



A new species of diminutive spiny driftwood catfish *Spinipterus* (Siluriformes: Auchenipteridae) from the Madeira River system, Amazon basin, Brazil

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The genus *Spinipterus*, a member of Auchenipterinae, was previously known from only two species: *S. acsi*, originally described from the Peruvian Amazon and later recorded from Juruá River in Brazil, and *S. moijiri*, described from the Purus River basin. In a 2020 expedition to the Madeira River basin during an intense drought that exposed lateritic rocks in the Guaporé River bed revealed a diminutive, previously undescribed species of *Spinipterus*. The new species differs from its congeners, *S. acsi* and *S. moijiri*, by the marbled body coloration, lower number of soft pectoral-fin rays, a longer head, a smaller interorbital distance, reduced maxillary barbels, and other osteological features. This new species, described herein, underscores the underestimated diversity within *Spinipterus*, likely due to its habitat specificity and rarity in ichthyological collections, highlighting the importance of exploring unusual microhabitats in revealing hidden components of Neotropical fish diversity. A key to identification of the species of *Spinipterus* is provided.

Keywords: Auchenipterinae, Biodiversity, Catfish, Identification key, Taxonomy.

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O gênero *Spinipterus*, um membro da subfamília Auchenipterinae, era previamente conhecido por apenas duas espécies: *S. acsi*, originalmente descrita da Amazônia peruana e posteriormente registrada no rio Juruá, no Brasil, e *S. moijiri*, descrita da bacia do rio Purus. Em uma expedição de 2020 à bacia do rio Madeira, uma intensa seca que expôs rochas lateríticas no leito do rio Guaporé revelou uma espécie diminuta de *Spinipterus*, até então não descrita. A nova espécie difere de seus congêneres, *S. acsi* e *S. moijiri*, pela coloração marmorizada do corpo, menor número de raios moles na nadadeira peitoral, cabeça mais longa, menor distância interorbital, barbilhões maxilares reduzidos e outras características osteológicas. Esta nova espécie, descrita aqui, destaca a diversidade subestimada dentro de *Spinipterus*, provavelmente devido à sua especificidade de habitat e raridade em coleções ictiológicas, evidenciando a importância de explorar microhabitats incomuns para revelar componentes ocultos da diversidade de peixes neotropicais. Uma chave para a identificação das espécies de *Spinipterus* é fornecida.

Palavras-chave: Auchenipterinae, Bagre, Biodiversidade, Chave de identificação, Taxonomia.

INTRODUCTION

The family Auchenipteridae is among the most prominent groups of Neotropical Siluriformes, currently comprising 133 recognized species distributed across 26 genera classified in the two subfamilies, Auchenipterinae and Centromochlinae (Calegari *et al.*, 2026; Fricke *et al.*, 2026). The genus *Spinipterus* Akama & Ferraris, 2011, a member of Auchenipterinae, was originally described from the Amazon basin in Peru, based on the holotype of *Spinipterus acsi* Akama & Ferraris, 2011. This species was later recognized from additional specimens collected in the Juruá River, Brazil (Calegari *et al.*, 2018). More recently, a second species, *S. moijiri*, was described from the middle Purus River basin, distinguished from its congeners by its much larger adult size and jaguar-like color pattern, which resembles that of *Liosomadoras ocinus* (Birindelli, Zuanon, 2012; Rocha *et al.*, 2020).

Spinipterus species are remarkable auchenipterid catfishes characterized by unique external autapomorphic features, including the presence of three rows of serrations along the anterior and anterolateral margins of the pectoral- and dorsal-fin spines, conspicuous spines on the dorsal surface of cephalic bones, nasal and cleithrum, and by a groove on the medial portion of the dorsum just behind the dorsal fin (Akama, Ferraris, 2011; Calegari *et al.*, 2019).

In a recent expedition to the Madeira River basin during the extreme drought of 2020, when sections of the Guaporé River were reduced to narrow, shallow channels, a brittle block of lateritic substrate was extracted from the riverbed. This block, riddled with narrow interconnected tunnels, harbored small fishes including auchenipterids. Within this microhabitat, a third, diminutive species of *Spinipterus* was discovered. Although exhibiting a color pattern reminiscent of *S. acsi*, it is genetically distinct and shows some clear differences in morphology and morphometry compared to its congeners.

Its occurrence in such a specialized microhabitat highlights the still underestimated diversity within the genus *Spinipterus*, likely a result of its cryptic behavior, habitat specificity, and the challenges associated with collecting specimens, which contributes to their rarity in scientific collections. The new species is described herein.

