Leposternon octostegum: NEW RECORD OF AN ENDANGERED WORM LIZARD SPECIES, WITH COMMENTS ON HABITAT AND OPPORTUNISTIC PREDATORS (SQUAMATA: AMPHISBAENIA)

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The worm lizard genus *Leposternon* currently comprises 11 species distributed in South America, mainly in Brazil, from where most of the species are endemic (Ribeiro *et al*., 2015; 2018; Colli *et al*., 2016). One of these species, *Leposternon octostegum* (A. Duméril *in* Duméril & Duméril, 1851) is known from a small area (577 km²) in the metropolitan region of Salvador, state of Bahia, northeastern Brazil (Barros-Filho *et al*., 2013; ICMBio, 2018). Described almost 170 years ago (Duméril & Duméril, 1851), this species remained known only from its holotype (from an unknown Brazilian locality), until recently when new specimens were recorded through field research (Couto-Ferreira *et al*. 2011) and collected during wildlife rescues (Barros-Filho *et al*., 2013). Today, *L. octostegum* is known from the following municipalities (specific localities in parenthesis): Camaçari (Arembepe), Dias d'Ávila (Santa Helena), Mata de São João (Reserva de Imbassaí), Salvador (Aterro Metropolitano Centro), and Simões Filho (Fazenda Real) (Couto-Ferreira *et al*., 2011; Barros-Filho *et al*., 2013). The record from Mata de São João, however, lacks a voucher specimen or even photographs (Couto-Ferreira *et al*., 2011). In this note we present new records of *L. octostegum* from Mata de São João based on four specimens deposited in Museu de Zoologia João Moojen, Universidade Federal de Viçosa (MZUFV), Minas Gerais, Brazil.

From 13 to 21 October 2014, CLA worked in a wildlife rescue at Fazenda Várzea de Baixo (12.4606° S, 38.0937° W; 70 m elevation; datum WGS 84), municipality of Mata de São João, state of Bahia, about 15 km northwest from Reserva de Imbassaí. An area of about 70 ha originally covered by rainforest was used for *Pinus* plantation, but abandoned after eight years, allowing native vegetation to grow among the *Pinus* trees. The wildlife rescue occurred

while the area was being deforested for *Eucalyptus* planting (Figure 1). When a bulldozer cut the trees and turned the soil, six specimens of *Leposternon octostegum* were observed after being unearthed from depths of 30–50 cm.

On 13 October 2014, two specimens (MZUFV 1390, 1391) were found dead after the soil was turned by the bulldozer, and other two specimens (MZUFV 1389, 1392) were found on 18 October. Specimens were collected in agreement with a Normative Instruction from the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio, 2014). Individuals of other species were also found dead: the skink *Brasiliscincus heathi* (Schmidt & Inger, 1951), the gecko *Gymnodactylus darwinii* (Gray, 1845), and the anole *Norops ortonii* (Cope, 1868).

On 18 October, CLA observed two crested caracaras, *Carcara plancus* (Miller, 1777) each capturing one *L. octostegum* as soon as the specimens were unearthed by the bulldozer. Although an opportunistic predation event, this is the first time *L. octostegum* is recorded as prey of another species. Other birds also landed to eat unearthed animals, although their prey could not be identified: the yellow-headed caracara (*Milvago chimachima* (Vieillot, 1816), the roadside hawk (*Rupornis magnirostris* (Gmelin, 1788)), and the lesser yellow-headed vulture (*Cathartes burrovianus* Cassin, 1845). Such opportunistic predation by birds on worm lizards was previously reported by Zamprogno & Sazima (1993), who observed *Carcara plancus* and other species preying on specimens of *Leposternon wuchereri* (Peters, 1879) unearthed by bulldozers in coastal Bahia.

The collected specimens can be identified as *L. octostegum*, despite MZUFV 1389 and 1392 having damage on the posterior portion of the body, by the presence of a large azygous shield covering most of the dorsal head, and the rostronasal, prefrontals, oculars and first temporals visible in dorsal view (Barros-Filho *et al.*, 2019). Although the head of MZUFV 1391 is severely damaged dorsally (Figure 2), the presence of more than 350 ventral postpectoral annuli confirms it as *L. octostegum*. MZUFV 1391 is also the largest specimen of *L. octostegum* ever recorded: snout-vent length (SVL) 388 mm; tail length 15.3 mm (Figure 3). Morphometric characters and scale counts of the four specimens are shown in Table 1. We measured SVL using a ruler to nearest 1 mm and the tail length using a digital caliper to nearest 0.1 mm.

