



A new species of *Hoplias malabaricus* species complex (Characiformes, Erythrinidae) from Northeastern Brazil

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Abstract

A new species of *Hoplias malabaricus* species complex is herein described from the Munim River Basin, Maranhão state, Northeastern of Brazil. *Hoplias cazumba* differs from its congeners by the following combination of characters: 19–22 scales around caudal peduncle, 40–42 lateral-line scales, 39–41 vertebrae, 11–13 dorsal-fin rays and, always 15 caudal-fin rays.

Resumo

Uma nova espécie do complexo de espécies *Hoplias malabaricus* é descrita aqui, proveniente da Bacia do Rio Munim, estado do Maranhão, Nordeste do Brasil. *Hoplias cazumba* difere de seus congêneres pela seguinte combinação de caracteres: 19–22 escamas ao redor do pedúnculo caudal, 40–42 escamas na linha lateral, 39–41 vértebras, 11–13 raios na nadadeira dorsal e sempre 15 raios na nadadeira caudal.

Key Words

Biodiversity, freshwater fish, Maranhão, Neotropical, Trahira

Palavras-chaves

Biodiversidade, Maranhão, Neotropical, Peixe de água doce, Traíra

Introduction

The family Erythrinidae is a group of Characiformes widely distributed in Neotropics with 17 valid living species belonging to three genera, *Erythrinus* Scopoli, 1777, *Hoplerythrinus* Gill, 1896 and *Hoplias* Gill, 1903

(Oyakawa 2003; Fricke et al. 2023), and one extinct species, *Paleohoplias assisbrasiliensis* Bocquentin, Negri, 2003 from State of Acre, Brazil (Toledo-Piza et al. 2024). *Hoplias*, the most species-rich genus of the family, comprises 13 valid species (Toledo-Piza et al. 2024) allocated into three different groups (Oyakawa 1990; Oyakawa

and Mattox 2009): the *H. lacerdae* group with five species, the monotypic *H. aimara* group and *H. malabaricus* group with currently seven species.

The *H. lacerdae* group is defined by the absence of teeth on the basihyal and basibranchials bones and the medial margins of contralateral dentaries lying almost parallel to each other, forming a U shape margin in ventral view (Oyakawa and Mattox 2009). In the *H. malabaricus* group, tooth plates are present on the basihyal and basibranchials bones and the medial margins of contralateral dentaries converge towards the symphysis, forming a V shape in ventral view of head (Oyakawa and Mattox 2009). The *H. aimara* group is defined by the absence of an accessory ectopterygoid and the presence of a dark spot on the opercular membrane (Mattox et al. 2006; Oyakawa and Mattox 2009).

Currently, *H. malabaricus* group comprises the following species: *H. malabaricus* (Bloch, 1794), *Hoplias microlepis* (Günther, 1864); *Hoplias teres* (Valenciennes, 1847); *Hoplias mbigua* Azpelicueta, Benítez, Aichino & Mendez, 2015; *Hoplias misionera* Rosso, Mabragaña, González-Castro, Delpiani, Avigliano, Schenone & Díaz de Astarloa, 2016; *Hoplias argentinensis* Rosso, González-Castro, Bogan, Cardoso, Mabragaña, Delpiani & Díaz de Astarloa, 2018 and *Hoplias auri* Guimarães, Rosso, González-Castro, Souza, Díaz de Astarloa & Rodrigues, 2021.

The existence of cryptic lineages in the *H. malabaricus* species complex has been known to the ichthyologists since the 1970s. After several morphological, molecular and chromosomal studies, the diversity of *H. malabaricus* species group remains unresolved, mainly due to its conservative morphological characters (Bertollo et al. 2000; Marques et al. 2013; Rosa et al. 2014; Guimarães et al. 2022a). Nevertheless, four new species belonging to the *H. malabaricus* species group were described in the last decade (Azpelicueta et al. 2015; Rosso et al. 2016; Rosso et al. 2018; Guimarães et al. 2022b), shedding light on the methods and characters that are informative for discriminating taxa within this group.

Some studies carried out in recent years with samples from the Maranhão Hydrological Unit (MHU) indicated the existence of several lineages and possible new species of *Hoplias* for the region (Piorski 2010; Souza 2014; Pires et al. 2019). However, none of these studies found diagnostic characters strong enough to differentiate species in these samples.

In the last years, there has been a focused effort to understand the process responsible for the distribution and diversification of ichthyofauna of MHU (Abreu et al. 2019, 2020a, b; Koerber et al. 2022). This effort resulted in at least a dozen new species described for the region and a dramatic increase from 83 to 287 species known from the region (Koerber et al. 2022, 2023). Herein we contribute to this effort, describing a new species belonging to the *Hoplias malabaricus* complex, one of the best-known, but most difficult to decipher, species complexes. The new species inhabits the Munim River, in Maranhão State, Northeastern, Brazil.

