



## A new distinctively banded species of *Panaqolus* (Siluriformes: Loricariidae) from the western Amazon Basin in Peru

NATHAN K. LUJAN<sup>1</sup>, SARAH STEELE<sup>1</sup> & MIQUEL VELASQUEZ<sup>2</sup>

<sup>1</sup>Department of Natural History, Royal Ontario Museum, 100 Queen's Park, Toronto, ON, M5S 2C6, Canada.

E-mail: [nklujan@gmail.com](mailto:nklujan@gmail.com); [sarah.steele@mail.utoronto.ca](mailto:sarah.steele@mail.utoronto.ca)

<sup>2</sup>Departamento de Ictiología, Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Apartado, 14-0434, Lima 14, Peru. E-mail: [mianvq@gmail.com](mailto:mianvq@gmail.com)

### Abstract

*Panaqolus albivermis* is described as a new species based on four specimens from the San Alejandro River, a tributary of the upper Ucayali River in central Peru. *Panaqolus albivermis* is diagnosed from all other *Panaqolus* except *P. maccus* by having head, body, and fins with widely separated small white to yellow spots, vermiculations, and/or thin oblique bands on a black base (vs. exclusively small white to yellow spots on a black base in *P. albomaculatus*, generally broad oblique bands of alternating light to dark brown in *P. changae*, *P. gnomus*, *P. purusiensis*, and a uniformly dark gray to black body color in *P. dentex*, *P. koko*, and *P. nocturnus*); *P. albivermis* can be diagnosed from *P. maccus* by having a black base color (vs. brown), by having parallel dentary tooth cups (vs. acute intermandibular tooth cup angle), and by having a larger known adult body size (95.8 mm SL vs. 84.8).

**Key words:** Neotropics, Taxonomy, Ancistrini, Andean piedmont, Aguaytia, Ucayali

### Resumen

Se describe la especie nueva *Panaqolus albivermis* basada en cuatro especímenes del río San Alejandro, tributario del río Alto Ucayali en el centro de Perú. *Panaqolus albivermis* se diferencia de los otros *Panaqolus* excepto *P. maccus* por presentar pequeños puntos dispersos blancos o amarillos en la cabeza, el cuerpo y las aletas, vermiculaciones y/o bandas delgadas oblicuas sobre un fondo negro (vs. pequeños puntos blancos o amarillos sobre fondo negro exclusivos en *P. albomaculatus*, generalmente bandas anchas oblicuas alternadas en claras y marrón oscuro en *P. changae*, *P. gnomus*, *P. purusiensis*, y color del cuerpo uniforme gris oscuro o negro en *P. dentex*, *P. koko*, y *P. nocturnus*); *P. albivermis* puede diferenciarse de *P. maccus* por presentar un fondo negro (vs. marrón), filas de dientes del dentario paralelos (vs. filas con ángulo agudo) y un tamaño de cuerpo mas grande en adultos (95.8 mm SL vs. 84.8).

**Palabras clave:** Neotrópico, Taxonomía, Ancistrini, piedemonte andino, Aguaytia, Ucayali

### Introduction

Historically, suckermouth armored catfishes having evertible cheek odontodes, acutely angled mandibular and premaxillary tooth rows, relatively few spoon-shaped teeth, and diets consisting predominantly of wood have been either combined in the genus *Panaque*, or separated into the genera or subgenera *Panaque* and *Panaqolus* based on adult body size and up to seven different internal and external morphological characteristics. Eigenmann and Eigenmann (1889) erected *Panaque* and designated *Chaetostomus nigrolineatus* Peters 1877 as the type species, with *Chaetostomus cochliodon* Steindachner 1879 and *Chaetostomus dentex* Günther 1868 as congeners. Schaefer and Stewart (1993) hypothesized the existence of two clades within *Panaque*: a smaller bodied *P. dentex* clade (now composed of *P. albomaculatus*, *P. changae*, *P. dentex*, *P. gnomus*, *P. koko*, *P. maccus*, *P. nocturnus*, and *P. purusiensis*) and a larger bodied *P. nigrolineatus* clade (*P. armbrusteri*, *P. cochliodon*, *P. bathyphilus*, *P.*

