

## Study on Some Snails in Hpa-an Township, Kayin State

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### Abstract

Snail samples were collected from five study sites in Hpa-an Township. They were Shwe-Yin-Hmyo Pagoda environs (site 1), the pond of Kyaukkanladd Pagoda (Site 2), Mya-Kan-Thar Inn (Site 3), Channel (Site 4) near the rice field of Eastern Thidar Street, and Kyar-Inn Bridge (Site 5) within Hpa-an Township from December, 2011 to February, 2012. These snails were taken photographs with digital camera. Identification was based on the shell shapes and classification of recorded snails were followed by Blanford and Godwin-Austen (1908); Gude (1914); Thompson (2004). All species differed in shape, colour, and pattern of the shell. A total of 22 species belonging to 15 families and 22 genera were recorded. All of them, 21 species can be identified down to species level but one species to genus level. Totally, freshwater snails were recorded 11 species but also land snails were 11 species.

Key words: shell, freshwater snail, land snail

### Introduction

According to the state-run newspaper, *New Light of Myanmar* (31 August, 2011) a large invasive species of snail has destroyed rice crops around seven villages in Chaungzon Township in Mon State. Moreover, *New Light of Myanmar* (26 September, 2008) stated that an unidentified freshwater snail has left scores of paddy farmers in southern Myanmar reeling. In the wake of Cyclone Nargis which left nearly 140,000 people dead or missing in May, farmers cited an increase in the invasive snail species. Experts believed that the snails were washed up by the sea's tidal surge when it submerged more than 783,000 ha of rice paddy fields or 63 percent of paddy land in the affected areas (Revindra, 2008). According to the above description, it is needed to study the species diversity of the mollusca included in Hpa-an Township.

Mollusks are mostly salt-water, though some are found in fresh-water and a few are terrestrial. They include snails and slugs. Snails are soft-bodied animals that carry with them a protective shell and have an anterior head, a dorsal visceral hump, a ventral muscular foot modified for crawling, burrowing or swimming. Shells are asymmetrical typically with a univalve spirally coiled (Jordan, 1976).

Johnson (2009) explained that most species of fresh-water snails originally evolved from saltwater habitats, although several species evolved from terrestrial habitats to fresh-water. Snails usually play a dominant role in the ecology of fresh-water by providing food for many animals and by grazing on vast amounts of algae and debris. Fresh-water snails belong to a larger group of shelled animals called mollusks. Together, fresh-water, saltwater and terrestrial snails number well over 50,000 individual species, by far the largest group of mollusks. Fresh-water snails generally are dull colored, especially in comparison to their marine and terrestrial cousins. Their color generally varies from yellow-brown to black, but some species have stripes and other distinctive markings. Fresh-water snails come in a variety of shapes and sizes. Some snails are almost completely round in shape, but most species are generally conical. Adults of some species are smaller than the head of a pin and others larger

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than a baseball. Along with size, shape and coloring, structural shapes such as large tubercles, spiny projections, folds, sharp ridges and fine lines on their elaborately sculptured shells are what give some individual species their distinctive forms. These ornate shell structures are formed while the snail is building its shell.

Land gastropods were found in natural vegetation provide with a damp and warm condition, the range of fallen leaves and branches, rocks, rubbish, tree and herbaceous plants. Land snails have several characteristics that make them easily identifiable. They have a single shell, usually coiled; that is a combination shield and humidior. The hard shell resists the efforts of predators and provides a haven during dry time (Anonymous, 2011).

In Hpa-an Township, there are many rice fields, natural River known as “Thanlwin River”, streams and some terrestrial habitats for various mollusks. Therefore, several members of the snails belong to the phylum Mollusca are abundantly found in Hpa-an Township. The fresh-water snails may be present where there are piles of rocks and stones while the reason for searching through the base of trees and under the rubbish mess is that land snails may be found in the ground with moist humus.

Snails provide an easily harvested source of protein to many people around the world. Land snails, fresh-water snails and sea snails are all eaten in a number of countries (Kathryn *et al.* 2008).

Snail is a vector for several pathogens and parasites. The parasites carried by the snail are usually passed to humans through the consumption of raw or improperly cooked snails. To avoid the risk of poisoning, snails must be deprived of food for some time before they are eaten, for they may have fed on plants harmless to themselves but poisonous to humans. (Lubell, 2012)

Snails can carry and transmit rat lungworm (*Angiostrongylus cantonensis*), when improperly cooked and eaten, causing fever or death in extreme cases. Also a known vector for blood flukes (*Schistosoma* spp.) and an intestinal flukes (*Echinostomailocanum*). The snails were introduced (sometimes without permission) and quickly became pests in Indonesia, Thailand, Cambodia, Hong Kong, southern China, Japan, Guam and New Guinea. In the Philippines, they became the top pest in rice fields; where there has been 100% crop loss heavily infested areas (Hawaii, 2008).

