

Baseline Inventory of Amphibians and Reptiles in the Vicinity of Kurupukari, Guyana

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ABSTRACT: The habitat in the vicinity of Kurupukari, on the Essequibo River in central Guyana, is tall evergreen lowland forest. The area has suffered some human disturbance from agriculture, road construction and ferry activity. The area was sampled for 10 days in 1990 and 12 days in 1997; seven days in rainy season and 15 in dry season. During this sampling 23 anuran and 17 reptile species were collected. Some differences exist between species collected on either side of the river. Comparisons are made with collections from other locations in Guyana.

INTRODUCTION

Northeastern South America, especially the Guiana Shield region, is well known for its high biodiversity (Hollowell and Reynolds 2005). Although the region's highlands have received much attention because of the high numbers of endemic species found there, lower-elevation areas are also home to diverse communities.

Some general works on the herpetofauna of the Guiana region have been recently published (Starace 1998; Gorzula and Señaris 1999; Lescure and Marty 2000; Reynolds *et al.* 2001; Avila-Pires 2005; McDiarmid and Donnelly 2005; Señaris and MacCulloch 2005; Cole *et al.* 2013). In Guyana, the herpetofaunas of several localities have been documented by Donnelly *et al.* (2005a), Ernst *et al.* (2005), MacCulloch *et al.* (2007), Kok and Kalamandeen (2008), MacCulloch and Lathrop (2009), MacCulloch and Reynolds (2012) and Reynolds and MacCulloch (2012). In this paper we report on collections of amphibians and reptiles from the vicinity of Kurupukari, Guyana deposited in the Royal Ontario Museum (ROM) and the Smithsonian's National Museum of Natural History (USNM). Specimens were collected from both sides of the Essequibo River, in habitat that has experienced human impact.

MATERIALS AND METHODS

Study Area

Kurupukari is located in central Guyana, on the east bank of the Essequibo River (04°39'50" N, 58°40'30" W, elevation 70 m, Figure 1). Habitat consists of tall evergreen forest, with areas of seasonally flooded riparian forest adjacent to the river (Huber *et al.* 1995). Topography is flat or gently rolling with a few large boulder outcrops. A few small ponds and streams are in the area.

The Iwokrama Forest Reserve, established in 1996, is a 360,000 ha area west of the Essequibo River. The habitat in the Iwokrama Reserve opposite Kurupukari consists of tall evergreen sclerophyllous forest (Huber *et al.* 1995).

The area has suffered some human disturbance. The principal road in central Guyana crosses the Essequibo River at Kurupukari. Vehicle crossings were facilitated by a ferry during the 1980s, but the ferry was not operating

when the first collection was made in 1990. At that time there was no vehicular traffic other than our own. By 1997, when the second collection was made, ferry service and associated road traffic had resumed.

Habitat disturbance on the east bank consisted of clearings at or near the river edge, as well as the clearing for the unpaved road. On the west side of the river, some land has been cleared for agriculture in the vicinity of the village of Fairview, in addition to road clearing.

Specimen Collection

Field work at Kurupukari was conducted during the dry season, from 6–16 October 1990. Collecting activities were concentrated on the east side of the Essequibo River, although a few specimens were collected on the west bank. Specimens collected in 1990 are deposited in the ROM collections.

Collections were made by Maureen Donnelly and associates on the west side of the river on 23–28 March (dry season) and 28 May–7 June (rainy season) 1997. Collecting activities occurred in two locations: opposite Kurupukari and at Three Mile Camp, the latter approximately 5 km southwest of the river (04°37'59" N, 58°42'52" W, 102 m). Specimens collected in 1997 are deposited in the USNM collections.

