

New records and distribution extensions of three species of *Mesoclemmys* Gray, 1863 (Testudines: Chelidae) in Mato Grosso state, Brazil, with observations on terrestrial movements

Elizângela Silva de Brito^{1*}, Christine Strüssmann^{2,3}, Ricardo Alexandre Kawashita-Ribeiro³, Drausio Honório Moraes⁴, Robson Waldemar Ávila⁵ and Vitor Azarias Campos³

- 1 Programa de Pós-Graduação em Biologia de Água Doce e Pesca Interior, Instituto Nacional de Pesquisas da Amazônia. Av. André Araújo, n. 2936, Aleixo. CEP 69060-001. Manaus, AM, Brazil.
 - 2 Departamento de Ciências Básicas e Produção Animal, Faculdade de Agronomia, Medicina Veterinária e Zootecnia, Universidade Federal de Mato Grosso. Av. Fernando Correia da Costa, n. 2367, Boa Esperança. CEP 78060-900. Cuiabá, MT, Brazil.
 - 3 Programa de Pós-graduação em Ecologia e Conservação da Biodiversidade, Universidade Federal de Mato Grosso, Instituto de Biociências. Av. Fernando Correia da Costa, n. 2367, Boa Esperança. CEP 78060-900. Cuiabá, MT, Brazil.
 - 4 Universidade Estadual Paulista Júlio de Mesquita Filho, Campus de Botucatu, Instituto de Biociências, Departamento de Parasitologia. Distrito de Rubião, Caixa Postal 510. CEP 18618-000. Botucatu, SP, Brazil.
 - 5 Universidade Regional do Cariri, Campus do Pimenta, Centro de Ciências Biológicas e da Saúde, Departamento de Ciências Biológicas, Rua Cel. Antonio Luiz, 1161, Bairro do Pimenta. CEP 63105-100. Crato, CE, Brazil.
- * Corresponding author. E-mail: esbbr@yahoo.com.br

ABSTRACT: Distribution patterns of most of the 20 Neotropical freshwater turtles belonging to the family Chelidae are usually based on few locality records. We here report on vouchered records of three species of the chelid genus *Mesoclemmys* in the Brazilian state of Mato Grosso. Presence of *M. vanderhaegei* is confirmed for the Amazon River Basin, and *M. gibba* and *M. raniceps* are recorded in Mato Grosso for the first time.

Although studies on Neotropical freshwater turtles have increased during the last years, several species are still poorly known, especially in regard to distributional records that are limited to a few localities. Among these are most of Brazilian freshwater turtles of the family Chelidae (Souza 2004; 2005). It presently comprises 20 species, eight of which belong to the genus *Mesoclemmys* (Bérnils and Costa 2011). Up to now, only one species in this genus (*M. vanderhaegei*) is positively recorded for the Brazilian state of Mato Grosso, which encompasses the headwaters of two major South American river basins: Amazon and Plata. We here present new locality records and range extensions for three species of *Mesoclemmys* (Figure 1) in Mato Grosso. We also call attention to the ability of these turtles to occasionally migrate across land, between aquatic habitats or even between distinct watersheds.

Previous records of the Vanderhaege's toad-headed turtle *Mesoclemmys vanderhaegei* (Bour, 1973) in Brazil refer mainly to localities belonging to the Parana-Paraguay River sub-basins of the Plata River Basin (e.g., Iverson 1992; Souza *et al.* 2000; Strüssmann 2000; Strüssmann *et al.* 2000; Brandão *et al.* 2002; Bour and Zaher 2005). Besides Mato Grosso, known records of *M. vanderhaegei* include the states of Mato Grosso do Sul and São Paulo. The species was also recorded in the São Francisco River Basin, in Minas Gerais State (Silveira 2009), and in streams of the southeastern portion of the Amazon River Basin (Araguaia-Tocantins sub-basin), in the states of Tocantins and Goiás (Brandão *et al.* 2002; Villaça 2004). Nevertheless, these Amazonian records were not considered by Bour and Zaher (2005), who revised the distribution of the genus

Mesoclemmys.