There is no previous study of mollusks in this region, so the present study was carried out with the following objectives;

- to observe the snails found in natural habitat in Hpa-an Township
- to identify the observed snails from the respective habitats
- to observe the beneficial and harmful snails species in Hpa-an environs

## Materials and Methods

### Study Sites

There are five study sites, designated for the collection of snail samples as; Shwe Yin Hmyo Pagoda environs (16 °53'41.1 " N and 97° 37' 53.2" E) is located in the north (Site 1), the pond of Kyaukkanladd Pagoda (17°41'0.5 " N and 97° 43' 34.9" E) is situated in the south (Site 2), Mya-Kan-Thar Inn (16 °53'88.5 " N and 97° 37' 56.9" E) is located in the north (Site 3), Channel (16 °53'38.6 " N and 97° 38' 18.4" E) is located in the north eastern (Site 4) and Kyar Inn Bridge (16 °52'20.5 " N and 97° 38' 21.5" E ) is situated in the south (Site 5) of Hpa-an Township (Fig.1).

### Study Period

The study period lasted from December, 2011 to February, 2012.

### Sample Collection and Identification

Samples of larger (Macro snails) specimens (Live or shell) with the size of 5mm and greater were collected and kept in plastic bags with date, site number.

Samples of smaller (Micro snails) specimens (Live or shell) with the size of less than 5mm were collected with leaf and soil. If any snails are observed, a quart-sized cotton drying boxes is filled with the material from the site, labeled with the date, site number.

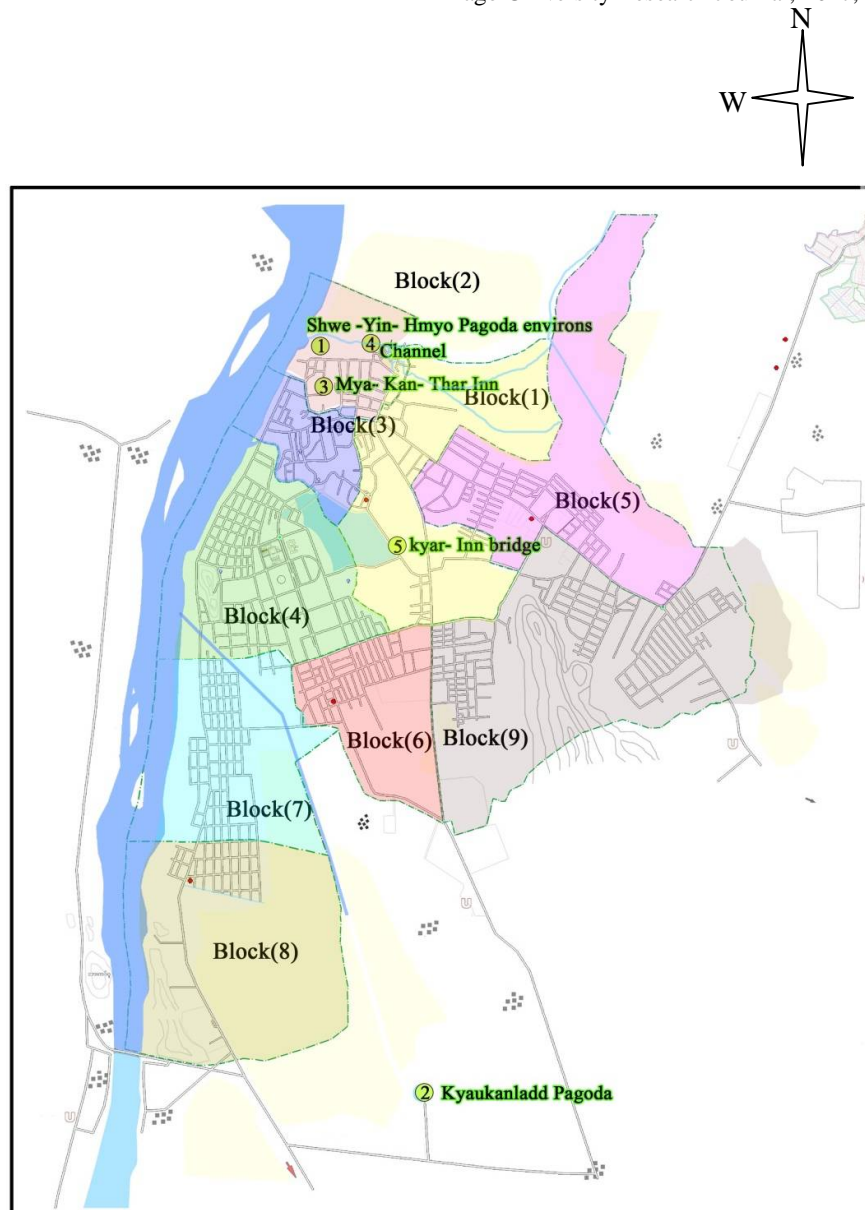
Then, all specimens were brought to Department of Zoology, Hpa-an University. And the specimens were washed and dried. The photographs were taken by digital camera. Measurement of the specimens was also recorded by centimeter ruler. After that, the specimens were identified according to the classification of Blanford and Godwin-Austen (1908); Gude (1914); Thompson (2004).