Most specimens were collected by hand, although pitfall traps were also used at Three Mile Camp (Donnelly *et al.* 2005a, b). Specimens were euthanized using approved methods (immersion in clove oil and ethanol for amphibians, injection of sodium pentobarbital for reptiles) and preserved in formalin. Tissue samples were taken from most specimens. In 1990, specimens were collected and exported under permit number 0031 issued by the Guyana Ministry of Agriculture. In 1997, specimens were exported under CITES permit numbers 4385–4390 issued by the Guyana Ministry of Agriculture.

Amphibian taxonomy follows Frost (2013). Reptile taxonomy follows Avila-Pires (2005), with modifications by Gamble *et al.* (2008), Adalsteinsson *et al.* (2009), Zaher *et al.* (2009) and Hedges and Conn (2012).

RESULTS AND DISCUSSION

In 1990, 11 species of amphibians in four families and 11 reptile species in eight families were collected (Table 1, Figure 2). Most of these were collected on the east side of the Essequibo, although a few were collected on the west side. Specimens were collected in a variety of habitats. The amphibians *Ameerega trivittata*, *Rhinella martyi*, *Scinax ruber*, and *Leptodactylus* spp. and the reptiles *Anolis* spp., *Copeoglossum nigropunctatum*, *Gonatodes annularis* and *Uranoscodon superciliosus* were found only in forest. *Ameiva ameiva* and *Kentropyx calcarata* were found in clearings. *Imantodes cenchoa* and *Oxybelis fulgidus* were found in trees, while *Erythrolamprus aesculapii* and *Epictia albifrons* were collected along the road. *Hypsiboas boans*, *H. cinerascens* and *H. aff. crepitans* were on vegetation adjacent to water. Tadpoles of *Rhinella marina* and *Hypsiboas boans* were collected. Some specimens of

Rhinella martyi are paratypes (Fouquet *et al.* 2007).

In 1997, on the west side of the river, 18 amphibian species in five families and eight reptile species in seven families were collected (Table 1). Only one species, the snake *Chironius scurrulus*, was collected at the river; the remainder were collected at Three Mile Camp, in forest habitat. Most specimens were collected by hand capture; although pitfall traps yielded some specimens, no species were collected only in pitfalls.

There were some differences in the species collected on the east and west sides of the Essequibo River. Most noteworthy is the toad *Rhinella martyi*, which was collected only on the west side, despite much more intensive collecting efforts on the east side in 1990. Twelve other amphibian and six reptile species were collected only on the west side. Three amphibian and six reptile species were collected only on the east side. These differences could be attributed to several factors. Collecting effort (number of collectors and collecting days), microhabitat differences, human impact, and wet vs dry season collecting are possible reasons for any differences. Species abundance may also play a role; seven of the nine species that were collected only on the east side are represented by a single specimen, indicating that they may be locally rare. Although it has been postulated that the Essequibo River may act as a barrier to dispersal of amphibians and reptiles (eg. *Stefania evansi*, MacCulloch and Lathrop 2006), further study is necessary to determine the extent to which it restricts dispersal.

Other specimens collected on the west side of the river were not deposited in the USNM collections. Information on these specimens is in Donnelly *et al.* (2005b).

At Kaieteur National Park, approximately 100 km northwest of Kurupukari, 45 anuran species were reported (Kok and Kalamandeen 2008). At Mabura Hill Forest Reserve, 70 km north of Kurupukari, 41 anuran species were found (Ernst *et al.* 2005). At Paramakatoi and Kato, two neighbouring locations approximately 120 km west of Kurupukari, 20 amphibian and 24 reptile species were collected (MacCulloch and Reynolds 2012). At Baramita, in northwestern Guyana 350 km northwest of Kurupukari, 25 amphibian and 28 reptile species were collected (Reynolds and MacCulloch 2012). Elevation at Mabura Hill and Baramita is similar to that at Kurupukari, Kaieteur is somewhat higher at 400–500 m, and Paramakatoi and Kato are at 760–800 m. The herpetofauna of Iwokrama Forest, which includes the west side of the Essequibo River, has also been documented. Donnelly *et al.* (2005a) reported 47 anurans and 64 squamates from nine collecting locations within the Reserve. Collecting effort at Kaieteur, Mabura Hill and Iwokrama Forest was greater than that of this study, while collecting effort at Paramakatoi/Kato and Baramita was similar to that of this study.