In preservative, three of the four collected specimens of *L. octostegum* (MZUFV 1389; 1390; 1392) show a pale beige color throughout the body, except in the dorsal region of the head, which has a darker beige color. MZUFV 1391 has a slightly darker beige color throughout the body. Except for MZUFV 1390, all specimens have a series of dorsal segments each bearing a dark brown spot,

the spots more intense in the posterior half of the body. The dark brown spots are also present at the dorsal region of the tail of MZUFV 1391. This pattern has also been reported for specimens from Camaçari, and Barros-Filho *et al.* (2019) suggested it could be age-related, since it was observed only in larger specimens, SVL > 230 mm. However, one specimen collected in this study, MZUFV 1390, exhibited only faint dark brown pigments on the dorsum (Figure 4), despite its large size (SLV 330 mm). This suggests that dark brown pigmentation in *L. octostegum* may not be linked to ontogeny. Gans (1968) stated that as dark pigmentation of an amphisbaenian species increases, the permeability of the skin to water and the preferred burrowing depth decreases, and that darker specimens tend to bask near or at the surface. It is possible that differences in pigmentation pattern of *L. octostegum* could simply be individual variation, with specimens with dark brown markings being able to forage and/or thermoregulate closer to the surface.

Leposternon octostegum was previously restricted to a small area originally covered by the Atlantic Forest biome (*sensu* IBGE, 2019), in the lowlands of Bahia Coastal Forests and the Atlantic Coast Restingas ecoregions, 15-85 m asl (Dinerstein *et al.* 2017). With the new record, its range is increased to 780 km². The main soil type at the areas where the species is recorded are acrisol and arenosol, the latter present at the more coastal localities (Imbassaí and Arembepe) (Table 2; Figure 5). Acrisol is an acidic and deep soil, poor in nutrients and with a subsoil rich in clay, typical of some tropical forests and common in river valleys of northeastern Brazil, while arenosol is a deep sandy soil typical of the northeastern coast (Gardi *et al.*, 2015, IUSS Working Group WRB, 2015). In the region where *L. octostegum* occurs, both soils have an upper layer with coarser texture, varying from loamy sand to sand (FAO *et al.*, 2012). This means that despite having a skull shape apparently more specialized for digging (Gans, 1968), *L. octostegum* inhabits less compacted soils (unless one finds that specimens can excavate the deeper clay-rich layers of acrisols), similar to a slender congener of southeastern coastal Brazil, *L. scutigerum* (Hemprich, 1820) (Hohl *et al.*, 2017).

Most of the known records of *L. octostegum* were based on wildlife rescues when the species habitat was destroyed by anthropic activities. Because of its narrow geographic range and the lack of records in protected areas other than the Imbassaí private reserve, the species is considered endangered in Brazil (MMA, 2014; ICMBio, 2018). *Leposternon octostegum*, however, seems to be able to occur in early growth secondary forest (Barros-Filho *et al.*, 2013; present study) and may be abundant in some areas, with records of up to 10

individuals within 150 m² (~667 ind. / hectare) (Barros-Filho *et al.*, 2013). Such high abundance was recorded for *L. wuchereri* at coastal Bahia, where Zamprogno & Sazima (1993) estimated one specimen per 50 m² (200 ind. / ha). The detection of amphisbaenians in the wild is difficult due to their fossorial habits, and records of large numbers of specimens at a single place is usually associated with human activities like dam filling or vegetation removal (e.g., Zamprogno & Sazima, 1993; Colli & Zamboni, 1999; Barros-Filho *et al.*, 2013). The low abundance at Fazenda Várzea de Baixo (six specimens in 70 ha), although observed during vegetation removal, should be viewed with caution and reinforces how little we still know about amphisbaenian natural history.



Figura 1. Fazenda Várzea de Baixo, municipality of Mata de São João, State of Bahia, northeastern Brazil, where the specimens of *Leposternon octostegum* were collected.