### Results

Total of 22 species of snails belong to phylum Mollusca were recorded in the present study. Identification and classification of recorded snails were followed by Blanford and Godwin- Austen (1908); Gude (1914); Thompson (2004);

#### Systematic Position of Recorded Species

Phylum	-	Mollusca
Class	-	Gastropoda
Subclass	-	Prosobranchia
Order	-	Mesogastropoda
Superfamily	-	Planorboidea
Family	-	Ampullariidae
Genus	-	<i>Pomacea</i>
Species	-	<i>P. canaliculata</i> (Lamarck, 1822)
Genus	-	<i>Pila</i>
Species	-	<i>P. globosa</i> (Swainson, 1822)



Source: Hpa-an Township Development Committee, Kayin State

Fig. 1. Map of study areas and study sites

Family	-	Planorbidae
Genus	-	<i>Planorbella</i>
Species	-	<i>P. trivolvislenta</i> (Say, 1834)
Genus	-	<i>Gyraulus</i>
Species	-	<i>G. parvus</i> (Say, 1817)
Genus	-	<i>Micromenetus</i>
Species	-	<i>M. dilatatusavus</i> (Pilsbry, 1905)
Superfamily	-	Cyclophoroidea
Family	-	Cyclophoridae

Genus	-	<i>Cyclophorus</i>
Species	-	<i>C. fultoni</i> (Godwin-Austen and Beddome, 1894)
Order	-	Neogastropoda
Family	-	Viviparidae
Genus	-	<i>Cipangopaludina</i>
Species	-	<i>C. chinensismalleatus</i> (Burch, 1980)
Subclass	-	Orthogastropoda
Order	-	Sorbeoconcha
Superfamily	-	Cerithioidea
Family	-	Thiaridae
Genus	-	<i>Tarebia</i>
Species	-	<i>T. granifera</i> (Lamarck, 1822)
Genus	-	<i>Melanoides</i>
Species	-	<i>M. turricula</i> (Lea, 1862)
Family	-	Pleuroceridae
Genus	-	<i>Elimia</i>
Species	-	<i>E. floridensis</i> (Reeve, 1860)
Subclass	-	Pulmonata
Superfamily	-	Lymnaeoidea
Family	-	Lymnaeidae
Genus	-	<i>Pseudosuccinea</i>
Species	-	<i>P. columella</i> (Say, 1825)
Order	-	Stylommatophora
Superfamily	-	Achatinoidea
Family	-	Achatinidae
Genus	-	<i>Achatina</i>
Species	-	<i>A. fulica</i> (Bowdich, 1822)
Family	-	Subulinidae
Genus	-	<i>Subulina</i>
Species	-	<i>S. octona</i> (Bruguiere, 1798)
Genus	-	<i>Opeas</i>
Species	-	<i>O.pyrgula</i> Schmacker and Boettger, 1891
Genus	-	<i>Allopeas</i>
Species	-	<i>A. gracile</i> (Hutton, 1834)
Genus	-	<i>Glessulaspp.</i> Von Martens, 1860

Family	-	Ferussacidae
Genus	-	<i>Caecilioides</i>
Species	-	<i>C. bensoni</i> (Smith, 1891)
Superfamily	-	Cochlicopoidea
Family	-	Cochlicopidae
Genus	-	<i>Cochlicopa</i>
Species	-	<i>C. lubrica</i> (Muller, 1774)
Superfamily	-	Punctoidea
Family	-	Charopidae
Genus	-	<i>Thysanota</i>
Species	-	<i>T. elegans</i> (Preston, 1909)
Superfamily	-	Gastrodontoidea
Family	-	Oxychilidae
Genus	-	<i>Oxychilus</i>
Species	-	<i>O. alliarius</i> (Miller, 1822)
Superfamily	-	Helixarionoidea
Family	-	Ariophantidae
Genus	-	<i>Ratnadvipia</i>
Species	-	<i>R. irradians</i> (Raheem and Naggs, 2006)
Family	-	Euconulidae
Genus	-	<i>Pseudaustenia</i>
Species	-	<i>P. atra</i> Godwin-Austen, 1891

### Morphological Characters of Recorded Species

*Pomacea canaliculata* (Lamarck, 1822)

(Golden apple snail)

*Pomacea* were found in ditches, freshwater marshes and similar aquatic environment. Apple snails have both gills and lungs. Shells are brown and have a pattern of stripes, yellow to green with reddish streaks, dark spiral bands, globose; shell opening (aperture) large, oval with large and deep umbilicus. Body is pale grey foot, with black pigment on the upper side of the body. Whorls have four and wide. Apical whorls bluntly rounded and not conspicuously elevated. Adult shells are about 40-70 mm in height and the width of it is 110-170 mm (Plate 1.A).

