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SERPENTICOBITIS, A NEW GENUS OF COBITID FISHES FROM THE MEKONG BASIN, WITH TWO NEW SPECIES

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ABSTRACT

Serpenticobitis, a new genus of the cobitid loach subfamily Cobitinae, is described from the Mekong basin, with two new species, *S. octozona* (generic type species) from tributaries of the Sekong watershed in southern Laos and *S. cingulata* from tributaries in northern Thailand. Both species are boldly banded and superficially resemble nemachilin loaches but have moveable suborbital spines.

INTRODUCTION

A boldly banded new genus and species of spiny loach with generalized mouth parts, body proportions, and fins was collected in the Sekong watershed of southern Laos during environmental assessment of hydropower projects. Superficially it resembles some vertically banded non-spinous nemacheilin loaches, numerous species of which occur in the Sekong and other Mekong tributaries. Unlike these nemachilins, however, its vertical bands continue all the way around the body, a condition unusual in loaches. Large bifid subocular spines indicate its relationships are with the subfamily Cobitinae rather than Nemacheilinae, but the subcylindrical head and body differs markedly from previously described cobitins and its closest relative among them has not been identified. A closely related new species found in Mekong tributaries along the borders with Myanmar and Laos in northern Thailand is also described. The specimens are deposited in the fish collection of the California Academy of Sciences (CAS).

Note on spelling of place names.—Huay, Houay, Se and Xe are Thai and Lao language prefixes for names of tributaries or streams. The spellings employed here, e.g. Huay Ngao, Houay Samang, Xe Pian, Xe Nam Noi, are those used on maps consulted. Thus Thai maps tend to use the spelling Huay, Lao maps Houay. Sekong can also be Se Kong, but is usually spelled Sekong. Se Kaman can also be Sekaman, but is more often Se Kaman. Xe tends to be used in northern Laos, and Se in southern Laos. Xe and Se are sometimes interchangeable, thus Xe Pian and Xe Nam Noi are sometimes spelled Se Pian and Se Nam Noi. Nam Noi is sometimes spelled Nam Noy.

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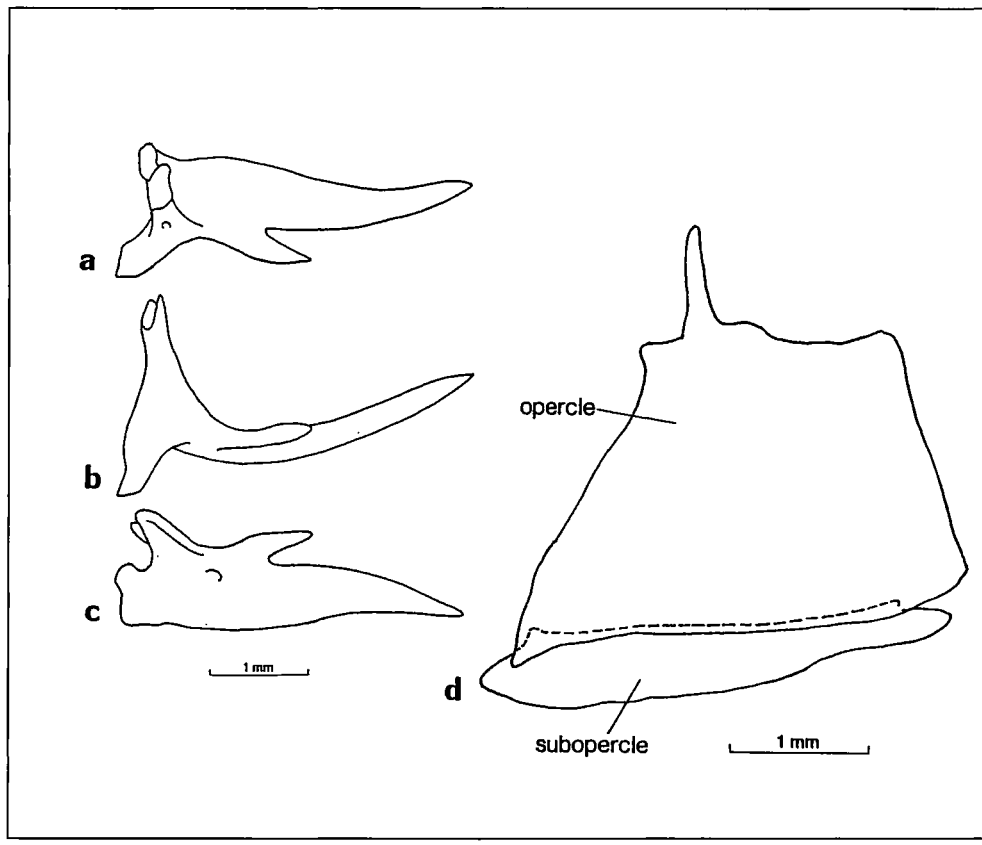

