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Overview on the Present Knowledge on *Varanus mabitang* Gaulke and Curio, 2001, Including New Morphological and Meristic Data

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Abstract: *Varanus mabitang*, a large arboreal monitor lizard, is endemic to the island of Panay in the central Philippines. It is confined to lowland evergreen rainforest, where it depends on a variety of forest fruits for food, and on tall forest trees for shelter. This habitat, and consequently also *V. mabitang*, are highly endangered because of ongoing logging and slash and burn activities. Measurements taken during field surveys give an average snout-vent length of 54.2 cm for adults; the largest measured animal had a total length of 175 cm. Scale counts show that meristic characters such as the number of transverse dorsal and ventral scales, and scales from rictus to rictus, are highly variable in this species.

Introduction

Unique to the Philippines is a small group of large and mainly arboreal monitor lizards. So far, they are only known from the Luzon faunal region in the north of the Archipelago (*Varanus olivaceus* Hallowell, 1856; *V. bitatawa* Welton, Siler, Bennett, Diesmos, Duya, Dugay, Rico, Weerd and Brown, 2010) and from Panay Island, which is part of the West Visayan faunal region in the center (*V. mabitang* Gaulke and Curio, 2001). These closely related species can be easily distinguished from all other monitor lizards by a combination of morphological and behavioural characters, among them blunt teeth, the presence of a large caecum, and a partly frugivorous diet. Their hemipenial and hemiclitoral morphology strongly supports a wide phylogenetic distance from other monitor lizards, and confirms the validity of the subgenus *Philippinosaurus* (erected by Mertens, 1959; discussed in Böhme, 1995; Ziegler and Böhme, 1997; Ziegler *et al.*, 2005). Due to their interesting and untypical varanid feeding habits, and their official conservation status (*V. olivaceus* is listed as vulnerable and *V. mabitang* as endangered in the IUCN Red List of threatened species), both species were, and are subject to intensive field investigations (e.g. Auffenberg, 1988; Bennett, 2001; Gaulke *et al.*, 2005, 2007; Gaulke and Demegillo, 2008).

Investigations on the feeding habits of *V. mabitang*, based on the examination of fecal pellets, disgorged stomach contents, feeding observations, and stable isotope analyses (a non-invasive method to gain insight into food web structures; Struck *et al.*, 2002; Gaulke *et al.*, 2007), revealed that this varanid is even more specialized for a frugivorous diet than *V. olivaceus*. In the diet of the latter species, land snails are of significant importance (Auffenberg, 1988; Bennett, 2001), while land snails and other carnivore food items comprise only a very small part of the diet of *V. mabitang*. In *V. mabitang*, we found evidence of folivory, which is not indicated in *V. olivaceus* (Gaulke *et al.*, 2007). This highly specialized diet is certainly the main limiting factor for the distribution of *V. mabitang* on Panay (Fig. 1). It is

