The Study on Scales of Some Bony Fishes in Hinthada Markets

Nilar Soe[1], Sa Soe Shwe[2], Kay Thi Oo[3]

Abstract

The study on scales of four bony fishes such as *Labeo rohita, Tenualosa toli, Oreochromis mossambicus,* and *Anabas testudineus* was carried out from two markets of Hinthada during April, 2017 to May 2018. The result observed that the type of cycloid scales was recorded in three species as *L. rohita*, *T. toli* and *O. mossambicus* and ctenoid scale in species *A. testudineus*. Regarding to size of the scales, the largest scale length and width of scales were found in *L. rohita* and the smallest length and width of scales were found in *A. testudineus*. In all species, the maximum length and width of scales were found in lateral part of body and the minimum length and width of scales in the part of caudal peduncle. Significant differences in width and length of scales on different parts of fish body were observed. The correlation of length and width of the scale with the weight and length of fish species were presented and discussed.

Keywords: scales, bony fishs, markets, Hinthada

Introduction

Fishes are valuable sources of high grade protein and other organic products. They occupy significant position in the socioeconomic fabric of the Southeast Asia countries by providing the population not only the nutritious food but also income and employment opportunities (Talwar and Jhingran, 1991). According to Crenshaw (2012), there are three different kinds of scales that may be found on bony fish such as ctenoid (teen-oid) scale - small sharp spines on one end, cycloid (sky-loid) scale - a smooth scale and ganoid (gan-oid) scale - a thick plate like scale which was found on sturgeons and gars. The study on fish scales is useful to ichthyologists for the classification of fish, determining the life history of a fish, and for understanding the relatedness of lineages, particularly since even fossil scales can be examined (Lagler *et al.,* 1962). Also Ichthyologists have been using fish scales to determine the age and growth for a long time. Therefore, fish scale characteristics are very useful in the identification as they tend to change from species to species (Renjith *et al.,* 2014).

Matondo *et al*, (2012) who stated that fish species description, identification and stock discrimination are very important in systematic and fish diversity conservation. Several studies have regarded the scales as a better alternative tool in studying of biology including sexual dimorphism. According to the former references, these are considerable variation in scale shape even between different areas of the same individual fish. Also the fish size is also generally not a desirable characteristic as scale size varies. There was an overlap not only between the species and individuals but also within a single specimen (Chikuni, 1968; Casteel, 1972). Therefore, the present study was carried out by the following objectives;

- to examine the types of scales from study fish species
- to study on variation of scales of different parts of body
- to determine the relationship between size of scales and fishes
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[1]Lecturer, Dr, Deparment of Zoology, University of Hinthada
[2] Lecturer, Dr, Deparment of Zoology, University of Hinthada
[3] Lecturer, Dr, Deparment of Zoology, University of Hinthada

Materials and Methods

Study site and study period

The fish collection was conducted at two markets viz, Pa Day Thar and Tike Kyaung markets locating at Hinthada environ 17° 36′ 0″ N and 95° 25′ 30″ E (Fig. 1). The study was lasted from April, 2017 to May, 2018.

Collection and measurement of specimens

The random sizes of ten fishes of selected fish species were brought from the markets during the study period. After collecting the specimens, fishes were identified, weighed and measured. For total length, the fish was measured in (cm) from the tip of the snout to the tail of longest fin rays and weight (gm) using digital balance (Fig. 2). A total of 50 scales were plucked off by using forceps from each of different body parts of the fish, i.e, behind the operculum, dorsal, ventral, lateral and caudal peduncle of the fish. After that, the length and width of collected scales were measured (mm). Morphological features of scales were recorded by photographs.

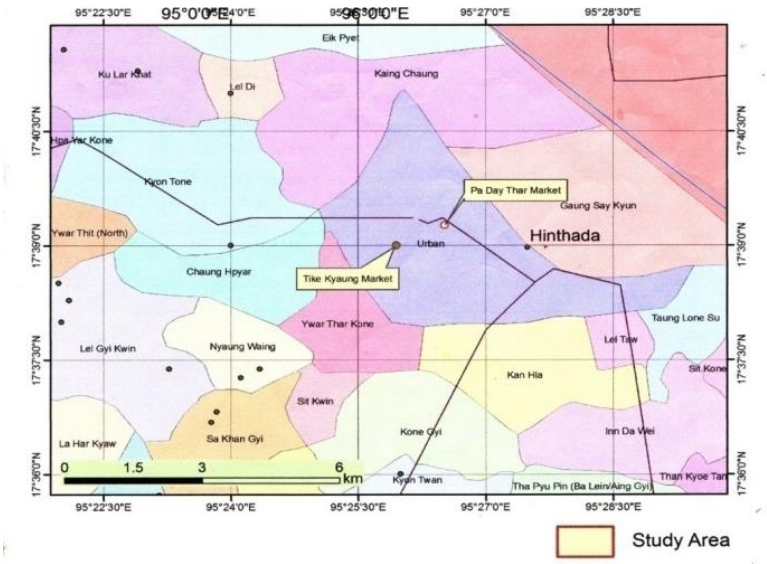


Figure (1) Location map of study area (Geography Department, Hinthada University).

