

Taxonomic revision of thorny catfish genus *Hassar* (Siluriformes: Doradidae)

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The genus *Hassar* (Doradidae) is diagnosed by a single exclusive feature: basioccipital with ventral ring-like arch surrounding aorta; and by the combination of several non-exclusive characters, including dark blotch in distal half of anterior branched rays of dorsal fin, and anteriormost postnuchal scutes reduced in size. Three nominal species are recognized and redescribed in *Hassar*: *H. orestis* from the Orinoco, Essequibo and Amazonas basins, excluding Tocantins and middle to upper Xingu drainages; *H. wilderi* from Tocantins; and *H. affinis* from northeastern Brazil, including Turiaçu, Pindaré-Mearim, Itapecuru and Parnaíba drainages. The nominal *Hemidoras notospilus* and *Hassar ucayalensis* are recognized as junior synonyms of *Hassar orestis*; *Hassar woodi* is considered a junior synonym of *H. affinis*; *Hassar iheringi* is recognized as a junior synonym of *H. wilderi*, and its type locality as originally reported is considered incorrect. A fourth new species, *Hassar gabiru*, is described from middle to upper Xingu river basin. *Hassar* is considered to be the sister taxon of *Anduzedoras* + *Leptodoras*. A detailed anatomical description and discussion of the phylogenetic relationships of *Hassar* among fimbriate-barbel doradids are provided.

O gênero *Hassar* (Doradidae) é diagnosticado por uma característica exclusiva: extensão ventral do basioccipital formando um anel sob a aorta; e pela combinação de diversas características não-exclusivas, incluindo uma mancha escura na porção médio-distal dos raios ramificados da nadadeira dorsal, e escudos laterais anteriores reduzidos. Três espécies nominais são reconhecidas e redescritas: *H. orestis* das bacias do Orenoco, Essequibo e do Amazonas, excluindo Tocantins e médio e alto Xingu; *H. wilderi* do rio Tocantins; e *H. affinis* do nordeste do Brasil, incluindo os rios Turiaçu, Pindaré-Mearim, Itapecuru e Parnaíba. As espécies nominais *Hemidoras notospilus* e *Hassar ucayalensis* são reconhecidas como sinônimos juniores de *H. orestis*; *Hassar woodi* é considerado um sinônimo júnior de *H. affinis*; *Hassar iheringi* é reconhecido como sinônimo júnior de *H. wilderi*, e sua localidade tipo como originalmente registrada é considerada incorreta. Uma quarta e nova espécie, *Hassar gabiru*, é descrita do médio e alto rio Xingu. *Hassar* é considerado o táxon irmão de *Anduzedoras* + *Leptodoras*. Uma descrição anatômica detalhada e uma discussão sobre as relações filogenéticas de *Hassar* entre os doradídeos de barbílhões fimbriados também são fornecidas.

Key words: Doradinae, New species, Phylogeny, Systematics.

Introduction

Hassar Eigenmann & Eigenmann, 1888 is a genus of fimbriate-barbel doradid, a monophyletic group well supported by morphological evidence (Eigenmann, 1925; Higuchi, 1992; Birindelli, 2006, 2010). *Hassar* is a relatively widespread genus, occurring in the Essequibo, Orinoco, Amazon (including Tocantins basin), Turiaçu, Pindaré-Mearim, Itapecuru, and Parnaíba drainages, in Bolivia, Brazil, Colombia, Guyana, Peru, and Venezuela. *Hassar* is easily diagnosed among doradids by having reduced anteriormost midlateral scutes, nuchal shield with well-developed bilaterally paired foramina, a long snout, and a dark blotch in the distal half of anterior branched rays of the dorsal fin.

Hassar was first proposed by Eigenmann & Eigenmann (1888:158) as a subgenus of *Hemidoras* Bleeker, 1858 to include *Oxydoras orestis* described by Steindachner (1875) from the Xingu and Iça rivers, Brazil, and *O. affinis* described by Steindachner (1881) from the rio Puty (= rio Poti, Parnaíba drainage, northeastern Brazil). Eigenmann & Eigenmann (1890) synonymized *Hassar* with *Hemidoras*, redescribed *Hemidoras affinis*, and distinguished it from *Hemidoras orestis* in an identification key. Eigenmann & Eigenmann (1891) once again recognized *Hassar* as a subgenus of *Hemidoras*, and Kindle (1895) subsequently elevated *Hassar* to generic rank. Kindle (1895) described *Hassar wilderi* from the rio Tocantins, distinguishing it from *H. affinis* and *H. orestis*. Eigenmann (1910) subsequently designated *Oxydoras orestis*

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Steindachner 1875 as the type species of *Hassar*. Miranda Ribeiro (1911) transferred *Doras (Oxydoras) lipophthalmus* Kner, 1855 (replacement name for *Doras (Corydoras) ophthalmus* Kner 1853) to *Hassar*. However, Sabaj & Ferraris (2003) considered this species a junior synonym of *Anduzedoras oxyrhynchus* (Valenciennes, 1821).

Five additional species were added to *Hassar* between 1912 and 1956. Eigenmann (1912) described *Hemidoras notospilus* from the Essequibo River, Guyana, and subsequently transferred this species to *Hassar* (Eigenmann, 1925). Fowler (1940) described *Hassar ucayalensis* based on a single juvenile from the rio Ucayali, Peru, and Fowler (1941) described *Hassar woodi* and *H. iheringi* considering both from the rio Parnaíba, Brazil. Finally, Myers & Weitzman (1956) described *Hassar praelongus* from the rio Negro, Brazil. None of these species were considered valid in *Hassar* by Sabaj & Ferraris (2003), who treated *H. notospilus* as a junior synonym of *Hassar orestis*, *H. ucayalensis* as a questionable junior synonym of *H. orestis*, *H. woodi* and *H. iheringi* as junior synonyms of *H. affinis*, and *H. praelongus* as a valid species in the genus *Leptodoras* Boulenger, 1898. Sabaj & Ferraris (2003) recognized three valid species of *Hassar*: *H. affinis* in the Parnaíba basin, *H. orestis* in the Amazon, Orinoco and Essequibo basins, and *H. wilderi* in the Tocantins basin.

Higuchi (1992) provided the first cladistic hypothesis of phylogenetic relationships among genera of Doradidae, and his morphological analysis recovered *Hassar* as sister to *Opsodoras* + *Hemidoras*. That same relationship was hypothesized by Moyer *et al.* (2004) in a parsimony analysis of molecular data combining sequences of mitochondrial genes 12S and 16S rRNA and nuclear gene elongation factor-1 alpha (Moyer *et al.*, 2004; fig. 9A). However, their maximum likelihood analysis of the same sequences placed *Hassar* as sister to *Nemadoras*. Sabaj (2002), in a cladistic analysis of the relationships among species of *Leptodoras*, recovered *Hassar* as sister to *Anduzedoras* + *Leptodoras*, and alternatively but less parsimoniously, as sister to *Hemidoras* (*Opsodoras* was not considered). Birindelli (2006, 2010) studied the phylogenetic relationships among most genera and species of Doradidae, and diagnosed *Hassar* based on internal and external characteristics. Birindelli (2006, 2010) also recovered *Hassar* as sister to *Anduzedoras* + *Leptodoras*, and distinguished its three valid species (*H. affinis*, *H. orestis*, *H. wilderi*) according to the ratio of body depth to standard length, and coloration of the dorsal fin.

In this paper we redefine the genus *Hassar* by unique and non-exclusive characters, redescribe *H. affinis*, *H. orestis*, *H. wilderi*, and describe a new species from the middle to upper rio Xingu. We also discuss the phylogenetic relationships of *Hassar* among fimbriate-barbel doradids.

Material and Methods

Measurements were made preferentially on the left side of the body using digital calipers (0.1 mm) and a stereomicroscope. Measurements follow Sabaj (2005), with the following additions:

prepelvic distance (horizontal distance from snout tip to base of first pelvic-fin ray); preanal distance (horizontal distance from snout tip to base of first anal-fin ray); body depth at anal-fin origin (vertical distance between anal-fin origin and dorsal margin of adipose fin); length of first branched ray of dorsal fin; length of dorsal-fin base; head width at operculum (transverse distance between the dorsalmost opening of opercula); body width at nuchal shield (minimum transverse distance between lateral margins of nuchal shield). All measurements were treated as percentages of standard length (SL), except for subunits of head, treated as percentages of head length (HL), and depth of 10th midlateral scute, treated as percentage of body depth at 10th midlateral scute (BD10). All measurements in material examined section refer to standard length in millimeters.

Osteological examinations were made on dry skeletons (sk), cleared and stained (c&s) material prepared according to Taylor & Van Dyke (1985) and Song & Parenti (1995), and radiographs taken with a Faxitron MX-20 digital x-ray system. Osteological terminology follows Weitzman (1962) with exceptions noted by Birindelli & Sabaj Pérez (in press); gas bladder terminology follows Birindelli *et al.* (2009). Institutional abbreviations are: ANSP, Academy of Natural Sciences, Philadelphia, PA; AUM, Auburn University Natural History Museum, Auburn, AL; BMNH, British Museum of Natural History, London; CAS, California Academy of Sciences, San Francisco, CA; CPDOL (UFMA), Coleção de Peixes do Departamento de Oceanografia e Limnologia, Universidade Federal do Maranhão, Chapadinha, MA; FMNH, Field Museum of Natural History, Chicago, IL; INHS, Illinois Natural History Survey, University of Illinois, Champaign, IL; INPA, Instituto Nacional de Pesquisas da Amazônia, Manaus, AM; MCP, Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, RS; MPEG, Museu Paraense Emílio Goeldi, Belém, PA; MZUSP, Museu de Zoologia da Universidade de São Paulo, São Paulo, SP; NMW, Naturhistorisches Museum, Vienna; UMMZ, University of Michigan Museum of Zoology, Ann Arbor, MI.

Hassar Eigenmann & Eigenmann, 1888

Hassar Eigenmann & Eigenmann, 1888: 158 [type species: *Oxydoras orestis* Steindachner 1875, by subsequent designation by Eigenmann 1910: 394]. Gender masculine. Originally proposed as a subgenus of *Hemidoras*.

Diagnosis. *Hassar* is diagnosed by a single exclusive character: basioccipital with a ventral ring-like arch surrounding aorta (Fig. 1); and by the combination of the following non-exclusive characters: 1) dark blotch in the middle to distal region of anterior branched rays of dorsal fin; 2) anteriormost postinfranuchal scutes reduced in size; 3) pores beneath the posterior cleithral process numerous; 4) maxillary barbels with 7 to 16 secondary barbels, and fleshy papillae restricted to anteriormost secondary barbels; 5) elongated mesethmoid, with lanceolate anterior tip and straight to slightly convex dorsal profile; 6) posterior cranial

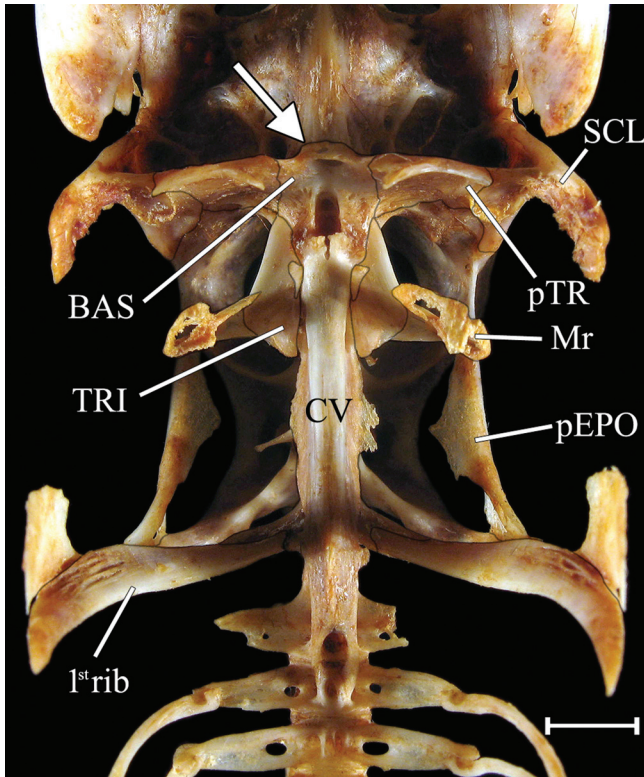


Fig. 1. Anteriormost vertebrae and associated structures, in ventral view, of *Hassar orestis*, MZUSP 105827, 144.7 mm SL. BAS, basioccipital; CV, complex vertebra; Mr, Müllerian ramus; pEPO, epioccipital process; pTR, transcapular process; SCL, posttemporo-supracleithrum; TRI, *tripus*. Arrow indicates the ring-shaped ventral arch of the basioccipital. Scale bar = 5 mm

fontanel relatively large, extending posteriorly into the parieto-supraoccipital; 7) first infraorbital long and slender, with dilated anterior extremity, articulating with the lateral border of mesethmoid; 8) ossified and extremely well-developed epioccipital process, sutured to the posterior nuchal plate; 9) less than 10 premaxillary teeth; 10) less than 20 dentary teeth; 11) well-developed nuchal foramina; 12) reduced anterior nuchal plate, enclosed by the posterior margin of the parieto-supraoccipital and anterior margin of the middle nuchal plate; 13) 30 to 34 midlateral scutes on each side of body. See Discussion for additional notes on the aforementioned diagnostic features.

Etymology. Eigenmann & Eigenmann (1888) did not specify the origin of *Hassar*, but it possibly refers to the name commonly applied to certain catfishes in Guyana, such as *Hoplosternum littorale* or *Hypostomus watawata* (Eigenmann, 1912).

Hassar affinis (Steindachner, 1881)

Figs. 2 and 3

Oxydoras affinis Steindachner, 1881: 107, pl. 1, figs. 1, 1a [type locality: “Rio Puty” (= rio Poti, Piauí, Brazil)].

Hemidoras affinis.—Eigenmann & Eigenmann, 1888: 158 [change of generic status].—Eigenmann & Eigenmann, 1890: 258 [description based on six specimens from rio Poti, probably collected with holotype].—Eigenmann & Eigenmann, 1891: 33 [literature compilation].—Eigenmann, 1910: 394 [literature compilation].—Steindachner, 1915: 73 [description, Itapicuru (=Itapecuru) at Caxias, Paranaíba (=Parnaíba) at Engenho d’Água].

Hassar affinis.—Kindle, 1895 [change of generic status, identification key].—Miranda Ribeiro, 1911: 188 [identification key; translation to portuguese of the description given by Eigenmann & Eigenmann, 1890].—Eigenmann, 1925: 355, pl. 27, fig. 4 [identification key, literature compilation, illustration].—Gosline, 1945: 22 [literature compilation].—Van der Stigchel, 1946: 95 [description based on a single specimen from Rio Puty (=rio Poti)].—Menezes, 1949: 93 [feeding habit, common name, rio Poti Velho, rio Parnaíba at Terezina, Lagoa de Nazaré at Floriano, rio Piauí at Poço do Salão, São João do Piauí].—Fowler, 1951: 491 [literature compilation, see notes on Distribution].—Eschmeyer, 1998: 49 [literature compilation].—Sabaj & Ferraris, 2003: 461 [literature compilation].—Ferraris, 2007: 171 [literature compilation].—Birindelli *et al.*, 2009: 276 [gas bladder morphology].

Hassar woodi Fowler, 1941a: 139, figs. 35, 36, 37 [type locality: Rio Parnahyba, Therezina, Piauí (= rio Parnaíba, Teresina, Piauí)].—Gosline, 1945: 23 [literature compilation].—Fowler, 1951: 493 [literature compilation].—Eschmeyer, 1998: 1796 [literature compilation].

Hassar wilderi.—Soares, 2005: 90 [description, illustration, rio Mearim].

Type-specimens. ANSP 69392 (1, 201.6 mm SL, holotype of *Hassar woodi*), rio Parnaíba, Teresina, PI, Brazil, 1936, R. von Ihering. ANSP 69396 (1, 76.0 mm SL, paratype of *Hassar iheringi*), Ceará [presumably purchased in the fish market at Fortaleza, CE], Brazil, 1937, R. von Ihering. NMW 45394 (1, 123.0 mm SL, holotype of *Hassar affinis*), Rio Puty [=rio Poti, 5°5’S 42°49’W, Teresina, PI, Dec 1865, O. St. John], Brazil.

Non-type specimens. Itapecuru basin (Brazil): MZUSP 104559 (3, 113.0–128.0 mm SL), rio Itapecuru, 3°31’39”S 44°24’19”W, Itapecuru-Mirim, MA, 2006, M. C. Barros *et al.* **Parnaíba basin (Brazil):** MCZ 7200 (4, 109.0–197.6 mm SL); BMNH 89.11.14.46 (1, 120.7 mm SL); collected with holotype. MZUSP 5123 (2, 127.2–129.1 mm SL), rio Parnaíba, Teresina, PI. MZUSP 36454 (2, 126.6–140.3 mm SL), Teresina, PI. MZUSP 36602 (1, 110.0 mm SL), Teresina, PI. MZUSP 37888 (2, 74.8–101.9 mm SL), rio Sambito, São Félix, PI. MZUSP 74914 (3, 102.6–104.3 mm SL), Teresina, PI. MZUSP 74890 (1 c&s, 5, 86.8–96.8 mm SL), rio Poti, Teresina, PI, Nov 2001, M. C. C. de Pinna. MZUSP 74919 (1, 97.7 mm SL), rio Sorubim, Campo Maior, PI. MZUSP 89935 (1 c&s, 11, 105.6–149.2 mm SL), Island at Lagoa de Parnaguá, 10°14’41”S 44°38’50”W, Parnaguá, PI, Apr 2001, Expedição Jalapão [O. T. Oyakawa *et al.*]. **Pindaré-Mearim basin (Brazil):** MZUSP 5067 (1, 86.7 mm SL), rio Grajaú, Grajaú, MA. MZUSP 43604 (4, 141.1–157.0 mm SL), Lago dos Viana, c. 3°13’S 45°10’W, MA, Apr 1984, Moura. MZUSP



Fig. 2. Holotype of *Hassar affinis* (a), NMW 4539, 123.0 mm SL, and holotype of *Hassar woodi* (b), ANSP 69392, 201.6 mm SL. Photos by Mark Sabaj Pérez.