*Pila globosa* (Swainson, 1822)

(Apple snail)

The shell is globose with an oval opening. The interior of the shell is dull reddish with visible spiral bands. *Pilaglobosa* has a large and deep umbilicus. The aperture is narrowed. The color varies from olive green to grey green with a tinge of red. They have 3.5 whorls. Like

*Pomacea* and *Pila* also have a siphon which can extend out of the water to breathe. They live in slow-moving fresh water including rice growing areas, ponds, ditches and wetlands. Adult shells are about 33-40 mm in height. The width of the shell is 100-130 mm (Plate 1.B).

*Planorbella trivolvis lenta* (Say, 1834)

(Horn snails)

*P. trivolvislenta* prefers habitats with floating water weeds. These all have sinistral or left-coiling shells. Shells are dull. Sculpture is with regularly spaced, fine, incremented threads and spirals striations; which evident only on base of whorls in some specimens. Apex is flattened. They have 5.5 whorls. The height of the shell is 9-12 mm and the width of the shell is 16-20 mm (Plate 2.A).

*Gyraulus parvus* (Say, 1817)

(Ash Gyro)

*G. parvus* prefers habitats with floating water weeds especially on vegetation in the quiet pools and larger rivers. Shell is grayish-white. Umbilicus is broad and shallow. Shell is nearly smooth, sculptured with irregularly spaced incremental striations. They have three whorls. Side of whorl is flattened and sloping toward apex. Aperture is strongly oblique. The height of the shell is 10-12 mm and the width of the shell is 18-24 mm (Plate 2.B).

*Micromenetus dilatatusavus* (Pilsbry, 1905)

(Bugle Sprite)

These are found in pond water. The shell is small, of a yellowish green-color, minutely wrinkled by the lines of growth. The spire is flat, composed of 2.5-3 whorls, separated by a well-defined suture. The whorl is very convexly rounded so as to encircle a small, deep, abruptly formed umbilicus. This whorl rapidly enlarges, and terminates in a very large but not very oblique aperture, with the lip expanded so as to make it trumpet-shaped. The height of the shell is 10-13 mm. The width of the shell is 17-22 mm (Plate 2.C).

*Cyclophorus fultoni* (Godwin-Austen and Beddome, 1894)

Color is umber-brown, marbled with madder-brown above, given off from a few strong spots of this color on the side of the suture. Whorls have five and sub convex. Spire is conoid, side's flat, sharp apex, and shallow suture; the last is sharply keeled, forming a strong rib, oblique-ovate aperture. Shell is umbilicated. Peristome is white and well thickened. The height of the shell is 40-45 mm and the width of the shell is 45-50 mm (Plate 2.D).

*Cipangopaludina chinensis malleatus* (Burch, 1980)

(Chinense mystery snail)

Shell is medium to large 12-23 mm high and 28-35 mm wide. They have six to seven whorls. They have operculum with concentric growth rings. The inner coloration is white to pale blue, umbilicus is small and round. The color of an adult is brown or reddish-brown in pigmentation (Plate 3.A).

*Tarebia granifera* (Lamarck, 1822)

(Quilted Melania)

Their habitats are quick flowing freshwater rivers, in small ponds, large puddles. The height of the shell is 13-28 mm and the width of the shell is 18-33 mm, moderately globose, the suture seems to be overlapping, the body whorl is a little larger having seven whorls. The

aperture is wider than that of high. Spiraling is dark brown with bands. Base of last whorl has prominent spiral ridges (Plate 3. B).

*Melanoides turricula* (Lea, 1862)

(Fawn Melania)

Their habitats are near the bank and streams. Shell is olive-green with spots. The height of the shell is 16-29 mm and the width of the shell is 20-33 mm. They have seven whorls. Shell sculptured with fine spiral threads and fine vertical ribs present on uppermost whorls. Base of shell is usually without spiral band (Plate 3.C).

*Elimia floridensis* (Reeve, 1860)

(WaccasassaElimia)

They live in quick flowing fresh-water rivers, in small ponds, large puddles. They have nine whorls with weakly scalariform, causing the suture is to be deeply incised. Aperture terminates below periphery of body whorl. Vertical ribs are relatively strong and more widely spaced and smooth along the periphery strongly developed. The height of the shell is 15-60 mm and the width of the shell is 32-82 mm (Plate 3.D).

*Pseudosuccinea columella* (Say, 1825)

(American ribbed fluke snail)

Its synonym is *Lymnaeacolumellae* Say, 1817. They are found in small ponds, large puddles. The shell of *Pseudosuccineacolumella* is horny brown, thin, fragile and very finely striated with peaky upper whorls. Aperture is large, oval, much more than half the length of shell. Shell is coiled to the right, with the aperture on the right side. The shell has 3.5-4 weakly convex whorls with shallow suture. The last whorls are predominating. The height of the shell is 12-14mm and the width of it is 18-20 mm (Plate 4.A).

