CURRENT POPULATION STATUS, DIVERSITY AND EXPLOITATION OF TORTOISES AND FRESHWATER TURTLES IN MYEIK AREA, TANINTHARYI REGION

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Abstract

Species diversity, population and exploitation of turtles and tortoises in Myeik area, Tanintharyi region were observed in the study work. The study was conducted in Myeik area, Tanintharyi Region from May 2015 to October 2016. The research designed was based on field study. The field work was conducted three times in the study period, in each study site. A total of 11 species were recorded representing two tortoise species and nine freshwater turtle species in Myeik area. Among the recorded species 18% of soft shell and 82% of hard shell were observed. The values of diversity index for three study sites indicated that the condition of these sites may be perfect habitat for the turtle species. During investigation, illegal shell trade was encountered in Tanintharyi and Palaw Township.

Keywords: Myeik area, freshwater turtles, tortoises, population, diversity, trade

Introduction

Turtles are among the most exploited and abused animals in the world. This exploitation and abuse have occurred at the hands of almost all civilizations and since ancient times. Since they are slow, docile, and easy to capture, turtles are being killed in many parts of the world. Today, the main threats are exploitation for food and commerce (Bonin *et al*.,2006). Most of turtles have been collected, illegally for food, medicinal, and pet markets in India, China and Thailand. Majority of wild caught turtles were exported to China and Thailand markets from Myanmar (Kalyar *et al*., 2014). The diversity of turtles and tortoises in the world that have existed in modern times, and currently generally recognized as distinct, consists of 334 species, of which 58 are polytypic, with 127 additional recognized subspecies, or 461 total of modern turtles and tortoises. There are about 90 species of turtles live in Southeast Asia (Sitha *et al*.,2006). Myanmar has the highest chelonian

diversity and highest chelonian endemism of any Southeast Asian country (Kuchling *et al*., 2004).

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Myanmar has 32 species of turtles and tortoises including seven endemic species (Win Maung and Win KoKo,2002). Twenty globally threatened non-marine reptile species have been recorded in Myanmar, all of which are turtles. Thus, turtles are among the most threatened of any major group of vertebrate species. The study focused on some turtles and tortoises in Myeik area, Tanintharyi region. The study area had been recognized as the hotspot of Chelonian diversity in Myanmar. Some authors reported that most endangered species of turtles and tortoises had been occurred in Tanintharyi region. According to the previous data, most of the turtle and tortoise species were reported to be extremely abundant in Tanintharyi Region. But in particular, little is known about species population and the exploitation level of the freshwater turtles and tortoises in Myeik area.

The present research is carried out with the following objectives: to record the diversity and population of freshwater turtle and tortoise species in Myeik area and to investigate the exploitation level of freshwater turtle and tortoise species in the study area.

Materials and Methods

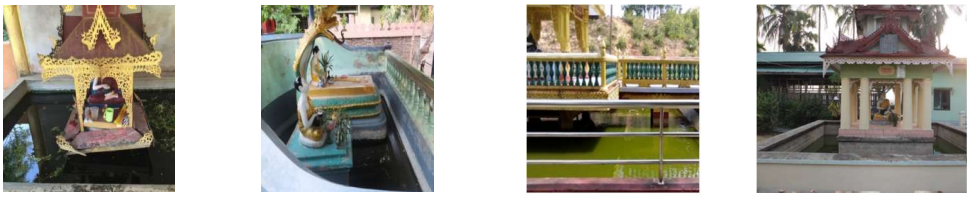
Study area and study period

Three study sites in Myeik area were selected for the study. Myeik township (12˚28'11" N, 98˚36'47" E), Tanintharyi township (12˚5'30" N, 99˚ 0'44" E), and Palaw township (12˚58'32" N, 98˚38'41" E) were chosen to study occurrence and population of freshwater turtles and tortoises in these environment. Data collections were carried out from May 2015 to October 2016.(Fig.1)

Figure 1. Location map of Myeik Area

Collection of the data

The study was carried out based on field study. Some information was first probed from some markets, villagers, natives, farmers, and fishermen lived in and around the study sites. Interviews with the local peoples and collectors using photo sheets of turtle were carried out. Visual encounter surveys were conducted at the natural habitat of the study areas.



(A) (B) (C) (D)

Plate1. Temple ponds

(A) (B) (C) (D)

Plate2. (A, B, and C) Trade and local collectors. (D) Interview survey

Identification

According to Smith (1931); CITES Identification Guide Turtles and Tortoises (1996); Win Maung and Win Ko Ko (2002) and Kalyar *et al*., (2014).

