

New records of *Macrobrachium* Spence Bate, 1868 (Decapoda, Palaemonidae) from the northern coast of Brazil

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Abstract

Among the species belonging to the genus *Macrobrachium* Spence Bate, 1868, *M. carcinus* (Linnaeus, 1758) and *M. ofersii* (Wiegmann, 1836) are geographically widespread in the western Atlantic from the Gulf Coast to southern Brazil. We describe the current geographic distribution of *M. carcinus* and *M. ofersii* and include records of these species in the state of Maranhão, Brazil.

Key words

Macrobrachium ofersii, *Macrobrachium carcinus*; shrimp; geographic distribution; new occurrences.

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Introduction

The genus *Macrobrachium* Spence Bate, 1868 belongs to the subfamily Palaemoninae, and with about 230 species, it is the most numerous genus of the subfamily Palaemonidae. There are 22 species known in Brazil (Melo 2003, Valencia and Campos 2007, Mantelatto et al. 2008, Loebmann et al. 2010, Maciel et al. 2011, Anger 2013, Dos Santos et al. 2013). To date, there are 4 known species of this genus in Maranhão, *M. acanthurus* (Wiegmann, 1836), *M. amazonicum* (Heller, 1862), *M. brasiliense* (Heller, 1862), and *M. jelskii* (Miers, 1877) (Melo 2003). Ramos-Porto et al. (1978) and Coelho and Ramos-Porto (1980) were the first authors to report freshwater shrimp, *M. acanthurus* and *M. amazonicum*, from the state. Herein, we provide the current geographic distribution of *M. carcinus* and *M. ofersii*, and include new records from northeastern Brazil.

Methods

Samples of *Macrobrachium* species were collected from 20 to 21 November 2014 in São José and Água Rica streams, in the municipalities of Paulino Neves and Tutóia, Maranhão state. These streams are part of the drainage basin of the Rio Preguiças and lie within the savanna biome (IBGE 2010, NUGEO/UEMA 2011).

Dip nets and sieves were used around the margins of the streams and in marginal vegetation for a 20-min period over a 150 m stretch. Collected specimens were fixed in a 10% formaldehyde solution and preserved in 70% alcohol. In the laboratory, specimens were identified by using taxonomic keys (Holthuis 1952, Garcia-Dávila and Magalhães 2003, Melo 2003, Sampaio et al. 2009), measured, and sexed.

The specimens total length was measured (CT, mea-



Figure 1. Lateral view of female *Macrobrachium olfersii* from Riacho Água Rica, Paulino Neves, Maranhão (scale bar: 14 mm).



Figure 2. Lateral view of male *Macrobrachium carcinus* from Riacho São José, Paulino Neves, Maranhão (scale bar: 36.5 mm).

surement from the tip of the rostrum to the tip of the telson). A representative lot of the collected specimens was deposited at the Zoology Didactic Collection of Garanhuns Campus, University of Pernambuco, under numbering CDZ 615 and CDZ 623.

Results

Family Palaemonidae Rafinesque, 1815
Genus *Macrobrachium* Bate, 1868

Macrobrachium olfersii (Wiegmann, 1836)

Figures 1, 3

Palaemon olfersii Wiegmann 1836: 150.

Collected and examined material. Brazil, Maranhão, Tutóia: Riacho Água Rica (02°46'04.3" S, 042°28'04.0" W), 19.X.2014, 13 females (15.12 to 41.93 mm CT), 18 males (17.96–55.48 mm); Brazil, Maranhão, Paulino Neves: Riacho São José (02°49'26.2" S, 042°32'38.3" W), 20.X.2014, 21 males (27.98–52.06 mm), 3 females (19.29–34.07 mm CT).

Geographic distribution. (Fig. 3; Table 1) United States, Central America, Colombia, Venezuela, Suriname, and

Brazil (Pará, Piauí, Ceará, Rio Grande do Norte, Pernambuco, Alagoas, Sergipe, Bahia, Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul) (Melo 2003); new occurrence: Maranhão.

Observations. The size of male specimens was between 17.96 and 60.18 mm; females 15.12 and 41.93 mm (CT), weighing between 0.046 and 2.386 g for males and 0.0292 and 0.655 g for females.

Bowles et al. (2000) recorded the largest male 90 mm long and ovigerous females between 30 and 65 mm, whereas Ammar et al. (2001) found males from 20.10 to 93.0 mm, females ranging from 23 to 58.20 mm, and ovigerous females 21.20 to 60.0 mm. Mossolin and Bueno (2002) recorded smaller sizes than previous literature, at 57.0 mm for the largest female and 81.93 mm for the largest male. In this study, sizes were smaller than found by Bowles et al. (2000), Ammar et al. (2001), and Mossolin and Bueno (2002).

Macrobrachium olfersii are found in submerged vegetation along the river banks, and with either a rocky and sandy substrate (Ammar et al. 2001, Mossolin and Bueno 2002, Melo 2003). Samples of *M. olfersii* from this study

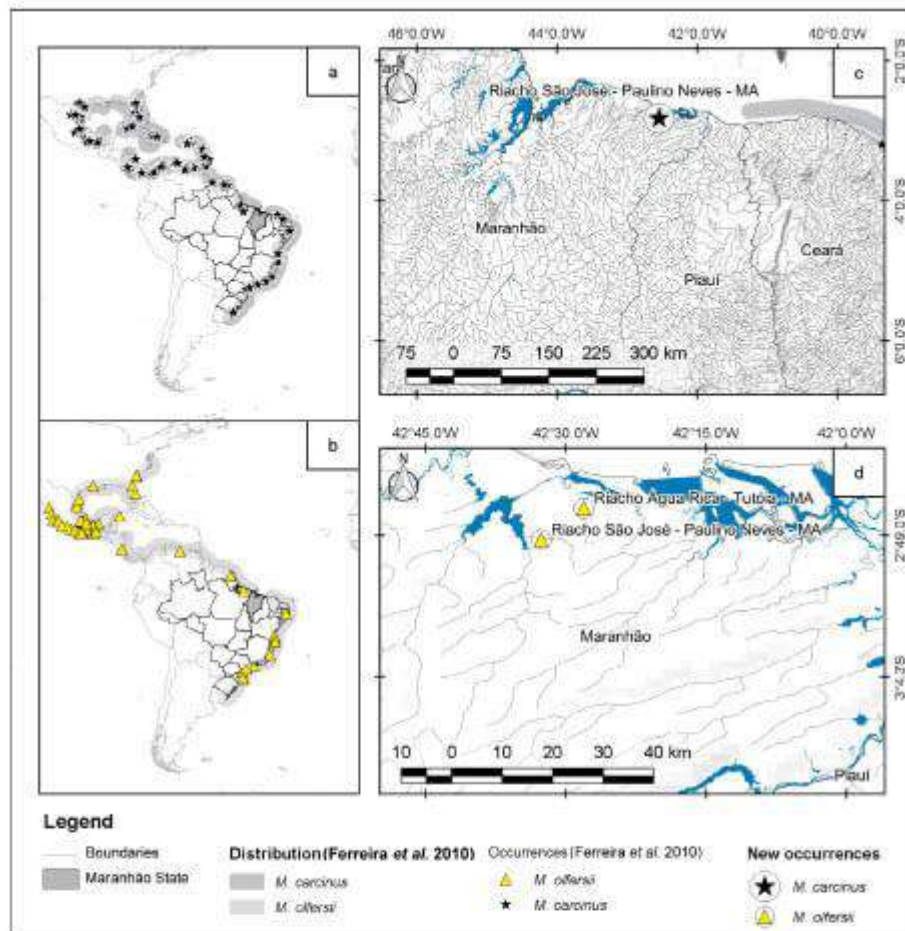


Figure 3. Geographic distribution of *M. carcinus* (Linnaeus, 1758) and *M. offersi* (Wiagmann, 1836) in the Neotropical regional (Table 1). In image c, there is a new occurrence of *Macrobrachium carcinus* (star) and in image d, the new occurrence of *Macrobrachium offersi* (yellow triangle).

were recorded in streams with marginal vegetation, sandy substrate, organic material and banks having leaves and roots.