Methods

Traditional measurements and counts were made on the left side of the body following Fink and Weitzman (1974) and Mattox et al. (2006). Meristic data were taken under a stereomicroscope and the morphometric data point-to-point with a digital caliper to 0.1 mm. Measurements are presented as percentages of standard length (SL) unless those referring to subunits of head, which are presented as percentages of head length (HL). Vertebral counts were taken from radiographs and included the anterior four vertebrae of the Weberian apparatus. Counts of the holotype are indicated with asterisks.

Information about congeners was based on examined material (see comparative material section) and literature (Azpelicueta et al. 2015; Rosso et al. 2016; Rosso et al. 2018; Guimarães et al. 2022b). Specimens analyzed here are deposited in Coleção de Peixes da Universidade Federal do Maranhão (CPUFMA), Museu de Ciência e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul (MCP), Museu de Zoologia da Universidade de São Paulo (MZUSP), Núcleo de Pesquisa em Limnologia, Ictiologia e Aquicultura, Universidade Estadual de Maringá (NUP), Museum für Naturkunde, Leibniz-Institut für Evolutions-und Biodiversitätsforschung, Berlin, Germany (ZMB), Museum d'Histoire Naturelle de Neuchâtel, Neuchâtel, Switzerland (MHNN), Muséum National d'Histoire Naturelle, Systématique et Évolution, Laboratoire d'Ichthyologie Générale et Appliquée, Paris, France (MNHN), National Museum of Natural History, Smithsonian Institution, Washington DC, United States of America (USNM).

Comparative material

Hoplias argentinensis: BRAZIL – **Paraná** • NUP 21167, 2, 147.74–176.73 mm SL; municipality of Mamboré, Córrego Sunumu, Piquiri River basin.

Hoplias mbigua: BRAZIL – **Mato Grosso** • MCP37703, 1, 152.44 mm SL; municipality of Poconé, Arroio na estrada BR070, Paraguai River basin. – **Paraná** • NUP22509, 1, 181 mm SL; municipality of Francisco Alves, Bagre River, Paraná River basin.

Hoplias malabaricus: BRAZIL – **Bahia** • MHNN 773, 1; holotype of *Erythrinus macrodon*; Lake Almada; photograph and x-rays. – **Pará** • MCP22472, 3, 81.05–110.21 mm SL; municipality of Paragominas, Capim River, Capim River basin. • MCP49127, 1, 146.29 mm SL; municipality of Curuá, Lago Preto, Amazon River basin. – **Acre** • MCP28854, 2, 91.13–117.83 mm SL; municipality of Senador Guimard, Iquiri River, Purus River basin. SURINAME • ZMB 3515, 1, 167 mm SL; lectotype; South America, probably Suriname; photograph and x-rays. • ZMB 33059, 1, 69 mm SL; paralectotype; South America, probably Suriname; photograph and x-rays. TRINIDAD ISLAND • USNM 1112, 1, 111 mm SL; syntype of *Macrodon ferox*; photographs and x-rays.

Hoplias cf. malabaricus: BRAZIL – **Maranhão** • CPUF-MA3083, 3, 140.18–152.57 mm SL; municipality of São Luís, Maracanã River, Bacanga River basin; x-rays (2). • CPUFMA1588, 4, 184.01–292.5 mm SL; municipality of Centro Novo do Maranhão, Rebio Gurupi, Ponema River, Gurupi River basin; x-rays (3). • CPUFMA613, 4, 191.42–249.11 mm SL; municipality of Mirador, Mirador State Park, Itapecuru River, Itapecuru River basin; x-rays (4). • CPUFMA2222, 3, 192.42–224.68 mm SL; municipality of Penalva, Igarapé Arineu, Mearim River basin; x-rays (2). • CPUFMA1202, 6, 138.17–151.61 mm SL; municipality of Viana, Viana Lake, Mearim River basin; x-rays (4). • CPUFMA3629, 4, 114.75–133.28 mm SL; municipality of Santa Quitéria, Parnaíba River, Parnaíba River basin; x-rays (3). • CPUFMA3630, 1, 178.16 mm SL; municipality of Santa Quitéria, Parnaíba River, Parnaíba River basin; x-rays (1). • CPUFMA888, 1, 259.89 mm SL; municipality of Balsas, Balsas River, Parnaíba River basin. • CPUFMA1417, 1, 117.6 mm SL; municipality of Santo Amaro, Alegre River, Peria River basin; x-rays (1). • CPUFMA030, 1, 175.67 mm SL; municipality of Barreirinhas, Queimada dos Britos, Preguiças River basin. • CPUFMA031, 1, 128 mm SL; municipality of Barreirinhas, Preguiças River, Preguiças River basin; x-rays (1). • CPUFMA2299, 1, 159.6 mm SL; municipality of Barreirinhas, Sucuriçu River, Preguiças River basin; x-rays (1). • CPUFMA132352, 2, 211.14–213.04 mm SL; municipality of Barreirinhas, Preguiças River basin; x-rays (1). • CPUFMA1862, 2, 240.65–290.02 mm SL; municipality of Barreirinhas, Preguiças River basin. • CPUFMA1204, 5, 178.33–205.63 mm SL; Quebra-pote Lake, municipality of Santa Helena, Turiaçu River basin; x-rays (3).

