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The Monitor Lizards of Camiguin Island, Northern Philippines

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Abstract - A short survey study was undertaken in February 2005 on Camiguin Island of the Babuyan group, northern Philippines to confirm earlier reports of the presence of a fruit-eating monitor lizard and a possible distinct taxon of the Asian water monitor lizard *Varanus salvator* complex on the island. After conducting brief visits to three sites and interviews with local residents, no evidence of a fruit-eating monitor lizard was found. Examination of a water monitor lizard captured by a local resident indicates that it is not distinct from *V. marmoratus*.

Introduction

Monitor lizard species that are mainly fruit-eating are known to occur only in the Philippines. They are *Varanus olivaceus* (Vulnerable – IUCN, 2007), which has been recorded in Polillo, Southern Luzon and Catanduanes, and the recently described *V. mabitang*, which occurs on Panay (Gaulke and Curio, 2001). Field studies indicate that fruits of the *Pandanus* palm are an important food item for all known populations (Auffenberg, 1988; Bennett, 2000; Gaulke and Curio, 2001). More recently, there has been photographic evidence of the occurrence of a frugivorous varanid in the Northern Sierra Madre Natural Park in northern Luzon (M. Van Weerd, pers. comm.). The true distribution of these lizards is only beginning to be understood. Their existence has been largely unnoticed because they are difficult to see or study in the wild and they are commonly mistaken for their meat-eating relatives belonging to the *V. salvator* complex.

In 2004 a team of researchers who were conducting a census of vertebrate wildlife in the Babuyan group of islands in the northern tip of the Philippines reported to have found evidence of the presence of a fruit-eating monitor lizard on Camiguin Island (Oliveros et al. 2004). The supposed evidence included: (a) the observation of clumps of *Pandanus* seeds that were believed to be fecal matter from a fruit-eating monitor lizard; (b) the clustering of *Pandanus* trees along ridges and hilltops, which on Polillo Island is hypothesized to be due to the dispersal of its seeds by *V. olivaceus* through its feces; and (c) information from local residents supporting the presence of a fruit-eating monitor lizard on Camiguin. However, no sighting of this lizard was made, nor a specimen, collected during their survey.

Another varanid lizard from Camiguin is also of particular interest because a specimen belonging to the Asian water monitor lizard *V. salvator* complex (see recent revision in Koch et al. 2007) from this island appears to represent a distinct form (R. Brown, pers. comm., cited in Anon., 2002).

In February 2005 a brief survey was conducted on Camiguin to verify the presence of a fruit-eating monitor lizard on the island and to determine the identity of the local population of water monitor lizards. The results of this study are presented in this report.

Methods

Camiguin Island (N 18° 56' E 121° 55') is a volcanic island situated 40-50 km north of Luzon (see Figure 1). It occupies an area of only 166 km^2, but it rises as high as 828m above sea level. Camiguin is characterized by steep forested hills overlain with clay, ricefields in small river floodplains and a volcanic cone (Mt Camiguin) in the south. Its population of almost 4,000 people is concentrated in three main settlement areas: Balatubat and Naguilian along the island's southwestern cove; and Minabel on the northwestern coast.