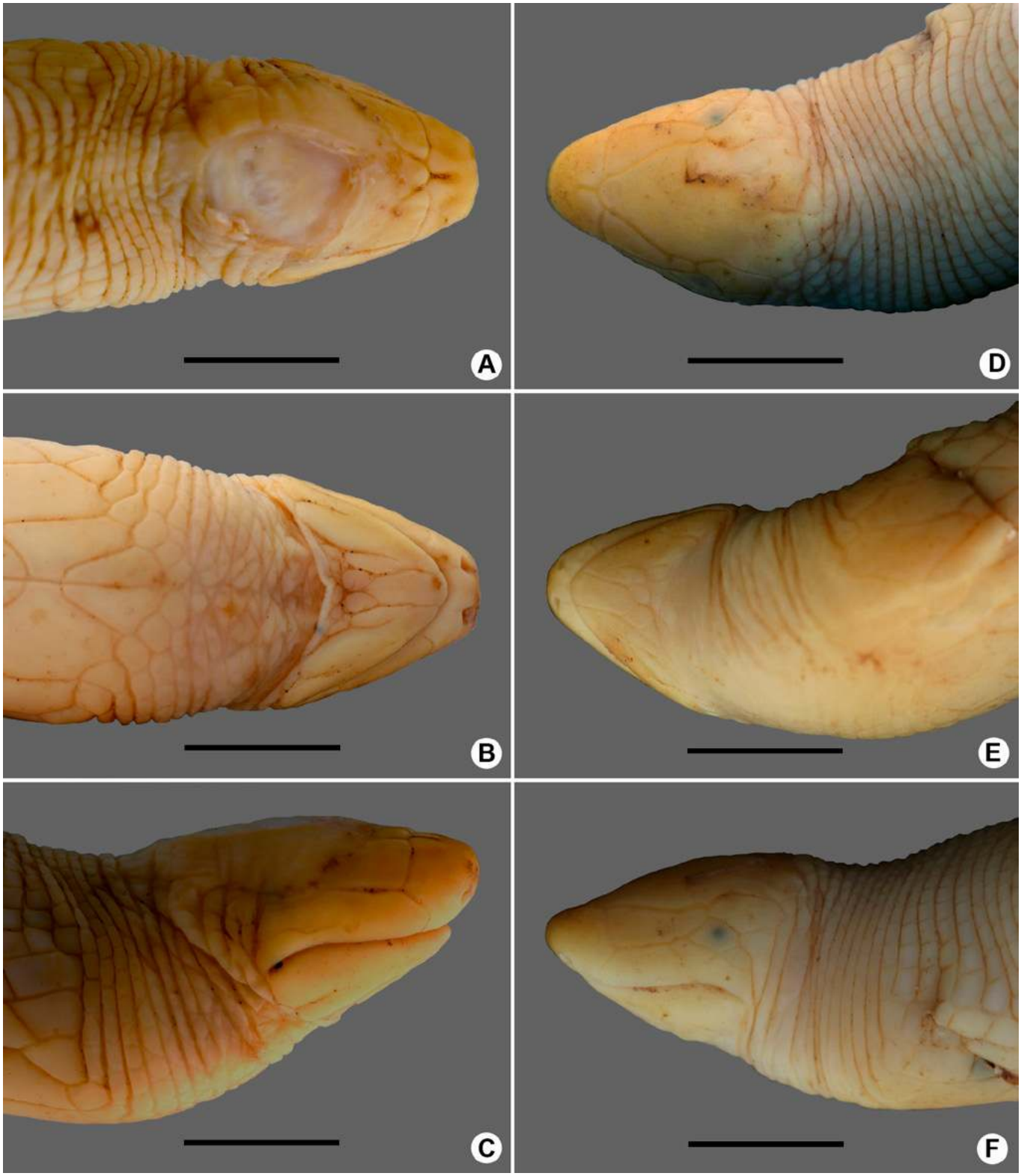


Figura 2. Detail of the head of two specimens of *Leposternon octostegum* collected at Fazenda Várzea de Baixo, municipality of Mata de São João, State of Bahia, Brazil in dorsal, ventral and lateral views. MZUFV 1391 (A, B, and C) (top of the head damaged) and MZUFV 1390 (D, E, and F). Scale bars = 5 mm.



Figura 3. MZUFV 1391, the largest recorded specimen of *L. octostegum* (388 mm snout-vent length) in dorsal (A) and ventral (B) views. Scale bars = 20 mm.

