Distribution and Diversity Status of Amphibians around Duya 'Inn' Environs in Hinthada Township

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Abstract

This study was conducted from April 2010 to March 2011 at Duya 'Inn' environs. The study sites were located into three different habitat types at the study area including water adjacent (Site I), grass plain of the bank of this 'Inn' (Site II), shrubs and trees planted naturally around this area. The line-transect sampling method was used to collect the samples. Amphibian diversity was calculated using different indices like (1) Shannon-Weiner index (H); (2) Simpson Dominance index (D) and (3) Margalef's index. The present study was conducted to record the distribution patterns of amphibian's species and assess its diversity status. A total number of 15 species of amphibian were recorded during the study period. The highest abundance and richness is recorded in site I, followed by site II and III. The Shannon-Weiner diversity index value (H) showed similar diversity index in site I and site II as 2.6 and then followed by site III as low diversity index of 2.4. The Simpson's dominance index values (D) showed high at site III as 0.1, followed by site I as 0.08 and low at site II as 0.04. The Margalef index of species richness values (Ma) revealed high at site I as 1.9, moderate at site III as 1.6 and low at site II as 1.5.

Key words: Amphibian, Diversity index, Distribution.

Introduction

Duya 'Inn' which is about 11.3 km south of Hinthada, filled with water throughout the seasons. It was once a part of the Ayeyarwady River, but being cut off by the building of the embankment along the river, it became an isolated mass of water, with no connection to the river itself. Only a few streams flow out of this 'Inn', the 'Inn' being filled only by rain. It is located at 17° 36' N and 95° 24' E with 432.15 hectare wide (Figure - 1). Its environs are surrounded by rice fields, planted trees and shrubs, and Duya village (Myint Myint Khaing, 1994).

Most amphibians prefer to inhabit such area with aquatic environs, rice fields and near human settlement areas. Zoologists defined the meanings to distinguish the general characteristics of amphibians. It means "living double lives", meaning that they live two lives: one in water with gills and the other on land by growing lungs as they age. They are vertebrates and cold blooded (ectothermic). Early amphibians, a crucial link from fish to terrestrial reptiles, were the first animals to leave the sea and venture onto the land. Frogs, toads are good examples of amphibians.

Three orders of amphibians exist today: the frogs and toads (Order Anura), the salamanders (Order Cuadata or Urodela) and the caecilians (Order Gymnophiona). There are over 4,600 species of amphibians encompassing vast differences in morphology, body size, ecology, and behavior. Anurans (frogs and toads) are the largest group of amphibians having approximately 3,800 species. Frogs and toads are also very ecologically diverse, inhabiting arboreal, aquatic and terrestrial niches with great success. Amphibians are a valuable part of the biotic community. Amphibians are important predators of insects, other invertebrates and vertebrates. A single Blanchard's cricket frog consumes approximately 4,800 insects per season. This impressive population is essential in controlling invertebrate populations (Zug, 2003). Amphibians live mainly in freshwater or damp places; a few although occur in the estuaries, none is truly marine. They are common in moist temperate region, but most of the species including the caecilians are tropical. Some frogs have been found in the Arctic Circle.

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Some toads and tree frogs live in deserts and a few have been found to hide in underground retreats during the dry periods.

Now amphibians are under considerable threat, and every year several species become extinct. Though they often go unnoticed, many species are important to the ecology of their habitats, acting as both prey and predators, and a decline in amphibian numbers from world ecosystem at an alarming rate may be a sign of environmental pollution (Alford and Richard, 1999). Regards on amphibians' conservation, the list of its fauna was made to provide as a baseline information for the further study and ecological research in this area. This study represents the Order Anura (frogs and toads).

This research therefore was conducted with the following objectives:

- To record the distribution patterns of amphibians' species existing in Duya ' In ' environs and

- To assess its diversity status.

Materials and Methods

Study period

This study was conducted from April 2010 to March 2011.

Study area and study sites

This study was carried out at Duya 'Inn' environs. The study sites were located into three different habitat types at the study area including water adjacent (Site I), grass plain of the bank of this 'Inn' (Site II), shrubs and trees planted naturally around this area (Site III) (Figure- 1).

Methods

The line-transect sampling method was used to collect the sample. The number of individuals observed in 50m distance of transect line in each study site by walking were counted. The visual counting was made. Some specimens were collected by hand whenever necessary for further investigation. The photographs of the specimens were taken at the study site. The field guide books of reptiles and amphibians written by OShea & Halliday, (2002); Cox, (1991); Cox, et al, (2002) and Zug, (2003) were used to identify the specimens.

Data analysis

Amphibian diversity was analyzed using different indices like (1) Shannon-Weiner index (H); (2) Simpson Dominance index (D) and (3) Margalef's index.

(1) Shannon-Weiner index (1949)

$H = - \Sigma Pi \log2 Pi$

Where, H = Shannon – Weiner index

$$Pi = \frac{ni}{N}$$

$\Sigma = Sum$

Species diversity was calculated following Shannon-Weiner index (H) which depends on both the number of species present and the abundance of each species.

ni = Number of individuals of each species in the sample.

N = Total number of individuals of all species in the sample.

Abundance of fish population was calculated by the sum of all available species in different sites. Species richness was simply estimated by the variety of frogs and toad species in three different sites.

(2) Simpson's diversity indices

Simpson's diversity index is a measure of diversity. In ecology, it is often used to quantify the biodiversity of a habitat. It takes into account the number of species present, as well as the abundance of each species.

(a) Simpson's index of dominance (1949)

$$D = \Sigma \ \frac{ni\,(ni - 1)}{N\,(N - 1)}$$

Where,

ni = the total number of individuals of a particular species.

N = The total number of individuals of all species.

