 12.

Measurement	Holotype	Range	Mean
Standard length, mm	98.5	50.3–98.5	76.8
Body depth	198	163–234	194
Predorsal length	376	366–414	385
Preanal length	682	640–707	675
Anal origin to caudal base	340	300–356	335
Caudal-peduncle length	201	163–206	186
Caudal-peduncle depth	124	99–130	119
Head length	286	278–310	295
Head depth	157	138–171	155
Head width (11)	213	185–226	205
Snout length	123	101–137	120
Mouth width	145	127–151	142
Interorbital width	87	79–100	89
Maxillary-barbel length (9)	434	337–516	466
Outer mental barbel length (11)	211	175–287	229
Inner mental barbel length (11)	128	104–161	127
Adipose-fin length	401	337–417	377
Adipose-fin maximum height	42	29–49	42
Anal-fin basal length	139	131–158	145
Pectoral-fin length (11)	172	157–191	171
Pectoral-spine length	96	91–121	103
Caudal-fin length (9)	211	208–241	223
Caudal fin, to notch (8)	86	76–111	95
Caudal fin, shortest ray length (8)	124	123–149	134

fins and the anal fin as well as on the interradial membranes of the dorsal fin (e.g., the 69-mm SL specimen, UMMZ 199016, kept alive over six months). The one individual with a tiny pigmented pupil (AMNH 38217, 36.7 mm SL) appears to lack pigment.

From the recently described Lake Nicaraguan species *Rhamdia luigiana* Villa (1977), the new species differs markedly in the much deeper body, shorter pectoral spine and fin, longer head, shorter maxillary barbel, shallower caudal-fin notch, and rounded rather than pointed caudal-fin lobes. It also has fewer post-Weberian vertebrae (37–39 vs. 39–42 in *R. luigiana*). *Rhamdia reddelli* is compared with other Mexican species of *Rhamdia* in the Key.

The karyotype (Fig. 3), kindly prepared by William H. LeGrande, shows a diploid number of 58 chromosomes and an arm number (FN) of 100±4. This diploid number may be the ancestral condition for pimelodids, as it evidently is for ictalurids (LeGrande 1981), but since the karyotypes of only seven species of pimelodids have been published (2n = 46, 56, 58, 62—*see* LeGrande 1981:42) this tentative conclusion must await further karyological studies of this family.

Habitat and associates.—The cave is at Cañada San Antonio, approximately 9 km SW of Acatlán, at an elevation of 100 m. The stream flowing from below the cave entrance is the primary source of the Río San Antonio and drains south into Presa Miguel Alemán, a dammed portion of the Río Tonto that is tributary to Río Papaloapan. The main passage of the cave extends for about 120 m to a deep lake containing many blind catfish and crayfish. Beyond this lake a shallow stream extends for 350 m in a passage 10 to 30 m wide and up to 11 m high. Several major side passages that contain secondary streams occur throughout the cave and bring the total length of the cave to about 4.5 km. The main stream floor is generally of sand and gravel with areas of flowstone and bedrock. Both air and water temperatures were 23.5°C. The catfish usually occurred in the deeper ponded portions of the streams, especially in areas over which bats roosted.

A rich invertebrate cave fauna is associated with the catfish. Four species of troglobitic crustaceans inhabit the cave: *Potamalpheops stygicola* Hobbs (Decapoda:

Alpheidae), *Macrobrachium villalobosi* Hobbs (Decapoda: Palaemonidae), *Procambarus (Austrocambarus) oaxacae reddelli* Hobbs (Decapoda: Cambaridae), and *Speleomysis olivae* Bowman (Mysidacea: Lepidomysidae). All have since been collected in other caves in the vicinity of Acatlán. A second species of mysid, *Antromysis (Antromysis) reddelli* Bowman, has been collected from a nearby cave and can be expected to occur in Cueva del Nacimiento del Río San Antonio. A specimen of the alpheid shrimp *Potamalpheops stygicola* was disgorged by a catfish upon preservation. The rarity of shrimps and mysids in pools containing catfish is doubtless related to predation by the fish on the crustaceans. The cave is also inhabited by a possibly troglobitic clam, which is abundant in various parts of the cave but awaits study.