79833 (2, 135.2-141.1 mm SL), rio Maracu, MA, Nov 1984. MZUSP 87493 (2, 122.0-146.6 mm SL), rio Balsas, 7°32'8"S 46°2'16"W, Balsas, MA, Mar 2005, A. Akama & E. Baena. **Turiaçu basin (Brazil):** CPDOL (UFMA) 98186 (12, 90.7-126.1 mm SL), rio Turiaçu basin, Oct 1999, N. Piorski & L. Pereira. MPEG 3014 (1, 134.0 mm SL), rio Turiaçu, Lagoa Guajá, near Posto Indígena Guajá, MA.

Diagnosis. *Hassar affinis* is diagnosed among congeners by having the distal tip of the anterior branched dorsal-fin rays and membranes darkened (vs. distal tip of anterior branched dorsal-fin rays and membranes pale). *Hassar affinis* is distinguished from *H. orestis* and *H. wilderi* by having two rounded diverticula restricted to each side of anterior chamber of gas bladder (rarely one extra pair on posterior chambers) (vs. many well-branched diverticula along margins of entire gas bladder) (Fig. 4); and gas bladder rounded posteriorly (vs. gas bladder triangular posteriorly, each posterior chamber extended into a short terminal diverticulum sharing medial septum with its pair). *Hassar affinis* is further distinguished from *H. orestis* by having 12th through 17th, modally 13th, midlateral scute as the anteriormost with median thorn (vs. 1st through 8th, modally 3rd) (Fig. 5), 10th midlateral scute 3.1-5.1%, mean 4.1%, of relative body depth (vs. 6.2-18.0%, mean 12.9%, of relative body depth),

and tip of upper caudal-fin lobe not darkened (vs. usually darkened). *Hassar affinis* is distinguished from *H. gabiru* by having lateral diverticula on gas bladder rounded (rarely branched in large specimens) (vs. lateral diverticula finger-like, weakly-branched in large specimens).

Description. Morphometric data are summarized in Tables 1 and 2; type specimens illustrated in Fig. 2; additional specimens in Fig. 3. Largest specimen examined 201.6 mm SL (ANSP 69392, holotype of *Hassar woodi*); reported to 213 mm SL (Menezes, 1949). Dorsal profile of head rising moderately, evenly (usually in smaller specimens) or strongly convex (especially in larger specimens) from snout tip to anterior margin of orbit, and relatively straight from latter point to dorsal-fin spine. Dorsal profile of body descending gradually, approximately straight from dorsal-fin spine to caudal peduncle. Ventral contour shallowly concave from snout tip to pectoral girdle, and slightly convex from latter point to caudal peduncle. Caudal peduncle short with shallow hourglass shape in lateral view.

Body elongate with prominent conical snout. Mouth subterminal, each premaxilla bearing small patch of approximately 5 to 10 acicular teeth, and each dentary with approximately 10 to

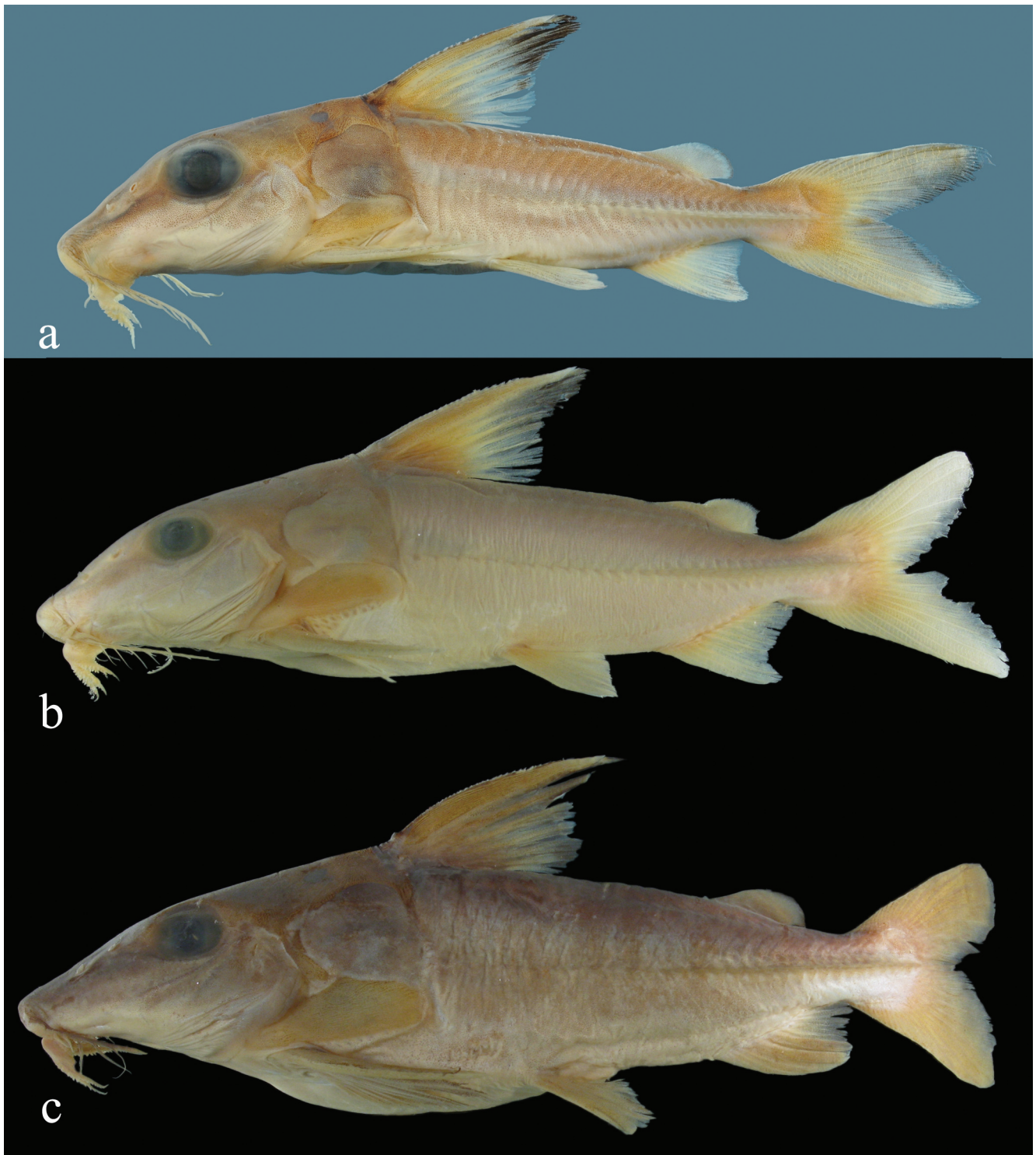


Fig. 3. *Hassar affinis*: (a) MCP 22524, 77.0 mm SL, rio Pindaré-Mearim (photo by Mark Sabaj Pérez); (b) MZUSP 89935, 110.7 mm SL, rio Parnaíba; (c) MZUSP 43604, 152.6 mm SL, rio Parnaíba.

20 acicular teeth. Oval orbit with weakly developed adipose eyelid in juveniles and adults, extended slightly beyond anterior and posterior limits of eye. Eyes positioned about half way between tip of snout and dorsal-fin origin.

Three pairs of barbels (maxillary, inner and outer mental), all fimbriate. Maxillary barbel usually reaching base of first

pectoral-fin ray; with 7 to 16 (mode 11, $n=47$) fimbriae along ventrolateral face. Inner and outer mentonian barbels of approximately equal size, covered with many rounded papillae, and falling short of ventralmost opening of gill slit.

Gill rakers small on first gill arch, absent on remaining arches. Accessory branchial lamellae on inner face of first gill

arch well developed in approximately ten rows from insertion of rakers to origin of branchial filaments (but not contacting the latter); accessory lamellae gradually reduced on remaining (second to fifth) gill arches.

Lateral-line tubules ossified, forming row of 31 to 34 (mode 32, n=17) midlateral scutes beginning with infranuchal. Three tympanal scutes, inconspicuous, usually without emergent thorn. Infranuchal scute with dorsal wing extremely thin and ventral wing dilated, expanded anteriorly, connected to posterior cleithral process; scute usually without medial thorn. Postinfranuchal scutes reduced anteriorly, non-overlapping; each with posterior margin bicuspid (without medial thorn) or tricuspid (including medial thorn), latter condition usually starting at 13th scute (range 12th through 17th, n=19); medial thorn and dorsal and ventral wings gradually increasing in size posteriorly; scutes with serrated posterior margins and overlapping on the last third of the body.

Dorsal-fin II,6 (n=52), triangular with distal margin approximately straight, vertical when erected. Dorsal-fin spine slightly compressed and curved, with relatively small antrorse serrations along anterior margin (serrations reduced or absent on distal third); slightly larger retrorse serrations along posterior margin (serrations absent on proximal portion). Pectoral fin modally I,8, range I,7-9 (n=52); distal margin straight, oblique relative to body axis. Pectoral-fin spine slightly depressed and curved, with antrorse serrations along anterior margin (serrations absent on distal third); slightly larger retrorse serrations along posterior margin (serrations larger distally). Pelvic fin i,6 (n=52); distal margin rounded. Anal fin modally iv,8, range iii-v,7-9 (n=51); subtriangular with scarcely rounded distal margin. Adipose fin relatively small, teardrop-shaped, with rounded free posterior margin. Caudal fin i,7/8,i (n=52, rarely i,7/7,i or i,7/9,i), distinctly forked, with lobes approximately equal in size.

Gas bladder (Fig. 4) moderately large, cordiform. Gas bladder walls entirely smooth in small specimens (up to 50 mm SL). Large specimens have only two short rounded diverticula on each side of anterior chamber; in the largest specimen examined (ANSP 69392, 201.6 mm SL) a third pair of diverticula are present at middle of lateral margin of posterior chambers; lateral diverticula rarely branched (only in large specimens). Gas bladder rounded posteriorly, not extended into terminal diverticula.

Osteology. Osteology generally similar to that described for *Hassar orestis*, excepting differences as follows. Total vertebrae 34 (n=1) or 36 (n=1), vertebrae 6-13 bearing ribs. Eight (n=2) dorsal-fin pterygiophores, 11 (n=2) pelvic-fin pterygiophores; 12 (n=1) or 13 (n=1) dorsal and 12 (n=1) ventral caudal-fin procurrent rays. All examined specimens with hypural fusion pattern PH; HY 1+2; HY 3+4; HY 5, and with complete ossification of sutural joint at junction of sphenotic, parieto-supraoccipital and frontal.

Coloration. In alcohol, head and body tan to brown, or grey, countershaded. Faint dark stripe from anterior margin of

upper lip to anterior margin of eye. First two (or rarely three) branched dorsal-fin rays and membranes distally darkened (distalmost fifth to third of fin-ray length), dark pigment extending to tips of rays and membranes (except in some large specimens with dorsal fin uniformly tan). Tip of upper caudal-fin lobe not conspicuously darkened. Soares (2005) noted the upper sides and flanks yellowish-gray and ventral surfaces white in a live specimen of *Hassar affinis*.

Distribution. *Hassar affinis* occurs in northeastern Brazil, including Turiaçu, Itapecuru, Pindaré-Mearim, and Parnaíba basins (Fig. 6). Only one other doradid species occurs in those northeastern Brazilian drainages, *Platydoras brachylecis*, which is also endemic to the area (Piorski *et al.*, 2008). Eigenmann & Fisher (1917) mistakenly identified a specimen from San Joaquin, in Bolivia, as *Hemidoras affinis* (= *Hassar affinis*). Fowler (1951) mentioned that *Hassar affinis* occurs in “Amazônia, Bolívia, Rio Paranaíba, Rio Itapicuru na Bahia”; but the species actually occurs in rio Parnaíba and rio Itapecuru (not Paranaíba, nor Itapicuru in Bahia).

Ecology. Menezes (1949) examined the diet of 25 specimens (48-180 mm SL) collected in lentic and lotic environments of the rio Parnaíba, Piauí, and observed that *H. affinis* feeds primarily on insects and, to a lesser extent, on crustaceans and plant residue. Fish remains were found in the intestine of a large examined specimen (213 mm SL). According to Soares (2005) *Hassar affinis* inhabits igarapés, lakes and rivers, and has an omnivorous diet.

Etymology. Steindachner (1881) described *Oxydoras affinis* (= *Hassar affinis*) as a variation of *O. orestis* (= *H. orestis*), a species he considered closely related or adjacent to.

Remarks. Steindachner (1881) distinguished *Hassar affinis* by having 18 to 20 midlateral scutes with thorns (*vs.* more in *H. orestis*), and a “slightly darker coloration on the superior marginal portion of the first rays of [dorsal] fin” (*vs.* a “sharply defined black mark” on the dorsal fin in *H. orestis*). Both characters are corroborated herein as consistent differences between the two species.

Fowler (1941a) reported a single juvenile specimen (ANSP 69396, 76 mm SL) as collected in Fortaleza (Ceará). However, since no large drainage exists between Fortaleza and rio Parnaíba, Sabaj (2002) suggested that that specimen was probably obtained in a fish market, making it unfeasible to substantiate its origin.

Hassar gabiru, new species

Figs. 7 and 8

Hassar orestis.— Camargo *et al.*, 2004: 143 [in part, distribution, Xingu upstream, middle Xingu, Bacajá river].—Camargo, 2009: 208 [feeding habitat].—Camargo & Giarrizzo, 2009: 221 [biological data].

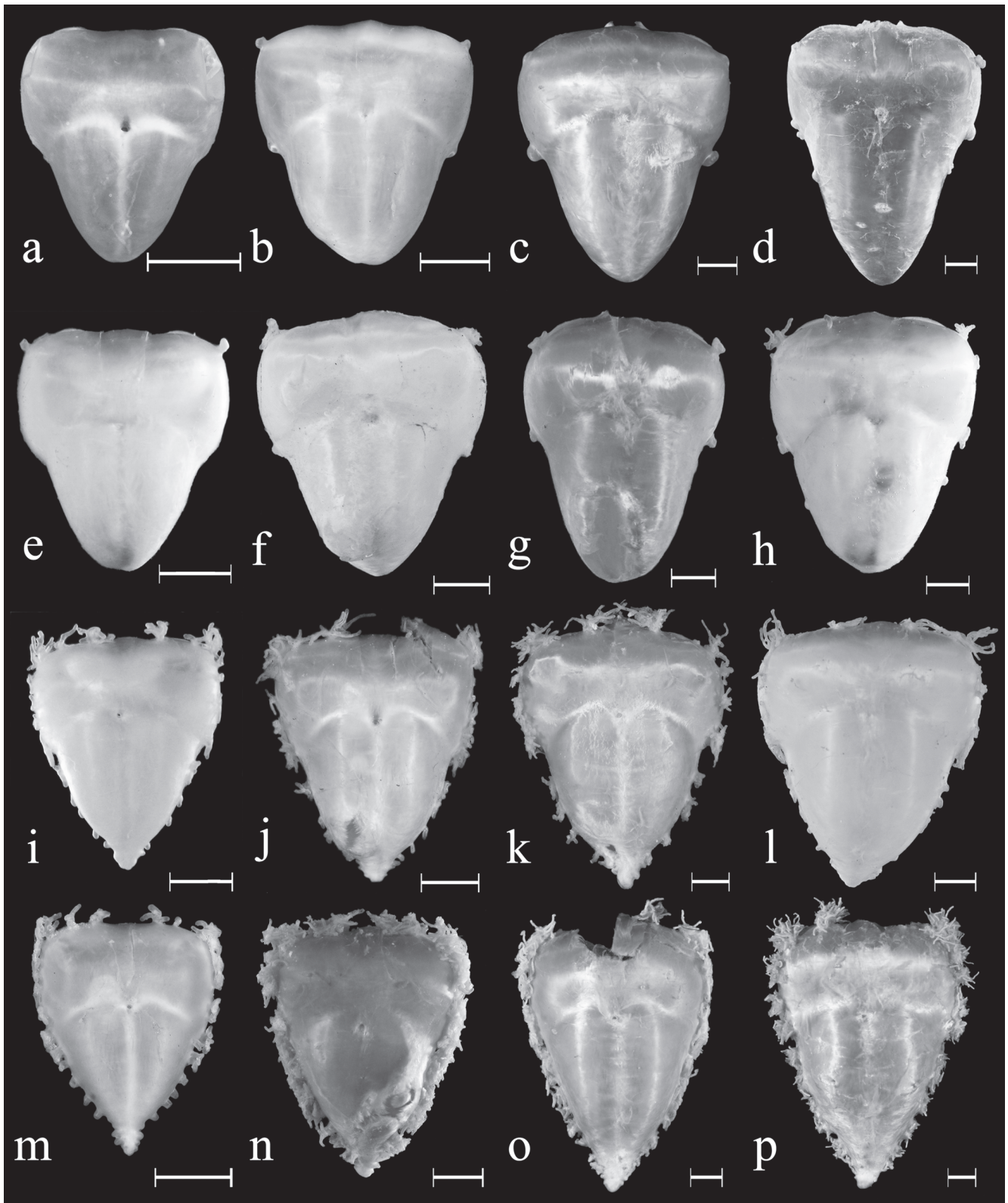


Fig. 4. Gas bladders in ventral view of *Hassar affinis* (a-d): (a) MZUSP 90583, 54.4 mm SL; (b) MZUSP 74890, 85.9 mm SL; (c) MZUSP 43604, 228.0 mm SL; (d) ANSP 69392, 201.6 mm SL (holotype of *Hassar woodi*, photo by Mark Sabaj Pérez); *Hassar gabiru* (e-h): (e) MZUSP 87026, 69.0 mm SL; (f) MZUSP 94142, 137.6 mm SL; (g) INPA 31043, 122.5 mm SL; (h) MZUSP 94142, 128.6 mm SL; *Hassar wilderi* (i-l): (i) MZUSP 46016, 67.0 mm SL; (j) MZUSP 4857, 103.6 mm SL; (k) MZUSP 63148, 148.8 mm SL; (l) MZUSP 62998, 161.6 mm SL; *Hassar orestis* (m-p): (m) MZUSP 6991, 71.0 mm SL; (n) MZUSP 74680, 123.5 mm SL; (o) MZUSP 15512, 132.0 mm SL; (p) MZUSP 32542, 220.0 mm SL. Scale bars = 5 mm.