(3) Margalef index (1972)

Ma = S-1 / Ln N

Where,

'S' is the number of species

'N' is the number of individuals in the sample.

The number of species per sample is a measure of richness. It gives as much weight to those species which have very few individuals as to those which have many individuals.

Figure (1) Map of Duya 'Inn'
Source: Survey Department (Hinthada)

Results

A total number of 15 species of amphibian (frog and toad) of under 4 Families (Ranidae, Microhylidae, Rhacophoridae and Bufonidae) belonging to Oder Anura, were recorded during the study period. The recorded species and total observed numbers associated with their habitats were presented in table 1. Some recorded amphibian species were shown in plate I. There were abundantly recorded species of *Rana limnocharis, Rana l.limnocharis, Rana l.greenii, Kaloula pulchra* and *Microhyla ornata* in site I. The edible big frog of *Rana tigrena, Rana tigrena panthrena* and *Rana rugulosa* were observed with a few numbers. One kind of little sticky frog species *Kalophrynus pleurostigma* was rarely found in the study area. The species richness, abundance, distribution and biodiversity indices in all the three sites are shown in table 2. The highest abundance and richness is recorded in site I, followed by site II and III. Different diversity indices were calculated as per standard methods. The Shannon-Weiner frog and toad diversity index value (H) of different sites showed similar diversity index in site I and site II as 2.6 and then followed by site III as low diversity index of 2.4. The Simpson's dominance index values (D) showed high at site III as 0.1, followed by site I as 0.08 and low at site II as 0.04. The Margalef index of species richness values (Ma) revealed high at site I as 1.9, moderate at site III as 1.6 and low at site II as 1.5.

Table (1) Recorded numbers of amphibians associated with their different habitats.

No.	Scientific name	Site I Water adjacent	Site II Grass and paddy field	Site III shrubs and trees
1	*Rana tigrena*	2	nil	nil
2	*Rana tigrena panthrena*	1	nil	nil
3	*Rana rugulosa*	12	6	3
4	*Rana limnocharis*	120	92	95
5	*Rana l.limnocharis*	112	93	60
6	*Rana l.greenii*	96	63	48
7	*Rana macrodactyla*	23	34	4
8	*Limnonectes nitidus*	28	6	nil
9	*Occidozyga lima*	4	nil	2
10	*Philatus nongkhorensis*	nil	nil	3
11	*Polypedates leucomystax*	nil	34	14
12	*Kaloula pulchra*	45	21	36
13	*Kalophrynus pleurostigma*	2	nil	nil
14	*Microhyla ornata*	98	37	64
15	*Bufo melanosticttus*	9	3	22

Table (2) Species richness, abundance, distribution and diversity indices of amphibians around Duya 'Inn'.

Diversity index	Site I Water adjacent	Site II Grass and paddy	Site III shrubs and trees
Species richness	13	10	11
Abundance	552	389	351
Shannon-Weiner index (H)	2.6	2.6	2.4
Simpson's index of dominance (D)	0.08	0.04	0.1
Margalef index (Ma)	1.9	1.5	1.6

1. *Rana rugulosa*

2. *Rana limnocharis*

3. *Rana l.limnocharis*

4. *Rana limnocharis greeni*

5. *Occidozyga lima*

6. *Philatus nongkhorensis*

7. *Kaloula pulchra*

8. *Kalophrynus pleurostigma*

9. *Microhyla ornata*

10. *Polypedates leucomystax*

11. *Philatus nongkhorensis*

12. *Bufo melanosticttus*

Plate (I) Some recorded amphibian species

Discussion

A total number of 15 species of amphibians were recorded around Duya 'Inn' environ during the study period. The findings showed the high species composition and richness. It was suggested that existing of a high number of diversity and abundance of these creature would be beneficial to the environment and the agriculture sector. Zug (2003) and Frost (2004) stated that amphibians play an important role in agriculture because they are important predators of insects. Among 15 species of amphibians belonging to four Families (Ranidae, Microhylidae, Rhacophoridae and Bufonidae), the Familiy Ranidae is dominant and fairly distributed in all the study sites. The species richness and abundance were higher in site I

than other site II and III. The endemic frog species (*Rana limnocharis*) to Myanmar was also recorded in this area. The frog species of *Rana tigrena, Rana tigrena panthrena* and *Rana rugulosa* were observed with a few numbers. These species were described as threatened in IUCN Red List of 2005. With respect of amphibians' population, Zug (2003) stated that amphibians are under considerable threat, and every year several species become disappearing and extinct. World conservation association also described that the year 2008 as a frog year to protect those species since they noticed their population is declining yearly. One kind of little sticky frog species, *Kalophrynus pleurostigma* was found rarely in the study area. For this species the population status and reproductive performance are not found in the literature.

The Shannon-Weiner diversity index (H) showed that the values were found to be similar in site I and site II as 2.6 and then followed by site III as low diversity index of 2.4. The Simpson's dominance index values (D) showed high at site III as 0.1, followed by site I as 0.08 and low at site II as 0.04. With this index, 0 represents infinite diversity and 1, no diversity. That is, the bigger the value of D, the lower the diversity. The Margalef index values (Ma) described higher at site I as 1.9, moderate at site III as 1.6 and low at site II as 1.5. This index value revealed that the species richness and distribution of amphibians are more likely to be abundant in water adjacent area (Site I).

Conclusion

The amphibian's species composition, abundance and distribution are high in the study area. Out of 15 species, *Rana* species are dominant and distributed fairly in all the study sites. Among three study sites, the species richness and abundance are found higher in water adjacent area (Site I). The diversity index revealed that the index value is larger in Site I than in the others. This study will also provide a baseline data to highlight some threatened species of amphibians and to recognize one endemic frog for further research and ecological research as well as to protect these valuable animals from becoming extinct.

Acknowledgement

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