Hoplias misionera: BRAZIL – **Paraná** • NUP22510, 2, 150.51–158.55 mm SL; municipality of Francisco Alves, Bagre River, Paraná River basin.

Hoplias teres: VENEZUELA • MNHN-4377–1, 1, 121 mm SL; and MNHN-4377–2, 1, 116 mm SL; syntypes; Lake Maracaibo.

Hoplias curupira: BRAZIL – **Pará** • CPUFMA172259, 1, 148.59 mm SL; municipality of Bom Jesus do

Tocantins, Jacundá River, Tocantins River basin. • CPUFMA172266, 1, 252.64 mm SL; municipality of Bom Jesus do Tocantins, Jacundá River, Tocantins River basin.

Hoplias intermedius: BRAZIL – **Paraná** • NUP857, 2, 235.05–237.29 mm SL; municipality of Campo Mourão, Ivaí River, Paraná River basin.

Hoplias sp.: BRAZIL – **Pará** • MCP 20978, 4, 98.82–158.53 mm SL; municipality of Alenquer, Lagoon of Amazon River, Amazon River basin. – **Acre** • MCP37704, 4, 67.69–117.19 mm SL; municipality of Bujari, Igarape Mapinguari, Purus River basin. – **Rondônia** • MCP37711, 1, 125.89 mm SL; municipality of Ji-Paraná, Machado River, Madeira River basin.

Results

Hoplias cazumba sp. nov.

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Figs 1, 2, 3, Tables 1, 2

Hoplias malabaricus – Piorski 2010: Pag 63 [genetic diversity and phylogeography].

Type materials. Holotype: BRAZIL • MZUSP130388, 193.43 mm SL; Maranhão, municipality of Chapadinha, Povoado Cedro, Munim River basin; 03°51'34"S, 43°19'33"W; 27 Nov. 2010; J.S. Nunes leg.

Paratypes: BRAZIL – **Maranhão** • MZUSP130389, 6, 141.61–214.78 mm SL; municipality of Chapadinha, Povoado Cedro, Munim River basin; collected with holotype. • MCP55320, 10, 152.32–240.83 mm SL; municipality of Chapadinha, Povoado Cedro, Munim River basin; 03°51'34"S, 43°19'33"W, 25 May 2011, J.S. Nunes leg.

Non-types: BRAZIL – **Maranhão** • CPUFMA2121, 3, 152.4–284.17 mm, SL; municipality of Chapadinha, Povoado Cedro, Munim River basin; 03°51'34"S, 43°19'33"W, 7 to 8 Jul. 2011, J.S. Nunes leg. • CPUFMA1600, 9; municipality of Chapadinha, Povoado Cedro, Munim River basin; 03°51'34"S, 43°19'33"W, 25 May 2011, J.S. Nunes leg.



Figure 1. *Hoplias cazumba*, holotype, MZUSP130388, 193.43 mm SL, Povoado Cedro, Munim River basin, municipality of Chapadinha, Maranhão, Brazil.



Figure 2. Details of head of *Hoplias cazumba* sp. nov. **a.** Ventral view of dentary of holotype; **b, c.** S&C individual showing details of teeth.



Figure 3. Morphological variation observed in paratypes of *Hoplias cazumba* sp. nov. From top to bottom: MZUSP130389 the first two specimens and MCP55320 all the rest.

Diagnosis. *Hoplias cazumba* is distinguished from other species, except *H. malabaricus* species-group by medial margins of contralateral dentaries converging to midline forming a V or Y-shaped angle in ventral view. *H. cazumba* can be distinguished from *H. malabaricus* by the number of dorsal-fin rays (11–13 vs. 14), number of caudal-fin rays (15 vs. 14–15), number of lateral-line

Table 1. Morphometric data of *Hoplias cazumba* sp. nov. Standard length in mm; values 1–14 in percents of standard length; values 15–22 in percents of head length. SD, standard deviation; n, number of specimens; Range includes the holotype.

	Holotype	n	Mean	Min	Max	SD
Standard Length	193.43	20	152.4	141.61	284.17	32.4
1 Body depth	22.5	20	21.6	17.3	24.5	1.7
2 Head length	31.1	20	31.5	27.6	32.8	1.1
3 Pectoral-fin length	16.9	20	17.0	15.7	18.0	0.6
4 Pelvic-fin length	18.0	19	18.4	16.6	20.8	1.0
5 Anal-fin length	18.2	20	17.5	15.2	18.9	1.0
6 Dorsal-fin length	29.0	20	31.1	28.5	33.4	1.3
7 Dorsal-fin base	18.1	20	17.9	16.0	20.5	1.1
8 Anal-fin base	9.5	20	8.6	7.1	10.8	1.0
9 Pre-pectoral length	29.0	20	28.8	26.5	30.3	0.9
10 Pre-pelvic length	54.1	20	54.3	51.6	57.6	1.5
11 Pre-dorsal length	49.9	20	49.2	45.9	51.6	1.6
12 Pre-anal length	78.8	20	80.3	75.0	86.1	2.4
13 Caudal peduncle depth	13.4	20	12.9	11.6	13.5	0.5
14 Caudal peduncle length	9.5	20	10.0	8.3	12.2	1.3
15 Head Depth	52.0	20	49.3	46.9	52.8	1.6
16 Snout length	27.8	20	27.4	25.2	29.8	1.4
17 Snout width	26.8	20	23.4	21.4	26.8	1.3
18 Snout Depth	17.8	20	17.2	14.8	21.1	1.5
19 Pre-nasal length	19.6	20	18.4	16.0	20.2	1.2
20 Orbital diameter	17.5	20	16.8	15.0	19.3	1.1
21 Interorbital width	26.1	20	26.1	24.3	29.1	1.2
22 Upper jaw length	53.2	20	54.3	51.0	57.3	1.7

scales (39–41; mode 40 vs. 38–39) and the number of scales around caudal peduncle (19–22 vs. 18). *Hoplias cazumba* can be distinguished from *H. teres* by the number of pre-dorsal scales (15–17 vs. 18), number of scales around caudal peduncle (19–22 vs. 18), number of vertebrae (39–41 vs. 42), greater snout length (25.3%–29.8% vs. 21.9–23.1% of HL), lower snout width (21.4%–26.8% vs. 29.4%–29.5% of HL) and lower snout depth (14.8%–21.1% vs. 24.4%–26.6% of HL). *Hoplias cazumba* can be distinguished from *H. microlepis* by the number of pre-dorsal scale (15–17; mode 15 vs. 17–19), number of lateral-line scales (39–41 vs. 43–47), longitudinal series of scales between lateral line and pelvic-fin origin (4–5 vs. 5.5–6.5), number of scales around caudal peduncle (19–22; mode 20 vs. 22–24), and the number of vertebrae (39–41 vs. 42–45), also, lower caudal peduncle length (8.3%–12.2% vs. 12.4%–16% of SL) and lower snout depth (14.8%–21.1% vs. 22.9%–29.2% of HL). *Hoplias cazumba* can be distinguished from *H. mbigua*

Table 2. Meristic data of *Hoplias cazumba* sp.nov.

	Meristic	Holotype	n	Min	Max	Mode
1	Unbranched dorsal fin rays	ii	20	i	ii	ii
2	Branched dorsal fin rays	12	20	11	13	12
3	Unbranched anal fin rays	i	20	i	ii	i
4	Branched anal fin rays	9	20	8	10	9
5	Unbranched pectoral fin rays	ii	20	i	ii	ii
6	Branched pectoral fin rays	11	20	12	12	12
7	Unbranched pelvic fin rays	i	20	i	ii	i
8	Branched pelvic fin rays	7	20	6	8	7
9	Unbranched caudal fin rays	ii	20	ii	ii	ii
10	Branched caudal fin rays	15	20	15	15	15
11	Scales between pectoral and pelvic fins	4	20	3	5	4
12	Scales between pelvic and anal fins	5	19	3	6	5
13	Predorsal scales	15	20	15	17	15
14	Lateral line scales	40	20	39	41	40
15	Scales above lateral line	5	20	4	6	5
16	Scales below lateral line	5	20	4	5	5
17	Scales around caudal peduncle	21	20	19	22	20
18	Laterosensory canal pores of the dentary	4	20	3	4	4
19	Laterosensory canal pores of the preopercle	6	20	5	6	6
20	Laterosensory canal pores of the infraorbitals total	11	20	10	12	11
21	Laterosensory canal pores of the infraorbital 1	3	20	2	3	3
22	Laterosensory canal pores of the infraorbital 2	3	20	2	3	3
23	Laterosensory canal pores of the infraorbital 3	1	20	1	1	1
24	Laterosensory canal pores of the infraorbital 4	1	20	1	1	1
25	Laterosensory canal pores of the infraorbital 5	0	20	0	1	0
26	Laterosensory canal pores of the infraorbital 6	3	20	3	4	3
27	Laterosensory canal pores of the dorsal surface of the head	10	20	9	12	10
28	Laterosensory canal pores of the nasal bone	2	20	2	3	2
29	Laterosensory canal pores of the frontal bone	4	20	3	5	4
30	Laterosensory canal pores of the pterotic bone	1	20	1	2	1
31	Laterosensory canal pores of the supraoperculum bone	2	20	2	2	2
32	Vertebra	40	11	39	41	40