MATERIAL AND METHODS

All counts and measurements were made under a stereomicroscope. Morphometric measurements were straight-line distances taken point-to-point obtained to the nearest 0.1 mm with digital calipers preferably on the left side of specimen. Measurements followed Lundberg, McDade (1986), with modifications introduced and described by Akama, Ferraris (2011). All measurements are expressed as percents of standard length (SL), except subunits of the head, which are expressed as percents of head length (HL). Specimens were cleared and counterstained (c&s) for bone and cartilage according to the technique of Taylor, Van Dyke (1985). Fin ray counts include all elements. Vertebral counts were based on two c&s specimens. Vertebral counts included all elements in the Weberian complex, which in *Spinipterus* the compound centrum includes up to eighth vertebra, and the complex caudal centrum (PU1 + U1) was counted as a single element. Counts for the holotype reported in the description are represented by an asterisk, and numbers of individual counts are given in parenthesis.

The species distribution map was developed using HydroSHEDS database (<http://www.hydrosheds.org>) in Quantum GIS v. 3.16.14 (2022). The specimens examined in this study are those listed in the comparative material section, and institutional abbreviations are those listed at <http://www.asih.org/codons.pdf> (Sabaj, 2023).

Genseq nomenclature for the new species follows Chakrabarty *et al.* (2013), and col sequences from secondary types are listed below the type material of the new species. Sequencing the Cytochrome c Oxidase I gene (col) was conducted with the primers LCO1490 (forward) and HCO2198 (reverse; Folmer *et al.*, 1994). Total genomic DNA was isolated through the DNeasy Blood & Tissues Kit (QIAGEN®, Hilden, Germany). The polymerase chain reaction (PCR) was performed in 25 µl of 10 µM of each primer, 1× Master Mix Kit (QIAGEN®, Hilden, Germany), and *ca.* 40 ng of DNA. The mitochondrial gene col was amplified to obtain a 522 bp fragment using the following PCR protocol. An initial denaturation step of 4 min at 95 °C followed by 35 cycles of denaturation at 95 °C for 60 s, annealing at four temperatures, 48 °C, 45 °C, 42 °C and 40 °C for 20 s each, and extension at 72 °C for 2 min. This was followed by a final extension of 5 min at 72 °C, and storage for 5 min at 4 °C. The amplicons were purified and sequenced in both directions at Functional Bioscience®, Inc. facility (WI, USA). The consensus sequences were edited and generated in Geneious® v. 9.1.8 (<http://www.geneious.com>) and deposited in GenBank. Comparative species for genetic distance were obtained from previous studies (Calegari *et al.*, 2019, 2026): *Spinipterus acsi* (Genbank Accession Number OR589635), *Spinipterus moijiri* (Genbank Accession Number MF595260), and *Liosomadoras oncinus* (Genbank Accession Number MF595249).

RESULTS

Spinipterus cuniculus, new species

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(Figs. 1–2; Tab. 1)

Holotype. INPA 61745, mature male, 34.2 mm SL, Rondônia, São Francisco do Guaporé, Guaporé River 3 km downstream Nova Vida Hotel, tributary of Madeira River, at border between Brazil and Bolivia, 12°26'23"S 63°43'11"W, 1 Nov 2020, Ohara, W. M. & D. H. Barbalho.



FIGURE 1 | Lateral, dorsal, and ventral views of the holotype of *Spinipterus cuniculus*, INPA 61745, mature male, 34.2 mm SL, Guaporé River, Madeira River basin, Rondônia, at border between Brazil and Bolivia.



FIGURE 2 | Paratypes of *Spinipterus cuniculus*, INPA 61746, adult males, 24.2 mm SL (A) and 21.9 mm SL (B), Guaporé River, Madeira River basin, Rondônia, at border between Brazil and Bolivia.

TABLE 1 | Morphometric data for *Spinipterus cuniculus*, range includes holotype (Hol). SD = Standard deviation.

	Hol	N	Range	Mean	SD
Standard length	34.2	12	21.8–34.2	24.8	–
Percents of standard length					
Predorsal length	31.2	12	31.2–38.0	34.6	2.1
Prepectoral length	21.6	12	20.2–25.6	23.2	1.6
Head length	25.8	12	25.8–29.9	28.2	1.2
Body depth at anterior nuchal plate	20.8	12	16.4–20.8	18.2	1.2
Body width at antero-lateral cleithrum	23.7	12	23.7–29.4	27.1	1.5
Upper gill membrane distance	19.5	12	19.5–24.5	22.9	1.4
Dorsal-fin base length	10.3	12	10.3–13.2	11.8	1.1
Dorsal-fin spine length	16.4	12	14.6–19.1	17.0	1.3
Postcleithral process length	18.4	12	18.0–20.4	19.1	0.7
Pectoral-fin spine length	19.2	12	19.2–24.8	22.5	1.5
Anal-fin base length	18.9	12	19.0–27.1	25.0	2.4
Caudal-peduncle length	16.7	12	12.0–17.0	15.0	1.4
Caudal-peduncle depth	10.8	12	8.7–12.2	11.0	1.1
Percents of head length					
Mouth width	54.4	12	52.1–58.4	55.8	1.9
Snout length	30.1	12	28.1–35.9	32.6	2.3
Orbital diameter	13.6	12	12.8–17.4	14.6	1.3
Interorbital distance	49.0	12	46.5–53.8	50.8	2.3
Anterior-posterior narial distance	18.7	12	17.1–20.0	18.8	1.0

Paratypes. All from Amazon basin: INPA 61746, 17, 18.2–26.2 mm SL; MCP 54517, 48, 21.8–29.5 mm SL, collected with holotype.