Figure 1. *Serpenticobitis octozona,* 48.6 mm. a-c, suborbital bone (dorsal, lateral and ventral views); d, opercle and subopercle (lateral view).

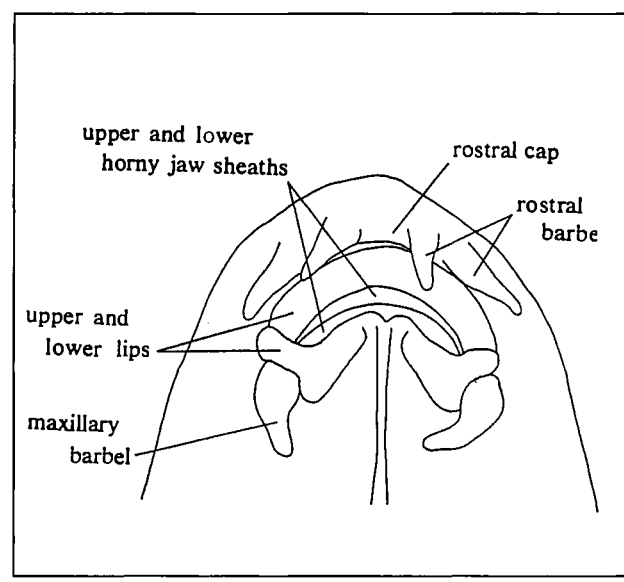

Figure 2. *Serpenticobitis octozona,* 52.3 mm, mouth parts.

Serpenticobitis new genus
(Figs. 1–6)

Type species.—*Serpenticobitis octozona* new species.

Diagnosis.—Superficially similar to *Nemacheilus* (sensu lato), but with a large bifid subocular spine just below the eye (Fig 1a). Body nearly cylindrical, slightly higher than broad. Its *Nemacheilus*-like fasces—including small head, morphologically simple and generalized mouth parts and barbels, and subcylindrical body—readily distinguish *Serpenticobitis* from all other cobitin genera. Body with vertical bands enhanced by thin dark or pale outlines which in larger specimens are continuous all the way around the body. Similarly enhanced bands occur in several nemacheilin species but usually are confined to dorsal and lateral body surfaces. All fins heavily barred with pigment on fin rays (bars on fins of nemacheilins usually fewer and much less noticeable, particularly on paired fins).