by the number of lateral-line scales (39–41 vs. 42–43), number of vertebrae (39–41 vs. 42) and a greater anal-fin (15.2%–18.9% vs. 11.9%–16.6% of SL) and dorsal-fin length (28.5%–33.4% vs. 14.6%–19.1% of SL). *Hoplias cazumba* can be distinguished from *H. misionera* by the number of dorsal-fin rays (11–13 vs. 14–16), number of caudal-fin rays (15 vs. 15–18), greater snout length (25.2–29.8% vs. 20.5–24.7% of HL) and pre-nasal length (16%–20.2% vs. 12.5%–16.2% of HL). *Hoplias cazumba* can be distinguished from *H. argentinensis* by the number of anal-fin rays (8–10; mode 9 vs. 7–8), number of caudal-fin rays (15 vs. 17–19), number of pre-dorsal scale (15–17; mode 15 vs. 17–19) and number of vertebrae (39–41 vs. 42–43). *Hoplias cazumba* can be distinguished from *H. auri* by the number of anal-fin rays (8–10; mode 9 vs. 7–8), number of caudal-fin rays (15 vs. 12–15) and number of lateral-line scales (39–41; mode 40 vs. 37–39).

Description. Morphometric and meristic data are summarized in Tables 1 and 2. Body cylindrical. Anterior profile of head angular to slightly rounded in lateral view. Dorsal profile of head straight or slightly convex. Greatest body depth at dorsal-fin origin. Medial margins of contralateral dentaries converging to midline forming a V or Y-shaped angle in ventral view. Upper jaw shorter than lower jaw. Lower and upper lips fleshy. Only anterior nostril with incomplete tubular skin flap covering its whole opening. Posterior nostril equidistant to the anterior nostril and the anterior margin of orbit. Infraorbitals 3 and 4 completely excluded from orbital ring.

Conical and caniniform teeth in both jaws covered by lips skin the largest with skin flaps of the same shape covering its labial and lingual faces. Premaxillary teeth row divided in two sections. The first section starts with the larger canine, followed by two decreasing in size teeth, to reach a gap. The second starts with three increasing in size teeth, followed by two decreasing in size. A single row of maxillary bone teeth, the first five increasing in size, followed by 45 smaller. Posterior portion of the maxilla with a large dorsal projection.

Two rows of dentary teeth. The first one with five small teeth displayed in a more lingual position, leaving a free space ahead, between teeth and lips to fit the larger symphyseal premaxillary tooth. Following, the two largest teeth of lower jaw, the largest one fits in the premaxillary gap, trespassing the bone to reach a foramen. After, five small teeth of equal size in a more lingual position leave a free space ahead, to fit the larger tooth of premaxillary. Then, a sequence of eight teeth alternating in size. The second row is an aligned sequence of 22 same size small teeth in a more lingual position starting right next to the first row end. Buccal face of accessory ectopterygoid and ectopterygoid with series of small conical teeth aligned along anterior edge and many smaller villiform teeth in a patch covering the bone surfaces.

Dorsal-fin origin placed at midbody 2–3 scales anterior to vertical through pelvic fin origin. Dorsal-fin rays i-12 (1), i-13 (1), ii-11 (2), ii-12* (14) or ii-13 (2), [mode: ii, 12]. Tip of longest ray of depressed dorsal fin extending

at or slightly beyond vertical through anus. Anal-fin rays i-8 (1), i-9* (11), i-10 (2), ii-8 (3) or ii-9 (3), [mode: i, 9]. Pectoral-fin rays i-11 (1), i-12 (2), ii-10 (1), ii-11* (6), ii-12 (9) or ii-13 (1), [mode: ii, 12]. The tip of pectoral fin separated from pelvic-fin origin 3 (2), 4* (10), or 5 (8) scales, [mode: 4]. Pelvic-fin rays i-7* (18), i-8 (1) or ii-6 (1), [mode: i, 7]. Tip of pelvic fin separated from vertical through anus by 3 (3), 4 (5), 5* (8) or 6 (3) scales, [mode: 5]. Total caudal-fin rays 17 (i-15-i). Pre-dorsal scales 15* (15), 16 (3) or 17 (2) in irregular series, [mode: 15].

