

## Species Richness, Distribution and Conservation Status of Some Fish from Segment of Ayeyawady River in Zalun Township

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### Abstract

Species richness of some fishes was investigated in three study sites (War Tha La village, Oe Bo village, Ywar Thar village) of Zalun Township, Ayeyawady Region. Monthly data collection was recorded from January 2022 to August 2022. A total of 25 fish species belonging to 22 genera and 12 families under nine orders were recorded during the study period. The highest number of species with their respective percentage were recorded in each order of Cypriniformes and Siluriformes (seven species, 28%), Gobiiformes (three species, 12%), Mugiliformes and Perciformes (two species, 8% each), Osteoglossiformes, Clupeiformes, Beloniformes and Synbranchiformes (one species, 4% each). The highest Margalef's species richness values were recorded in Site III while the lowest value was noted in Site I. Some of the species of Site I and Site III could be considered as indicator species. During the study period, nine fish species were observed to catch below their size at sexual maturity.

**Keywords:** species richness, distribution, conservation status

### INTRODUCTION

Fish is a vital source of high-quality protein for people. Freshwater fish are one of the great natural resources of the world (The Farmer Myanmar Journal, 2019). Fish are very diverse animals and can be categorized in many ways. Although most fish species have probably been discovered and described, about 250 new ones are still being discovered every year. According to Fish Base, 34,300 species of fish had been described as of September 2020. Myanmar owns the richness of her freshwater and brackish water fisheries to the extensive big river network system in delta region. Approximately there are at least 449 freshwater fishes and 581 marine fish species in Myanmar (<http://fish.mongabay.com/data/Myanmar>).

All along the river system, natural lakes, reservoirs and seasonal flood plains are inland fisheries waters. Open fisheries consist of all kinds of fishing in streams, rivers, lakes and in all flooded areas (Khin Maung Soe, 2008). Naturally, freshwater bodies that include rivers, lakes, ponds and course which are of permanent or temporary for inland fisheries, are highly sensitive to the rainfalls and flooding in monsoon (Lymer, *et al.*, 2010). In the recent year, several broad scale studies have identified modification and loss of aquatic habitat as primary factor threatening the conservation of freshwater fishes and communities (Hewitt *et al.*, 2008).

Ayeyawady River gives off many branches which flow through vast delta region in Ayeyawady Region. Ayeyawady delta is important for the richness and abundance of the inland fisheries resources. Zalun is one of the Townships of Ayeyawady Region. Present study was conducted to the following objectives:

- to identify the fish species richness in the study sites
- to observe the different indices of fish species in the study area
- to compare catch size of fish (mean total length) and standard exploitable length at first maturity

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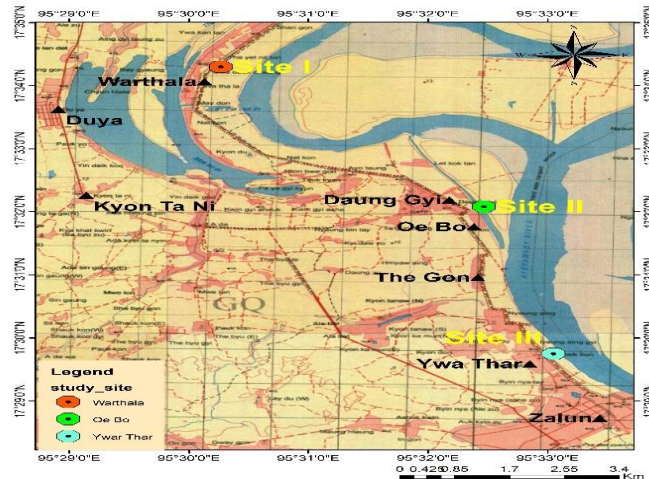
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## MATERIALS AND METHODS

### Study area and study sites

The present study was conducted at Zalun Township located between latitudes 17° 25' N and longitude 95° 34'E. The study area of three villages, War Thala (Site I) is situated 17° 34' 18" N to 95° 30' 16"E and 18.22 km from Zalun. Oe Bo (Site II) is situated 17° 32' 05" N to 95° 32' 28" E from 23.05 km from Zalun. Ywar Thar (Site III) is situated 17° 29 ' 45" N to 95° 33' 03" E from 27.88 km from Zalun (Figure 1).



(Source: Geology Department, Hinthada University)  
Figure 1. Map of three study sites

### Study period

The study period lasted from January 2022 to August 2022.

