
ARTICLES

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Notes on the Natural History of Blue-tailed Monitors (*Varanus doreanus*) in Australia

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Abstract - The blue-tailed monitor (*Varanus doreanus*) is a large but poorly known lizard described from New Guinea and adjacent islands. Recently, *V. doreanus* was recorded from mainland Australia, but its extent of occurrence there and aspects of its natural history remain unknown. We provide basic notes on the habitat associations, morphometrics, male combat, diet, predation and relative abundance of *V. doreanus*, based on observations of 12 specimens from the northern tip of Cape York Peninsula, Australia. We conclude by providing an assessment of the distribution range and conservation status of *V. doreanus* in Australia.

Introduction

The blue-tailed monitor (*Varanus doreanus* [Meyer 1874]) is a large monitor lizard (< 1.6 m) described from New Guinea and surrounding islands (Böhme *et al.*, 1994; Ziegler *et al.*, 2007). In the 1990s, examination of specimens held in European museum collections suggested that *V. doreanus* also occurred on the Australian mainland (Ziegler *et al.*, 1999; Ziegler *et al.*, 2001). However, the specimens' locality data were vague (referring only to "Queensland, Australia") and herpetologists did not recognize the species' occurrence in the country until recently (Cogger, 2014; Wilson, 2015). Since then, several photographs of specimens resembling *V. doreanus* were taken in the Iron Range area of Cape York Peninsula, Australia. Finally, detailed examination of *V. indicus* specimens held in the collections of the Queensland Museum revealed they were in fact *V. doreanus* (Weijola *et al.* 2016; Weijola,

pers. comm. 2017). The species' remote distribution and superficial similarity to the mangrove monitor (*V. indicus*) are the primary reasons for it remaining unrecorded for so long (Ziegler *et al.*, 1999).

Few field studies have been conducted on *V. doreanus* in its native range (but see Phillip, 1999), and they remain one of the rarest monitor lizards in zoological gardens worldwide (< 10 specimens; Ziegler *et al.*, 2016; although they are moderately common in the pet trade, S. Sweet, pers. comm. 2017). Hence, basic information on the natural history of the species is lacking. In 2013, we began a field study on the ecology of tropical snakes in the vicinity of the Lockerbie Scrub, near the town of Bamaga at the northern tip of Cape York Peninsula, Australia (*e.g.*, see Natusch *et al.*, 2016). While undertaking fieldwork we made observations of 12 specimens of *V. doreanus*. Here, we use those observations to describe aspects of the species' natural history, and discuss its conservation status in Australia.

Materials and Methods

Data collection

While conducting fieldwork in New Guinea from 2009 to 2011, we observed 70 live specimens of *V. doreanus* at wildlife traders' premises (to be sold as pets) and in the wild (Natusch & Lyons, 2012). In addition, we observed 68 specimens of *V. indicus* and three specimens of *V. jobiensis*, against which comparisons could be made. Based on this experience, we are confident in our ability to correctly identify specimens of *V. doreanus*. We did observe many more than 12 monitor lizards while conducting fieldwork in the Lockerbie Scrub, some of which were undoubtedly *V. doreanus*. However, many of those sightings were only fleeting glances of fast-moving lizards in dense undergrowth, and so we have only recorded observations where we are certain the specimen was *V. doreanus*.

Study site and habitat associations

The observations reported in this paper all occurred in the Lockerbie Scrub, at the extreme northern tip of

Cape York Peninsula, Queensland (Fig. 1). The climate there is hot year-round (27 to 33 °C) with an average annual rainfall of 1,744 mm (range = 1,268 to 3,184 mm), most of which falls during the summer monsoon (December to April; Bureau of Meteorology, 2016). The rest of the year remains relatively dry with frequent fires (at least in woodland vegetation). The Lockerbie Scrub is characterized by semi-deciduous notophyll vine forest (hereafter referred to as "rainforest"), interspersed and surrounded by tropical woodlands dominated by *Corymbia tessellaris*, *C. clarksoniana* and/or *Eucalyptus brassiana* (Nelder & Clarkson, 1995; Stanton & Fell, 2005).