Species identifications followed keys and diagnoses in Ernst and Barbour (1989), Pritchard and Trebbau (1984) and Rueda-Almonacid *et al.* (2007). As a tool for identification, we also provide (Table 1) measurements of carapace length (CL), head width (HW), and ratio between HW and CL, for some of the specimens of *Mesoclemmys* referred herein. Vouchers are deposited in the Coleção Zoológica de Vertebrados of the Universidade Federal de Mato Grosso (UFMT, Cuiabá, Mato Grosso, Brazil).

We here report seven records of the presence of *M. vanderhaegei* in Mato Grosso rivers belonging to three distinct Amazonian sub-basins (Guaporé-Madeira, Juruena-Tapajós, and Araguaia-Tocantins) of the southern section of the Amazon River Basin (Figure 2). In the municipality Vale de São Domingos, southwestern Mato Grosso, an adult individual of *M. vanderhaegei* (UFMT 1625) was captured on 30/May/2002. It was crossing an unpaved road near the Guaporé River hydroelectric powerplant (UHE Guaporé; 15°07' S, 58°57' W). In the municipality Vila Bela da Santíssima Trindade, two specimens (a juvenile, UFMT 8423, and two adults, UFMT 8767; UFMT 8768) were captured on 14/March/2008, in a small stream impoundment of a gold mining project (Projeto São Francisco) in the top of Serra da Borda (14°51' S, 59°39' W). In the same locality and habitat, another juvenile (UFMT 8565) was collected on 17/April/2010. River courses from Vale de São Domingos and from Vila Bela da Santíssima Trindade both belong to the Upper Guaporé River Basin. Guaporé River is an affluent of the Madeira River, a major contributor of the right margin of the Amazon River.