The terrestrial fauna is extremely abundant and includes troglobitic trichoniscid isopods, nicoletiid thysanurans, millipeds, spiders, and opilionids.

Etymology.—I am pleased to name this distinctive species for James R. Reddell, who donated all of the type specimens and has pioneered in exploring caves in Latin America.

Nominal or Misidentified Species Referred to Mexican Catfishes of the Genus *Rhamdia*

Pimelodus laticaudus Heckel in Kner, 1858 (Abtheilung Sitzber. Akad. Wiss. Wien, 26: 420). Type locality (on label in jar): "Rio Xamapa, Mexiko." Oldest available name for a Middle American *Rhamdia*. A valid species. Three syntypes, Vienna Museum 50554 (166, 171, 203 mm SL), examined.

Pimelodus guatemalensis Günther, 1864 (Cat. Fish. British Mus., 5:122). Type locality: Huamuchal, on Pacific coastal plain, Guatemala. A valid species.

Pimelodus godmani Günther, 1864 (ibid.:124). Type locality: Guatemala (Río Motagua, lower Vera Paz) and Mexico. Species illustrated by Regan (Biol. Centrali-Americana, 8:pl. 21, fig. 1). A synonym of *Rhamdia guatemalensis* (Miller 1966:787).

Pimelodus petenensis Günther, 1864 (ibid.:126). Type locality: Lake Petén, Guatemala. Listed for Mexico by Alvarez 1950 (Sec. de Marina, Dir. Gen. Pesca e Ind. Conexas, Mexico:35) with the remark "probably only in Guatemala." Illustrated by Regan (op. cit.:pl. 22, fig. 1). A subspecies of *R. guatemalensis* (Hubbs 1938:266).

Pimelodus hypselurus Günther, 1864 (ibid.:126–127). Type locality (on label in jar): Orizaba [but listed as Cordova in cat. book], Mexico. Holotype, BMNH 1858–11.22.32 (103.5 mm SL), examined by R. M. Bailey; illustrated by Regan (op. cit.: pl. 21, fig. 3). A synonym of *R. laticauda*.

Pimelodus motaguensis Günther, 1864 (ibid.:127). Type locality: Río Motagua, Guatemala. Holotype illustrated by Regan (op. cit.:pl. 20, fig. 1). A synonym of *R. laticauda* (see comment by Miller 1976:4).

Pimelodus brachypterus Cope, 1866 (Trans. Amer. Philos. Soc., 13:404). Type locality: Orizaba, Mexico. Holotype, ANSP 16471 (147 mm SL), examined. A synonym of *R. laticauda*.

Rhamdia parryi Eigenmann and Eigenmann, 1888 (Proc. Calif. Acad. Sci., ser. 2, vol. 1:130). Type locality: Río Zanaleneo [=Sanatenco], near Tonalá, on Pacific slope of Chiapas, Mexico. Five syntypes, MCZ 27273 (77–88 mm SL), examined. A valid species (called *R. hypselura* by Miller 1966:787).

Rhamdia oaxacae Meek, 1902 (Field Col. Mus. Publ. 65:74, pl. 14). Type locality: Río Quiotepec at Cuicatlán, Oaxaca, Mexico, in Río Papaloapan basin. A synonym of *R. guatemalensis* (Regan op. cit.:132).

Rhamdia depressa Barbour and Cole, 1906 (Bull. Mus. Comp. Zool. 50(5):155, pl. 1). Type locality: Ikil [=Ixil] Cenote near Chichén-Itzá, Yucatán, Mexico. A subspecies of *R. guatemalensis* (Hubbs 1936:194).

Rhamdia sacrificii Barbour and Cole, 1906 (ibid.:156). Type locality: Sacrificial cenote near Chichén-Itzá, Yucatán, Mexico. A synonym of *R. guatemalensis* (Hubbs 1936: 200).

