

Study on Breeding Habit of Two Fish Species Collected from Ngamoeyeik Creek, Yangon Region

San San Myaing¹

Abstract

Fish species *Notopterus notopterus* and *Otolithoides pama* from Ngamoeyeik Creek, Yangon Division were studied from January 2010 to December 2010. The study area included North Dagon Myothit, Tharkayta and Thingungyun Townships, between Latitude 16° 52' North and Longitude 96° 1' East, Latitude 16° 52' North and Longitude 96° 12' East, Latitude 16° 48' North and Longitude 96° 12' East with the co-ordinates were collection sites of fish samples. Fish samples were taken monthly to assess the reproductive performance. Standard and total length, gonad weight, liver weight and body weight were recorded for Hepatosomatic and Gonadosomatic Indices (HSI % and GSI %) values and sex ratio. The recorded species were discussed based on their occurrence in relation to the rainfall, water temperature and salinity of creek water.

Keywords: Hepatosomatic, Indices (HSI %), Gonadosomatic Indices (GSI %)

Introduction

Myanmar is well known in richness of natural resources including fish fauna. Fishes are usually consumed in this country in various forms. Fish is the world's largest wild food harvest and provides a vital source of protein. In the conservation and exploitation of fishery products a basic knowledge of fish fauna and its ecology is essential. Ngamoeyeik Creek originates from Bago Yoma courses along Phaungyi, Hlegu, Dawegyaung, South Dagon, North Dagon, North Okkalapa, South Okkalapa, Thingungyun and Tharkayta. Most of fish have specific spawning season which depends on temperature, salinity and water chemical parameters. Out of the three seasons, the hot season, the wet season and the cool season in Myanmar the wet season beings with the onset of the south west monsoon winds on 15th May from mid-May to mid-June, breeding fish proceed to the main creek. It is known as the spawning season. From mid-May to July, mating, laying eggs and hatching occur. The reproductive cycle of fishes is closely tied to the environmental change particularly temperature, photoperiod and food supply. Reproductive parameters such as size at first maturity, spawning frequency, fecundity, sex ratio. The reproductive cycle in fish involves large changes in the weight of ovary. In the studies involving reproductive biology of fish, the degree of gonad development is expressed as per cent gonad weight in relation to the body weight, which usually termed as Gonadosomatic Index (GSI) (Welcomme, 1805; Wootton, 1990). Many fishes have a very short breeding season, occurring only once a year as the males and females are in fully ripe condition at the same instant. A few fishes show similar marvelously timed relationships for breeding. Most fish species have definite seasons for spawning as a part of their timed reproductive relationship and are generally grouped as follows.

This paper is therefore aimed to assess water pollution effects on growth and reproductive performance of selected fish in Ngamoeyeik Greek with following objectives:

1. to record the standard length and body weight
2. to examine the HSI and GSI
3. to determine the seasonal changes of gonad development species, *Notopterus notopterus* (Pallas, 1769) and *Otolithoides pama* (Hamilton, 1822) from Ngamoeyeik Creek
4. to estimate the sex ratio in two selected fish species

¹ Dr. Lecturer, Department of Zoology, Dagon University

5. to compare the data of the fish collected from three segments of the creek.

Materials and Methods

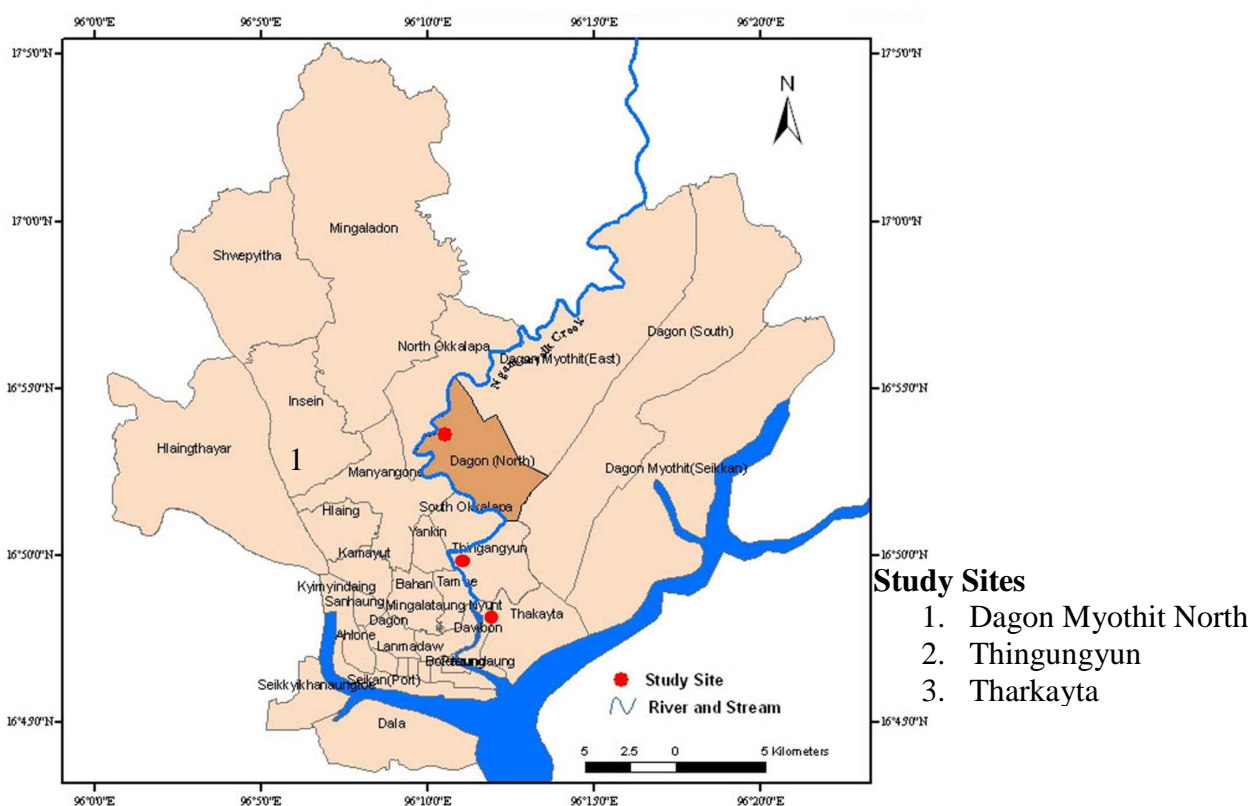
Study area

The designated study areas are three different segments in Ngamoeyeik creek such as (i) Dagon Myothit North Township situated between latitude $16^{\circ} 52'$ North and longitude $96^{\circ} 1'$ East, (ii) Thingungyun Township situated between latitude $16^{\circ} 50'$ North and longitude $96^{\circ} 12'$ East, (iii) Tharkayta Township situated between latitude $16^{\circ} 48'$ North and longitude $96^{\circ} 12'$ East.

Study period

The study period lasted from January, 2010 to December, 2010.

Location Map of Study Site



Source: Geology Department (YU)

Data collection

Fishes and water samples were collected fortnightly from each collection site throughout the study period. Total length, standard length, body weight, gonad weight and liver weight were recorded to detect monthly changes. Body weight, gonad weight, liver weight were recorded for Gonadosomatic Index and Hepatosomatic Index.

Weather parameters

Rainfall and air temperature of Yangon environ within the study period were also obtained (Department of Meteorology and Hydrology, Karbaraye, Yangon).

Water parameters

Water analysis was also done at the Department of Fisheries, Tharkayta, pH of water, Salinity, