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## Species diversity of amphibians, reptiles and mammals in Suan Sunandha Rajabhat University Samut Songkhram Campus and around area

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### Abstract

The study on species diversity of three vertebrate groups such as amphibians, reptiles and mammals in Suan Sunandha Rajabhat University Samut Songkhram Campus and its around area. This data was assessed for relative abundance of all populations and conservation status from December 2012 to June 2013, for seven months of all. The results were carried out by walking survey around the site in day and night time. For amphibians and reptiles surveyed along of stagnant drains, roadside ditch, a lawn, a weediness and material wastes. Mammals were operated on a direct surveying and especially a trapping and netting. The results founded that the presence of 16 species in three groups of vertebrate, amphibians were classified to 2 species from 2 genera, 2 families in 1 order; reptiles were classified to 10 species from 9 genera, 5 families in 1 order and mammals were classified to 4 species from 4 genera, 3 families in 1 order. In addition to the abundance of population status showed one common and one rare species of amphibians, four common, one uncommon and five rare species of reptiles and the mammals were divided on three common and one rare species. According to the International Union for Conservation of Nature (IUCN) 2012 and ONEP (2006) on the conservation status indicated that mostly reptiles and mammals were groups of wildlife protection and least concern. It is recommended that the campus area should consider conducting long-term monitoring of wildlife diversity and should develop a habitat management plan for maintaining wildlife diversity.

Keywords: Species diversity; vertebrates; amphibians; reptiles; mammals; Suan sunandha Rajabhat University Samut Songkhram Campus.

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## 1. Introduction

Thailand is a country with a wide range of biological diversity and high in forest resources and wildlife including genetic, species and ecological diversity. The biological resources of vertebrates are group of organisms that play some vital roles and are associated with other organisms in the ecosystem such as pollination, get rid of pests, control ecological balance and also used as indicator of the abundance of the forest as well. But the exploitation of human resources, regardless of the consequences that will occur in the future as a result, the country's biodiversity thus diminishing. Concluding from the status study of mammals, reptiles and amphibians, there are 13 orders, 42 families, 147 genera, and 302 species of mammals; 3 orders, 23 families, 139 genera, and at least 350 species (366 forms) of reptiles; 3 orders, 8 families, 40 genera, and 137 species (138 forms) of amphibians. However new records of these three groups of animals are continuously being reported. The population of the wild vertebrates decreased by 31% globally between 1970 to 2006 with the high rate in the tropical region and fresh water ecosystems (ONEP, 2006).

Samut Songkhram province is located in the central region on the west coast of the Gulf of Thailand. This province had 83,900 hectares of mangrove areas in the past such later destroyed quickly because people have to live and transform forests into shrimp farms and other benefits make plenty of near-shore marine resources are wasted. Bang Kaew sub-district, Muang Samut Songkhram has a long coastline mangroves of about three kilometers. Environment typical of mangrove forest is different from the other, especially in mangrove soils with plenty of minerals which is derived from coast, water streams and organic matter from dead organisms. Due to the abundance of vegetation in, the higher animals such as insects, spiders lived a lot which of these is the food source of amphibians, reptiles and mammals. This cycle is characterized by recurring food web as helps to balance the ecosystem (Chamchoi, 2015). Suan Sunandha Rajabhat University Samut Songkhram Campus is the perfect environment for wetlands surrounding the shrimp with salt and abundant mangrove communities. It is best to be a source of refuge habitat to nest and lay eggs, as a source of food for many species of vertebrates. It is also suitable for the study and explore the diversity of life in this area. Thus, the purpose of this research was to study and explore the species diversity of vertebrates, including three groups of amphibians, reptiles and mammals in Suan Sunandha Rajabhat University Samut Songkhram Campus and its surrounding area. To serve this study about the status of population abundance and conservation status of all three groups of vertebrates as the database of the biological diversity for those who want this information to be studied further and a guideline for the sustainable conservation of vertebrates.

## 2. Materials and Methods

### 2.1. Study site

This study area is located in Suan Sunandha Rajabhat University Samut Songkhram Campus, Bang Kaew sub-district, Muang Samut Songkhram, central region of Thailand and its around area (Figure 1). Duration of surveying was undertaken from December 2012 to June 2013. The current study was to determine the species diversity and the conservation status of amphibians, reptiles and mammals.