*nigrolineatus*, *P. schaeferi*, *P. suttonorum*, and *P. titan*). Characteristics used to distinguish the *P. dentex* clade from the *P. nigrolineatus* clade include: 1) dorsal margin of the fifth ceratobranchial with posterior elongate indentation (vs. lacking elongate indentation in members of the *P. nigrolineatus* clade and other ancistrins; Schaefer and Stewart, 1993), 2) symplectic foramen of the preopercle greatly enlarged (vs. symplectic foramen relatively small in the *P. nigrolineatus* clade and other ancistrins; Schaefer and Stewart, 1993), 3) anterior preopercle–quadrate suture positioned well posterior relative to distance between the symplectic foramen and quadrate–anguloarticular condyle (vs. suture positioned well anterior toward the articular condyle in the *P. nigrolineatus* clade and other ancistrins; Schaefer and Stewart, 1993), 4) preopercle with deep lateral groove located near the reflected lateral margin of the bone (vs. groove absent in the *P. nigrolineatus* clade and other ancistrins; Schaefer and Stewart, 1993), 5) elongate lateral projections born distally from ventral processes of the Weberian complex centrum (vs. lateral projections absent in the *P. nigrolineatus* clade; Chockley and Armbruster, 2002), 6) absence of the posterior orbital notch (vs. notch present in members of the *P. nigrolineatus* clade; Schaefer and Stewart, 1993), and 7) absence of a keel on the caudal peduncle (vs. present in members of the *P. nigrolineatus* clade; Schaefer and Stewart, 1993).

Isbrücker *et al.* (2001) assigned members of the smaller bodied *P. dentex* clade to the new genus *Panaqolus*, designating *Panaque gnomus* Schaefer and Stewart 1993 as the type species. Although Chockley and Armbruster (2002) placed *Panaqolus* in synonymy with *Panaque*, Armbruster (2004) recommended recognition of *Panaqolus* as a subgenus within *Panaque*, and Armbruster (2008) provided further morphology-based phylogenetic support for monophyly of genus *Panaque* and subgenus *Panaqolus*. In contrast, the molecular phylogenetic studies of Hardman (2005) and Cramer *et al.* (2011) recovered *Panaque* sensu lato as paraphyletic. Cramer *et al.* (2011) examined two *Panaque* sensu stricto species and two *Panaqolus* species among a host of other Ancistrini taxa and recovered each genus as a clade distantly separated from the other.

Recent taxonomic studies have differed in their treatment of *Panaqolus* as a genus or subgenus. Lujan *et al.* (2010) revised the *Panaque nigrolineatus* clade and followed Armbruster (2004) in treating this as one of three subgenera within *Panaque* – the others being *Panaqolus* and *Scobinancistrus*. Conversely, Eschmeyer (2013) recognized *Panaqolus* as a genus and Fisch-Muller *et al.* (2012) did likewise in their description of *Panaqolus koko*. Given the conflicting evidence for monophyly of *Panaque* sensu lato, the consistent support for monophyly of *Panaqolus*, and the recent trend toward recognizing *Panaqolus* as a genus, we treat *Panaqolus* as a genus herein.

*Panaqolus* species appear to be locally uncommon throughout much of their range. Specimens for many species are scarce in collections and type series for most species are small. Despite this, available material suggests that the genus is widespread in the Amazon and Orinoco basins and in Atlantic Coastal drainages of the Guianas. During recent field work in the San Alejandro River in central Peru, the third author collected four specimens of a distinctive, undescribed species assignable to genus *Panaqolus*. We describe the species herein as *Panaqolus albivermis*.