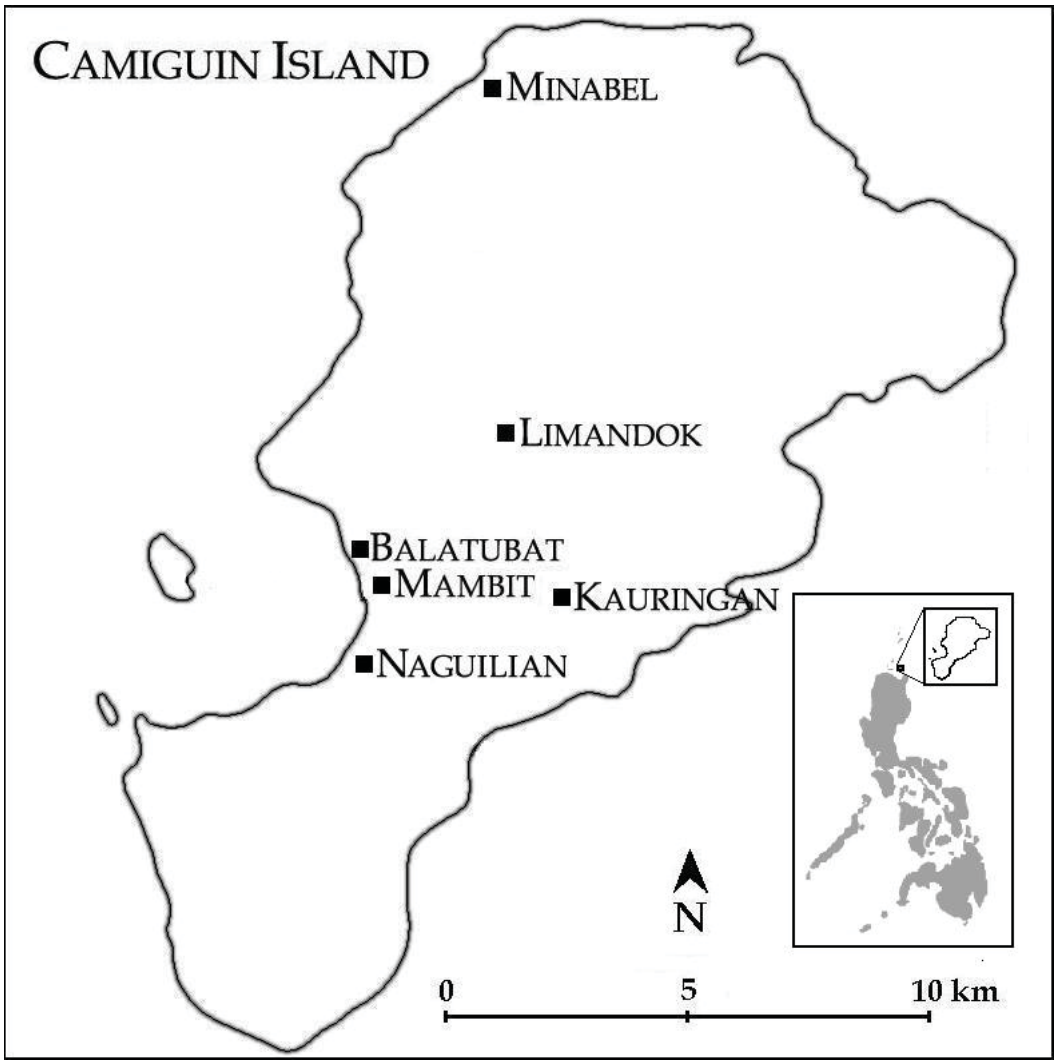

Figure 1. Map of Camiguin Island.

Interviews of local residents were conducted to determine local knowledge of monitor lizard species on the island. A total of fifteen respondents from two barangays on the island – Balatubat and Naguilian – were interviewed using standard questionnaires. Fourteen out of the fifteen respondents relied on rice farming as their main source of livelihood. Slash and burn farming (14 respondents) and fishing (10 respondents) were frequent supplemental sources of income. Four respondents were hunters.

It was presumed that if a large lizard was regularly feeding on *Pandanus* fruits distributions of *Pandanus* seedlings would be similar to those found in other places occupied by similar lizards (i.e. high concentrations of plants on ridges with clumps of seedlings uphill of any prospective parent plant). On this basis it has been possible to identify areas inhabited by *V. olivaceus* on Polillo Island. It was further presumed that other similarities in the diet of the Camiguin animal and *V. olivaceus* would make it possible to identify important food trees quickly, and that these trees could be monitored with infra-red triggered camera traps.