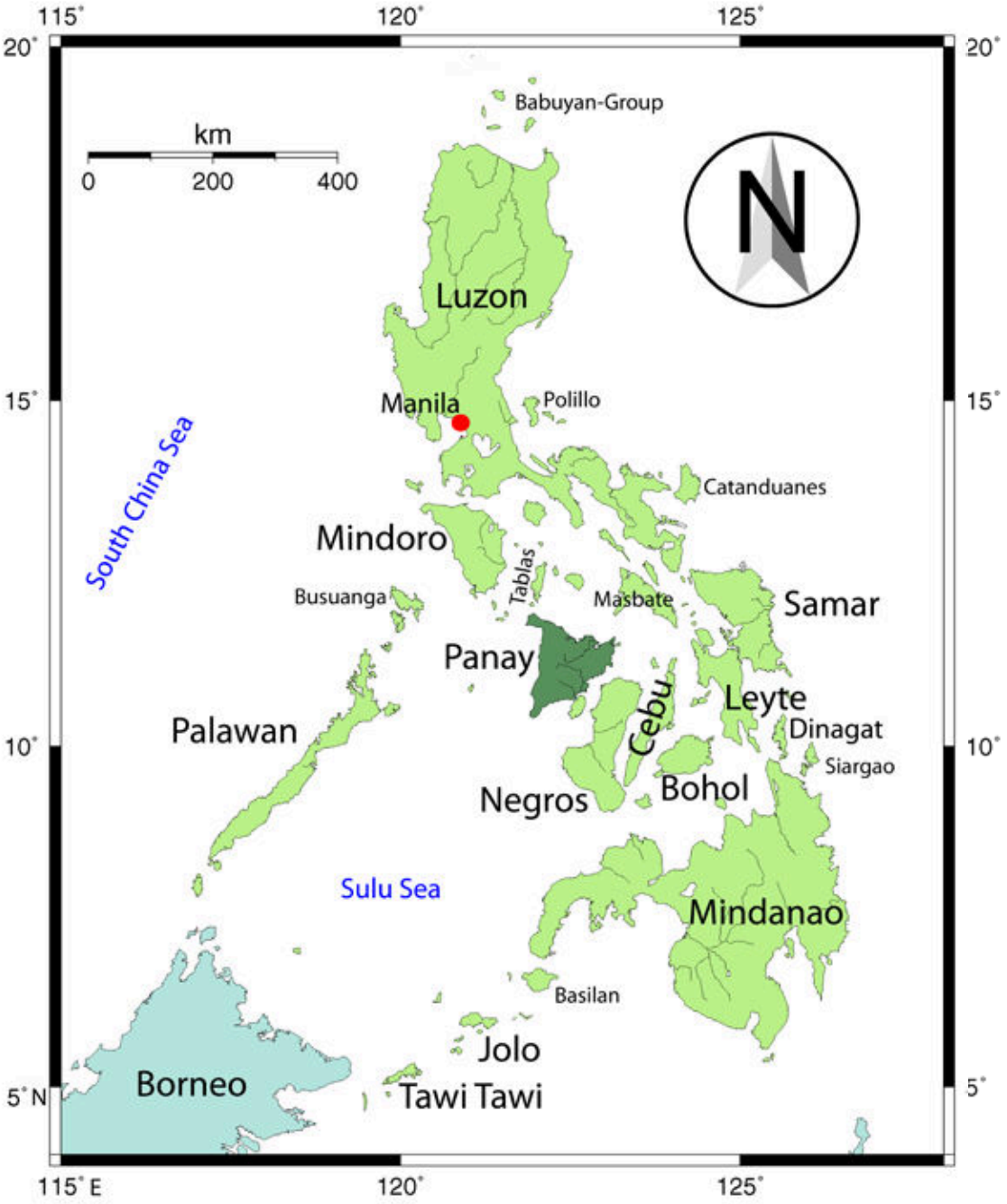

Fig. 1. Map of the Philippines. Panay Island, the range of *Varanus mabitang*, is indicated in dark green. Drawing by A.V. Altenbach.

confined to the evergreen lowland dipterocarp forest (Fig. 2), where it feeds on the fruits of at least 20 different forest trees. Most important are the fruits of screw palms (*Pandanus* spp.) and some palms (Family Arecaceae), whereas the fruits of different fig tree species (Family Moraceae) and others are less frequently eaten (Gaulke *et al.*, 2007). The population density of both *V. mabitang* and its preferred food trees, are highest below 500 m asl. Few specimens of *V. mabitang* were detected at higher elevations, with a maximum altitudinal distribution at around 1000 m asl.

Varanus mabitang are rarely sighted on the ground, usually while feeding on fallen fruits or basking in exposed areas. They spend most of their time resting on branches in the canopies of tall trees, or in tree cavities in the upper part of the trunk (Gaulke *et al.*, 2005).