Most observations of *V. doreanus* occurred deep within the rainforest (Fig. 2). The exceptions were four specimens collected or observed on roads transecting tropical woodlands. On all occasions, rainforest habitat was < 50 m away. We never observed a monitor lizard resembling *V. doreanus* in tropical woodland away from rainforest. It is therefore reasonable to assume that this species is closely associated with rainforests in Australia. By contrast, we never observed the closely related *V. indicus* within the inland rainforest of the Lockerbie Scrub. All specimens of that species were

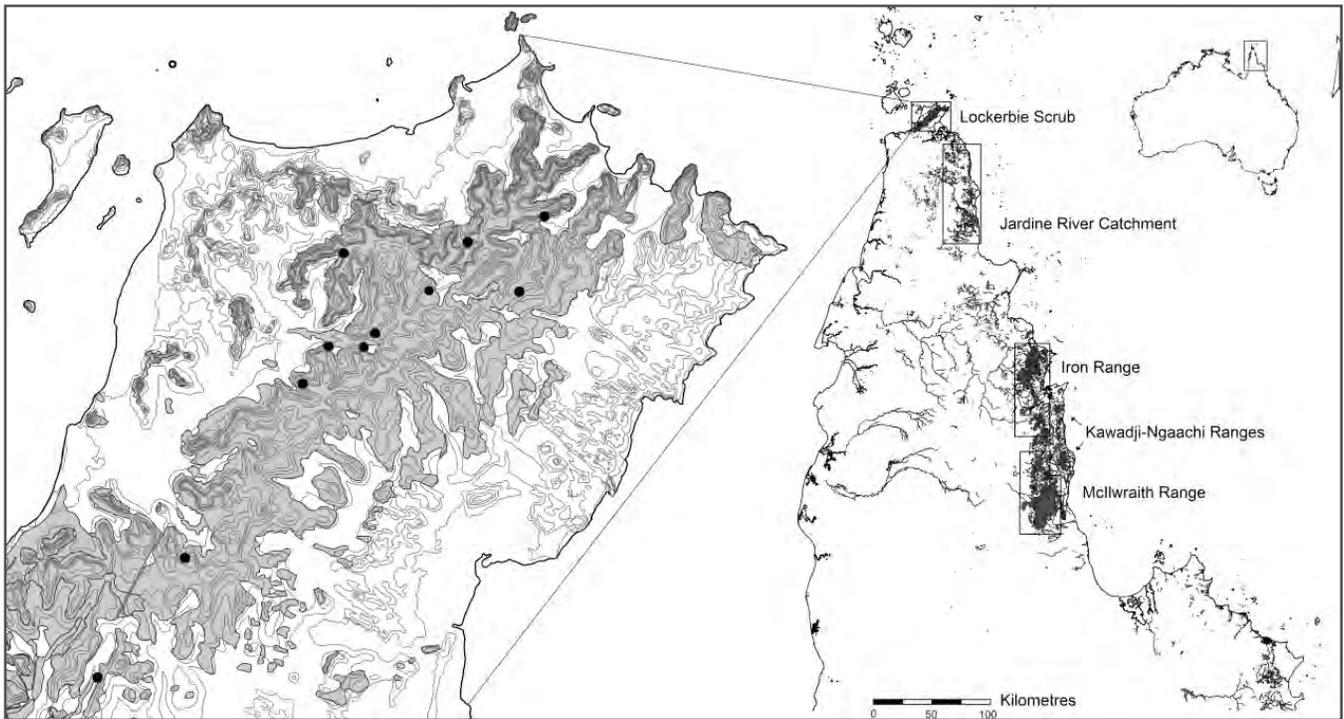


Fig. 1. The Lockerbie Scrub at the northern tip of Cape York Peninsula, Australia, where *Varanus doreanus* were observed (black dots) in relation to semi-deciduous notophyll vine forest (grey shading). The map also shows the Lockerbie Scrub in relation to other major rainforest habitats on Cape York Peninsula (based on regional ecosystem mapping for Queensland; Neldner & Clarkson, 1995; Sattler & Williams, 1999). *Varanus doreanus* has also been recorded from the Iron, McIlwraith and Kawadji-Ngaachi ranges, but is yet to be recorded from the Jardine River Catchment.



Fig. 2. Typical rainforest habitat of *V. doreanus* in the Lockerbie Scrub, at the northern tip of Cape York Peninsula, Australia. Photograph by **Daniel Natusch**.

observed in mangroves or in rainforest near the coast. That being said, DJDN has observed true *V. indicus* at 400 m a.s.l in the McIlwraith Range (Fig. 2; D. Natusch unpubl. data, 2008), suggesting the species may be more broadly distributed in the Lockerbie Scrub but simply not recorded by us.

