

Herpetofauna, municipality of Porto Murtinho, Chaco region, state of Mato Grosso do Sul, Brazil

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ABSTRACT: Among the physiographic regions included in the central South American diagonal of open formations, the Chaco, with some endemic species, represents the southernmost dry area. In Brazil, the Chaco is found in southwestern corner of Mato Grosso do Sul state, mostly in the municipality of Porto Murtinho along the Paraguay and Apa rivers. From February 2008 to December 2009, we carried out an inventory of amphibians and reptiles in Porto Murtinho, using pitfall traps, time-limited searches, and occasional encounters. A total of 34 amphibian and 39 reptile species were registered. Although some typical Chacoan species were found, most of the species are open area dwellers that also occur in other open biomes, such as the Cerrado and Caatinga.

INTRODUCTION

Physiographic regions in the state of Mato Grosso do Sul consist of an array of open habitats, such as the Pantanal, Cerrado, Chaco, and dry forests with a distinct biota, formed by an interconnected mosaic of habitats. However, during the last few decades, most of this heterogeneous landscape has been converted into agricultural fields and pastures. The state of Mato Grosso do Sul is located inside the great South American open diagonal, a broad area of open formations extending from the northeastern Brazilian Caatinga to the southern Chaco in Argentina. The diagonal has a high herpetofauna biodiversity, including endemic species (Bucher 1980; Vanzolini 1988; Leynaud and Bucher 1999; Cabrera 1995, 1998; Duellman 1999; Colli *et al.* 2002; Souza 2005; Brusquetti and Lavilla 2006). The Chaco, one of the phytogeographic domains found in the diagonal, occurs in Mato Grosso do Sul in the southwestern municipality of Porto Murtinho.

The Chaco is a flat formation lying on top of the great Andean outwash plain, and encompasses approximately 1,000,000 km² (Bucher and Huszar 1999; Pennington *et al.* 2000). Chacoan phytophysognomies include shrubs and mesophytic vegetation usually associated with saline soil, and a great diversity of Leguminosae, Bromeliaceae, and Cactaceae (Pennington *et al.* 2000; Silva *et al.* 2000; Pott and Pott 2003). Climate is markedly seasonal, with a hot (over 40 °C) and wet summer and severe frosts in the dry winter (Pennington *et al.* 2000). The Chaco in Brazil (Porto Murtinho) is restricted to a small narrow strip located between the Paraguay and Apa rivers, not easily identified and defined in regional scale maps (Prado *et al.* 1992; Prado 1993). With the flat topography, the semi-arid climate, and the distinct plant formations (Prado *et al.* 1992; Prado 1993; Navarro *et al.* 2006), the Chaco is a well-defined biogeographical province (Morrone 2006) with associated endemism (Gallardo 1979; Leynaud and Bucher 1999; Pennington *et al.* 2000; Vinke and Vinke

2001; Morrone *et al.* 2004; Spichiger *et al.* 2004; Brusquetti and Lavilla 2006; Almeida *et al.* 2007).

At present, approximately 720 reptile species (Bérnils 2010) and 880 anuran species (SBH 2010) are known from Brazil. Most of the records on “Chacoan” herpetofauna are limited to Paraguay (Krieg 1948; Scott and Lovett 1975; Norman 1994; Ziegler *et al.* 2002) and Argentina (Cruz *et al.* 1992; Cabrera 1995, 1998; Cruz 1997) (readers must refer to Leynaud and Bucher 1999, Giraud 2004 and Brusquetti and Lavilla 2006 for a broader literature review). For Brazil, the only known information about the Chacoan herpetofauna comes from the *Plano de Conservação da Bacia do Alto Paraguai* (PCBAP 1997), which cites 11 amphibian and four reptilian species, including three crocodylians. With this study we present a list of amphibians and reptiles from the Brazilian Chaco.

MATERIALS AND METHODS

Sampling was conducted bi-monthly from February 2008 to December 2009 throughout the municipality of Porto Murtinho, southwestern Mato Grosso do Sul state (approx. 21°40' S, 57°54' W to 21°56' S, 57°34' W; Figures 1 and 2). Sampling techniques included pitfall traps with drift fences, time-limited searches, and occasional encounters (Martins and Oliveira 1998). Pitfall trap consisted of 10 Y lines with four 60 L buckets (see Cechin and Martins 2000), each Y arm with 10 m long and each pitfall trap line distant 300 meters. Pitfall traps were kept opened for five days during sampling months. Voucher specimens were immediately killed with xylocaine, fixed in 5 % formalin, and transferred to 70 % alcohol.