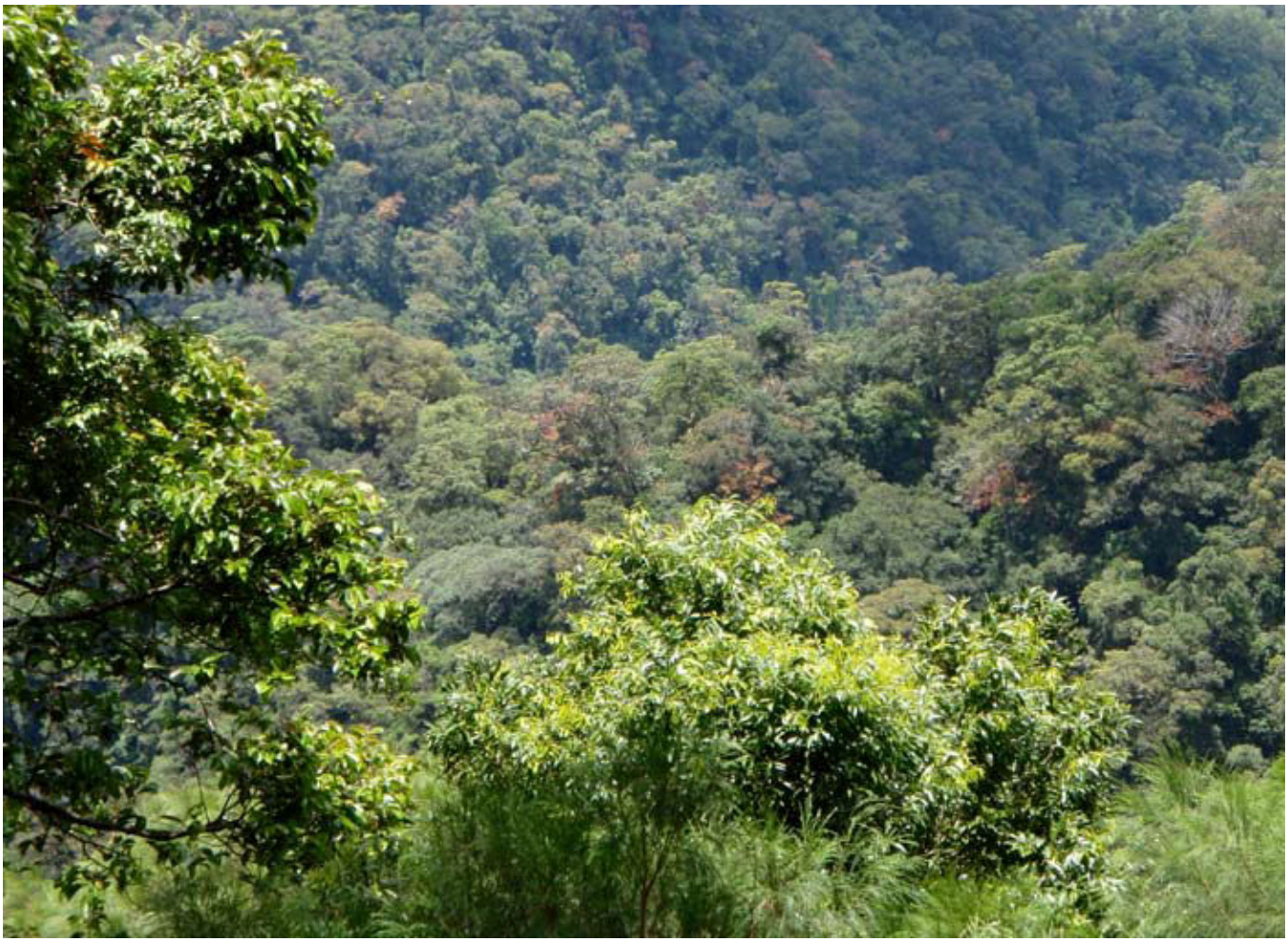

Fig. 2. Typical habitat of *V. mabitang*, the lowland evergreen rainforest along the Central Panay Mountain Range.

Radiotelemetric observations of several individuals show that they do not use the same resting trees, but make use of all adequate trees (preferably very tall, with a smooth trunk) within their individual ranges. One specimen, for example, used at least 70 different resting trees within a period of two years. The detailed results of the radiotelemetric study will be published in a forthcoming report (Gaulke, in prep.).