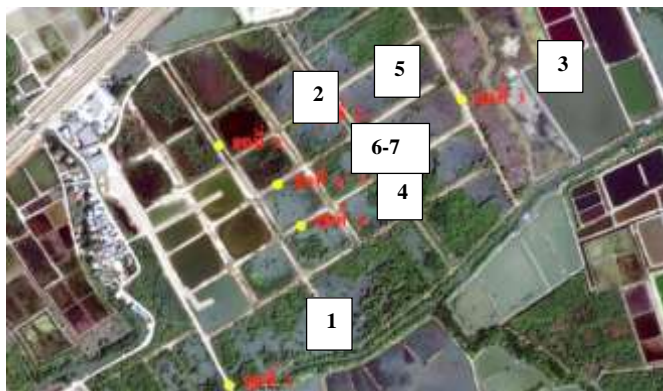


Figure 1. The study area in Suan Sunandha Rajabhat University Samut Songkhram Campus, Bang Kaew sub-district, Muang Samut Songkhram (Source: Adapted from Google Earth, 2013)

### 2.2. Data collection

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Planned and carried out a survey in the study area by doing a survey of Meewattana (2014). Scoping area from satellite image and a set of routing study and then determine cage drop points to trap rats and spread nets to catch bats (Figure 2).



**Figure 2. Cage drop points and spread nets around Suan Sunandha Rajabhat University Samut Songkhram Campus (Source: Adapted from Google Earth, 2013)**

The diversity of vertebrates to assess the status of the data was abundant and conservation status. The survey explored the animal directly, record the data of the number of species and individuals found in the study area. Data collection is as followed: 1) observation is the data collection in the study area of the sighting of the animal directly such as bite to eat, scream, hair etc.; 2) find the animals on the timber, stack materials and trees; 3) spotlight count is how to use of lights in front of the animals to explore out at night and life trap is how to use a net to trap bats.

### 2.3 Data analysis

Classified animal lists according to the taxonomy and determine the level of abundance to assess the status of abundance followed by Meewattana (2014).

#### 2.3.1 Specific Abundance: A

$$\% A = \frac{\text{A number of time were found (t)}}{\text{All number of studies (T)}} \times 100$$

#### 2.3.2 Relative Abundance

$$RA = \frac{At}{\text{Total of all species}}$$

#### 2.3.3 Relative density

$$RD = \frac{\text{Total of average number of all species}}{\text{species}} \times 100$$

#### 2.3.4 Importance Value Index (IVI)

$$\%IVI$$

All of vertebrates were divided of their status into three status: common, uncommon and rare from Importance Value Index (IVI) (Meewattana, 2014). Assess the conservation status as followed the Wildlife Preservation and Protection Act 1992; the Office of Natural Resources and Environmental Policy and Planning 2006 (Red Data of Thailand) and International Union for Conservation of Nature (IUCN) 2012.

## 3. Results and Discussion

### 3.1. Species diversity of vertebrates

The species diversity of vertebrates were studied in Suan Sunandha Rajabhat University Bang Kaew sub-district, Muang District, Samut Songkhram Province and its surrounding area. The result of the study revealed a total of 16 species of vertebrates in three groups were found which could be divided into 2 species of amphibians from 2 genera 2 families 1 order; 10 species of reptiles from 9 genera 5 families 1 order and 4 species of mammals from 4 genera 3 families 1 order (Table 1).

However, the most abundant vertebrate found was reptiles: 10 species or 63% of the total vertebrate found since mostly reptiles have been ecological resistant, can live in a variety of environments and adapt to the changing environment to be good. The second most abundant was mammals: 4 species (25%) probably because of the area studied include the whole community, grass, trees, shrubs and flowering plants and fruit trees is a food source of insects causing mammals which are sensitive to the environment has to adapt difficult for living. The least abundant was amphibians: 2 species (12%) (Figure 3). It is possible that the study area is quite specific ecological conditions since most of the areas are the mangrove canal and the surrounding water is brackish thus limiting the living space of amphibians. When comparing the number of vertebrate species in three groups found similar with Theerapat and Jitt (2006) studied a diversity of vertebrates in the mangroves of Thailand (excluding fish) found amphibian 4 families 6 species, reptile 13 families 32 species and mammal 13 families 36 species. In this study, the number of species of reptiles and mammals were additional from Theerapat and Jitt include reptiles: *Ptyas korros*, *Chrysopelea ornate*, *Coelognathus radiates*, *Calotes emma* and mammal: *Niniventer fulvescens*.

