Description of a New Species of *Aspidoras* (Siluriformes, Callichthyidae) from the Serra dos Carajás, Lower Tocantins River Basin, Brazil

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A new species of *Aspidoras* (Corydoradinae) is described from the Serra dos Carajás, lower Tocantins River basin, representing the northernmost record of the genus at the edge of the Brazilian Shield into the Amazon basin. *Aspidoras gabrieli* is easily distinguished from all congeners by having the rays and interradial membranes of the dorsal and pectoral fins entirely and densely pigmented, the inner bony margin of the pectoral spine expanded as a narrow laminar shelf with edge smooth or scarcely serrated; lateral-line canal posterior to the two anterior lateral-line ossicles absent (also in *A. taurus*), naked predorsal region (also in *A. velites* and *A. psammatides*), large brown oval spots on the flank and caudal peduncle that sometimes merge to form irregular patches (also in *A. maculosus, A. albater, A. lakoi,* and *A. depinnai*), and several additional morphometric distinguishing features. Comments on generic allocation and interspecific relationships are presented.

Uma nova espécie de *Aspidoras* (Corydoradinae) é descrita da Serra dos Carajás, bacia do baixo rio Tocantins, representando o registro mais ao norte na bacia Amazônica, na borda do Escudo Brasileiro. *Aspidoras gabrieli* é facilmente distinta das demais espécies do gênero pelo padrão de coloração das nadadeiras peitoral e dorsal inteira e densamente pigmentadas sobre os raios e membranas inter-radiais, pela margem interna da porção óssea do espinho peitoral estendida em uma estreita lâmina de borda lisa ou suavemente asserreada, pela ausência de canal da linha lateral após os dois ossículos anteriores da linha lateral (exceto *A. taurus*), por apresentar a região pré-dorsal nua (exceto *A. velites* e *A. psammatides*), por apresentar grandes manchas marrons aproximadamente ovais nos flancos e pedúnculo caudal que às vezes se unem formando grandes manchas irregulares (exceto *A. maculosus, A. albater, A lakoi* e *A. depinnai*), e por várias diferenças morfométricas. Comentários sobre alocação genérica bem como relações interespecíficas são apresentados.

THE genus *Aspidoras* (Corydoradinae) is a natural group of the Callichthyidae (Reis, 1998; Britto, 2003), its species sharing the following synapomorphies: a large posterior portion of the mesethmoid, reduced frontal fontanel, a circular fossa in the parieto-supraoccipital, a compact operculum, and a very small ossified portion of the pectoral spine, less than half the length of the first branched ray (Britto, 2003).

Aspidoras currently consists of 20 valid species, with a rather recent taxonomic history. Ihering (1907) described the genus to include *Aspidoras rochai* from near Fortaleza, Ceará State, Brazil, and distinguished it from the other members of the family by its possession of ''two pairs of nuchal plates between the occipital and the base of the dorsal; occipital plate nearly truly hexagonal, the posterior angle not much produced; head rather elevated, not depressed, rounded in front and somewhat compressed laterally, coracoid plates entirely hidden by the skin; and barbels short, not reaching the gill-opening''. In his revision of the family Callichthyidae, Gosline (1940) continued to recognize only one species in *Aspidoras*, and a second species was only described nine years after that as *A. lakoi* Miranda Ribeiro, 1949. It was only with the revision of Nijssen and Isbrücker (1976) that most of the diversity within *Aspidoras* was unraveled, when nine new species were described and two additional species were transferred from *Corydoras*, elevating to 13 the number of recognized species. Except for *A. virgulatus* Nijssen and Isbrücker, 1980, all remaining species have been described during the last 15 years.

Species of *Aspidoras* have omnivorous or detritivorous feeding habits and some are important in the ornamental fish market. Based on the analysis of material from streams draining the Serra dos Carajás into the lower Rio Tocantins, a new species of *Aspidoras* is described herein.

MATERIALS AND METHODS

Morphometric and meristic data follow Reis (1997), with the addition of prepectoral distance, measured from the snout tip to the insertion of the pectoral-fin spine, and length of mental barbel, measured from the mid-point between both barbel bases and their distal tip. Measurements were obtained with 0.1 mm precision calipers. Vertebral counts were taken from cleared-and-stained (CS) specimens prepared according to Taylor and Van Dyke (1985). Vertebral counts exclude the centra of the Weberian apparatus, and regard the compound caudal centra (preural 1 + ural 1) as a single element. Lateral plate counts include all dorsolateral and ventrolateral plates, except for the small and irregular plates on the caudal peduncle. Numbers with an asterisk in the description represent holotype values. Nomenclature of laterosensory canals follows Schaefer and Aquino (2000), and that of preopercular pores follows Schaefer (1988). Osteological terminology follows Reis (1998), except that parieto-supraoccipital replaces supraoccipital (Arratia and Gayet, 1995), compound pterotic replaces pterotic-supracleithrum (Aquino and Schaefer, 2002), and scapulocoracoid replaces coracoid (Lundberg, 1970). Homology of barbels follows Britto and Lima (2003). Museum abbreviations follow Sabaj Pérez (2013).