In 1990, some habitat disturbance had occurred in the area and by 1997, human presence had increased. In the years since these collections were made, ferry service and road traffic have increased further, resulting in additional disturbance on both sides of the river. We recommend additional study in the area to determine the effects of human disturbance on the herpetofauna. This study should serve as a baseline for comparison with future faunal studies.



FIGURE 1. Location of study areas, Kurupukari (K) and Three Mile Camp (T), on the Essequibo River, central Guyana.

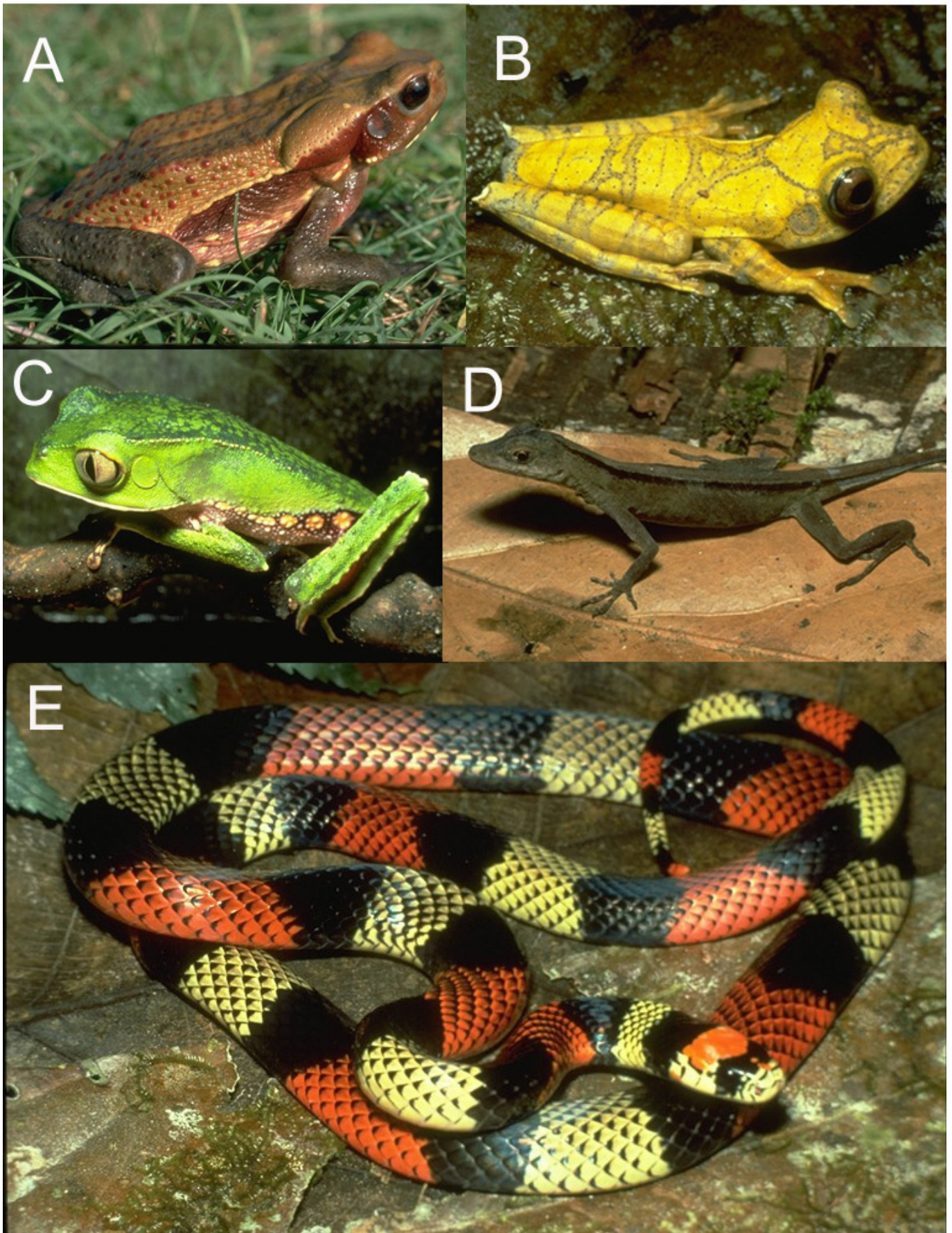


FIGURE 2. Some species of amphibians and reptiles collected in the vicinity of Kurupukari, east bank of Essequibo River, central Guyana.. A. *Rhaebo guttatus* (Bufonidae); B. *Hypsiboas geographicus* (Hylidae); C. *Phyllomedusa vaillanti* (Hylidae); D. *Anolis fuscoauratus* (Polychrotidae); E. *Erythrolamprus aesculapii* (Dipsadidae). Photos by RPR and W.W. Lamar.

TABLE 1. Species of amphibians and reptiles collected on the east and west banks of the Essequibo River near Kurupukari, central Guyana.

TAXON	EAST	WEST
AMPHIBIANS		
Bufonidae		
<i>Amazophrynella minuta</i> (Melin, 1941)		USNM 531329–39
<i>Rhaebo guttatus</i> (Schneider, 1799)	ROM 20644–7	USNM 531293–5
<i>Rhinella marina</i> (Linnaeus, 1758)	ROM 20640–1	USNM 531300–1
<i>Rhinella martyi</i> Fouquet, Gaucher, Blanc and Velez-Rodriguez, 2007		ROM 20652–4; USNM 531307–11
Dendrobatidae		
<i>Ameerega trivittata</i> (Spix, 1824)	ROM 20566–8	
Hylidae		
<i>Dendropsophus leucophyllatus</i> (Beireis, 1783)		USNM 531429–33
<i>Hypsiboas boans</i> (Linnaeus, 1758)	ROM 20556–8	USNM 531358–9
<i>Hypsiboas cinerascens</i> (Spix, 1824)	ROM 20562–5	USNM 531414–6
<i>Hypsiboas</i> aff. <i>crepitans</i> (Wie-Neuwied, 1824)	ROM 20560	
<i>Hypsiboas geographicus</i> (Spix, 1824)		USNM 531389–92
<i>Osteocephalus taurinus</i> Steindachner, 1862		USNM 531458–60