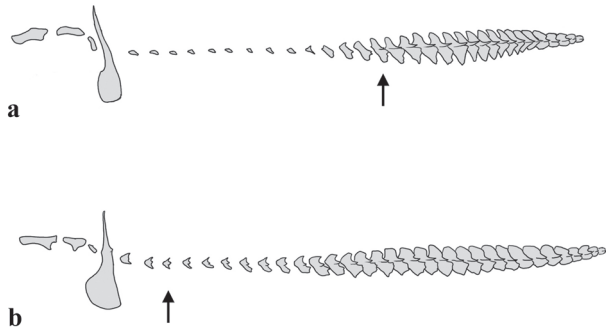


Fig. 5. Schematic illustration of midlateral scutes of (a) *Hassar affinis*, based on MZUSP 89935, 110.7 mm SL, and (b) *Hassar orestis*, based on MZUSP 6991, 65.7 mm SL, in left lateral view. Arrow indicates anteriormost scute with median thorn.

Holotype. MZUSP 108440 (1, 130.4 mm SL), rio Curuá, Iriri drainage, at Vila Castelo dos Sonhos, 8°19'7"S 55°5'23"W, Altamira, PA, Brazil, 22 Oct 2010, J. L. Birindelli, L. M. Sousa, A. L. Netto-Ferreira, M. H. Sabaj Pérez, N. Lujan.

Paratypes. Xingu basin (Brazil): ANSP 187335 (3, 125.0–151.7 mm SL), same data as holotype. INPA 26726 (1, 156.6 mm SL), rio Xingu, Ilha do Babaquara, Altamira, PA, Oct 1990, L. Rapp Py-Daniel & J. Zuanon. INPA 31043 (3, 122.5 mm SL [only one measured]), Mouth of rio Novo, 4°28'15"S 53°40'6"W, Aug 2008, H. López-Fernández *et al.* MPEG 847 (3, 142.4–172.2 mm SL), confluence of rio Culuene and rio Sete de Setembro, MT, Aug 1981, M. Goulding. MPEG 6736 (3, 108.7–131 mm SL), Xingu basin, Altamira, PA, Jan 2001, Camargo. MZUSP 86888 (1, 56.2 mm SL), rio Sete de Setembro, 13°30'19"S 52°24'57"W, Canarana, MT, Oct 2004, C. R. Moreira *et al.* MZUSP 86991 (12, 66.5–91.4 mm SL), rio Culuene, 13°30'52"S 53°5'34"W, Gaúcha do Norte, MT, Oct 2004, J. L. Birindelli *et al.* MZUSP 87026 (2, 65.3–79.2 mm SL), rio Curisevo, Porto do Vitória, 13°2'5"S 53°25'19"W, Gaúcha do Norte, MT, Oct 2004, Moreira *et al.* MZUSP 94142 (6, 35.9–136.0 mm SL), rio Culuene, 13°30'53"S 53°5'40"W, Gaúcha do Norte, MT, May 2007, J. L. Birindelli *et al.* MZUSP 94308 (1 c&s, 1, 114.0–116.0 mm SL), marginal lake, rio Culuene, 13°30'51"S 53°5'49"W, Gaúcha do Norte, MT, May 2007, J. L. Birindelli *et al.* MZUSP 94374 (4, 81.9–117.4 mm SL), lago da Mirim, rio Culuene, 13°25'48"S 53°2'24"W, Canarana, MT, May 2007, J. L. Birindelli *et al.* MZUSP 97219 (3, 124.7–133.8 mm SL), same data as holotype. MZUSP 100328 (3, 60.4–65.9 mm SL), lagoas Tarik Yegun, rio Jatobá, 12°41'49"S 54°9'8"W, MT, Jul 2008, M. C. Lopes.

Diagnosis. *Hassar gabiru* is distinguished from *H. orestis* and *H. wilderi* by having two weakly-branched diverticula restricted to each side of anterior chamber of gas bladder (rarely one extra pair on posterior chambers) (*vs.* gas bladder with many well-branched diverticula along margins of entire bladder); and gas bladder rounded posteriorly (*vs.* gas bladder triangular posteriorly, each posterior chamber extended posteriorly into a short terminal diverticulum sharing medial septum with its pair). *Hassar gabiru* is further distinguished from *H. orestis* by having 11th through 15th, modally 13th,

midlateral scute as the anteriormost with median thorn (*vs.* 1st through 8th, modally 3rd), tip of upper caudal-fin lobe not darkened (*vs.* usually darkened), body depth at dorsal-fin origin 24.3–33.1%, mean 25.8% SL (*vs.* 16.8–22.2%, mean 21.1% SL), body depth at anal-fin origin 15.9–20.7%, mean 17.3% SL (*vs.* 10.0–14.7%, mean 13.1% SL), and caudal peduncle depth 6.6–8.6%, mean 7.1% SL (*vs.* 4.3–6.4%, mean 5.5% SL). *Hassar gabiru* is distinguished from *H. affinis* by having the distal tip of the first branched dorsal-fin rays and membranes pale (*vs.* first branched dorsal-fin rays and membranes distally darkened); and lateral diverticula on the gas bladder finger-like, weakly-branched in large specimens (*vs.* rounded, rarely branched in large specimens).

Description. Morphometric data are summarized in Tables 1 and 2; holotype and additional specimens illustrated in Figs. 7 and 8. Largest specimen examined 156.6 mm SL (INPA 26726). Dorsal profile of head rising moderately, evenly (usually in smaller specimens) or slightly convex (especially in larger specimens) from snout tip to anterior margin of orbit, and relatively straight from latter point to dorsal-fin spine. Dorsal profile of body descending gradually, approximately straight from dorsal-fin spine to caudal peduncle. Ventral contour shallowly concave from snout tip to pectoral girdle, and slightly convex from latter point to caudal peduncle. Caudal peduncle short with shallow hourglass shape in lateral view.

Body elongate with prominent conical snout. Mouth subterminal, each premaxilla bearing small patch of approximately 5 to 10 acicular teeth, and each dentary with approximately 10 to 20 acicular teeth. Oval orbit with weakly developed adipose eyelid in juveniles and adults, extended slightly beyond anterior and posterior limits of eye. Eyes positioned about half way between tip of snout and dorsal-fin origin.

Three pairs of barbels (maxillary, inner and outer mental), all fimbriate. Maxillary barbel usually reaching base of first pectoral-fin ray; with 10 to 14 (mode 12, n=13) fimbriae along ventrolateral face. Inner and outer mentonian barbels of approximately equal size, covered with many rounded papillae, and falling short of ventralmost opening of gill slit.

Gill rakers small on first gill arch, absent on remaining arches. Accessory branchial lamellae on inner face of first gill arch well developed in approximately ten rows from insertion of rakers to origin of branchial filaments (but not contacting the latter); accessory lamellae gradually reduced on remaining (second to fifth) gill arches.

Lateral-line tubules ossified, forming a row of 30 to 33 (mode 31, n=13) midlateral scutes beginning with infranuchal. Three tympanal scutes, inconspicuous, usually without emergent thorn. Infranuchal scute with dorsal wing extremely thin and ventral wing dilated, expanded anteriorly, connected to posterior cleithral process; scute usually without medial thorn. Postinfranuchal scutes reduced anteriorly, non-overlapping; each with posterior margin bicuspid (without medial thorn) or tricuspid (including medial thorn), latter condition usually starting at 13th scute (range 11th through

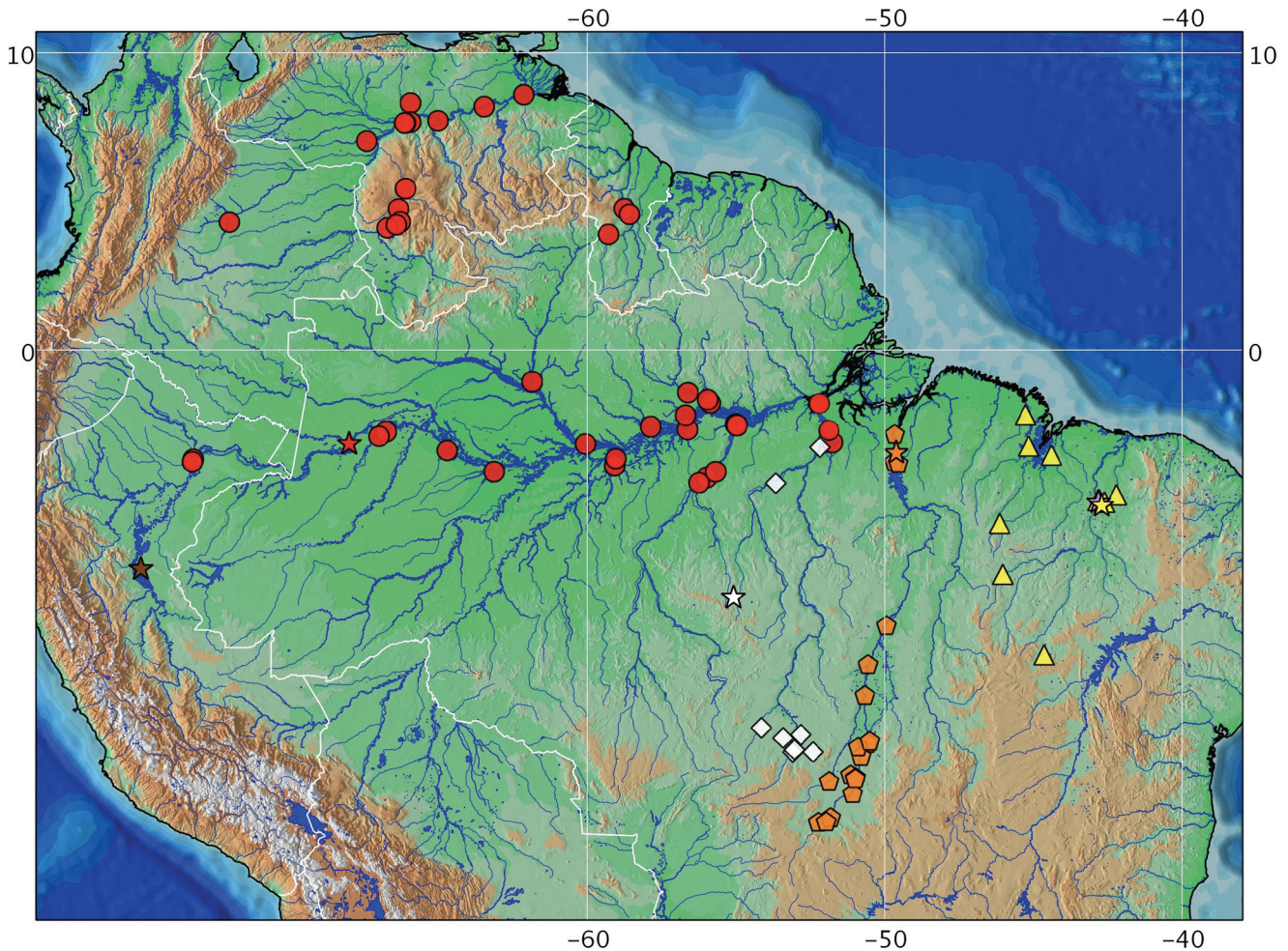


Fig. 6. Distribution map of *Hassar affinis* (yellow triangles), *H. gabiru* (white diamonds), *H. orestis* (red circles), *H. wilderi* (orange pentamer). Stars represent type localities. Brown star indicates the type locality of *Hassar ucayalensis*, and pink star indicates that of *Hassar woodi*.

15th, n=13); medial thorn and dorsal and ventral wings gradually increasing in size posteriorly; scutes with serrated posterior margins and overlapping on the posterior third of body.

Dorsal-fin II,6 (n=13), triangular with distal margin approximately straight, vertical when erected. Dorsal-fin spine slightly compressed and curved, with relatively small antrorse serrations along anterior margin (serrations reduced or absent on distal third); slightly larger retrorse serrations along posterior margin (serrations absent on proximal portion). Pectoral fin modally I,9, range I,8-9 (n=13); distal margin straight, oblique relative to body axis. Pectoral-fin spine slightly depressed and curved, with antrorse serrations along anterior margin (serrations absent on distal third); slightly larger retrorse serrations on posterior margin (serrations larger distally). Pelvic fin i,6 (n=13); distal margin rounded. Anal fin modally iv,9, range iii-iv,8-9 (n=13); subtriangular with scarcely rounded distal margin. Adipose fin relatively small, teardrop-shaped, with rounded free

posterior margin. Caudal fin i,7/8,i (n=13, rarely i,7/7,i), distinctly forked, with lobes approximately equal in size.

Gas bladder (Fig. 4) moderately large, cordiform. Gas bladder walls entirely smooth in small specimens (up to 50 mm SL). Large specimens have only two short weakly-branched diverticula on each side of anterior chamber; in the largest specimens examined a third pair of diverticula are present at middle of lateral margin of posterior chambers. Gas bladder rounded posteriorly, not extended into terminal diverticula.

Osteology. Osteology generally similar to that described for *Hassar orestis*, excepting differences as follows. Total vertebrae 35 (n=1), vertebrae 6-13 bearing ribs. Eight (n=1) dorsal-fin pterygiophores, 10 (n=1) pelvic-fin pterygiophores; 12 (n=2) dorsal and 12 (n=1) ventral caudal-fin procurent rays. All examined specimens with hypural fusion pattern PH; HY 1+2; HY 3+4; HY 5, and with complete ossification of sutural joint at junction of sphenotic, parieto-supraoccipital and frontal.



Fig. 7. *Hassar gabiru*: (a) MZUSP 108440, 103.4 mm SL, holotype, rio Curuá, Altamira, PA; (b) INPA 26726, 156.6 mm SL, rio Xingu at Ilha do Babaquara, Altamira, PA; (c) MZUSP 87026, 65.3 mm SL, paratype, rio Curisevo, Gaúcha do Norte, MT.



Fig. 8. *Hassar gabiru*, paratype, MZUSP 97219, c.130 mm SL, rio Curuá, Irixi-Xingu drainage, Altamira, PA. Photo by Mark Sabaj Pérez.

Coloration. In alcohol, head and body tan to brown, or grey, countershaded. Faint dark stripe from anterior margin of upper lip to anterior margin of eye. A conspicuous dark blotch on the first three branched dorsal-fin rays and membranes, blotch starting from midlength of rays and membranes and almost reaching their distal tips, which are pale. Tip of upper caudal-fin lobe not conspicuously darkened.

In life, ground color yellowish or greenish laterally and white ventrally; lower lip pinkish; eye silvery (Fig. 8).

Distribution. *Hassar gabiru* occurs in the middle to upper Xingu river basin (Fig. 6), and is apparently endemic to the Xingu basin above the rapids of Volta Grande, near Altamira.

Ecology. Like its congeners, *Hassar gabiru* was collected usually in swift water over sand beaches at night. Camargo (2009) considered that specimens of *Hassar orestis* (= *Hassar gabiru*) collected at the Volta Grande rapids have preference for benthic invertebrates and detritus.

Etymology. Named in honor of Leandro Melo de Sousa, known to his friends as “Gabiru”, for his many contributions to the understanding of the Doradidae, including his MSc and PhD dissertations (Sousa & Rapp Py-Daniel, 2005; Sousa, 2010). Leandro also helped to collect part of the type series of the new species. Treated as a noun in apposition.

Remarks. Specimens of *Hassar* from the rio Xingu above the rapids of Volta Grande are distinct from the specimens below the rapids (including the area near Belo Monte) in overall body shape and gas bladder morphology, and are similar to the specimens from the upper Xingu river basin, herein referred to as the new species *Hassar gabiru*. This indicates

that the Volta Grande rapids impose a distributional limit between *H. gabiru* and *H. orestis*. The identity of the specimens cited by Camargo *et al.* (2004), Camargo (2009) and Camargo & Giarrizzo (2009) were not verified by us. However, specimens collected at the rapids of Volta Grande or upstream (putatively including rio Bacajá) are likely to be *Hassar gabiru*.

Hassar orestis (Steindachner, 1875)

Figs. 9 and 10

Oxydoras Orestis Steindachner, 1875: 138, pl. 1 [type locality: “Rio Xingu (bei den Wasserfällen) und Rio Iça” (= rio Xingu near rapids and rio Iça)].

Hemidoras orestes.—Eigenmann & Eigenmann, 1888: 158 [change of generic status, Huytahy (=Jutaí), misspelling].—Eigenmann & Eigenmann, 1890: 258 [literature compilation].—Eigenmann & Eigenmann, 1891: 33 [literature compilation].—Eigenmann, 1910: 394 [literature compilation].—Eigenmann & Fisher, 1917: 422 [Bolivia, Santarém].

Hassar orestes.—Kindle, 1895 [change of generic status, identification key, misspelling].

Hassar orestis.—Eigenmann, 1910: 394 [subsequent designation of type species].—Miranda Ribeiro, 1911: 185 [identification key, translation to Portuguese of the original description].—Eigenmann, 1925: 356 [identification key, “Itaituba, Brazil”, “R. Tapajós, Santarém”, “Amazon, Santarém”].—Gosline, 1945: 23 [literature compilation].—Fowler, 1951: 492 [literature compilation]; Burgess, 1989: 217 [literature compilation].—Eschmeyer, 1998: 1247 [literature compilation].—Sabaj & Ferraris, 2003: 461 [literature compilation].—Camargo *et al.*, 2004: 143 (in part,



Fig. 9. (a) Lectotype of *Hassar orestis*, NMW45428, 66.8 mm SL, (b) paralectotype of *Hassar orestis*, NMW 45427, 206.0 mm SL; and (c) holotype of *Hassar ucayalensis*, ANSP 68647, 68.9 mm SL. Photos (b) and (c) by Mark Sabaj Pérez.

distribution, lower Xingu).—Ferraris, 2007: 171 [literature compilation].—Sabaj Pérez *et al.*, 2007: 189 [listed as comparative material].—Birindelli *et al.*, 2009: 276 [gas bladder morphology].