Shape of opercle (Fig. 1b) may be diagnostic for the new genus. As described and illustrated by SAWADA (1982: 122–124, Figs. 44–45) the ventral margin of the opercle in cobitins is markedly concave, and therefore (except in *Acantopsis*) markedly separated from the more or less straight dorsal margin of the subopercle, while in nemachilins (included with homalopterins by Sawada) the ventral margin of the opercle is straight and lies laterad to, and conformably with, the dorsal margin of the subopercle. In *Serpenticobitis* the opercle is of the homalopterid or nemachilin type, or rather of the presumably primitive or generalized type. It is also deeper and perhaps more generalized in shape than the opercle in any of the cobitids illustrated by Sawada. Two additional characters resembling the condition reported in Nemacheilinae more than that in Cobitinae involve the cranial fontanel and suspensorium. In *Serpenticobitis* the cranial fontanel is shaped like an hour-glass, with broader portions anteriorly and posteriorly joined by a narrowed portion; a similar cranial fontanel is illustrated in some species of *Nemacheilus* by SAWADA (op. cit., Figs. 17a, 18a). In fishes of the subfamily Cobitinae studied by Sawada, all but the genus *Misgurnus,* have a large metapterygoid-quadrate fenestra in the suspensorium (SAWADA, op. cit.:121, Fig. 44. In *Serpenticobitis,* as in Nemacheilinae, the fenestra is absent.

Mouth and barbels simple or generalized (Fig. 2), morphologically similar to those of most nemacheilins. Rostral cap distinct from upper lip but only slightly indented. Barbels short and simple, two pairs rostral and one pair maxillary. Upper and lower lips complete; upper lip simple, lower lip with small lobes and medial notch similar to those in many nemacheilins. Upper and lower horny jaw sheaths distinct from lips and moderately developed. Upper horny jaw sheath not forming "processus dentiformis"; lower horny jaw sheath without trenchant cutting edge. Lower pharyngeal bone with a single row of about 10 large, hooked conical teeth on its posterior margin. Auditory capsules complete.

Entire body surface including abdomen covered with uniformly small and deeply embedded scales, the exposed posterior margin of each scale bearing a small conical tubercle 100–150 micra in diameter (Fig. 3). Such tuberculate squamation, present in both sexes, is unknown in other cobitids. The tubercles are unculiferous and dehiscent; their surface often is considerably eroded.

a b

Figure 3. *Serpenticobitis octozona,* 47.9 mm. a, embedded scales on side of body, with emergent tubercles near posterior margins (picture width 2.2 mm); b, individual tubercle on scale (note smooth conical apex, broad unculiferous base, and ring of dehiscence) (picture width 200 micra).

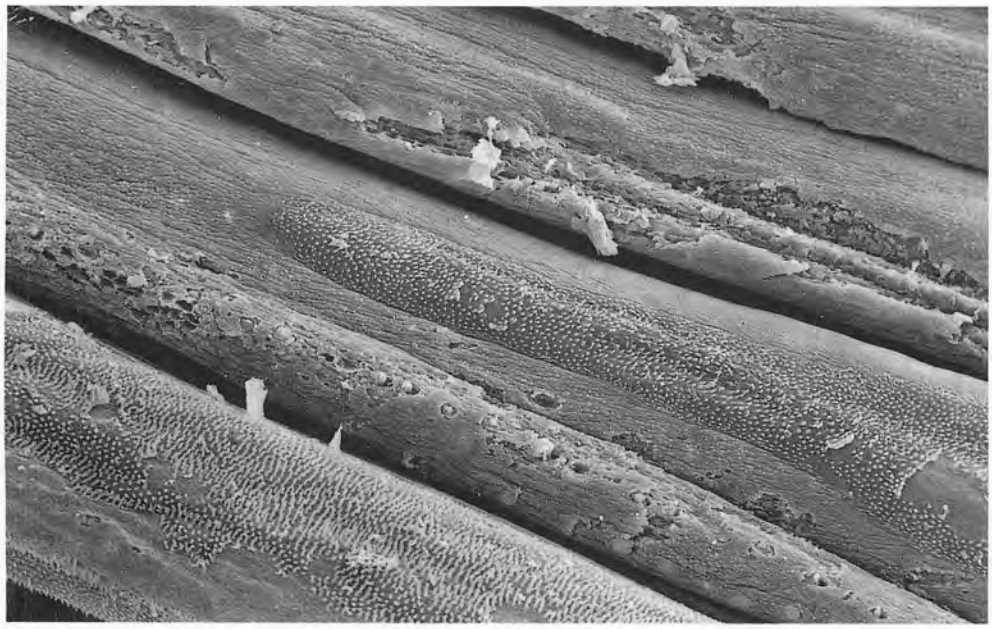

Figure 4. *Serpenticobitis octozona,* 47.9 mm, unculiferous pads on ventral surface of pectoral fin (picture width 1.5 mm)

