

New records of *Mesoclemmys raniceps* (Testudines, Chelidae) for the states of Amazonas, Pará and Rondônia, North Brazil, including the Tocantins basin

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Of the 58 species of living Chelidae (Rhodin et al., 2017), 20 are known from Brazil (Costa and Bérnils, 2018). Of these, nine occur in the Amazon basin, including species of the genera *Chelus*, *Mesoclemmys*, *Platemys*, *Phrynops* and *Rhinemys* (Ferrara et al., 2017). The genus *Mesoclemmys* is the most diverse in Brazil, and five of the eight species of *Mesoclemmys* in Brazil occur within the Amazon basin (Souza, 2005; Ferrara et al., 2017). Species of genus *Mesoclemmys* are rare and inconspicuous when compared to other freshwater turtles, and live in hard-to-reach places, to extent that populations are rarely studied. This genus represents the least studied among Amazonian turtles (Vogt, 2008; Ferrara et al., 2017).

Among the rare species of the genus, *Mesoclemmys raniceps* (Gray, 1856), a medium-sized freshwater turtle (approximately 330 mm carapace length - CL; Rueda-Almonacid et al., 2007), inhabits streams and flooded forest, but can also be found in rivers, shallow lakes and temporary pools in the forest (Vogt, 2008; Ferrara et al., 2017). *Mesoclemmys raniceps* is relatively easy to identify, especially as an adult. Specimens of this species have a large broad head, which is approximately one quarter of the length of the CL (head width between 23-27%). The head is dark, but may show depigmentation in adults, resulting in a lighter color, generally in patches, as shown in Figure 2 (af). The rhamphotheca and plastron are yellow. To identify specimens of the species, we use the keys in Ernst and Barbour (1989), Rueda-Almonacid et al. (2007), and Ferrara et al. (2017), as well as the description in Vogt (2008). Individuals in the juvenile age-class of *M. raniceps* are more difficult to distinguish from those of other species. Accordingly, all new records presented here are of sub-adult and adult animals, so that there is no ambiguity in identification. The distribution of *M. raniceps* is restricted to the Amazon forest, and the basin of the Amazonas and Orinoco river systems (Rueda-Almonacid et al., 2007; Vogt, 2008; Ferrara et al., 2017). In Brazil, the species is known from the states of Amazonas (Iverson, 1992; Pezzuti et al., 2010; Balensiefer and Vogt, 2012; Molina et al., 2012; Morcatty, 2015; Keller et al., 2016), the frontier between Acre and Peru (Catenazzi et al., 2013), Mato Grosso (Brito et al., 2012), Rondônia (Iverson, 1992; Fachín-Terán, 1994; Vogt, 1998; Brandão, 2002; Molina et al., 2012) and Pará (Iverson, 1992; Molina et al., 2012). Elsewhere in South America, it occurs in Bolívia (Iverson, 1992), Colombia (Iverson, 1992; McCord et al., 2001), Ecuador (Cisneros-Heredia, 2006), and Peru (Iverson, 1992; McCord et al., 2001;