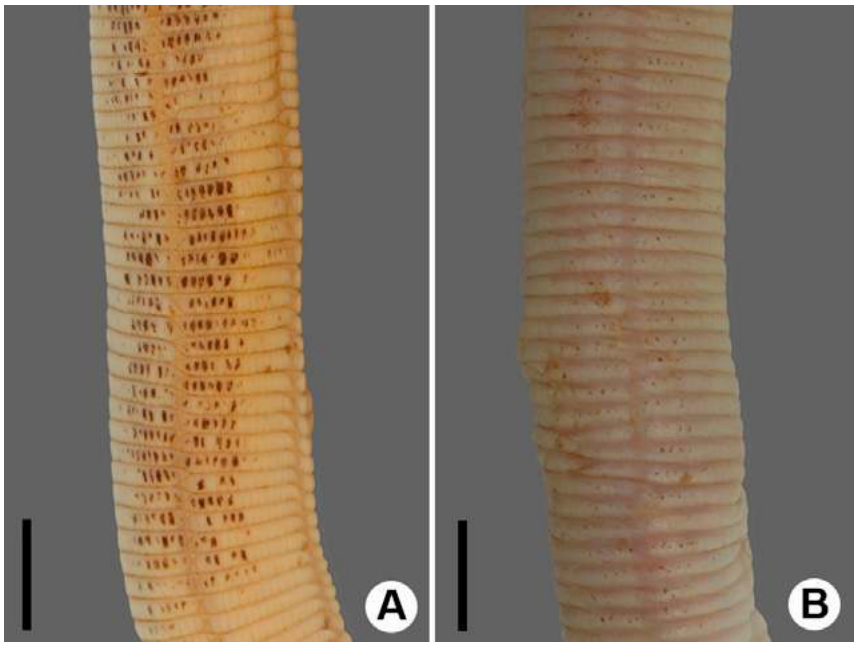


Figura 4. Detail of the intensity of dark brown pigmentation at the dorsum of specimens of *Leposternon octostegum*, MZUFV 1391 (A) and MZUFV 1390 (B), collected at Fazenda Várzea de Baixo, municipality of Mata de São João, State of Bahia, Brazil. Scale bars = 5 mm.