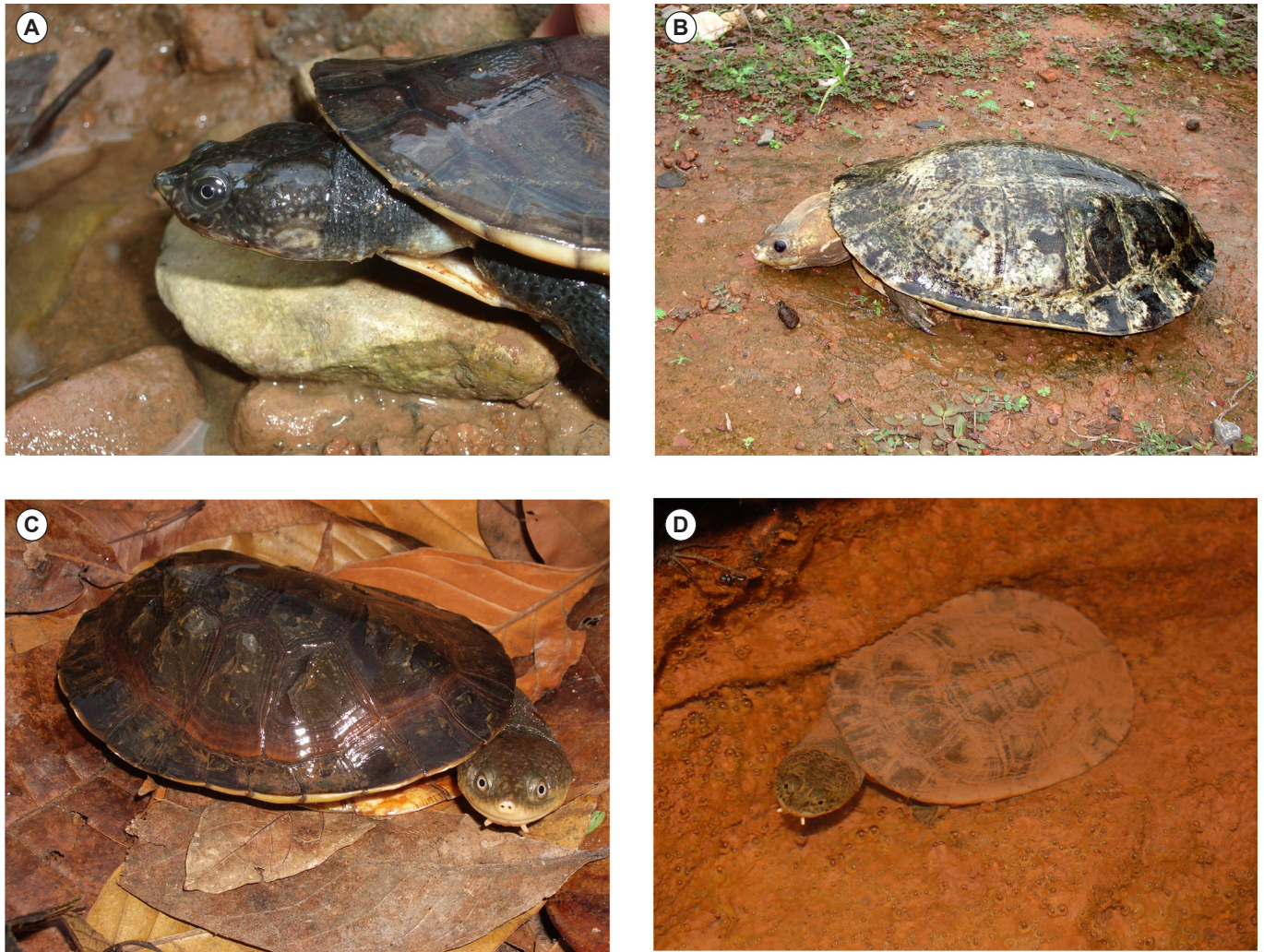


FIGURE 1. Representatives of the species of *Mesoclemmys* treated herein, in life. (A) *Mesoclemmys gibba* (UFMT 6245) from Parque Estadual Igarapés do Juruena, municipality Colniza; (B) *Mesoclemmys raniceps* (UFMT 4888) from municipality Aripuanã; (C–D) *Mesoclemmys vanderhaegei*, adult and juvenile specimens, respectively, from Projeto São Francisco, Serra da Borda, municipality Vila Bela da Santíssima Trindade.

