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1 **Observations of aquatic behaviour in Malagasy ground boas**  
2 ***Acrantophis madagascariensis* (Duméril & Bibron, 1844) and *A.***  
3 ***dumerili* Jan, 1860**

4  
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14 Madagascar possesses a diverse snake fauna comprising over 90 species in four families  
15 (Jenkins et al. 2014; Nagy et al. 2015). However, while recent years have seen the description  
16 of several new taxa (e.g. Vieites et al. 2010; Glaw et al. 2013) and important advances in our  
17 understandings of snake systematics (e.g. Nagy et al. 2012, 2015), our knowledge of Malagasy  
18 snake ecology and behaviour remains patchy, and entirely lacking for many species (Rosa et  
19 al. 2016). This is the case even for charismatic, widespread and economically important species  
20 such as the boas, family Boidae (Vences & Glaw 2003).

21

22 Madagascar's boas consist of three or four species in two genera, *Acrantophis* (ground boas)  
23 and *Sanzinia* (tree boas) (Raxworthy 2003; Vences & Glaw 2003; Reynolds et al. 2014). Both  
24 species of ground boa are widespread, with the Madagascar ground boa (*Acrantophis*  
25 *madagascariensis*) occurring through much of northern Madagascar and Dumeril's ground boa  
26 (*A. dumerili*) restricted to southern regions (Vences & Glaw 2003). Both species occur in a  
27 range of forest and open habitats and share similarities in known behaviour and diet: they are  
28 ground-dwelling and active nocturnally and diurnally (Raxworthy 2003), and predate  
29 mammals including rodents, tenrecs and lemurs (Brygoo 1982; Sommer 2000; Goodman 2003;  
30 Gardner et al. 2015). *Acrantophis madagascariensis* also takes birds in captivity (Branch &  
31 Erasmus 1976). Here, we present the first observations of aquatic behaviour in both  
32 *Acrantophis* species, providing further insights into their behaviour and ecology.

33

34 On 29<sup>th</sup> December 2013 CJG and LDJ visited Grotte Mitoho (24°02'51"S, 43°45'13"E), a  
35 shallow cave on the western edge of the limestone Mahafaly Plateau in Tsimanampesotse  
36 National Park (southwest Madagascar). The cave is permanently flooded, and one of the few  
37 areas in the region where freshwater is available (Goodman and Jungers 2014): as a result it is  
38 regularly visited by ring-tailed lemurs *Lemur catta* (Sauter et al. 2013) and birds such as  
39 Madagascar turtle dove *Nesoenas picturata* (CJG and LDJ pers. obs.) that come to drink at the  
40 water's edge. National Park guides also state that the cave is permanently inhabited by an adult  
41 *Acrantophis dumerili* (Francisco pers. comm., Julien Anselme pers. comm.). At 06.38 we  
42 entered the cave and found the boa lying in the open along the water's edge, with most of its  
43 body submerged (Fig. 1). We left after a few minutes but returned at 16.53 to find that the  
44 snake had moved along the water's edge and was now almost fully submerged, and hidden  
45 behind the submerged roots of a fig tree, with only the nostrils and top of the head above water.  
46 We accidentally disturbed the snake as we approached, at which point it withdrew its head

47 underwater and behind the roots, so that it was completely submerged. We did not wait for it  
48 to re-emerge.

49

50 [Figure 1]

51

52 On 21<sup>st</sup> July 2014 NM and CE were conducting a herpetological survey in the vicinity of Lake  
53 Matsedroy (15°29'18"S, 46°38'57"E), a permanent lake approximately 5 ha in area (though  
54 highly variable in size seasonally), which is part of the Matsedroy forest fragment of Mariarano  
55 Classified Forest (northwest Madagascar). At approximately 20:00 (about 2.5 hours after  
56 sunset) we encountered an adult *A. madagascariensis* stationary in the water, less than 0.5 m  
57 from the lake edge (Fig. 2). The snake was fully submerged apart from the head. The boa was  
58 captured and measured before being released at the same location: it measured 1.7 m in length  
59 and weighed 2.5 kg, and was noticeably thin.

60

61 [Figure 2]

62

63 Few Malagasy snakes are known to forage in or otherwise use aquatic habitats: *Liopholidophis*  
64 *sexlineatus* is semiaquatic and *Thamnosophis lateralis* is often found in water (Cadle 2003;  
65 Glaw & Vences 2007), while *Madagascarophis meridionalis* appears to hunt aquatic frogs in  
66 streams of Isalo National Park (Rosa et al. 2016). However, although *Acrantophis*  
67 *madagascariensis* frequently occurs near rivers and streams (Raxworthy 2003), we are not  
68 aware of any published observations of aquatic behaviour in Malagasy boas (C. Raxworthy  
69 pers. comm., F. Glaw pers. comm.). C. Raxworthy (pers. comm.) has observed *A. dumerili*  
70 crossing a shallow stream, but in both the cases that we report here the boas were stationary in  
71 non-flowing bodies of water. Since they were not traversing the water bodies, the animals may  
72 have been submerged either for thermoregulation or foraging purposes. However, we do not  
73 believe that thermoregulation is a likely explanation due to the different thermal conditions in  
74 which the two observations were made: the *A. dumerili* was observed during the day in the hot  
75 season (though in a cave significantly cooler than the surrounding landscape), while the *A.*  
76 *madagascariensis* was observed at night in mid-winter.

77

78 Little is known about the foraging mode of Malagasy ground boas but, unlike many aquatic  
79 snakes which actively hunt prey such as fish and amphibians (e.g. Bilcke et al. 2006), the boas  
80 we observed were stationary. We therefore believe that they were engaged in 'sit-and-wait'

81 ambush predation. Ambush predators select microhabitats in order to maximise encounters  
82 with prey (Eskew et al. 2009), and in this respect it is notable that both observations were made  
83 in semi-arid areas lacking abundant surface water: in such contexts, diverse animal species may  
84 visit watercourses to drink and thus occur at higher densities than in the surrounding landscape,  
85 increasing the probability of prey encounters. Since both water bodies lacked surrounding  
86 vegetation, lying within the water may have offered the snakes the only opportunities to conceal  
87 themselves from potential prey animals.

88

### 89 **Acknowledgements**

90 We thank Barry Ferguson for support with fieldwork in Mariarano.

91

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156

157 **Figures**

158

159 Fig.1A Dumeril's ground boa, *Acrantophis dumerili*, lying partially submerged at the edge of  
160 a pool in Grotte Mitoho, Tsimanampesotse National Park, southwest Madagascar. The snake  
161 is submerged from just behind the head. 1B Wider view of Grotte Mitoho (boa not present).

162 Photos: Louise Jasper.

163



164

165

166 Fig.2A Madagascar ground boa *Acrantophis madagascariensis* submerged at the edge of  
167 Lake Matsedroy, northwest Madagascar. 2B Wider view of Lake Matsedroy. Photos: Naidi  
168 McDonnell.

169



170