The expected local species richness was estimated according to individual-based rarefaction curves for sampled localities, obtained in EstimateS 7.5 (Colwell 2005) with 1,000 randomizations of the original field samples employing the non-parametric Jackknife 1 index.

Specimens were deposited at the Coleção Zoológica

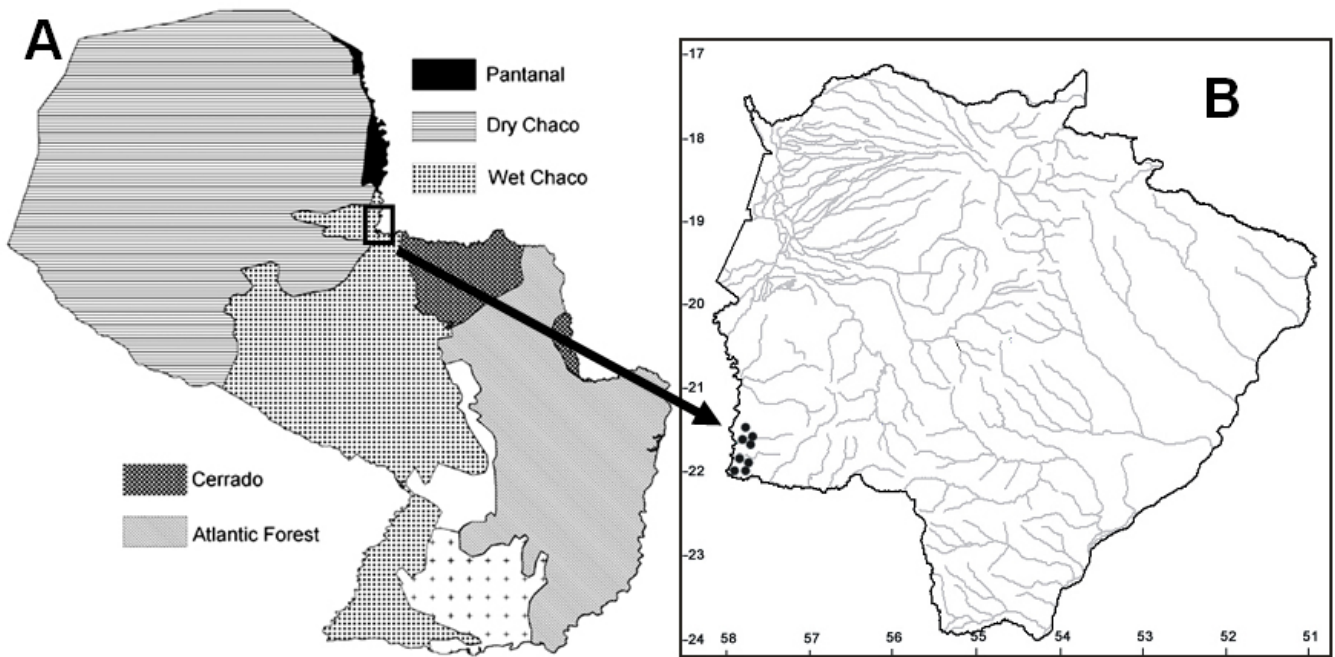


FIGURE 1. The major Paraguay ecoregions (modified from Cacciali 2010) neighboring Brazil and the close association of Porto Murtinho region with the Chaco biome (A). Points represent approximated herpetofauna sampling sites in Porto Murtinho Chaco region, state of Mato Grosso do Sul (B).

