Diversity of land snail in Phu Phra Bat Historical Park, Udon Thani Province

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ABSTRACT: Phu Phra Bat Historical Park is located in Ban Phue District, Udon Thani Province, Thailand. This area has an abundance of forest and high diversity of organisms. There is much majority of animals, fungi, mushrooms, plants and also land snails. The land snails play an important role as predators and also consumers in the food webs. Moreover, they have been associated with humans for food and medicine. The diversity of land snails was investigated several habitats in Phu Phra Bat Historical Park.The study was conducted from October 2013 to September 2014 along the tourist path. The results showed that all samples were classified to two orders, three families, four genera and five species. They were *Hemiplecta distincta*, *H. siamensis*, *Cryptozona siamensis*, *Cyclophorus volvulus* and *Pseudobuliminus (Giardia) siamensis*.

Keywords: land snail, diversity

Introduction

The Phylum Mollusca is possibly the third important animal after the arthropods and vertebrates (South, 1992). Snails including land snails and slugs are classified in class Gastropoda. They are found in very diverse habitats (Orstan et al., 2005; Boonngam et al., 2008). Some of them are lived in everywhere such as wasteland, ditches, woodland litter, on the soil, in the cracks and at the base of the calcareous rocks. They also live in many climates such as base of a hill slope, stream valley and waterfall area and table top plan (Srihata et al., 2010; Liberto et al., 2013). The temperature and the moisture, rather than light, are the most important factors to an explanation for their night-time habits. Land snails have many the activities of feeding, reproduction, growth and more are happening on the territory (Sallam and Wakeil, 2012). They have varieties of shapes and sizes of the shell, the colors of food, habitat, and behavior. Some land snails have a tiny of the shell so they could not be seen clearly with the naked eye. *Hemiplecta distincta* and African snail (*Achatina fulica*) are giant shells (Kumprataung et al., 1989; Silva and Omena, 2014). For identification of land snails, using the height and width of the shell as well as its shape and color are the essential features (Sallam and Wakeil, 2012).

Some land snail serves as hosts for parasites, *H. distincta*. The people can be consumed especially in Northeastern, Thailand and also prospective an intermediate host of a rat lungworm, *Angiostrongylus cantonensis* (Panha, 1987, 1988). Most land snails such as *A. fulica* contribute to the degradation on the animal matter to the environment (Stokes, 2006). There are a few studies on the diversity of land snail especially in the areas of the rocky mountain. Thus, the study investigates the variety of land snail in Phu Phra Bat Historical Park.

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Materials and Methods

Snail Collection in the field

The study localities for land snail collection were in Phu Phra Bat Historical Park along the tourist track. The snail survey was conducted during October 2013 to September 2014. The snail samples were collected from 59 field sites on the walkway and areas nearby within 300 meters from the path (**Figure 1**). All collection sites were recorded, with a Garmin Nuvi 203 (Garmin (Asia) Co., Taiwan) (**Table 1**). All snails were collected both living and dead land snail in each study site by handpicked, separately labeled, kept in plastic bags and brought to the laboratory for further study. Numbering recorded a number of snail samples.

Snail Identification

Before identification, shells were washed with tap water and air dried. All snails were taking a photo and identified based on shell morphology for species following available keys and descriptions (Schell, 1970; Chitramvong, 1992; Kulsantiwong, 2013; Jumlong et al., 2013).