*Achatina fulica* (Bowdich, 1822)

(Giant African Land Snail)

They are found in agricultural areas, coastal areas and wetlands, natural and planted forests, scrublands and shrub lands and urban areas. *Achatinafulica* is generally reddish-brown in color with weak yellowish vertical markings but coloration varies with environmental conditions and diet. The light coffee color is common. There are seven to nine whorls when fully grown. The height of the shell is 45-90 mm. The width of the shell is 85-120 mm (Plate 4.B).

*Subulina octona* (Bruguiere, 1798)

They were found in large number, habitat in under pieces of wood, large rocks. The shell is thin, translucent, yellowish corneous, almost regularly tapering to the obtuse summit, very glossy. Whorls are 7.5 and quite convex. Suture is impressed and transverse line present. Aperture is oblique, ovate, columella concave above, obliquely truncate at its base. The shell of this species was elongated. The height of the shell is 10-14 mm. The height of the shell is 3-5 mm in width and dextral (Plate 4.C).

*Opeas pyrgula* Schmacher and Boettger, 1891

They are mostly found under large rocks or other types of semi-permanent material that provides a damp environment. The shells are small, thin, and usually perforate, with large, obtuse, rounded apex and six flattened whorls, corneous or yellowish. Aperture is small, ovate and the outer thin lip. They are 5-7 mm in height and 3-5 mm in length (Plate 4.D).



*Allopeas gracile* (Hutton, 1834)

(Graceful awl snail)

This species is found in large numbers, habitat in under pieces of wood, large rocks. The shell of this species was elongated. They are 8-10 mm in height and 3-6 mm in width, dextral and suture slightly impressed. Whorl is 7.5. The shell is whitish in color, transverse line present and smooth surface and translucent. Aperture is nearly vertical, longer than wide. This species may be confused with *Subulinaoctona* (Plate 5.A).

*Glessula* spp. Von Martens, 1860

This species is found in large numbers, lives in under pieces of wood, large rocks. The shell of this species was elongated. They are 3-5 mm in width and 7-9 mm in height, apex is obtuse, dextral and suture is slightly impressed. Shell is with 6.5 flattened whorls. Aperture is wide. The shell is dark brown in color and smooth and glossy transverse line is present. It is imperforate and translucent (Plate 5.B).

*Caecilioides bensoni* (Smith, 1891)

This species is found in large numbers, lives in under pieces of wood, large rocks. Shell is narrowly cylindrico-conoid, almost fusiform, rather thin, opaque white, smooth and glossy. Spire is narrow, with straight sides; suture linear, apex obtuse. They have six flattened whorls increasing slowly at first and the last four very rapidly. Aperture is oblique, pyriform, and peristome is slightly thickened. They are 10-12 mm in height and 3-5 mm in width (Plate 5.C).

*Cochlicopa lubrica* (Muller, 1774)

(Glossy Pillar)

*Cochlicopalubrica* lives in wasteland areas, moist upland woods; rock talus. *Cochlicopalubrica* is a [species](#) of small air-breathing [land snail](#). Shells are glossy, spindle shaped and translucent, elongate with unreflected but thickened lips. They have five whorls. They are 5-6 mm in width and 3-4 mm in height (Plate 5.D).

*Thysanota elegans* (Preston, 1909)

They live in wasteland areas, moist upland woods and rock. Shell is yellowish white and they have six whorls, the first two rounded, spirally striate while the remainder are sculptured with fine spiral lines crossed by coarser. The last whorls are sharply carinate at the base; base of shell spirally only; sutures deeply impressed; umbilicus very narrow; peristome simple; aperture narrow sublunate. They are 4-6 height and 4.5-6.5 mm in width (Plate 6.A).

*Oxychilus alliarius* (Miller, 1822)

(Garlic Glass-snail)

*Oxychilusalliarius* lives in moist gardens, humid habitats and woodlands. *Oxychilus* is small air-breathing land snail, terrestrial pulmonate gastropods. Shell is smooth, shiny, and glossy and has wide umbilicus, weakly reddish to greenish brown. They have 4-4.5 slightly convex whorls, last whorl often weakly descending near aperture, umbilicus is wide. They are 5-7 mm in height and 10-15 mm in width (Plate 6.B).

*Ratnadvipia irradians* (Raheem and Naggs, 2006)

They are found in wetland and under tree. Adult *Ratnadvipia*, in contrast, has a distinctly more solid shell with 3.5 whorls and a raised spire. The body is generally grey or brown and olive green. Aperture is large and ovate. They are 20-26 mm in height and 30-45 mm in width (Plate 6.C).