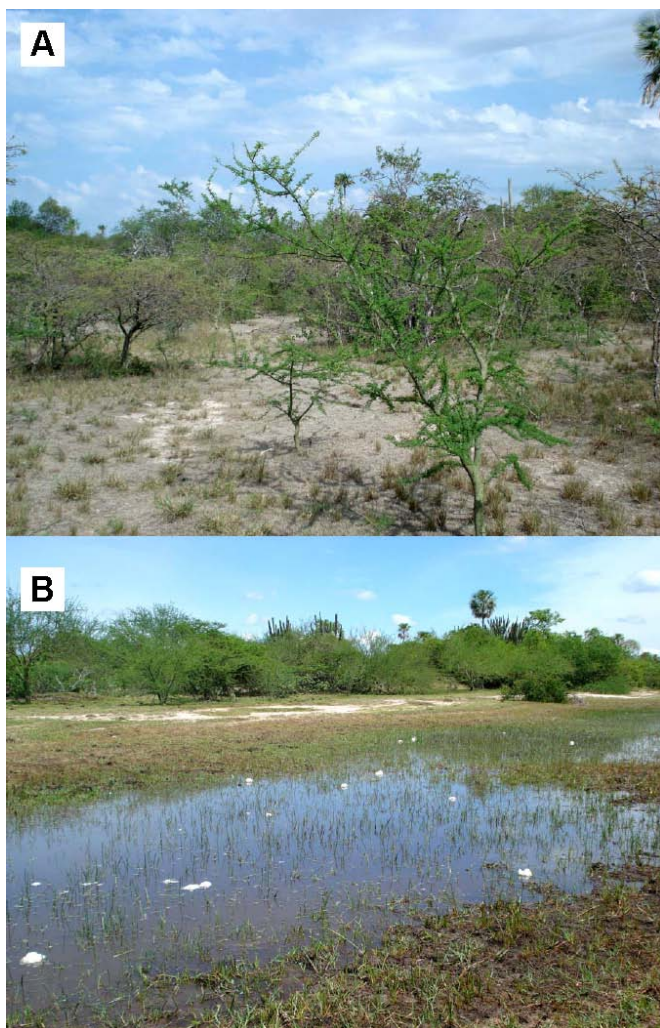


FIGURE 2. The dry (A) and wet (B) seasons create distinct physiognomies in Chaco throughout the year. (Photos: F.L. Souza).

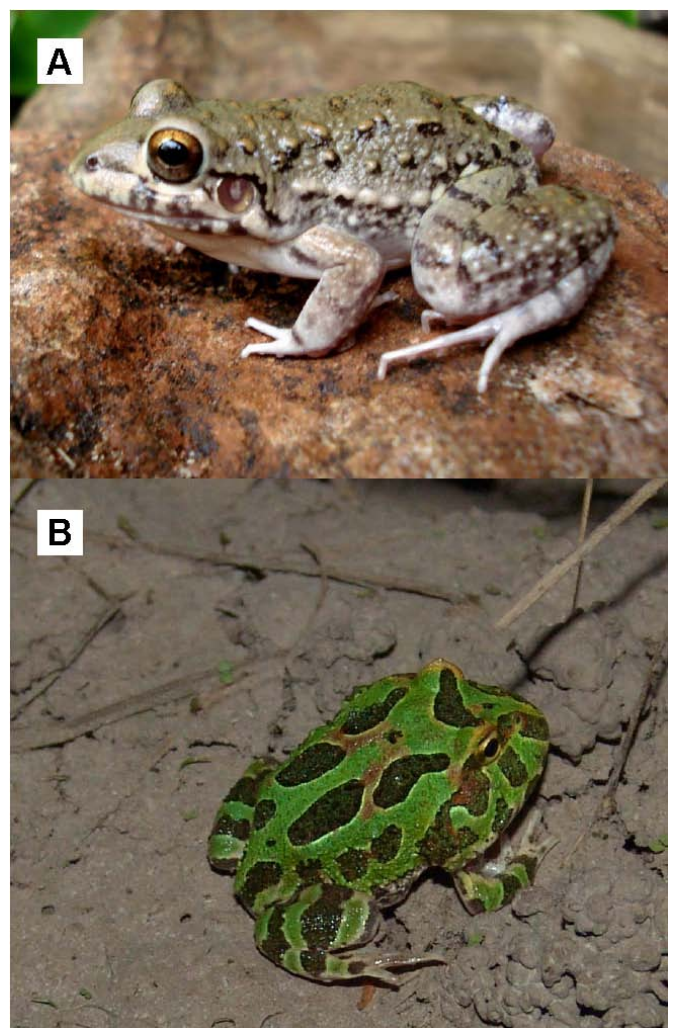


FIGURE 3. Typical amphibian species from the region: *Leptodactylus bufonius* (A) and a juvenile *Ceratophrys cranwelli* (B). (Photos: L. Piatti).

de Referência of the Universidade Federal de Mato Grosso do Sul (ZUFMS, Campo Grande, Mato Grosso do Sul state). Collecting activities were carried out under permit IBAMA 10379.