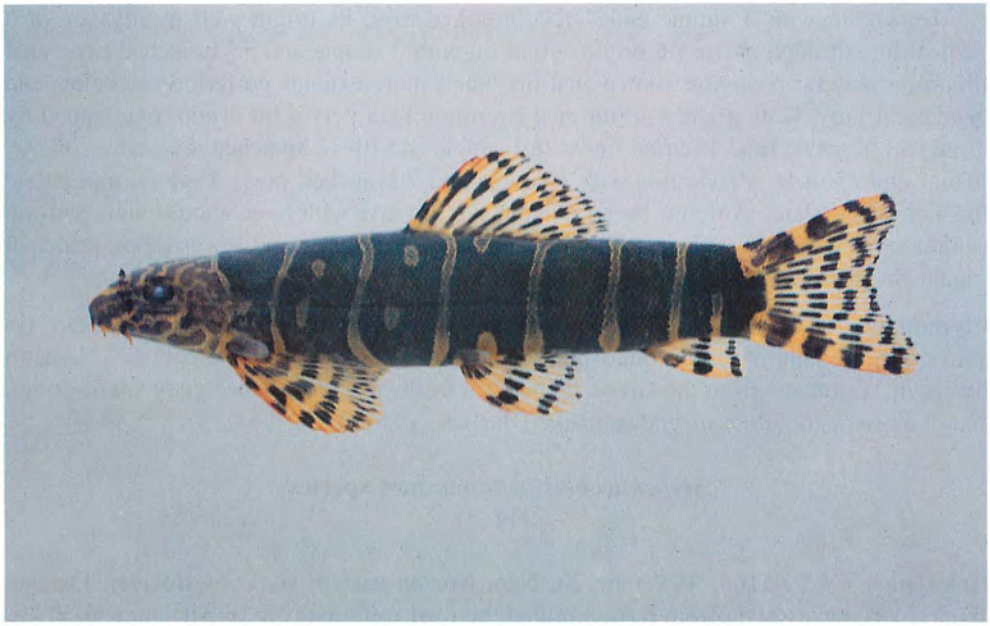

Figure 5. *Serpenticobitis octozona*, 48.1 mm holotype.

Figure 6. *Serpenticobitis cingulata*, 38.6 mm holotype.

Dorsal fin with 4 simple and 7–8 $\frac{1}{2}$ branched rays, its origin well in advance of a vertical line through pelvic fin origin. Anal fin with 3 simple and 5 $\frac{1}{2}$ branched rays; anal fin origin very far posterior, so that anal fin, albeit short, extends posteriorly to below end of hypural fan. Vent slightly nearer anal fin origin than pelvic fin origin, overlapped by distal part of pelvic fins. Pectoral fins with 1 simple and 10–12 branched rays; no secondary sexual dimorphism. Pelvic fins with 1 simple and 7 branched rays. Pectoral and pelvic fins non-tuberculate. Anterior pectoral and pelvic fin rays with large unculiferous pads on ventral surface (Fig. 4). Caudal fin with well developed upper and lower lobes, principal caudal fin rays 10/9. Vertebrae 22–24+10–13=33–35.

Etymology.—The name *Serpenticobitis* (fem.) is from "serpentis", Latin for snake (in allusion to the fang-like suborbital spines and banded coloration); and "cobitis", Neolatin for loach. Cobitis is from the Greek "kobios", a freshwater fish (hence gudgeon or goby), and "kobitis", goby-like or gudgeon-like (BROWN, 1956: 372).