Aspidoras gabrieli, new species

Figure 1, Table 1

Holotype.—MPEG 27080, 31.3 mm SL, Brazil, Pará, Parauapebas, Serra dos Carajás, unnamed tributary to the left bank of Rio Parauapebas, tributary to the right bank of Rio

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Fig. 1. *Aspidoras gabrieli*, holotype, MPEG 27080, 31.3 mm SL, Brazil, Pará, Parauapebas, unnamed tributary to the left bank of Rio Parauapebas, Rio Tocantins basin. Left lateral view.

Itacaiúnas, lower Rio Tocantins basin, 06°05′15.6″S, 50°07′56.9″W (approx. 660 m asl), M. B. Mendonça and T. M. S. Freitas, 9 January 2010.

Paratypes.—Same data as for the holotype, except where noted: INPA 41151, 5, 21.2–26.8 mm SL, MCP 48100, 20, 20.3–31.8 mm SL, MNRJ 41447, 5, 20.7–29.4 mm SL, MPEG 17393, 51, 19.5–30.5 mm SL, MPEG 17394, 139, 11.3–36.6 mm SL, 5 CS (19.0–25.6 mm SL), MZUSP 115044, 5, 19.0–28.6 mm SL, 06°05′15.6″S, 50°07′56.9″W, 21 September 2009; MPEG 17389, 14, 10.0–28.8 mm SL, MPEG 17390, 8, 11.8–24.9 mm SL, 06°06′13.5″S, 50°07′58.6″W, 22 September

Table 1. Morphometric data for 30 specimens of *Aspidoras gabrieli*. Holotype values in millimeters; range includes holotype. SD = standard deviation.

	Holotype (mm)	Range	Mean	SD
Standard length (mm)	31.3	22.0–36.6	28.5	
Percent of standard length				
Depth of body	9.4	27.7–34.4	30.4	1.5
Predorsal distance	13.2	40.2–47.7	44.4	1.6
Prepectoral distance	8.8	24.4–31.9	28.6	1.7
Prepelvic distance	14.9	45.7–52.7	49	1.7
Preanal distance	23.4	73.2–79.7	75.6	1.6
Preadipose distance	25.3	77.8–85.7	81.4	2.1
Length of dorsal-fin spine	4.1	7.6–14.3	10.7	1.9
Length of pectoral-fin spine	3.1	8.2–12.5	10.1	1.2
Length of adipose-fin spine	2.3	3.9–9.5	7.1	1.3
Depth of caudal peduncle	4.3	13.3–16.4	14.5	0.9
Dorsal to adipose distance	7.7	21.4–27.9	24.9	1.6
Maximum cleithral width	7.7	23.5–27.8	25.1	0.9
Head length	10.1	30.0–35.0	32.5	1.2
Length of maxillary barbel	6.1	17.4–25.6	21.2	2.0
Length of rictal barbel	6.6	16.1–26.4	20.9	2.4
Length of mental barbel	2.1	3.9–6.7	5.8	0.7
Length of dorsal-fin base	4.9	12.2–18.2	15.6	1.4
Percent of head length				
Head depth	7.9	73.5–87.5	79.8	2.8
Least interorbital distance	3.8	34.2–45.5	39.4	2.8
Horizontal orbit diameter	1.1	8.2–14.3	11.5	1.5
Snout length	4.2	40.0–48.9	44.3	2.3
Least internarial distance	2.3	20.6–33.0	25.2	2.2

2009; MPEG 17392, 40, 10.4–29.5 mm SL, 06°06′02.8″S, 50°08′11.9″W, 20 September 2009; MPEG 18609, 16, 10.8–27.0 mm SL, MPEG 27079, 13, 9.6–28.8 mm SL, 06°06′13.5″S, 50°07′58.6″W, 9 January 2010; MPEG 18610, 26, 11.3–31.0 mm SL, MPEG 18611, 5, 25.7–28.7 mm SL; MPEG 18612, 18, 16.5–29.0 mm SL, 06°06′02.8″S, 50°08′11.9″W, 11 January 2010; MZUSP 87674, 12, 12.7–32.9 mm SL, 1 CS (31.4 mm SL), Brazil, Pará, Parauapebas, Igarapé Jacaré, tributary to Rio Parauapebas, 06°08′20.61″S, 48°46′45.54″W (approx. 160 m asl), March 2005, P. S. Pompeu e F. Vieira.