Reconnaissance trips were made to three sites: Limandok, Kauringan and Mambit. Limandok was visited on 20-21 February 2005; Kauringan on 22-24 February; and Mambit on 25 February 2005. During these trips, the team: (a) searched for families of trees that are known to be used by other frugivorous monitor lizards; and (b) investigated other evidence such as the presence of fecal matter, unusual clumps of fruiting trees and cracked shells of land mollusks. At Limandok, an infra-red triggered still camera trap was installed on a *panglumboyin* (local name) tree where more than 800 scratch marks that were made by a monitor lizard were observed on its trunk. The trap was open for approximately 125 hours.

At the Kauringan site, where the team found *Pandanus* trees occurring along hilltops and ridges, the distribution density of adult *Pandanus* plants was mapped following Bennett (in preparation). The distance of plants along the transect and their perpendicular distance to the transect were recorded. Trees were classed as “adult” if they bore a trunk, in which case their height from the ground and their number of crowns were also noted Furthermore, when juvenile plants formed a discreet group, they were considered to form a “clump.” A clump’s position was measured from its approximate geometric center and the number of juvenile plants in the clump (“clump size”) was counted. Four transects on two peaks were

Figure 2. *Panglumboyin* tree where a camera trap was installed.
Photograph by Daniel Bennett.

mapped, one near the peak of Nagtapulan (671 m) and three at the peak of Mt. Mapula-pula (~ 660 m).

From results of the reconnaissance trips and interviews with local residents, previous evidence of the existence of a fruit-eating monitor lizard on the island was cast in doubt (see later text) and thus a proposed exhaustive survey of fecal material was not undertaken.

A live water monitor lizard captured by a local hunter was examined. Biometric measurements, scale counts and photos of the live animal were taken.

Results

Local knowledge of monitor lizards

Six (6) out of the 15 respondents interviewed said there are two kinds of monitor lizard on Camiguin Island. One, which they call "*banyas*," the commonly used term for water monitor lizards by Ilocano speakers, is flesh-eating and occasionally preys on their domesticated chicks. The other, which they call "*lupi*," is arboreal and fruit-eating. The nine (9) other respondents know only of the *banyas*.

Those respondents purportedly familiar with the *lupi* said it differs from the *banyas* by having a shorter snout, a shorter tail, a more bulky body, a pure brown dorsal color and a dirty white ventral color. This description is consistent among the six respondents. Furthermore, according to these people, the *lupi* feeds on fruits of trees they call *camarig*, *sidae*, *panglumboyin*, *anibong* and *aru-e* (all local names), none of which were in fruit during the study. Nobody claimed that the lizard ate *Pandanus* fruit, contradicting previous reports in 2004. When trees are not fruiting, the *lupi* feeds on grubs, they added. However, the respondents' knowledge of the *lupi*'s diet was ambivalent as none of them has either seen the animal eat fruit or seen its feces or its gut contents.

There were only two accounts of captures and one sighting of the *lupi* in the living memory of respondents interviewed. One lizard was reported to have been captured near Nagtapulan in 2003 by a hunter and three were captured on the hills adjacent to the ricefields of Taneg by another hunter in the 1970's. In the first case, the lizard was eaten but the hunter did not notice anything unusual about its taste, gut contents or intestines. In areas where *V. olivaceus* is known to occur, people hunt and eat it in preference to the water monitor lizard since it is commonly reported to have healthier, better-tasting and better-smelling meat (M. Rosaros, pers. comm.).

According to respondents monitor lizard meat is a delicacy, preferably served with alcoholic drinks, as in other parts of the country. Aside from being a delicacy monitor lizards are also hunted in Camiguin for their bile, which supposedly has the ability to cure stomachaches, body pains and convulsions in children. Lizard skin was reportedly sold a decade ago to merchants from Luzon. Local residents harbor no fondness of monitor lizards, which are considered pests and bearers of bad tidings and whose name in the local language used as a verb "*agbanyas*" means "to betray."