Serpenticobitis octozona new species
(Fig. 5)

Holotype.—CAS 95165, 48.1 mm, Xe Nam Noi on eastern slope of Bolaven Plateau, about 3 km downstream from ferry crossing the road from Saravan to Attapeu and 30 km from Ban Nam Tang, Attapeu Province, Laos, elevation 130 m, 27 March 1995, T. R. Roberts.

Paratypes.—CAS 95166, 11:31.4–47.9 mm, collected with the holotype (47.9 mm used for SEM); CAS 95167, 7:21.6, 33.9–39.9 mm, Se Kaman at Muang Saisetthirat, 12 km E of Attapeu town, Attapeu Province, Laos, 6 April 1995, T. R. Roberts; CAS 95168, 11:34.6–41.6 mm, Xe Pian 1 km downstream from Sepa waterfall and 6 km upstream from Ban Hin Lat, Attapeu Province, Laos, 8 April 1995, T. R. Roberts; CAS 95169, 19:33.1–53.7 mm, Houay Samong about 1 km upstream from its mouth into Xe Pian near Ban Hin Lat, Attapeu Province, Laos, 10 April 1995, T. R. Roberts (3: 42.1, 48.6 and 53.4 mm cleared and stained for osteological study).

Diagnosis.—General characteristics of the species are given in the generic diagnosis above. *Serpenticobitis octozona* is distinguished from the only other known species of the genus mainly by its coloration. Scales in lateral series about 90–95; predorsal scales 37–42; transverse scale rows 16–20/1/12–14; and circumpeduncular scales 42–46. Vertebrae 23+10=33(1), 22+13=35(2) or 23+12=35(1) (from radiographs and cleared and stained specimens).

Coloration in life.—Live *Serpenticobitis octozona* are quite beautiful. Head and body including abdomen and other ventral surfaces blackish overall; head with numerous thin lemon yellow vermiculations and body with pale spots and thin vertical bars of the same color. All fins bright yellow or orangish yellow overall, with interrupted black bars. The basic color pattern is well retained in preserved specimens.

Habitat.—The Xen Nam Noi and Xe Pian where *S. octozona* was collected are large, clear, high gradient mountain streams with very swift current, large boulders, and rich and

diverse fish faunas with over 50 fish species including numerous cyprinids and cobitids and such highly specialized rheophilic genera as *Annamia, Balitora,* and *Sewellia.* The Houay Samang is a somewhat smaller tributary but with quite rocky bottom and equally high fish diversity, while the Se Kaman at the site of collection was shallow, with a more unstable gravelly bottom and much less fish diversity (mainly nemacheilins and young cyprinids).

Distribution.—*Serpenticobitis octozona* is known only from the Sekong watershed of the lower Mekong basin in southern Laos. The Xe Nam Noi and Xe Pian both originate on the Bolaven plateau, the Nam Noi flowing off the plateau to the east, the Pian to the southwest. The upper part of the Pian is separated from the lower parts by a series of waterfalls 10–20 m high, of which the lowermost is Sepa Waterfall, and the upper part of the Nam Noi is separated from its lower part by at least one very high waterfall, Jroong Droong. The top of the Bolaven plateau has a very reduced fish fauna, with *Poropuntius, Annamia, Sewellia,* and two or three nemacheilins but no *Serpenticobitis.* The Nam Noi joins the Sekong roughly 70 km upstream from the Se Kaman, and the Pian roughly 70 km below that. Long stretches of mostly sandy and relatively sluggish Sekong mainstream thus separate the Xe Nam Noi, Se Kaman, and Xe Pian (including Houay Samong) sampling sites of *S. octozona,* which may represent three distinct populations.

Etymology.—The specific epithet "octozona" is from the Latin octo, eight, and zona, belt or girdle.