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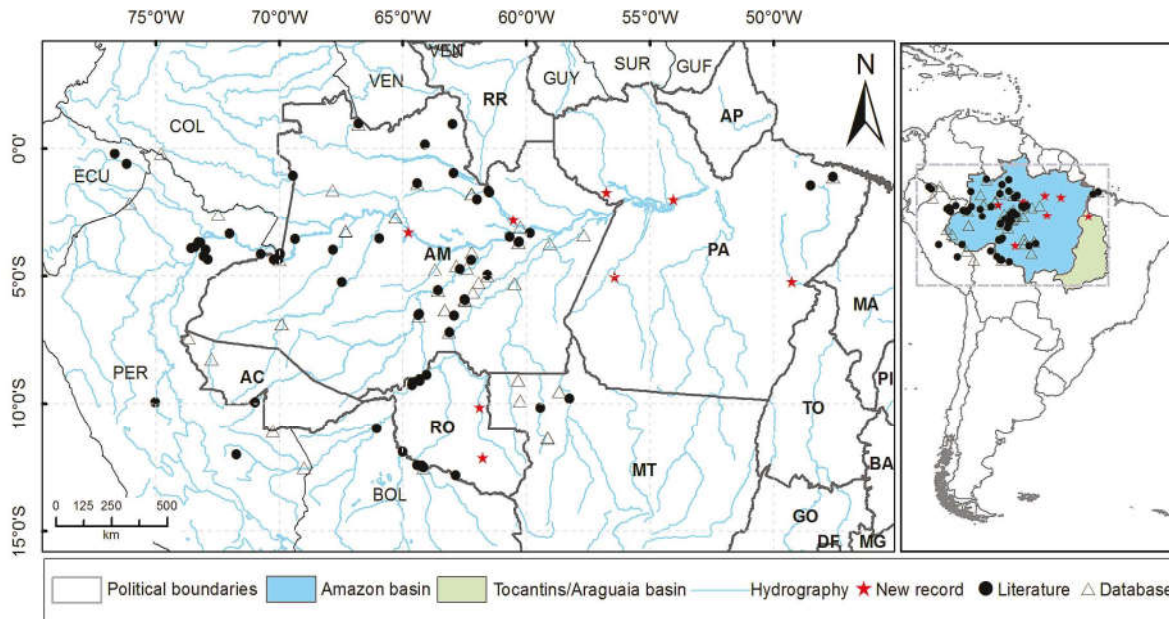


Figure 1. Distribution map of *Mesoclemmys raniceps*. Known occurrence records (black circles and triangles) and new records (red star) for *Mesoclemmys raniceps* in Amazonas, Pará and Rondônia states, Brazil.

Ferronato and Morales, 2012; Molina *et al.*, 2012).

Mesoclemmys raniceps may occur in sympatry with *M. gibba* (Schweigger, 1812) and *M. heliostemma* (McCord, Joseph-Ouni & Lamar, 2001). Both species inhabit bodies of water within the forest. *M. nasuta* (Schweigger, 1812) is a larger species with a distribution restricted to extreme northern Brazil, in the states of Amapá and Pará (Costa and Bémils, 2018). Taxonomic controversies involving *M. raniceps*, *M. heliostemma* and *M. nasuta* (Rueda-Almonacid *et al.*, 2007; Ferrara *et al.*, 2017). For this reason, we believe the distribution of *M. raniceps* is currently underestimated. This includes gaps in records in the area between the eastern portion of the State of Amazonas and east of the State of Pará. In order to fill some of these we have, in the current study, added two new records for Amazonas, four new records for Pará and two new records for the State of Rondônia, in areas without prior records for *M. raniceps*. In addition, we present the first record of the species in the Tocantins-Araguaia River basin.

In addition to unpublished primary records reported in this study, we present a collation of all *M. raniceps* distribution records known to date (Fig. 1). We used the following resources to construct the used records database: 1) an extensive review of the literature, including articles published in periodicals, dissertations/theses and abstracts from herpetology congresses; 2)

specimens held in scientific collections; 3) Species Link Banks (GBIF, EMYSYstem, Biodiversity Portal). To minimize problems arising from georeferencing errors, we excluded obviously erroneous records of occurrence and/or doubtful records. The records were checked comparing the coordinates with the name of locality, city, state, and hydrographic basin.

Here we report eight new distributional records of *M. raniceps* for three Brazilian states in the northern of Brazil (Amazonas, Pará and Rondônia), documented between 2009 and 2017 (Table 1; Fig. 1). In addition, we present a brief description of capture localities for each specimen. Describing the environments used by *M. raniceps* can inform the biology and behavior of the species and may help orient future studies.

Our first records are two adult female *M. raniceps*, captured using funnel traps placed in small streams. These streams are tributaries of the Machado River, in the Reserva Biológica do Jaru, Ji-Paraná municipality, Rondônia, in January 2009 (Fig. 2a). The streams are permanent, undisturbed, and shallow, with sandy pebbly bottoms and, at the time of capture, had turbid water due to intense rains (Fig. 3a). Capture points were 1 km from the stream's headwaters, which remain unflooded even when the water level in the Machado River is at annual maximum level.