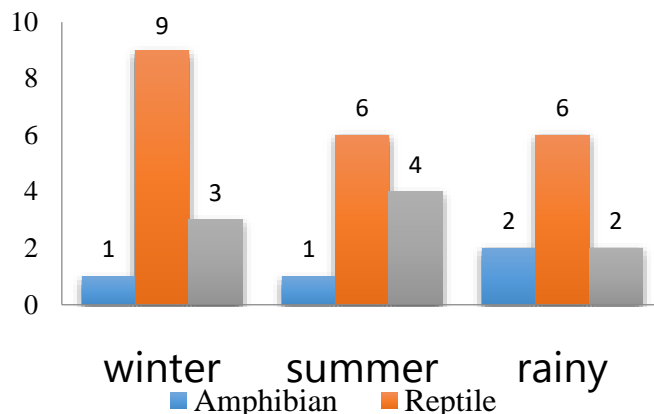
**Table 1. List of vertebrates recorded on the Suan Sunandha Rajabhat University, Samut Songkram Campus**

Class	Order	Family	Scientific name	Individuals
Amphibian	Anura	Dicroglossidae	<i>Fejervarya cancrivora</i>	107
		Bufoinae	<i>Duttaphrynus melanostictus</i>	3
total	1	2	2	110
Reptilia	Squamata	Agamidae	<i>Calotes emma</i>	15
		Gekkonidae	<i>Hermidactylus frenatus</i>	93
			<i>Hermidactylus platyurus</i>	5
		Scincidae	<i>Eutropis multifasciata</i>	1
		Varanidae	<i>Varanus salvator</i>	30
		Colubridae	<i>Cerberus rynchops</i>	103
			<i>Ptyas korros</i>	2
			<i>Lycodon capucinus</i>	1
			<i>Chrysopelea ornata</i>	2
		total	1	5
Mammalia	Rodentia	Muridae	<i>Rattus losea</i>	6
			<i>Niniventer fulvescens</i>	4
		Sciuridae	<i>Calloscirus finlaysonii</i>	6
		Cercopithecidae	<i>Macaca fascicularis</i>	60
total	1	3	4	76

The number of amphibian species were different from Wut et al. (2006) studied the diversity of amphibians in Khlong Sang Wildlife Sanctuary, Surat Thani province probably due to the environment of study area and the survey period are different but found the same 1 species was *Duttaphrynus melanostictus* and differ from Pitak et al. (2006) studied the herpetological survey of Trat Agroforestry

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Research Station, Trat Province which found *Fejervarya cancrivora* in this study. In addition, reptile species in this study differ with Piyawan (2004) studied the species diversity of herpetofauna in Khao Kra Jome, Amphur Suan Pueng, Ratchaburi Province and Kanokorn (2009) studied on the reptile diversity in Limestone Forest and Religious Territory, Khaowong Sub-district, Phraphutthabat District, Saraburi Province probably due to the difference of environments, boundaries of study area and survey period.



**Figure 3. Percentage of vertebrate species in Suan Sunandha Rajabhat University, Samut Songkram Campus**

When comparing the number of mammal species found similar to Sopsis (2011) studied the species diversity of birds and mammals in Yee-Sarn, Amphoe Amphawa, Samut Songkhram province because ecological habitats are similar.