Hemidoras notospilus Eigenmann, 1912: 196, pl. 19, fig. 2 [type locality: Crab Falls (=Essequibo basin, Guyana)].—Eigenmann, 1910: 394 [*nomen nudum* in species list].

Hassar notospilus.—Eigenmann, 1925: 356 [new combination].—Gosline, 1945: 23 [literature compilation].—Burgess, 1989: 217 [literature compilation].—Eschmeyer, 1998: 1200 [literature compilation].

Hassar ucayalensis Fowler, 1939: 228, figs. 15, 16, 17 [type locality: Ucayali River basin, Contamana, Peru].—Fowler, 1941b: 390 [literature compilation].—Eigenmann & Allen, 1942: 135 [diagnosis].—Gosline, 1945: 23 [literature

compilation].—Fowler, 1945: 61 [literature compilation].—Fowler, 1951: 492 [literature compilation].—Eschmeyer, 1998: 1718 [literature compilation].

Hassar iheringi.—Fernández-Yépez, 1968: 13, fig. 16 [Orinoco, illustration].—Mago-Leccia, 1970: 79 [literature compilation, Orinoco].

Opsodoras notospilus.—Fernández-Yépez, 1968: 49 [new combination, identification key, Orinoco].—Mago-Leccia, 1970: 79 [literature compilation, Orinoco].

Hassar sp.—Moyer *et al.*, 2004: 555 [cladistic analysis based on molecular data].

Type-specimens. ANSP 68647 (1, 68.9 mm SL, holotype of *Hassar ucayalensis*), Contamana, Peru, Jul 1937, W. C. Morrow. NMW 45428 (1, 66.8 mm SL, lectotype of *Oxydoras orestis* [herein

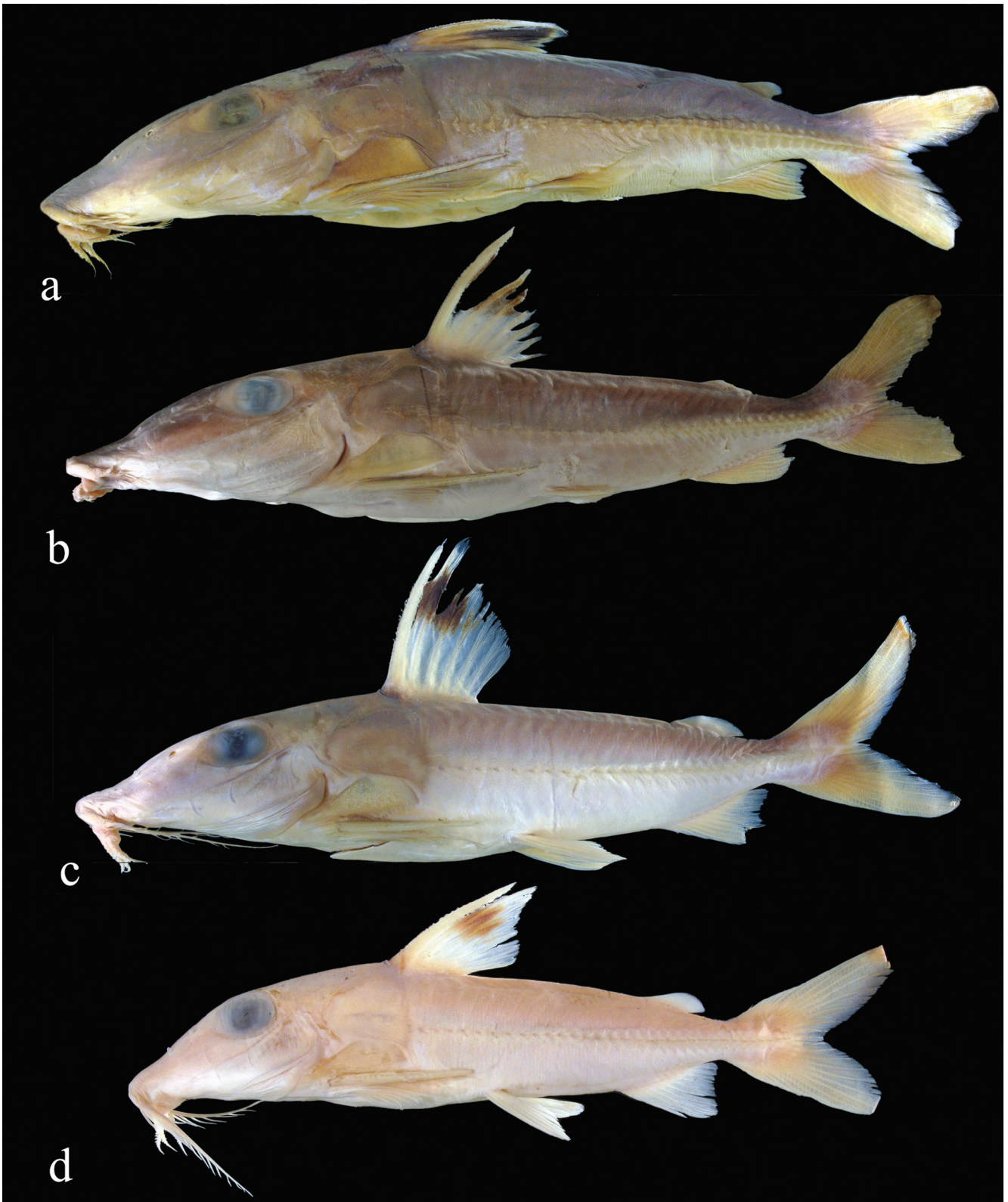


Fig. 10. *Hassar orestis*: (a) MZUSP 32542, 218.5 mm SL, rio Xingu at Belo Monte; (b) MZUSP 15528, 186.5 mm SL, rio Trombetas; (c) MZUSP 74680, 123.5 mm SL, rio Tefé; (d) MZUSP 6721, 79.4 mm SL, rio Negro.

designated]); NMW 45428 (2, 47.9-48.0 mm SL, paralectotypes of *Oxydoras orestis*); Rio Iça (=rio Iça, tributary of rio Amazonas, AM, Brazil). NMW 45427 (1, 206.0 mm SL); NMW 45429 (2, 148.3-162.0 mm SL); NMW 45430 (1, 198.0 mm SL); NMW 60015 (1 sk, c.189 mm SL); NMW 78651 (1, 169.0 mm SL); Xingu Cascades (=rio Xingu near rapids, PA, Brazil; all paralectotypes of *Oxydoras orestis*).

Non-type specimens. Amazon basin (Brazil): ANSP 185357 (1, 105.2 mm SL), rio Trombetas, Santa Cecília, 1°39'59"N 55°57'24"W, Oriximiná, PA, Oct 1994, R. Reis *et al.* BMNH 1926.10.27.262 (1, 73.9 mm SL), rio Amazonas, Monte Alegre, Ternetz. CAS 76797 (1, 111.3 mm SL), rio Amazonas, Santarém, PA, Aug 1924, C. Ternetz. INPA 17742 (1, 48.8 mm SL), near igarapé Curumbaú, rio Branco basin, 1°2'44"S 61°51'21"W, RR, Nov 1996, L. Chao. INPA 5312 (1, 166 mm SL), ilha da Marchantaria, Iranduba, AM, Feb 1976. MPEG 1452 (1, 196.2 mm SL), rio Xingu, Ilha de Mucuripe, PA, Jun 1984, Paulo Sá. MPEG 2219 (1, 216.4 mm SL), rio Xingu, Baía Sousel, PA, Dec 1984, Paulo Sá. MZUSP 3719 (1, 143.6 mm SL), rio Tapajós, c. 2°25'S 54°44'W, Santarém, PA. MZUSP 6721 (1, 79.4 mm SL), rio Negro, c. 3°0'S 60°0'W, Manaus, AM. MZUSP 6991 (1 c&s, 65.7 mm SL), rio Madeira, c. 3°53'S 59°5'W, Nova Olinda do Norte, AM, Nov 1967. MZUSP 7650 (3, 65.1-72.7 mm SL), rio Amazonas, Boca do Lago São José Açú, c. 2°40'S 56°37'W, Parintins, AM, Jul 1967. MZUSP 9516 (7, 137.7-170.7 mm SL), rio Tapajós, Aveiro, c. 3°35'S 55°20'W, PA. MZUSP 9531 (2, 103.8-141.4 mm SL), rio Tapajós, Alter do Chão, PA. MZUSP 9536 (2, 141.0-162.4 mm SL), rio Nhamundá, PA, Aug 1968. MZUSP 9547 (2, 137.3-156.1 mm SL), rio Uatumã, São Sebastião do Uatumã, AM, Sep 1968. MZUSP 15528 (1, 195.8 mm SL), rio Trombetas, Reserva Biológica do Trombetas, c. 1°25'0"S 56°37'0"W, PA. MZUSP 15762 (4, 133.0-156.0 mm SL), rio Trombetas, Reserva Biológica do Trombetas, Igapó do Lago Farias, c. 1°25'S 56°37'W, PA, Jul 1979, Castro. MZUSP 21915 (1, 146.4 mm SL), rio Tapajós, Itaituba, c. 4°17'S 55°59'W, PA. MZUSP 31696 (1, 127.2 mm SL), rio Tefê, Jurupari, c. 3°22'S 64°43'W, Tefê, AM, Aug 1979, M. Goulding. MZUSP 32539 (142, 109.2-180.6 mm SL), rio Tapajós, São Luis, c. 4°27'S 56°15'W, PA, M. Goulding. MZUSP 32540 (12, 125.9-164.3 mm SL), rio Tapajós, c. 4°17'S 55°59'W, Itaituba, PA. MZUSP 32541 (2, 117.3-209.2 mm SL), rio Trombetas, c. 1°46'S 55°52'W, Oriximiná, PA. MZUSP 32542 (2 sk, 237, 140.6-246.8 mm SL), rio Xingu, Belo Monte, c. 3°7'S 51°42'W, PA, M. Goulding. MZUSP 46010 (1 c&s, 11, 57.8-80.7 mm SL), rio Solimões, Coari, Ilha de Sorubim, AM. MZUSP 49179 (4, 122.0-139.2 mm SL), rio Trombetas, c. 1°46'S 55°52'W, Oriximiná, PA. MZUSP 49181 (13, 122.3-187.1 mm SL), rio Tapajós, Monte Cristo, c. 4°5'S 55°37'W, PA. MZUSP 49183 (13, 147.4-200.5 mm SL), rio Tapajós, Barreirinha, PA, Nov 1970. MZUSP 49184 (2, 143.6-156.0 mm SL), rio Tapajós, São Luis, c. 4°27'S 56°15'W, PA. MZUSP 50839 (1 c&s, 2, 74.6-88.8 mm SL), rio Solimões, near Ilha Baruruá, mouth of rio Jutai, c. 2°44'S 66°46'W, AM, Dec 1968. MZUSP 56680 (3, 68.5-83.6 mm SL), rio Amazonas, rio Jutai, 2°53'17"S 67°0'24"W, AM. MZUSP 56865 (1, 56.0 mm SL), rio Madeira, 3°38'35"S 59°2'50"W, AM. MZUSP 74680 (1, 126.2 mm SL), rio Tefê, Jurupari, c. 3°22'S 64°43'W, Tefê, AM. MZUSP 82256 (1, 186.6 mm SL), rio Xingu, Belo Monte, c. 3°7'S 51°42'W, PA. MZUSP 86781 (1, 164.0 mm SL), rio Xingu, Belo Monte, c. 3°7'S 51°42'W, PA. **Amazon basin (Peru):** ANSP 181090 (1, 67.2 mm SL), near Iquitos, mouth of rio Itaya, 3°40'36"S 73°14'37"W, Aug 2005, M. H. Sabaj *et al.* ANSP 181094 (10, 87.0-106.4 mm SL), near Iquitos, Peru, Aug 2006, M. H. Sabaj *et al.* INHS 53720 (2, 59.0-83.8 mm SL), rio Nanay drainage, Pampa Chica, 4.5 Km from Iquitos downtown, near Loreto,

3°45'9"S 73°17'0"W, Aug 1999. **Essequibo basin (Guyana):** ANSP 175875 (1, 140.8 mm SL), Essequibo river, Maipuri, 4°45'43"N 58°45'52"W, Jan 1997, W. Saul. ANSP 175876 (1, 82.1 mm SL), Essequibo river, 4°34'17"N 58°35'17"W, Maipuri, Jan 1997, W. Saul *et al.* ANSP 179642 (1, 119.9 mm SL), Rupununi river, 3°53'41"N 59°17'37"W, Oct 2002, M. H. Sabaj *et al.* BMNH 1971.4.14.52 (1, 82.7 mm SL), Rupununi river, at sandcreek road crossing South Savannas (RHL602), Apr 1961, R. Lowe-McConnel. **Orinoco basin (Colombia):** AUM 28765 (4, 45.3-58.9 mm SL), rio Manacias, rio Meta basin, Puerto Gaitan, Colombia, X-1978, J. S. Ramsey *et al.* **Orinoco basin (Venezuela):** ANSP 152870 (1, 43.9 mm SL), Isla Isabela, between Palua and Ciudad Bolívar, 8°18'43"N 65°56'52"W, Nov 1979, J. G. Lundberg. ANSP 160904 (1, 69.6 mm SL), mouth of rio Cuchivero, c. 7°40'N 65°57'W, Bolívar, Nov 1985, B. Chernoff. ANSP 165493 (1, 146.7 mm SL), rio Capanaparo, mouth of Caño Las Varitas, near San Fernando de Apure, c. 7°2'N 67°25'W, Nov 1989, S. Schaefer. ANSP 165787 (1, 45.0 mm SL), rio Caura, 7°38'42"N 64°52'48"W, Bolívar, Nov 1985, B. Chernoff. ANSP 166595 (1, 121.2 mm SL), Anzoategui, Soledad, I. Tineo, 8°11'25"N 63°28'20"W, Jan 1987, M. Rodriguez & S. Richardson. ANSP 166597 (1, 70.9 mm SL), Caicara, I. Bartolico, 7°38'30"N 66°7'W, Jan 1987, M. Rodriguez & S. Richardson. ANSP 180294 (1 sk, 4, 162.9-225.2 mm SL), rio Ventuari, Macuruco, San Fernando de Atabapo, 4°45'0"N 66°21'13"W, Apr 2004, M. H. Sabaj *et al.* ANSP 180295 (1 sk, not measured), rio Orinoco, rio Ventuari, Macuruco, 4°18'51"S 66°17'32"W, San Fernando de Atabapo, Apr 2004, M. H. Sabaj *et al.* ANSP 182221 (2, 119.4-159.1 mm SL), rio Ventuari, 4°6'55"N 66°45'52"W, May 2004, Sabaj *et al.* ANSP 182796 (1, 101.3 mm SL), rio Manapiare, San Juan de Manapiare, 5°26'12"N 66°6'45"W, Apr 2004, M. H. Sabaj *et al.* CAS 58084 (1, 54.1 mm SL), rio Orinoco, Delta Amacuro, Nov 1979, J. N. Baskin & J. G. Lundberg. INHS 35082 (3, 90.5-95.4 mm SL), Laguna Castellero, 7°38'20"N 66°9'W, Bolívar, Jan 1988, M. A. Rodriguez. MZUSP 105827 (1 sk, 144.7 mm SL), rio Ventuari, 4°13'37"N 66°25'26"W, Puerto Maldonado, Apr 2010, J. L. Birindelli *et al.* UMMZ 214799 (3, 142.9-172.1 mm SL), rio San Jose, 10 km from mouth of San Jose and rio Guariquito, Feb 1987, W. L. Fink. **No data:** MZUSP 84553 (2 c&s, not measured).