## Methods

Counts and measurements follow Armbruster (2003). Standard length (SL) is expressed in mm and other measurements are expressed as either percentages of standard length or, for subunits of the head, percentages of head length. Measurements and counts were taken on the left side of specimens when possible. Meristic counts listed in the text are followed by the total number of individuals having each count (in parentheses) and/or an asterisk indicating the value of the holotype. Dorsal-fin spinelet is counted as a spine. Lateral trunk plate row terminology follows Schaefer (1997). Institutional abbreviations follow Sabaj Pérez (2010).

### *Panaqolus albivermis*, new species

Figure 1. Table 1.

**Holotype.** MUSM 35879, 95.8 mm SL, Peru, Padre Abad Province, Irazola District, San Alejandro River, Ucayali River drainage, 195 masl, 8°55'02"N, 75°12'26"W, M. Velasquez, 13 June 2009.

**Paratypes.** Three specimens, collected with holotype. ANSP 182815, 1: 78.7 mm SL; AUM 58781, 1: 70.9 mm SL; ROM 93945, 1: 45.5 mm SL.

**Diagnosis.** *Panaqolus albivermis* can be diagnosed from all other *Panaqolus* except *P. maccus* by having head, body, and fins with widely separated small white to yellow spots, vermiculations, and/or thin oblique bands on a black base (vs. exclusively small white to yellow spots on a black base in *P. albomaculatus*, generally broad oblique bands of alternating light to dark brown in *P. changae*, *P. gnomus*, *P. purusiensis*, and a uniformly dark gray to black body color in *P. dentex*, *P. koko*, and *P. nocturnus*); *P. albivermis* can be diagnosed from *P. maccus* by having a black base color (vs. brown), by having parallel dentary tooth rows (vs. acute intermandibular tooth row angle), and by having a larger known adult body size (95.8 mm SL vs. 84.8; Schaefer & Stewart, 1993).



**FIGURE 1.** Holotype of *Panaqolus albivermis* n. sp., 95.8 mm SL, Peru, Padre Abad Province, Irazola District, San Alejandro River, Ucayali River drainage, 195 masl, 8°55'02"N, 75°12'26"W, M. Velasquez, 13 June 2009 (photo by NKL).

**Description.** Morphometrics in Table 1. Largest specimen 95.8 mm SL. Body depth increasing from tip of snout to greatest body depth at origin of dorsal fin, decreasing to posterior margin of adipose fin with slight increase at base of caudal fin. Dorsal profile slightly convex between snout and dorsal-fin origin. Ventral profile flat from snout to anus, slightly concave between anus and caudal fin. Ossified dermal plates with small odontodes covering snout and body flanks. Abdomen naked, lacking plates except for area between opercular openings. Cheek plates bearing hypertrophied, distally-hooked odontodes (mean 21, range 15-38, holotype 38) evertible to approximately 90° from sagittal plane in dorsal view; longest odontodes extending to posterior exposed margin of opercle. Orbit positioned dorsolaterally on head with opening sloped ventrolaterally at approximately 45° from sagittal plane in anterior view. Snout rounded. Slight ridge from anterolateral corner of naris to dorsal margin of orbit.

Oral disk occupying majority of ventral surface of head anterior of cleithrum. Premaxillary teeth 4-5 on left ramus (holotype = 5); dentary teeth 4-6 on left ramus (holotype = 4). All teeth with thick, strong shafts, and spoon-shaped, paired cusps bent inward slightly; teeth slightly larger on dentary, teeth in middle of each row slightly larger than marginal teeth. Maxillary barbel short and attached to lower lip along most of length; ventral surface of labial disk with hemispherical papillae decreasing in size distally.