<i>Scinax boesemani</i> (Goin, 1966)		USNM 531488–90
<i>Scinax ruber</i> (Laurenti, 1768)	ROM 20561	
<i>Phyllomedusa bicolor</i> (Boddaert, 1772)		USNM 531599–601
<i>Phyllomedusa vaillanti</i> Boulenger, 1882		USNM 531608–13
Leptodactylidae		
<i>Physalaemus cuvieri</i> Fitzinger, 1826		USNM 531577–83
<i>Leptodactylus guianensis</i> Heyer and de Sa, 2011	ROM 20580–90	ROM 20633–4; USNM 531501
<i>Leptodactylus knudseni</i> Heyer, 1972		USNM 531513–4
<i>Leptodactylus mystaceus</i> (Spix, 1824)		USNM 531526–7
<i>Leptodactylus petersii</i> (Steindachner, 1864)	ROM 20613–5	ROM 20616
<i>Leptodactylus rhodomystax</i> Boulenger, 1884		USNM 531564–6
<i>Leptodactylus validus</i> Garman, 1888	ROM 20625–32	ROM 20624
Pipidae		
<i>Pipa pipa</i> (Linnaeus, 1758)		USNM 531587–8
REPTILES		
Gekkonidae		
<i>Hemidactylus palaichthus</i> Kluge, 1969	ROM 20523–4	ROM 20521–2
Polychrotidae		
<i>Anolis planiceps</i> Troschel, 1848	ROM 20510–2	
<i>Anolis fuscoauratus</i> D'Orbigny, 1837		USNM 531644
<i>Anolis punctatus</i> Daudin, 1802	ROM 20513	
Scincidae		
<i>Copeoglossum nigropunctatum</i> (Spix, 1825)	ROM 20516	USNM 531659
Sphaerodactylidae		
<i>Gonatodes annularis</i> Boulenger, 1887	ROM 20518–9	ROM 20520
<i>Gonatodes humeralis</i> (Guichenot, 1855)		USNM 531623–4
Teiidae		
<i>Ameiva ameiva</i> (Linnaeus, 1758)	ROM 20545–53	ROM 20554
<i>Kentropyx calcarata</i> Spix, 1825	ROM 20529	USNM 531686–7
Tropiduridae		
<i>Plica umbra</i> (Linnaeus, 1758)		USNM 531649
Colubridae		
<i>Chironius scurrulus</i> (Wagler, 1824)		USNM 531697
<i>Oxybelis aeneus</i> (Wagler, 1824)		USNM 531701
<i>Oxybelis fulgidus</i> (Daudin, 1803)	ROM 20501	
Dipsadidae		
<i>Erythrolamprus aesculapii</i> (Linnaeus, 1758)	ROM 20504	
<i>Helicops angulatus</i> (Linnaeus, 1758)		USNM 531698–9
<i>Imantodes cenchoa</i> (Linnaeus, 1758)	ROM 20502	
Leptotyphlopidae		
<i>Epictia albifrons</i> (Wagler, 1824)	ROM 20503	