### Identification

Fish species caught by different fishing gears from different study sites were identified according Talwar and Jhingram (1991) and Jayaram (2013). The status of the species was adopted after IUCN (2020).

### Measure method

Each specimen was measured for total length (TL) from the tip of the snout to the end of caudal fin with scale ruler. Comparison between catch size of fish (mean total length) and standard exploitable length at first maturity of fish species was identified by MYFish, 2014.

### Data analysis

Species composition richness index was calculated with monthly sample collection from the local fishermen of the study sites. Similarity Indices of the fish species recorded in different study sites were measured according to Czechanovski (1930) cited in Dash, 1993. Similarity Index is expressed as:

$$S = 100 \times 2c/(a+b)$$

a = the number of species in one site

b = the number of species in another site

c = the number of species common to both sites

S = Czechanovski's similarity Index

Richness values were calculated using the richness index formula of Margalef (1969). The species richness index was calculated by the following formula:

$$R=S-1/\ln N$$

Where, R= Margalef 's species richness index

S=number of species

In=natural logarithm

N=total number of all species

## RESULTS

A total of 25 fish species belonging to 23 genera and 12 families under nine orders were recorded from the study sites in the Zalun Township during the study period (Table 1). The species composition of (28%) was observed in each order of Siluriformes and Cypriniformes, (12%) in Gobiiformes, (8%) in each order of Mugiliformes and Perciformes, (4%) in each order of Osteoglossiformes, Clupeiformes, Beloniformes and Synbranchiformes. (Table 2, Figure 2)

The richness of fish species was recorded highest in Site III (2.32) followed by Site II (1.86) and Site I (1.85). Due to difference in environment factors richness of species varied among the study sites (Table 4).

The similarity index value for fish community in study sites revealed a number of different patterns. Based on the results, the overall similarity index of fish species in Site I and Site II was 88.88, Site II and Site III was 80.95 and Site I and Site III was 67.76 (Table 5, Figure 3).

This indicated that *Eutropiichthys burmannicus* and *Otolithoides pama* of Site I and *Clupisoma garua*, *Silonia silondia*, *Rhinomugil corsula* of Site II were observed as indicator species.

*Clupisoma garua*, *Silonia silondia*, *Rhinomugil corsula* of Site II were observed as indicator species with *Notopterus notopterus*, *Microrasbora nana*, *Puntius chola*, *Mystus pulcher*, *Gobius rubicundus* of Site III, *Eutropiichthys burmannicus* and *Otolithoides pama* of Site I and *Notopterus notopterus*, *Microrasbora nana*, *Puntius chola*, *Mystus pulcher* and *Gobius rubicundus* of Site III were observed as indicator species.

Out of the 25 species of fishes collected from the study area the genus *Aspidoparia*, *Microrasbora* and *Parambassis* were recorded in good numbers and were considered in the IUCN category of least concerned (LC), while the genus *Tenuialosa* and *Osteobrama* were moderately collected and were considered near threatened (NT). The rest of genus was recorded in small number but they showed least concerned (LC), not evaluated (NE) and data deficient (DD) status (Table 3).

Catch size of fish (mean total length) and standard exploitable length at first maturity of 16 species were compared while those of 9 fish species were not available to compare. Average catch size of fish species ranged from 4.27 to 23.26 cm. *Notopterus notopterus* (23.26cm), *Microrasbora nana* (4.27cm), *Osteobrama belangeri* (12.04cm), *Mystus cavasius* (8.81cm), *Eutropiichthys burmannicus* (16.83cm), *Parambassis ranga* (4.74cm) and *Gobius rubicundus* (19.35cm) were found to overcome the standard exploitable length at first maturity and the rest nine fish species were observed as under size (Table 6, Plate1).