Preservation of specimens and identification

Scales were first washed in water and then scrubbed gently using the paint brush to remove the mucus and other extraneous matters attached to the scales. They were then dried on a neat blotting paper and kept in plastic zigbag for each scale. Scales types were studied with the help of under dissecting microscope. Collected specimens were identified and classified according to following references Talwar and Jhingram (1991), Jayaram (1981). The morphology of fish scales were expressed according to Ganguly and Mookerjee, 1947; Barger and Morits, 2016; Crenshaw, 2012; Esmaeili *et al.*, 2007.

Data analysis

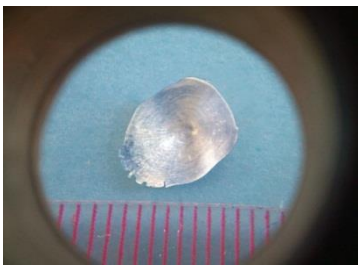
All data were presented as means and standard deviation. Student's test, Pearson correlation analyses were used to know the relation of size of scales and fishes. All calculations were tested by using SPSS software version 16.0.

Figure (2) Utilized materials for the present study.

Results

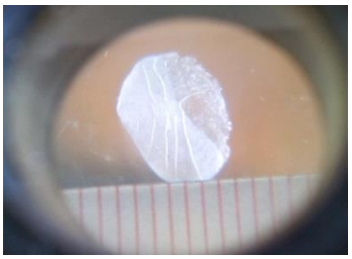
A total of four bony fish species belonging to four genera, four families and under three orders could be examined to study the scale morphology (Fig. 3).

Labeo rohita



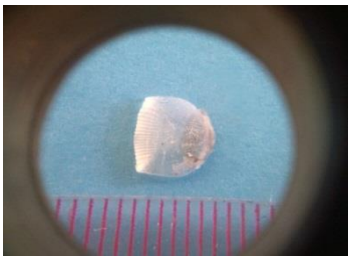
Scale (*Labeo rohita)*

Tenualosa toli



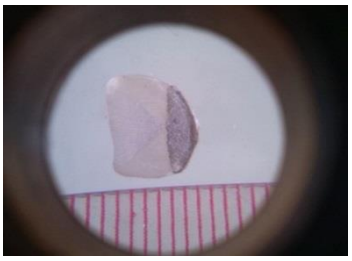
Scale (*Tenualosa toli)*

Oreochromis mossambicus



Scale (*Oreochromis mossambicus)*

Anabas testudineus



Scale (*Anabas testudineus)*

Figure (3) Photograph of four bony fish species and their scale morphology.

Systematic position and descriptive accounts of the studied species

(i)	Phylum	-	Chordata
	Class	-	Actinopterygii
	Order	-	Cypriniformes
	Family	-	Cyprinidae
	Genus	-	*Labeo* Cuvier, 1817
	Species	-	*Labeo rohita* (Hamilton-Buchanan, 1822)
	Synonym	-	*Cyprinus rohita* (Hamilton-Buchanan, 1822)
	Local name	-	Nga-myit-chin, Nga-myat-san-nee
	Common name	-	Rohu
	Total length	-	34-38 cm
	Fin formula	-	D iii-iv - 12-14; A ii-iii.5; P i 16-18, V i 8
(ii)	Phylum	-	Chordata
	Class	-	Actinopterygii
	Order	-	Clupeiformes
	Family	-	Clupeidae
	Genus	-	*Tenualosa* (Valenciennes, 1847)
	Species	-	*T. toli* (Valenciennes, 1847)
	Synonym	-	*Hilsa toli* (valenciennes, 1847)
	Local name	-	Nga-tha-lauk-youk-pha
	Common name	-	Tolishad
	Total length	-	19 – 23 cm
	Fin formula	-	D.iv-v/14-15, A. iii/15-17; Pi 13; V i 8
(iii)	Phylum	-	Chrodata
	Class	-	Actinopterygii
	Order	-	Perciformes
	Family	-	Cichlidae
	Genus	-	*Oreochromis* (Gunther, 1889)
	Species	-	*O. mossambicus* (Peter, 1852)
	Synonym	-	*Tilapia mossambica*
	Local name	-	Tilapia
	Common name	-	Tilapia
	Total length	-	15 – 22 cm
	Fin formula	-	DXV-XVI 10-12; A III 10-11; P 14-15; V 15