RESULTS AND DISCUSSION

A total of 34 amphibian and 39 reptile species were registered in the Chaco of Porto Murтинho (Figures 3 and 4; Table 1). Hylidae (N = 13 species) was the most speciose amphibian family, and Dipsadidae was the richest reptilian family (N = 15 species).

Although rarefaction curves showed 36 amphibians (Figure 5A) and 54 reptile species could be expected (Figure 5B), the number of species recorded in the present study is similar to the projected herpetofauna richness for neighboring Cerrado (Diniz-Filho et al. 2007, 2009). Some typically Chacoan amphibian species, such as *Lepidobatrachus laevis* and *Leptodactylus laticeps*, recorded from neighboring Paraguayan Chaco areas (Ziegler et al. 2002; Brusquetti and Lavilla, 2006), were not found in Porto Murтинho. On the other hand, *Liophis poecilogyrus caesius*, a subspecies typical of the Chaco (Leynaud and Bucher 1999), was very common around Porto Murтинho and intergrades with *L. poecilogyrus schotti* from Cerrado in eastern Mato Grosso do Sul (Dixon and Markezich 1992; Giraud 2004). *Micrablepharus maximiliani*, a common

reptile species further east in the Brazilian Cerrado (Nogueira et al. 2009) was not found in Porto Murтинho. Both *L. poecilogyrus schotti* and *M. maximiliani* are found at Serra da Bodoquena, around 100 km east from Porto Murтинho (Uetanabaro et al. 2007; Nogueira et al. 2009). These results demonstrate the importance of Porto Murтинho as a real Chacoan province.

Most of the species can be considered open area dwellers reflecting partially the characteristics of this habitat. For amphibians, the flooding during the rainy season creates temporary ponds and favors their reproductive behavior. Also, some natural depressions accumulate permanent water and may represent important micro habitat during dry periods. Flooded areas are used by reptiles, such as *Acanthochelys macrocephala* (captured during rainy days), or they may favor the establishment of local aquatic populations of *Caiman yacare* and *Hydrodynastes gigas*. For these open area inhabitants, some species are typical of dry areas, such as *Liophis dilepis* (Caatinga), *Teius teyou/Leptodactylus bufonius* (Chaco), *Eupemphix nattereri* (Cerrado) (Brusquetti and Lavilla 2006; Ribeiro et al. 2008; Nogueira et al. 2009; Álvarez et al. 2009), showing that the Porto Murтинho Chaco has herpetological affinities with other open biomes. Finally, several species benefit from anthropic habitats and associated edge effects from the region (*Rhinella schneideri*, *Hypsiboas raniceps*, *Ameiva ameiva*), and have a broad geographical distribution in South America.



FIGURE 4. Typical reptile species from the region: *Liophis poecilogyrus caesius* (A) and *Teius teyou* (B). (Photos: F.L. Souza).

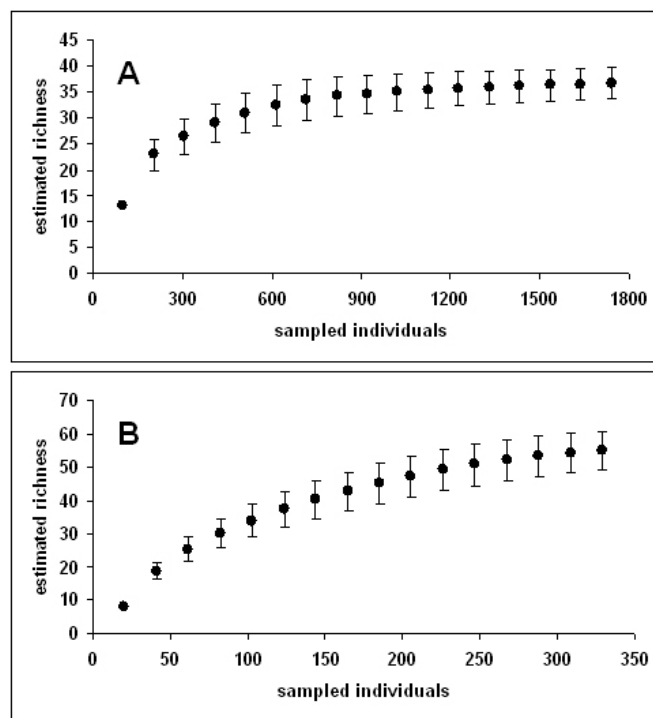


FIGURE 5. Rarefaction curves for amphibians (A) and reptiles (B) from Porto Murтинho Chaco region, Mato Grosso do Sul state. Curves represent mean richness (bars denote standard deviations) estimated by Jackknife 1 method after 1,000 randomizations of the sampled individuals.