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LITERATURE CITED

- Adalsteinsson, S.A., W.R. Branch, S. Trape, L.J. Vitt and S.B. Hedges. 2009. Molecular phylogeny, classification, and biogeography of snakes of the family Leptotyphlopidae (Reptilia, Squamata). *Zootaxa* 2244: 1–50.
- Avila-Pires, T.C.S. 2005. Reptiles; p. 25–40 In T. Hollowell and R.P. Reynolds (ed.). *Checklist of the terrestrial vertebrates of the Guiana Shield*. Bulletin of the Biological Society of Washington 13: 98 p.
- Cole, C.J., C.R. Townsend, R.P. Reynolds, R.D. MacCulloch and A. Lathrop. 2013. *Amphibians and reptiles of Guyana, South America: illustrated keys, annotated species accounts and a biogeographic synopsis*. Proceedings of the Biological Society of Washington 125: 317–620.
- Donnelly, M.A., M.H. Chen and G.G. Watkins. 2005a. An exploration of diversity in a Guyanan rainforest; p. 428–460 In M.A. Donnelly, B.I. Crother, C. Guyer, M.H. Wake, and M.E. White (ed.). *Ecology and Evolution in the Tropics: a Herpetological Perspective*. Chicago: University of Chicago Press.
- Donnelly, M.A., M.H. Chen and G.G. Watkins. 2005b. Sampling amphibians and reptiles in the Iwokrama forest ecosystem. *Proceedings of the Academy of Natural Sciences of Philadelphia* 154: 55–69.
- Ernst, R., M.-O. Rödel and D. Arjoon. 2005. On the cutting edge – The anuran fauna of the Mabura Hill Forest Reserve, central Guyana. *Salamandra* 41(4): 179–194.
- Fouquet, A., P. Gaucher, M. Blanc and C.M. Velez-Rodriguez. 2007. Description of two new species of *Rhinella* (Anura: Bufonidae) from the lowlands of the Guiana shield. *Zootaxa* 1663: 17–32.
- Frost, D.R. 2013. Amphibian Species of the World: an Online Reference. Version 5.6 (9 January 2013). Electronic Database accessible at <http://research.amnh.org/vz/herpetology/amphibia/index.html>. American Museum of Natural History, New York, USA. Captured on 5 June 2013.
- Gamble, T., A.M. Bauer, E. Greenbaum and T.R. Jackman. 2008. Evidence for Gondwanan vicariance in an ancient clade of gecko lizards. *Journal of Biogeography* 35(1): 88–104.
- Gorzula, S. and J.C. Señaris. "1998" [1999]. Contribution to the herpetofauna of the Venezuelan Guayana I. A data base. *Scientia Guaianae* No. 8, Caracas, xviii–269.
- Hedges, S.B. and C.E. Conn. 2012. A new skink fauna from Caribbean islands (Squamata, Mabuyidae, Mabuyinae). *Zootaxa* 3288: 1–244.
- Hollowell, T. and R.P. Reynolds (ed.). *Checklist of the terrestrial vertebrates of the Guiana Shield*. Bulletin of the Biological Society of Washington 13: 98 p.