Genseq-2 coI. MCP 54517 (tissue tag B6); Genbank Accession Number PX921089.

Diagnosis. The new species differs from the other two congeners, *Spinipterus acsi* and *S. moijiri*, by having four or five soft pectoral-fin rays (*vs.* seven rays in *S. moijiri*, and six rays in *S. acsi*), color of the body in having light brown background with small dark melanophores distributed sparsely with small dark dots of unequal sizes on middorsal portion of trunk (*vs.* color pattern with irregular dorsolateral brown blotches on body larger than eye diameter in *S. acsi*, or large black rosette-like spots over a light yellow to brown background in *S. moijiri*; figs. 1, 6, and 7 in Rocha *et al.*, 2020), longer head length 25.8–29.9% SL (*vs.* 24.6–25.2% in *S. acsi* and 22.7–25.4% SL in *S. moijiri*), smaller interorbital distance 46.5–53.8% HL (*vs.* 58.9–61.8% in *S. acsi* and 53.9–59.1% HL in *S. moijiri*), postcleithral process 18.0–20.4% SL (*vs.* 20.8–24% in *S. acsi* and 13.5–15.1% SL in *S. moijiri*), short maxillary barbel, extending posteriorly just before pectoral-fin origin or not surpassing pectoral-fin base (*vs.* long maxillary barbel, surpassing far that point, at least reaching one third of pectoral-fin spine length or dorsal-fin origin in both species *S. acsi* and *S. moijiri*). The new species further differs from *S. acsi* by having shallower body depth 16.4–20.8% SL (*vs.* 20.9–22.8% SL), and smaller eye 12.8–17.4% HL (*vs.* 19.8–20.5% HL). The new species additionally differs from *S. moijiri* by the caudal fin rounded (Fig. 1, *vs.* caudal fin truncated); larger anal-fin base 19–27.1% SL (*vs.* 14–18.8% SL), anterior cranial fontanel bordered by the frontal and mesethmoid (*vs.* anterior fontanel restricted to frontal; Fig. 3); anterior nuchal plate extremely reduced not contacting epioccipital (*vs.* larger anterior nuchal plate, size slightly smaller than epioccipital, contacting epioccipital; Fig. 3).

Description. Morphometric data in Tab. 1. Body compressed, relatively elongate; body deeper at predorsal region, and wider at pectoral girdle and operculum. Lateral line incomplete, ending slightly before end of anal fin, simple, not bifurcated; one individual with interruption at vertical through anal-fin origin. Lateral line midlateral, with canals forming straight line.

Head depressed and broadly convex anteriorly in lateral view, then relatively straight from vertical running through end of orbit to dorsal-fin origin. Snout length approximately twice orbital diameter; snout margin rounded. Eye small, laterodorsal, situated at one-fourth of HL, slightly visible in dorsal view but not visible in ventral view. Ocular rim circular, bordered anteriorly and dorsally by strong and large conical spines on margin of antorbital, lateral ethmoid and sphenotic. Frontal excluded from margin of orbit. Conspicuous spines surrounding entire margin of cephalic shield, lateral ethmoid, antorbital, mesethmoid, and preoperculum; bones at middle portion of cranium without spines, except in some larger adults (>30 mm SL) showing smaller spines in supraoccipital and epioccipital; spines present in males and females, both juveniles and adults. Cephalic lateral-line sensory canals narrow and ossified; three infraorbital canals bordering ventral margin of eye. Anterior nostril located on snout margin, tubular and directed anteroventrally. Posterior nostril located between eyes; nostril rim with thin, folded membrane. Anterior fontanel bordered by the frontal and mesethmoid.