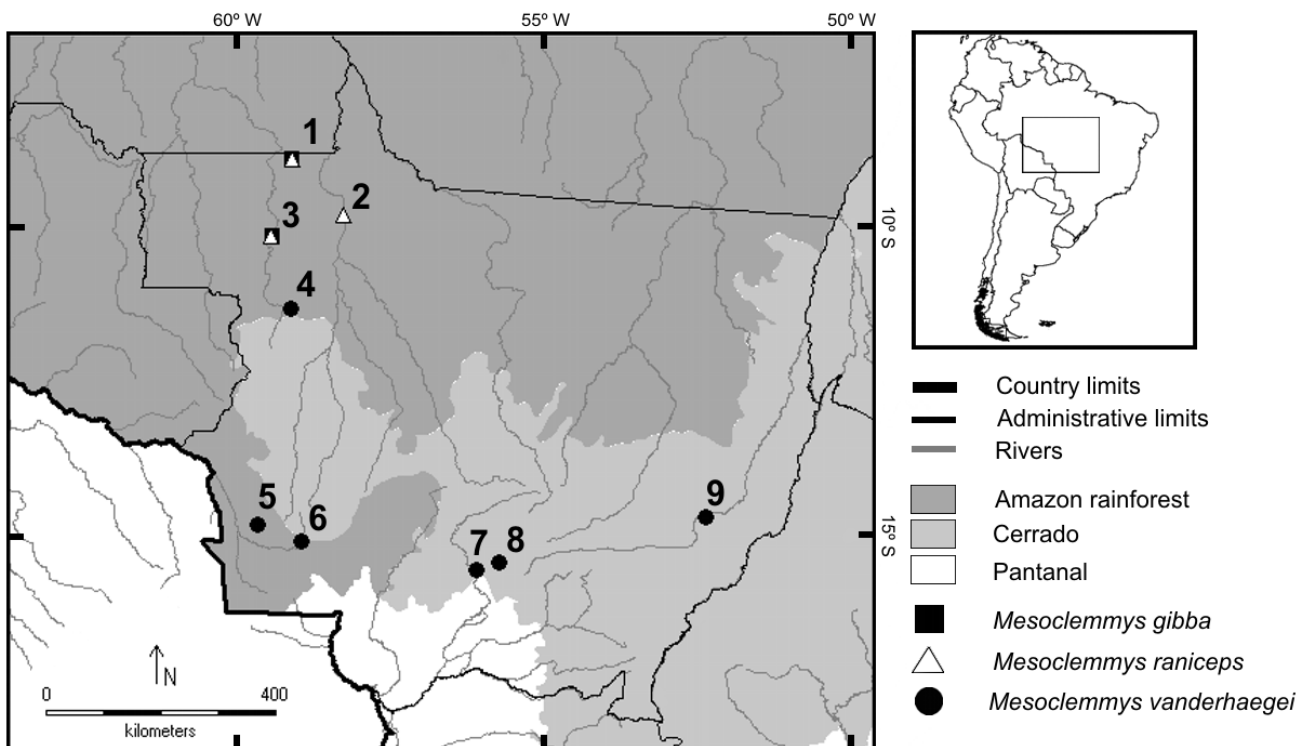


FIGURE 2. Locality records in Mato Grosso state, Brazil, mentioned in the text for representatives of the genus *Mesoclemmys*. *Mesoclemmys gibba*: 1) Colniza, 3) Aripuanã; *Mesoclemmys raniceps*: 1) Colniza, 2) Cotriguaçu, 3) Aripuanã; *Mesoclemmys vanderhaegei*: 4) Juína, 5) Vila Bela da Santíssima Trindade, 6) Vale de São Domingos, 7) Cuiabá, 8) Chapada dos Guimarães, 9) Nova Xavantina.

TABLE 1. Carapace length (CL) and head width (HW), in mm, and ratio between HW and CL in selected specimens of *Mesoclemmys* from Mato Grosso State, Brazil. U – unsexed; F – female; M – male.

UFMT	SPECIES	CL	HW	RATIO HW/CL	AGE/SEX
8423	<i>Mesoclemmys vanderhaegei</i>	81.1	17.7	0.218	U
8568	<i>Mesoclemmys vanderhaegei</i>	162.1	31.0	0.191	M
8667	<i>Mesoclemmys vanderhaegei</i>	173.3	33.4	0.192	M
8764	<i>Mesoclemmys vanderhaegei</i>	171.5	33.9	0.197	F
6245	<i>Mesoclemmys gibba</i>	95.6	20.5	0.214	U
6244	<i>Mesoclemmys gibba</i>	82.7	17.8	0.215	U
6868	<i>Mesoclemmys gibba</i>	145.7	28.3	0.194	M
4888	<i>Mesoclemmys raniceps</i>	228.2	73.3	0.321	F
9086	<i>Mesoclemmys raniceps</i>	77.9	20.8	0.267	U
9085	<i>Mesoclemmys raniceps</i>	87.6	22.4	0.255	U

In the municipality Juína, an adult of *M. vanderhaegei* (UFMT 6056) was captured on 04/December/2006, while crossing an unpaved road near the Juruena River (11°20' S, 59°07' W). This is a main affluent of the Tapajós River, also a major contributor of the right margin of the Amazon River.

In the municipality Nova Xavantina, an adult female (UFMT 8764) was captured on 16/April/2003, in a pitfall trap amidst a sandy area covered by open vegetation ("cerrado sentido restrito", *sensu* Ribeiro and Walter, 1998). The pitfall was installed near the margins of the small and oligotrophic Bacaba stream (14°43' S, 52°21' W). Bacaba is an affluent of the Mortes River, which belongs to the Araguaia-Tocantins sub-basin. To our knowledge, this is the southernmost record of that species in this sub-basin.

Presence of *M. vanderhaegei* was also recorded in both natural and urban areas of two municipalities in southern Mato Grosso (Figure 2), amidst Cerrado (Brazilian's second largest ecosystem, covering most of Central Brazil). On 23/December/2004, during the local dry season, a juvenile of *M. vanderhaegei* (not collected) was found crossing a sandy, unpaved road inside the National Park of Chapada dos Guimarães, mostly situated in the municipality Chapada dos Guimarães. Also in December/2004, a juvenile specimen (UFMT 1787) was found road killed on a paved street of the urban area of Cuiabá, the capital of Mato Grosso State. On 20/April/2010, in the same municipality, an adult female (UFMT 8564) was found at an urban site still covered by "cerrado sentido restrito" vegetation.