Lateral line with 39 (8), 40* (10) or 41 (2) perforated scales, [mode: 40], with 1 or 2 unperforated scales anteriorly and located beneath opercle membrane. Longitudinal series of scales between dorsal-fin origin and lateral line 4 (1), 5* (16) or 6 (3), [mode: 5]. Longitudinal series of scales between lateral line and pelvic-fin origin 4 (6) or 5* (14), [mode: 5]. Longitudinal series of scales around caudal peduncle 19 (3), 20* (14), 21 (2) or 22 (1), [mode: 20]. Latero-sensory canal along ventral surface of dentary with four (19) pores. Latero-sensory canal with 5 (3) or 6* (17) pores in preopercle, [mode: 6]. Latero-sensory canal along infraorbitals with 10 (2), 11* (14) or 12 (4) pores, [mode: 11]. Infraorbital 1: 2 (2) or 3* (18) pores, [mode: 3], infraorbital 2: 2 (1) or 3* (19) pores, [mode: 3], infraorbital 3: 1* (20) pore, infraorbital 4: 1* (20) pore, infraorbital 5 lacking pores and infraorbital 6 with 3* (16) or 4 (4) pores, [mode: 3]. Latero-sensory system of dorsal surface of head with 9 (1), 10* (11), 11 (6) or 12 (2) pores, [mode: 10]. Nasal bone: 2* (19) or 3 (1) pores, [mode:

2], frontal bone: 3 (1), 4* (18) or 5 (1) pores, [mode: 4], pterotic bone: 1* (11) or 2 (8) pores, [mode: 1]. One pore between parietal bones, on the posterior end of suture. Total vertebrae 39 (4), 40* (6) or 41 (1), [mode: 40].

Color in alcohol. Ground coloration of head and body dark to light brown, darker dorsally and paler ventrally. Approximately five to six lateral chevron-shaped blotches, irregularly spaced with distance between subsequent blotches gradually decreasing towards caudal peduncle. Some specimens have a completely dark head and others have a darker dorsal part than the ventral part. Patch of dark brown pigmentation covering entire mid-ventral of opercular bone. Latero-ventral surface of dentaries with transverse brown bands or blotches. Dorsal, anal and caudal fins light brown, lighter than body, with dark spots on rays and interradyal membranes forming pattern of irregular dark stripes. Pectoral and pelvic fins with dark spots or a dark brown roundish spot covering almost the entire fin, darker than body.

Distribution. *Hoplias cazumba* is only known from the Munim River basin, in the state of Maranhão, North-eastern of Brazil (Fig. 4).

Habitat. The village of Cedro is located about 15 km from the center of Chapadinha, on the banks of the Munim River. In this location, the surrounding vegetation is mainly composed of medium-sized trees and shrubs, such as *Senna alata*, *Inga* sp., *Mimosa caesalpiniaefolia*, *Ipomea* sp., *Astrocaryum* ssp., *Bactris* spp. and *Orbignya* spp.

Etymology. The specific name *cazumba*, a noun in apposition, refers to the Cazumba, a mythical creature of the