Sex differentiation

Male and female freshwater turtles usually differ in coloration, size, shell proportions and features; by enlarged base and longer tail in male than in female (Ernst and Barbour, 1989); usually differ in coloration, size, shell proportions and features (Carr, 1952).

Statistical analysis parameters

Descriptive variable and indices of species richness and diversity were utilized (Krebs et al., 1989; Solow, 1993). Shannon Diversity Index, Margalef D Index and Species richness were performed utilizing Species Richness and Diversity III Software Informer ver. 3.0 and Excel 2007.

Results

Species composition and Conservation status

Study recorded altogether 11chelonian species in Myeik area. A total of 11 species were studied representing two species of tortoises and nine species of freshwater turtles belonging to four families, Testudinidae (two species), Trionychidae (two species), Geoemydidae (six species), Emydidae (one species). There were *Indotestudo elongata* (Yellow tortoise), *Manouria emys* (Asian brown tortoise), *Siebenrockiella crassicollis* (Black marsh turtle), *Morenia ocellata* (Myanmar eyed turtle), *Cyclemys oldhamii*, (Oldham leaf turtle), *Cuora amboinensis lineata* (Myanmar box turtle), *Heosemys grandis* (Giant Asian pond turtle), *H.spinosa* (Spiny turtle), *Trachemys scripta elegan* (Red eared slider turtle), *Amyda cartilaginea* (Asiatic soft shell turtle), *Dogania subplana* (Malayan soft shell turtle) in Myeik area (Table1). As the conservation status according to the IUCN Red List (2012), three species are endangered (EN), five vulnerable (VU), one is nearly threaten (NT), and two are least concerned (LC) (Table2.Fig.2).

Population of different species

In Myeik area, a total of 361 individuals of 11 turtle species were recorded in rearing condition from three examined study sites. There were 45 individuals from Myeik, 259 individuals from Tanintharyi and 57 individuals from Palaw. The percentages population of *M.ocellata* was recorded the highest and *S.crassicollis* was the second highest population, *D.subplana* was the lowest percentage population respectively in the study area. Among the recorded species 18% of soft shell and 82% of hard shell were observed (Fig.3). Results show that overall percentage population was composed 21% juveniles, 51% females and 28% males during the study periods (Fig.4). The highest number of occurrence found for female, resulting in male to female ratio of 1:1.83 in Myeik area.

Species diversity in different study sites

Regarding the species diversity of different sites, Palaw Township was found to have the highest diversity of species with a modest H′ value 1.550 and D value 4.520. While, the second highest index value was observed in Tanintharyi Township with H′ value 1.329 and D value 2.427, which was followed by Myeik Township with H′ value 1.093 and D value 2.380 (Table3).

The species richness was found to be highest in Myeik with 1.842, second in Palaw with 1.732 and Tanintharyi had the lowest species richness value 1.429 during the study period. Although, the evenness value of Palaw with 0.383, Myeik with 0.287 and Tanintharyi with 0.239 were analyzed (Table3).

Exploitation

During the study period, most of the village in the state and potential sites with local respondents were interviewed and observed. Most turtle species were exploited for meat and trade purpose during the study period. There were about over 200 dead shell of chelonian were observed in Shaninntaw village, Tanintharyi township (Plate 3). During investigation, plastrons sale prices ranged from 1000Ks to 4000Ks per viss, while carapace could be sold for only an average of 6000Ks/viss. Moreover, live turtles were also sold for a mean of 8000Ks/viss depending on species (Plate3). Most of turtles and tortoises came from different villages around in Myeik environs. According to interview survey and several respondents, tortoises and turtles were consumed locally as food in some villages around Tanintharyi Township. The local agents collected the parts of turtles from different places and informed the main dealer (Plate3.B). Dealer visited these areas at regular intervals, collected the turtle's parts, and gave them money in return. During the study periods, most of the turtle and tortoise species were recorded by finding shells from trader. All sizes and life history stages ranging from small/juvenile, medium/subadult, and to large/adult were for sale.

