Notes on an Isolated Population of *Brachymeles taylori* Brown (Family Scincidae) on an Islet in Bago River, Negros Occidental, Philippines

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A study of the biodiversity of a small river islet resulted in the discovery of a population of the burrowing skink, *Brachymeles taylori* Brown (Family Scincidae), in the vegetated portion of the islet. The population density of the species during the rainy season was determined at 4±2.8 (SD) individuals/100m2 or about 800 individuals in the two hectares of forested area with thick humus soil and decaying leaves and logs on the forest floor. The species was not observed in the adjacent river banks with *Nypa fruticans* and/or occupied by a human community. The Pungtod Islet skink population is assumed to have had no contact with other populations of the species for a long time since the geological formation of the islet. The possible genetic differentiation of this population from the other Negros populations of Brachymeles taylori needs to be pursued. The present threats to the species and its microhabitats on the islet are also discussed.

KEYWORDS: lizard, Scincidae, river islet, Negros Occidental, ecology

INTRODUCTION

The genus *Brachymeles* consists of several species of burrowing skinks characterized by smooth, fusiform bodies and by varying degrees of reduction in the number of digits or complete loss of limbs (Brown & Alcala, 1980). These characteristics make this group of skinks excellent burrowers in loose, humus soil. The genus was initially thought to be endemic to the Philippines until the recent discovery of two species, *B. apus*, on Borneo (Hikida, 1982) and *B. miriamae* (Heyer, 1972) in Thailand, formerly placed under the genus *Davewakeum* (Siler, Diesmos, Alcala & Brown, *In Press*).

Early studies of the species of the genus *Brachymeles* using the morphological approach include those by Taylor (1917), Brown (1956), Brown and Rabor (1967), Brown and Alcala (1980), Alcala (1986) and Alcala and Brown (1999). In their revision of the genus, Brown and Alcala (1980) recognized 13 species. Later, Brown and E. Alcala (1995) described another species from the island of Catanduanes, bringing the total number to 14. Later studies using the molecular and lineage approaches by Siler, Rico, Duya and Brown (2009) and Siler and Brown (2010) resulted in the discovery of 10 more new species, bringing the total number of Philippine endemic species to 24 and leading to a better understanding of the evolutionary relationships of populations in the various regions of the Philippines. To date, 26 species of the genus *Brachymeles* are recognized, including *B. apus*, found on Borneo (Hikida, 1982) and *B. miriamae* from Thailand (Siler et al., *In Press*).

We present in this paper our finding of a population of *B. taylori* occurring on a small four-hectare islet that was formed near the middle of the Bago River in northwestern Negros. This skink was able to survive on this islet and had remained isolated from the rest of the species population on mainland Negros Island for an unknown period of time, but it is not known whether it is genetically distinct from the other populations of the species. Geographic isolation is often invoked as an important factor in the formation of new species (Kadmon & Pulliam, 1993).

Site Description

Pungtod islet (10°31'33.3" N; 122°49' 58.5" E) is a small flat, leaf-shaped islet located about 1.5 km upstream from the Bago River mouth and about 350 m downstream from the Bago Bridge in northwest Negros Island. Its present land area is estimated at four hectares. The islet