Diagnosis. *Hassar orestis* is diagnosed among its congeners by having the 1st through 8th (modally 3rd) midlateral scute as the anteriormost with median thorn (*vs.* 9th through 17th), and tip of upper caudal-fin lobe usually darkened (*vs.* rarely or never darkened). *Hassar orestis* is further distinguished from *H. affinis* and *H. gabiru* by having gas bladder with many well-branched diverticula on margins of entire bladder (*vs.* gas bladder with two rounded or weakly-branched diverticula restricted to each side of anterior chamber of the bladder [rarely one extra pair on the posterior chambers]); and gas bladder triangular posteriorly, each posterior chamber extended into a short terminal diverticulum sharing medial septum with its pair (*vs.* gas bladder posteriorly rounded, lacking terminal diverticula). *Hassar orestis* is yet distinguished from *H. affinis* by having the distal tip of the first branched dorsal-fin rays and membranes pale (*vs.* first branched dorsal-fin rays and membranes distally darkened); and 10th midlateral scute 6.2-18.0%, mean 12.9%, of relative body depth (*vs.* 3.1-5.1%, mean 4.1%, of relative body depth). *Hassar orestis* is also distinguished from *H. gabiru* by having body depth at dorsal-fin origin 16.8-22.2%, mean 21.1%, SL (*vs.* 24.3-33.1%, mean 25.8%, SL), body depth at anal-fin origin 10.0-

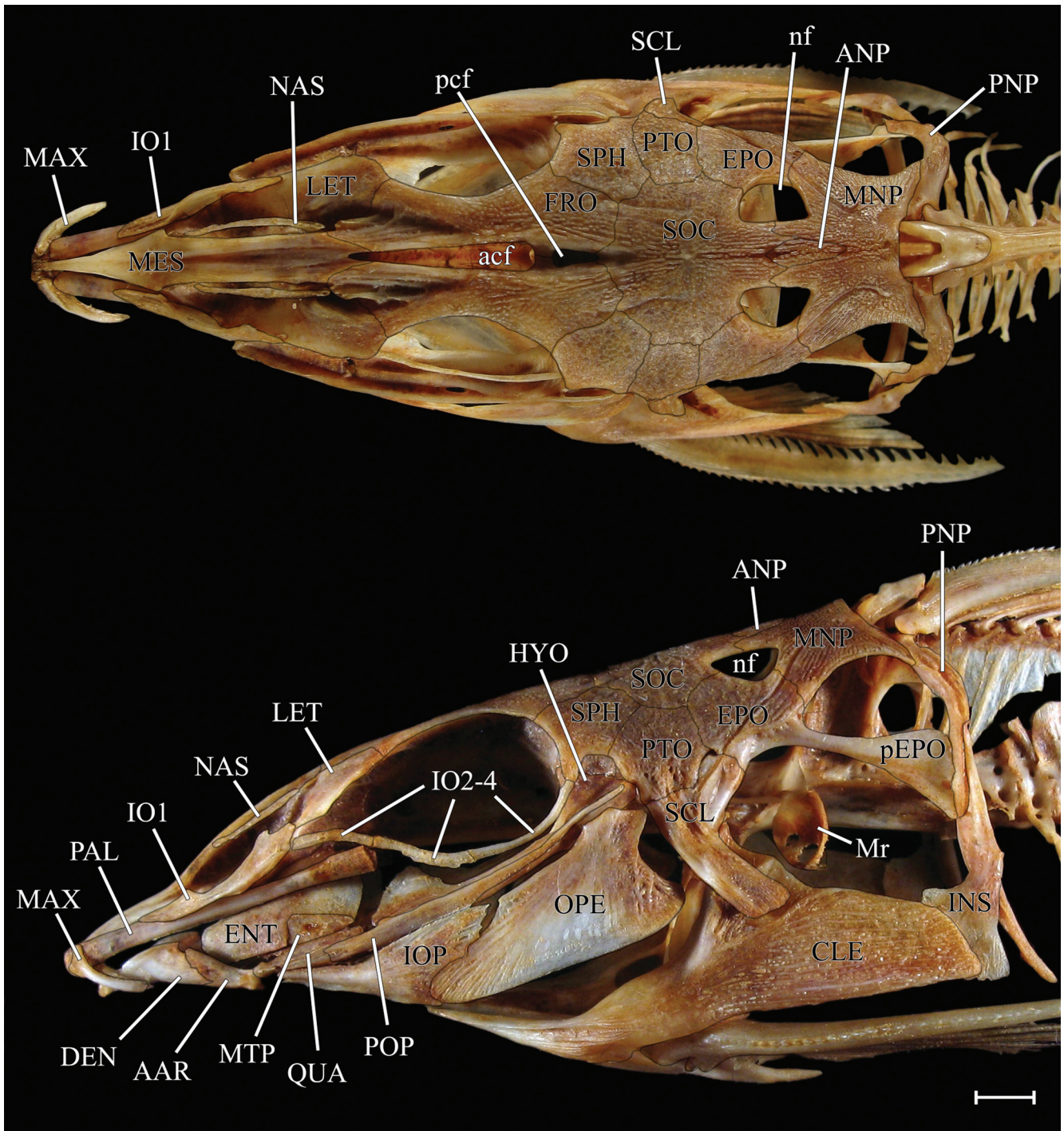


Fig. 11. Head and anterior portion of body in dorsal (above) and lateral (below) views of *Hassar orestis*, MZUSP 105827, 144.7 mm SL. AAR, anguloarticular; acf, anterior cranial fontanel; ANP, anterior nuchal plate; CLE, cleithrum; DEN, dentary; ENT, entopterygoid; EPO, epoccipital; FRO, frontal; INS, infranuchal scute; IO, infraorbital; IOP, interopercle; LET, lateral ethmoid; MAX, maxilla; MES, mesethmoid; MNP, middle nuchal plate; MTP, metapterygoid; Mr, Müllerian ramus; NAS, nasal; nf, nuchal foramina; OPE, opercle; PAL, autopalatine; pcf, posterior cranial fontanel; pEPO, epioccipital process; PNP, posterior nuchal plate; POP, preopercle; PTO, pterotic; QUA, quadrate; SCL, posttemporo-supracleithrum; SOC, parieto-supraoccipital; SPH, sphenotic. Scale bar = 5 mm.

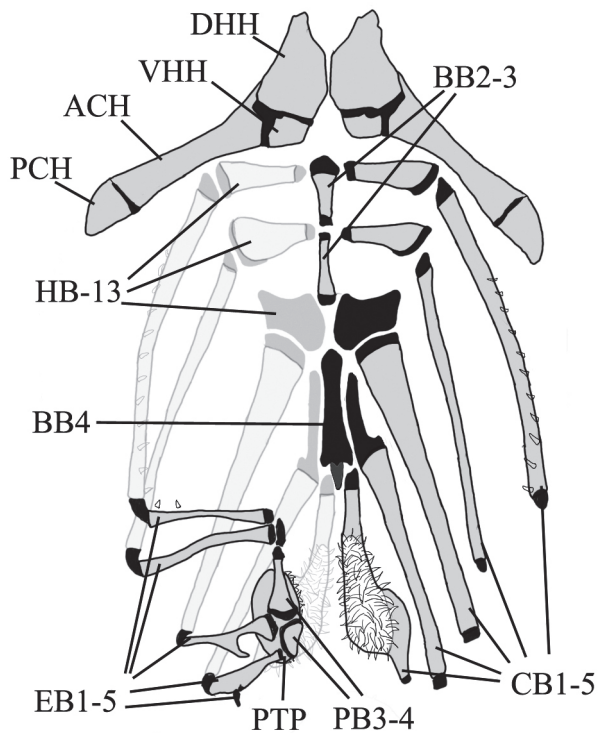


Fig. 12. Schematic illustration of the hyoid and branchial arches of *Hassar orestis*, based on MZUSP 6991, 65.7 mm SL. ACH, anterior ceratohyal; BB, basibranchial; CB, ceratobranchial; DHH, dorsal hypohyal; EB, epibranchial; HB, hypobranchial; PB, pharyngobranchial; PCH, posterior ceratohyal; PTP, pharyngobranchial tooth plate; VHH, ventral hypohyal.

14.7%, mean 13.1%, SL (vs. 15.9–20.7%, mean 17.3%, SL), and caudal peduncle depth 4.3–6.4%, mean 5.5%, SL (vs. 6.6–8.6%, mean 7.1%, SL).

Description. Morphometric data are summarized in Tables 3 and 4; morphometric data for type specimens in Table 4; type specimens illustrated in Fig. 9, additional specimens in Fig. 10. Largest specimen examined 246.8 mm SL (MZUSP 32542). Dorsal profile of head rising moderately, evenly (usually in smaller specimens) or strongly convex (especially in larger specimens) from snout tip to anterior margin of orbit, and relatively straight from latter point to dorsal-fin spine. Dorsal profile of body descending gradually, approximately straight from dorsal-fin spine to caudal peduncle. Ventral contour shallowly concave from snout tip to pectoral girdle, and slightly convex from latter point to caudal peduncle. Caudal peduncle short with shallow hourglass shape in lateral view.

Body elongate with prominent conical snout. Mouth subterminal, each premaxilla bearing small patch of approximately 5 to 10 acicular teeth, and each dentary with approximately 10 to 20 acicular teeth. Oval orbit with adipose eyelid weakly developed in juveniles (SL ≤ 14 cm), extended slightly beyond anterior and posterior limits of eye, and well-developed in adults (SL > 14 cm), extended well beyond anterior

margin of the eye. Eyes positioned about half way between tip of snout and dorsal-fin origin.

Three pairs of barbels (maxillary, inner and outer mental), all fimbriate. Maxillary barbel usually reaching base of first pectoral-fin ray; with 8 to 16 (mode 12, n=101) fimbriae along ventrolateral face. Inner and outer mentonian barbels of approximately equal size, covered with many rounded papillae, and falling short of ventralmost opening of gill slit.

Gill rakers on first gill arch 10 to 15; gill rakers completely absent or remnant on remaining arches. Accessory branchial lamellae on inner face of first gill arch well developed in approximately ten rows from insertion of rakers to origin of branchial filaments (but not contacting the latter); accessory lamellae gradually reduced on remaining (second to fifth) gill arches.

Lateral-line tubules ossified, forming row of 31 to 34 (mode 32, n=101) midlateral scutes beginning with infranuchal. Three tympanal scutes, inconspicuous, usually without emergent thorn. Infranuchal scute with dorsal wing extremely thin and ventral wing dilated, expanded anteriorly, connected to posterior cleithral process; scute usually without medial thorn. Postinfranuchal scutes reduced anteriorly, non-overlapping; each with posterior margin bicuspid (without medial thorn) or tricuspid (including medial thorn), latter condition usually starting at 3rd scute (range 1st through 8th, n=101); medial thorn and dorsal and ventral wings gradually increasing in size posteriorly; scutes with weakly serrated posterior margin and overlapping.

Dorsal-fin II,6 (n=101), triangular with distal margin approximately straight, vertical when erected. Dorsal-fin spine slightly compressed and curved, with relatively small antrorse serrations along anterior margin (serrations reduced or absent on distal third); slightly larger retrorse serrations along posterior margin (serrations absent on proximal portion). Pectoral fin modally I,8, range I,7–9 (n=99); distal margin straight, oblique relative to body axis. Pectoral-fin spine slightly depressed and curved, with antrorse serrations along anterior margin (serrations absent on distalmost portion); slightly larger retrorse serrations along posterior margin (serrations larger distally). Pelvic fin i,6 (n=97); distal margin rounded. Anal fin modally iii,8, range iii–v,7–9 (n=25); subtriangular with scarcely rounded distal margin. Adipose fin relatively small, teardrop-shaped, with rounded free posterior margin. Caudal fin i,7/8,i (n=101, rarely i,8/8,i or i,7/7,i), distinctly forked, with lobes approximately equal in size.

Gas bladder (Fig. 4) moderately large, cordiform. Bundles of diverticula present along the anterior, lateral, and posterior margins of entire bladder in small specimens (≤ 50 mm SL); diverticula become thinner and more branched in larger specimens (lateral diverticula slightly more developed than in *H. wilderi*). Gas bladder triangular posteriorly, each posterior chamber extended into a short terminal diverticulum sharing medial septum with its pair and possessing smaller lateral diverticula.

Osteology. Osteological features of head and anterior body in Fig. 11; hyoid and branchial skeleton in Fig. 12; pectoral girdle

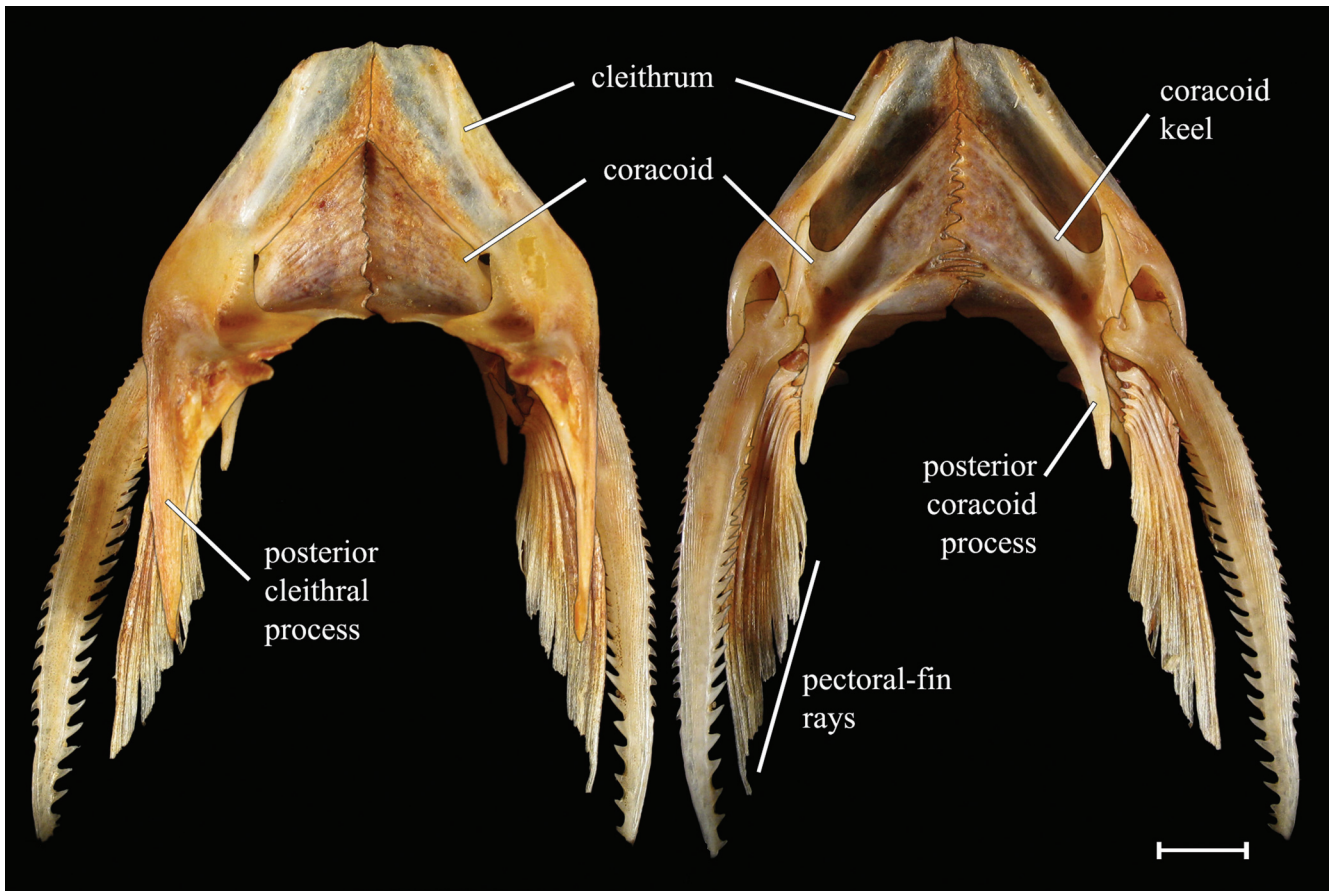


Fig. 13. Pectoral girdle in dorsal (left) and ventral (right) views of *Hassar orestis*, MZUSP 105827, 144.7 mm SL. Scale bar = 5 mm.

in Fig. 13; pelvic girdle in Fig. 14. Cranial roof bones and nuchal plates well developed and ornamented with delicate small grooves and striae; relatively straight between orbits and triangularly arched (almost reaching 90°) near dorsal-fin origin.

Mesethmoid extremely elongate, arrow-shaped with paired median lateral processes and sharp anterior tip (bifid only in juveniles), lacking cornua for articulation with premaxillae; dorsal profile concave in lateral view, especially near median lateral processes. Lateral ethmoid long, rectangular, participating in externally visible portion of cephalic shield and contacting infraorbital 1 anterolaterally. Nasal long, tubular, reaching to median lateral process of mesethmoid anteriorly.

Cranial fontanel divided by epiphyseal bar into a large, elongate anterior opening beginning at mesethmoid, and a smaller posterior opening extended posteriorly as a narrow V-shaped notch in anterior margin of parieto-supraoccipital; lateral margins of cranial fontanel bordered by frontals.

Dorsal half of orbit rounded, distinctly concave in dorsal view, completed by lateral ethmoid, frontal and sphenotic. Four infraorbitals; first one long and slender, with anterior wing extended well beyond concavity for anterior naris, articulating with the lateral border of the mesethmoid immediately anterior to median lateral process; remaining infraorbitals long, tubular, completing orbit.

Sphenotic with well-developed lateral process (articulated

with infraorbital 4). In a few specimens (ANSP 165493, 166595) there is a small gap in the sutural joint of the sphenotic, parieto-supraoccipital and frontal bones. Epioccipital forming lateral border of cranium, and with well-developed laminar posterior process, composed of a vertical portion (distally dilated and sutured to posterior nuchal plate) and a horizontal portion. Anterior nuchal plate reduced to a small diamond-shaped bone surrounded by parieto-supraoccipital and middle nuchal plate. Nuchal foramina wide, somewhat triangular, enclosed by parieto-supraoccipital, epioccipital and middle nuchal plate. In most specimens, there is a small foramen between pterotic, posttemporo-supracleithrum and epoccipital.

Vomer with reduced anterolateral processes, and with anterior portion enclosed by expanded mesethmoid. Parasphenoid long, anterior tip bifid, posterior portion small. Cranium with well-developed ventral keel between orbits, greatly formed by enlarged orbitosphenoid. Optic foramen bounded by pterosphenoid and parasphenoid. Trigemino-facial foramen enclosed by pterosphenoid and prootic. Basioccipital with laminar ventral extension sutured to ventral extension of transcapular process and forming a thin ring-like arch surrounding the aorta.

Premaxilla small, somewhat triangular with apex articulating with mesethmoid, and ventral face with small concave patch with few acicular teeth. Maxilla relatively long, curved inward.