Two additional species of the genus *Mesoclemmys* are herein reported to be present in the state of Mato Grosso (Figure 2): *Mesoclemmys gibba* (Schweigger, 1812) and *Mesoclemmys raniceps* (Gray, 1855). The first species is widely distributed in the Orinoco River and the Amazon River basins, in Guyana, Suriname, French Guiana, Colombia, Ecuador, Peru, Venezuela, Trinidad, and northern Bolivia and Brazil (Bour and Zaher 2005 and references therein; Rueda-Almonacid *et al.* 2007; Vogt 2008; Ferronato *et al.* 2010).

Little is known on the distribution of *M. gibba* in Brazil. Confirmed records in Brazil are limited to the states of Amazonas (Schneider *et al.* 2009), Pará (Mittermeier *et al.* 1978; Avila-Pires *et al.* 2010), Acre (Bernarde *et al.* 2011), and Tocantins (Pavan and Dixo 2004). Therefore, the species seems to be restricted to the Amazon basin, as also inferred from distribution maps provided by Iverson

(1992), Bour and Zaher (2005), and Rueda-Almonacid *et al.* (2007), among others. We are unaware of any previous confirming record of its presence in Mato Grosso State (but see São Pedro *et al.* 2009).

On 31/October/2007, during faunal inventories at "Parque Estadual Igarapés do Juruena" (08°54' S, 59°06' W), municipality Colniza, two juvenile specimens of *M. gibba* were collected (UFMT 6244; UFMT 6245) in a small forest stream (locally called "igarapé"). On 18/May/2008, an adult male of the same species (UFMT 6868) was captured in a small stream at "Dardanelos Mineradora" (10°08' S, 59°25' W), a mining project situated in the municipality Aripuanã, contacting northwards with Colniza. To our knowledge, Aripuanã currently represents the southwesternmost record for the species. In both municipalities, local streams are tributaries of the Aripuanã River, which belongs to the Aripuanã-Madeira sub-basin of the Amazon River Basin.

Another representative of the genus *Mesoclemmys* here shown to be present in northwestern Mato Grosso State is *M. raniceps*. As *M. gibba*, it is widely distributed in the Orinoco River and Amazonas River basins, being known from Colombia, Venezuela, Peru, Bolivia, and Brazil (Iverson 1992; McCord *et al.* 2001; Bour and Zaher 2005). In Brazil, it was until now restricted to the states of Acre, Rondônia, Amazonas, and Pará, as suggested by general distribution maps, as those provided by Iverson (1992), McCord *et al.* (2001), Bour and Zaher (2005), and Rueda-Almonacid *et al.* (2007).

On 11/July/2006, an adult female of *M. raniceps* (UFMT 4888) was found inside a burrow near a small stream, affluent of the left margin of the Aripuanã river (10°09' S, 59°26' W), municipality Aripuanã. Another individual of *M. raniceps* (UFMT 7034) was found road killed on an unpaved road on 01/May/2008, during faunal inventories at "Parque Estadual Igarapés do Juruena", municipality Colniza (see above). Only carapace and skeleton of this specimen were collected and later deposited in the vertebrate collection at UFMT. Additionally, two juvenile specimens were collected (in 28/February/2011, UFMT 9085, and in 02/March/2011, UFMT 9086) near the left margin of the Juruena River, at Fazenda São Nicolau (09°48' S, 58°16' W), municipality Cotriguaçu.

Although strongly associated to aquatic habitats, individuals of *Mesoclemmys* spp. are frequently found while crossing dry habitats or interflaves. The wide distribution

of *Mesoclemmys vanderhaegei*, for example, may be a result of the ability of these turtles to perform terrestrial displacements between water bodies (sometimes crossing interfluves), especially at the end of the rainy season. Indeed, individuals of *M. vanderhaegei* were found in dry places in nearly half of the records reported herein. Reasons to do so probably include the search for empty territories or for suitable places to spend the dry season, among others.

Terrestrial displacements were already reported for other freshwater turtles, such as the chelid *Chelodina longicollis* (Roe and Georges 2008; Rees et al. 2009), and the emydids *Trachemys scripta* (Gibbons et al. 1990), *Emydoidea blandingii* (Ross and Anderson 1990), and *Clemmys guttata* (Haxton and Berrill 2001). Presumably, most freshwater turtles have the skill to migrate across land, and effectively do it when resources become meager in their original aquatic habitats (Kramer 1995; Milan and Melvin 2001). Due to this ability, and also considering the confluence of at least three distinct ecosystems and river basins in the state of Mato Grosso, representatives of Chelidae probably have even wider ranges than presently indicated by available data.