(iv)	Phylum	-	Chordata
	Class	-	Actinopterygii
	Order	-	Perciformes
	Family	-	Anabantidae
	Genus	-	*Anabas*
	Species	-	*A. testudineus* (Bloch, 1792)
	Synonym	-	*Anabas scandens*; (Day, 1878, Day, 1889)
	Local name	-	Nga-pyay-ma
	Common name	-	Climbing perch
	Total length	-	13 - 17 cm
	Fin formula	-	DXVI–XV III. 8-10; A.VIII–XI 9-11;Pi 13-14;V 15

Morphometric measurement of scales in different parts of fish

Labeo rohita

The mean and standard deviation of length and width of scales on behind the operculum were 13.4 ±1.6 mm and 11.7 ±1.4 mm; scales on dorsal were 11.9 ±0.7 mm and 9.5 ±0.8 mm, scales on ventral were 12.9 ±0.4 mm and 9.6 ±0.7 mm; scales on caudal peduncle were 11.4 ±0.9 mm and 8.1 ±0.5 mm and scales on lateral were 14.5 ±1.0 mm and 12.2 ±1.0 mm respectively (Table. 1). The width and length of scales in different parts of body were significantly different (Table. 2).

Tenualosa toli

The mean and standard deviation of length and width of scales on behind the operculum were 7.3 ±0.9 mm and 9.6 ±1.0 mm; scales on dorsal were 5.2 ±0.7 mm and 5.5 ±1.0 mm; scales on ventral were 5.9 ±0.9 mm and 7.3 ±1.0 mm; scales on caudal peduncle were 4.9 ±1.2 mm and 4.7 ±0.8 mm; scales on lateral were 8.3 ±1.1 mm and 9.3 ±0.9 mm respectively (Table. 3). The width and length of scales on different parts of body were significantly different (Table. 4).

Oreochromis mossambicus

The mean and standard deviation of length and width of scales on behind the operculum were 5.6 ±0.8 mm and 6.9 ±1.1 mm; scales on dorsal were 4.6 ±0.7 mm and 4.8 ±1.1 mm; scales on ventral were 4.0 ±0.9 mm and 2.9 ±0.8 mm; scales on caudal peduncle were 4.3 ±0.9 mm and 4.4 ±1.0 mm and scales on lateral were 5.7 ±0.7 mm and 7.2 ±0.8 mm respectively (Table. 5). The width and length of scales on different parts of body were significantly different (Table. 6).

Anabas testudineus

The mean and standard deviation of length and width on behind the operculum were 5.5 ±1.4 mm and 5.8 ±1.5 mm; scales on dorsal were 4.2 ±0.8 mm and 3.5 ±0.9 mm; scales on ventral were 4.7 ±0.8 mm and 3.6 ±0.8 mm; scales an caudal peduncle were 3.8 ±0.8 mm and 3.3 ±0.7 mm and scales on lateral were 5.8 ±1.1 mm and 6.3 ±0.1 mm (Table. 7). The width and length of scales on different parts of body were significantly different (Table 8).

Table (1) Morphometric measurement of scale in *Labeo rohita*.

Body parts	Length (mm, n=100)	Width (mm, n=100)
Behind the operculum	13.4 ±1.6	11.7 ±1.4
Dorsal	11.9 ±0.7	9.5 ±0.8
Ventral	12.9 ±0.4	9.6 ±0.7
Caudal peduncle	11.4 ±0.9	8.1 ±0.5
Lateral	14.5 ±1.0	12.2 ±1.0

Table (2) Comparative values of different parts of scale in *Labeo rohita*.

Length / Width	Behind the operculum	Dorsal	Ventral	Caudal peduncle	Lateral
Behind the operculum		8.58	3.29	11.41	-5.74
Dorsal	13.57		-12.07	3.91	-20.89
Ventral	14.45	-1.02		14.56	-15.97
Caudal peduncle	25.94	12.24	16.99		-22.47
Lateral	-2.52	-19.49	-20.58	-33.41	

** All are highly significant difference.

Table (3) Morphometric measurement of scale of *Tenualosa toli*.

Body parts	Length (mm, n=100)	Width (mm, n=100)
Behind the operculum	7.3 ±0.9	9.6 ±1.0
Dorsal	5.2 ±0.7	5.5 ±1.0
Ventral	5.9 ±0.9	7.3 ±1.0
Caudal peduncle	4.9 ±1.2	4.7 ±0.8
Lateral	8.3 ±1.1	9.3 ±0.9

Table (4) Comparative values of different parts of species *Tenualosa toli*.