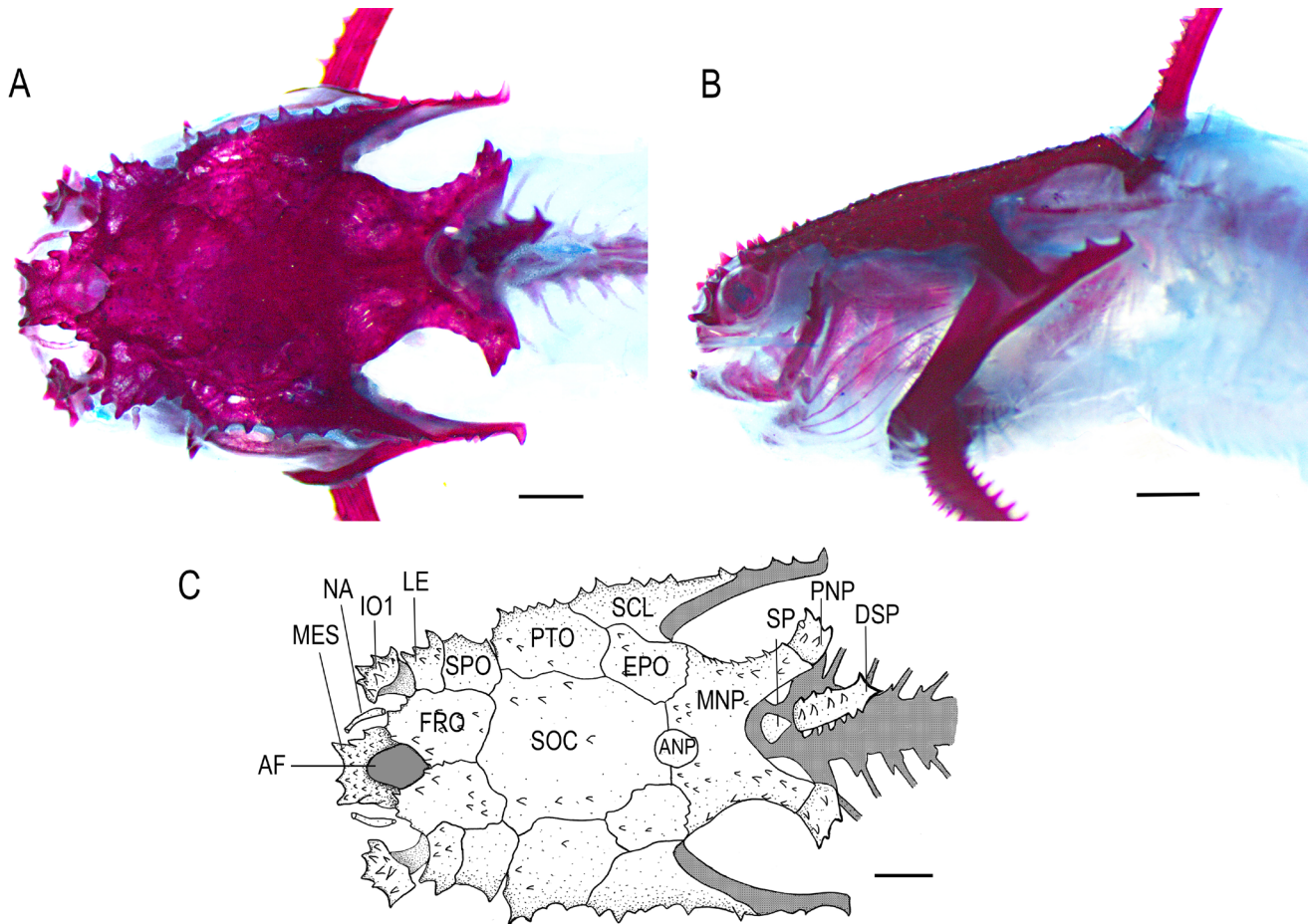


FIGURE 3 | Dorsal (A) and lateral (B) views, and schematic drawing of dorsal view (C) of neurocranium of *Spinipterus cuniculus*, paratype, MCP 54517, 22.7 mm SL. AF, anterior fontanel; ANP, anterior nuchal plate; DSP, dorsal-fin spine; EPO, epioccipital; FRO, frontal; IO1, infraorbital 1; LE, lateral ethmoid; MES, mesethmoid; MNP, median nuchal plate; NA, nasal; PNP, posterior nuchal plate; PTO, pterotic; SCL, supra-claithrum; SP, spinelet; SPO, sphenotic; SOC, supraoccipital. Scale bars = 1 mm.

Mouth terminal, subequal with dentary projecting slightly beyond upper jaw. Anterior dentary teeth slightly visible from dorsal and lateral views when mouth closed. Premaxillary and dentary tooth patches with three irregular villiform tooth rows. Dentary teeth slightly larger than those on premaxilla; teeth on anterior portion of both dentary and premaxilla larger than those on lateral portion, decreasing in size progressively. Palate without teeth.

Three pairs of slender barbels. Maxillary barbel relatively long, extending posteriorly short before pectoral-fin origin. Adpressed medial mandibular barbel extending posteriorly slightly short of origin of lateral mandibular barbel. Tip of adpressed lateral mandibular barbel extending posteriorly to anterior margin of cleithrum. Branchiostegal membrane broadly attached to isthmus; ventral margin of gill opening extending to lateral margin of exposed pectoral girdle or at vertical of medial portion of base of pectoral-fin spine.

Exposed portion of postcleithral process long and narrow, inclined posterodorsally and extended up to vertical line through end of dorsal-fin base. Dorsal portion of

postcleithral process ornamented with two or three large and strong spines. Anterior nuchal plate very small, smaller than exposed portion of spinelet; posterior nuchal plate with short posterior process. Dorsal fin inserted at anterior one-third of SL. Dorsal-fin spine robust, straight and not pungent; longer than branched rays.

