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**ZONOSAURUS LATICAUDATUS** (Western girdled lizard): SEMIAQUATIC DEFENSIVE BEHAVIOUR. *Zonosaurus laticaudatus* is a medium sized lizard with an average SVL of 135mm (Glaw & Vences, 1994) which can be identified by the presence of a lateral fold of skin which runs along the neck terminating at the inguinal region, dorsolateral stripes that begin behind rather than on the head, strongly keeled dorsal scales and the possession of prefrontal scales that are clearly in contact with each other (Glaw & Vences, 1994).

This species belongs to the family Gerrhosauridae and is one of 17 genera endemic to Madagascar. Members of this genus have been divided into one of three different categories

dependent upon their distribution across the island: those with very restricted distributions, those occurring across regions within well-defined bioclimatic areas and those with very broad distributions across bioclimatic zones (Raselimanana, 2003).

*Zonosaurus laticaudatus* fits into the third of these categories as it is found in three separated areas located in the northwest, west, and south (Raselimanana, 2003). Two possible explanations have been forwarded to explain this current distribution. The first suggests that at some point this species must have possessed a continuous distribution over Madagascar and that the current disjunct range is the result of local extirpation in certain zones or separation of populations associated with ecological change (Raselimanana, 2003). The alternative theory is that populations originated in the southeast with subsequent expansion into the west and north (Raselimanana, 2003).

This relatively large and conspicuous species has been the focus of numerous studies that have resulted in detailed behavioural observations (see Avery, 1979; Brygoo, 1985; Glaw & Vences, 1994, Henkel & Schmidt, 2000; Raselimanana, 2003 and Raselimanana *et. al.*, 2005). These observations have highlighted certain aspects of its ecology that may be responsible for its current distribution. Firstly, this species is highly adaptable with regard to structural microhabitat as rupicolous, terrestrial and arboreal behaviour has been documented (Raselimanana, 2003). Secondly, it does not appear to be limited by the physical factors of temperature and humidity as populations have been found in dry, humid, and transitional forest (Raselimanana, 2003). Finally, *Z. laticaudatus* is a generalist, opportunistic feeder with a varied diet which is known to include invertebrates and fruit (Urbani & Bels, 1995).

This paper intends to add to this current knowledge by documenting the behaviour of individuals from a population located in the south of the island. In particular, it draws attention to previously undocumented observations and highlights how (together with the existing ecological knowledge detailed above) they may have contributed to the current wide and disjunct distribution of this species across Madagascar.



**Figure 1.** *Zonosaurus laticaudus*. Spet Lacs, 2005. Photograph © N. D'Cruze.

In January 2005 The Frontier-Madagascar Forest Research Programme conducted a biodiversity survey in the Sept Lacs region (S 23° 28' - S 23° 31', E 44° 04' - E 44° 10'), which is a core area of gallery forest found in the Parc Regional de Belomotse, southeast Madagascar. Behavioural observations of this species were made between 14<sup>th</sup> January and 28<sup>th</sup> January, during the wet season.

Members of this population appeared terrestrial in nature as all sightings occurred on the forest floor. Individuals typically selected exposed rocks in open areas amongst vegetation on which to bask and were observed displaying typical 'heliotherm shuttling' behaviour as described by Avery (1979). This behaviour was responsible for the majority of sightings which occurred between 10:00 and 12:00 hr in the morning and 14:00 and 16:00 hr in the afternoon when the sun was at its strongest.

Interestingly, of the 11 lizards observed during this period, 4 individuals were missing forelimbs. Although limb regeneration has been observed in both *Z. ornatus* (Brygoo, 1985) and *Z. haraldmeieri* (Raselimanana, 2000) this is a phenomenon which has not been recorded in populations of this species before. Predators such as snakes of the genus *Leioheterodon* and birds of prey such as *Falco eleonorae*, which were also observed in the area, are most likely responsible for these injuries.

Additionally, during this study one individual displayed a previously undescribed semi-aquatic defensive flight response. When disturbed while basking on a rock adjacent to a medium sized pool,

this individual dived into the water in an attempt to escape. Once in the water this lizard swam for approximately 50 cm before diving down to a depth of around 20 cm, submerging itself in the layer of leaf litter substrate located at the bottom. It remained there for approximately three minutes before surfacing for air and returning once again to the bottom of the pool. This type of behaviour has been previously observed in *Zonosaurus maximus* (known locally as the 'petite caiman') which is renowned for its semi aquatic nature (Glaw & Vences, 1994). However, until now it was the only member of this genus that has been known to flee into water in times of danger.

In conclusion this paper details two new observations regarding the behavioural ecology of this species. Firstly this lizard is able to survive serious injuries resulting from predation events that might prove fatal for other organisms. Secondly it documents semi aquatic behaviour which may have allowed this species to overcome hydrographic dispersal barriers (e.g. the Onhilay River in the south) which are believed to be responsible for the highly restricted ranges of other closely related species such as *Z. trilineatus* (Raselimanana, 2003).

If considered in conjunction with the current knowledge regarding the ecology of this species these observations have far reaching implications with regards to the ubiquitous distribution of this species. Upon crossing hydrographic dispersal barriers the generalist attitude of this species towards structural microhabitat, microclimatic conditions, and its diet would have been instrumental in allowing it to survive in widely contrasting habitats. This information suggests that range extensions into the west and north of the island are a feasible explanation for the current distribution of this species.

Although this paper has served to highlight previously unrecorded aspects of the ecology of this endemic Malagasy lizard, further research into its behavioural ecology are required in order to ascertain conclusive evidence regarding its role in the distribution of this species.

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