Since the description of *V. mabitang* (Gaulke and Curio, 2001), which was based on the holotype (PNM 7272) and some additional data on one captured and subsequently released individual, several additional specimens have been examined. Here, data from these examinations are presented to show the range in size and the rather high variability of some of the meristic characters of *V. mabitang*.

Material and Methods

Twenty-five specimens of *V. mabitang* were captured between 2001 and 2009. All of them were released at their capture sites after taking measurements and scale counts, and marking them permanently with passive integrated transponders. To minimize stress, only some of the standard measurements and scale counts were taken, namely snout-vent length (SVL), tail length (TaL), mass, transverse rows of ventrals and dorsals from the gular fold to the insertion of hindlegs, scales from rictus to rictus, and the number of enlarged supraoculars. Measurements were taken with a tape measure to the nearest cm or mm, depending on the behaviour of the respective animal. While most specimens were very timid during handling (Fig. 3) and could be easily examined, a few were more lively, and did not relax their muscles during measuring. Weights were taken with +/- 10 g accuracy in small individuals, and +/- 100 g in the largest individuals (a more exact balance did not make sense, since the animals usually did not have empty stomachs even after two days, the maximum time an animal was kept before bringing it back to its capture

Fig. 3. Even large individuals of *V. mabitang* are usually very relaxed during examination.

Fig. 4. *Varanus mabitang* during the counting of transverse ventral scale rows.

site). While counting, the scales were marked with a pencil in order not to lose track (Fig. 4). Nevertheless, all scale counts were taken three times to receive reliable results.

Results and Discussion

Table 1 gives the lengths and masses of *V. mabitang*, compared to data from *V. olivaceus* and *V. bitatawa*. Not all data can be directly compared. Auffenberg (1988) dissected all of the examined specimens, and therefore could safely distinguish between males and females, and between mature and immature individuals. Consequently, he separated his measurements of adults according to sex, showing that males attain a much larger length than females. Not all of the examined *V. mabitang* could be sexed with certainty (e.g., males were identifiable when everting their hemipenes during handling), since probing of the hemipenal pockets did not show clear results. Only two of the 25 examined specimens (with a SVL of 34 and 38 cm, respectively) were considered as not mature, based on Auffenberg's data containing no mature individuals with a SVL of less than 40 cm. Table 1 shows that the average length of adult *V. mabitang* is slightly larger than *V. olivaceus*, and lower than *V. bitatawa* (so far based on only three examined specimens), while the average mass of adult *V. mabitang* is slightly lower than *V. olivaceus*. The mass difference between *V. mabitang* and *V. olivaceus* is more pronounced in smaller individuals (Gaulke *et al.*, 2005) than in large ones. The largest *V. mabitang* measured to date had a total length of 175 cm. However, several hunters or former hunters have reported animals of more than two metres in length.

The Tal/SVL ratio of *V. mabitang* ranges from 1.36–1.61; a relation between size and Tal/SVL ratio is not evident. Nevertheless, this might prove to be different when hatchlings and young juveniles are examined.

Table 2 shows the variability of some meristic characters of *V. mabitang*, *V. olivaceus*, and *V. bitatawa*. The range of the scale counts is higher in *V. mabitang* when compared to both sister species. The average numbers of the transverse rows of ventrals and dorsals are distinctly higher in *V. mabitang*, even though the highest ventral counts for *V. olivaceus* are overlapping with the lowest ventral counts for *V. mabitang*. Another scale count given in the species diagnosis as a distinguishing character between *V. mabitang* and *V. olivaceus* turns out to be of no value when looking at more material. While the number of scales from rictus to rictus is 70 in the holotype, the new counts show that this was untypically high. The range in rictus to rictus counts turned out to be rather high in *V. mabitang*, with an only slightly higher average count than in *V. olivaceus*, while it is comparably high in *V. bitatawa*.