Dorsal-fin spine with three anterior rows of perpendicular well-developed serrations running along axis of spine; one situated at midline, and other two parallel at anterolateral margin of spine. Posterior margin of dorsal-fin spine smooth, lacking any serration. Midline of dorsal surface posterior to dorsal-fin base with groove to accommodate fin rays. Spinelet of dorsal-fin large, approximately of same size of base of dorsal-fin spine. Dorsal-fin rays II,4(8) or 5*(4). Adipose fin elongate, with thick base, and free posterior lobe; extending to or closely to dorsal procurent caudal-fin rays.

Pectoral fin with strong spine, curved and serrate along entire length of both margins. Three rows of strong perpendicular serrations along spine's axis on anterior margin, and one row of retrorse on posterior margin. Tip of pectoral-fin spine not pungent and usually ending in two largest serrations, one in each margin of spine. First soft ray longest, but shorter than pectoral-fin spine. Pectoral-fin rays I,5*(10), or I,4(2).

Pelvic fin inserted slightly anterior to vertical through middle of SL. Pelvic-fin margin convex, with branched rays longest. Tip of adpressed pelvic falling short of anal-fin origin or reaching urogenital tube. Pelvic-fin rays I,5(12).

Anal-fin base relatively long, with slightly convex distal margin. Anal fin with first ray longest and subsequent rays becoming progressively shorter. Last anal-fin ray without membranous attachment to caudal peduncle. Anal-fin rays i,18*(7) or 19(5).

Caudal fin obliquely convex, with dorsal rays more elongated than ventral rays. Dorsal and ventral caudal-fin folds conspicuous, including several procurent rays preceding principal ones; dorsal fold long reaching approximately end of adipose fin. Principal caudal-fin rays i,7,9,i*(3) or i,7,8,i(9). Total vertebrae 42 or 43 (compound centrum including 8 vertebra + 33 or 34 free vertebra + compound caudal complex), pleural ribs 7, first pleural rib on seventh vertebrae.

Coloration in alcohol. Overall ground coloration creamy to pale yellow, with dorsal coloration dark brown pigmented varying in intensity, darker on head and mid-dorsal portion of body. Overall pigmentation less intense in some individuals, most notable in subadults. Body pigmented with melanophores sparsely and irregularly distributed on head and body.

Dorsolateral surface of body covered with irregular spots formed by concentrated pigmentation of different sizes and erratic distribution; spots often absent in specimens of overall light ground pigmentation and in some smaller individuals (< 25 mm SL). Body side bearing less pigmentation ventrally; abdomen pale white lacking pigmentation, except by few melanophores covering anterior border of cleithrum. Ventral head with pigmentation more concentrated on border of jaw and branchiostegal membrane. Maxillary barbels typically dark pigmented along entire length; lighter individuals with diffuse pigmentation. Mental barbels without dark chromatophores, except for base of barbels. Cephalic spines, margin of nuchal plates, lateral portion of postcleithrum process mostly lacking pigmentation or less pigmented.

Patch of dark pigmentation typically present at base of dorsal fin, reaching one third of dorsal-fin rays length. Dorsal-fin spine with irregularly distributed pigmentation,

sometimes more concentrated on its distal half. Dorsal-fin branched rays varying in pigmentation; darker individuals with distal portion of rays dark pigmented. Pectoral-fin spine covered by irregular pigmentation; pectoral-fin branched rays less pigmented. Dorsal surface of pelvic-fin rays with diffuse pigmentation in some individuals, usually over principal pelvic-fin ray and base of pelvic fin, but without any distinct patch of pigmentation. Anal fin distinctly darker at base, pigmentation typically concentrated on proximal half of fin; distal half lighter, bearing few diffuse pigments or none. Most of caudal fin covered with dark chromatophores continuing pigmentation of body; some individuals with small unpigmented field in region overlying central rays.

Coloration in life. Similar to color pattern in preserved specimens, but with lighter ground color of body. Color of fins (dorsal, pectoral, adipose and caudal) slightly yellowish. Cheek and opercle region, as well as pelvic fin reddish. Small black dots conspicuous in some individuals (Fig. 4).

Sexual dimorphism. Mature males have an elongated intromittent organ attached along the entire length anteriorly to the first anal-fin ray (*vs.* females with urogenital opening before anal fin). Intromittent organ in subadult males run in a more parallel position to the anal fin and shorter in size, one quarter to half of anal-fin length.

Geographical distribution. *Spinipterus cuniculus* is only known from the Guaporé River, tributary of the Madeira River basin, Rondônia, Brazil (Fig. 5).