Table 1. Location, number of captures per site and type of water bodies where *Mesoclemmys raniceps* individuals were captured, in Amazonas, Pará and Rondônia states, Brazil. Sex: F – female; M – male; ND - not determined.

| City/State | Date | Number of individuals (sex) | Approximate coordinates (WGS84) | | Hydrographic basin (sub-basin) | Water body type | Water body size | Substrate |
|-----------------------------------|------------------|-----------------------------|---------------------------------|--------|--------------------------------|-----------------|------------------------|-------------|
| | | | S | W | | | | |
| Ji Paraná - Rondônia | Jan/2009 | 2 (F) | 10°08' | 61°54' | Amazon (Madeira) | Lotic | 2 nd order | Sandy/rocky |
| Itupiranga - Pará | Mar/2010 | 1 (F) | 05°13' | 49°16' | Tocantins-Araguaia (Tocantins) | Lotic | 1 st order | Sandy |
| Itaituba/Trairão - Pará | Jul and Oct/2012 | 2 (ND) | 05°02' | 56°25' | Amazon (Tapajós) | Lotic | 1 st order | Sandy |
| Monte Alegre - Pará | Feb/2016 | 1 (ND) | 02°00' | 54°03' | Amazon (Xingu e Paru) | Lentic | Lake | Sandy |
| Faro/Oriximiná - Pará | Jul/2016 | 1 (F) | 01°43' | 56°03' | Amazon (Amazonas) | Lotic | 1 st order | Sandy |
| Alvarães - Amazonas | Jun/2016 | 1 (F) | 03°17' | 64°46' | Amazon (Solimões) | Lentic | 1 st order | Sandy |
| Manaus - Amazonas | Jul/2017 | 2 (M, F) | 02°49' | 60°31' | Amazon (Negro) | Lotic | >3 rd order | Sandy |
| Alto Alegre do Parecis - Rondônia | Nov/2017 | 1 (M) | 12°08' | 61°46' | Amazon (Madeira) | Lotic | >3 rd order | Sandy |

Our second record was of another adult female (CL 265 mm), also captured with a funnel trap placed in a small stream along the Tocantins-Araguaia River, Itupiranga municipality, Pará, in March 2010 (Fig. 2b). The stream was approximately 2 m wide, featuring clear, shallow water, a sandy bottom, and ran through a patch of preserved Amazonian forest, approximately 2 km in straight-line distance from the main course of the Tocantins River (Fig. 3b).

Our third record was of two *M. raniceps* individuals captured in the Tapajós River basin, between Itaituba and Trairão municipalities, Pará, in July and October 2012, respectively (Fig. 2c). Both were adults, a female and a male, measuring 279 mm (female) and 292 mm (male) in CL. They were captured in two small streams in protected forest (Fig. 3c, d). The first stream was approximately 2 m wide and very shallow, with clear water and a sandy bottom. The capture site was in dense forest approximately 1 km in straight-line distance from the Jamanxim River and 25 km from the Tapajós River. The second stream was approximately 5 m wide, no more than 80 cm deep, had a sandy bottom and clear water, and featured large amounts of woody vegetation within. The capture site layed approximately 3 km from the Tapajós River.

Our fourth record was that of an adult *M. raniceps* caught by a fisherman in a lake on the edge of the Amazonas River, in Monte Alegre municipality, Pará, February 2016. The record is attributed to photo identification (Fig. 2d). In the same year, we obtained our fifth and sixth records, with the capture of two female *M. raniceps*. The first female (CL 140 mm, Fig. 2e) was captured by hand in Faro municipality, July 2016, near the boundary of the neighboring municipality of Oriximiná, Pará, in a small, shallow, clear-water stream, with a sandy bottom, set in dense Amazonian forest (Fig. 3e). The second female (CL 270 mm) was also captured in July 2016 using a net in Alvarães municipality, Amazonas, in an area of flooded forest. As estimated by palpation of the inguinal cavity, this individual had around five calcified eggs within, and was presumably close to egg deposition.