TABLE 1. Checklist of amphibians and reptiles from Porto Murinho Chaco region, state of Mato Grosso do Sul, recorded between February 2008 and December 2009.

	SAMPLING SITES COORDINATES							
	22°04'54"	22°01'35"	22°04'49"	22°00'13"	21°54'29"	21°42'07"	21°39'00"	21°33'16"
	57°56'22"	57°54'15"	57°50'21"	57°46'26"	57°50'12"	57°43'13"	57°42'43"	57°46'51"
Bufonidae								
<i>Melanophryniscus fulvoguttatus</i> (Mertens, 1937)						X		X
<i>Rhinella bergi</i> (Céspedes, 2000 "1999")	X	X	X	X	X	X	X	X
<i>Rhinella major</i> (Müller and Helmich, 1936)	X	X	X	X	X	X	X	X
<i>Rhinella schneideri</i> (Werner, 1894)	X	X	X			X		
Ceratophryidae								
<i>Ceratophrys cranwelli</i> Barrio, 1980						X		
Cycloramphidae								
<i>Odontophrynus americanus</i> (Duméril and Bibron, 1841)			X			X	X	
Hylidae								
<i>Dendropsophus melanargyreus</i> (Cope, 1887)						X		
<i>Dendropsophus nanus</i> (Boulenger, 1889)	X	X	X	X	X	X	X	X
<i>Hypsiboas punctatus</i> (Schneider, 1799)	X	X	X	X	X	X	X	X
<i>Hypsiboas raniceps</i> Cope, 1862	X	X	X	X	X	X	X	X
<i>Phyllomedusa azurea</i> Cope, 1862	X	X	X	X	X	X	X	X
<i>Phyllomedusa sauvagii</i> Boulenger, 1882		X	X			X	X	
<i>Pseudis limellum</i> (Cope, 1862)	X	X	X	X	X	X	X	X
<i>Pseudis platensis</i> Gallardo, 1961	X	X	X	X	X	X	X	X
<i>Scinax acuminatus</i> (Cope, 1862)	X	X	X	X	X	X	X	
<i>Scinax fuscomarginatus</i> (A. Lutz, 1925)						X	X	
<i>Scinax fuscovarius</i> (A. Lutz, 1925)	X	X	X			X		
<i>Scinax nasicus</i> (Cope, 1862)	X	X	X		X	X	X	X
<i>Trachycephalus venulosus</i> (Laurenti, 1768)		X	X			X		
Leiuperidae								
<i>Eupemphix nattereri</i> Steindachner, 1863						X		
<i>Physalaemus albonotatus</i> (Steindachner, 1864)	X	X	X	X	X	X	X	X
<i>Physalaemus biligonigerus</i> (Cope, 1861 "1860")	X	X	X	X	X	X	X	X
<i>Pseudopaludicola falcipes</i> (Hensel, 1867)	X	X	X	X	X	X	X	X
Leptodactylidae								
<i>Leptodactylus bufonius</i> Boulenger, 1894	X	X	X	X	X	X	X	X
<i>Leptodactylus chaquensis</i> Cei, 1950	X	X	X	X	X	X	X	X
<i>Leptodactylus diptyx</i> Boettger, 1885		X	X		X	X		X
<i>Leptodactylus elenae</i> Heyer, 1978	X	X	X	X	X	X	X	X
<i>Leptodactylus fuscus</i> (Schneider, 1799)		X	X		X	X		
<i>Leptodactylus labyrinthicus</i> (Spix, 1824)						X		
<i>Leptodactylus podicipinus</i> (Cope, 1862)								
Microhylidae								
<i>Chiasmocleis albopunctata</i> (Boettger, 1885)				X				
<i>Dermatonotus muelleri</i> (Boettger, 1885)						X		X
<i>Elachistocleis bicolor</i> (Valenciennes in Guérin-Ménéville, 1838)		X	X		X	X	X	X
<i>Elachistocleis ovalis</i> (Schneider, 1799)		X	X			X	X	
Testudinidae								
<i>Chelonoidis carbonaria</i> (Spix, 1824)						X		
Chelidae								
<i>Acanthochelys macrocephala</i> Rhodin, Mittermeier and McMorris, 1984							X	
<i>Phrynops geoffroanus</i> (Schweigger, 1812)							X	
Alligatoridae								
<i>Caiman yacare</i> (Daudin, 1802)	X	X	X	X	X	X	X	X
Amphisbaenidae								
<i>Amphisbaena cf. leeseri</i>			X					
<i>Amphisbaena mertensii</i> Strauch, 1881			X			X		
Iguanidae								
<i>Iguana iguana</i> (Linnaeus, 1758)	X							