Ecological notes. Many rivers of the southern Amazon experienced a severe drought in 2020, including portions of the Guaporé River, causing its channel to become narrow and shallow with widths reduced to approximately 60 m and depths ranging from 3 to 5 m (Fig. 6). In one such section, a brittle lateritic block was taken from the riverbed. The block, measuring approximately 1.5 m in length, 60 cm in width, and weighing nearly 45 kg, contained a complex network of interconnected tunnels and galleries (Fig. 7). The innermost, narrower tunnels were inhabited exclusively by small fishes, notably species of *Tatia* and the new species of *Spinipterus*, herein described. In contrast, the outermost and wider tunnels were occupied by larger fish species (*i.e.*, *Acanthodoras spinosissimus* (Eigenmann & Eigenmann, 1888), *Agamyxis pectinifrons* (Cope, 1870), *Batrochoglanis raninus* (Valenciennes, 1840), *Peckoltia* cf. *vittata* (Steindachner, 1881), *Platydoras armatulus* (Valenciennes, 1840), and *Trachelyopterus* sp.). A total of more than 350 fish specimens were collected from the block, representing members of Auchenipteridae, Apterodontidae, Doradidae, Loricariidae, and Pseudopimelodidae. All *Spinipterus* individuals ($n = 63$) were recovered from the deepest portions of the lateritic block, suggesting a strong association with these microhabitats for shelter. The surface of the block was covered by a thin layer of greenish biofilm, where chironomid larvae were abundant. Stomach content analysis of three *Spinipterus* paratypes revealed two empty stomachs, while one contained a single chironomid larva, indicating possible benthic insectivory in this species.



FIGURE 4 | Live coloration of adult paratypes of *Spinipterus cuniculus*, from Guaporé River, tributary of Madeira River basin, Rondônia, Brazil.

Conservation status. *Spinipterus cuniculus* is known only from Guaporé River in Rondônia State at the border between Bolívia and Brazil. Despite the relatively restricted range, the species occurs in an area not densely sampled and possibly has a broader distribution. Data on abundance or population tendencies are unknown, but no specific threats were identified. Consequently, we recommend *S. cuniculus* is categorized as Least Concern (LC) (IUCN, 2024).

Etymology. The specific epithet, *cuniculus*, is derived from the Latin and means hole or burrow, referring to the particular habitat of the new species in living inside of lateritic blocks. An adjective.