*Pseudaustenia atra* Godwin - Austen, 1891

They are found in wetland and under tree. Shell is ovate, slightly convex above, concave below, smooth, covered with a straw-colored epidermis. They have one whorl. The apex is flat. All the lower surface of the shell is opened. Aperture is wider than that of high. They are 4-5 mm in height and 10-12 mm in width (Plate 6. D)

**Species composition and occurrence of the recorded snail among the study sites**

In all study sites, the most species composition (19 species) is found in, Mya-Kan-Thar Inn (site3) and that of moderate six species in Shwe-Yin-Hmyo (site 1) while the least composition of three species in Kyar-Inn bridge ( site 5) (Table 1).



(Dorsal view)



(Ventral view)

*A. Pomacea canaliculata*



(Dorsal view)



(Ventral view)

*B. Pila globosa*

**Plate 1 Recorded snail species of family Ampullariidae**



(Dorsal view)



(Ventral view)

*A. Planorbella trivolvis lenta*



(Dorsal view)



(Ventral view)

*B. Gyrulu sparus*



(Dorsal view)



(Ventral view)

*C. Micromenetus dilatatus*



(Dorsal view)



(Ventral view)

*D. Cyclophorus fultoni*

Plate .2 Recorded snail species of family Planorbidae and Cyclophoridae



(Dorsal view)



(Ventral view)

*A. Cipangopaludina chinensis malleatus*



(Dorsal view)



(Ventral view)

*B. Tarebia granifera*



(Dorsal view)



(Ventral view)

*C. Melanoides turricula*



(Dorsal view)



(Ventral view)

*D. Elimia floridensis*

Plate .3 Recorded snail species of family Viviparidae, Thiariidae and Pleuroceridae



(Dorsal view)



(Ventral view)

*A. Pseudosuccinea columella*



(Dorsal view)



(Ventral view)

*B. Achatina fulica*



(Dorsal view)

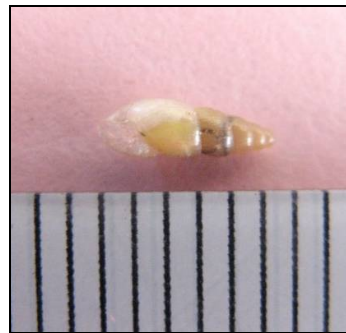


(Ventral view)

*C. Subulina octona*



(Dorsal view)



(Ventral view)

*D. Opeas pyrgula*

Plate 4 Recorded snail species of family Lymnaeidae, Achatinidae and Subulinidae



(Dorsal view)



(Ventral view)

*A. Allopeas gracile*





(Dorsal view)



(Ventral view)

*B. Glessula* spp.



(Dorsal view)

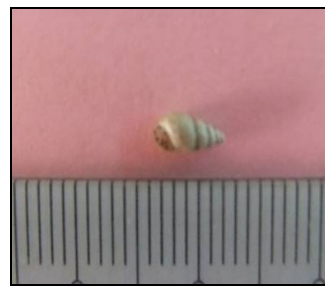


(Ventral view)

*C. Caeciliodes bensoni*



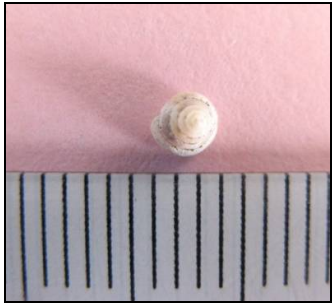
(Dorsal view)



(Ventral view)

*D. Cochlicopa lubrica*

Plate 5 Recorded snail species of family Subulinidae, Ferussacidae and Cochlicopidae



(Dorsal view)



(Ventral view)

*A. Thysanota elegans*

(Dorsal view)



(Ventral view)

*B. Oxychilus alliarius*

(Dorsal view)



(Ventral view)

*C. Ratnadvipia irradians*

(Dorsal view)



(Ventral view)

*D. Pseudaustenia atra*



**Table 1. Occurrence of Snails from Different Study Sites.**

Sr. NO.	Scientific name	Study Site				
		1	2	3	4	5
1.	<i>Pomacea canaliculata</i>	A	A	A	A	A
2.	<i>Pila globosa</i>	A	A	A	A	-
3.	<i>Planorbella trivolvis lenta</i>	-	-	A	-	-
4.	<i>Gyraulus parvus</i>	-	-	A	-	-
5.	<i>Micromenetus dilatatus avus</i>	-	-	A	-	-
6.	<i>Cyclophorus fultoni</i>	-	-	A	-	-
7.	<i>Cipangopaludina chinensis malleatus</i>	-	-	A	-	A
8.	<i>Tarebia granifera</i>	A	-	-	-	-
9.	<i>Melanoides turricula</i>	A	-	-	-	-
10	<i>Elimia floridensis</i>	A	A	-	A	-
11.	<i>Pseudosuccinea columella</i>	-	-	A	-	-
12.	<i>Achatina fulica</i>	A	A	A	A	-
13.	<i>Subulina octona</i>	-	-	A	-	-
14.	<i>Opeas pyrgula</i>	-	-	A	-	-
15.	<i>Allopeas gracile</i>	-	-	A	-	-
16.	<i>Glessula</i> spp.	-	-	A	-	-
17.	<i>Caeciliodes bensoni</i>	-	-	A	-	-
18.	<i>Cochlicopa lubrica</i>	-	-	A	-	-
19.	<i>Thysanota elegans</i>	-	-	A	-	-
20.	<i>Oxychilus alliarius</i>	-	-	A	-	-
21.	<i>Ratnadvipia irradians</i>	-	-	A	-	-
22	<i>Pseudaustenia atra</i>	-	-	A	-	-