ACKNOWLEDGMENTS: We thank to Marcos André de Carvalho, from the Vertebrate Zoological Collection at UFMG, for the loaning of specimens under his care, and to Richard Carl Vogt, from Instituto Nacional de Pesquisas da Amazônia (INPA; Manaus, Amazonas State, Brazil), for checking some of the identifications.

LITERATURE CITED

- Avila-Pires, T.C.S., M.S. Hoogmoed and W.A. Rocha. 2010. Notes on the Vertebrates of northern Pará, Brazil: a forgotten part of the Guianan Region, I. Herpetofauna. *Boletín do Museu Paraense Emílio Goeldi. Ciências Naturais* 5(1): 13-112.
- Bernarde, P.S., R.A. Machado and L.C.B. Turci. 2011. Herpetofauna da área do Igarapé Esperança na Reserva Extrativista Riozinho da Liberdade, Acre, Brasil. *Biota Neotropica* 11(3): 117-144.
- Bérnils, R.S. and H.C. Costa. 2011. *Brazilian reptiles – List of species*. Electronic Database accessible at <http://www.sberpetologia.org.br/>. Sociedade Brasileira de Herpetologia. Captured on 05 May 2012.
- Bour, R. and H. Zaher. 2005. A new species of *Mesoclemmys*, from the open formations of northeastern Brasil (Chelonii, Chelidae). *Papéis Avulsos de Zoologia* 45(24): 295-311.
- Brandão, R.A., G.J. Zerbin, A. Sebben and F.B. Molina. 2002. Notes on distribution and habitats of *Acanthochelys spixii* and *Phrynops vanderhaegei* (Testudine, Chelidae) in Central Brazil. *Boletín de la Asociación Herpetológica Española* 13(1-2): 11-15.
- Ernst, C.H. and R.W. Barbour. 1989. *Turtles of the World*. Smithsonian Institution Press, Washington, 313 p.
- Ferronato, B., F.B. Molina, R. Espinosa and V. Morales. 2010. Hatchling Morphology of the Amazonian Toad-headed Turtle (*Mesoclemmys raniceps* [Gray 1855]) from Peruvian Tropical Andes (Testudines: Chelidae). [Erratum: = *Mesoclemmys gibba*. Published online]. *Herpetology Notes* 3: 211-214.
- Gibbons, J.W., J.L. Greene and J.D. Congdon. 1990. Temporal and spatial movements patterns of Sliders and other turtles; p. 201-215 In J. W. Gibbons (ed). *Life History and Ecology of the Slider Turtle*. Smithsonian Institution Press, Washington, D.C.
- Haxton, T. and M. Berrill. 2001. Seasonal activity of Spotted Turtles (*Clemmys guttata*) at the northern limit of their range. *Journal of Herpetology* 35(4): 606-614.
- Iverson, J.B. 1992. *A Revised Checklist with Distribution Maps of the Turtles of the World*. Richmond: Privately Printed. 363 p.
- Kramer, M. 1995. Home range of the Florida RedBellied Turtle (*Pseudemys nelsoni*) in a Florida spring run. *Copeia* 1995(4): 883-890.
- McCord, W.P., M. Joseph-Ouni and W.W. Lamar. 2001. A Taxonomic Reevaluation of *Phrynops* (Testudines:Chelidae) with the Description of two new Genera and a new Species of *Batrachemys*. *Revista de Biología Tropical* 49: 715-764.
- Milan, J.C. and S.M. Melvin. 2001. Density, habitat use, movements, and conservation of Spotted Turtles (*Clemmys guttata*) in Massachusetts. *Journal of Herpetology* 35(3): 418-427.
- Mittermeier, R.A., A.G.J. Rhodin, F. Medem, P. Soini, M.S. Hoogmoed and N.C. Espinosa. 1978. Distribution of the South American Chelid Turtle *Phrynops gibbus*, with Observations on Habitat and Reproduction. *Herpetologica* 34(1): 94-100.