Diagnosis.—*Aspidoras gabrieli* can be distinguished from all congeners by having the rays and interradial membranes of the dorsal and pectoral fins densely pigmented, from base to tip in young individuals, with a gradual reduction in pigmentation on the fin extremities over the course of ontogeny, though the base remains densely pigmented in larger individuals (vs. dorsal and pectoral fins pale or with little pigmentation on base). It can also be distinguished from all congeners by having the inner bony margin of the pectoral spine expanded as a narrow laminar shelf with edge smooth or scarcely serrated (Fig. 2; vs. posterior margin totally or partially covered with sharp serrations or totally smooth and without a laminar shelf in *A. albater* and *A. eurycephalus*). It is further distinguished from other species of *Aspidoras*, except *A. taurus*, by the absence of a lateral-line canal posterior to the two anterior lateral-line ossicles (Fig. 3; vs. lateral-line canal present in at least one dorsolateral plate posterior to the ossicles). It is also distinguished from its congeners (except *A. velites* and *A. psammatides*) by having the predorsal region naked, with contralateral dorsolateral plates not meeting each other on the dorsal midline at any ontogenetic stage (vs. predorsal region covered by dorsolateral plates). It is further distinguished from its congeners (except *A. maculosus*, *A. albater*, *A. lakoi,* and *A. depinnai*) by having large, oval, brown spots on the flank and caudal peduncle that sometimes merge to form irregular patches (vs. large oval spots absent). It can be distinguished from *A. poecilus*, *A. fuscoguttatus*, *A. rochai*, *A. albater*, *A. depinnai,* and *A. virgulatus* by the presence of two pores along the nasal sensory canal (vs. three pores). *Aspidoras gabrieli* is further distinguished from *A. albater* by having pelvic-fin rays i,5 (vs. i,6), azygous preadipose plates 2–4 (vs. 5), pectoral-fin rays I,9 (vs. I,8), length of the pectoral-fin ray 8.0–12.1 times in SL (vs. 5.0–7.3; Nijssen and Isbrücker, 1976), and body depth 2.9–3.6 times in SL (vs. 3.7–4.2; Nijssen and Isbrücker, 1976). *Aspidoras gabrieli* is distinguished from *A. maculosus* by having pectoral-fin rays, I,9 (vs. I,8), body depth 2.9–3.6 times in SL (vs. 3.8–4.0; Nijssen and Isbrücker, 1976), length of the pectoral spine, 8.0–12.1 times in SL (vs. 5.5–7.0; Nijssen and Isbrücker, 1976), and orbital diameter, 6.2–11.0 times in HL (vs. 3.5–4.5; Nijssen and Isbrücker, 1976). *Aspidoras gabrieli* is distinguished from *A. depinnai* by the length of the maxillary barbel, 17.4–25.6% SL (vs. 4.1–15.3%), horizontal diameter of the orbit, 8.2–14.3% HL (vs. 15.5–20.8%), and absence (vs. presence) of bifid serrations on the pectoral spine. *Aspidoras gabrieli* can be distinguished from *A. lakoi* by the length of the pectoral-fin spine, 8.0–12.1 times in SL (vs. 6.0–7.0; Nijssen and Isbrücker, 1976),

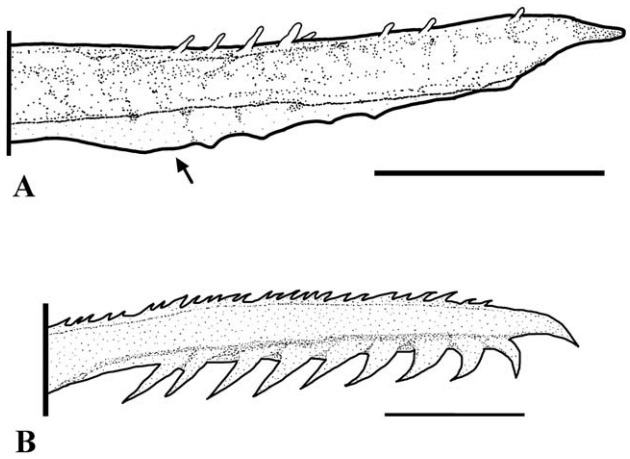

Fig. 2. Schematic illustration of pectoral-fin spine morphology of *Aspidoras*. (A) *A. gabrieli*, paratype, MPEG 17394; (B) *A. pauciradiatus*, USNM 218375. Right pectoral-fin spine; dorsal view. Arrow indicates narrow laminar shelf along inner margin of spine. Scale = 1 mm.

absence (vs. presence) of serrations on the posterior margin of the pectoral spine, and preadipose azygous plates, 2–4 (vs. 6–13; Nijssen and Isbrücker, 1976).