Table 1. Recorded tortoises and turtles of order Testudines in Myeik area

Order	Family	Genus	Species/Subspecies	Common name
Testudines	Testudinidae	*Manouria*	*M. emys*	Asian Brown Tortoise
		Indotestudo	*I. elongata*	Yellow Tortoise
	Trionychidae	*Amyda*	*A. cartilaginea*	Asiatic Soft shell Turtle
		Dogania	*D. subplana*	Malayan Soft shell Turtle
	Geoemydidae	*Morenia*	*M. ocellata*	Myanmar Eyed Turtle (Endemic)
		Cyclemys	*C. oldhamii*	Oldham's Leaf Turtle
		Siebenrockiella	*S. crassicollis*	Black Marsh Turtle
		Cuora	*C. amboinensis lineata*	Myanmar Box Turtle (Endemic)
		Heosemys	*H. grandis*	Giant Asian Pond Turtle
		Heosemys	*H. spinosa*	Spiny Turtle
	Emydidae	*Trachemys*	*T. scripta elegan*	Red-eared Slider Turtle

Table 2. National and International protection/conservation status of recorded species

No	Species	Conservation Status			
		IUCN Red List (2012)	CITES (2010)	MWL (1994)	MFL(1993)
1	*M. emys*	Endangered	Appendix II	Protected	Not Listed
2	*I. elongata*	Endangered	Appendix II	Protected	Not Listed
3	*A. cartilaginea*	Vulnerable	Appendix II	Protected	Protected
4	*D. subplana*	Least Concerned	Not Listed	Protected	Protected
5	*M. ocellata*	Vulnerable	Appendix I	Protected	Protected
6	*C. oldhamii*	Nearly Threatened	Not Listed	Protected	Protected
7	*S. crassicollis*	Vulnerable	Appendix II	Protected	Protected
8	*C. amboinensis lineata*	Vulnerable	Appendix II	Protected	Protected
9	*H. grandis*	Vulnerable	Appendix II	Protected	Protected
10	*H. spinosa*	Endangered	Appendix II	Protected	Protected
11	*T. scripta elegan*	Least Concerned	Not Listed	Protected	Protected

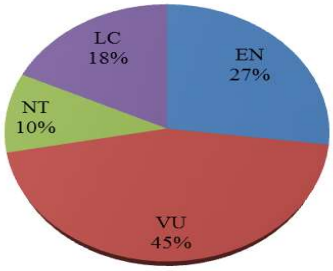


Figure 2. Conservation status of recorded turtles and tortoises in Myeik area

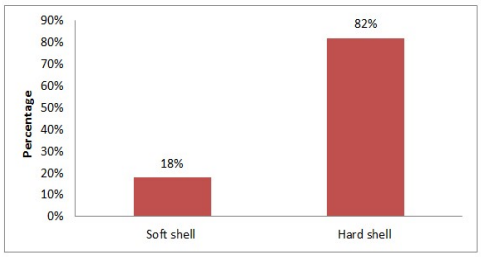


Figure 3. Percentage shell types of recorded turtles and tortoises in Myeik area

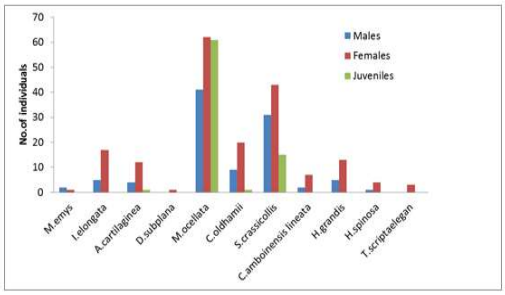


Figure 4.Comparison of recorded turtles and tortoises in Myeik area

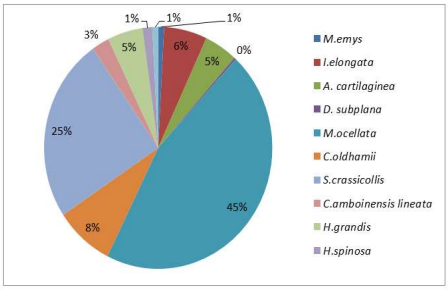


Figure 5. Percentage population of recorded turtles and tortoises in Myeik area

Table 3. Species diversity and richness in three study sites of Myeik area

Sr. No.	Particular	Myeik	Tanintharyi	Palaw
1	Species abundance (N)	45	259	57
2	Shannon Diversity Index (H)	1.093	1.329	1.550
3	Simpson's Index of Dominance (D)	2.380	2.427	4.520
4	Simpson's Index of Diversity (1 – D)	-1.380	-1.427	-3.520
5	Evenness of Shannon Index (E)	0.287	0.239	0.383
6	Margalef Index of species richness (R)	1.842	1.429	1.732