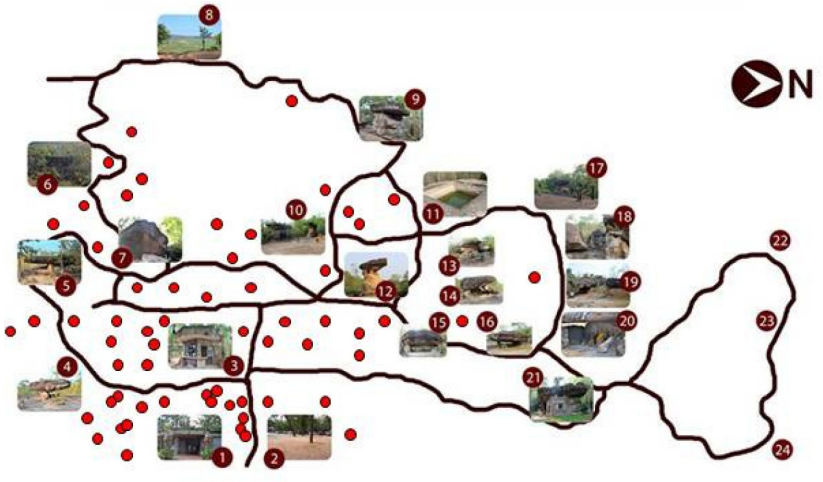

Figure 1 Map of snail collecting sites in Phu Phra Bat Historical Park ( ); 1=Information center, 2=Parking area, 3=Ticket box, 4=kork Mah Noi, 5=Kork Mah Tao Baros, 6=Tham Ruesi, 7=Tham Wua-Tham khon, 8=Pha Sadet, 9=Chang Khao Phran,10=Pheng Hin Nok Kratha, 11=Bor Nam Nang U-Sa, 12=Hor Nang U-Sa, 13=Tham Chang, 14=Heebsob Porta, 5=Heebsob Nang U-sa, 16=Heebsob Tao Baros, 17=Kou Nang U-sa, 18=Tham Phra, 19=Wat Porta, 20=Bot Wat Porta, 21=Wat Louk Koei, 22=Tham Phra Siang, 23=Chedi Raang, 24=Tham Dinphiang

Results

The land snail samples were collected from Phu Phra Bat Historical Park, Udon Thani province of Thailand (Figure 1). They were classified to two orders, three families, four genus, five species of snails and the distribution of those samples was at various stations. They were *H. distincta*, *H. siamensis, Cryptozona siamensis*, *Cyclophorus volvulus* and *Pseudobuliminus (Giardia) siamensis* with and without an operculum (Figure 2).

Table 1 The collection site of snail in Phu Phra Bat Historical Park

Snail species	Habitats	Coordinates	
		Latitude	Longitude
H. distincta	Dead leaves, Ground	17°43'41.5"	102°21'15.9"
(Pfeiffer, 1850)		17°43'45.5"	102°21'14.9"
		17°43'42.1"	102°21'6.1"
		17°43'49.3"	102°21'22.4"
		17°43'58.2"	102°21'12.4"
		17°43'58.6"	102°21'15.2"
		17°44'0.9"	102°21'14.7"
		17°44'53.3"	102°21'8.6"
		17°44'2.9"	102°21'15.7"
		17°44'4.3"	102°21'16.6"
		17°44'4.7"	102°21'22.0"
		17°46'2.0"	102°25'16.7"
		17°34'5.1"	102°21'25.5"
		17°43'49.5"	102°21'22.8"
		17°43'48.1"	102°21'22.4"
		17°43'38.6"	102°21'19.4"
		17°43'37.4"	102°21'19.1"
		17°43'38.3"	102°21'18.7"
		17°43'36.8"	102°21'17.9"
		17°43'38.9"	102°21'12.7"
		17°43'51.2"	102°21'13.7"
		17°43'49.5"	102°21'22.5"
		17°42'10.9"	102°24'14.2"
		17°43'54.6"	102°21'14.8"
		17°44'4.8"	102°21'18.8"
		17°43'38.6"	102°23'14.2"
		17°52'14.0"	102°33'29.5"
		17°47'40.6"	102°28'29.5"
		17°45'16.9"	102°24'47.2"
		17°45'27.5"	102°25'32.3"
		17°43'41.6"	102°21'6.53"
		17°43'49.4"	102°21'5.78"
		17°43'49.3"	102°21'5.72"
		17°43'49.5"	102°21'8.91"
		17°55'20.4"	102°38'33.6"
		17°43'46.4"	102°21'20.5"
		17°43'46.2"	102°21'20.3"
		17°43'52.4"	102°21'25.0"
		17°44'4.6"	102°21'21.1"
		17°44'1.6"	102°21'22.4"
		17°43'54.2"	102°22'44.1"
		17°43'53.1"	102°21'24.3"

H. siamensis (Pfeiffer, 1856)	Dead leaves, Ground	17°43'59.7"	102°21'14.6"
		17°43'58.7"	102°21'13.8"
		17°43'47.0"	102°21'24.1"
C. siamensis (Pfeiffer,1856)	Dead leaves, Ground	17°43'41.0"	102°21'17.5"
		17°43'48.1"	102°21'23.0"
		17°43'47.9"	102°21'14.3"
		17°43'53.1"	102°21'24.3"
C. volvulus (Muller, 1774)	Dead leaves	17°43'45.0"	102°21'35.2"
P. (Giardia) siamensis (Redfield, 1853)	Dead leaves, Ground	17°43'49.1"	102°21'40.2"

In the study, we found that the number of snail species in each month with the various sites. The highest number of snail was in *H. distincta* (42) and followed by *C. siamensis* (27), *H. siamensis* (25), *C. volvulus* (7) and *P. (Giardia) siamensis* (1) (**Figure 3**). In addition, the number of snails was found most on March (28) and subsequently in July (17), September (17), June (15), May (11), August (6), November (4) and February (4). There was not found the number of a snail on December, January, and April. All snails were found a slightly much in number during the rainy season but on March were found only three snail species of the operculate snails, namely *H. distincta*, *H. siamensis* and *C. siamensis* during the rainy season.