Description.—Morphometric data in Table 1. Greatest standard length 36.6 mm. Body elongate; trunk relatively oval in cross-section at pectoral-fin base, gradually becoming more compressed at caudal peduncle. Lateral dorsal profile of head straight to slightly convex, ascending from tip of snout to origin of dorsal fin; posteriorly mostly straight, slightly descending to base of caudal fin. Ventral profile straight or slightly concave until isthmus, then slightly convex until base of pelvic fin, straight and posteriorly ascending from anus to anal-fin origin and slightly concave to base of caudal fin. Head and snout rounded in dorsal view, greatest width between origins of pectoral-fin spines; sides of body straight and converging posteriorly to base of caudal fin. Mouth subterminal, small, width about twice orbital diameter; upper lip more anterior and thicker than lower lip; lower lip narrower, extending posteriorly as thick fleshy fold. Three pairs of barbels. Maxillary and rictal barbels cylindrical, with wide bases, narrowing gradually to reach operculum or base of pectoral fin; mental barbels on posterior margin of lower lip, short, flat, with wide base tapering gradually to tip giving triangular aspect. Small papillae covering upper lip, entire surface of maxillary and rictal barbels, dorsal surface of lower lip, and entire surface of mental barbels; papillae absent on isthmus.

Four branchiostegal rays; innermost two thin, originating from same cartilaginous projection; outermost two laminar, knife-shaped, slightly curved with similar lengths, larger than innermost rays. Distal end of two outermost branchiostegal rays connected to ellipsoid branchiostegal cartilage attached to mesial surface of upper opercle. Teeth on upper pharyngobranchial 28 (1), 29 (2), 31 (1), or 33 (1). Teeth on fifth ceratobranchial 27 (1), 28 (2), 29 (1), or 32 (1).

Eyes circular, positioned dorsolaterally, with free orbital margin and circular pupil; orbit bounded dorsally by frontal and sphenotic, ventrally by infraorbitals. Anterior naris tubular, opening circular with small fold extending posteriorly. Posterior naris closer to anterior naris than to orbit, distant from orbital margin by its own diameter; opening circular, anterior margin with shell-like fold that covers opening when depressed.

Nasal, frontal, sphenotic, and compound pterotic covered with thick skin and not easily visible externally. Parieto-supraoccipital externally visible, covered by thinner skin. Frontal fontanel ranging from ellipsoid to rhomboid, covered with thick skin, reaching anterior border of parieto-supraoccipital; opening anterior to epiphyseal bar small and circular, posterior opening larger and triangular. Parieto-supraoccipital fossa not fully opened but forming slight circular bony concavity.

Nasal slender, tubular, slightly curved laterally; mesial edge contacting frontal and mesethmoid. Frontal broad, approximately rectangular, anteriorly contacting nasal and mesethmoid, posteriorly contacting parieto-supraoccipital and sphenotic. Sphenotic trapezoidal, contacting parieto-supraccipital dorsally, compound pterotic posteriorly and infraorbital 1 ventrally.

Compound pterotic pipe-shaped, highest portion contacting sphenotic anteriorly, parieto-supraoccipital dorsally; posterior portion thinner, dorsally contacting first plate and first ossicle of lateral line; ventrally contacting cleithrum and opercle. Parieto-supraoccipital quadrangular, diamond-shaped, posteriorly triangular and short, not reaching nuchal plate.

Opercle externally visible, covered by thin skin and devoid of odontodes; compact, roughly trapezoidal, with angular dorsal free margin. Preopercle externally visible, covered by thin skin, slender, long, boomerang-shaped. Interopercle distinctly smaller than opercle, triangular, not visible externally, covered by thick skin.

Two infraorbitals nearly restricted to laterosensory canal (prolonged by concave blade internally, under and behind eyeball), externally visible, covered by thin skin, without odontodes. First infraorbital distinctly longer than second, tubular, slightly curved, accompanying lower margin of eye with narrow laminar expansion across inferior edge. Second infraorbital tubular, skirting posterior margin of eye, with slight laminar posterior projection at inferior extremity.

