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PENSOFT

Geographic distribution extension of *Landonia latidens* Eigenmann & Henn, 1914 (Characidae, Stevardiinae) in coastal drainages of Peru

Vanessa Meza-Vargas[1,2], Dario Faustino-Fuster[1,3], José Marchena[1], Hernán Ortega[1]

1 Departamento de Ictiología, Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Avenida Arenales 1256, Lima 14, Peru. **2** Laboratório de Sistemática de Vertebrados, Pontifícia Universidade Católica do Rio Grande do Sul, Avenida Ipiranga 6681, 90619-900 Porto Alegre, RS, Brazil. **3** Laboratório de Ictiologia, Departamento de Zoologia, Universidade Federal do Rio Grande do Sul. Avenida Bento Gonçalves, 9500, 91501-970 Porto Alegre, RS, Brazil.
Corresponding author: Vanessa Meza-Vargas, meza.sv@gmail.com

Abstract
The monotypic genus *Landonia* Eigenmann & Henn, 1914 was only known from its type locality in western Ecuadorian drainages. Recent collections revealed the presence of *Landonia latidens* Eigenmann & Henn, 1914 in Chira and Piura river basins in Peru. Thus, the distribution of this species is extended, constituting the southernmost record of the species.

Keywords
Chira River, freshwater fishes, Pacific drainage, Piura River, range extension.

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Introduction

Stevardiinae (Characiformes, Characidae) is a group of small-sized tetras, comprises 340 valid species arranged in 46 genera (Mirande 2018; Fricke et al. 2019), widely distributed in the Neotropical region. This subfamily is recognized, mostly, by the presence of ii, 8 dorsal-fin rays and four internal premaxillary teeth (Vanegas-Ríos 2017; Mirande 2018). The monotypic genus *Landonia* Eigenmann & Henn, 1914 was described from the Vinces and Daule rivers in the basin of the Guayas River in northwestern Ecuador. Its name honored Mr Hugh McKennan Landon, one of those who supported the collection during 1913 (Eigenmann et al. 1914). Almost 60 years later of its description, its osteology was described in a comparative study with its congeners *Iotabrycon* Roberts, 1973 and *Phenacobrycon* Roberts, 1973.

Collections events from 2007 to 2018 in Chira and Piura river basins in Peru have revealed the presence of *Landonia latidens* Eigenmann & Henn, 1914, before known for the coastal drainages in Ecuador. However it is still considered endemic from the type locality (Barriga 2012; Fricke et al. 2019). The aim of this contribution is to update the knowledge of *Landonia latidens*, which has extended its distribution.

Methods

Specimens were caught with small seine (5 m long × 2 m high, 5 mm mesh). Specimens were fixed in 10% formalin and preserved in 70% ethanol; and susequently deposited at Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima (MUSM), and Department of Natural History, Royal Ontario Museum,

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Toronto (ROM). The identifications were made following the original descriptions (Eigenmann and Henn 1914), compared to samples from Ecuador and the holotype photography (Fig. 1) deposited at the California Academy of Science, San Francisco (CAS) as well as complementary information of *L. latidens* (Roberts 1973; Weitzman and Fink 1985). Nineteen morphological measurements and 14 meristic data were taken from 32 adult specimens following Roberts (1973), 10 specimens were dissected for gut content analysis, and two specimens were cleared and stained following Taylor and Van Dyke (1985) for osteology characters. The material examined is organized by: locality, coordinates, date, collectors, acronym, catalogue number, number of individuals, and range of standard length.

Results

New records. Perú: Piura • Sechura, Piura River, Laguna Ñapique, 05°31′39″S, 080°41′50″W, 27 Sep. 2010, H. Ortega & J, Espino leg., MUSM 43932, 43 ex., SL = 34.0–36.4 mm. • Sullana, Querecotillo, Chira River, Laguna de los Patos, 04°46′56″S, 080°36′05″W, 26 Aug. 2017, J. Marchena & S. Lizama leg., MUSM 60277, 6 ex., SL = 41.4–44.0 mm. • Sullana, Lancones, Chira River, 04°23′18″S, 080°14′32″W, 5 Sep. 2012, H. Ortega, A. Cortijo & J. Marchena leg., MUSM 48196, 72 ex., SL = 35.8–44.5 mm. • Sullana, Lancones, Martinez, Chira River, 04°35′35″S, 080°29′40″W, 8 Oct. 2012, J. Marchena leg., MUSM 48206, 12 ex., SL = 33.6–45.6 mm. • Sullana, Lancones, Algarrobillo, Chira River, 04°28′49″S, 080°22′59″W, 18 Oct. 2015, V. Meza-Vargas, J. Marchena & C. Bustamante leg., MUSM 52779, 62 ex, SL = 39.8–46.5 mm. Sullana, Miguel Checa, Sojo, Chira River, 04°53′38″S, 080°49′31″W, 5 Oct. 2015, V. Meza-Vargas, N. Faustino & C. Bustamante leg., MUSM 52799, 13 ex., SL = 38.6–45.0 mm. • Morropón, Carrasquillo, Piura River, 05°12′39″S, 080°01′01″W, 18 Jul. 2015, J. Marchena, MUSM 60278, 4 ex., SL = 38.7–41.4 mm. • Sullana, Chira River, 04°50′34″S, 080°37′48″W, 19 Aug. 2018, N. Lujan, D. Werneke, D. Faustino, J. Chuctaya, D. Brooks & C. Black leg., ROM 109158, 1 ex., SL = 39.6 mm.