Pimelodus boucardi Regan, 1907 (Ann. Mag. Nat. Hist., ser. 7, vol. 19:258). Type

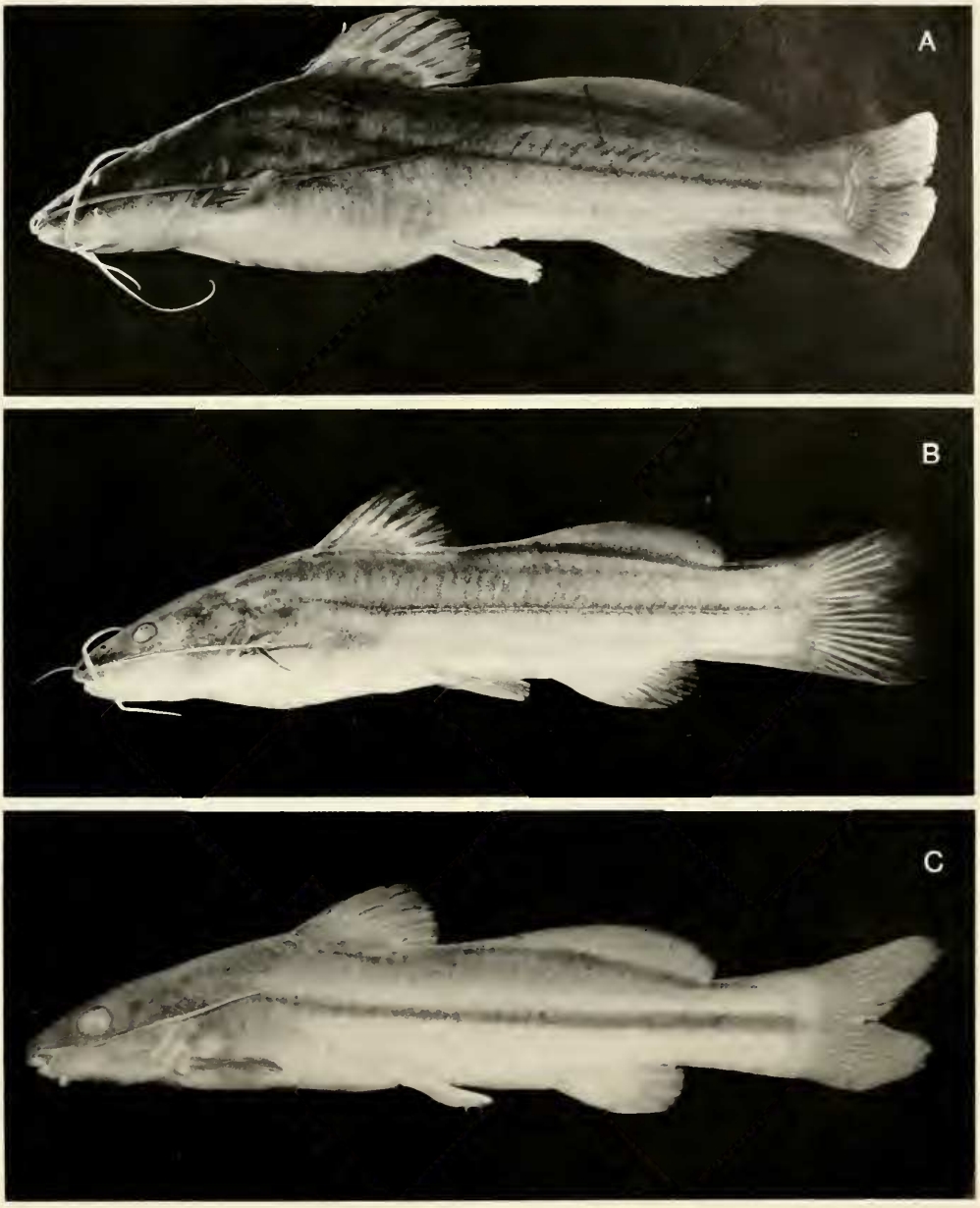

FIGURE 4. Three species of *Rhamdia* from Mexico. A, *R. guatemalensis*, UMMZ 183901 (126.2 mm), Nacimiento del Río Cosalapa, 2.6 km SE of Estación Tezonapa, Veracruz; B, *R. laticauda*, UMMZ 196674 (68.8 mm), tributary to Río Metlac, Fortín, Veracruz; C, *R. parryi*, UMMZ 184739 (68.0 mm), headwaters of Río Tapanatepec, at Hwy 190 bridge E of Tapanatepec, Oaxaca.