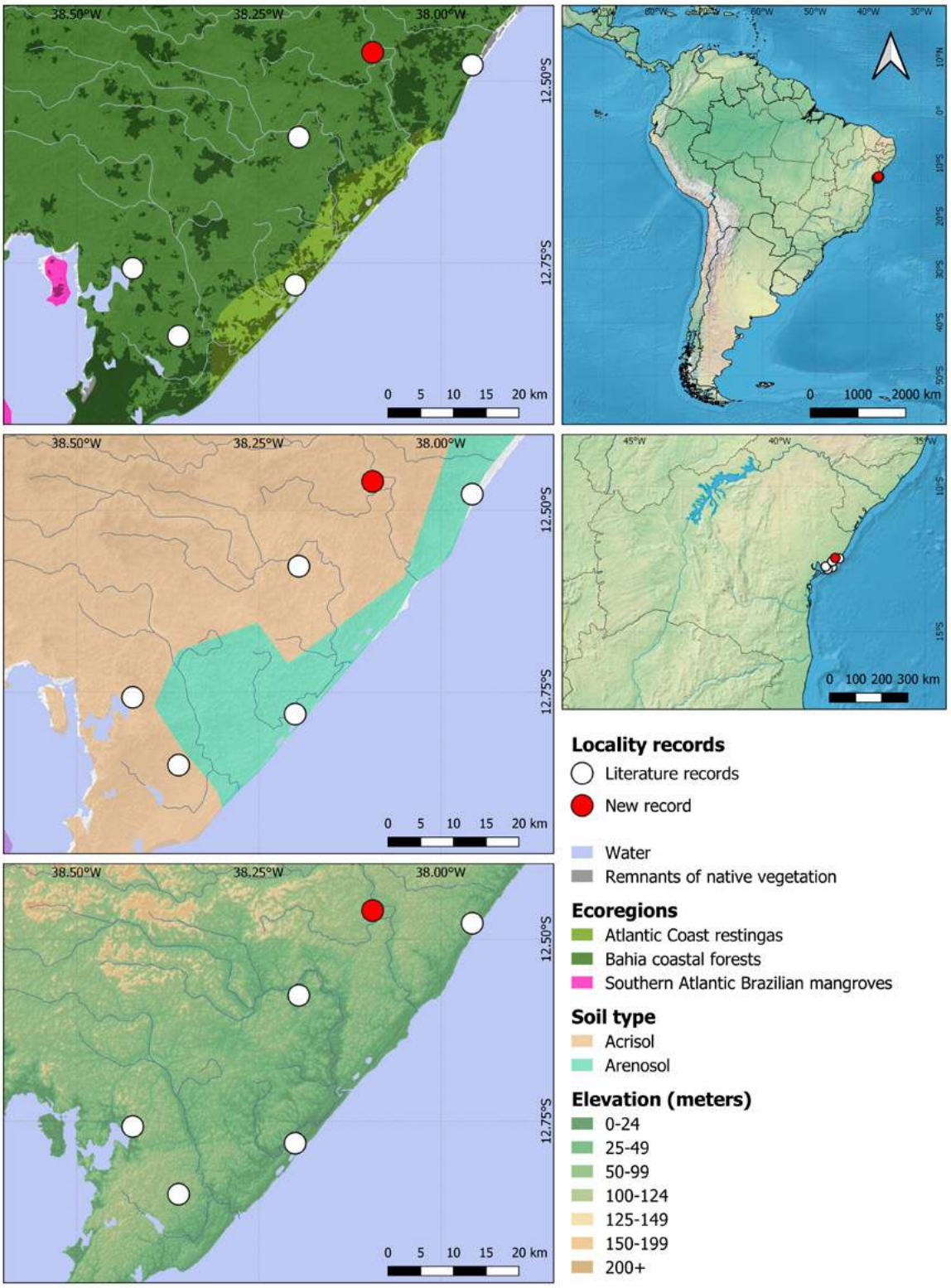


Figura 5. Known locality records of *Leposternon octostegum*, considering ecoregions (Dinerstein et al., 2017) and native vegetation remnants (SOS Mata Atlântica & INPE, 2018) (top map), soil type (FAO et al., 2012) (middle map), and elevation (CSI, 2018) (bottom map).The shape file of ecoregions has a gap in the coastal area of Imbassaí (a light thin line), which could be the eastern limit of Bahia Coastal Forests or the northern range of Atlantic Coast Restingas (more plausible, due to soil type), although the mapped point is at the edge of Bahia Coastal Forests.

Table 1. Summary of morphological data of the four specimens of *Leposternon octostegum* collected at Fazenda Várzea de Baixo, municipality of Mata de São João, State of Bahia, northeastern Brazil.

Specimen	MZUFV 1389	MZUFV 1390	MZUFV 1391	MZUFV 1392
Dorsal postpectoral annuli	325	377	373	235
Ventral postpectoral annuli	327 +n	363	365	233 +n
Lateral annuli	damaged	6	6	damaged
Caudal annuli	damaged	12	10	damaged
Midbody dorsal segments	28	28	29	27
Midbody ventral segments	25	25	25	25
Precloacal pores	damaged	0	0	damaged
Precloacal segments	damaged	7	6	damaged
Postcloacal segments	damaged	20	20	damaged
Supralabials	1	1	1	1
Infralabials	1	1	1	1
Snout-vent length (mm)	270 +n	330	385	250 +n
Tail length (mm)	damaged	15.01	15.32	damaged
Head length (mm)	8.54	8.25	9.54	9.94
Head width (mm)	5.58	5.94	6.73	7.06
SVL / HW	unknown	55.5	57.2	unknown

Table 2. Summary of the locality records (datum WGS 84) for *Leposternon octostegum*. All localities are in the State of Bahia, Brazil. Vegetation according with literature sources; ecoregions follow Dinerstein *et al.* (2017) (BCF = Bahia Coastal Forests; ACR = Atlantic Coast restingas); soil type and texture follows FAO *et al.*, (2012); Collection acronyms follow Sabaj (2016); Source: 1 – Barros-Filho *et al.* (2013); 2 – Couto-Ferreira et al. (2011); 3 – this study.The shape file of ecoregions has a gap in the coastal area of Imbassaí, which could be the eastern limit of BCF or the northern range of ACR (more plausible, due to soil type), although the mapped point is at the edge of BCF.

Locality	Municipality	Lat.	Long.	Elev.	Vegetation	Ecoregion	Soil type	Soil texture	Voucher	Source
Aterro Metropolitano Centro	Salvador	-12.85°	-38.36°	55 m	rainforest in initial / median regeneration stages	BCF	acrisol	loamy sand	MNHN 2007.0023, 2007.0024; ZUFRJ 1748, 1749; MZUEFS 652–657, 695, 696	1
Arembepe	Camaçari	-12.78°	-38.20°	15 m	restinga	ACR	arenosol	sand	MCP 18192, 18193; MZUSP 96349, ZUFRJ 1713–1716)	1
Fazenda Real	Simões Filho	-12.757°	-38.423°	18 m	rainforest in initial / median regeneration stages	BCF	acrisol	loamy sand	MZUSP 100074	1
Santa Helena	Dias d'Ávila	-12.577°	-38.195°	27 m	secondary rainforest within a savanna (cerrado) enclave	BCF	acrisol	loamy sand	released	1
Reserva de Imbassaí	Mata de São João	-12.478°	-37.957°	25 m	restinga	ACR*	arenosol	sand	released	2
Fazenda Várzea de Baixo	Mata de São João	-12.4606°	-38.0937°	85 m	rainforest in initial regeneration stage within abandoned *Pinus* plantation	BCF	acrisol	loamy sand	MZUFV 1389–1392	3

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