- Huber, O., G. Gharbarran and V. Funk. 1995. *Vegetation map of Guyana*. Georgetown: Centre for the Study of Biological Diversity, University of Guyana.
- Kok, P.J.R. and M. Kalamandeen. 2008. Introduction to the taxonomy of the amphibians of Kaieteur National Park, Guyana. *Abc Taxa* 5: 1–278.
- Lescure, J. and C. Marty. 2000. Atlas des amphibiens de Guyane. *Patrimoines Naturels* 45: 1–388.
- MacCulloch, R.D. and A. Lathrop. 2006. *Stefania evansi*. Catalogue of American Amphibians and Reptiles 827: 1–3.
- MacCulloch, R.D. and A. Lathrop. 2009. Herpetofauna of Mount Ayanganna, Guyana: Results of the Royal Ontario Museum Ayanganna Expedition 2000. *Contributions in Science, Royal Ontario Museum* 4: 1–35.
- MacCulloch, R.D., A. Lathrop, R.P. Reynolds, J.C. Señaris and G.E. Schneider. 2007. Herpetofauna of Mount Roraima, Guiana Shield region, northeastern South America. *Herpetological Review* 38: 24–30.
- MacCulloch, R.D. and R.P. Reynolds 2012. Amphibians and reptiles from Paramakatoi and Kato, Guyana. *Check List* 8(2): 207–210.
- McDiarmid, R.W. and M.A. Donnelly. 2005. The herpetofauna of the Guayana Highlands: amphibians and reptiles of the Lost World; p. 461–560 In M.A. Donnelly, B.I. Crother, C. Guyer, M.H. Wake and M.E. White (ed.). *Ecology and evolution in the tropics: a herpetological perspective*. Chicago: University of Chicago Press.
- Reynolds, R.P. and R.D. MacCulloch. 2012. Preliminary checklist of amphibians and reptiles from Baramita, Guyana. *Check List* 8(2): 211–214.
- Reynolds, R., R.D. MacCulloch, M. Tamessar and C. Watson. 2001. Checklist of the herpetofauna of Guyana. Electronic database accessible at <http://www.mnh.si.edu/biodiversity/bdg>. Captured on 26 August 2013.
- Señaris, J.C. and R. MacCulloch. 2005. Amphibians; p. 9–23. In: T. Hollowell and R.P. Reynolds (ed.). *Checklist of the terrestrial vertebrates of the Guiana Shield*. Bulletin of the Biological Society of Washington 13: 98 pp.
- Starace, F. 1998. *Guide des serpents et amphibiens de Guyane*. Guadeloupe: Éditions Ibis Rouge. 449 p.
- Zaher, H., F.G. Grazziotin, J.E. Cadle, R.W. Murphy, J.C. Moura-Leite and S.L. Bonatto. 2009. Molecular phylogeny of advanced snakes (Serpentes, Caenophidia) with an emphasis on South American Xenodontines: a revised classification and descriptions of new taxa. *Papéis Avulsos de Zoologia* 49(11): 115–153.

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