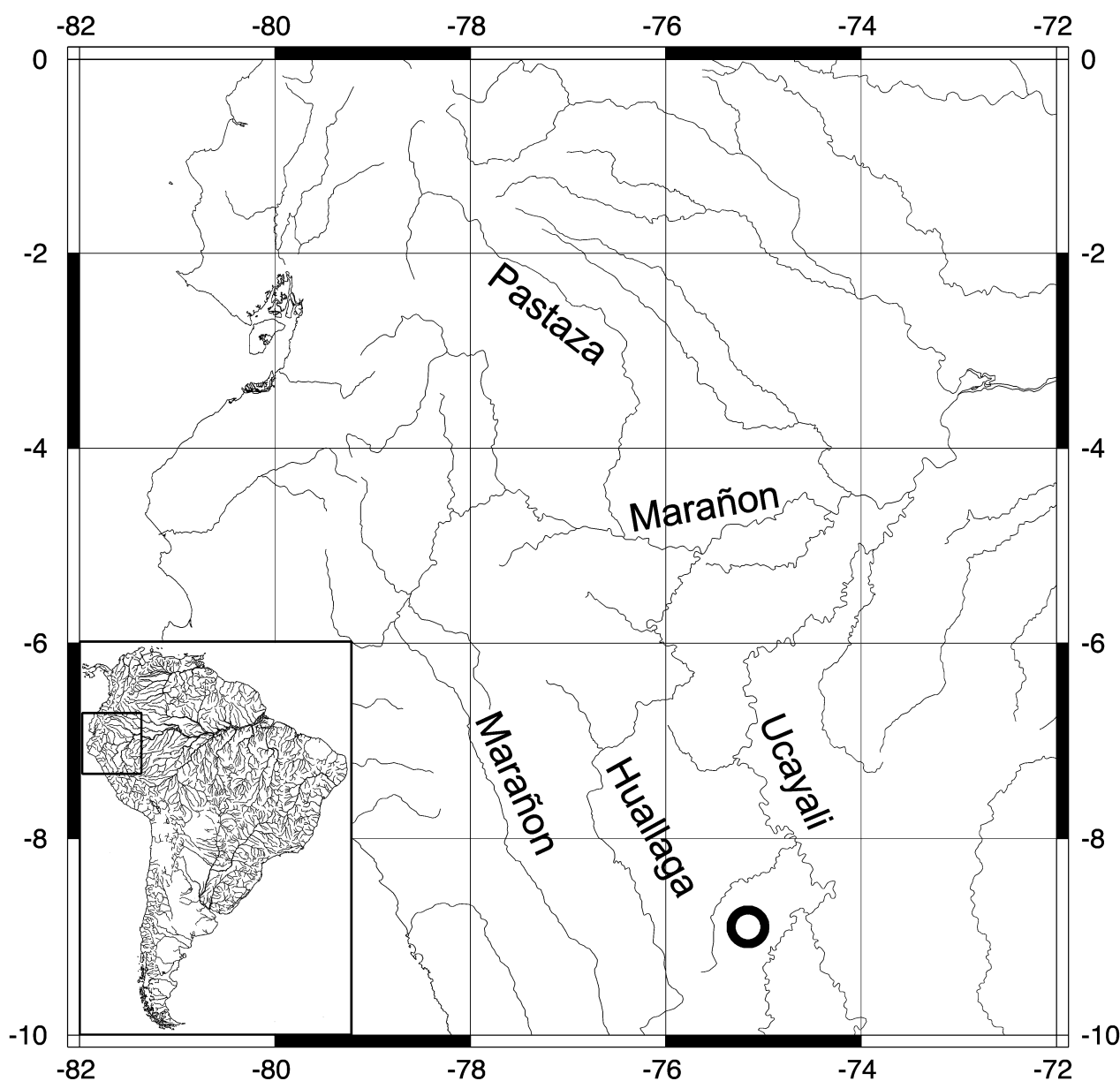


FIGURE 2. Map of northern Peru showing the type locality (open circle) of *Panaqolus albivermis*.

**TABLE 1.** Selected morphometric characters for *Panaqolus albivermis* n. sp. Interlandmarks (ILM) are the two points between which measurements were taken (from Armbruster, 2003; \* = too small to be measured precisely).