### 3.2. Vertebrate species found in each season

The survey included a total period of 7 months from December 2012 to June 2013. The period can be divided into three phases: December to February is winter, March to April is summer and May to June is rainy season. Each season, the survey found vertebrates different (Figure 4). Vertebrates found in three seasons as 1 amphibian species (*Fejervarya cancrivora*), 5 reptile species (*Calotes emma*, *Varanus salvator*, *Hemidactylus frenatus*, *Hemidactylus platyurus*, *Cerberus rynchops*) and 1 mammal species (*Calloscuiurus finlaysonii*). Most amphibians found at nighttime since those are the activities such as living and breeding in the night and high temperature in daytime will make these animals are hiding. This survey also found during the rainy season especially near the pool or humid areas compliance with Tunya (2003). Most reptiles and mammals found in the daytime because living and to get heat from the environment to adjust the temperature to be ready to carry out activities and most mammals live in mangrove forest since these are sensitive to the environment easily.

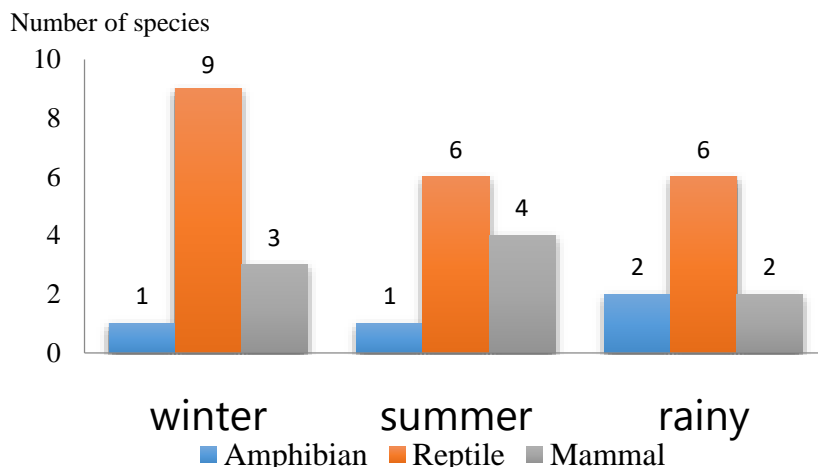


Figure 4. Number of vertebrate species in each season in Suan Sunandha Rajabhat University, Samut Songkram Campus

### 3.3. The species abundance status

Assessing the abundance of vertebrate population status surveyed in this study has the difference in an abundance of each species and a number of time were found in each animal species. When analyzed the Importance Value Index (IVI) of each group found that species abundance status were different (Table 2). Assessing the species abundance status in some animals, if there are more than 30 individuals and the number of times were found more than any other type, it will not be analyzed the Importance Value Index (IVI) because of the data error.

The species abundance status for Suan Sunandha Rajabhat University, Samut Songkram Campus was identified as a disturbed and isolated habitat, particularly because of poor dispersal ability for vertebrates, especially amphibians, reptiles and mammals. Thus, progressive urbanization has resulted in the replacement of many species by a smaller number of widespread species, for example, the black-spined toad (*Duttaphrynus melanostictus*), the common sun skink (*Eutropis multifasciata*), the finlayson's squirrel (*Calloscirus finlaysonii*) and the crab-eating macaque (*Macaca fascicularis*). Urbanization and industrialization in the study area have also fostered the local extinction of species unable to adapt to the changing conditions (Mortberg, 2001; Crooks et al., 2004; Castelletta et al., 2005). However, the population trend of the crab-eating macaque (*Macaca fascicularis*) has shown an increase (Duengkae, 2010). Malaiivijitnond and Hamada (2008) reporting on the then-current situation of the crab-eating macaque concluded that the habitat for this species had changed from natural forests to urban or recreation parks and that the species had adapted well to disturbed habitats. Moreover, many sites were overpopulated and there were conflicts with humans in Thailand.

**Table 2. Species abundance status of vertebrates in each group recorded on the Suan Sunandha Rajabhat University, Samut Songkram Campus**