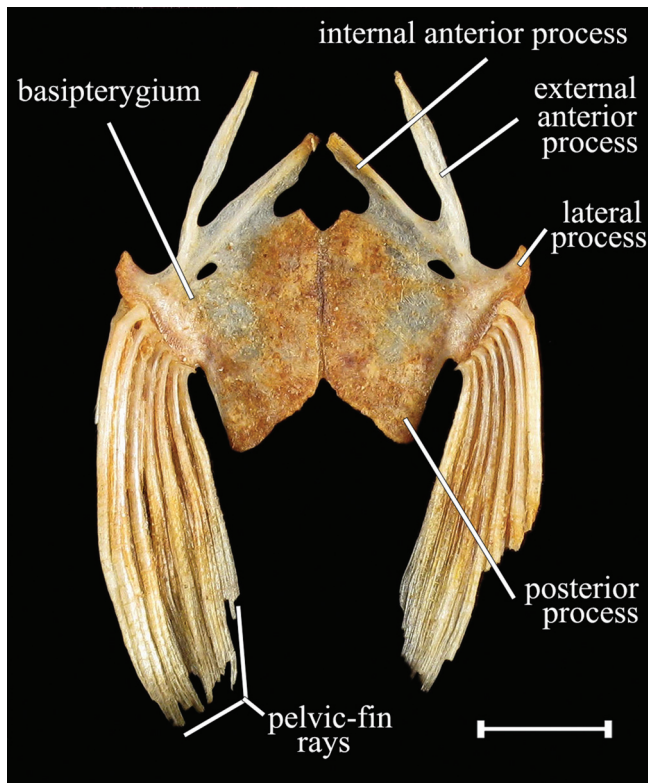


Fig. 14. Pelvic girdle in dorsal view of *Hassar orestis*, MZUSP 105827, 144.7 mm SL. Scale bar = 5 mm.

Autopalatine extremely elongate, rod-like, with weakly dilated ends. Dentary with small patch of acicular teeth. Coronomeckelian bone extended, sutured to both dentary and anguloarticular. Mandibular sensory branch with three pores on lower jaw.

Suspensorium elongate; hyomandibula elongate with laminar medial extension restricted to anterior portion; metapterygoid small, somewhat triangular, medially surrounded by expanded entopterygoid, which is medially connected to lateral ethmoid. Opercle subtriangular, contacting relatively large interopercle.

Urohyal small, with well-developed ventral process. Ventral hypohyal large, elongate, with somewhat spiny anterior tip, joined to anterior ceratohyal via suture on anterior face, cartilage posteriorly. Dorsal hypohyal much smaller, with acute posterior margin. Small fenestra enclosed by ventral and dorsal hypohyal. Anterior ceratohyal rod-like with dilated tips, anteriorly expanded by a small process sutured to ventral hypohyal, posteriorly joined to posterior ceratohyal via cartilage and suture. Seven branchiostegal rays, five attached to anterior ceratohyal and two to interceratohyal cartilage.

Five branchial arches, elongate. Three basibranchials (first one absent); basibranchials two and three elongate, ossified with cartilaginous caps; fourth one longest, cartilaginous. Three hypobranchials; first and second ones elongate, ossified with cartilaginous caps (in specimens ≥ 80 mm SL), or broad with continuous cartilaginous margin (in specimens

≤ 60 mm SL); third one short and broad, cartilaginous, medially attached between basibranchials three and four. Five ceratobranchials; first four narrow, elongate, ossified with cartilaginous caps; dorsal half of cartilaginous cap of fourth ceratobranchial expanded anteriorly as narrow process parallel to fourth basibranchial; fifth ceratobranchial with narrow proximal stalk and oval tooth patch (bearing many acicular teeth) with laminar lateral border. Five epibranchials; first four elongate, ossified with cartilaginous caps; third one with small posterior process; fifth one small, rod-like, cartilaginous. Two pharyngobranchials, first two absent; third elongate, ossified with cartilaginous caps; fourth small, ossified portion semicircular with rounded margin capped in cartilage, connected to second pharyngobranchial and third and fourth epibranchials and supporting lenticular plate with many acicular teeth. Accessory pharyngobranchial cartilage small, rectangular, connected to first two epibranchials and second pharyngobranchial.

Total vertebrae 35 (n=1) or 36 (n=3). Centra 1-5 fused into the Weberian complex, sixth and seventh centra completely sutured to complex centra, eighth centrum partially sutured into seventh (remnant of intervertebral disk between seventh and eighth centrum present). Aortic passage completely enclosed by superficial ossifications. Müllerian ramus with ossified proximal portion oval-shaped in outline, narrower distal end gradually transitioning into spherical cartilaginous knob directed posteroventrally into anterior chamber of gas bladder. Fifth centrum either lacks or possesses process-like parapophyses. Vertebrae 6-14 (n=3) or 6-15 (n=1) bearing distinct pairs of simple ribs. Eight (n=4) dorsal-fin pterygiophores, 11 (n=4) pelvic-fin pterygiophores; 13 (n=4) dorsal and 12 (n=1) or 13 (n=3) ventral caudal-fin procurent rays. Caudal fin with hypural fusion pattern PH; HY 1+2; HY 3+4; HY 5 (1 abnormal specimen [MZUSP 105837] with HY3 and HY4 distinct); hypurapophyses Type C (*sensu* Lundberg and Baskin, 1969:15).

Pectoral girdle subtriangular in ventral view, elongated anteriorly with broad, truncate anterior margin, lateral margins slightly concave. Coracoid posterior process moderate in size. Ventral surface of pectoral girdle completely covered by muscle and skin (not visible externally). *Abductors superficialis* and *arrector ventralis* muscles separated by oblique (approximately at 45° in relation to body axis) bony crest on ventral face of coracoid. Posterior cleithral process subtrapezoidal, in lateral view, deep with obtuse posterior margin.

Basipterygium with internal anterior process partially incorporated into main body of basipterygium; external anterior process distinct, rod-like, moderately long; ossified posterior process well developed, with acute posterior tip attenuated by cartilage.

Coloration. In alcohol, head and body tan to brown, or grey, countershaded. Faint dark stripe from anterior margin of upper lip to anterior margin of eye. A conspicuous dark blotch on the first three branched dorsal-fin rays and membranes, blotch



Fig. 15. *Hassar orestis*, MZUSP 103327, 106.5 mm SL, rio Jari, Monte Dourado, PA, photographed live.

starting from midlength of rays and membranes and almost reaching their distal tips, which are pale. Tip of upper caudal-fin lobe usually darkened.

In life, ground color yellowish or greenish laterally and white ventrally; lower lip pinkish (Fig. 15). Eye silvery, distinctly contrasted with pale surrounding adipose tissue.

Distribution. *Hassar orestis* is distributed in the Amazon, Orinoco and Essequibo river basins, in Bolivia, Brazil, Colombia, Guyana, Peru, and Venezuela, particularly in the Amazon lowlands (Fig. 6). *Hassar orestis* is apparently absent in the upper Tapajós, middle and upper Xingu, and Tocantins basins.

Ecology. Specimens of *Hassar orestis* are usually collected in swift water over sandy beaches (substrate sometimes with fine gravel or mud), and often in the main channel of large rivers. Mature males of *H. orestis* develop an elongate and flexible extension to dorsal-fin spine.

Etymology. Named in honor of Orestes Saint John, member of the Thayer expedition who collect the types specimens of *Hassar orestis*. The species name was given by Louis Agassiz, the leader of the Thayer Expedition, as indicated by Steindachner in the original description: “*Oxydoras Orestis* Agass. in lit.” “...von Herrn Orestes Santi-John gesammelt, und letzterem zu Ehren bezeichnete Prof. Agassiz diese schöne Art *Oxydoras Orestis*...” (=Orestes Saint John, in honor to whom Prof. Agassiz described *Oxydoras orestis*).

Remarks. *Hassar orestis* was described based on specimens collected in two localities: rio Xingu near rapids (“bei den Wasserfällen”, or as it appears on the label “Xingu, Cascades”) and rio Iça. The Thayer Expedition collected fishes at two localities in the rio Xingu, at Porto de Moz, near the mouth of the rio Xingu, and “Cascades”. The latter locality probably refers to some place in the rio Xingu near Belo Monte, just downstream of the Volta Grande rapids, where the rio Xingu

begins (upstream) to have rocky bottom and rapids. Examined specimens from Belo Monte are identical to the types of *Hassar orestis* in overall morphology, and herein referred to as *Hassar orestis*. The Volta Grande rapids seem to be the upstream geographical limit of *Hassar orestis* in the Xingu basin.

Steindachner (1875) described *Oxydoras orestis*, currently *Hassar orestis*, noting morphometric differences between juveniles and adults. According to him, juveniles have shorter snout and vestigial adipose eyelid. Both characters are corroborated in this study.

Eigenmann (1912, 1925) proposed *Hemidoras notospilus*, from the Essequibo River in Guyana, as a valid species. The holotype of *H. notospilus* (FMNH 53184) is currently missing (Sabaj & Ferraris, 2003:461; Sabaj Pérez, pers. comm. 2011), but the specimen is clearly assignable to *Hassar* based on Eigenmann’s (1912) illustration (Plate 19, fig. 2), and is also a juvenile, with a length (probably TL) reported as 7 cm (Eigenmann, 1912: 196). The only difference between specimens from the Essequibo River is that most individuals have tympanal and infranuchal scutes with emergent median thorns, whereas most examined specimens from the Amazonas-Solimões and Negro basins lack this feature. In the absence of other conspicuous differences between specimens from the Essequibo River and other localities, we agree with previous authors (e.g., Sabaj & Ferraris, 2003) in considering *Hemidoras notospilus* a junior synonym of *Hassar orestis*.

Fowler (1940) described *Hassar ucayalensis* from the rio Ucayali, upper Amazon basin in Peru. Comparisons of juveniles and adults of *H. orestis* with the holotype of *H. ucayalensis* (SL= 6.89 cm; ANSP 68647) revealed only a difference in the number of secondary maxillary barbels (8-16 in *H. orestis* vs. 3 in the holotype of *H. ucayalensis*). We believe that the reduced number of maxillary-barbel fimbriae might be best attributed to damaging and poor preservation of the holotype of *H. ucayalensis*. In the absence of additional differences that we could identify, the suspicion of Sabaj &

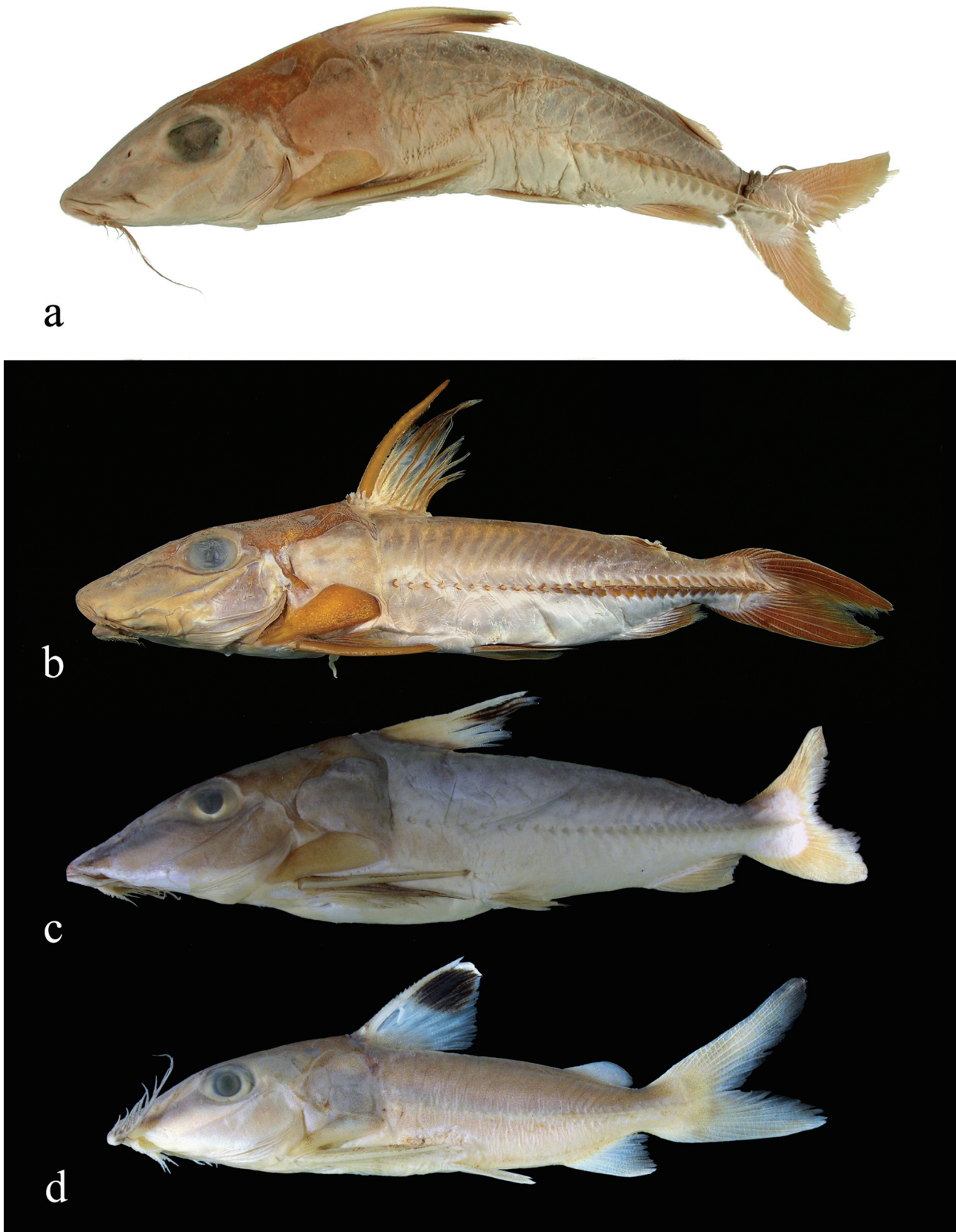


Fig. 16. *Hassar wilderi*: (a) SU 2243, 157.7 mm SL (lectotype of *Hassar wilderi*, photo available from CAS website), (b) ANSP 69393, 135.6 mm SL (holotype of *Hassar iheringi*, photo by Mark Sabaj Pérez), (c) MZUSP 52394, 168.3 mm SL, rio Araguaia, Bandeirantes, MT, (d) MZUSP 52418, 68.2 mm SL, rio Araguaia, between Araguaiana and Itaiacú, MT.

Ferraris (2003) that *H. ucayalensis* is a junior synonym of *H. orestis* is corroborated. To avoid further taxonomic changes, we herein designated as lectotype of *Hassar orestis* a specimen from rio Iça in the upper Brazilian Amazon, near the Peruvian Amazon.

***Hassar wilderi* Kindle, 1895**
Fig. 16

Hassar wilderi Kindle, 1895: 251 [type locality: Trocera on Tocantins [=likely rio Tocantins at Trocará Indigenous territory, c.20 km downstream from Tucuruí, Tucuruí, PA, Brazil].—Kindle, 1893: 72 [name appeared as a *nomen nudum*].—Eigenmann, 1925: 355, pl. 22, fig. 2 [identification key, illustration].—Gosline, 1945: 23 [literature compilation].—Fowler, 1951: 492 [literature compilation].—Myers & Weitzman, 1956 [Lectotype designation].—Santos *et al.*, 1984: 51 [identification key, description, Tucuruí reservoir].—Burgess, 1989: 222 [literature compilation].—Eschmeyer, 1998: 1792 [literature compilation].—Sabaj & Ferraris, 2003: 461 [literature compilation].—Ferraris, 2007: 171 [literature compilation].—Birindelli *et al.*, 2009: 276 [gas bladder morphology].—Mérona *et al.*, 2010: 53 [ecology].

Hassar iheringi Fowler, 1941a: 140 [type locality: Rio Parnahyba, Therezina, Piahy (=rio Parnaíba, Terezina, PI, Brazil, probably a wrong locality, see Remarks)].—Gosline, 1945: 23 [literature compilation].—Fowler, 1951: 491 [literature compilation].—Burgess, 1989: 218 [literature compilation].—Eschmeyer, 1998: 760 [literature compilation].

Type-specimens. ANSP 69393 (1, 135.6 mm SL, holotype of *Hassar iheringi*); ANSP 69394-69395 (2, 116.8-144.0 mm SL, paratypes of *Hassar iheringi*); rio Parnaíba, Teresina, PI, 1936, R. von Ihering [probably a wrong locality, see Remarks]. SU 2243 (1, 157.7 mm SL, lectotype of *Hassar wilderi*, ex. CU 1704); CAS 60710 (1, 181.2 mm SL, paralectotype of *Hassar wilderi*, ex. CU 1705); CAS 60711 (1, 139.5 mm SL, paralectotype of *Hassar wilderi*, ex. CU 1703); Trocera on Tocantins (=likely rio Tocantins at Trocará Indigenous territory, c.20 km downstream from Tucuruí, Tucuruí, PA, Brazil), 1870-1876, F. C. Hartt.