Table 4. Species number of distribution observed in captive and trade

No	Species	Captive*	Trade**	Males	Females	Juveniles
1	*M. emys*	2	1	2	1	-
2	*I. elongata*	9	13	5	17	-
3	*A. cartilaginea*	8	9	4	12	1
4	*D. subplana*	1	-	-	1	-
5	*M. ocellata*	5	159	41	62	61
6	*C. oldhamii*	2	28	9	20	1
7	*S. crassicollis*	51	38	31	43	15
8	*C. amboinen sislineata*	4	5	2	7	-
9	*H. grandis*	-	18	5	13	-
10	*H. spinosa*	-	5	1	4	-
11	*T. scripta elegan*	3	-	-	3	-

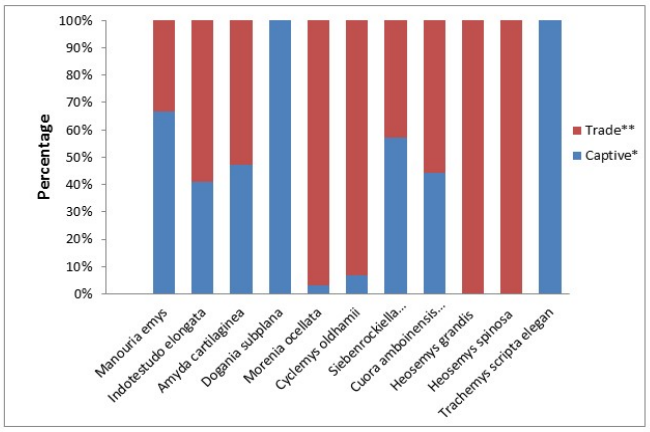
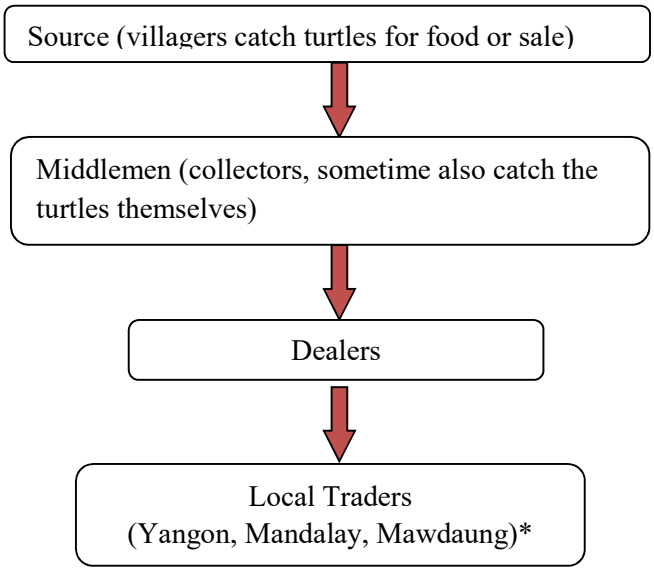


Figure 6 . Species percentage of distribution observed in captive and trade
*Specimens from captive areas (temple ponds or monastery)
**Shell trade or consumed specimens from exploited population

Trade Chain



*According to dealers, these are three main exporting regions

Discussion

Based on the species diversity of freshwater turtles and tortoises, a total of 26 species are present in Myanmar (Kalyar ,2012). Daw Mi Mi Maw (2004) reported that the total number of 17 species of some marine turtles, terrapin, tortoises, and freshwater turtles were recorded in the study area. In the present study, a total of 11 species (42%) were recorded representing two species of tortoises and nine species of turtles from Myeik area, Tanintharyi Region. Among the recorded species 18% of soft shell and 82% of hard shell were observed (Fig.3). It means that the soft shell chelonian population was less than that of hard shell species in the study environs. So, Myeik area is one of the major centers of turtle diversity in Myanmar.

According to the survey, *M.ocellata* and *S.crassicollis* were found abundant in Myeik area while other was relatively occurring with smaller numbers during the study periods. Very few individuals of *M. emys* (Asian brown tortoise), *C. amboinensis lineata* (Myanmar box turtle), *H.spinosa* (Spiny turtle), *D. subplana* (Malayan soft shell turtle) were recorded (Table.1) (Fig.5). Therefore the status of these species was rare in the study area. There are four tortoise species are present in Myanmar (Win Maung and Win Ko Ko, 2002). Among them two species of tortoises *I.elongata* and *M.emys* were recorded in the study area. Large numbers of these two tortoises are illegally exported to markets in southern China (Platt *et al.,* 2001).In the present study, these two species were found in the local shell trade. Moreover, the two species were heavily affected by local consumption, forest fires and habitat destruction. Forest fires posed a significant threat to tortoises in this area.