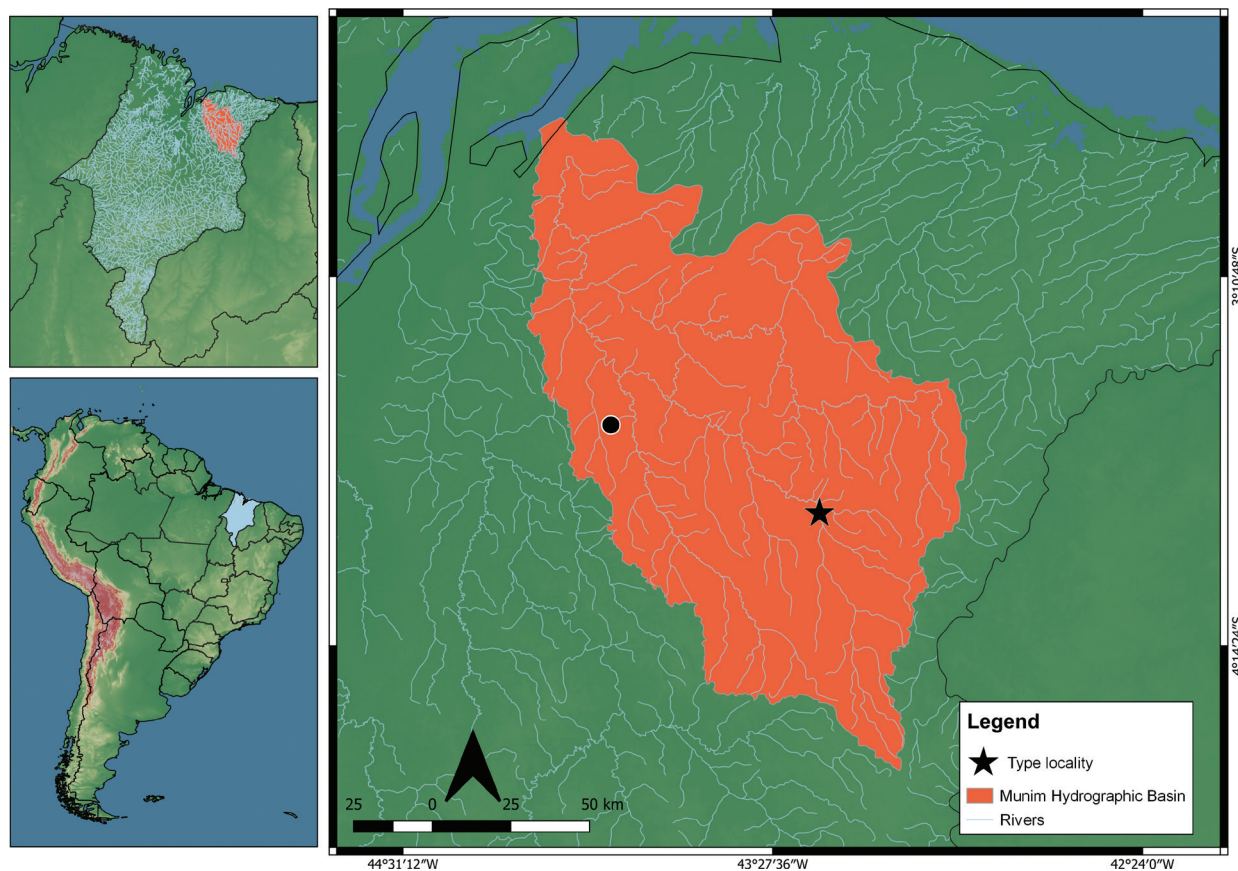


Figure 4. Distribution of *Hoplias cazumba* from Munim River, Maranhão State, Brazil. Star: type locality.

bumba-meu-boi, a Maranhão folklore character. The Cazumba is a character represented by a mythical creature with a big and strange head, that protects the nature. The word cazumba has its origins in the word cazumbi from the Kimbundu linguistic group and means little spirit.

Discussion

Herein, we described a new species belonging to the *H. malabaricus* species group, based on morphological and morphometric characters. This new species is endemic to the Munim Basin in Northeastern Brazil. *Hoplias cazumba* is distinguished from *H. malabaricus* by the lower number of dorsal-fin rays, number of caudal-fin rays, higher number of lateral-line scales and higher number of scales around caudal peduncle. A combination of several characters, especially number of pre-dorsal scale, number of lateral-line scales and number of vertebrae, can be used to distinguish *H. cazumba* from the congeners in the *H. malabaricus* species group.

The *H. malabaricus* group is one of the most intriguing Neotropical fish species complexes. Its complexity ranges from karyotypic overlaps in disjunct populations (Bertollo et al. 2000; Marques et al. 2013; Rosa et al. 2014) to molecular differences in sympatric populations with high morphological overlap (Cardoso et al. 2018; Pires et al. 2021; Guimarães et al. 2022a). Initially recognized as comprising *H. malabaricus*, new species within the group have only been identified since 2015, using both morphological and molecular characters (Azpelicueta et al. 2015; Rosso et al. 2016; Rosso et al. 2018; Guimarães et al. 2022b). Notably, three species with restricted distribution emerged during this period: *H. mbigua* from the Paraná and Paraguay rivers, *H. argentinensis* from the lower Río de La Plata basin, and *H. auri* from the Crepori River drainage in the Tapajós basin. Additionally, *H. misioneia* with a restricted distribution to Río de La Plata was expanded to the lower Amazon basin (Guimarães et al. 2021).