locality: Yucatán, Mexico. A synonym of *R. guatemalensis depressa* Barbour and Cole (Hubbs 1936:193, 195); illustrated by Regan (op. cit.:pl. 20, fig. 3).

Pimelodus brachycephalus Regan, 1907 (op. cit.:258). Type locality: Río Nacasil, Pacific slope of Guatemala. Recorded tentatively from Mexico by Alvarez 1950 (op. cit.: 37) with the remark "probably only in Guatemala." Illustrated by Regan (op. cit.: pl. 22, fig. 2). A synonym of *R. cabrerai* (type examined by R. M. Bailey). Later, Alvarez (1970:77) listed *R. brachycephala* from "southeastern Mexico near the

Guatemalan frontier," but this represents a misidentification since *R. cabrerai* is known on the Atlantic slope of Guatemala only from the upper Río Motagua.

Key to Mexican Species of *Rhamdia*[2]

R. laticauda and *R. parryi* are commonly sympatric with *R. guatemalensis.*

1a. Anterior and posterior edges of pectoral spine with small, numerous serrae of subequal length, developed about equally or those on posterior edge somewhat stronger (especially in older fish); caudal fin deeply notched for at least two-thirds the distance from tips of caudal lobes to base of mid-caudal rays. (Maxillary barbel long, typically extending well beyond origin of adipose fin; head long, 3.5–3.8 in SL; adipose fin long, ca. one-third SL; occipital process long, extending nearly half way or more to dorsal origin.) *Atlantic and Pacific lowlands from just NW of Veracruz City on Atlantic slope and Rio Tehuantepec basin on Pacific versant southward to Panama* (if *R. wagneri* is a synonym—*see* Hubbs 1936:181); typically in pools ..... *Rhamdia guatemalensis* (Fig. 4)

b. Pectoral spine with strong, retrorse to nearly straight serrae only on posterior edge (anterior edge smooth or roughened); caudal fin weakly notched, to no more than half distance from tips of caudal lobes to base of mid-caudal rays. *Atlantic and Pacific versants*; cavernicolous and in rocky streams of piedmont slopes and foothills 2

2a. Skull depressed; head long, 3.25–3.75 in SL; blind and depigmented; adipose fin well developed, overlapped by depressed dorsal fin. *Cueva del Nacimiento del Río San Antonio, Oaxaca*; cavernicolous ..... *Rhamdia reddelli* (Figs. 1–2)

b. Skull domed; head short, 4.0–5.5 in SL; eyes and pigment well developed; adipose fin short, not (or rarely) overlapped by depressed dorsal fin 3

3a. A prominent, dark lateral stripe on midside, from behind head to base of caudal fin, becoming broader posteriorly; post-Weberian vertebrae fewer, 35–38, usually 36 or 37 (98%). *Pacific slope of Oaxaca and Chiapas southeastward into Guatemala (to Dpto. de Santa Rosa)*; on rocky riffles ..... *Rhamdia parryi* (Fig. 4)

b. Side of body without a conspicuous dark stripe; post-Weberian vertebrae more numerous, 37–41, usually 38–40 (91%). *Atlantic slope from Río Jamapa, Veracruz, southeastward to western Honduras*; on rocky riffles and in current of streams ..... *Rhamdia laticauda* (Fig. 4)

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Robert W. Mitchell called my attention to the existence of the new species. James R. Reddell provided the information from which the account of the habitat and associates was written.

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[2] Much of this key was derived from information provided by R. M. Bailey.

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