Non-type specimens. Tocantins basin (Brazil): ANSP 178700 (1, 152.7 mm SL), Araguaia basin, c. 13°14'S 50°35'W, Luis Alves, GO, Apr 1994, F. L. T. Garro. INPA 20109 (1, 178.9 mm SL), lago Volta Grande, Caseara, TO, May 2000. MPEG 1027 (1, 126.9 mm SL), Aragarças, GO, Jan 1958, Hidas. MZUSP 4857 (1 c&s, 101.0 mm SL), rio Araguaia, c. 14°55'S 51°5'W, Aruanã, GO, Sep 1966, Excursão do Departamento de Zoologia [H. A. Britski *et al.*]. MZUSP 46016 (2, 65.8-83.3 mm SL), Araguaia basin, c. 14°55'S 51°5'W, Aruanã, GO. MZUSP 49177 (1, 105.2 mm SL), Araguaia basin, c. 10°35'S 50°34'W, Santa Terezinha, MT, Oct 1964, H. A. Britski. MZUSP 49178 (1, 169.9 mm SL), rio Tocantins, c. 3°46'S 49°41'W, Tucuruí, PA. MZUSP 49180 (3, 136.5-150.0 mm SL), lago Dumbá Grande, Araguaia basin, MT, 1976. MZUSP 49182 (1, 147.9 mm SL), rio Tocantins, Barra de Tapirapé, MT. MZUSP 49185 (2, 116.9-135.7 mm SL), rio Tocantins, c. 2°50'S 49°40'W, Baião, PA, Sep 1970. MZUSP 49186 (3, 112.2-152.2 mm SL), Araguaia basin,

c. 14°55'S 51°5'W, Aruanã, GO. MZUSP 52315 (2, 157.6-173.1 mm SL), Araguaia basin, c. 14°55'S 51°5'W, Aruanã, GO. MZUSP 52336 (4, 172.0-185.6 mm SL), Araguaia basin, Cocalinho, MT. MZUSP 52432 (1, 178.2 mm SL), Araguaia basin, c. 14°55'S 51°5'W, Aruanã, GO. MZUSP 52359 (1, 183.4 mm SL), beach between Bandeirantes and Luis Alves, c. 13°40'S 50°48'W, Luis Alves, GO, Jul 1997. MZUSP 52394 (4, 161.0-188.4 mm SL), Bandeirantes, MT. MZUSP 52408 (1, 165.8 mm SL), Itaiacú, MT. MZUSP 52418 (1, 71.3 mm SL), between Araguaiana and Itaiacú, MT. MZUSP 53817 (2, 130.5-137.6 mm SL), near Aldeia Fontora, MT. MZUSP 53819 (6, 97.6-116 mm SL), lago da Pedra, MT. MZUSP 53825 (6, 83.7-166.2 mm SL), lago das Branquinhas, MT, Feb 1998. MZUSP 53835 (1, 159.6 mm SL), Araguaiana, MT. MZUSP 54194 (1, 85.6 mm SL), rio Cristalino, MT. MZUSP 54284 (2, 101.6-123.8 mm SL), between Araguaiana and Itaiacú, MT. MZUSP 54296 (2, 99.5 mm SL), Araguaia basin, São Félix do Araguaia, MT, Nov 1997. MZUSP 54451 (1 sk, not measured), rio Cristalino, MT, Oct 1997, Coleção rio Araguaia. MZUSP 61987 (1, 111.2 mm SL), rio Tocantins, c. 3°42'S 49°27'W, Tucuruí, PA. MZUSP 62794 (4, 76.9-90.8 mm SL), Araguaia basin, c. 14°22'S 51°0'W, Cocalinho, MT, Jun 1997, W. Severi *et al.* MZUSP 62998 (5, 141-165.7 mm SL), Araguaia basin, Barra do Garças, 15°52'3"S 51°58'17"W, Ouro Fino, MT. MZUSP 63020 (4, 83.4-164.2 mm SL), Araguaiana, near mouth rio das Mortes (Pontal), MT. MZUSP 63148 (2, 152.4-154.3 mm SL), rio das Mortes, Capitariguara, 14°30'22"S 51°52'29"W, Nova Xavantina, MT. MZUSP 84205 (1, 157 mm SL), rio Tocantins, Tucuruí, PA. MZUSP 86216 (7, 72.4-157 mm SL), Araguaia basin, Cocalinho, 14°17'20"S 51°9'12"W, MT. MZUSP 86782 (7, 142.2-162.0 mm SL), Araguaia basin, Cocalinho, 14°24'11"S 50°59'27"W, MT, Oct 2004, J. L. Birindelli *et al.* MZUSP 89187 (10, 128.9-165.7 mm SL), Araguaia basin, 14°25'33"S 50°59'40"W, Cocalinho, MT, Jul 2005, C. Chamon *et al.* MZUSP 89620 (3, 113.8-127.2 mm SL), rio Verde, 13°9'28"S 50°30'22"W, Luis Alves, GO, Apr 2004, A. Akama. UMMZ 203401 (1, 138.6 mm SL), Baiaom, PA, Jul 1935, H. W. Curran.

Diagnosis. *Hassar wilderi* is distinguished from *H. orestis* by having 9th through 14th, modally 12th, midlateral scute as the anteriormost with median thorn (vs. 1st through 8th, modally 3rd), and tip of upper caudal-fin lobe rarely darkened (vs. usually darkened). *Hassar wilderi* is distinguished from *H. affinis* and *H. gabiru* by having gas bladder with many well-branched diverticula on margins of the entire bladder (vs. gas bladder with two rounded or weakly-branched diverticula restricted to each side of anterior chamber of the gas bladder [rarely one extra pair on the posterior chambers]), and gas bladder triangular posteriorly, each posterior chamber extended into a short terminal diverticulum sharing medial septum with its pair (vs. gas bladder posteriorly rounded, lacking terminal diverticula) (Fig. 4). *Hassar wilderi* is further distinguished from *Hassar affinis* by having the first branched dorsal-fin rays and membranes pale (vs. first branched dorsal-fin rays and membranes distally darkened).

Description. Morphometric data are summarized in Tables 3 and 4; morphometric data for type specimens in Table 4; type and non-type specimens illustrated in Fig. 16. Largest specimen examined 188.4 mm SL (MZUSP 52394). Dorsal profile of head rising moderately, evenly (usually in smaller

Table 1. Morphometric data for non-type specimens of the *Hassar affinis* and *H. gabiru*. SD = standard deviation.

	<i>Hassar affinis</i>				<i>Hassar gabiru</i>			
	N	Range	Mean	SD	N	Range	Mean	SD
Standard length (SL)	52	74.8-197.6			13	81.85-156.6		
	Percent of standard length							
Head length (HL)	52	31.29-37.09	33.11	1.30	13	29.89-43.17	32.56	3.31
Predorsal distance (PdD)	52	38.85-47.35	42.35	1.72	13	40.19-56.02	43.12	3.98
Prepectoral distance (PpD)	52	27.12-33.44	29.66	1.49	13	28.04-36.91	29.50	2.33
Prepelvic distance	52	52.92-59.31	55.92	1.48	13	54.91-57.60	56.38	0.85
Preanal distance	52	72.01-77.86	74.78	1.27	13	16.04-96.17	78.84	5.32
Body depth at dorsal-fin origin (BD)	52	20.32-25.94	23.88	1.45	13	24.26-33.13	25.78	2.30
Body depth at 10 th scute (BD10)	47	16.60-21.60	19.12	1.36	13	17.39-24.33	19.13	1.72
Body depth at anal-fin origin	52	13.34-18.17	16.09	1.16	13	15.93-20.66	17.31	1.27
Dorsal-fin spine length (DSL)	45	24.09-32.99	28.82	2.21	13	23.80-30.46	26.25	1.71
Dorsal-fin lobe length	39	23.16-30.44	26.80	2.09	12	24.65-31.35	27.24	1.78
Dorsal-fin base length	52	12.44-15.18	13.80	0.72	13	12.56-20.28	24.08	2.05
Distance from dorsal-fin origin to adipose-fin terminus (DOAD)	52	43.36-49.58	46.74	1.48	11	46.63-51.90	49.42	1.83
Adipose-fin base length (AdFB)	52	6.62-11.53	9.62	1.11	13	9.09-11.79	10.17	0.89
Distance from adipose-fin terminus to caudal-fin origin (AdCD)	52	15.20-19.06	16.91	0.78	13	12.99-15.84	14.81	0.74
Pectoral-fin spine length (PSL)	47	17.16-29.33	25.54	2.31	13	18.44-34.16	26.85	4.14
Distance from pectoral-fin origin to pelvic-fin origin (PPD)	52	18.93-28.90	25.78	1.81	13	23.12-34.93	28.38	2.68
Pelvic-fin lobe length (PFL)	46	10.42-18.01	16.06	1.23	13	16.09-19.19	17.56	0.9
Distance from pelvic-fin origin to adipose-fin origin (PAD)	52	17.30-22.12	19.78	1.46	13	13.01-26.12	22.21	3.55
Anal-fin base length (AnFB)	52	9.95-14.10	11.58	0.80	13	10.66-12.82	11.54	0.71
Distance from anal-fin terminus to caudal-fin origin (AnCD)	52	14.12-17.58	15.78	0.77	13	11.64-15.27	13.32	0.96
Caudal-peduncle depth (CPD)	52	6.09-7.78	7.03	0.35	13	6.55-8.63	7.07	0.56
	Percent of body depth at 10 th midlateral scute							
Depth of 10 th scute (PD10)	11	3.08-5.11	4.11	0.72	13	4.63-8.99	6.12	1.23
	Percent of head length							
Body width at opercle (BWO)	52	44.27-54.64	49.71	2.42	13	48.11-56.58	53.71	2.54
Body width at nuchal shield (BWNP)	52	24.27-31.11	27.17	1.70	13	25.28-27.28	26.24	0.64
Body width at cleithrum (CW)	52	55.59-70.63	63.24	2.86	13	61.62-69.79	67.10	2.66
Adipose-eye diameter (AED)	52	24.00-39.13	30.41	2.53	13	24.37-33.39	29.75	2.39
Eye diameter (ED)	52	19.72-29.14	25.27	2.38	13	18.86-27.00	24.02	2.33
Snout length (SnL)	52	43.12-53.61	50.42	2.70	13	49.43-58.88	53.37	2.69
Distance from snout to anterior nare (SAND)	52	21.01-29.17	25.83	1.81	13	21.56-27.04	24.58	1.60
Distance from snout to posterior nare (SPND)	52	35.42-41.07	38.36	1.14	13	34.65-39.42	37.93	1.52
Distance from snout to terminus of adipose eye (SPOD)	52	73.18-83.33	78.85	2.16	13	77.75-83.27	81.02	1.81
Distance from terminus of adipose eye to terminus of nuchal shield (PL)	52	49.44-59.76	54.76	2.37	13	52.51-61.54	56.31	2.59
Distance from anterior nares to terminus of adipose eye (ANPOD)	52	48.46-58.70	52.53	1.74	13	54.48-60.74	56.04	1.58
Distance from posterior nares to terminus of adipose eye (PNPOD)	52	35.70-46.38	40.65	1.88	13	42.09-45.80	43.28	1.01
Interorbital width (IW)	52	12.58-25.17	19.77	2.42	13	17.31-22.98	19.58	1.47
Length of posterior cleithrum process (PcPL)	52	32.76-43.60	39.02	2.57	13	36.14-43.78	39.56	2.05
Depth of posterior cleithrum process (PcPD)	52	14.52-21.15	17.30	1.42	13	17.46-20.59	19.24	1.12
Horizontal length of nuchal foramina	49	4.31-9.86	6.41	1.14	13	4.80-7.84	6.25	0.98

specimens) or slightly convex (especially in larger specimens) from snout tip to anterior margin of orbit, and relatively straight from that point to the dorsal-fin spine. Dorsal profile of body descending gradually, approximately straight from dorsal-fin spine to caudal peduncle. Ventral contour shallowly concave from snout tip to pectoral girdle, and slightly convex from that point to caudal peduncle. Caudal peduncle short with shallow hourglass shape in lateral view.

Body elongate with prominent conical snout. Mouth subterminal, each premaxilla bearing small patch of approximately 5 to 10 acicular teeth, and each dentary with approximately 10 to 20 acicular teeth. Oval orbit with weakly developed adipose eyelid in juveniles (SL ≤ 14 cm), extended slightly beyond anterior and posterior limits of eye, and moderately developed in adults (SL > 14 cm), extended slightly further anteriorly than in juveniles. Eyes positioned about half way between tip of snout and dorsal-fin origin.

Three pairs of barbels (maxillary, inner and outer mental), all fimbriate. Maxillary barbel usually reaching base of first pectoral-

fin ray; with 8 to 13 (mode 10, n=66) fimbriae along ventrolateral face. Inner and outer mentonian barbels of approximately equal size, covered with many rounded papillae, and falling short of ventralmost opening of gill slit.

Gill rakers small on first gill arch, absent on remaining arches. Accessory branchial lamellae on inner face of first gill arch well developed in approximately ten rows from insertion of rakers to origin of branchial filaments (but not contacting the latter); accessory lamellae gradually reduced on remaining (second to fifth) gill arches.

Lateral-line tubules ossified, forming row of 31 to 34 (mode 32, n=60) midlateral scutes beginning with infranuchal. Three tympanal scutes, inconspicuous, usually without emergent thorn. Infranuchal scute with dorsal wing extremely thin and ventral wing dilated, expanded anteriorly, connected to posterior cleithral process; scute usually without medial thorn. Postinfranuchal scutes reduced anteriorly, non-overlapping; each with posterior margin bicuspid (without medial thorn) or tricuspid (including medial thorn), latter condition usually

Table 2. Morphometric data for type specimens of the *Hassar affinis* and *H. gabiru*. SD = standard deviation.

	<i>Hassar affinis</i>		<i>Hassar gabiru</i>
	<i>Hassar affinis</i>	<i>Hassar woodi</i>	Holotype
	Holotype NMW 45394	Holotype ANSP 69392	MZUSP 108440
Standard length (SL) (mm)	123.0	201.6	130.4
	Percent of standard length		
Head length (HL)	30.70	32.44	32.99
Predorsal distance (PdD)	39.55	42.36	42.70
Prepectoral distance (PpD)	28.90	29.76	28.31
Prepelvic distance	54.31	55.95	55.74
Preanal distance	75.98	76.19	77.29
Body depth at dorsal-fin origin (BD)	21.05	23.12	24.85
Body depth at 10 th scute (BD10)	18.29	18.40	18.24
Body depth at anal-fin origin	15.46	15.48	16.23
Dorsal-fin spine length (DSL)			26.62
Dorsal-fin lobe length	25.36		27.02
Dorsal-fin base length	12.00	13.05	13.83
Distance from dorsal-fin origin to adipose-fin terminus (DOAD)	49.51	45.54	48.87
Adipose-fin base length (AdFB)	8.70	9.82	11.79
Distance from adipose-fin terminus to caudal-fin origin (AdCD)	15.88	16.77	14.95
Pectoral-fin spine length (PSL)		22.77	29.10
Distance from pectoral-fin origin to pelvic-fin origin (PPD)	26.31	26.09	28.41
Pelvic-fin lobe length (PFL)	13.53	13.69	17.99
Distance from pelvic-fin origin to adipose-fin origin (PAD)	21.58	21.58	22.99
Anal-fin base length (AnFB)	12.23	11.41	11.17
Distance from anal-fin terminus to caudal-fin origin (AnCD)	13.64	15.53	14.01
Caudal-peduncle depth (CPD)	7.14	6.55	6.55
	Percent of body depth at 10 th midlateral scute		
Depth of 10th scute (PD10)	4.66	5.10	6.73
	Percent of head length		
Body width at opercle (BWO)		48.17	54.53
Body width at nuchal shield (BWNP)		24.92	26.20
Body width at cleithrum (CW)	67.00	63.61	64.39
Adipose-eye diameter (AED)	33.78	24.31	30.29
Eye diameter (ED)	30.02	19.72	23.31
Snout length (SnL)	49.52	58.56	54.37
Distance from snout to anterior nare (SAND)	23.25	28.44	24.90
Distance from snout to posterior nare (SPND)	38.13	41.28	38.05
Distance from snout to terminus of adipose eye (SPOD)	81.53	81.04	80.24
Distance from terminus of adipose eye to terminus of nuchal shield (PL)	57.63	54.59	52.67
Distance from anterior nares to terminus of adipose eye (ANPOD)	57.34	52.45	54.70
Distance from posterior nares to terminus of adipose eye (PNPOD)	43.68	40.67	42.52
Interorbital width (IW)	20.02	24.16	19.80
Length of posterior cleithrum process (PcPL)	44.45	37.61	38.47
Depth of posterior cleithrum process (PcPD)	20.50	18.35	19.60
Horizontal length of nuchal foramina	7.31		6.76

starting at 12th scute (range 9th through 14th, n=60); medial thorn and dorsal and ventral wings gradually increasing in size posteriorly; scutes with serrated posterior margin and overlapping on last third of body.

Dorsal-fin II,6 (n=67), triangular with distal margin approximately straight, vertical when erected. Dorsal-fin spine slightly compressed and curved, with relatively small antrorse serrations along anterior margin (serrations reduced or absent on distal third); slightly larger retrorse serrations along posterior margin (serrations absent on proximal portion). Pectoral fin modally I,9, range I,7-9 (n=67); distal margin straight, oblique relative to body axis. Pectoral-fin spine slightly depressed and curved, with antrorse serrations along anterior margin (serrations absent on distal third); slightly larger retrorse serrations along posterior margin (serrations larger distally). Pelvic fin i,6 (n=66); distal margin rounded. Anal fin modally iii,7, range ii-v,6-9 (n=65); subtriangular with scarcely rounded

distal margin. Adipose fin relatively small, teardrop-shaped, with rounded free posterior margin. Caudal fin i,7/8,i (n=67, rarely i,6/8,i or i,7/9,i), distinctly forked, with lobes approximately equal in size.

Gas bladder (Fig. 4) moderately large, cordiform. Bundles of diverticula present along the anterior, lateral, and posterior margins of the entire bladder in small specimens (≤ 50 mm SL); diverticula become thinner and more branched in larger specimens. Gas bladder triangular posteriorly, each posterior chamber extended into a short terminal diverticulum sharing medial septum with its pair and possessing smaller lateral diverticula.

Osteology. Osteology generally similar to that described for *Hassar orestis*, excepting differences as follows. Total vertebrae 36 (n=1), vertebrae 6-14 bearing ribs. Eight (n=1) dorsal-fin pterygiophores, 11 (n=1) pelvic-fin

Table 3. Morphometric data for non-type specimens of the *Hassar orestis* and *H. wilderi*. SD = standard deviation.