***Macrobrachium carcinus* (Linnaeus, 1758)**

Figures 2, 3

Cancer carcinus Linnaeus, 1758: 631.

Collected and examined material. Brazil, Maranhão, Paulino Neves: Riacho São José (02°49'26.2" S, 042°32'38.3" W), 20.X.2014, 1 male, 169.15 mm (CT).

Geographic distribution. (Fig. 3; Table 1) USA (Florida, Mississippi, and Texas) Mexico, Guatemala, Nicaragua, Costa Rica, Cuba, Porto Rico, Jamaica, Barbados, Lesser Antilles, Colombia, Venezuela, Guiana, Suriname,

Ecuador, Peru, and Brazil (Pará, Pernambuco, Alagoas, Espírito Santo, Rio de Janeiro, São Paulo, Santa Catarina, Rio Grande do Sul, and Paraná) (Holthuis 1952, Bowles et al. 2000, Melo 2003, Sampaio et al. 2009); new occurrence: Maranhão.

Observations. This species occurs in the coastal basins and usually preferred pools with reduced water flow, occurring mainly in the middle to lower sections (Mejía-Ortiz 2001, Melo and Coelho 2008), although Mejía-Ortiz (2010) recorded species at altitudes varying from 1100 to 200 m. In this study, the species was records in streams with marginal vegetation, silt substrate, and organic material and roots.

Discussion

Freshwater shrimp are important biotic components of the ecosystem (Lima et al. 2014), acting as herbivores, scavengers, predators, or prey of other animals (Ligeiro et al. 2014). They have the capacity to mitigate effects of catfish on periphyton and sediments (Scott et al. 2012), possess the symbiotic cleaning function (Garrone-Neto et al. 2014), and they are bioindicators of aquatic contamination (Nazari et al. 2003).

Macrobrachium olfersii is a small crepuscular species with continuous reproduction (Ammar et al. 2001, Mossolin and Bueno 2002, Melo 2003). Mossolin and Bueno (2002) observed that the species prefers warm waters than the other species recorded in this study and are greater in numbers during months with higher temperatures. *Macrobrachium olfersii* shows high sexual dimorphism in the second pair of pereopods between the left and right, in terms of unequal size and robustness in males, while in females the pereopods are less robust and equal (Mossolin and Bueno 2003). Cheliped growth occurs gradually, a distinguishing factor in the juvenile to the adult phases, in addition to be the main characteristic for taxonomic identification (Melo 2003, Mossolin and Bueno 2003).

Popularly known as *pinu*, it is considered one of the largest of the freshwater shrimp on the east coast of the Americas (Lara and Wehrmann 2009). *Macrobrachium carcinus* is included in the Red List of endangered invertebrate species in Brazil (Melo and Coelho 2008). The threats are mainly overfishing, habitat destruction, pollution, and construction of hydroelectric dams (Bowles 2000, Bauer 2011). Dams act as barriers that prevent the larvae of *M. olfersii* from migrating upstream in rivers. Planktonic marine larvae of this species are usually widespread because of currents (Bauer 2011), and the connectivity between marine and freshwater environments provide favorable conditions for reproduction. Therefore, disturbances in these habitats can affect species survival.

Fifty-five *M. olfersii*, but only 1 *M. carcinus*, were collected. This single collected specimen of *M. carcinus* is probably due to the difficulty in collecting this species in gill and dip nets, because cove traps are generally used for this shrimp (Rocha 2010). The number of freshwater shrimp species in the state of Maranhão is now increased from 4 to 6 species.

The freshwater crustaceans of the state of Maranhão are underestimated. A catalog of species is urgently needed to comprehend species diversity. In future research, information on collection methodology, including the type of traps, are needed in order to obtain a more effective qualitative and quantitative survey of the local crustacean fauna. Mantelato et al. (2016) highlighted the need for new checklists and better knowledge of palaemonidean shrimp life histories.

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Authors' Contributions

JN collected the data, KA and MA identified the species, KA, MA and JN wrote the manuscript.

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Table 1. Geographic distribution of *Macrobrachium carolinus* (Linnaeus, 1758) and *M. ofersi* (Wiegmann, 1836) in the Neotropical region.

Species	Locality	State	Country	Latitude	Longitude
<i>M. ofersi</i>	Ilha Mosqueiro (Furo das Marinhas)	Pará	Brazil	01°10'19"S	048°19'02"W
<i>M. ofersi</i>		Espírito Santo	Brazil	20°03'40"S	040°37'00"W
<i>M. ofersi</i>		Bahia	Brazil	16°22'49"S	039°03'14"W
<i>M. ofersi</i>	St Augustine area waters	Florida	USA	29°53'52"S	081°18'35"W
<i>M. ofersi</i>	Rio Zimatán, camatera Salina Cruz-Huautulco	Oaxaca	Mexico	15°49'48"S	096°00'00"W
<i>M. ofersi</i>			Franch Gutana	3°12'04"S	052°19'04"W
<i>M. ofersi</i>	Gulf of Mexico, vicinity of Brownsville	Texas	USA	25°59'07"S	007°07'24"W
<i>M. ofersi</i>	Rio Miquinas	Veracruz	Mexico	18°38'24"S	094°52'48"W
<i>M. ofersi</i>	Macayo 1a Sección, rio Mazcalapa	Chiapas	Mexico	17°57'0"S	093°12'00"W
<i>M. ofersi</i>	Arroyo Agua de Pardo	Guerrero	Mexico	17°05'24"S	099°33'36"W
<i>M. ofersi</i>	Laguna de Sontacomapan, rio Coscoapan	Veracruz	Mexico	18°34'12"S	094°55'48"W
<i>M. ofersi</i>	Rio Carrizal, Buenavista Rio Nuevo, 3a sección	Tabasco	Mexico	17°56'24"S	093°01'48"W
<i>M. ofersi</i>	Rio La Palma, Los Tuxtlas	Veracruz	Mexico	18°34'12"S	094°55'12"W
<i>M. ofersi</i>	Rio Murga, a la altura del poblado de Murga, 17 km al Noroeste de Petatán	Guerrero	Mexico	17°41'24"S	100°40'12"W
<i>M. ofersi</i>	at the end of James Island Yacht Club pier		USA	32°45'20"S	079°55'06"W
<i>M. ofersi</i>	Rio González	Tabasco	Mexico	18°32'24"S	091°19'48"W
<i>M. ofersi</i>	Macayo 1a Sección, rio Mazcalapa	Chiapas	Mexico	17°57'0"S	093°12'00"W
<i>M. ofersi</i>	Rio Ayutla, Morro Ayutla, camR Salina Cruz-Huautulco	Oaxaca	Mexico	15°54'36"S	095°51'00"W
<i>M. ofersi</i>	La Palma, Los Tuxtlas Var	Veracruz	Mexico	18°33'36"S	094°55'12"W
<i>M. ofersi</i>	Rio Coyula, cuenca baja, abajo del puente de la camatera Huautulco-Salina Cruz	Oaxaca	Mexico	15°48'36"S	096°18'36"W
<i>M. ofersi</i>	La Carbonera, San Fernando	Tamaulipas	Mexico	24°37'01"S	097°43'19"W
<i>M. ofersi</i>		Florida	USA	27°40'36"S	080°23'20"W
<i>M. ofersi</i>	Rio Carrizal Platano y cacao, 2a Sección	Tabasco	Mexico	17°58'12"S	093°07'48"W
<i>M. ofersi</i>	Rio Zimatán, camatera Salina Cruz-Huautulco	Oaxaca	Mexico	15°49'48"S	096°00'00"W
<i>M. ofersi</i>	Rio Miquinas	Veracruz	Mexico	18°38'24"S	094°52'48"W
<i>M. ofersi</i>	Antes de la descarga, Corregidora de Ortiz, 3a Sección, rio Mazcalapa	Tabasco	Mexico	17°58'48"S	092°55'48"W
<i>M. ofersi</i>	Rio del Salmoral	Veracruz	Mexico	19°20'24"S	096°20'24"W
<i>M. ofersi</i>	Bajo el puente de Rio Purificación, Jal. Carr. Malaque-Pto. Vallarta	Jalisco	Mexico	19°44'24"S	103°22'12"W
<i>M. ofersi</i>	Charleston Harbor, at James Island Yacht Club pier	South Carolina	USA	32°45'20"S	079°55'06"W
<i>M. ofersi</i>	Rio de la Estación Biológica Los Tuxtlas	Veracruz	Mexico	18°36'36"S	094°52'48"W
<i>M. ofersi</i>	Puente Petatango, cuenca alta del rio Zimatán, tributario del rio Zimatán	Oaxaca	Mexico	15°56'24"S	096°01'48"W