Dorsal fin I,8, subtriangular with rounded distal margin, spine shorter than first two branched rays and with smooth anterior and posterior margins; branched rays 1–3 longest; origin posterior to fifth laterodorsal plate. Adipose fin triangular with sharply rounded posterior margin; spine pronounced, straight; origin separated from base of last dorsal-fin ray by ten laterodorsal plates. Anal fin i,6(1), i,7*(27), or i,8(2), subtriangular, with rounded distal margin, first and second branched rays longest.

Caudal fin ii,5/6,i(2), i,6/6,ii*(1), i,6/6,i(25), iii,4/6,i(1), or i,6/5,i(1), bilobed, with upper lobe slightly longer than lower; central rays thicker. Procurrent dorsal/ventral rays vi/vi; posterior ones longer and with laminar expansions near base.

Pectoral fin I,9*(29) or I,10(1), subtriangular, origin shortly after opercular margin. Spine with ossified proximal portion, similar in length to penultimate branched ray, outer margin with few small, scattered odontodes; inner bony margin expanded by narrow laminar shelf with edge smooth or scarcely serrated in middle portion or near base (Fig. 2); first and second branched rays longest, branching twice. Pelvic fin i,5*(30), ellipsoid, second and third branched rays longest; origin posterior to fourth lateroventral plate, vertically aligned with base of third branched dorsal-fin ray.

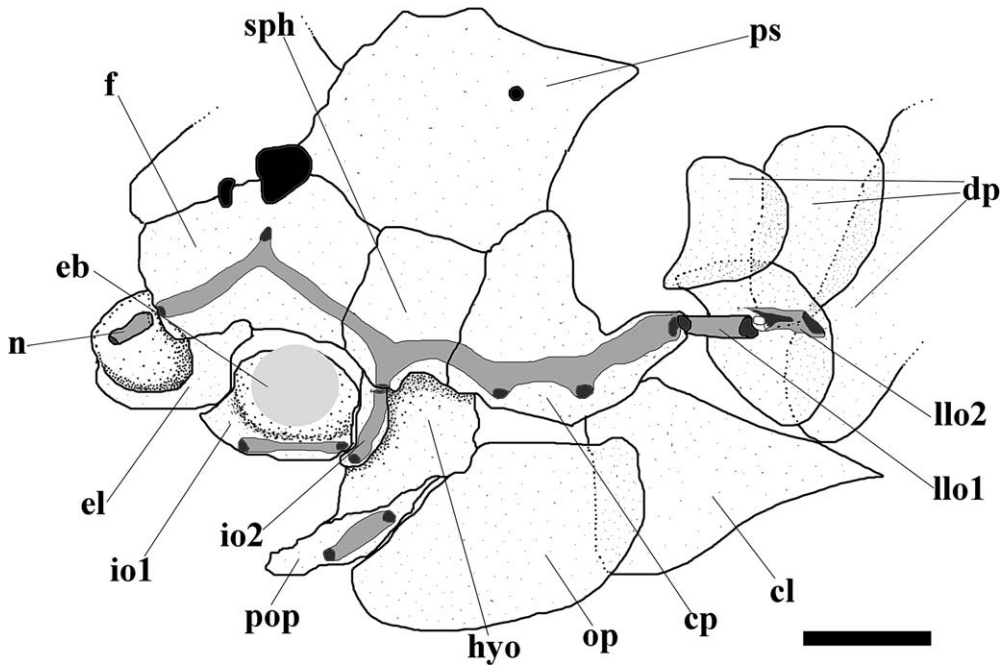

Fig. 3. Dorsolateral view of the head of *Aspidoras gabrieli*, paratype, MPEG 17394, 19.7 mm SL, depicting the sensory canal system in gray: cl, cleithrum; cp, compound pterotic; dp, dorsolateral body plate; eb, eye ball; el, lateral ethmoid; f, frontal; hyo, hyomandibula; io1-2, infraorbital 1–2; llo1-2, lateral line ossicle 1–2; n, nasal; op, opercle; pop, preopercle; ps, parieto-supraoccipital; sph, sphenotic. Scale bar = 1 mm.