Despite the crucial role of molecular tools in uncovering cryptic species, some recent taxa in the *H. malabaricus* group have been described solely based on anatomical characters, like *H. mbigua* (Azpelicueta et al. 2015). This suggests that the karyotypic and molecular variations observed within the group may be associated with morphological differences identifiable through refined analyses of anatomical characters. For instance, Piorski (2010) proposed the existence of new *Hoplias* species in the Maranhão Hydrological Unit (MHU) using geometric morphometry and mitochondrial DNA data. This pattern was also observed by Abreu-Souza (2014). However, those researchers were unable to describe diagnostic characters for the lineages identified. Cardoso et al. (2018), through analyses of Cytochrome c Oxidase I (COI) gene sequences, reported the occurrence of *Hoplias malabaricus sensu stricto* in the state of Maranhão, as well as a potentially new species in the Itapecuru River basin, with 3.2% of genetic distance – a finding later confirmed by Guimarães et al. (2022), with 2.8% of genetic distance.

In our examination of multiple *Hoplias* specimens from various hydrographic basins in Maranhão, we identified not only *H. cazumba* but also *H. malabaricus* and putative new species from Itapecuru and Mearim basins (these new species are being described in an ongoing study by another research group).

Despite the increasing number of studies involving specimens from Maranhão, it is important to note that only Piorski (2010) and Abreu-Souza (2014) included samples from the Munim River basin—and in very limited numbers (2 and 6 individuals, respectively). This may reflect the basin's relatively small size and consequently lower research interest, or possibly the scarcity of available specimens in ichthyological collections. This limitation is also evident in the present study, which includes only a few specimens from two localities within the basin. Nonetheless, these were sufficient to demonstrate the presence of a distinct, previously unrecognized species.

More recently, Conde-Saldaña et al. (2025), based on an analysis of 2,519 ultraconserved element (UCE) loci, recovered the monophyly of Erythrinidae genera and confirmed that *H. malabaricus* represents a broadly distributed species. However, their dataset did not include any samples from the hydrographic basins of Maranhão. These authors also suggested that the diversification and dispersal of species within the *H. malabaricus* complex intensified over the last 10 million years—coinciding with the timing of recent biogeographic events that drove freshwater fish diversification in Maranhão's basins (Abreu et al. 2019, 2020a, 2020b).

Abreu et al. (2020b) further demonstrated that populations of *Schizodon dissimilis* and *Prochilodus lacustris* underwent recent diversification in this region, around 0.6 million years ago. This may indicate that *H. malabaricus* populations in Maranhão also experienced recent diversification. Given the conservative morphological traits of this species, this could have hindered the recognition of new taxa within the genus in previous studies.

The Maranhão Hydrological Unit (MHU), located in the Eastern Amazon region, has been identified as a potential endemic area for freshwater fishes (Hubert and Renno 2006). Recent studies based on local scientific collections and the availability of new samples encouraged the discovery of new taxa in this region (Leão et al. 2019; Brito et al. 2019; Saraiva et al. 2021; Aguiar et al. 2022; Dutra et al. 2022; Lustosa-Costa et al. 2022; Oliveira et al. 2022). Nevertheless, the ichthyofauna of the MHU is likely still underestimated, influenced by its geomorphological history and historical connections with adjacent river basins (Abreu et al. 2019, 2020a, 2020b).

Recent studies have reaffirmed Piorski's (2010) pioneering findings on *Hoplias* from the MHU, using the mitochondrial marker COI (Pires et al. 2020; Guimarães et al. 2022). However, a comprehensive analysis of the previously identified molecular groups and subgroups, aimed at clarifying their taxonomic status, remains lacking.

Key to the species of the *Hoplias malabaricus* group (adapted from Guimarães et al. 2022b)

- 1 Last vertical series of scales on caudal-fin base curved.....*Hoplias misionera*
- Last vertical series of scales on caudal-fin base nearly straight..... 2
- 2 Five distinctive transverse brown bands on the lower jaw..... *H. mbigua*
- Color pattern of lower jaw lacking series of five brown bands..... 3
- 3 Lateral line scales 37–41..... 4
- Lateral line scales 41–47..... 7
- 4 Dorsal-fin rays 11–13..... 5
- Dorsal-fin rays 14.....*H. malabaricus*
- 5 Pre-dorsal scales 14–17..... 6
- Pre-dorsal scales 18..... *H. teres*
- 6 Lateral line scales 37–39; anal-fin rays iii–iv, 7–8; caudal-fin rays ii–iv, 12–15; vertebrae 38–39.....*H. auri*
- Lateral line scales 39–41; anal-fin rays i–ii, 8–10; caudal-fin rays ii, 15; vertebrae 39–41..... *H. cazumba* sp. nov.
- 7 Scales around caudal peduncle 20..... *H. argentinensis*
- Scales around caudal peduncle 22–24..... *H. microlepis*

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