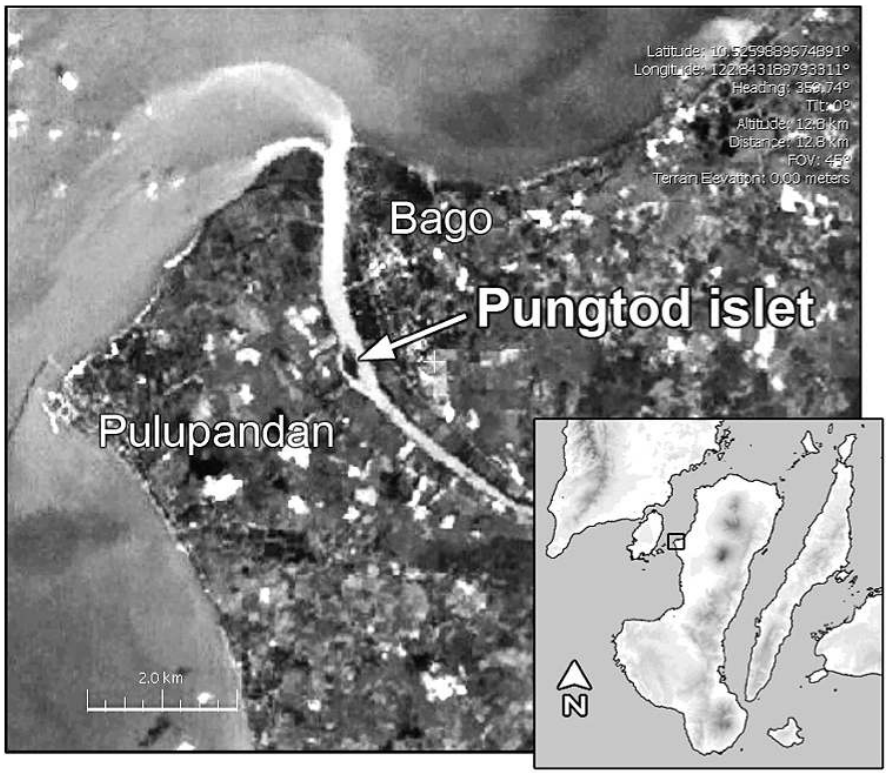

Figure 1. Site map showing the islet's relative position downstream of Bago Bridge and its closer affinity to the Pulupandan river bank (Source: NASA World Wind).

divides the Bago River into two river channels. The northern channel is about 100 m wide and runs along the Lag-asan, Bago side of the Bago River, while the southern channel is about 50 m wide and runs along the Pulupandan side of the Bago River (Figure 1). The islet is predominantly overgrown with planted and wild trees, including *Gmelina arborea, Bambusa sp., Ficus sp.,* and *Cocos nucifera* (Figure 2). A small portion (ca 1 ha) of the islet has been cleared for corn and sweet potato farming. *Nypa fruticans* grows on the banks of the islet along the southern channel.

MATERIALS AND METHODS

The population of *Brachymeles taylori* Brown and associated vertebrate species on Pungtod Islet were surveyed by a two-person team in July

Figure 2. Dorso-lateral view of the pentadactyl *Brachymeles taylori* found on Pungtod islet.

and October (part of the wet season) and in December 2009 and April, 2010 (dry season) in western Negros Island for a total of 21 labor hours. Ten plots measuring 10m x 10m (100m^2 in area) were carefully searched by digging with shovels through the thick, loose humus soil and by turning over decaying logs, leaves, and coconut husks in areas overgrown and shaded by trees. The plot method was supplemented with the cruising method consisting of a thorough search of all possible microhabitats of the skink (Alcala, Alcala, & Dolino, 2004). In addition, 12 plots of 10mx10m size (six in the north bank and six in the south bank of the Bago River) were searched for the presence of the skink. A total of 14 adult specimens of the skink and one specimen of the burrowing snake (*Pseudorabdion mcnamarae*) were collected as voucher specimens.

Captured amphibian, reptiles (other than the skink and the snake), birds, and mammals were released to the wild after identification. The voucher specimens were fixed in 10% formalin and later preserved in 70% ethanol. A couple of specimens were also preserved in 95% ethanol for possible DNA analysis. These are currently stored at the Rodolfo B. Gonzales Natural History Museum (formerly Silliman University-Biology Museum).

Figure 3. Ground litter forming part of the skink habitat (foreground). More skinks were observed in ground litter under the trees (background).

RESULTS

The taxonomic identification was based on a sample of 14 sexually mature individuals, fitting the description of *Brachymeles taylori* in Siler and Brown (2010) (Figure 2). This species is the most common species on Negros Island. Size measurements of the three species of *Brachymeles* on the island of Negros were obtained (Table 1). The islet population of *B. taylori* seems smaller than the Negros Island population.

To determine the total population on the islet, ten 10m x 10m plots were surveyed. The total number of adult and subadult skinks caught and released after identification in the 10 plots chosen haphazardly was 41 (mean, 4.1±2.8 (SD). By extrapolation, the total population of *B. taylori* on the islet was determined to be about 800 individuals, based on the habitable area with trees and thick organic ground material of about two hectares.

The habitats of *B. taylori* include humus, decaying logs and coconut husks and ground litter, as earlier reported by Alcala and Reyes (1957). These sites (Figure 3) harbor the prey organisms of this species such as termites, crickets, earthworms, and so on.

Also observed were a toad and several reptiles, including *Rhinella marina, Lamprolepis smaragdina philippinica, Eutrophis multifasciata, Varanus nuchalis, Gekko gecko, Hemidactyllus frenatus, Rhyncotyphlops braminus, Cerberus rynchops,* and *Calamaria gervaisi*. Twenty species of birds and four species of mammals (three of which were fruit bats) were also observed. Except for the *Brachymeles* and the snake *Pseudorabdion*, all of these species were released after collection and identification.

DISCUSSION

Origin of the islet and present threats

It is likely that the islet was separated from the mainland by the formation of the north and south channels of Bago River. Earlier accounts of the channels passing alongside the islet indicate that the south channel used to be the larger and deeper channel. This configuration later changed (circa 1950's) with the reduction of the south channel and the creation of the north channel as the major drainage, probably as a result of natural "re-channeling."