Continued

Table 1. Continued.

Species	Locality	State	Country	Latitude	Longitude
<i>M. offera</i>	Rio Zimatón, carretera Salina Cruz-Huastulco	Oaxaca	Mexico	15°49'48" S	096°00'00" W
<i>M. offera</i>	Laguna de Sontecomapan, Los Tuxtlas	Veracruz	Mexico	18°31'12" S	094°55'48" W
<i>M. offera</i>	El Naranjo entre Tonalá y Pijjapan	Chiapas	Mexico	15°43'12" S	092°37'48" W
<i>M. offera</i>	Rio Tonalá	Tabasco	Mexico	17°52'12" S	092°34'12" W
<i>M. offera</i>	Prasa José Ma Morelos "La Villa", límite entre Michoacán y Guerrero	Michoacán de Ocampo	Mexico	18°02'24" S	102°10'48" W
<i>M. offera</i>	Rio Copalita, cuenca baja, abajo del puente de la carretera Huastulco-Salina Cruz	Oaxaca	Mexico	15°49'12" S	096°03'36" W
<i>M. offera</i>	Desembocadura del Rio Jamapa	Veracruz	Mexico	19°05'28" S	096°06'11" W
<i>M. offera</i>	Rio Zimatón, carretera Salina Cruz-Huastulco	Oaxaca	Mexico	15°49'48" S	096°00'00" W
<i>M. offera</i>	Rio Papagayo, Gro.	Guerrero	Mexico	16°45'36" S	098°19'48" W
<i>M. offera</i>	Actopan	Veracruz	Mexico	19°30'00" S	096°36'00" W
<i>M. offera</i>	Rio Colotepec	Oaxaca	Mexico	15°48'36" S	097°00'36" W
<i>M. offera</i>	Poblado de Castillo	Rio San Juan	Nicaragua	11°00'36" N	084°24'00" W
<i>M. offera</i>	Rio de la Estación Biológica Los Tuxtlas	Veracruz	Mexico	18°36'36" S	094°52'48" W
<i>M. offera</i>	Rio Copalita, cuenca baja, abajo del puente de la carretera Huastulco-Salina Cruz	Oaxaca	Mexico	15°49'12" S	096°18'36" W
<i>M. offera</i>	Rio González	Tabasco	Mexico	18°32'24" S	091°19'48" W
<i>M. offera</i>	Rio Cutzmalá, Jalisco a 5 km del Puente de la carretera Melaque-Pto. Vallarta	Jalisco	Mexico	19°25'12" S	103°00'00" W
<i>M. offera</i>	Rio Lagartero, cerca de Arriaga	Chiapas	Mexico	16°15'36" S	092°04'12" W
<i>M. offera</i>	Rio Tonalá	Tabasco	Mexico	17°52'12" S	092°34'12" W
<i>M. offera</i>	Rio Máquinas, Los Tuxtlas	Veracruz	Mexico	18°38'24" S	094°52'48" W
<i>M. offera</i>	Rio Chichiriviche	Distrito Federal	Venezuela	10°32'27" S	067°14'22" W
<i>M. offera</i>	Rio Ayutla, Morro Ayutla, carr Salina Cruz-Huastulco	Oaxaca	Mexico	15°54'36" S	095°51'00" W
<i>M. offera</i>	Ashley River	South Carolina	USA	32°50'52" S	080°02'32" W
<i>M. offera</i>	Rio entre La Palma y Rio Basura, Los Tuxtlas	Veracruz	Mexico	18°33'36" S	094°55'12" W
<i>M. offera</i>	Ashley River, just below railroad bridge near Charleston	South Carolina	USA	32°50'52" S	080°02'32" W
<i>M. offera</i>	Arroyo Colorado	Sinaloa	Mexico	23°19'12" S	105°56'24" W
<i>M. offera</i>	Rio saliendo de Pto. Escondido	Oaxaca	Mexico	15°51'00" S	097°03'00" W
<i>M. offera</i>	Arroyo el Zapote entre Tuxtepec y Palomares	Oaxaca	Mexico	17°10'12" S	094°52'12" W
<i>M. offera</i>	Marmontau River (RM 16.7) and Little Pacan Bayou confluence	Louisiana	USA	29°47'45" S	092°52'14" W
<i>M. offera</i>	Rio Zimatón, carretera Salina Cruz-Huastulco	Oaxaca	Mexico	15°49'48" S	096°00'00" W
<i>M. offera</i>	El estanque, La Tavera	Nayarit	Mexico	21°31'48" S	105°15'00" W
<i>M. offera</i>	Rio Coscoapan, Laguna de Sontecomapan	Veracruz	Mexico	18°34'12" S	094°55'48" W
<i>M. offera</i>	Rio Máquinas	Veracruz	Mexico	18°38'24" S	094°52'48" W
<i>M. offera</i>	Rio Zimatón, Huastulco	Oaxaca	Mexico	15°49'48" S	096°00'00" W
<i>M. offera</i>	Rio Máquinas	Veracruz	Mexico	18°38'24" S	094°52'48" W
<i>M. offera</i>	20 km S. SE de Martínez de la Torre	Veracruz	Mexico	20°06'36" S	095°04'12" W
<i>M. offera</i>	19 km S. SE de Martínez de la Torre	Veracruz	Mexico	20°06'36" S	095°04'12" W
<i>M. offera</i>	Arriba de la descarga, corredera de Ortiz, 3a Sección, Río Mezcalapa	Tabasco	Mexico	17°58'48" S	092°55'48" W
<i>M. offera</i>		Bahia	Brazil	15°13'07" S	039°03'57" W
<i>M. offera</i>		Bahia	Brazil	14°47'32" S	039°11'32" W
<i>M. offera</i>		Bahia	Brazil	14°38'46" S	039°14'53" W
<i>M. offera</i>	Playa Paraiso, Puerto Morelos	Quintana Roo	Mexico	20°53'24" S	085°04'12" W
<i>M. offera</i>				16°23'23" S	039°15'48" W
<i>M. offera</i>	Rio San Nicolás, 5 km río arriba del puente de la carretera Melaque-Pto. Vallarta, Mpio. Huerta, Jalisco	Jalisco	Mexico	19°39'36" S	104°46'48" W
<i>M. offera</i>	Rio Máquinas rumbo a Montapio	Veracruz	Mexico	18°38'24" S	094°52'48" W
<i>M. offera</i>	Rio Carrizal Platino y cacao, 2a Sección	Tabasco	Mexico	17°58'12" S	093°07'48" W
<i>M. offera</i>		Paraná	Brazil	25°48'51" S	048°48'57" W
<i>M. offera</i>		Paraná	Brazil	25°49'40" S	048°47'24" W
<i>M. offera</i>		Santa Catarina	Brazil	27°44'32" S	048°31'49" W
<i>M. offera</i>	Rio Chechalecas	Veracruz	Mexico	19°27'36" S	095°39'00" W
<i>M. offera</i>		Santa Catarina	Brazil	27°38'47" S	048°37'10" W
<i>M. offera</i>	La Pasca, Soto La Marina	Tamaulipas	Mexico	23°46'37" S	097°44'20" W
<i>M. offera</i>		Pernambuco	Brazil	07°58'32" S	035°51'20" W
<i>M. offera</i>		São Paulo	Brazil	23°46'35" S	045°21'05" W
<i>M. offera</i>	Rio Carrizal, Corredera de Ortiz, 5a Sección	Tabasco	Mexico	17°57'00" S	093°07'12" W
<i>M. offera</i>				24°39'41" S	047°34'13" W
<i>M. offera</i>		Santa Catarina	Brazil	27°45' S	048°32" W