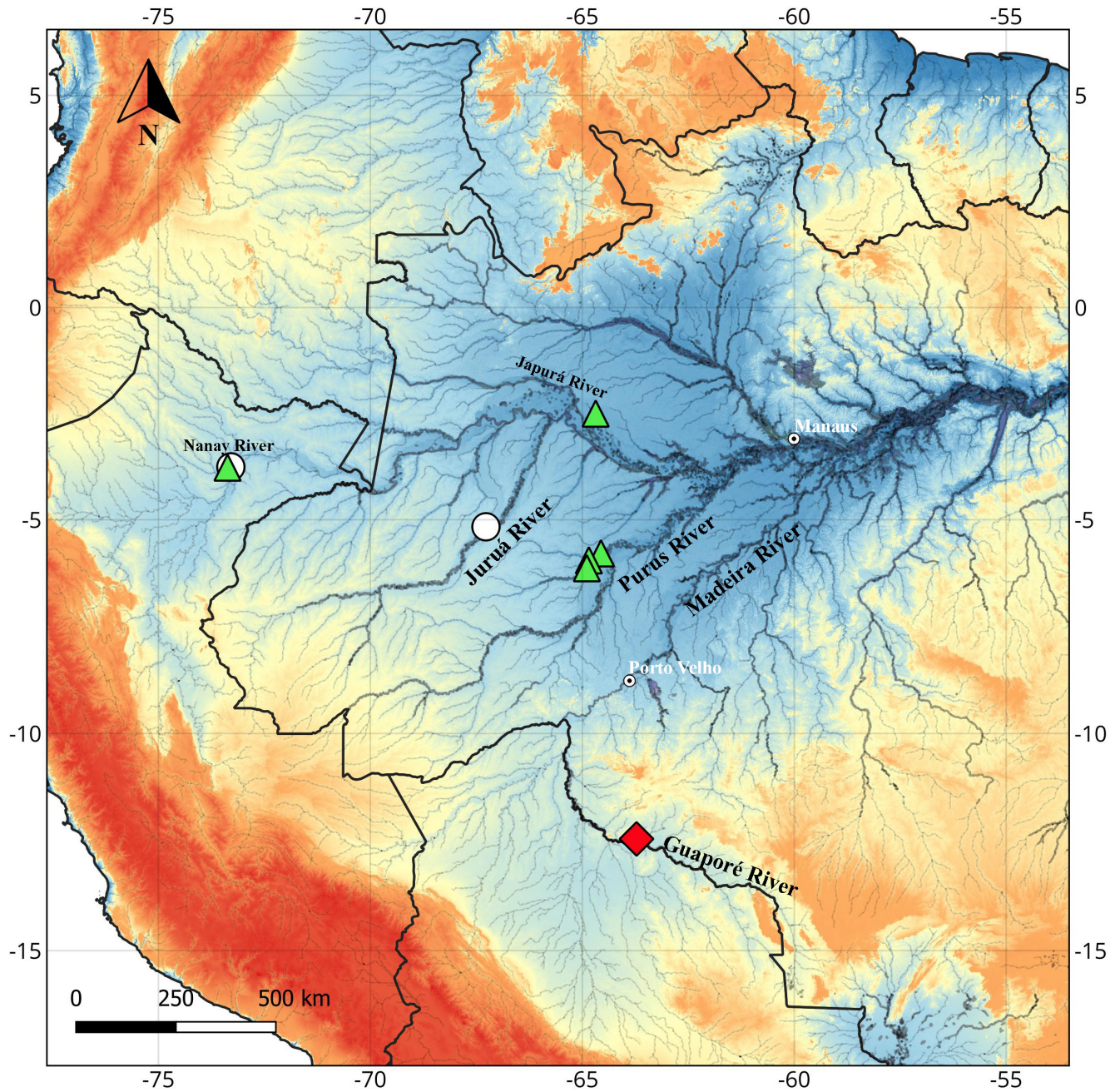


FIGURE 5 | Geographic distribution of the new species *Spinipterus cuniculus* (red diamond = type locality) from Madeira River basin, Rondônia, Brazil; and records of the examined congeners *S. acsi* (triangles) and *S. mojiri* (circles) and from literature. The symbols can represent more than one individual.

Remarks. Specimens of *Spinipterus* from Igarapé Caracol (UFRO 9984, 18324), tributary of Madeira River (Brazil) were examined (lots listed in comparative material section). Despite having a very similar overall body pattern to that of *S. cuniculus*, the few specimens showed slight differences in body coloration. Since the material is scarce and we are uncertain whether that population is conspecific with *S. cuniculus* or represents a closely related but distinct species, we are herein referring to them as *Spinipterus* aff. *cuniculus* until additional material is obtained and allows to resolve their taxonomic status.



FIGURE 6 | Guaporé River during the period of severe drought in November 2020. Type locality of *Spinipterus cuniculus*, Madeira River basin, Rondônia, Brazil.



FIGURE 7 | Portion of a larger lateritic block (approx. 45 kg, 1.5 m in length, 0.6 m in width) containing numerous interconnected tunnels, from which specimens of *Spinipterus cuniculus* were collected. The block was taken from the riverbed of the “Guaporé River (type locality),” Rondônia, Brazil, type locality.

Key for identification of species of *Spinipterus*

- 1a. Overall body color pattern with large black rosette-like spots over light yellow to brown background; pectoral fin with 7 soft rays; truncated caudal fin, large adult size (up to 104.5 mm SL)*S. moijiri*
- 1b. Overall body color composed of a creamy to brown background with irregular dark spots or dots and scattered melanophores; pectoral fin with 4 to 6 soft rays; rounded caudal fin, small adult size (< 40.0 mm SL) 2
- 2a. Adpressed maxillary barbel extending beyond base of pectoral fin, at least reaching one third of pectoral-fin spine length; 6 soft pectoral-fin rays; interorbital distance 58.9–61.8% HL.....*S. acsi*
- 2b. Adpressed maxillary barbel extending posteriorly short before or just reaching pectoral fin base; 4 or 5 soft pectoral-fin rays; interorbital distance 46.5–53.8% HL *S. cuniculus*

DISCUSSION

The new species described from the Madeira River basin shares all of diagnostic characters of *Spinipterus*, confirming its placement within the genus: three rows of serrations along the anterior and anterolateral margins of the pectoral- and dorsal-fin spines, prominent spines on the dorsal surface of the cephalic bones, nasal, and cleithrum, and a medial groove on the dorsum just posterior to the dorsal fin (Akama, Ferraris, 2011; Calegari *et al.*, 2019).

The discovery of a third species of *Spinipterus* in the Madeira River basin not only expands the known diversity within the genus, but also reinforces the importance of specialized microhabitats in harboring unknown fish species. The rarity of *Spinipterus* species in ichthyological collections has long hindered a better understanding of the diversity and distribution of the genus. Specimens of *Spinipterus* are rare in museums (*S. acsi*, n = 2; *S. moijiri*, n = 11; *S. cuniculus* n = 63; *S. aff. cuniculus* = 3; and found inside of submerged trunks and rocks (Akama, Ribeiro, 2013; Rocha *et al.*, 2020), which may explain its absence in samples obtained with traditional fishing devices. The recovery of 63 individuals of the new species from a single lateritic block during an exceptional drought event in Guaporé River underscores both the cryptic behavior and potential microendemism of these fishes. Their use of narrow deep tunnels within the substrate for shelter and the possible benthic insectivorous diet points to a highly specialized lifestyle that may partly explain their absence in catches obtained with conventional sampling methods.

Genetic analysis reveals that the new species is more similar to *Spinipterus acsi*, showing 3.8% coI sequence divergence, while it is considerably more distant from *S. moijiri* (~18%) (Tab. 2). The comparable levels of genetic divergence observed across *Spinipterus* species, but also between *Liosomadoras* and *Spinipterus* species (18.4–19%) further reinforce the hypothesis that *Spinipterus* represent an early-diverging lineage within Auchenipterinae with its origin dating to the Miocene, approx. 20 mya (Calegari *et al.*, 2026). These findings highlight that our knowledge about *Spinipterus* diversity and its evolutionary history is still incomplete and additional surveys using specialized sampling methods are likely to result in the discovery of additional species.