Results

Morphometrics

On 16 August 2013 and 9 March 2016 we encountered two specimens of *V. doreanus* killed on a dirt road in the vicinity of the Lockerbie Scrub. The first specimen was a sexually mature male (assumed by its size), measuring 630 mm from snout-to-vent (SVL) and 910 mm from vent to tail tip. This specimen therefore represents a maximal size record for this species (Fig. 3b). The second specimen was a female, measuring 310 mm SVL and 500 mm from vent to tail (Fig. 3a). Dissection of the female specimen revealed that she had not undergone a reproductive event (determined by the absence of vitellogenic follicles, thickened oviducts and corpora albicantia indicative of ovulation) and was thus likely to be physiologically immature. Both specimens contained ectoparasites (ticks) common to snakes and other monitors in the area (D. Natusch, unpubl. data).

Diet

While surveying a colony of metallic starlings

(*Aplonis metallica*) we observed a small (estimated 300 mm SVL) *V. doreanus* approximately 10 m up the trunk of the colony's host tree. We did not observe the specimen entering starling nests, but speculate that it was preying upon starling eggs or chicks. In keeping with this, Phillip *et al.* (2007) recorded a bird in the stomach of the closely related *V. semotus* from Mussau Island (Weijola *et al.*, 2016). Finally, dissection of the small female specimen (SVL 310 mm, see above) found dead on the road revealed its stomach to contain few content except for the remains of unidentified coleopterans (as has been shown previously; Phillip *et al.*, 2007).

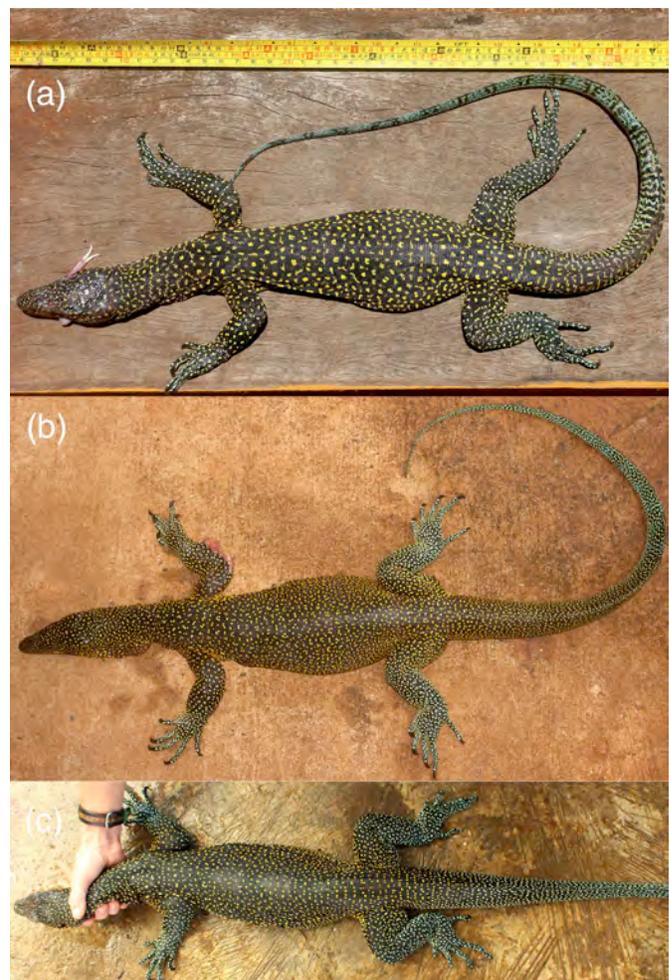


Fig. 3. Comparison of *V. doreanus* dorsal pattern between (a) a female specimen (310 mm SVL) from the Lockerbie Scrub, Cape York Peninsula, Australia, (b) a male specimen from the Lockerbie Scrub (630 mm SVL), and (c) a male specimen (not measured) from Muting, southern Papua, Indonesia. Note the ontogenetic change in colour pattern between (a) smaller and (b, c) larger specimens. Photographs by **Daniel Natusch**.