Anterior laterodorsal plates not reaching dorsal midline, leaving predorsal area naked. Nuchal plate reduced, V-shaped, apex facing anteriorly, barely visible, covered by thick skin. Laterodorsal plates 25(3), 26*(25), or 27(2); lateroventral plates 23(13) or 24*(17); plates along dorsal-fin base 6*(29) or 7(1); preadipose azygous plate 1(5), 2*(11), 3(13), or 4(1); plates between adipose and caudal fin 2(6), 3*(16), or 4(8). Odontodes tiny, restricted to posterior margin of lateral plates of caudal peduncle, visible only in CS specimens. Scapulocoracoid not exposed, covered by thick skin. Cleithrum exposed distally above base of pectoral fin; not exposed mesially, covered by thick skin.

Seven(2) or 8(1) pairs of ribs, first one distinctly larger and thicker. Seven(2) or 8(1) pre-caudal vertebrae, 17(3) caudal vertebrae; 2(2) or 3(1) vertebrae anterior to compound caudal centrum with bases of neural and hemal spines placed posteriorly, close to post-zygapophyses. Post-zygapophyses of precaudal vertebrae produced, with dorsal expansions connected or closer to respective neural spine.

Trunk lateral line reduced, restricted to two anterior ossicles; anterior one tubular, posterior one laminar and ellipsoid. Lateral-line canal entering neurocranium through compound pterotic and spliting into two branches, posterolateral and preopercle-mandibular, each with one pore. Sensory canal continues into compound pterotic, entering sphenotic (temporal canal), branching out twice, one branch in lateroventral direction giving rise to infraorbital canal, other in anterior direction through frontal as supraorbital canal (Fig. 3).

Supraorbital canal dividing into two branches in frontal; epiphyseal branch short, with pore opening close to anterior fontanel, and anterior branch entering nasal. Nasal tubular and short, with small laminar expansions and two pores, one in frontal-nasal joint, and other in anterior extremity of nasal (Fig. 3).

Infraorbital canal continuing for entire length of second and first infraorbitals; one pore at origin of infraorbital branch with temporal canal, one pore between first and second infraorbitals, and one pore on anterior margin of first infraorbital. Preoperculo-mandibular branch follows full length of preopercle, opening into pores 3, 4, and 5.

Coloration pattern in ethanol.—Background coloration cream. Head entirely covered with chromatophores, distinctly more concentrated dorsally on snout, interorbital, and parieto-supraoccipital, giving darker aspect. Small area below eye noticeably lighter. Upper lip lightly pigmented by tiny chromatophores. Maxillary barbels lightly pigmented at base, gradually lighter distally to completely cream at tip. Rictal barbel similar but paler. Mental barbel lightly pigmented along medial margin. Ventral region of head, isthmus, pectoral girdle, abdomen, and pelvic girdle just anterior to anus cream, with tiny chromatophores scattered and separate from one another. Predorsal region dark, forming saddle over naked area. Trunk, flank, and caudal peduncle with irregular pattern of large dark spots, margins blurred; anterior spots larger and closer together, sometimes conjoined to form large dark area. Typically with large blotch on dorsal region of cleithrum; one below origin of dorsal fin, on area of contact between laterodorsal and lateroventral plates; one near base of last dorsal-fin ray; one below anterior spot on lateroventral plates; one lateral spot below origin of adipose fin almost forming bar with spot above anal-fin base; and vertically paired spots forming bar at end of caudal peduncle. Intensity of fin coloration varies among individuals and ontogenetically, but predominant pattern with dorsal, pectoral, pelvic, and anal fins with dark chromatophores densely concentrated on rays and interradial membranes, particularly so near base, gradually becoming slightly paler distally (Fig. 4). Adipose-fin spine covered by chromatophores, membrane along spine with chomatophores, fin darker distally. Caudal fin with one or two series of small dark spots restricted to rays and forming two poorly defined arcs, anterior one darker and more

Fig. 4. *Aspidoras gabrieli*, paratypes, MPEG 17392, left lateral view showing ontogenetic development of the dark color pattern on head, body, and fins. Scale bar = 5 mm.

clearly defined; interradial membranes hyaline or with very few chromatophores.

Distribution.—*Aspidoras gabrieli* is known from streams draining the Serra dos Carajás, Paraupebas, Pará, Brazil, at the type locality and nearby points, in unnamed tributaries to the left bank of Rio Paraupebas, itself a tributary to the Rio Itacaiúnas, lower Rio Tocantins basin (Fig. 5). Seven other species are know to occur in the Rio Tocantins-Araguaia basin, namely *A. albater*, *A. belenos*, *A. brunneus*, *A. eurycephalus*, *A. pauciradiatus*, *A. poecilus*, and *A. velites*. All these species, however, occur in the upper portions of the basin, while *A. gabrieli* is found in the lower portion of the Rio Tocantins basin, at the edge of the Brazilian Shield into the Amazon basin.