Figure 2 The study area in Phu Phra Bat Historical Park, Udon Thani province of Thailand

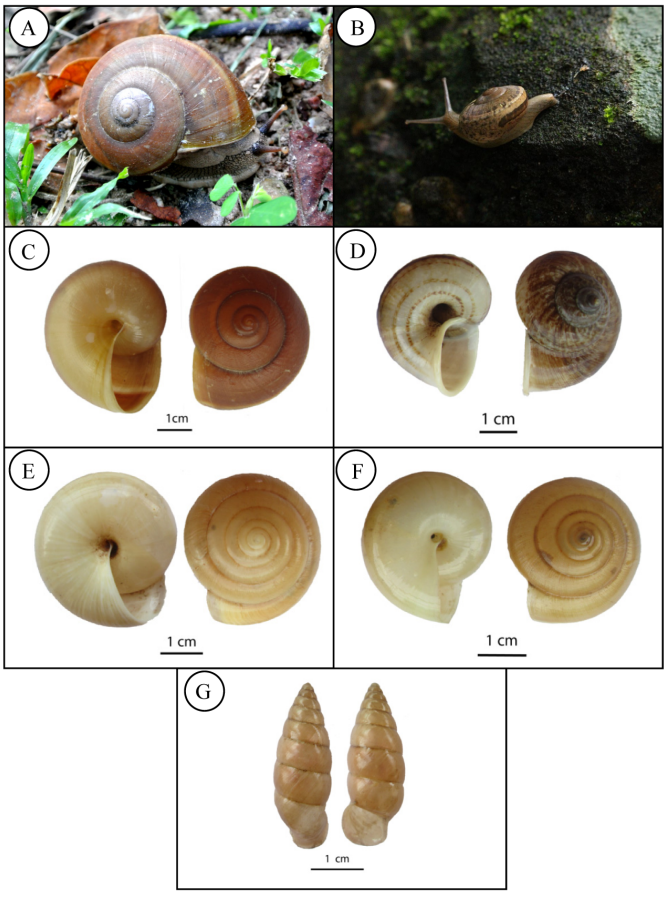

Figure 3 Snail species in Phu Phra Bat Historical Park, Udon Thani Province (A)-(B) =Alive of land snail and (C)-(G) =Shell of a land snail: (A) *Hemiplecta distincta*; (B) *H. siamensis*; (C) *H. distincta*; (D) *Cyclophorus volvulus* (E) *H. siamensis* (F) *Cryptozona siamensis* (G) *P.* (*Giardia*) *siamensis*

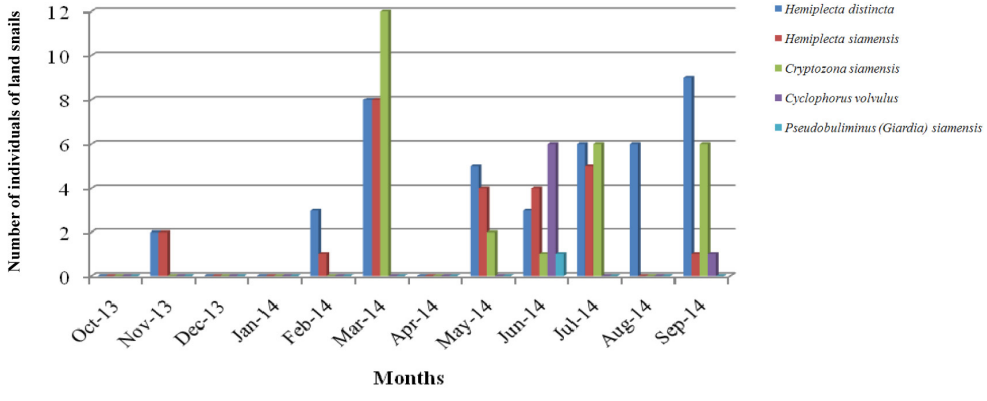

Figure 4 The number of individuals of land snails that found within 12 months in Phu Phra Bat Historical Park, Udon Thani Province, Thailand

Conclusion and Discussion

Land snails were collected throughout Phu Phra Bat Historical Park, Udon Thani Province. A total of two orders, three families, four genera and five species were found. They were found a varieties habitat in this area. The distribution of land snail species was mostly limited to geographical areas and along rocky. However, we can find *H. distincta*, *H. siamensis*, *C. siamensis*, *C. volvulus* and *P.* (*Giardia*) *siamensis* in the rocks, bare soil, litter and woody debris which was the same as found in the previous study (Boonngam et al., 2008; Sallam and Wakeil, 2012). Field investigation in this study indicated that land snails were found with a few number of snails may be due to temperature and moisture, rather than light, are the main factors to relation for their habits (Sallam and Wakeil, 2012). The rainy season was found a highest land snail in Phu Phra Bat Historical Park. The results of this study can be used as a database to examine the diversity of land snail.

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