	<i>Hassar orestis</i>				<i>Hassar wilderi</i>			
	N	Range	Mean	SD	N	Range	Mean	SD
Standard length (SL)	101	43.9-246.8			67	65.8-188.4		
	Percent of standard length							
Head length (HL)	101	29.95-42.67	34.04	2.30	67	30.36-37.13	33.20	1.32
Predorsal distance (PdD)	101	29.42-46.27	43.25	1.38	67	38.34-46.50	42.84	1.60
Prepectoral distance (PpD)	101	25.05-32.22	30.32	1.26	67	24.62-35.03	30.03	1.48
Prepelvic distance	101	52.45-57.55	55.33	1.29	67	53.69-59.30	56.22	1.31
Preanal distance	101	70.62-77.10	74.73	1.43	67	71.94-81.60	75.63	1.51
Body depth at dorsal-fin origin (BD)	101	16.82-22.19	21.11	0.83	67	21.56-25.55	23.56	0.86
Body depth at 10 th scute (BD10)	100	12.44-17.51	15.63	1.19	61	16.18-21.44	18.39	1.01
Body depth at anal-fin origin	101	9.97-14.68	13.14	0.93	65	13.00-17.90	15.22	0.86
Dorsal-fin spine length (DSL)	71	18.98-27.08	24.53	1.40	55	17.11-27.96	25.14	1.74
Dorsal-fin lobe length	95	15.28-25.81	22.15	1.74	63	20.05-28.08	23.88	1.80
Dorsal-fin base length	101	10.50-13.03	12.23	0.35	67	12.04-16.47	13.08	0.67
Distance from dorsal-fin origin to adipose-fin terminus (DOAD)	101	42.22-48.52	45.26	1.31	66	43.32-52.62	47.41	1.93
Adipose-fin base length (AdFB)	101	5.07-11.49	8.69	1.07	64	6.79-10.83	8.66	0.99
Distance from adipose-fin terminus to caudal-fin origin (AdCD)	101	12.94-18.01	16.51	0.81	66	14.25-18.75	16.04	0.83
Pectoral-fin spine length (PSL)	82	17.44-29.15	25.5	1.40	60	22.62-27.36	24.72	1.18
Distance from pectoral-fin origin to pelvic-fin origin (PPD)	101	22.25-26.88	24.74	0.95	67	23.93-29.00	26.13	1.16
Pelvic-fin lobe length (PFL)	88	11.16-16.08	14.25	0.78	63	12.10-17.49	15.43	1.09
Distance from pelvic-fin origin to adipose-fin origin (PAD)	101	17.05-21.29	19.58	1.03	67	16.49-23.03	20.31	1.31
Anal-fin base length (AnFB)	101	6.41-12.89	11.19	0.74	67	7.27-12.57	10.95	0.82
Distance from anal-fin terminus to caudal-fin origin (AnCD)	101	10.95-17.02	15.80	0.81	67	11.55-17.81	15.14	0.92
Caudal-peduncle depth (CPD)	101	4.25-6.44	5.50	0.44	67	5.73-7.68	6.52	0.37
	Percent of body depth at 10 th midlateral scute							
Depth of 10 th scute (PD10)	87	6.15-18.00	12.85	2.73	56	3.24-8.15	5.30	1.14
	Percent of head length							
Body width at opercle (BWO)	101	33.56-51.70	45.25	2.82	67	45.06-54.94	48.67	2.14
Body width at nuchal shield (BWNP)	101	15.86-37.37	22.99	3.51	67	20.54-26.32	23.13	1.20
Body width at cleithrum (CW)	101	45.02-65.99	58.31	4.19	67	54.36-68.58	61.10	2.85
Adipose-eye diameter (AED)	101	23.23-35.93	29.52	3.21	67	23.69-35.02	28.31	2.46
Eye diameter (ED)	101	15.03-35.83	24.74	4.90	67	18.47-30.88	23.34	2.77
Snout length (SnL)	91	38.38-60.07	52.23	5.64	67	47.47-60.40	54.98	2.79
Distance from snout to anterior nare (SAND)	91	18.86-30.99	26.49	3.23	67	22.38-32.38	27.45	1.90
Distance from snout to posterior nare (SPND)	101	25.24-45.07	34.57	7.34	67	35.02-42.16	39.02	1.55
Distance from snout to terminus of adipose eye (SPOD)	91	59.93-85.11	79.99	6.33	67	77.17-84.12	81.00	1.44
Distance from terminus of adipose eye to terminus of nuchal shield (PL)	91	42.75-60.96	51.06	4.50	67	48.78-60.08	53.32	2.53
Distance from anterior nares to terminus of adipose eye (ANPOD)	101	40.40-59.36	52.81	3.54	67	49.91-58.40	53.16	1.82
Distance from posterior nares to terminus of adipose eye (PNPOD)	100	30.30-44.39	39.36	2.78	67	38.59-47.95	42.29	1.50
Interorbital width (IW)	101	11.87-19.05	15.28	1.31	67	14.17-20.53	17.90	1.31
Length of posterior cleithrum process (PcPL)	91	27.69-39.74	34.76	3.25	67	31.47-42.15	36.02	2.38
Depth of posterior cleithrum process (PcPD)	90	10.44-15.46	13.58	1.24	67	14.23-20.34	17.19	1.40
Horizontal length of nuchal foramina	92	4.82-10.15	7.82	1.38	67	5.48-11.97	8.33	1.40

pterygiophores; 11 (n=2) or 12 (n=3) dorsal and 10 (n=1), 11 (n=2) or 12 (n=2) ventral caudal-fin procurent rays. All examined specimens with hypural fusion pattern PH; HY 1+2; HY 3+4; HY 5, and with complete ossification of sutural joint at junction of sphenotic, parieto-supraoccipital and frontal.

Coloration. In alcohol, head and body tan to brown, or grey, countershaded. Faint dark stripe from anterior margin of upper lip to anterior margin of eye. A conspicuous dark blotch on the first three branched dorsal-fin rays and membranes, blotch starting from midlength of rays and membranes and almost reaching their distal tips, which are pale. Tip of upper caudal-fin lobe only rarely darkened.

In life, ground color yellowish or greenish laterally and white ventrally; lower lip pinkish. Eye silvery, distinctly contrasted with pale surrounding adipose tissue.

Distribution. *Hassar wilderi* occurs in the Tocantins and Araguaia river basins, in Brazil (Fig. 6).

Ecology. Like its congeners, specimens of *Hassar wilderi* are usually collected over sandy beaches (substrate sometimes with fine gravel or muddy), and often in the main channel of large rivers. Santos *et al.* (1984) stated that individuals of *H. wilderi* reach sexual maturity with approximately 15 cm long. Eggs are deposited between November and January.

Etymology. Named in honor of B. G. Wilder, who sent the collection made by C. F. Hartt in Brazil to C. H. Eigenmann for identification. The catfishes of this collection were then transmitted to E. M. Kindle for final determination. According to Kindle (1895: 249), the collection contained 19 genera and 27 species, including two new species: *Hassar wilderi* and *Hemiancistrus longipinnis* (= *Baryancistrus longipinnis*).

Table 4. Morphometric data for type specimens of the *Hassar orestis* and *H. wilderi*. SD = standard deviation.

	<i>Hassar orestis</i>			<i>Hassar wilderi</i>		
	<i>H. orestis</i>	<i>H. orestis</i>	<i>H. ucayalensis</i>	<i>H. wilderi</i>	<i>H. wilderi</i>	<i>H. iheringi</i>
	Lectotype NMW 45428	Paralectotypes NMW 45427, 45429, 45430, 78651	Holotype ANSP 68647	Lectotype SU 2243	Paralectotypes CAS 60710, 60711	Holotype ANSP 69393
Standard length (SL) (mm)	66.8	148.3-207.9	68.9	157.7	142.3-181.2	135.6
	Percent of standard length					
Head length (HL)	31.73	31.08-33.69	31.93	32.50	30.85-31.29	32.08
Predorsal distance (PdD)	44.97	42.74-44.75	42.38	40.11	39.49-41.05	40.86
Prepectoral distance (PpD)	31.38	29.80-31.92	29.03	29.30	27.69-28.53	30.97
Prepelvic distance	57.05	55.32-58.10	53.70	58.15	53.55-55.46	57.15
Preanal distance	76.15	75.10-79.24	75.47	76.92	76.46-76.49	75.96
Body depth at dorsal-fin origin (BD)	21.83	20.20-21.81	19.74	22.74	23.34-24.39	22.79
Body depth at 10 th scute (BD10)	17.49	14.48-17.40	13.21	18.15	17.16-19.11	17.63
Body depth at anal-fin origin	14.22	11.98-14.56	11.18	15.38	14.18-15.53	14.60
Dorsal-fin spine length (DSL)	26.14	18.70-22.66		25.11	24.12-25.93	
Dorsal-fin lobe length	25.40	18.57-23.47	22.64			22.94
Dorsal-fin base length	11.40	11.49-12.30	11.76		13.58-13.95	11.73
Distance from dorsal-fin origin to adipose-fin terminus (DOAD)	44.53	46.97-49.78	45.43	52.65	50.72-53.48	45.80
Adipose-fin base length (AdFB)	9.60	5.17-7.65	5.08	7.45	6.90-10.96	8.33
Distance from adipose-fin terminus to caudal-fin origin (AdCD)	14.07	12.76-15.68	15.97	13.85	15.74-16.06	16.67
Pectoral-fin spine length (PSL)	25.33	20.99-24.46		25.83	23.89-23.90	
Distance from pectoral-fin origin to pelvic-fin origin (PPD)	26.06	25.82-27.24	25.98	26.40	25.72-27.59	26.40
Pelvic-fin lobe length (PFL)	13.42	11.36-13.10	14.08	14.96	14.76-15.12	16.08
Distance from pelvic-fin origin to adipose-fin origin (PAD)	19.69	19.02-21.75	18.87	23.02	21.19-23.33	20.28
Anal-fin base length (AnFB)	12.97	8.64-11.64	10.16	10.47	10.49-11.31	9.73
Distance from anal-fin terminus to caudal-fin origin (AnCD)	13.13	10.65-13.72	14.51	13.29	16.06-16.16	15.56
Caudal-peduncle depth (CPD)	6.56	5.19-6.07	5.08	6.09	6.07-6.61	6.12
	Percent of body depth at 10 th midlateral scute					
Depth of 10 th scute (PD10)	17.5	12.03-16.33	14.29	7.33	5.1-5.51	6.10
	Percent of head length					
Body width at opercle (BWO)		51.23	50.00	51.32	48.68-51.03	46.44
Body width at nuchal shield (BWNP)		22.85	22.73		22.32-22.93	21.84
Body width at cleithrum (CW)	61.63	53.68-60.54	62.73	60.92	63.33-65.38	62.53
Adipose-eye diameter (AED)	34.51	24.47-32.65	32.27	31.89	28.57-31.66	29.89
Eye diameter (ED)	29.07	18.23-23.93	27.27	27.55	24.69-24.83	26.90
Snout length (SnL)	55.53	53.28-58.82	50.91	49.53	50.57-56.61	54.02
Distance from snout to anterior nare (SAND)	30.80	25.44-29.44	25.00	22.19	24.83-25.57	25.75
Distance from snout to posterior nare (SPND)	45.01	44.11-46.43	39.55	36.04	35.98-38.04	37.24
Distance from snout to terminus of adipose eye (SPOD)	84.31	80.23-85.37	83.18	57.74	81.78-81.83	81.38
Distance from terminus of adipose eye to terminus of nuchal shield (PL)	60.94	49.01-55.99	55.45	51.28	52.85-52.91	51.72
Distance from anterior nares to terminus of adipose eye (ANPOD)	55.48	54.08-60.35	56.82	57.55	55.13-56.61	54.94
Distance from posterior nares to terminus of adipose eye (PNPOD)	41.36	39.98-42.38	42.27	43.77	43.74-46.56	45.06
Interorbital width (IW)	16.84	15.33-18.51	15.00	18.06	18.22-19.22	15.63
Length of posterior cleithrum process (PcPL)	39.23	33.40-40.57	36.36	36.81	36.45-37.57	37.93
Depth of posterior cleithrum process (PcPD)	15.50	14.28-17.14	13.64	16.87	18.22-19.05	19.08
Horizontal length of nuchal foramina				11.13	9.34-9.70	

Remarks. According to Fowler's (1941a) description of *Hassar iheringi*, three of the four type specimens (including the holotype) were collected in "Rio Parnahyba, Terezina, Piauhy". Examination of these specimens, however, revealed that they possess some characters that are absent in specimens from northeastern Brazilian drainages, which are herein referred to as *H. affinis*. Those characters are: many thin, branched lateral diverticula on entire margin of gas bladder, dark blotch over the median portion of the first branched dorsal-fin rays, first five postinfranuchal scutes developed with two posteriorly directed thorns, and relatively deep body (see Tables 1 to 4). Actually, these features are present in *H. wilderi*, who seems to occur exclusively in the Tocantins basin according to the specimens we examined. This indicates that the locality of three type specimens of *H. iheringi* referred by Fowler (1941a) is

probably wrong, and that those specimens were probably collected in the Tocantins basin. Similar locality errors have already been recorded by Vari (1995), Vari & Harold (2001), and Castro & Vari (2004). We therefore consider that *H. iheringi* is a junior synonym of *H. wilderi*, and that Fowler (1941a)'s referred locality is wrong.

Hassar wilderi was described based on four specimens first deposited in the Cornell University (under catalogue numbers CU 1703-1705, plus one uncatalogued specimen), which were then transferred to the Indiana University to be identified by Eigenmann (catalogued as IU 5120). Eigenmann's (1925) monograph listed the specimens as "I.U.M. 5120, types, 162 and 207 mm" (measurements given in TL), and included an illustration of the smallest specimen (Eigenmann, 1925: pl. 22, fig. 2). Those specimens were subsequently transferred to the

Stanford University, and Myers & Weitzman (1956) elected as lectotype one of them (CU 1704), catalogued as SU 2243. The specimens were finally transferred to the California Academy of Sciences, where the paralectotypes are catalogued as CAS 60710 (181.2 mm SL or 208 mm SL) and CAS 60711 (139.5 mm SL or 168 mm TL), while the lectotype remained as SU 2243 (157.7 mm SL or 191 mm TL). Sabaj & Ferraris (2003) considered Eigenmann (1925)'s figure as a designation of lectotype, with the consequence that Myers & Weitzman (1956)'s designation of lectotype is invalid. Nevertheless, Eigenmann (1925) considered both specimens as types, and clearly did not intend to elect a lectotype. We therefore prefer to accept Myers & Weitzman (1956)'s designation of the lectotype as valid.

Discussion

Species of *Hassar* are easily distinguished based on the combination of gas bladder, midlateral scutes morphologies, and dorsal-fin coloration. In addition, a few morphometric measurements also may help to diagnose each species (Tables 1 to 4). For example, the head and body of *H. orestis* is more slender than in congeners, as evidenced by comparing some measurements, such as body depth at dorsal-fin origin and caudal peduncle depth. *Hassar orestis* also has the largest anteriormost midlateral scutes, with depth of 10th midlateral scute 6.15–18.0% (mean 12.85%) of relative body depth (*vs.* 3.08–8.99%, mean 4.11–6.12%).

A group including all fimbriate-barbel doradids has long been recognized as natural (*e.g.*, Eigenmann, 1925), and its monophyly is well supported by phylogenetic analyses based on both morphology (Higuchi, 1992; Birindelli, 2010) and molecules (Moyer *et al.*, 2004). In his unpublished dissertation, Birindelli (2010) defined the fimbriate-barbel clade on the basis of eight exclusive morphological synapomorphies. Within the clade composed of fimbriate-barbel doradids, Birindelli (2010) hypothesized that *Hassar* is the sister group of *Anduzedoras* + *Leptodoras*. The monophyly of this clade is supported by the following synapomorphies: epioccipital process sutured to posterior nuchal plate; first infraorbital long and slender, with anterior wing extended well beyond concavity for anterior naris; anterior ceratohyal anteriorly expanded by a small process sutured to ventral hypohyal; branchial arches 2 to 5 without gill rakers. Those characters are also homoplastically present in species of *Doras* (Sabaj Pérez & Birindelli, 2008), which is hypothesized as the sister group of a large clade including *Hemidoras*, *Opsodoras*, *Nemadoras*, *Hassar*, *Anduzedoras*, and *Leptodoras* (Sabaj Pérez & Birindelli, 2008; Birindelli, 2010).

Hassar is defined by a single non homoplastic synapomorphy, which is the basioccipital with a ventral ring-like arch surrounding the aorta. Other non-exclusive characters, some present in only a few taxa, also help to recognize *Hassar* among fimbriate-barbel doradids. The distal half of dorsal fin with anterior branched rays darkened is a feature present in *Hassar*, and also in *Leptodoras hasemani*, and *L. marki*. The anteriormost postinfranuchal scutes are reduced in *Hassar*, and also in *Nemadoras hemipeltis* and

Doras micropoeus. The posterior cranial fontanel is usually occluded in doradids (Higuchi, 1992; Birindelli, 2010). However, it is relatively large in *Hassar*, *Anduzedoras*, *Leptodoras*, *Nemadoras*, and *Trachydoras*. The anterior nuchal plate reduced in size and enclosed by the parieto-supraoccipital and middle nuchal plate, and well-developed nuchal foramina, are only present in *Anduzedoras*, *Hassar*, *Hemidoras*, *Opsodoras*, and in some species of *Leptodoras*, *Nemadoras*, *Doras fimbriatus*, and *Oxydoras eigenmanni*.

Other characters commonly found in *Hassar*, such as numerous pores beneath the posterior cleithral process, maxillary barbels with 7 to 16 secondary barbels, elongated mesethmoid with lanceolate anterior tip, reduced number of teeth on upper and lower jaws, and 30 to 34 midlateral scutes on each side of body, are present in most fimbriate-barbel doradids.

Key to identification of species of *Hassar*:

1. Distal tip of first branched dorsal-fin rays and membranes darkened; lateral diverticula of gas bladder rounded, unbranched *Hassar affinis* (northeastern Brazil: Turiaçu, Pindaré-Mearim, Itapecuru and Parnaíba)
- 1^o. Distal tip of first branched dorsal-fin rays and membranes pale; lateral diverticula of gas bladder branched 2
2. 1st through 8th (modally 3rd) midlateral scute as the anteriormost with median thorn; tip of upper caudal-fin lobe usually darkened *Hassar orestis* (Amazon, Orinoco and Essequibo)
- 2^o. 9th through 17th (modally 13th) midlateral scute as the anteriormost with median thorn; upper caudal-fin lobe rarely darkened 3
3. Several well-branched diverticula on margins of entire gas bladder; gas bladder triangular posteriorly, each posterior chamber extended into short terminal diverticulum sharing medial septum with its pair *Hassar wilderi* (Tocantins and Araguaia)
- 3^o. Two weakly-branched diverticula restricted to each side of anterior chamber of gas bladder (rarely one extra pair on posterior chambers); gas bladder rounded posteriorly *Hassar gabiru* (middle and upper Xingu)

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