Additional material examined. Ecuador: Guayas • Colimes, Vinces, Daule River, photographed by the California Academy of Sciences, Ichthyology Section; CAS 55297, holotype, SL = 20 mm. • Colimes, Daule River, 200 m above de Coliares; 10 Aug. 1995; R. Barriga leg.; MZUSP 49195, 9 ex., SL = 28.7–43.9 mm. • **Los Ríos**: Vinces, Vinces River, 3 km above Vinces town, 01°32′03″S, 079°15′05″W; 8 Jun. 1989; R. Barriga & E. Morales leg.; MEPN 1989-12, 15 ex., SL = 21.1–41.2 mm.

Figure 1. Lateral, dorsal and ventral view of *Landonia latidens*, CAS 55297, holotype, SL = 20 mm, Vinces, Colimes, Daule River, western Ecuador. Photograph by the California Academy of Sciences, Ichthyology Section.

Identification. Morphometric and meristic data are presented in Table 1. *Landonia latidens* (Figs 1, 2) can be identified by the presence of two rectangular, straight, and sharp maxillary teeth (Fig. 3). The infraorbital series contain four elements, first and second fused as well as fourth and fifth. The caudal-fin is forked, with lower lobe slightly longer than the upper lobe. The base of the caudal-fin is covered by scales. Mature males present two middle caudal rays curved to support the membranous caudal organ on the middle caudal fin. The caudal organ is a pocket with a horizontal, flame-shaped opening posteriorly. The anal and pelvic fins with short and blunt bony hooks which extend from first to third branched rays in the anal-fin and from first to fifth branched rays in the pelvic-fin. *Landonia* has a distinct, black, roundish spot at the base of the caudal-fin, slightly in the base of upper lobe and above the caudal organ. The tip of the dorsal fin rays and upper lobe of the caudal fin are blackish; the other fins are hyaline or slightly dark brown.

Ecological notes. Stomach content analyzed in some specimens showed preferences for aquatic insect larvae (chironomids), filamentous algae, and scales and fin rays of fish.

Table 1. Morphometric and meristic data of *Landonia latidens* from Chira River, Piura Peru. SD = standard deviation.

Morphometric (mm)	***N***	**Min.**	**Max.**	**Mean**	**SD**
Standard length (SL)	30	33.6	46.5	39.8	3.67
Percentage of standard length					
Snout to anal-fin	30	58.6	63.1	61.1	1.26
Snout to pelvic-fin	30	25.3	48.5	45.4	3.93
Snout to pectoral-fin	30	24.5	28.4	26.3	0.92
Snout to dorsal-fin	30	51.0	55.1	52.8	1.11
Dorsal-fin to hypural	30	48.9	53.1	51.0	0.99
Dorsal-fin to anal-fin	30	29.4	62.4	32.7	5.75
Dorsal-fin to pelvic-fin	30	28.4	46.2	30.8	3.14
Dorsal-fin to pectoral-fin	30	25.8	39.9	36.9	3.16
Peduncle depth	30	10.0	12.9	11.1	0.57
Pectoral-fin length	29	18.0	22.7	21.2	1.10
Pelvic-fin length	30	14.7	16.9	15.8	0.65
Dorsal-fin length	24	22.3	27.7	25.9	1.44
Anal-fin length	27	19.3	24.2	20.8	1.15
Head length (HL)	30	23.3	27.3	25.3	0.86
Percentage of Head length					
Postorbital- head length	30	35.3	42.4	38.8	1.70
Snout length	30	21.8	29.3	26.1	2.20
Orbital diameter	30	36.7	45.1	40.1	2.12
Interorbital wide	30	25.0	30.0	27.3	1.42
Meristic	**N**	**Min**	**Max**	**Mode**	
Lateral Line (LL)	29	44	52	47	—
Scales dorsal-fin to LL	29	8	9	9	—
Scales anal-fin to LL	31	6	7	7	—
Scales anal-fin	29	6	10	7	—
Unbranched dorsal-fin rays	32	2	2	2	—
Branched dorsal-fin rays	32	9	9	9	—
Branched anal-fin rays	31	26	33	30	—
Branched pelvic-fin rays	31	7	7	7	—
Branched pectoral-fin rays	31	9	12	11	—
Premaxillary outer row teeth	31	3	3	3	—
Premaxillary inner row teeth	31	4	4	4	—
Maxillary teeth	31	2	2	2	—
Dentary teeth	31	5	6	5	—
Vertebrae	4	30	31	30	—

Discussion

Among characids, there is a high variety of teeth. However, the morphology of teeth in *Landonia latidens* is unknown in other characids (Mirande 2010) and let us reliably confirms the identification of specimens. This species is easily diagnosed by the presence of: two rectangular, sharp, maxillary teeth, and modified caudal fin scales that form a pocket in males.