ILM	Measurement	Holotype	Paratypes		
		MUSM 35879	ANSP 182815	AUM 58781	ROM 93945
1–20	Standard length	95.8	78.7	69.9	45.5
	% of SL:				
1–10	Predorsal length	45.2	42.8	46.2	44.0
1–7	Head length	36.1	35.3	37.9	36.4
7–10	Head-dorsal length	9.0	8.6	8.9	8.1
8–9	Cleithral width	30.8	32.4	31.4	29.7
1–12	Head-pectoral length	23.1	24.1	25.2	23.7
12–13	Thorax length	21.5	27.3	23.9	25.5
12–29	Pectoral-spine length	35.2	33.9	32.1	33.4
13–14	Abdominal length	24.3	24.9	23.4	21.6
13–30	Pelvic-spine length	30.7	30.7	26.8	30.4
13–13'	Pelvic girdle width	19.9	20.5	18.5	21.0
14–15	Postanal length	30.9	31.9	29.0	30.1
14–31	Anal-fin spine length	13.8	14.2	14.9	11.0
10–12	Dorsal-pectoral depth	29.5	28.5	30.9	30.0
10–11	Dorsal spine length	33.0	34.3	33.6	36.0
10–13	Dorsal-pelvic depth	23.6	22.0	22.3	20.4
10–16	Dorsal-fin base length	28.3	28.3	26.9	24.5
16–17	Dorsal-adipose distance	14.7	13.9	14.1	11.8
17–18	Adipose-spine length	11.3	12.0	10.9	11.4
17–19	Adipose-upper caudal distance	17.6	11.6	17.4	18.9
17–18'	Adipose height	10.7	9.7	11.2	9.9
15–19	Caudal peduncle depth	14.9	13.3	14.4	12.2
20–32	Caudal peduncle-middle caudal ray	16.4	12.0	16.0	17.5
20–33	Caudal peduncle-dorsal caudal spine	31.4	33.7	28.4	20.4
15–17	Adipose-lower caudal depth	22.8	25.2	23.1	22.6
14–17	Adipose-anal depth	17.3	16.4	17.9	15.8
14–16	Dorsal-anal depth	16.6	15.7	17.2	12.9
13–16	Pelvic-dorsal depth	27.7	25.0	28.4	24.4
	% of HL:				
5–7	Head-eye length	29.3	34.1	32.1	53.3
4–5	Orbit diameter	17.1	18.1	17.6	20.5
1–4	Snout length	66.1	62.1	60.3	59.0
2–3	Internares width	13.5	13.8	13.8	15.8
5–6	Interorbital width	40.8	39.4	38.7	41.0
7–12	Head depth	68.3	70.4	63.3	68.3
1–24	Mouth length	47.5	45.6	40.5	44.2
21–22	Mouth width	40.5	36.0	40.7	37.7
22–23	Barbel length	9.6	10.1	11.7	8.1
25–26	Dentary tooth cup length	18.9	16.6	10.5	*
27–28	Premaxillary tooth cup length	11.9	11.4	9.4	*

Dorsal fin II,7(3)\*, I,8(1); dorsal-fin spinelet small, V-shaped; (dorsal-fin lock present and functional); posteriormost dorsal-fin ray free from body. Pectoral fin I,5(2)\*, I,6(2); adpressed pectoral-fin spine reaching approximately to anus, spine having hypertrophied odontodes increasing in length distally. Pelvic fin I,5; pelvic-fin spine extending to or past insertion of anal fin when adpressed. Anal fin I,4; second unbranched ray longest. Adipose-fin spine slightly curved distally, adnate to caudal peduncle via fleshy membrane with concave or convex posterior margin. Caudal fin I,14,I; caudal fin asymmetrically emarginate with ventral lobe longer than dorsal lobe.

Body broadest at cleithrum; posterior margin of exposed posterior process of cleithrum tapering to a point. Lateral median plates 24 or 25\*, middorsal plates 23 or 24\*, midventral plates 22–25\*; anteriormost midventral plates strongly bent forming slight lateral ridge between verticals through pectoral- and dorsal-fin origins. Caudal peduncle plate rows five. One azygous preadipose plate; two predorsal plate rows not including nuchal plate; five interdorsal plate rows.