Table 3 summarizes the coloration differences between the three species. Nothing new can be added here. All examined *V. mabitang* were almost uniformly dark (Figs. 3 & 4), as compared to the much lighter and distinctly banded *V. olivaceus*, and the very brightly colored *V. bitatawa*. No hatchlings of *V. mabitang* were seen during the surveys, though the youngest examined individuals are completely dark, just as the adults (Fig. 5). According to interviewed hunters, even hatchling *V. mabitang* are uniformly dark. Hatchlings and juvenile *V. olivaceus* are more brightly coloured and patterned than the adults (Fig. 6), as is typical for many varanids.

Table 1. Length and mass measurements of *Varanus mabitang*, *V. olivaceus*, and *V. bitatawa*. Data for *V. olivaceus* from Auffenberg (1988); data for *V. bitatawa* from Welton *et al.* (2010).

	V. mabitang			*V. olivaceus*			*V. bitatawa*		
Measurements	Range	Average	N	Range	Average	N	Range	Average	N
SVL (cm)	42-70	54.2	23	48.5-73	51.2	99	49.0-76.6	62.3	3
TaL (cm)	63-107	82	23	largest male: 102.5, largest female: 87.2	-	-	69.4-103.6	89.3	3
Ratio TaL/SVL	1.36-1.61	1.45	23	largest male: 1.40, largest female 1.54	-	-	1.35-1.55	1.44	3
Total Length (cm)	105-175	136	23	largest male: 175.5, largest female: 144	-	-	118-180	152	3
Mass (g)	1000-8000	3060	23	-	3120	97	9000		1

Table 2. Scalation characters of adult *V. mabitang*, *V. olivaceus*, and *V. bitatawa*. Data for *V. olivaceus* from Auffenberg (1988, N[1]) and Gaulke and Curio (2001, N[2]); data for *V. bitatawa* from Welton *et al*. (2010).

	V. mabitang			*V. olivaceus*			*V. bitatawa*		
Scale Counts	Range	Average	N	Range	Average	N	Range	Average	N
Transverse rows of ventrals, counted from gular fold to a theoretical line connecting the insertion of hindlegs ventrally	111-143	127	22	101-121	109	N[1]= 106	106-110	108	3
				95-107	104	N[2]= 5			
Transverse rows of dorsals, counted from dorsal side of gular fold to a theoretical line connecting the insertion of hindlegs dorsally	124-175	136	18	105-122	112.2	N[2]= 5	113-127	119	3
Scales from rictus to rictus, counted in a straight line across head	52-70	61	18	50-61	58.4	N[1]= 106	69, 78	-	2
				51-61	56.5	N[2]= 4			
Number of distinctly enlarged supraoculars on each side	0-15	3.7	20	0-14	-	N[1]= 106	-		
Texture of ventrals	Strongly keeled		25	Feebly keeled		N[1]= 106	-		
				Smooth		N[2]= 6			

Table 3. Coloration of *V. mabitang*, *V. olivaceus*, and *V. bitatawa*. Data for *V. olivaceus* from Auffenberg (1988) and Gaulke and Curio (2001), data for *V. bitatawa* from Welton *et al*. (2010).

	Varanus mabitang	*V. olivaceus*	*V. bitatawa*
Dorsal coloration	Black or blackish-grey, with tiny yellow markings on the posterior part of some scales of neck, back, and extremities (N=26)	Greenish-grey, with darker transverse bands across neck, back, and tail; extremities irregularly mottled yellowish-olive and grey (N=112)	Black, with constrasting golden yellow transverse rows of ocelli across back and golden yellow bands across tail
Ventral coloration	Dark grey to blackish-grey, without pattern (N=26)	Greyish, greyish-green, or yellow-grey, three to four longitudinal brownish black to black stripes on throat (N=112)	Darkish throat region

Fig. 5. Head and neck region of a young *V. mabitang*.

Fig. 6. Young specimens of *V. olivaceus* are brightly coloured; photo taken in the Avilon Montalban Zoological Park on Luzon.