- Pavan, D. and M. Dixo. 2004. A Herpetofauna da Área de Influência do Reservatório da Usina Hidrelétrica Luís Eduardo Magalhães, Palmas, TO. *Humanitas* 4-6: 13-30.
- Pritchard, P.C.H. and P. Trebbau. 1984. *The Turtles of Venezuela*. Athens, Society for the Study of Amphibians and Reptiles. 403 p.
- Rees, M., J.H. Roe and A. Georges. 2009. Life in the suburbs: Behavior and of a freshwater turtle in response to drought and urbanization. *Biological Conservation* 142(12): 3172-3181.
- Roe, J.H. and A. Georges. 2008. Terrestrial activity, movements and spatial ecology of an Australian freshwater turtle, *Chelodina longicollis*, in a temporally dynamic wetland system. *Austral Ecology* 33: 1045-1056.
- Ribeiro, J.F. and B.M.T. Walter. 1998. Fitofisionomias do Bioma Cerrado; p. 89-166. In S.M. Sano and S.P. Almeida (ed.). *Cerrado: Ambiente e Flora*. Planaltina: EMPRAPA-CPAC.
- Ross, D.A. and R.K. Anderson. 1990. Habitat use, movements, and nesting of *Emydoidea blandingi* in central Wisconsin. *Journal of Herpetology* 24(1): 6-12.
- Rueda-Almonacid, J.V., J.L. Carr, R.A. Mittermeier, J.V. Rodríguez-Mahecha, R.B. Mast, R.C. Vogt, A.G.J. Rhodin, J.L. Ossa-Velásquez, J.N. Rueda and C.G. Mittermeier. 2007. *Las tortugas y los cocodrilianos de los países andinos del Trópico*. Bogotá: Conservación Internacional. 536 p.
- São-Pedro, V.A., H.C. Costa and R.N. Feio. 2009. A Herpetofauna do AHE Dardanelos, Aripuanã, Mato Grosso. Viçosa: [s.n.] 40 p.
- Schneider, L., C. Ferrara, R.C. Vogt and L.B. Santos-Junior. 2009. *Phrynops gibbus* (Gibba Turtle). Brazil, Amazonas, Barreirinha. *Herpetological Review* 40(2): 236.
- Strüssmann, C. 2000. Herpetofauna; p. 153-189. In C.J.R. Alho (ed.). *Fauna silvestre da região do rio Manso, MT*. Brasília: IBAMA / Centrais Elétricas do Norte do Brasil.
- Strüssmann, C., C.A. Prado, M. Uetanabaro and V.L. Ferreira. 2000. Amphibians and reptiles of selected localities in the southern Pantanal floodplains and neighboring Cerrado areas, Mato Grosso do Sul, Brasil; p. 98-102 In P.W. Willink, B. Chernoff, L.E. Alonso and J.R. Montambault. (ed.). *A biological assessment of the aquatic ecosystems of the Pantanal, Mato Grosso do Sul, Brasil*. RAP Bulletin of Biological Assessment 18. Washington: Conservation International.
- Silveira, A.L. 2009. *Mesoclemmys vanderhaegei*: Brasil: Minas Gerais. *Herpetological Review* 40(2): 235-236.
- Souza, F.L. 2004. Uma revisão sobre padrões de atividade, reprodução e alimentação de cágados brasileiros (Testudines, Chelidae). *Phyllomedusa* 3(1): 15-27.
- Souza, F.L. 2005. Geographical distribution patterns of South American side-necked turtles (Chelidae), with emphasis on Brazilian species. *Revista Española de Herpetología* 2005(19): 33-46.
- Souza, F.L., M. Martins and R.J. Sawaya. 2000. A new record and observations of Vanderhaege's Toad-Headed Turtle, *Phrynops vanderhaegei* (Testudines, Chelidae) in SE Brazil. *Boletín de la Asociación Herpetológica Española* 11(2): 85-88.
- Villaça, A.M. 2004. *Bufocephala vanderhaegei* (Testudines, Chelidae) no Estado do Tocantins. *Humanitas* 4-6(2002-2004): 73-75.
- Vogt, D.C. 2008. *Tartarugas Amazônicas*. Lima: Limos. 104 p.

RECEIVED: December 2011

ACCEPTED: February 2012

PUBLISHED ONLINE: May 2012

EDITORIAL RESPONSIBILITY: Philippe Kok