Etymology.—The specific epithet *gabrieli* is a reference to Gabriel P. Wosiacki, son of the first author, as an encouragement of his growing interest in zoology.

DISCUSSION

The genus *Aspidoras* represents a natural group, since its species share a large posterior portion of the mesethmoid, a reduced frontal fontanel, a parieto-supraoccipital fossa, a compact opercle, and an ossified portion of the pectoral spine measuring less than half the length of the first branched ray (Britto, 2003). *Aspidoras gabrieli* shares all the above synapomorphies, justifying the placement of the new species in this genus.

Lima and Britto (2001) observed the lateral line restricted to the two lateral-line ossicles in *Aspidoras taurus*, and considered this a uniquely derived condition, since the remaining species of *Aspidoras* have at least one laterodorsal plate with a lateral-line canal. According to Reis (1998), other genera of Callichthyidae have one to six dorsolateral plates with a lateral-line sensory canal. *Aspidoras gabrieli* shares an essentially identical condition (Fig. 3) to that observed and illustrated for *A. taurus* (Lima and Britto, 2001:fig. 3) in which the trunk segment of the lateral line is restricted to the two anterior ossicles.

Similarly to *Aspidoras taurus*, *A. gabrieli* is also distinguished from other species of the genus by the primitive state of the nuchal plate being covered with thick skin and not visible externally. In the derived state, the nuchal plate is externally visible (Reis, 1998; Lima and Britto, 2001). A reduced nuchal plate is another putative primitive condition shared by *Aspidoras gabrieli* and *A. taurus* (Lima and Britto, 2001:fig. 4a), distinguishing both from congeners and other species of Corydoradinae, which share the derived state of having the nuchal plate equal to or slightly wider than the dorsal-fin pterygiophores. *Aspidoras gabrieli* is distinguished from *A. taurus* by having an exposed preopercle, covered by

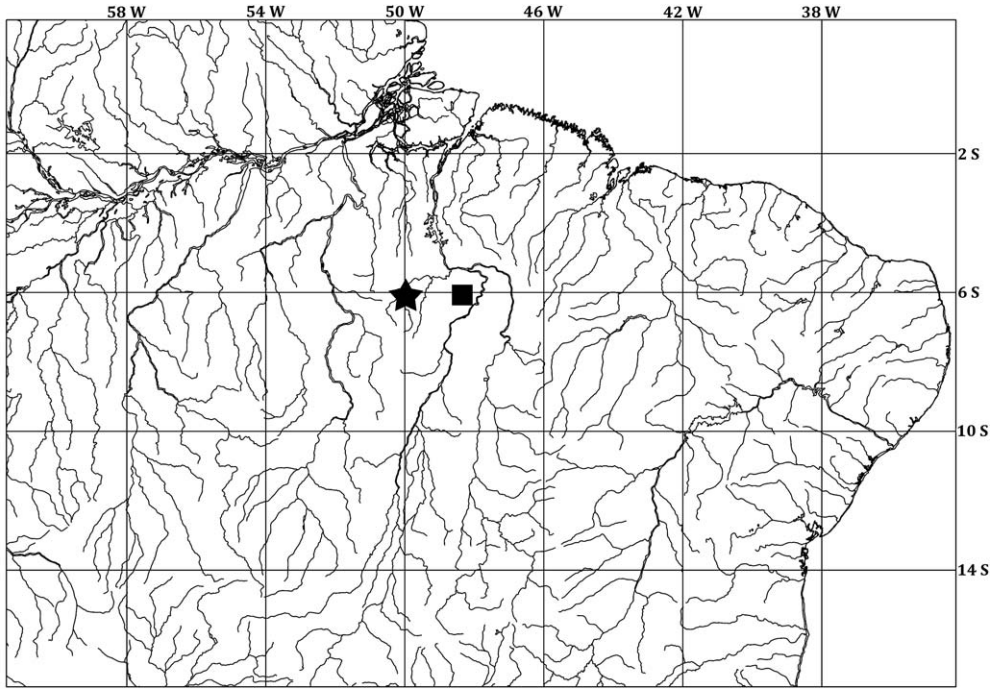

Fig. 5. Map of northern Brazil showing the distribution of *Aspidoras gabrieli*. Symbols may represent more than one lot. Star is the type-locality.

thin skin, representing a derived state, shared with other Corydoradinae (Reis, 1998).