Male combat

On 8 December 2013, DJDN observed two large male (> 500 mm SVL) *V. doreanus* engaged in ritualized combat next to a dirt road in the vicinity of the Lockerbie Scrub. The specimens were in tropical woodland habitat, but closed rainforest was approximately 20 m away. The specimens were on their hind-legs, engaged in combat typical of other varanids. The combat ritual was observed for fewer than 10 seconds before the lizards disengaged and fled into the surrounding rainforest.

Predation

On 20 May 2015, a male black-headed python (*Aspidites melanocephalus*) measuring 1700 mm SVL with a mass of 1068 g (measured without stomach contents) regurgitated a female (approximately 200 mm SVL) *V. doreanus*. The specimen was partly digested, but identifiable by its bright blue-banded tail. The python was captured in tropical woodland, but only 20 m from rainforest. Black-headed pythons frequently consumed monitor lizards at our study site (usually *V. panoptes* and *V. scalaris*), and may represent a common predator for *V. doreanus* (D. Natusch, unpubl. data).

Discussion**Distribution within Australia**

In addition to occurring in the Lockerbie Scrub, *V. doreanus* has also been recorded from semi-deciduous mesophyll vine forests in the vicinity of Lockhart River (Iron Range), 230 km to the south (Fig. 4). It also occurs in the nearby McIlwraith Range, as well as the Kawadji-Ngaachi Ranges (V. Weijola, pers. comm. 2017; Fig. 1).

The occurrence of *V. doreanus* in the Lockerbie Scrub strongly suggests that this species is not confined

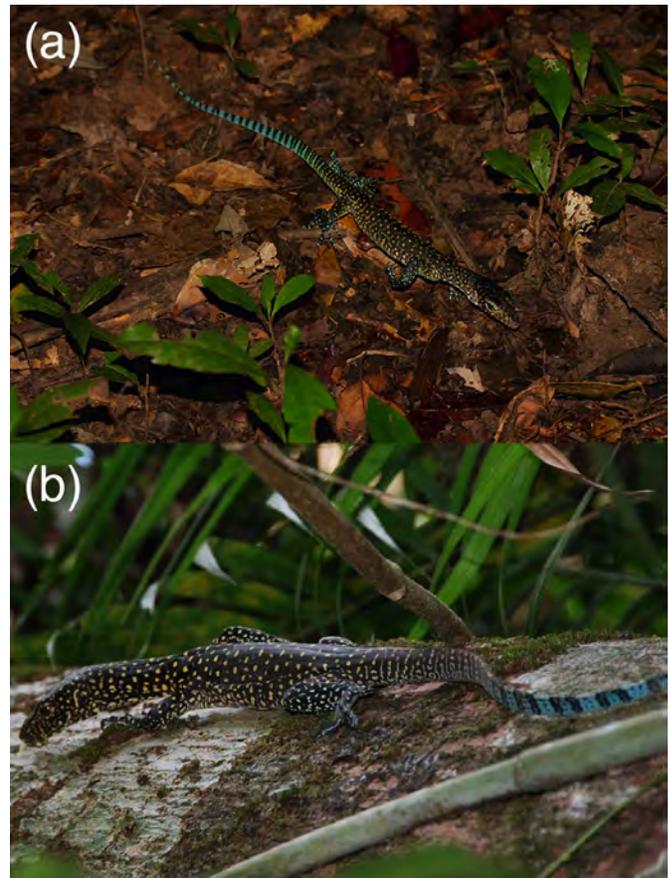


Fig. 4. Two young *V. doreanus* from the Iron Range area, Cape York Peninsula, Australia (approximately 230 km south of the Lockerbie Scrub). Photographs by (a) **Ricky Mackenzie** and (b) **David Newman**.

to well-developed rainforest. Unlike other obligate rainforest species (*e.g.*, the eclectus parrot [*Eclectus roratus macgillivrayi*] and the green python [*Morelia viridis*]; Legge *et al.*, 2004; Natusch & Natusch, 2011), *V. doreanus* must have persisted in the Lockerbie Scrub

Table 1. Extent of closed forest on Cape York Peninsula suitable for *Varanus doreanus*. Values from Neldner & Clarkson (1995) and adapted from Natusch & Natusch (2011). All values in km².