Continued

Table 1. Continued.

Species	Locality	State	Country	Latitude	Longitude
<i>M. offensiv</i>		Santa Catarina	Brazil	27°28'S	048°30'W
<i>M. offensiv</i>	Oeste da Praia do Jabaquara	São Paulo	Brazil	23°44'12.6"S	045°17'38.0"W
<i>M. offensiv</i>	Estrada da Praia do Jabaquara	São Paulo	Brazil	23°44'12.3"S	045°18'10.4"W
<i>M. offensiv</i>	Ponta das Canas	São Paulo	Brazil	23°43'42.8"S	045°20'28.0"W
<i>M. offensiv</i>	Praia da Armação	São Paulo	Brazil	23°44'13.7"S	045°20'36.2"W
<i>M. offensiv</i>	Alto da Praia do Sino	São Paulo	Brazil	23°45'01.3"S	045°20'41.4"W
<i>M. offensiv</i>	Alto da Praia da Siribúba	São Paulo	Brazil	23°45'25.2"S	045°20'34.5"W
<i>M. offensiv</i>	Praia do Viana	São Paulo	Brazil	23°45'38.4"S	045°20'54.8"W
<i>M. offensiv</i>	Praia do Itaquanduba	São Paulo	Brazil	23°47'45.5"S	045°21'50.8"W
<i>M. offensiv</i>	Alto do Cocata	São Paulo	Brazil	23°48'35.4"S	045°21'10.8"W
<i>M. offensiv</i>	Cocata	São Paulo	Brazil	23°49'01.7"S	045°21'10.8"W
<i>M. offensiv</i>	Bateu da Cachoeira da Toca	São Paulo	Brazil	23°49'31.8"S	045°20'56.6"W
<i>M. offensiv</i>	Mato do Rio da Água Branca	São Paulo	Brazil	23°49'23.2"S	045°21'47.9"W
<i>M. offensiv</i>	Cachoeira da Toca	São Paulo	Brazil	23°49'34.8"S	045°20'30.3"W
<i>M. offensiv</i>	Cachoeira da Zabumba	São Paulo	Brazil	23°50'08.1"S	045°22'00.1"W
<i>M. offensiv</i>	Tesouro de Colina	São Paulo	Brazil	23°50'19.9"S	045°22'25.0"W
<i>M. offensiv</i>	Ilhota	São Paulo	Brazil	23°50'20.4"S	045°23'55.1"W
<i>M. offensiv</i>	Praia do Fortinho	São Paulo	Brazil	23°50'42.8"S	045°24'15.6"W
<i>M. offensiv</i>	Campo do Pontinho	São Paulo	Brazil	23°50'53.6"S	045°24'16.3"W
<i>M. offensiv</i>	Cachoeira Pancada D'Água	São Paulo	Brazil	23°51'12.0"S	045°24'25.8"W
<i>M. offensiv</i>	Cachoeira dos Três Tombos	São Paulo	Brazil	23°51'17.6"S	045°24'10.1"W
<i>M. offensiv</i>	Norte da Praia Grande	São Paulo	Brazil	23°51'23.0"S	045°24'47.0"W
<i>M. offensiv</i>	Sul da Praia Grande	São Paulo	Brazil	23°51'34.5"S	045°25'03.5"W
<i>M. offensiv</i>	Norte da Praia do Cumal	São Paulo	Brazil	23°51'49.0"S	045°25'40.7"W
<i>M. offensiv</i>	Alto da Praia do Cumal	São Paulo	Brazil	23°52'05.3"S	045°25'30.9"W
<i>M. offensiv</i>	Praia do Veloso	São Paulo	Brazil	23°52'15.1"S	045°26'07.3"W
<i>M. offensiv</i>	Camping do Veloso	São Paulo	Brazil	23°52'23.2"S	045°26'09.7"W
<i>M. offensiv</i>	Cambarau	São Paulo	Brazil	23°52'31.9"S	045°26'35.0"W
<i>M. offensiv</i>	Rodamonte/Taubaté	São Paulo	Brazil	23°53'55.4"S	045°27'31.8"W
<i>M. offensiv</i>	Mesilhão	São Paulo	Brazil	23°54'20.8"S	045°27'26.3"W
<i>M. offensiv</i>	Borrfios	São Paulo	Brazil	23°55'16.0"S	045°27'03.5"W
<i>M. offensiv</i>	Porto dos Frades	São Paulo	Brazil	23°55'44.6"S	045°26'33.3"W
<i>M. offensiv</i>	Cachoeira da Vista	São Paulo	Brazil	23°55'54.9"S	045°26'26.0"W
<i>M. offensiv</i>	Marambala	São Paulo	Brazil	23°56'04.0"S	045°25'51.9"W
<i>M. offensiv</i>	Praia do Gato / Poço do Gordo	São Paulo	Brazil	23°56'40.6"S	045°17'04.0"W
<i>M. offensiv</i>	Castelhanos/Cachoeira do Engenho	São Paulo	Brazil	23°51'03.2"S	045°17'22.6"W
<i>M. offensiv</i>	Praia Maroa	São Paulo	Brazil	23°52'07.8"S	045°17'28.1"W
<i>M. offensiv</i>	Praia Vermelha	São Paulo	Brazil	23°52'24.8"S	045°17'29.4"W
<i>M. offensiv</i>	Cachoeira da Laje	São Paulo	Brazil	23°55'55.2"S	045°24'32.7"W
<i>M. offensiv</i>	Engenho D'Água I	São Paulo	Brazil	23°47'40.8"S	045°21'29.3"W
<i>M. offensiv</i>	Taubaté	São Paulo	Brazil	23°54'02.5"S	045°27'28.0"W
<i>M. offensiv</i>	Sul da Praia do Cumal	São Paulo	Brazil	23°52'07.6"S	045°25'56.5"W
<i>M. offensiv</i>	Canal da Lagoa do Peri	Santa Catarina	Brazil	27°43'30"S	048°32'18"W
<i>M. offensiv</i>	Parque Municipal da Lagoa do Peri	Santa Catarina	Brazil	27°43'S	048°32'W
<i>M. offensiv</i>	Guaratuba	Paraná	Brazil	48°43'45.8"S	025°49'55.6"W
<i>M. offensiv</i>	Guaratuba	Paraná	Brazil	48°43'57.0"S	025°49'78.6"W
<i>M. offensiv</i>	Guaratuba	Paraná	Brazil	48°43'56.0"S	025°50'03.2"W
<i>M. offensiv</i>	Guaratuba	Paraná	Brazil	48°44'55.3"S	025°48'09.7"W
<i>M. offensiv</i>	Guaratuba	Paraná	Brazil	48°44'33.4"S	025°47'51.0"W
<i>M. offensiv</i>	Guaratuba	Paraná	Brazil	48°44'33.0"S	025°48'52.6"W
<i>M. offensiv</i>	Área de ecoturismo	Espírito Santo	Brazil	20°05'21.6"S	040°33'28.0"W
<i>M. offensiv</i>		Espírito Santo	Brazil	20°05'27.4"S	040°33'05.6"W
<i>M. offensiv</i>		Espírito Santo	Brazil	20°05'24.7"S	040°32'59.8"W
<i>M. offensiv</i>	Comunidade ribeirinha	Espírito Santo	Brazil	20°05'27.4"S	040°33'05.6"W
<i>M. offensiv</i>	Bacia do Ribeira de Iguaçu, município de Pariqueara-Açu, rio Pariqueara-Açu	São Paulo	Brazil	24°37'37"S	047°44'43"W
<i>M. offensiv</i>	Bacia do Ribeira de Iguaçu, município de Pariqueara-Açu, rio Pariqueara-Mirim	São Paulo	Brazil	24°23'09"S	047°01'07"W
<i>M. offensiv</i>	Bacia do Ribeira de Iguaçu, município de Pariqueara-Açu, Cachoeira do Paraito	São Paulo	Brazil	24°23'49"S	047°07'17"W