The seventh record was made in July 2017, when we captured two adult *M. raniceps* in the same locality—a female (CL 335 mm), and a male (CL 334 mm)—in Manaus municipality, Amazonas. The animals were found together and active, and were captured by hand at night near a waterfall on the Cuieiras River, near of the Negro River. The Cuieiras River is a blackwater river (a coloration derived from dissolved humic substances liberated during the decomposition of fallen vegetation),



Figure 2. Some of the *Mesoclemmys raniceps* individuals recorded during this study: **a)** General picture and detail of the head of one of two specimens captured at Ji-Paraná, Rondônia; **b)** Adult female captured at Itupiranga, Pará; **c)** One of the two specimens captured at Itaituba/Trairão, Pará; **d)** Specimen captured at Monte Alegre, Pará, Photo: Otávio Peleja; **e)** Female captured at Faro/Oriximiná, Pará, Photo: Tainá F. D. Rodrigues; **f)** Male captured at Alto Alegre do Parecis, Rondônia.

but relatively transparent, with a maximum depth of 1.5 m. The site was in dense forest that was flooded at the time of specimen capture.

Our eighth and final *M. raniceps* record was of an adult male captured in November 2017 at Alto Alegre do Parecis, Rondônia, in the Guaporé basin (Fig. 2f). We caught this animal in a fishing net at night on the Branco River, at a site with clear water and a sandy

bottom. At the time of capture, the Branco River was flooded, overflowing its banks due to heavy rains, and reaching 27 m in width (Fig. 3f).

All captured animals were photographed, sexed, weighed and measured, and released. Exceptions include the specimen from Monge Alegre, which was captured and photographed by fishermen, and the specimen from Alvarães, which we deposited in the collection



Figure 3. Habitats in which *Mesoclemmys raniceps* has been captured in Brazil. **a)** Stream in Jauru, Rondônia; **b)** Small stream in Itupiranga, Pará; **c e d)** Streams in Itaituba, Pará; **e)** Stream in Faro/Oriximiná, Pará; **f)** Branco river at Alto Alegre do Parecis, Rondônia. Figures b and c show in place the funnel traps that were used to capture *M. raniceps* at some sites.

of reptiles and amphibians at the *Instituto Nacional de Pesquisas da Amazônia*, Manaus (INPA-H37242).

These captures have expanded the known distribution of *M. raniceps* in Pará by 631 km west from the nearest known Pará record, and 215 km from the closest record in Amazonas. In addition, our records expand the known distribution for the species in the Tapajós, Trombetas, and Tocantins-Araguaia river basins, and

include the first record of the species in the Tocantins-Araguaia River basin. In Rondônia, we extended the known distribution by 272 km to the southeast of the closest record in that state, documenting the species in the Machado River sub-basin, and 179 km from the nearest point in the neighboring State of Mato Grosso.

Most of the environments where *M. raniceps* were captured resemble those reported in the literature

(Rueda-Almonacid *et al.* 2007; Vogt 2008; Ferrara *et al.* 2017): small streams and shallow lakes, and flooded forests. All of our records came from areas of continuous forest and anthropogenically undisturbed forest patches. In two sample locations in Pará (Itupiranga and Itaituba municipalities), intense visual searches and funnel trapping in less well-preserved streams or near urban areas failed to register *M. raniceps* (Elizângela Brito, unpublished data), indicative of preference for more pristine environments or strong hunting pressure in these anthropized environment.

The low number of records of *M. raniceps* in recent decades, especially in Pará, may be explained by the difficulty in identifying species of the genus *Mesoclemmys* and by the difficulty in their capture. Many of our *M. raniceps* records were located at least 1 km inland from rivers, and in remote locations. Access to such sites is logistically challenging. Few researchers invest the time and financial resources necessary to visit them and capture such rare freshwater turtles primarily because of the risk of not obtaining sufficient data to justify such efforts. This is further enhanced by the inconspicuous nature of this species and the fact that so many other turtles inhabit environments that are less difficult to access. As a result, we strongly recommend that herpetofaunal inventories direct sampling efforts to small, in-forest water bodies (both temporary and permanent) to record the diversity of freshwater turtles inhabiting such environments, to help fill in the considerable gaps in our knowledge of the biology of these animals. This is urgent work because their habitats have often undergone major structural changes related to direct human impacts, giving rise to altered forest (Phillips *et al.*, 2008). Current knowledge is inadequate to assess the level of these threats.

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