The modified dentition, as well its food intake, suggests that *L. latidens* is facultative scale-feeder (without restrictions to other food), considering also that the degree of lepidophagy depends on ontogeny and seasonality (Kolmann et al. 2018).

Figure 2. Lateral view of *Landonia latidens* MUSM 48196, SL = 45.7 mm, Lancones, Alamor River, Chira river basin, Piura, Peru.

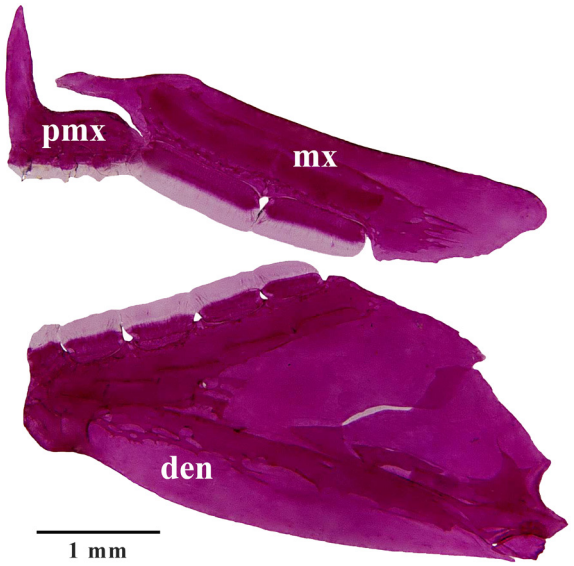

Figure 3. Lateral view of jaws of *Landonia latidens*, MUSM 52779. Abbreviations: mx, maxilla; pmx, premaxila; den, dentary.

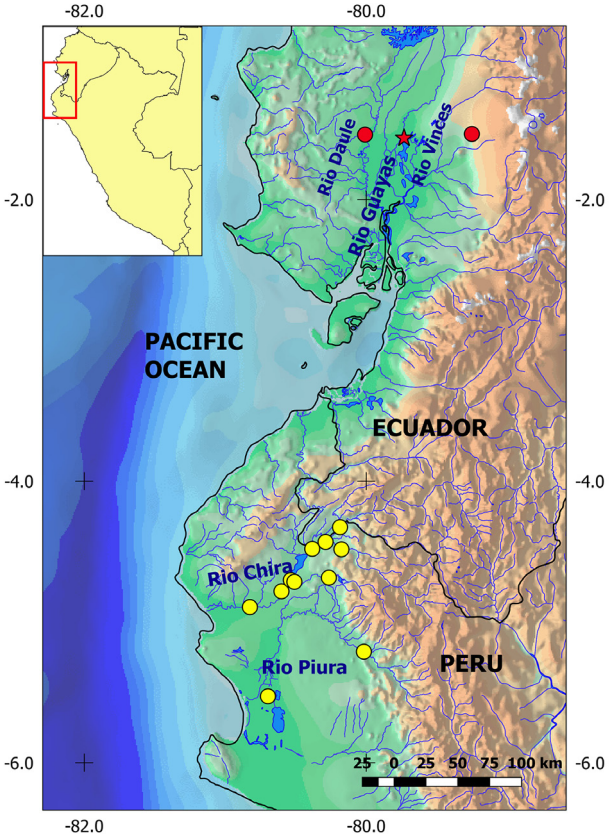

Figure 4. Distribution map of *Landonia latidens*. Type locality from the Guayas river basin, Ecuador (red stars). New records from the Chira and Piura river basins, Peru (yellow dots).

Although there have been recent collections in the Tumbes (Ortega et al. 2015) and Santa Rosa river basins (Aguirre et al. 2014), northernmost and southernmost rivers in Peru and Ecuador respectively, no samples of *L. latidens* were recorded. Approximately 300 km separate the Vinces and Chira rivers, and our study makes *L. latidens* the only species with modified caudal-fin scales in the Pacific drainage in Peru (Fig. 4).

There is a connection between Chira and Piura basins through a channel to divert water from the Poechos reservoir. It was built 40 years ago to take advantage of permanent water in Chira River and supply water to Piura city. Although we do not have information to prove an ancient natural connection of these rivers, this channel likely might explain the distribution of *L. latidens* in the Piura River.

Landonia latidens has not yet been assessed using IUCN Red List criteria. Using the new data provided here, we have estimated area of occupancy (AOO) to equal 30 km^2 and the extent of occurrence (EOO) to be 5112 km^2. Thus, might be categorized as Near Threatened because of its restricted distribution in two main localities in Ecuador and Peru (B1: EOO < 20 000 km^2; B2: AOO < 2000 km^2), and because of a continuing decline in habitat quality. Some of those events include anthropogenic activities (reservoirs, pollution by chemicals, and agriculture) and a natural phenomenon, the El Niño Southern Oscillation (causing floods and drought), make the area between the Vinces and Piura basins vulnerable for several threats which might shift the species category towards Endangered in the future.

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Authors' Contributions

All authors collected the data in the various expeditions and identified the specimens. VMV and DF wrote the text. DF took the photographs and edited them. All authors finalized and approved the manuscript.

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