Table 1. Recorded fish species in the study sites

No	Order	Family	Species	Common name	Local name
1	Osteoglossiformes	Notopteridae	<i>Notopterus notopterus</i>	Grey feather back	Nga-hphe
2	Clupeiformes	Clupeidae	<i>Tenuulosa ilisha</i>	Hilsa	Nga-tha-lauk
3	Cypriniformes	Cyprinidae	<i>Aspidoparia jaya</i>	Jaya	Nga-yin-baung-zar
4			<i>Microrasbora nana</i>	Indian Anchovy	Nga-phyu-lay
5			<i>Osteobrama belangeri</i>	Manipur osteobrama	Nga-hphe-oung
6			<i>Osteobrama cotio</i>	Carplet	Nga-lay-daunt
7			<i>Puntius chola</i>	Swamp bard	Nga-khone-ma
8			<i>Labeo boga</i>	Boga labeo	Nga-loo
9			<i>Lepidocephalus thermalis</i>	Burmese loach	Nga-tha-lae-htoe
10	Siluriformes	Bagridae	<i>Rita rita</i>	Rita	Nga-htwe
11			<i>Mystus cavasius</i>	Gangetic mystus	Nga-zin-yine
12			<i>Mystus pulcher</i>	Pulchermystus	Nga-zin-yaing-kyet-chee
13		Schilbidae	<i>Clupisoma garua</i>	Schilbid catfish	Nga-kyi-tauk
14			<i>Eutropiichthys burmannicus</i>	Batchwavacha	Nga-kyi-tauk
15			<i>Silonia silondia</i>	Silondiavacha	Nga-myin
16		Sisoridae	<i>Gagata gagata</i>	Gangetic gagata	Nga-zin-gote
17	Mugiliformes	Mugilidae	<i>Sicamugil hamiltonii</i>	Mullet	Nga-khun-gyun
18			<i>Rhinomugil corsula</i>	Corsula mullet	Nga-zine

Table 1. Continued

No	Order	Family	Species	Common name	Local name
19	Beloniformes	Belonidae	<i>Xenentodon cancila</i>	Freshwater garfish	Nga-phaung-yoe
20	Synbranchiformes	Mastacembelidae	<i>Macrogathus aral</i>	One-striped spiny eel	Nga-mway-doe
21	Perciformes	Ambassidae	<i>Parambassis ranga</i>	Indian glass fin	Nga-zin-zat
22		Sciaenidae	<i>Otolithoides pama</i>	Pama	Nga-pouk-thin
23	Gobiiformes	Gobiidae	<i>Gobius rubicundus</i>	Goby	Nga-di
24			<i>Glossogobius giuris</i>	Tank goby	Ka-tha-boe
25			<i>Pseudopocryptes lanceolatus</i>	Pointed-tail-goby	Nga-byat

Table 2. Percentage of fish species composition in all study sites

Sr.No	Order	Family	Genus	Species	Percentage
1	Osteoglossiformes	1	1	1	4%
2	Clupeiformes	1	1	1	4%
3	Cypriniformes	1	6	7	28%
4	Siluriformes	3	6	7	28%
5	Mugiliformes	1	2	2	8%
6	Beloniformes	1	1	1	4%
7	Synbranchiformes	1	1	1	4%
8	Perciformes	2	2	2	8%
9	Gobiiformes	1	3	3	12%
Total		12	22	25	100%

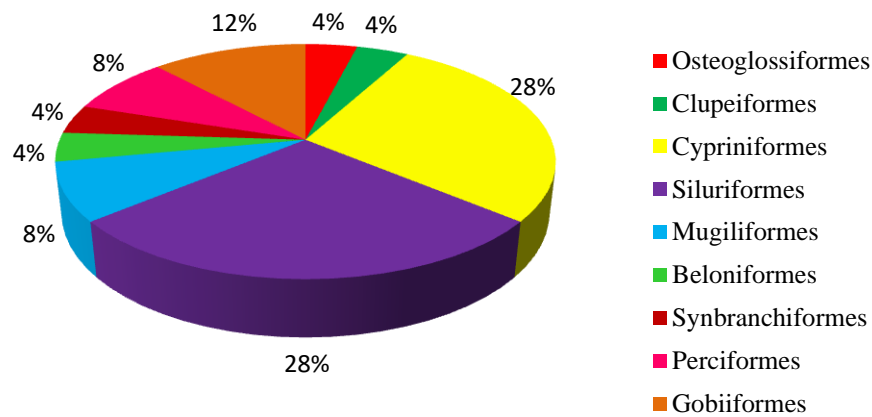


Figure 2. Percentage of fish species by order in all study sites

Table 3. Catch number of fish species and IUCN Status in different study site

No	Species	I	II	III	IUCN Status (2020)
1	<i>Notopterus notopterus</i>	36	3	0	LC
2	<i>Tenualosa ilisha</i>	18022	5458	47	NT
3	<i>Aspidoparia jaya</i>	660	1220	1240	LC
4	<i>Microrasbora nana</i>	115875	71177	0	NE
5	<i>Osteobrama belangeri</i>	134	140	152	NT
6	<i>Osteobrama cotio</i>	40	50	31	LC
7	<i>Puntius chola</i>	1133	130	0	LC
8	<i>Labeo boga</i>	58	33	64	LC
9	<i>Lepidocephalus thermalis</i>	52	13	14	LC
10	<i>Rita rita</i>	12	11	9	LC
11	<i>Mystus cavasius</i>	381	80	150	LC
12	<i>Mystus pulcher</i>	120	29	0	LC
13	<i>Clupisoma garua</i>	180	0	17	LC
14	<i>Eutropiichthys burmannicus</i>	0	2	44	LC