Site 1 = Shwe-Yin-Hmyo pagoda environs

Site 2 = Kyaukkanladd pagoda

Site 3 = Mya-Kan-Thar

Site 4 = Channel

Site 5 = Kyar-Inn bridge

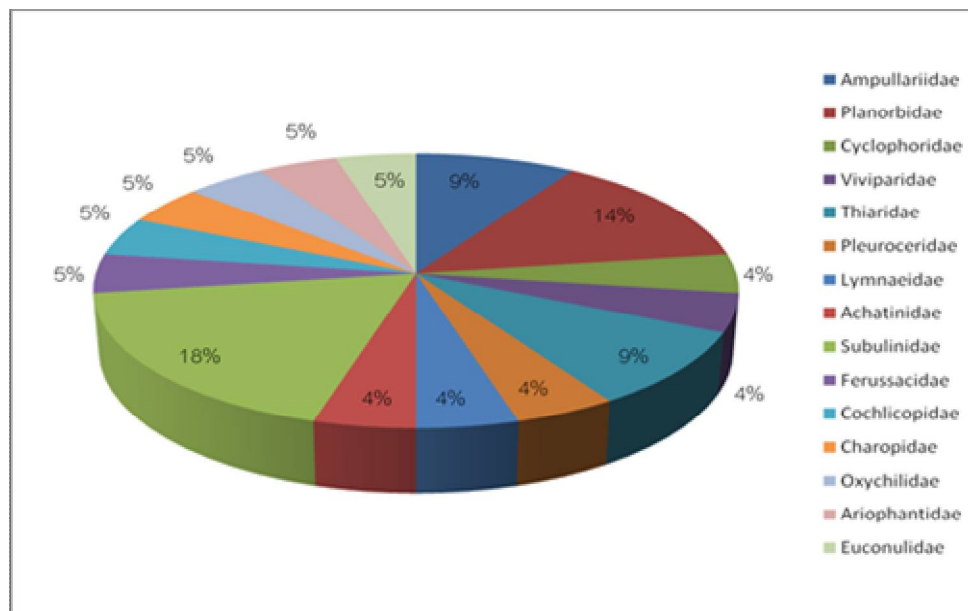


Fig. 2 Occurrence of recorded snails according to family

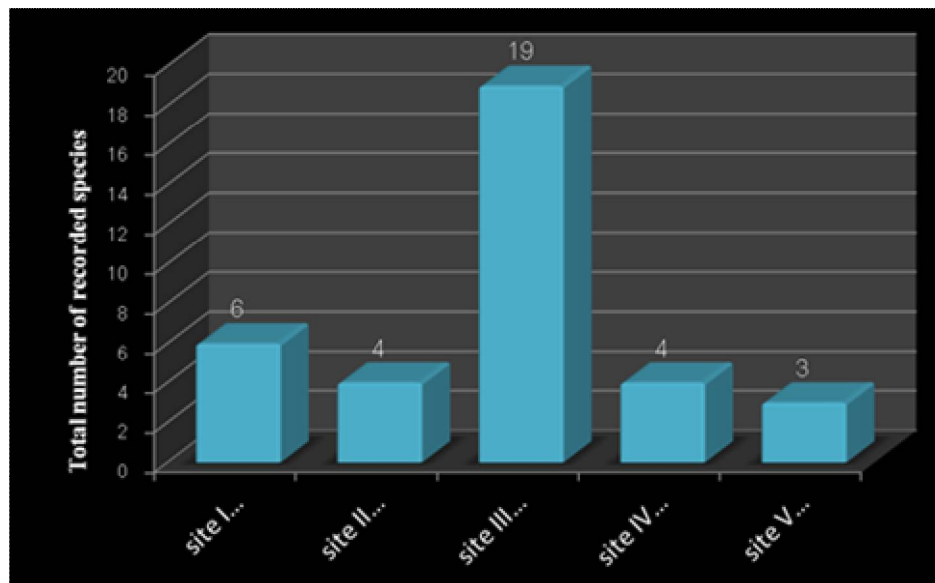


Fig. 3 Species diversity of snails from different study sites

### Discussion

In the present study, a total of 22 species belonging to 15 families and 22 genera of some snails were recorded. Of them, 21 species can be identified down to species level but one species to genus level. Eleven species of fresh-water snails were recorded while land snails, 11 species.