Continued

Table 1. Continued.

Species	Locality	State	Country	Latitude	Longitude
<i>M. offensiv</i>	Bacia do Ribeira de Iguape, município de Pariqueira-Açu, Trilha do Fundão	São Paulo	Brazil	24°23'14"S	47°01'02"W
<i>M. offensiv</i>	Bacia do Ribeira de Iguape, município de Cananéia, rio Branco	São Paulo	Brazil	24°54'36"S	47°59'52"W
<i>M. offensiv</i>	Bacia do Ribeira de Iguape, município de Ilha Comprida, córrego sem nome	São Paulo	Brazil	25°00'50"S	47°52'32"W
<i>M. offensiv</i>	Bacia do Ribeira de Iguape, município de Pariqueira-Açu, rio Capivari	São Paulo	Brazil	25°00'05"	47°51'53"W
<i>M. offensiv</i>	Bacia do Ribeira de Iguape, Parque Estadual da Ilha do Cardoso, cachoeira do rio Pedro Luis	São Paulo	Brazil	25°00'50"S	47°52'31"W
<i>M. offensiv</i>	Estação Ecológica Juréia-Itatins	São Paulo	Brazil	24°22'05"S	47°03'17"W
<i>M. offensiv</i>	Estação ecológica Juréia -Itatins	São Paulo	Brazil	24°23'09"S	47°01'07"W
<i>M. offensiv</i>	Rio Pasagoula		Brazil	30°31'N	88°36'W
<i>M. offensiv</i>	Rio Burunhém, cerca de 8km ao sul de Vera Cruz, na Estrada Eunópolis	Bahia	Brazil	16°25'28"S	39°21'W
<i>M. offensiv</i>	Rio Jucaçu (afluente do Rio Dioca), sob ponte da Estrada BR-116 em Frai Inocêncio	Minas Gerais	Brazil	18°34'21"S	41°54'42"W
<i>M. offensiv</i>	Rio Jucuruçu (costeiro), numa fazenda acima do município de Itamaraju	Bahia	Brazil	17°01'10"S	39°39'57"W
<i>M. offensiv</i>	Rio Cachoeira Ilhéus	Bahia	Brazil	14°48'05.18"S	39°09'54.49"W
<i>M. offensiv</i>	Cachoeira River, Ilhéus	Bahia	Brazil	14°48'10.33"S	39°10'03.65"W
<i>M. offensiv</i>	Cachoeira River, Ilhéus	Bahia	Brazil	14°47'3.16"S	39°11'07.8"W
<i>M. offensiv</i>	River Santana, Ilhéus	Bahia	Brazil	14°51'16.8"S	39°05'58.6"W
<i>M. offensiv</i>	Rio Aculpa	Bahia	Brazil	15°04'40"S	39°01'40"W
<i>M. offensiv</i>	Lagoa Encantada, Ilhéus	Bahia	Brazil	14°37'20.8"S	39°08'32.5"W
<i>M. offensiv</i>	Lagoa Encantada, Ilhéus	Bahia	Brazil	14°37'20.8"S	39°08'32.5"W
<i>M. offensiv</i>	Santana River, Povoador Rio do Engenho, Ilhéus	Bahia	Brazil	14°51'07.4"S	39°04'12.8"W
<i>M. offensiv</i>	Aculpa River, Ilhéus	Bahia	Brazil	15°04'40"S	39°01'40"W
<i>M. offensiv</i>	Lagoa Encantada, Ilhéus	Bahia	Brazil	14°37'20.8"S	39°08'32.5"W
<i>M. offensiv</i>	Santana River, Fazenda Theobroma, Ilhéus	Bahia	Brazil	14°50'58.2"S	39°04'52.7"W
<i>M. offensiv</i>	Small stream, Estação Experimental da CEPLAC	Bahia	Brazil	15°17'02.3"S	39°05'21.5"W
<i>M. offensiv</i>	River Una	Bahia	Brazil	15°17'28.1"S	39°06'09.5"W
<i>M. offensiv</i>	Tijupinho River, Unaçuca	Bahia	Brazil	14°26'39.7"S	39°03'13.2"W
<i>M. offensiv</i>	Alameda River, Ilhéus	Bahia	Brazil	14°39'09.6"S	39°04'58.7"W
<i>M. carolinus</i>	Rio Pánuco en Tampico	Tamaulipas	Mexico	22°12'43"N	97°05'28"W
<i>M. carolinus</i>	Aldama	Tamaulipas	Mexico	22°55'23"N	98°04'55"W
<i>M. carolinus</i>			Cuba	20°00'25"N	75°00'38"W
<i>M. carolinus</i>	Fresa Maria R. Gómez, Carvango	Tamaulipas	Mexico	28°14'10"N	98°55'41"W
<i>M. carolinus</i>			Colombia	9°24'0"N	75°40'00"W
<i>M. carolinus</i>			USA	29°14'46"N	81°38'37"W
<i>M. carolinus</i>	Rio Bravo en Matamoros	Campache	Mexico	25°53'06"N	97°31'01"W
<i>M. carolinus</i>	La Pesca, Soto La Marina	Tamaulipas	Mexico	23°46'37"N	97°44'20"W
<i>M. carolinus</i>	Quebrada Rabollado, a la salida de Chuspa	Miranda	Venezuela	10°36'43"N	66°18'46"W
<i>M. carolinus</i>	Rio Agualaguas	Nuevo Leon	Mexico	28°31'58"N	100°34'58"W
<i>M. carolinus</i>		Florida	USA	27°09'43"N	81°54'06"W
<i>M. carolinus</i>		Florida	USA	29°59'39"N	81°40'33"W
<i>M. carolinus</i>	Upper San Marcos River, San Marcos, near headwaters of San Marcos River, campus of Texas State University	Texas	USA	29°53'21"N	97°56'20"W
<i>M. carolinus</i>	Los Tuxtlas	Veracruz	Mexico	18°36'36"N	94°54'0"W
<i>M. carolinus</i>	Upper San Marcos River, San Marcos, near headwaters of San Marcos River, campus of Texas State University	Texas	USA	29°53'21"N	97°56'20"W
<i>M. carolinus</i>	Rio Sonodoro, Rio Sonodoro		Puerto Rico	18°19'32"N	65°49'13"W
<i>M. carolinus</i>	Upper San Marcos River, San Marcos, near headwaters of San Marcos River, campus of Texas State University	Texas	USA	29°53'21"N	97°56'20"W
<i>M. carolinus</i>	Cd. Mier.	Tamaulipas	Mexico	26°25'48"N	99°08'42"W
<i>M. carolinus</i>	Upper San Marcos River, San Marcos, near headwaters of San Marcos River, campus of Texas State University	Texas	USA	29°53'21"N	97°56'20"W
<i>M. carolinus</i>			Virgin Islands, U.S.	18°22'01"N	064°57'49"W
<i>M. carolinus</i>			Venezuela	10°36'05"N	066°53'52"W
<i>M. carolinus</i>	Rio Samaria, Cumuapan, la sección	Tabasco	Mexico	18°00'36"N	093°04'12"W
<i>M. carolinus</i>	La Pesca, Soto La Marina	Tamaulipas	Mexico	23°46'37"N	097°44'20"W
<i>M. carolinus</i>	Rio Tamesí en Tampico	Tamaulipas	Mexico	22°13'48"N	097°08'56"W
<i>M. carolinus</i>	Rio Jacal Blanco, Cd. Mier	Tamaulipas	Mexico	26°25'48"N	099°08'42"W

Continued

Table 1. Continued.