Serpenticobitis cingulata new species
(Fig. 6)

Holotype.—CAS 95170, 38.6 mm, Huay Ngao where it flows into Mekong mainstream 1 km S of Ban Chaem Pong, about 30 km S of Chiang Khong, Loei Province, Thailand, 12 May 1990, T. R. Roberts.

Paratypes.—CAS 95171, 6:25.5–34.0 mm, collected with the holotype (2:26.2–30.8 mm cleared and stained for osteological study); CAS 95172, 37.7 mm, Huay Huang 30 km W of Chiang Khan, Loei Province, Thailand, 7 April 1990, T. R. Roberts.

Serpenticobitis cingulata is morphologically almost identical with *S. octozona,* but differs strikingly in coloration. Instead of 8–9 thin pale complate bands on a dark background, it has 7–12 thin dark mostly incomplete bands on a pale background. Most of the specimens have only 7–8 incomplete bands; only the 37.7 mm specimen from Huay Huang has 12 bands, many of which go completely around the body (as in S. *octozona*). Scales in lateral series about 100; predorsal scales about 40; transverse scale rows 19/1/14; circumpeduncular scales about 50. Vertebrae 23+10=33(1) or 24+11=35(1).

Habitat.—The Huay Ngao in May 1990 was a shallow (less than 50 cm deep), fairly swift flowing, and muddy stream 5 m wide with unstable or loose gravelly bed. Specimens were collected in the last few hundred meters of the Huay Ngao to its mouth into the Mekong mainstream. Only about a half-dozen fish species present, mainly nemacheilins. Huay Huang in April 1990 was a considerably larger stream, muddy and very swift, to 1 m deep and 10 m wide, with a more stable rocky as well as gravelly bottom, and some 20 fish

species, including a variety of carps, loaches, mastacembelids and pufferfishes.

Distribution.—*Serpenticobitis cingulata* is known only from tributaries of the middle Mekong basin in northern Thailand. The middle Mekong basin is separated from the lower Mekong by Khone Falls on the Mekong mainstream in southern Laos, just 4 km upstream from the border with Cambodia. The Sekong flows into the Mekong mainstream at Stung Treng in Cambodia, some 60 km downstream from Khone Falls. Thus *S. cingulata* is known only from tributaries that are physiographically isolated as well as distant from the Sekong watershed where *S. octozona* occurs. The closest collection sites of *S. cingulata* and *S. octozona,* Huay Ngao and Xe Pian, are separated by roughly 1,600 km of river.

Etymology.—The specific epithet "cingulata" (Latin, adjective) from cingulum, (belt or zone) refers to the belted or banded coloration.

DISCUSSION

If cobitids form natural groups defined by presence versus absence of the subocular spine, then *Serpenticobitis* with its massive bifid subocular spine clearly belongs in Cobitinae as opposed to Nemacheilinae. Then the question arises, is the absence of the spine in nemacheilins a primitive or a derived condition? The spine develops on the lateral ethmoid bone, present in all cobitoids. In groups with a spine, the lateral ethmoids are moveable, while in those without a spine, they are fixed. Forms with a spine have a subocular slit, through which the spine is exposed and retracted. Nemacheilins do not have such a fully developed slit, but males of many species do have a fleshy suborbital flap and sometimes a groove as well as a flap just below and anterior to the eye (KOTTELAT, 1990, pp. 28–29, Figs. 11–12) in the same position as the slit and presumably homologous with it. In the nemacheilin genus *Acanthocobitis,* which superficially at least resembles cobitins such as *Cobitis* and *Lepidocephalichthys,* the suborbital groove and flap tend to be very well developed (only in males). Many nemacheilins (males only) have a well developed suborbital flap but no groove (KOTTELAT, 1990). One hypothesis is that nemacheilins originated from cobitins from ancestors similar to *Acanthocobitis. Serpenticobitis* represents a potential nemacheilin ancestor quite different from *Acanthocobitis*-like forms.

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