Rainforest site	Extent of rainforest habitat	Percent in protected areas
Lockerbie Scrub	87	0%
Jardine River Catchment	241	100%
Iron Range	532	73%
McIlwraith Range	1,512	62%
Total	2,372	58%



Fig. 5. A *Varanus doreanus* from the Lockerbie Scrub, Cape York Peninsula, Australia, escapes up a nearby tree. Photograph by **Anders Zimny**.

during periods of glaciation and continental drying. At those times, the extent of rainforest vegetation on Cape York diminished considerably, and probably disappeared almost completely from the Lockerbie Scrub (Nix & Kalma, 1972; Kikkawa *et al.*, 1981; Rowe, 2007).

This ability to persist in drier vine thickets indicates that *V. doreanus* probably also occurs in the rainforests

of the Jardine River Catchment (Fig. 1). In terms of southern distribution, *V. doreanus* is unlikely to occur south of the Princess Charlotte Bay dry corridor in southern Cape York (in keeping with many other species of Papuan origin; *e.g.*, see Natusch & Natusch, 2011). Therefore, assuming an almost continuous distribution within suitable habitat in the major rainforests of Cape York Peninsula, we estimate that *V. doreanus* has an Australian range of 2,372 km² (Table 1).

Abundance and conservation status of Varanus doreanus in Australia

We do not consider *V. doreanus* to be rare in the Lockerbie Scrub. That being said, we conducted fieldwork in rainforest habitat almost daily for four years but only recorded 12 specimens. A possible explanation for this is that, in contrast with several other Australian monitors, *V. doreanus* is extraordinarily elusive (Fig. 5). This is undoubtedly a major factor contributing to it remaining undetected in Australia, and we suspect the species is more abundant than it appears (Fig. 6). We consider *V. doreanus* to be the most common rainforest monitor in the Lockerbie Scrub rainforest. In comparison, Phillip *et al.* (1999) recorded remarkably high densities of this species within a riverbed in West Papua, Indonesia (13 specimens within 600 m²). A similar situation occurs in the Lockerbie Scrub. Four individuals (adults and juveniles) were seen congregating around a pool of water in the bed of a rainforest stream in the late dry season (L. McIntyre, pers. comm. 2016).

Varanus doreanus in Australia is subject to few threatening processes. Introduced cane toads (*Rhinella marina*) severely impacted populations of monitor lizards in other parts of Australia (Shine, 2010), and



Fig. 6. A camera trap photograph of a young *V. doreanus* in the Lockerbie Scrub, Cape York Peninsula, Australia. Interestingly, we recorded only two photographs of monitor lizards from > 20,000 photographs of > 100,000 animals in the Lockerbie Scrub – both were *V. doreanus* (Natusch *et al.*, 2016).

probably impacted *V. doreanus* in a similar way when they first reached Cape York Peninsula. Despite this, and despite a continually high abundance of cane toads in the Lockerbie Scrub, the *V. doreanus* population there has likely stabilized. In conclusion, based on the species' estimated area of occupancy (2,372 km²), lack of known threats, and extremely remote distribution (much of which occurs in protected areas), we consider the conservation status of *V. doreanus* in Australia to be of least concern (IUCN, 2001).