Species	Locality	State	Country	Latitude	Longitude
<i>M. carolinus</i>			Puerto Rico	17°58'04" N	066°03'42" W
<i>M. carolinus</i>	Rio de la Estación Biológica Los Tuxtlas	Veracruz	Mexico	18°36'36" N	094°52'48" W
<i>M. carolinus</i>			Costa Rica	09°58'43" N	083°02'05" W
<i>M. carolinus</i>	Rio Pánuco en Tampico	Tamaulipas	Mexico	22°12'43" N	097°05'28" W
<i>M. carolinus</i>			Vera Cruz	18°26'56" N	095°12'57" W
<i>M. carolinus</i>	Ciénaga	Bolívar	Colombia	10°23'05" N	075°23'52" W
<i>M. carolinus</i>			Venezuela	10°49'00" N	064°10'59" W
<i>M. carolinus</i>	Arroyo Blanco	Quintana Roo	Mexico	21°10'48" N	090°19'12" W
<i>M. carolinus</i>			Castries	14°00'00" N	061°00'00" W
<i>M. carolinus</i>	Rio Pánuco	Tamaulipas	Mexico	22°12'56" N	097°55'19" W
<i>M. carolinus</i>			Puerto Rico	18°03'16" N	066°30'25" W
<i>M. carolinus</i>			Brazil	22°55'00" S	042°49'00" W
<i>M. carolinus</i>	San Antonio	Texas	USA	29°28'22" N	098°28'23" W
<i>M. carolinus</i>			Brazil	24°09'00" S	046°48'00" W
<i>M. carolinus</i>			Mexico	18°17'39" N	092°30'15" W
<i>M. carolinus</i>	Presa cerro de oro	Oaxaca	Mexico	18°01'12" N	096°14'24" W
<i>M. carolinus</i>	Rio Pánuco en Tampico	Tamaulipas	Mexico	22°12'43" N	097°05'28" W
<i>M. carolinus</i>	La Pesca, Soto La Marina	Tamaulipas	Mexico	23°46'37" N	097°44'20" W
<i>M. carolinus</i>			Puerto Rico	18°14'10" N	066°02'56" W
<i>M. carolinus</i>			French Guiana	5°45'00" N	053°58'00" W
<i>M. carolinus</i>			Mexico	17°32'21" N	092°48'29" W
<i>M. carolinus</i>	Laguna de Chila, Pánuco	Veracruz	Mexico	22°10'48" N	098°07'30" W
<i>M. carolinus</i>			Colombia	10°05'09" N	074°50'48" W
<i>M. carolinus</i>	Rio Pánuco en Tampico	Tamaulipas	Mexico	22°12'43" N	097°05'28" W
<i>M. carolinus</i>	Rio de la Estación Biológica Los Tuxtlas	Veracruz	Mexico	18°36'36" N	094°52'48" W
<i>M. carolinus</i>	Veracruz	Veracruz	Mexico	19°12'36" N	095°40'48" W
<i>M. carolinus</i>	Rio Miquilinas, camaronera Los Tuxtlas-Montu Pío	Veracruz	Mexico	18°36'36" N	095°09'36" W
<i>M. carolinus</i>	Rio Miquilinas, Los Tuxtlas	Veracruz	Mexico	18°38'24" N	094°52'48" W
<i>M. carolinus</i>	Rio Miquilinas	Veracruz	Mexico	18°38'24" N	094°52'48" W
<i>M. carolinus</i>	Rio Pánuco en Tampico	Tamaulipas	Mexico	22°12'43" N	097°05'28" W
<i>M. carolinus</i>	Rio de la Estación Biológica Los Tuxtlas	Veracruz	Mexico	18°36'36" N	094°52'48" W
<i>M. carolinus</i>	Rio Espíritu Santo, 1st pool area from Stream House trail		Puerto Rico	18°20'31" N	065°40'32" W
<i>M. carolinus</i>			Cuba	20°16'59" N	076°28'00" W
<i>M. carolinus</i>	Mameyes River, Mameyes (astriffle before estuary) across from Westin Rio Mar golf course		Puerto Rico	18°22'28" N	065°45'44" W
<i>M. carolinus</i>			Colombia	11°15'00" N	073°46'00" W
<i>M. carolinus</i>	Mameyes River, Mameyes (astriffle before estuary) across from Westin Rio Mar golf course		Puerto Rico	18°22'28" N	065°45'44" W
<i>M. carolinus</i>	Mameyes River, furthest upstream [of Patrick Cooney's 2009 sites] on the Mameyes		Puerto Rico	18°19'41" N	065°45'11" W
<i>M. carolinus</i>	Rio Tocantins, em Carmelá	Pará	Brazil	2°14'44" S	049°29'34" W
<i>M. carolinus</i>	Mameyes River, further upstream (from PRR12) on Mameyes		Puerto Rico	18°21'22" N	065°46'06" W
<i>M. carolinus</i>			Brazil	23°03'21" S	043°33'51" W
<i>M. carolinus</i>	Mameyes River, further upstream (from PRR12) on Mameyes		Puerto Rico	18°21'22" N	065°46'06" W
<i>M. carolinus</i>			Brazil	17°07'00" S	039°13'00" W
<i>M. carolinus</i>	Mameyes River, Mameyes (astriffle before estuary) across from Westin Rio Mar golf course		Puerto Rico	18°22'28" N	065°45'44" W
<i>M. carolinus</i>	Mameyes River, Mameyes (astriffle before estuary) across from Westin Rio Mar golf course		Puerto Rico	18°22'28" N	65°45'44" W
<i>M. carolinus</i>			Mexico	18°46'52" N	95°45'26" W
<i>M. carolinus</i>	Mameyes River, further upstream (from PRR12) on Mameyes		Puerto Rico	18°21'22" N	65°46'06" W
<i>M. carolinus</i>			Brazil	21°37'00" S	41°03'00" W
<i>M. carolinus</i>	Mameyes River, Mameyes (astriffle before estuary) across from Westin Rio Mar golf course		Puerto Rico	18°22'28" N	65°45'44" W
<i>M. carolinus</i>			Guadeloupe	16°17'33" N	61°31'56" W
<i>M. carolinus</i>	Rio arriba de Coatzacoalcos	Veracruz	Mexico	17°58'48" N	94°33'00" W
<i>M. carolinus</i>	Mameyes River, Mameyes (astriffle before estuary) across from Westin Rio Mar golf course		Puerto Rico	18°22'28" N	65°45'44" W
<i>M. carolinus</i>			USA	30°14'56" N	97°43'01" W
<i>M. carolinus</i>	Mameyes River, 2nd furthest upstream [of Patrick Cooney's 2009 sites] on Mameyes		Puerto Rico	18°20'41" N	65°45'24" W

Continued

Table 1. Continued.