Common name	Scientific name	t	n	IVI	Status
Mangrove frog*	<i>Fejervarya cancrivora</i>	12	107	-	-
Black-spined toad*	<i>Duttaphrynus melanostictus</i>	4	3	-	-
Forest crested lizard	<i>Calotes emma</i>	12	15	32.8236	C
Spiny-tailed house gecko*	<i>Hermidactylus frenatus</i>	14	93	-	-
Flat-tailed house gecko	<i>Hermidactylus platyurus</i>	6	5	17.8824	U
Common sun skink	<i>Eutropis multifasciata</i>	1	1	9.0589	R
Water monitor*	<i>Varanus salvator</i>	12	30	-	-
Dog-faced water snake*	<i>Cerberus rynchops</i>	12	103	-	-
Indochinese rat snake	<i>Ptyas korros</i>	2	2	11.0589	R
Common wolf snake	<i>Lycodon capucinus</i>	1	1	9.0589	R
Golden tree snake	<i>Chrysopelea ornata</i>	2	2	11.0589	R
Copper-headed racer	<i>Coelognathus radiatus</i>	1	1	9.0589	R
Lesser ricefield rat	<i>Rattus losea</i>	3	3	34.2657	C
Chestnut white-bellied rat	<i>Niniventer fulvescens</i>	3	3	29.0210	R
Finlayson's squirrel	<i>Calloscirus finlaysonii</i>	6	6	36.7133	C
Crab-eating macaque*	<i>Macaca fascicularis</i>	5	5	-	-

C = Common, U = Uncommon, R = Rare, t = a number of time were found, n = an abundance of each species, \* = species more than 30 individuals

### 3.4. The conservation status

From the results, no animal was a wildlife sanctuary but there was only wildlife protection found in reptiles 4 species (*Calotes emma*, *Varanus salvator*, *Coelognathus radiates* and *Ptyas korros*) and mammals 1 species (*Macaca fascicularis*). When evaluated the conservation status of vertebrates followed by IUCN 2012 were classified as least concern in three groups and also assessed by Red Data of Thailand 2006 using the same criteria with IUCN. Both of amphibians and reptiles were evaluated as least concern but not in mammals (Table 3).

From many papers found that most study and survey aim is to exploit the mangrove forest and benthos therefore, there was no documentation on amphibians, reptiles and mammals in this study area. It is possible that the study was quite specific ecological conditions since most areas are mangrove and canals surrounding area is mostly brackish. Resulting in amphibians are animals which make a limited living space and adapt to living inconveniently. This survey found only 2 species of amphibian as *Fejervarya cancrivora* can live for food in areas where is marine and *Duttaphrynus melanostictus* lives in the building as well.

**Table 3. The conservation status of vertebrates in the area of Suan Sunandha Rajabhat University, Samut Songkram Campus**

Scientific name	The conservation status		
	Act. <sup>1</sup> 1992	IUCN <sup>2</sup> 2012	Red Data of Thailand <sup>3</sup> 2006
1. Fejervarya cancrivora	-	LC	LC
2. Duttaphrynus melanostictus	-	LC	LC
3. Calotes emma	P	-	LC
4. Hermidactylus frenatus	-	-	LC
5. Hermidactylus platyurus	-	-	-
6. Eutropis multifasciata	-	-	LC
7. Varanus salvator	P	LC	LC
8. Cerberus rynchops	-	LC	LC
9. Ptyas korros	P	-	LC
10. Lycodon capucinus	-	-	LC
11. Chrysopelea ornata	-	-	LC
12. Coelognathus radiatus	P	-	LC
13. Rattus losea	-	LC	-
14. Niniventer fulvescens	-	LC	-
15. Calloscuiurus finlaysonii	-	-	-
16. Macaca fascicularis	P	LC	-
total	5	7	11

<sup>1</sup> = Status according to the Wildlife Reservation and Conservation Act (1992); WP = Wildlife Protection and WS = Wildlife Sanctuary

<sup>2,3</sup> = Status according to IUCN (2012) and Red Data of Thailand (2006); CR = Critically Endangered, EN = Endangered, VU = Vulnerable, LC = Least Concern, NT = Near Threatened and - = No conservation status

#### 4. Conclusion

The species composition of the vertebrates in the area of Suan Sunandha Rajabhat University, Samut Songkram Campus from December 2012 to June 2013, for seven months were studied by walking survey around the site in day and night time. This survey found vertebrates in 16 species from 3 orders 10 families and 15 genera which consisted of the amphibians 2 species from 1 order 2 families and 2 genera; the reptiles 10 species from 1 order 5 families and 9 genera; and the mammals 4 species from 1 order 3 families and 4 genera. The species abundance status of the vertebrates were mostly rare and the conservation status was also least concern in each group.

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