Five of the six respondents who claimed knowledge of the *lupi* were not born on Camiguin Island; they came to Camiguin as migrants from northern Luzon. According to these migrants, they know of the *lupi* because it also occurs in the Marag Valley in Cagayan province, Luzon, from where they originated. There have been no reports of fruit-eating monitor lizards from this area but documented evidence has been collected from as far north of Luzon as San Mariano, Isabela province, where local people call them *batitawa*. While these respondents' previous knowledge of the *lupi* from Luzon (assuming the *lupi* is frugivorous) and the secretive behavior of fruit-eating monitor lizards could explain why they are aware of this kind of animal and natives of Camiguin are not, it is also possible that this pre-conception could also have led them to mistake the common water monitor lizard, which is also known to climb trees occasionally, for a fruit-eating monitor lizard.

Site Observations

At Limandok, a tree locally referred to as *panglumboyin* near the Mamolo-molo trail was observed with more than 800 scratch marks that were certainly made by a *Varanus* lizard based on their length and position on the trunk. However, the camera trap that was installed near this tree recorded only a *Spenomorphus* skink. Inside a dead *anibong* tree (*Caryota rhumphiana*) near the Lipit trail, grubs of rhinoceros beetles (family Scarabaeidae) were found. *Pandanus* trees were observed on hilltops and ridges near this site in 2004 (C. Española, pers. comm.) but the location of these trees was not found during the two-day visit to the site. The site where an old clump of *Pandanus* seeds was found on a previous occasion was not visited. Land mollusks were abundant at Limandok and empty cracked shells were common on the forest floor.

At Kauringan, a high density of *Pandanus* trees was observed on the ridges of Mts. Nagtapulan and Mapula-pula. The *Pandanus* fruits available on Camiguin (probably a form of *P. tectorius*) are approximately 2.5 times larger than the fruit of *P. radicans* (Table 1) which commonly occurs in habitats on Polillo, Luzon, Catanduanes and Panay and supports fruit-eating lizards (Auffenberg 1988, personal observations).

Table 1. Dimension of *Pandanus* fruits

	Camiguin (n=45)	Polillo
	Pandanus sp.	*Pandanus radicans*
Length	48 mm (± 6.3)	30.1 mm
Width	27.8 mm (± 2.8)	20.2 mm
Mass	16.1 g (± 5.2)	5.6 g

A typical transect from Mt. Mapula-pula yielded a mean density of 0.17 adult *Pandanus* per m^2. Detailed examination of 1,250 m^2 of hill ridges and cursory inspections throughout fieldwork did not identify any clumps of immature plants uphill of a prospective parent.

The *Pandanus* cluster collected in 2004 in Kauringan was taken from beneath an exposed root mass. A visit to the site yielded a similar cluster in exactly the same position. The position, size and condition of the seeds made it very doubtful that they represented the feces of a lizard and strongly suggested a rodent cache. Such caches have been reported for many forest rodents but have not been observed for *Rattus everetti* on Polillo,.

At Mambit, no *Pandanus* trees nor other evidence indicating the presence of a fruit-eating monitor lizard were observed.

In all three sites visited, no fecal matter suspected to come from a large monitor lizard was found. Clumps of *Caryota* palm seeds and seedlings were commonly found but they were likely to have been dispersed by civet cats (*Paradoxurus hermaphroditus*). *Caryota* fruit are important in the diet of these mammals and fresh civet cat droppings that contain palm seeds were commonly seen in the forest floor. Although the team found several trees with scratch marks, there is no evidence that they were not made by the water monitor lizard.

Appendix 1 lists tree genera that are important for *V. olivaceus* in Polillo Island. Their presence or absence on Camiguin is indicated. Other than Pinanga, very few trees were fruiting during the survey.