Species	Locality	State	Country	Latitude	Longitude
<i>M. carolinus</i>	Río Espíritu Santo, 1st pool area from Stream House trail		Puerto Rico	18°20'31" N	65°40'32" W
<i>M. carolinus</i>	Río Cazonas, Ejido Flores Magón, Cazonas	Veracruz	Mexico	20°42'32" N	97°18'43" W
<i>M. carolinus</i>	Mameyas River, Mameyas (last riffle before estuary) across from Westin Rio Mar golf course		Puerto Rico	18°22'28" N	65°45'44" W
<i>M. carolinus</i>	Mameyas River, 2nd furthest upstream [of Patrick Cooney's 2009 sites on Mameyas]		Puerto Rico	18°20'41" N	65°45'24" W
<i>M. carolinus</i>	Mameyas River, 2nd furthest upstream [of Patrick Cooney's 2009 sites on Mameyas]		Puerto Rico	18°20'41" N	65°45'24" W
<i>M. carolinus</i>	Río Tocantins, em Cametá	Pará	Brazil	02°14'44" S	49°29'34" W
<i>M. carolinus</i>	Mameyas River, 2nd furthest upstream [of Patrick Cooney's 2009 sites on Mameyas]		Puerto Rico	18°20'41" N	65°45'24" W
<i>M. carolinus</i>	Los Tuxtlas	Veracruz	Mexico	18°36'36" N	94°52'48" W
<i>M. carolinus</i>		Coarí	Brazil	03°12'00" S	39°22'00" W
<i>M. carolinus</i>		Florida	USA	27°49'12" N	80°30'28" W
<i>M. carolinus</i>			Puerto Rico	18°22'21" N	66°11'17" W
<i>M. carolinus</i>			Venezuela	10°36'00" N	66°55'59" W
<i>M. carolinus</i>	Río de la Estación Biológica Los Tuxtlas	Veracruz	Mexico	18°36'36" N	94°52'48" W
<i>M. carolinus</i>	La Pesca, Soto La Marina	Tamaulipas	Mexico	23°46'37" N	97°44'20" W
<i>M. carolinus</i>			Venezuela	10°07'18" N	66°46'18" W
<i>M. carolinus</i>	Río Jaguariba	Coarí	Brazil	04°27'53" S	37°47'31" W
<i>M. carolinus</i>			Colombia	13°21'00" N	81°22'00" W
<i>M. carolinus</i>	La Pesca, Soto La Marina	Tamaulipas	Mexico	23°46'37" N	97°44'20" W
<i>M. carolinus</i>			Panama	9°13'45" N	79°32'10" W
<i>M. carolinus</i>			Virgin Is., U.S.	17°42'53" N	64°42'31" W
<i>M. carolinus</i>	Río entre La Palma y Río Basura, Los Tuxtlas	Veracruz	Mexico	18°33'36" N	94°55'12" W
<i>M. carolinus</i>		Brokopondo	Suriname	4°45'00" N	55°00'0" W
<i>M. carolinus</i>		Bathsheba	Barbados	13°12'56" N	59°31'41" W
<i>M. carolinus</i>			Mexico	17°51'00" N	93°22'59" W
<i>M. carolinus</i>	Doctor's River, near Spayville, in small dammed pond	Trinidad	Trinidad and Tobago	11°18'00" N	60°31'48" W
<i>M. carolinus</i>			Mexico	18°22'00" N	95°48'0" W
<i>M. carolinus</i>	Río Samaria, en la descarga	Tabasco	Mexico	17°49'12" N	93°21'36" W
<i>M. carolinus</i>	Río Sonadora, Río Sonodoro		Puerto Rico	18°19'32" N	65°40'13" W
<i>M. carolinus</i>	Trinidad, Doctor's River, near Spayville, dammed up pond (n. coll.) pond		Trinidad and Tobago	11°18'00" N	60°31'48" W
<i>M. carolinus</i>	Camino a la Laguna Escondida, Estación de Biología Tropical Los Tuxtlas	Veracruz	Mexico	18°34'48" N	95°03'36" W
<i>M. carolinus</i>	Río González	Tabasco	Mexico	18°32'24" N	91°19'48" W
<i>M. carolinus</i>	Río Carrizal Platino y cacao, 2a Sección	Tabasco	Mexico	17°58'12" N	93°01'12" W
<i>M. carolinus</i>	Coxcoapan Restaurant Sontecomapan	Veracruz	Mexico	18°27'36" N	94°51'0" W
<i>M. carolinus</i>	Río Pánuco en Tampico	Tamaulipas	Mexico	22°12'43" N	97°05'28" W
<i>M. carolinus</i>	Miami	Florida	USA	25°46'12" N	80°11'13" W
<i>M. carolinus</i>	Río Pánuco en Tampico	Tamaulipas	Mexico	22°12'43" N	97°05'28" W
<i>M. carolinus</i>	El Mezquita, Matamoros	Tamaulipas	Mexico	25°14'35" N	97°25'23" W
<i>M. carolinus</i>		Hidalgo	Mexico	21°07'40" N	98°52'28" W
<i>M. carolinus</i>	Dique Jiménez, Jiménez	Tamaulipas	Mexico	24°12'18" N	98°29'06" W
<i>M. carolinus</i>	Coxcoapan	Veracruz	Mexico	18°27'36" N	94°51'0" W
<i>M. carolinus</i>	Punta de Tlacotalpan	Veracruz	Mexico	18°37'12" N	94°19'12" W
<i>M. carolinus</i>	San Marcos River	Texas	USA	29°52'36" N	97°56'24" W
<i>M. carolinus</i>	Río Pánuco en Tampico	Tamaulipas	Mexico	22°12'43" N	97°05'28" W
<i>M. carolinus</i>	Punta de Piedra, San Fernando	Tamaulipas	Mexico	24°29'28" N	97°44'31" W
<i>M. carolinus</i>	Coxcoapan Restaurant Sontecomapan	Veracruz	Mexico	18°27'36" N	94°51'0" W
<i>M. carolinus</i>	La Palma, Los Tuxtlas	Veracruz	Mexico	18°33'36" N	94°55'12" W
<i>M. carolinus</i>			Colombia	11°30'57" N	72°58'10" W
<i>M. carolinus</i>	Río Suriname		Suriname	05°49'19" N	55°08'58" W
<i>M. carolinus</i>			Gulana	06°22'59" N	58°40'59" W
<i>M. carolinus</i>	Desembocadura del Río Coatzacoalcos, Coatzacoalcos	Veracruz	Mexico	18°07'12" N	94°25'19" W
<i>M. carolinus</i>	Río Blanco, Mictizuma, Landa de Matamoros	Quintana Roo	Mexico	21°10'48" N	99°19'12" W
<i>M. carolinus</i>			Curaçao	12°10'08" N	68°59'27" W
<i>M. carolinus</i>			Colombia	11°01'00" N	73°46'59" W

Continued

Tabla 1. Continued.