Table 3. Continued

No	Species	I	II	III	IUCN Status (2020)
15	<i>Silonia silondia</i>	6	0	16	LC
16	<i>Gagata gagata</i>	633	284	542	LC
17	<i>Sicamugil hamiltonii</i>	94	83	888	NE
18	<i>Rhinomugil corsula</i>	5	0	20	LC
19	<i>Xenentodon cancila</i>	23	11	5	LC
20	<i>Macrognathus aral</i>	18	28	10	LC
21	<i>Parambassis ranga</i>	6055	1925	113	LC
22	<i>Otolithoides pama</i>	0	7	131	DD
23	<i>Gobius rubicundus</i>	12	11	0	NE
24	<i>Glossogobius giuris</i>	79	12	9	LC
25	<i>Pseudopocryptes lanceolatus</i>	91	26	15	LC
Total no. of individual		143719	80733	3517	
Total no. of species		23	22	20	

LC- least concerned NT- near threatened NE- not evaluated DD- data deficiency

Table 4. Richness index of fish species recorded in the study sites

Particular	Study sites		
	I	II	III
Number of species	23	22	20
Number of individuals	143719	80733	3517
Species Richness Index (R)	1.85	1.86	2.32

Table 5. Similarity index of fish species in different study sites

Study sites	I	II	III
I	-	88.88	67.76
II	88.88	-	80.95
III	67.76	80.95	-

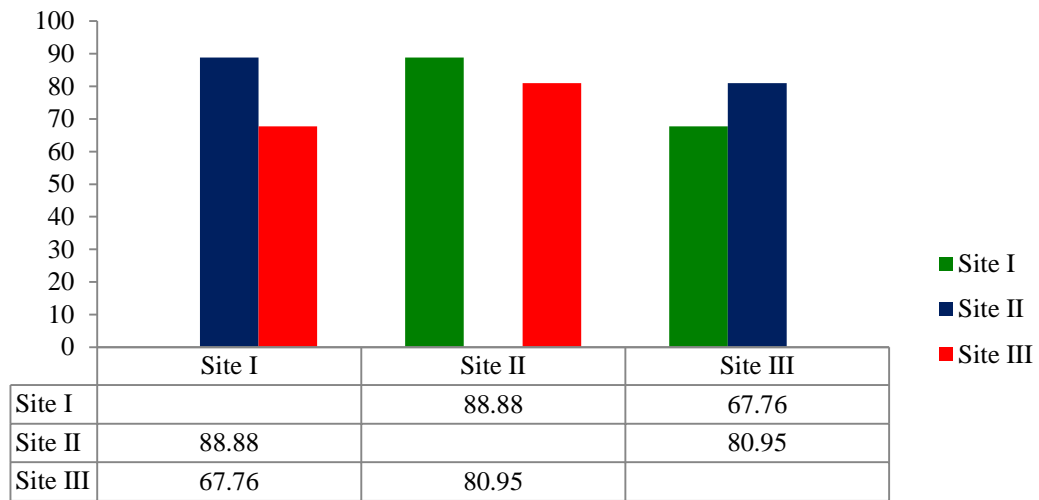


Figure 3. Similarity index of fish species in different study sites

Table 6. Comparison of average catch size (total length) and length at first maturity (Lm) of fish species in the study area

No	Species	Mean Total length	Lm (cm)
1	<i>Notopterus notopterus</i>	23.26 ± 8.68	19.0
2	<i>Tenualosa ilisha</i>	12.96 ± 6.32	34
3	<i>Aspidoparia jaya</i>	7.5 ± 1.25	Not available
4	<i>Microrasbora nana</i>	4.27 ± 0.93	2.3
5	<i>Osteobrama belangeri</i>	12.04 ± 3.37	10.0
6	<i>Osteobrama cotio</i>	12.78 ± 8.18	Not available
7	<i>Puntius chola</i>	6.55 ± 2.20	8.0
8	<i>Labeo boga</i>	13.24 ± 4.29	25.0
9	<i>Lepidocephalus thermalis</i>	6.34 ± 3.46	Not available
10	<i>Rita rita</i>	16.5 ± 4.38	29.5
11	<i>Mystus cavasius</i>	8.81 ± 3.80	6.9
12	<i>Mystus pulcher</i>	7.03 ± 3.46	Not available
13	<i>Clupisoma garua</i>	10.7 ± 2.72	17.1
14	<i>Eutropiichthys burmannicus</i>	16.83 ± 1.97	15.4
15	<i>Silonia silondia</i>	22.43 ± 8.88	Not available