Moreover, *A. gabrieli* is easily distinguished from *A. taurus* by the possession of anterior laterodorsal plates that do not contact each other at the dorsal midline, and instead leave a wide predorsal naked area in small (22.0 mm SL), medium (26.2 mm SL), and large (36.6 mm SL) specimens. Conversely, the laterodorsal plates of *A. taurus* and most species of *Aspidoras* (exept *A. velites* and *A. psammatides*) meet along the midline of the predorsal region. *Aspidoras velites* and *A. psammatides* are two species that share with *A. gabrieli* a naked predorsal region, not covered by the dorsolateral plates (Britto et al., 2002, 2005). The naked predorsal area was considered to be a reductive or paedomorphic characteristic in *A. velites* and *A. psammatides* by Britto et al. (2002, 2005). The naked predorsal area in *A. gabrieli* is not as extreme as in *A. velites* and *A. psammatides*, and is likely a non-homologous acquisition since *A. gabrieli* does not share characteristics related to psammophily, such as faint coloration (*A. velites* and *A. psammatides*), a small and narrow parieto-supraoccipital process (*A. velites*), or poorly ossified spines of the dorsal and pectoral fins (*A. velites*).

Britto (2000, 2003) proposed a group composed of *A. poecilus*, *A.* aff. *poecilus*, *A. fuscoguttatus*, *A. rochai*, *A. albater*, *A. virgulatus*, and *A. depinnai* defined by the presence of three nasal pores in the nasal sensory canal. *Aspidoras gabrieli* has only two pores in the nasal sensory canal, a plesiomorphic state shared with other species of *Aspidoras*, and is, therefore, unlikely a member of the species group with three nasal pores. Within that group, *A. rochai*, *A. albater*, *A. virgulatus,* and *A. depinnai* share the slender shape of the palatine, also distinct from that observed in *A. gabrieli*, in which the palatine is distinctly more compact and wide.

The inner bony margin of the pectoral spine of *Aspidoras gabrieli* is expanded by narrow laminar shelf with edge smooth or scarcely serrated (Fig. 2), a condition not seen in other congeners. Most *Aspidoras*, except *A. albater* and *A. eurycephalus* (Nijssen and Isbrücker, 1976:fig. 15f, i), as well as the great majority of the Callichthyidae, possess a widely serrated pectoral-fin spine throughout its entire length, representative of the primitive state for Siluriformes (Britto, 2003). Considering that the reduction and absence of serrations along the inner margin of the pectoral spine are sequentially derived states in Siluriformes (Britto, 2003), the condition displayed by *A. gabrieli* is distinct from that observed in all other congeners and probably represents an autapomorphy.

Considering the above distribution of character states and the current knowledge on phylogenetic relationships among species of *Aspidoras* (Britto, 1998, 2000, 2003; Lima and Britto, 2001; Britto et al., 2002, 2005), it is likely that *A. gabrieli* belongs to a basal lineage within the genus, and probably is closely related to *A. taurus*.

MATERIAL EXAMINED

All from Brazil:

Aspidoras albater: MZUSP 12991, 35.6 mm SL, holotype, Goiás, Rio Tocantinzinha, Rio Tocantins basin, 14°46′S, 47°30′W.

Aspidoras belenos: MZUSP 51208, paratype, 21.7 mm SL, Mato Grosso, creek on road from Pimavera do Leste to Paranatinga, 82 km N of Primavera do Leste, Rio das Mortes basin, 15°03′S, 52°03′W.

Aspidoras depinnai: MZUSP 56214, 32.5 mm SL, holotype, Pernambuco, creek on road from Amaraji to Primavera, Rio Ipojuca basin, 08°21′S, 35°26′W.

Aspidoras pauciradiatus: USNM 218375, 2, 15.3–17.3 mm SL, Amazonas, Rio Negro, São João Near Tapurucuara, 0°24′S, 65°02′W.

Aspidoras psammatides: MZUSP 67194, 26.3 mm SL, paratype, Bahia, Lençóis, Rio Caldeirão, 12°39′33″S, 41°22′12″W.

Aspidoras rochai: MZUSP 2195, 39.9 mm SL, lectotype, Ceará, Fortaleza, 03°45′S, 38°35′W.

Aspidoras taurus: MZUSP 57154, 52.1 mm SL, holotype, Mato Grosso, Alto Garças, Rio Itiquira, Rio Paraguay basin, 16°56′S, 53°32′W.

Aspidoras velites: MZUSP 74447, 23.6 mm SL, holotype, Mato Grosso, Alto Araguaia, Córrego Boiadeiro, km 487 of Ferronorte rail-road, 17°20′01″S, 53°14′53″W.

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