The evidence for the islet's separation may be inferred by the presence of *Lamprolepis smaragdina philippinica, Gekko gecko, Hemidactylus frenatus,* and *Pseudorabdion mcnamarae* on the islet. These species were probably carried by the islet at the time of separation, while the rest of the reptiles listed above could have colonized the islet by rafting or swimming the narrow channel.

It is also possible that alluvial silt accumulated on the islet through the process of aggradation, a common phenomenon on river courses close to the estuary (Morig, 2004; Southard, 2007; Black, 2009). This type of formation appears to support the Pungtod islet origin. The islet is located in the river estuary near the river bend (Figure 1), which favors the trapping of silt and organic materials.

It is known that the early Pulupandan cadastral survey in 1906 indicated that the islet was more than five hectares in area, one hectare larger than its present area of four hectares. The southern side of the islet once had a deep channel that allowed port operations for schooners transporting sugar from the late 1800s to the early 1960s (Sa-onoy, 2003; Varona, 1938; Romero, 1974). The channel later became shallow, causing port operations to cease.

The islet habitat may be vulnerable to both natural events such

as strong floods and human-made activities such as quarrying. The latter was going on at the time of the visits for this study. Furthermore, because the islet is controlled and managed by land owners, it is vulnerable to farming activities that can lead to the destruction of the skink habitat. The islet is not only an important habitat for the skink but also for 21 species of birds, four species of mammals, and eight species of herpetofauna.

Population estimates and behavior

The estimated 800 Brachymeles individuals on the islet during the wet season appear to be an adequate population size that can ensure the survival of the species. These numbers conform to the estimate of Wilson (1992), who proposed that at least 500 individuals are needed to keep a species population healthy for a long period of time. However, our estimate of the population size during the month of April 2010 was low, ca 25 individuals per ha. As yet, the reason for this is not known. It may be due to their fossorial habit, making them difficult to observe in such microhabitats as ground fissures and soil cracks.

Table 1.

Summary of Morphological Characteristics among Selected Pentadactyl Species of the Genus Brachymeles.

Characteristics	taylori* (This study)	taylori** (Siler & Brown)	talinis**	boulengeri**
Total length (TL)	109-151mm (mean=128mm)	130.3-176.7mm	191.7-238.4mm	124.3-173.1mm
Snout-Vent (SVL)	57-80mm (mean=65mm)	65.8-99.2mm	103.1-126.7mm	60.5-95.5mm
Axilla-groin (AGD)	39-63mm (mean=50mm)	46.6-66mm	64.2-90.3mm	36.2-61.3mm
Light dorsal stripes	-	-	+ or -	+ (continuous)
Dark mid-dorsal stripes	+ (intermittent)	+ (continuous)	+ or -	-

* Based on Pungtod Islet specimens (N=14).
**Based on Siler & Brown (2010).

Species isolation

It appears that the islet was once part of the Negros mainland. If the islet skink population was originally part of the Negros mainland population of *Brachymeles taylori*, when did it become isolated from the Negros population? Was there repeated colonization by individuals through waif dispersal from the upper reaches of the Bago River? At this time, all we know is that the islet has existed since 1906, over a hundred years ago. Biochemical and genetic evidence is needed to throw light on these questions to determine whether or not the islet skink population has significantly diverged genetically from the mainland population.

The concept of speciation resulting from isolation has been elucidated by Funk and Wagner (1995), who proposed that certain taxa disperse and colonize recently formed islands from older islands causing new colonies to eventually develop into new species. In the case of the Pungtod islet skink population, physical separation of the islet from the mainland by a river isolated it from other populations of the species on the mainland (Negros Island). It is possible that this species could eventually evolve into a new species as a result of reproductive isolation (Mayr, 1942; MacArthur & Wilson, 1963, 1967; Baker, 2005).

CONCLUSIONS AND RECOMMENDATIONS

Pungtod islet appears as the only remaining habitat of *Brachymeles* in the vicinity of lower Bago River. The rest of the areas on both sides of the Bago River have undergone habitat modification as a result of intensive agriculture and establishment of human settlements.

For this reason, we recommend that efforts should be exerted to conserve the skink and other fauna on the islet. Its close proximity to Bacolod City makes it a convenient destination for wildlife enthusiasts and students undertaking bird watching and wildlife studies.

As for the erosion of the islet, we recommend further investigation on the effects of river scouring on the islet and the impact of sand extraction on the river channel and surrounding areas. We also recommend studies on DNA to determine whether Spandrel's theory (Mayr, 1942) of conspecific populations evolving independently as a result of physical separation has occurred in this particular case.

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