Species	Locality	State	Country	Latitude	Longitude
<i>M. cardnus</i>	Landa de Matamoros	Queretaro	Mexico	21°14'24"N	98°52'48"W
<i>M. cardnus</i>	Axtla	San Luis Potosí	Mexico	21°17'24"N	97°10'48"W
<i>M. cardnus</i>	Rio Pánuco en Pánuco	Veracruz	Mexico	22°03'20"N	98°10'37"W
<i>M. cardnus</i>	Veracruz	Veracruz	Mexico	19°12'36"N	95°40'48"W
<i>M. cardnus</i>	Escumbrimiento al lado del río Pedregal	Tlaxco	Mexico	17°52'12"N	92°34'12"W
<i>M. cardnus</i>	Playa Lauro Villa; Matamoros	Tamaulipas	Mexico	25°40'19"N	97°09'07"W
<i>M. cardnus</i>		Bahia	Brazil	15°13'05"S	39°03'57"W
<i>M. cardnus</i>	Rio Pánuco en Pánuco	Veracruz	Mexico	22°03'20"N	98°10'37"W
<i>M. cardnus</i>		Bahia	Brazil	14°47'23"S	39°11'36"W
<i>M. cardnus</i>		Bahia	Brazil	14°38'48"S	39°14'58"W
<i>M. cardnus</i>		Panamá	Brazil	25°13'41"S	48°45'22"W
<i>M. cardnus</i>	Laguna La Playuela		Nicaragua	10°55'00"N	83°42'0"W
<i>M. cardnus</i>			Cuba	22°19'00"N	83°45'0"W
<i>M. cardnus</i>	Escollera de Tuxpan, Tuxpan	Veracruz	Mexico	20°57'04"N	97°25'16"W
<i>M. cardnus</i>			Aruba	12°29'45"N	69°55'44"W
<i>M. cardnus</i>		Pernambuco	Brazil	07°56'22"S	35°44'21"W
<i>M. cardnus</i>	Parque Estadual Ilha Bela	São Paulo	Brazil	23°51'22"S	45°24'30"W
<i>M. cardnus</i>		Vera Cruz	Mexico	19°24'41"N	96°21'14"W
<i>M. cardnus</i>	Parque Estadual Ilha Bela	São Paulo	Brazil	23°50'31"S	45°23'04"W
<i>M. cardnus</i>	Rio Ribeira do Iguape	São Paulo	Brazil	24°41'14"S	47°37'44"W
<i>M. cardnus</i>			Colombia	08°43'40"N	76°36'17"W
<i>M. cardnus</i>	Vaes Bay	Texas	USA	28°44'14"N	96°25'59"W
<i>M. cardnus</i>	Havana		Cuba	23°05'58"N	82°20'38"W
<i>M. cardnus</i>	Canal São Gonçalo	Rio Grande do Sul	Brazil	32°00'57"S	52°25'09"W
<i>M. cardnus</i>		Florida	USA	29°52'08"N	81°18'23"W
<i>M. cardnus</i>			Panamá	09°00'47"N	79°50'17"W
<i>M. cardnus</i>	Sabancuy, Cd. del Carmen	Campeche	Mexico	18°37'55"N	91°50'06"W
<i>M. cardnus</i>		Texas	USA	29°51'33"N	97°54'49"W
<i>M. cardnus</i>	Matagorda Bay	Texas	USA	28°45'47"N	96°08'57"W
<i>M. cardnus</i>	Rio Sonodoro, Rio Sonodoro		Puerto Rico	18°19'32"N	65°40'13"W
<i>M. cardnus</i>	Escollera de Tuxpan, Tuxpan	Veracruz	Mexico	20°57'04"N	97°25'16"W
<i>M. cardnus</i>	Oeste da Praia do Jabaquara	São Paulo	Brazil	23°44'12.6"S	45°17'38.9"W
<i>M. cardnus</i>	Estrada da Praia do Jabaquara	São Paulo	Brazil	23°44'12.3"S	45°18'19.4"W
<i>M. cardnus</i>	Alto da Praia de Sriniba	São Paulo	Brazil	23°45'25.2"S	45°20'34.5"W
<i>M. cardnus</i>	Praia do Vilna	São Paulo	Brazil	23°45'38.4"S	45°20'54.8"W
<i>M. cardnus</i>	Praia do Itaquanduba	São Paulo	Brazil	23°47'45.5"S	45°21'50.8"W
<i>M. cardnus</i>	Rio de Toca	São Paulo	Brazil	23°40'08.3"S	45°21'22.0"W
<i>M. cardnus</i>	Tesouro de Colina	São Paulo	Brazil	23°50'19.9"S	45°22'25.0"W
<i>M. cardnus</i>	Campo do Portinho	São Paulo	Brazil	23°50'53.6"S	45°24'16.3"W
<i>M. cardnus</i>	Porto dos Pradiz	São Paulo	Brazil	23°55'44.6"S	45°26'33.5"W
<i>M. cardnus</i>	Marambala	São Paulo	Brazil	23°56'04.0"S	45°25'51.9"W
<i>M. cardnus</i>	Praia Mansa	São Paulo	Brazil	23°52'07.8"S	45°17'28.1"W
<i>M. cardnus</i>	Cachoeira da Laje	São Paulo	Brazil	23°55'55.2"S	45°24'32.7"W
<i>M. cardnus</i>	Bacia do Ribeira de Iguape, município de Cananóia, rio Branco	São Paulo	Brazil	24°54'36"S	47°59'52"W
<i>M. cardnus</i>	Bacia da Baixada Santista, município de Paratiaba, Estação Ecológica Junília-Itatins, rio Paratiaba	São Paulo	Brazil	24°22'27"S	47°04'03"W
<i>M. cardnus</i>	Estação Ecológica Junília-Itatins - rio sam nome	São Paulo	Brazil	24°23'09"S	047°01'07"W
<i>M. cardnus</i>	Estação Ecológica Junília-Itatins Trilha do Fundão	São Paulo	Brazil	24°23'14"S	047°01'02"W
<i>M. cardnus</i>		São Paulo	Brazil	00°03'40.9"S	051°08'46.6"W
<i>M. cardnus</i>			Brazil	00°15'36.9"S	051°20'42.3"W
<i>M. cardnus</i>	Estação Ecológica Junília-Itatins	São Paulo	Brazil	24°23'05"S	047°01'08"W
<i>M. cardnus</i>	Ilha de Arapiranga	Pará	Brazil	01°19'S	048°33'W
<i>M. cardnus</i>	Rio Pascagoula, near Bay St. Louis (Rotten Bayou), Hancock County	Mississippi	USA	30°31'N	088°36'W
<i>M. cardnus</i>	Rio Capibaribe-Mirim	Pernambuco	Brazil	07°42'S	035°33'W
<i>M. cardnus</i>	Rio Pinhalta, um pequeno rio no continente, cerca de 3 milhas ao sul da ponta sul da ilha de Santa Catarina	Santa Catarina	Brazil	27°00'00"S	50°00'00"W
<i>M. cardnus</i>	Rio San Juan		Nicaragua	11°11'N	84°46'W
<i>M. cardnus</i>		São Paulo	Brazil	23°32'12"S	045°03'55"W

Continued

Tabela 1. Continued.

Species	Locality	State	Country	Latitude	Longitude
<i>M. carolinus</i>	Rio da Praia do Sambaqui	Santa Catarina	Brazil	27°28'36" S	048°32'00" W
<i>M. carolinus</i>		Santa Catarina	Brazil	27°40'51.1" S	048°32'42.6" W
<i>M. carolinus</i>	Ilhéu da Ilha, Florianópolis	Santa Catarina	Brazil	27°42'11" S	048°33'00" W
<i>M. carolinus</i>		Santa Catarina	Brazil	27°25'08.3" S	048°35'47.4" W
<i>M. carolinus</i>	Rio Cachoeira, Ilhéus	Bahia	Brazil	14°48'05.18" S	039°09'54.48" W
<i>M. carolinus</i>	Rio Contas, distrito de Taboquinhas, Itacaré	Bahia	Brazil	14°2'05"	039°1'0" W
<i>M. carolinus</i>	Fazenda ribeiro, Serra Grande, Unaçuca	Bahia	Brazil	14°2'25"	039°0'0" W
<i>M. carolinus</i>	Rio Santana, Povoado Rio do Engenho, Ilhéus	Bahia	Brazil	14°51'07.4" S	039°04'12.8" W
<i>M. carolinus</i>	Rio Santana	Bahia	Brazil	14°51'16.8" S	039°05'58.6" W