Varanus salvator of Camiguin

An adult female water monitor lizard (Figure 3) was captured by a resident of Brgy. Balatubat, Camiguin on 27 February 2005. The following measurements, scale counts and observations of the animal were made: Snout to vent length: 438 mm; Tail length: 718 mm; Total length: 1156 mm; Head length: 84 mm; Head height: 21 mm; Head width: 33 mm; Femur length: 7.3 mm; Tibia length: 64 mm; Girth: 195 mm. Number of supraoculars: 7; Number of mid-body scale rows: 140; Number of ventral scale rows: 87.

The nuchal scales were of equal size to the occipital scales, identifying the lizard as *V. marmoratus* rather than a member of the nominate race. The midbody and ventral scale row counts are within the established range of *V. marmoratus* (137-181 and 80-95 respectively (Mertens, 1942; Gaulke and Horn, 2004)) and no characteristic of this specimen suggest that it differs from the typical form of *V. marmoratus*.

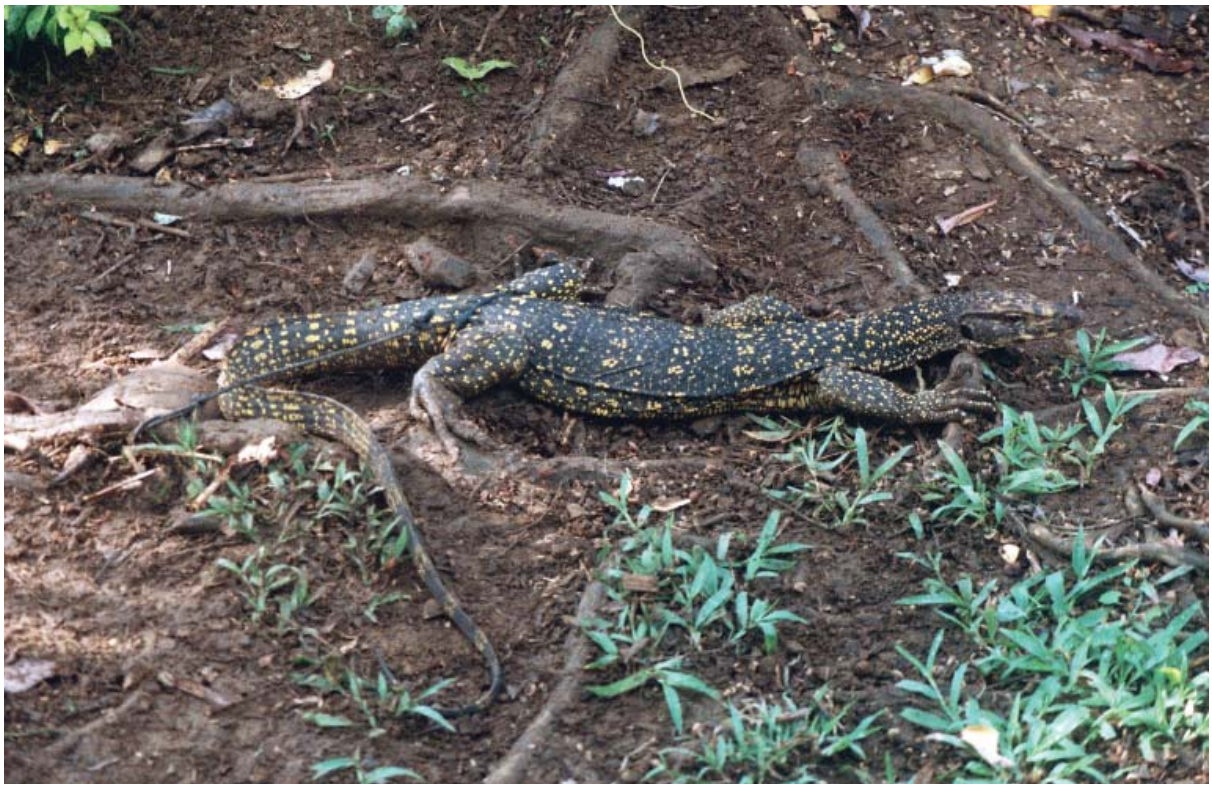

Figure 3. *Varanus marmoratus* of Camiguin Island.
Photograph by Mark Anthony P. Reyes.