Length / Width	Behind the operculum	Dorsal	Ventral	Caudal peduncle	Lateral
Behind the operculum		18.37	11.69	16.79	-7.05
Dorsal	34.56		-7.38	2.03	-25.98
Ventral	18.84	-14.56		6.83	-18.53
Caudal peduncle	41.05	5.75	22.87		-18.47
Lateral	2.48	-33.33	-16.28	-40.43	

** All are highly significant difference.

Table (5) Morphometric measurement of scale in different body parts of fish *Oreochromis mossambicus*.

Body parts	Length (mm, n=100)	Width (mm, n=100)
Behind the operculum	5.6 ±0.8	6.9 ±1.1
Dorsal	4.6 ±0.7	4.8 ±1.1
Ventral	4.0 ±0.9	2.9 ±0.8
Caudal peduncle	4.3 ±0.9	4.4 ±1.0
Lateral	5.7 ±0.7	7.2 ±0.8

Table (6) Comparative values of different parts of species *Oreochromis mossambicus.*

Width \ Length	Behind the operculum	Dorsal	Ventral	Caudal peduncle	Lateral
Behind the operculum		13.53	22.08	17.31	-2.14
Dorsal	14.93		9.29	3.76	-15.99
Ventral	31.29	14.22		-4.74	-21.52
Caudal peduncle	22.40	2.84	-11.40		-19.91
Lateral	-3.06	-18.68	-41.34	-30.81	

** All are highly significant difference.

Table (7) Morphometric measurement of scale in different body parts of fish *Anabas testudineus.*

Body parts	Length (mm, n=100)	Width (mm, n=100)
Behind the operculum	5.5 ±1.4	5.8 ±1.5
Dorsal	4.2 ±0.8	3.5 ±0.9
Ventral	4.7 ±0.8	3.6 ±0.8
Caudal peduncle	3.8 ±0.8	3.3 ±0.7
Lateral	5.8 ±1.1	6.3 ±1.0

Table (8) Comparative values of different parts of species *Anabas testudineus.*

Width \ Length	Behind the operculum	Dorsal	Ventral	Caudal peduncle	Lateral
Behind the operculum		8.93	6.34	11.99	-1.93
Dorsal	13.21		-5.25	4.98	-17.38
Ventral	13.61	-0.97		11.44	-12.81
Caudal peduncle	18.49	2.09	3.51		-22.87
Lateral	-3.30	-23.48	-24.16	-35.42	

** All are highly significant difference.

Discussion

Four species under four genera and four families belonging to three orders were examined on the morphometric characteristics of scales in different body parts of fishes *i.e* behind the operculum, dorsal, ventral, lateral and caudal peduncle. Shwe Sin (2009) stated that in comparison the sizes of scales of fishes as *Labeo calbasu, Notopterus notopterus, Channa striatus* and *Anabas testudineus.* She reported that the largest scale of fish in *A. testudineus* and the smallest was in *N. notopterus* among her study species. The sizes of scales on lateral line are usually different on various parts of the body of fishes. The largest scales are located in the middle part of the body and the smallest ones on caudal peduncle.

The result of present study noted that an increase in length and width of scales were corresponding to increase in size of fish. The maximum length and width of scales were found in lateral part of the body of all fishes whereas the minimum length and width of scales were found in caudal peduncle of fish body. The result was that the largest length and width

of scales were found in *Labeo rohita* and the smallest length and width of scales in *Anabas testudineus*. Similarly, this condition on size of scales were found in fish *Arripis trutta* and *Chrysophrys auratus* (Adelman, 1987) and *Oreochromis mossambicus* (Kamonrat and Doyle, 1989). The minimum length and width of scale was noted in operculum whereas the maximum was in the mid-lateral scales of fishes *Oreochromis mossambicus* (Pius and Parkasam, 2001).

Aung Thu Zar Tun (2016), studied on the different species such as *Tenualosa toli, Amblypharyngodon mola, Johnius coitor, Otolithoides pama, Nemipterus japonicas* and *Polynemus paradiseus.* She stated that the largest scale length 11.9 mm is found in middle lateral line scale of *Tenualosa toli* due to the total length of that fish species is the largest in size. The smallest scale length, 0.8 mm is found in the head scale of *Amblypharyngodon mola* due to the total length of *A. mola*is the smallest of this study. The average scale length of *Otolithoides pama*is similar to that of *Johnius coitor* for belonging to only some family of the species but in this two species, structures of scales were quite different. Compared with as the present study, the largest scale length 10.0 mm is found in middle lateral line scale and the smallest scale length, 3.0 mm is found in the scale of caudal in species *Tenualosa toli.*

Sire (1986) reported that the length and width of scales showed variations in different body position of *Hemichromis bimaculatus*. The similar finding was observed in the present study fish species, although there were significant variation in sizes of scales depend on sizes of fishes. Therefore, the present study suggests that the scales in shape are considerable variation even between different areas of the same individual fish and the fish size is also generally a desirable characteristic as scale size varies.

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