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References

- Böhme, W., H.G. Horn & T. Ziegler. 1994. Zur Taxonomie der Pazifikwarane (*Varanus indicus*-Komplex): Revalidierung von *Varanus doreanus* (A.B. Meyer, 1874) mit Beschreibung einer neuen Unterart. *Salamandra* 30: 119–142.
- Bureau of Meteorology 1887–1955. Monthly climate statistics. 2016. Available: http://www.bom.gov.au/climate/averages/tables/cw_027004.shtml.
- Cogger, H. 2014. *The Reptiles and Amphibians of Australia*. Reed Books, Sydney. 1033 pp.
- IUCN. 2001. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland/Cambridge, UK.
- Kikkawa, J., G. Monteith, & G.J. Ingram. 1981. Cape York Peninsula: Major region of faunal interchange. Pp. 1695–1742. *In*: Keast, A. (ed.), *Ecological Biogeography of Australia*. Dr. W. Junk, The Hague.
- Legge, S., R. Heinsohn & S. Garnett. 2004. Availability of nest hollows and breeding population size of eclectus parrots, *Eclectus roratus*, on Cape York Peninsula. *Wildlife Research* 31: 149–161.
- Natusch, D.J.D. & D.F.S. Natusch. 2011. Distribution, abundance and demography of green pythons (*Morelia viridis*) in Cape York Peninsula, Australia. *Australian Journal of Zoology* 59: 145–155.
- Natusch, D.J.D. & J.A. Lyons. 2012. Exploited for pets: The harvest and trade of amphibians and reptiles from Indonesian New Guinea. *Biodiversity and Conservation* 21: 2899–2911.
- Natusch, D.J.D., J.A. Lyons, G.P. Brown & R. Shine. 2016. Communally breeding birds create ecological hotspots in tropical Australia. *PLoS ONE* 11(10): e0162651.
- Neldner, V. J. & J.R. Clarkson. 1995. *Vegetation of Cape York Peninsula*. Department of Environment and Heritage, Brisbane. 141 pp.
- Nix, H. A. & J.D. Kalma. 1972. Climate as a dominant control in the biogeography of northern Australia and New Guinea. Pp. 61–91. *In*: Walker, D. (ed.), *Bridge and Barrier: The Natural and Cultural History of Torres Strait*. Research School of Pacific Studies, ANU, Canberra.
- Phillip, K.M. 1999. Niche partitioning of *Varanus doreanus*, *V. indicus* and *V. jobiensis* in Irian Jaya: Preliminary results. Pp. 307–316. *In*: Horn, H.-G. & W. Böhme (eds.), *Advances in Monitor Research II*, Mertensiella 11. Deutsche Gesellschaft für Herpetologie und Terrarienkunde, Rheinbach.
- Phillip K.M., T. Ziegler & W. Böhme. 2007. Preliminary investigations of the natural diet of six monitor lizard species of the *Varanus (Euprepiosaurus) indicus* group. Pp. 336–345. *In*: Horn, H.-G. & W. Böhme (eds.), *Advances in Monitor Research III*, Mertensiella 16. Deutsche Gesellschaft für Herpetologie und Terrarienkunde, Rheinbach.
- Rowe, C. 2007. A palynological investigation of Holocene vegetation change in Torres Strait, seasonal tropics of northern Australia. *Palaeogeography, Palaeoclimatology, Palaeoecology* 251: 83–103.
- Sattler, P. & R. Williams. 1999. *The Conservation of Queensland's Bioregional Ecosystems*. Environmental Protection Agency, Brisbane. 625 pp.
- Shine, R. 2010. The ecological impact of invasive cane toads (*Bufo marinus*) in Australia. *Quarterly Review of Biology* 85: 253–291.
- Stanton, P. & D. Fell. 2005. *The Rainforests of Cape York Peninsula*. Cooperative Research Centre for

- Tropical Rainforest Ecology and Management. Rainforest CRC, Cairns. 204 pp.
- Weijola, V., S.C. Donnellan & C. Lindqvist. 2016. A new blue-tailed monitor lizard (Reptilia, Squamata, *Varanus*) of the *Varanus indicus* group from Mussau Island, Papua New Guinea. *ZooKeys* 568: 129–154.
- Wilson, S. 2015. A Field Guide to Reptiles of Queensland. New Holland, Chatswood. 304 pp.
- Ziegler, T., K.M. Philipp & W. Böhme. 1999. Zum Artstatus und zur Genitalmorphologie von *Varanus finschi* Böhme, Horn et Ziegler, 1994, mit neuen Verbreitungsangaben für *V. finschi* und *V. doreanus* (Meyer, 1874) (Reptilia: Squamata: Varanidae). *Zoologische Abhandlungen, Staatliches Museum für Tierkunde, Dresden* 50: 267–279.
- Ziegler, T., W. Böhme, B. Eidenmüller & K.M. Philipp. 2001. A note on the coexistence of three species of Pacific monitor lizards in Australia (Sauria, Varanidae, *Varanus indicus* group). *Bonner Zoologische Beiträge, Bonn* 50:27–30.
- Ziegler T., A. Schmitz, A. Koch & W. Böhme. 2007. A review of the subgenus *Euprepiosaurus* of *Varanus* (Squamata: Varanidae): Morphological and molecular phylogeny, distribution and zoogeography, with an identification key for the members of the *V. indicus* and the *V. prasinus* species groups. *Zootaxa* 1472: 1–28.
- Ziegler, T., A. Rauhaus & I. Gill. 2016. A preliminary review of monitor lizards in zoological gardens. *Biawak* 10(1): 26–35.