Johnson (2009) stated that fresh water snails live in tropical areas, in slow-moving fresh water including rice growing areas, ponds, ditches, wetlands and slow-moving streams. In the present study, the family Subulinidae is the most abundance while the family Planorbidae is second most in serial order and the other five families: Cyclophoridae, Viviparidae, Thiaridae, Pleuroeridae and Achatinidae are the least abundance in occurrence.

Kathryn (2008) explained that snails provide an easily harvested source of protein to many people around the world. Land snails, freshwater snails and sea snails are all eaten in a number of countries. Shrimp farmers in Bangladesh have traditionally used the meat of the freshwater apple snail (*Pila globosa*) as a feed for prawns <http://www.applesnail.net> (27.2.2012). *Pila globosa* are abundantly found in the present study and serve as the food sources for local consumers in Mon and Kayin State.

*Pomacea canaliculata* differ from the apple snails (*Pilaglobosa*) by their large size shell body. It feeds on minute particles or organic waste but never on aquatic plants. Specialists have found that the snails devastate rice fields by feeding on the base of paddy seedlings, as well as on leaves and stems. They prefer young paddy plant and feed by scraping the plant surface with their rough tongue (New light of Myanmar, 2008).

*Pomacea canaliculata* is not a Myanmar species. The Myanmar farm snails (*Pila globosa*) also eat duckweeds and rice plants, but they are not as destructive as *Pomacea canaliculata* (New Light of Myanmar, 2011).

The protein contained in the snails which is harmful to the digestive system. In the present study, *Pomacea canaliculata*, pest snails were mostly abundance in rice fields. The farmers usually pick them up by hand and dispose them. The pesticide that could use to destroy this species is not yet known.

Kathryn (2008) revealed that land snails collection can be divided into two basic categories: qualitative and quantitative. Qualitative means that areas are searched for snails without being under the confined of measured time or space. Locality data for the specimen is recorded by the collector, often along with other information relating to its habitat. Quantitative means that land snails are collected using some standard measurement, either by time, by volume sampled (leaf litter, soil) or by area, and often by some combination of these factors. The survey was made by the qualitative method because the present study period lasted for three months.

Land gastropods were found in natural vegetation provide with a damp and warm condition, the range of fallen leaves and branches, rocks, rubbish, tree and herbaceous plants. The results in the present study agreed with above statement. The six species, *Subulina octona*, *Opea pyrgula*, *Glessula* spp., *Allopeas gracile*, *Caeciliodes bensoni*, *Cochlicopa lubrica* were abundantly found in fallen leaves and rubbish while five species, *Glessula* spp., *Thysanota elegans*, *Ratnadvipia irradians*, *Pseudaustenia atra*, *Oxychilus alliarius* under the shaded-areas of trees and two species, *Subulina octona*, *Opeas pyrgula* under the rocks (Anonymous, 2011).

Among them, *Achatina fulica* was found abundantly in only four study sites. Stokes (2006) reported that Giant East African Snail (*Achatina fulica*) is a vector for several pathogens and parasites, including the roundworm responsible for eosinophilic meningoencephalitis in humans and the bacterium, *Aeromonashydrophila* that was also found in shellfish in New Zealand. The parasites carried by the snail are usually passed to humans through the consumption of raw or improperly cooked snails. Giant East African Snail is also a general nuisance when found near human habitations and can be hazardous to drivers, causing cars to skid. This species (*Achatina fulica*) found in the present study was beneficial in part but harmful in another aspect. Their decaying bodies also release a bad stench and the calcium

carbonates in their shells neutralize acid soils, altering soil properties and the types of plants that can grow in the soil.

Some mollusks are also agents that carry the pollen grains from one flower to another so they act as very important species for the reproductive biology of some aquatic plants.

Lubell (2012) described that snail is a vector for several pathogens and parasite. The parasites carried by the snail are usually transmitted to humans through the consumption of raw or improperly cooked snails. Moreover, Thompson (2004) reported that *Pseudosuccinea columella* is the intermediate host for *Fasciola hepatica*, the liver fluke, a parasite of livestock especially in sheep. *Tarebia granifera* are medically important because they can serve as first intermediate host for the human lung fluke, *Paragonium westermani*. *Tarebia granifera* are parasites and in nature it is assumed to be an alternate host for various cercaria, final host are mammals. *Planorbella trivolvis* *lenta* is an intermediate host for *Echinostoma trivolvis*. This species prefers habitats with floating water weeds. *Achatina fulica* that affects leaves and fruits can also pose a risk to human health. *Pseudosuccinea columella*, *Tarebia granifera*, *Planorbella trivolvis* and *Achatina fulica* were found in the present study and these may have harmful effects to human health.

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