Fig. 7. *Varanus mabitang* within its natural habitat.

Prospects

The future survival of *V. mabitang* depends on the existence and persistence of the most endangered ecosystem on Panay, the primary lowland evergreen forests (Fig. 2). This forest type is dominated by huge dipterocarps, and harbours a comparatively dense population of the preferred *V. mabitang*-food trees. Once in a while a *V. mabitang* sighting is reported from more open areas: along the forest edge, within secondary growth, or even from riverbanks in the open. However, these sightings have to be regarded with some reservation. Even though an occasional individual might be seen along the forest edge or in secondary forests of areas consisting of a patchwork of primary and secondary growth, this does not contradict their dependency on primary forests for feeding, resting, and most certainly breeding. Besides, sometimes "*V. mabitang*-sightings" actually refer to melanistic variants of *V. nuchalis*, a member of the *V. salvator* group which is found in different habitats, including primary lowland forests, but also cultivated areas. As experienced on more than one occasion, even biologists sometimes mistake both species. When asked to examine a newly caught "*V. mabitang*", it sometimes turned out to be the much more common and widespread *V. nuchalis*.

In most areas, the population status of *V. mabitang* has already reached a critical stage. If the ongoing habitat destruction through illegal logging and slash and burn activities cannot be stopped within the next few years, the existence of this varanid is seriously threatened, and its rapid extinction is likely.

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References

Auffenberg, W. 1988. Gray's Monitor Lizard. University Presses of Florida. Gainesville, Florida.

Bennett, D. 2001. Wildlife of Polillo Island, Philippines. University of Oxford – University of the Philippines at Los Banos Polillo '99 Project, Final Report.

Böhme, W. 1995. Hemiclitoris discovered, a fully differentiated erectile structure in female monitor lizards (*Varanus* spp.) (Reptilia: Varanidae). Journal of Zoological Systematics and Evolutionary Research 33: 129–132.

Gaulke, M. and E. Curio. 2001. A new monitor lizard from Panay Island, Philippines. Spixiana. 24(3): 275–286.

Gaulke, M. and A.D. Demegillo. 2008. The Mabitang: large fruit-eating monitor of the Philippines- *Varanus mabitang*. Reptilia 59: 39–46.

Gaulke, M., V.A. Altenbach, A. Demegillo and U. Struck. 2005. On the distribution and biology of *Varanus mabitang*. Silliman Journal 46: 89–117.

Gaulke, M., A.V. Altenbach, A. Demegillo and U. Struck. 2007. On the diet of *Varanus mabitang*. Pp. 228-239. In Horn, H-.G., W. Böhme and U. Krebs (eds.), Advances in Monitor Research III. Mertensiella 16, Rheinbach.

Mertens, R. 1959. Liste der Warane Asiens und der Indo-autralischen Inselwelt mit systematischen Bemerkungen. Senckenbergiana Biologica. 40: 221–240.

Struck, U., A.V. Altenbach, M. Gaulke and F. Glaw. 2002. Tracing the diet of the monitor lizard *Varanus mabitang* by stable isotope analysis (delta 15N, delta 13C). Naturwissenschaften 89: 470–473.

Welton, L. J., Siler, C. D., Bennett, D., Diesmos, A., Duya, M. R., Dugay, R., Rico, E. L. B., Van Weerd, M. and R. M. Brown 2010. A spectacular new Philippine monitor lizard reveals a hidden biogeographic boundary and a novel flagship species for conservation. Biology Letters, doi: 10.1098/rsbl.2010.0119

Ziegler, T. and W. Böhme. 1997. Genitalstrukturen und Paarungsbiologie bei squamaten Reptilien, speziell den Platynota, mit Bemerkungen zur Systematik. Mertensiella 8: 1–207.

Ziegler, T., Gaulke, M. and W. Böhme. 2005. Genital morphology and systematics of *Varanus mabitang* Gaulke & Curio, 2001 (Squamata: Varanidae). Current Herpetology 24(1): 13–17.

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