Morphologically, the new species of *Spinipterus* differs notably from its two congeners, *S. acsi* and *S. moijiri*, by a combination of features associated with reduced size and structural simplification. It exhibits not only diminutive adult body size, but also several reductions and development truncations suggesting potential miniaturization process. Reductions in size including the lower number of soft pectoral-fin rays (4–5 *vs.* 5–6 in *S. acsi*, and 7 in *S. moijiri*), and proportional differences such as a relatively longer head, shallower body, smaller eye, and reduced maxillary barbels further support its distinction. Notably, the anterior nuchal plate is extremely reduced, and the anterior fontanel extends between both the frontal and mesethmoid bones, features that may be related to skeletal miniaturization, also shared with *S. acsi*, species also with small body size. On the other hand, the new species shows an incomplete lateral line truncated anteriorly at anal-fin origin. Overall, the new species represent a case of significant reduction in the adult size among Neotropical catfishes and close to the proposed threshold for inclusion as a miniature species (*q.v.*, Weitzmann, Vari, 1988). Additionally, all the truncations and reduced size traits evidence possible morphological miniaturization processes within

TABLE 2 | Pairwise genetic distance (%) of *Spinipterus* species and *Liosomadoras oncinus* based on *col* gene.

Species	<i>S. cuniculus</i>	<i>S. acsi</i>	<i>S. moijiri</i>	<i>L. oncinus</i>
<i>S. cuniculus</i>	-			
<i>S. acsi</i>	3.76	-		
<i>S. moijiri</i>	17.92	16.59	-	
<i>L. oncinus</i>	18.58	19.03	18.36	-

Spinipterus and Auchenipteridae, a phenomenon known in other Neotropical catfish lineages but previously documented in the family only for *Gelanoglanis*.

Coloration also provides key diagnostic differences. While *S. moijiri* displays a conspicuous jaguar-like pattern of large rosettes (Rocha *et al.*, 2020, figs. 1, 6), and *S. acsi* shows diffuse pigmentation with scattered large dark blotches, the new species has a marbled body color pattern characterized by a light brown background with small, irregularly distributed melanophores and fine dark dots concentrated along the dorsal trunk. These markings, along with a rounded caudal fin and smaller number of pectoral-fin rays, provide useful field characters for distinguishing *S. cuniculus* among congeners.

From a biogeographic perspective, the discovery of this species in the upper Madeira basin adds an important new record for the genus in the southwestern Amazon. The Guaporé River, a clearwater tributary of the Madeira system, is known for its high levels of endemism and transitional faunal elements between the Amazon and Paraná-Paraguay basins. The microhabitat from which the specimens were collected, narrow tunnels within a lateritic block, may constitute a key factor in the natural history of the species and help explaining its supposedly patchy and limited distribution. Furthermore, the clearwater characteristic of the Guaporé River, with neutral pH and low turbidity, contrasts with the turbid whitewater environments of the Solimões, Juruá and lower Madeira rivers, possibly influencing patterns of habitat use, ecological specialization and dispersal limitation within *Spinipterus*.

These findings emphasize the need for targeted microhabitat sampling and exploration of under-surveyed aquatic systems, to uncover hidden biodiversity and resolve the taxonomic complexity of poorly known Neotropical fish groups.

Comparative material examined. Brazil. *Liosomadoras oncinus*: MCP 46029, 7 (1 c&s), Amazonas, Barcelos, creek Apanha-Luz, 20 km downstream Barcelos. *Spinipterus acsi*: UFRGS 21671, 1, Amazonas, Carauari, Cachimbo Creek, tributary to Bauana Branco, Juruá River, upper Amazon basin. *Spinipterus* aff. *cuniculus*: UFRO 9984, 2, UFRO 18324, 1, Rondônia, Porto Velho, Igarapé Caracol, tributary of Madeira River, Amazon basin, 09°14'34"S 64°19'20"W, 21 Jul 2010, W. M. Ohara. *Spinipterus moijiri*: INPA 35411, 1 skeleton, Amazonas, Tapauá, Caniúá River, Purus River basin, 06°08'18"S 64°53'33"W. **Peru.** *Spinipterus acsi*: ANSP 178209, holotype, Loreto, Maynas, caño Santa Rita, right bank of Nanay River, at 3.32 mi NW center of Iquitos near village of Pampa Chica. **Venezuela.** *Liosomadoras oncinus*: ANSP 190707, 2, Caño Tigre, right bank tributary to Orinoco, 9.6 km NE of Macurucu; MZUSP 46015, 1, purchased in aquarium shop.

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The authors confirm that the data supporting the findings of this study are available within the article or from the corresponding author upon reasonable request.

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