**Color.** Head, body, and fins with widely separated small white to yellow spots, vermiculations, and/or thin oblique bands on a black base. Several specimens have only thin widely-spaced, white to yellow oblique bands and lack spots entirely. Numbers of bands increase, and width of bands decrease, with body size, with juveniles having relatively few broad bands and adults having more numerous, thin bands and bands that are broken into vermiculations or spots.

**Distribution and habitat.** Known only from the San Alejandro River, a tributary of Aguaytia River in the upper Ucayali watershed in central Peru.

**Etymology.** The specific epithet *albivermis* is a combination of the Latin *albus*, meaning white, and *vermis*, meaning worm, and is in reference to this species' variable but distinctive white to yellow markings.

## Discussion

Live specimens of *Panaqolus albivermis* have been exported from Iquitos, Peru, for several years and distributed globally for sale as ornamental aquarium fishes under the common names 'L204', 'flash pleco', or 'pinstripe pleco' (Planet Catfish, 2013). As far as we are aware, the specimens on which our description is based are the only specimens with precise locality data currently present in any institutional scientific collection. In general, knowledge of the fish fauna of the San Alejandro River appears to be relatively poor, although it has provided type material for at least one other fish species: the characid *Creagrutus changae* (Vari and Harold, 2001).

*Panaqolus albivermis* is externally most similar to *P. albomaculatus*, which appears to have a much broader geographic distribution along the Andean piedmont extending to both the north and south of the San Alejandro River (NKL pers. obs.). The color pattern of *P. albivermis* differs from that of *P. albomaculatus* by always have a large portion of its light-colored markings being elongate as either vermiculations or, most often as oblique bands encircling the body. In addition to their similar coloration, *P. albivermis* and *P. albomaculatus* also both have dentary tooth rows that are nearly parallel to each other and to the longitudinal body axis. Lujan and Armbruster (2012) illustrated the dentary of *P. albomaculatus*, showing that the angle between the distal dentary tooth cup and the proximal dentary-angular articular shaft is greater than it might appear externally, that dentary tooth shafts are longer in *P. albomaculatus* than in any other *Panaqolus* species, and that the tooth cusps themselves are oriented obliquely relative to the tooth row. Lujan *et al.* (2011) present stable isotope data supporting the assertion that such morphological specializations of the jaw are an important means by which food resources associated with the surfaces of course woody debris may be partitioned among different loriciariid species.

**Comparative material examined.** *Panaqolus albomaculatus*, all specimens Peru, Amazonas Region, Condorcanqui Province, AUM 45502 (5), AUM 45557 (3), AUM 45576 (6), AUM 46691 (1), AUM 45507 (26), AUM 45511 (2), AUM 45628 (1). *Panaqolus gnomus*, all specimens Peru, Amazonas Region, Condorcanqui Province, AUM 45501 (34), AUM 46692 (1), AUM 45603 (1), AUM 45505 (36), AUM 45509 (2). *Panaqolus maccus*, all specimens Venezuela, specimens from Apure Province: AUM 35279 (2), AUM 35280 (1), AUM 35281 (1), AUM 35282 (1), AUM 35283 (1), AUM 35294 (2), AUM 37645 (1); specimens from Portuguesa Province: AUM 17527 (1), AUM 22109 (1), AUM 22665 (4), AUM 22666 (1), AUM 22794 (5), AUM 22812 (1), AUM 22835 (1), AUM 41079 (2), AUM 53768 (3). *Panaqolus nocturnus*, all specimens Peru, Amazonas Region, Condorcanqui Province, AUM 45528 (2), AUM 45532 (1), AUM 45500 (59), AUM 45558 (8), AUM 45563 (5), AUM 45577 (2), AUM 45591 (13), AUM 45601 (2), AUM 45604 (2), AUM 45506 (25), AUM 45612 (1), AUM 45508 (15), AUM 45629 (1).

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