Discussion

This study found no evidence of a fruit-eating monitor lizard on Camiguin. *Pandanus* are very abundant in some habitats, but no clumps of immature plants were found uphill of possible parent trees and their dispersal on hill ridges appears to be due to rodent activity. The *Pandanus* species found on Camiguin appears to be the coastal species *P. tectorius*. It has restricted distribution in the forest and much larger fruits than those recorded in the diet of *V. olivaceus*. Known animal dispersal agents *of P. tectorius* include bats, crabs rodents and people. On Camiguin rats regularly cache *Pandanus* seeds under tangles of roots , and similar caching activity has been observed during short visits to areas bordering Sierra Madre National Park in northern Luzon, but no rat caches have ever been seen during six years investigations on Polillo Island,

Camiguin remains an important area for conservation of reptiles. The little information known about its reptilian fauna already suggests that the island is a small center of endemism. The Camiguin Wolf Snake *Lycodon bibonius* is known only from the island (Ota and Ross, 1994). Recent surveys have led to the discovery of new endemic forms including a species of gecko (H. Ota and R. Crombie, unpublished data), a species of flying lizard and a species of frog (R. Brown, CO, unpublished data) that are currently being described. It would be desirable to implement a management plan to conserve the island's wildlife and natural habitats. The development and implementation of such a plan will greatly benefit from the cooperation of local government officials, government agencies, non-government organizations and members of the local community.

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Appendix 1

Genera that are known to be eaten by frugivorous monitors elsewhere are listed below with their abundance and distribution on Camiguin Island.

Pinanga species - very common, widespread. Similar to *Pinanga insignis* but with fruits that turn from green to yellow and purplish-black when ripe. All *Pinanga* seen were low (individuals over 3m high were rare). *Pinanga* is important in the diet of *V. olivaceus* on Polillo and *V. mabitang* on Panay but was not recorded by Auffenberg (1988) in Caramoan Peninsula or Catanduanes. The seeds were frequently observed in feces of civet cats (*Paradoxurus hermaphroditus*).

Caryota rhumphiana. - common, widespread. Important seasonally in the diet of *V. olivaceus* on Luzon and Polillo. Trees observed on Camiguin appeared identical to the variety on Polillo. Frequently observed in the feces of *Paradoxurus*. The hollow stumps of dead trees are often used for shelter and basking by both water monitor lizards and *V. olivaceus*. One examined on Camiguin Norte contained beetle larvae, a gecko (*Crytdactylus* sp) and a crab. No trees in fruit were observed although it was evident from *Paradoxurus* feces that fruit must have been available. A number of flowering trees were observed.

Pandanus - common, patchy distribution. Two species belonging to the genus were seen. One grows as a shrub or occasionally as a vine. The trunks are very thin and trees have multiple small crowns. The fruits of this species were not observed. The other species grows as a small tree and is discussed in the text. No trees with scratches were observed.

Canarium vrieseanum – rare. The only member of this important genus observed on the island. No trees with scratches were observed.

Grewia – absent. A tree with abundant and distinctive fruits that are of great importance in the diets of many animals for a few weeks in early summer on Luzon and Polillo. Local people did not recognize our description of it and it is probably absent from Camiguin Norte.

Gnetum – absent? Gymnosperms growing as trees or vines that are important in the diet of *V. olivaceus* on Polillo.

Figure 4. *Pandanus* fruit taken from the hilltops of Camiguin Norte.
Photograph by Daniel Bennett.

Figure 5. Fruit of the *Pinanga* palm, which is common on Camiguin Norte.
Photograph by Daniel Bennett.