Table 6. Continued

No	Species	Mean Total length	Lm (cm)
16	<i>Gagata gagata</i>	6.49 ± 1.35	Not available
17	<i>Sicamugil hamiltonii</i>	6.64 ± 1.39	Not available
18	<i>Rhinomugil corsula</i>	7.38 ± 1.74	Not available
19	<i>Xenentodon cancila</i>	14.19 ± 1.84	17.85
20	<i>Macragnathus aral</i>	13.31 ± 0.82	16.0
21	<i>Parambassis ranga</i>	4.74 ± 0.82	2.58
22	<i>Otolithoides pama</i>	18.71 ± 5.33	28.1
23	<i>Gobius rubicundus</i>	19.35 ± 7.57	6.0
24	<i>Glossogobius giuris</i>	8.5 ± 1.96	Not available
25	<i>Pseudopocryptes lanceolatus</i>	14.21 ± 3.78	15.4

A. *Tenualosa ilisha*B. *Puntius chola*C. *Labeo boga*D. *Rita rita*E. *Clupisoma garua*F. *Xenentodon cancila*



G. *Macrornathus aral*



H. *Otolithoides pama*



I. *Pseudopocryptes lanceolatus*

Plate 1. Fish species caught as below their sizes at sexual maturity from study sites

## DISCUSSION

During the study period, total of 25 species of fish belonged to 23 genera and 12 families under nine orders were recorded in study sites. Although the recorded species were few in number, most of the fish species are commercially important.

Aye Thinzar Maung (2019) reported that 25 species with the highest species composition 32 % in Cypriniformes, Siluriformes 20% and the lowest 4% in Clupeiformes from Hinthada to Danubyu of Ayeyawady river segment.

In this study, 25 fish species were recorded with the highest species composition of (28%) in each order of Cypriniformes and Siluriformes, (12%) in Gobiiformes, (8%) in each order of Mugiliformes and Perciformes. The lowest of (4%) in each order of Osteoglossiformes, Clupeiformes, Beloniformes, Synbranchiformes. The order Cypriniformes and Siluriformes were recorded predominantly in the study area because the highest number of fish species belonged to that order.

Ei Wathan Win (2019) observed the highest richness index was recorded in Site III (2.01) (19 species) followed by Site I (1.95) (17 species) and Site II (1.89) (15 species) in the Darka River of Ayeyawady Region. The highest richness index in Site III (2.32) (20 species) followed by Site II (1.86) (22 species) and lowest richness index in Site I (1.85) (23 species) in the present study. In Site I, the individual number of fish species was collected occasionally during the study period thus it showed the lowest richness index.

The overall similarity index of fish species in Site I and Site III was 67.76. Site III was significant dissimilar to Site I and II. Nautiyal (2001) suggested that the fish species distribution is highly influenced by altitudinal and longitudinal zonation of any particular river system.

According to the IUCN Redlist, two species *Tenuolosa ilisha* and *Osteobrama balangeri* were in the category of Near-threatened species; in Zalun Township of Ayeyawady River segment. MYFish (2013) reported that the exploiting of fish smaller than its length at first maturity ( $L_m$ ) is notified irresponsible. The conditions of the increase fishing effort could have been one of the influential factors retarding the growth of fish species. In the study site, *Osteobrama balangeri* was near-threatened according to IUCN Redlist but it was observed to overcome the standard exploitable length at first maturity. In the present study, mean total length of *Tenuolosa ilisha*, *Puntius chola*, *Labeo boga*, *Rita rita*, *Clupisoma garua*, *Xenentodon cancila*, *Macragnathus aral*, *Otolithoides pama* and *Pseudopocryptes lanceolatus* were observed as under size comparing with the standard exploitable length at first maturity.

## CONCLUSION

In the present study area, order Cypriniformes and Siluriformes emerged as the most dominant group thus protection of these habitat is recommended for conservation and management of the fish biodiversity. Fishes below their size at maturity should be released and should not be traded. Therefore, for sustainable use of aquatic resources, environmental management of river water system becomes essential.

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