TABLE 1. CONTINUED.

	SAMPLING SITES COORDINATES							
	22°04'54"	22°01'35"	22°04'49"	22°00'13"	21°54'29"	21°42'07"	21°39'00"	21°33'16"
	57°56'22"	57°54'15"	57°50'21"	57°46'26"	57°50'12"	57°43'13"	57°42'43"	57°46'51"
Polychrotidae								
<i>Anolis meridionalis</i> Boettger, 1885							X	
<i>Anolis nitens</i> (Wagler, 1830)							X	
Tropiduridae								
<i>Tropidurus guarani</i> (Cope, 1862)			X				X	
Gekkonidae								
<i>Hemidactylus mabouia</i> (Moreau de Jonnés, 1818)	X		X				X	
Phyllodactylidae								
<i>Phyllopezus pollicaris</i> (Spix, 1825)			X				X	
Teiidae								
<i>Ameiva ameiva</i> (Linnaeus, 1758)	X	X	X	X	X	X	X	X
<i>Teius teyou</i> (Daudin, 1802)							X	X
<i>Tupinambis meriana</i> (Duméril and Bibron, 1839)	X	X	X		X	X		X
Gymnophthalmidae								
<i>Cercosaura ocellata</i> Wagler, 1830			X				X	
Scincidae								
<i>Mabuya frenata</i> (Cope, 1862)							X	X
<i>Mabuya guaporicola</i> Dunn, 1936							X	X
Boidae								
<i>Boa constrictor</i> Linnaeus, 1758							X	
<i>Eunectes notaeus</i> Cope, 1862	X						X	
Colubridae								
<i>Mastigodryas bifossatus</i> (Raddi, 1820)							X	
Dipsadidae								
<i>Helicops leopardinus</i> (Schlegel, 1837)							X	
<i>Hydrodynastes gigas</i> (Duméril, Bibron and Duméril, 1854)			X				X	X
<i>Leptodeira annulata</i> (Linnaeus, 1758)			X		X		X	X
<i>Liophis dilepis</i> (Cope, 1862)							X	
<i>Liophis poecilogyrus</i> (Wied, 1825)	X	X	X		X		X	X
<i>Liophis typhlus</i> (Linnaeus, 1758)							X	
<i>Mussurana bicolor</i> (Peracca, 1904)							X	
<i>Oxyrhopis rhombifer</i> Duméril, Bibron and Duméril, 1854							X	
<i>Philodryas patagoniensis</i> (Girard, 1858)			X				X	
<i>Pseudoboa nigra</i> (Duméril, Bibron and Duméril, 1854)							X	X
<i>Psomophis genimaculatus</i> (Boettger, 1885)							X	
<i>Thamnodynastes chaquensis</i> Bergna and Alvarez, 1993			X				X	X
<i>Thamnodynastes hypoconia</i> (Cope, 1860)							X	
<i>Xenodon matogrossensis</i> (Scrocchi and Cruz, 1993)							X	
<i>Xenodon merremii</i> (Wagler, 1824)							X	
Elapidae								
<i>Micrurus tricolor</i> Hoge, 1956							X	
Viperidae								
<i>Bothropoides matogrossensis</i> (Amaral, 1925)			X		X		X	X
<i>Caudisona durissa</i> (Linnaeus, 1758)		X	X				X	

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