The present study was the first attempt concerning with species diversity and species richness of turtle fauna in Myeik area. The values of Shannon-Weiner index and Simpson's index for three study sites indicated that the condition of these sites may be perfect habitat for the turtle species. Of all the study sites, Palaw Township found to be the highest values of both indices. It may be assumed that this township provides various habitats preferable for most turtle species. Daget, 1976 stated that values greater or equal to 0.8 are usually considered as indicators of equitability in the communities. In the present study, the values of evenness are below 0.8, which suggests that the communities of turtles were not in evenness at the study area.

During investigation, illegal shell trade was encountered in Tanintharyi Township. In Shaninntaw village of turtle collector, shells of several species were obtained during the study periods. According to the owner, the price for one live individual ranged from 3000Ks to 8000Ks for a small individual, and then these were exported to Thailand. Information on trade routes was gathered through informal interviews with some collectors in Tanintharyi Township. In the present record, a total of nine species were traded species in Myeik area, all of species listed in the IUCN Red List of threatened animals. The present study found no evidence of the occurrence of *T. scripta elegan* (Red eared slider turtle) and *D. subplana* (Malayan soft shell turtle) in shell trade. The most abundant species observed during the study was the Myanmar eyed turtle, *M.ocellata*, with a total of 159 specimens observed in shell trade. Highest population size was recorded in May-June from Tanintharyi Township.

Moreover, the turtle species were more threatened by local consumption as food in the study sites (Plate.3). In some villages of Tanintharyi and Palaw Townships, turtles were caught mainly by local fishers. Large scale awareness programme could be initiated along the Tanintharyi region to protect the endangered chelonian species, because the village people have frequently been used to kill the turtle for consumption. Turtles and tortoises were protected under Myanmar Wildlife Law (1994) in Myanmar. However, local people have continuously captured the turtle species for food and for sale. The study found signs of over-exploitation or local extinction of turtle and tortoise species in Myeik area. During the study period, turtle and tortoise species were conserved to cooperate together with the local monks in some monastery of Myeik area (Plate 4). However, there was obviously a weakness in legislation regarding turtles and tortoises protection.

Conclusion

The present study highlighted the diversity and abundance of Chelonian species and its conservation threats in Myeik area, Tanintharyi region. Study revealed the existence of 11 Chelonian species under four families. By any standard, this is very high species diversity. But all of the turtle species are under threat of illegal hunting for meat and shell in this area. The conservation point of views, the population of the turtle species has been dramatically declined and conservation measures are in urgent needed in Myeik area.

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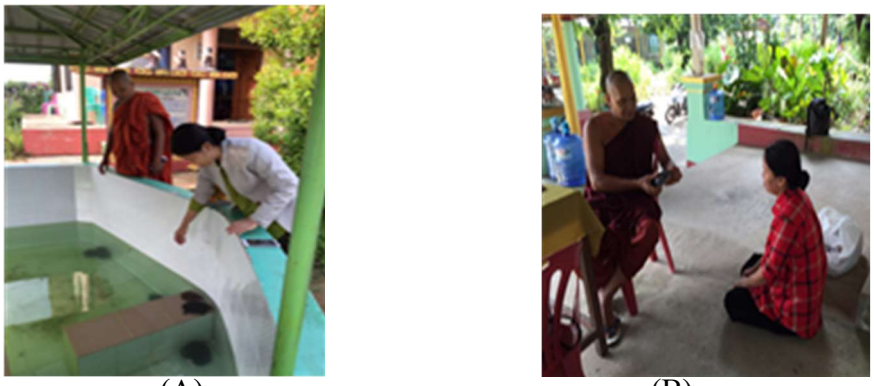
(A) (B) (C) (D)

(E) (F) (G) (H)

Plate 3.(A and B) Shell trade in Tanintharyi Township; (C) Shell trade (Carapaces) (D and E) Shell trade (Plastrons); (F, G and H) Dead of hard shell and soft shell turtles



(A) (B)

Plate 4. Conservation and cooperation with local monks (A and B)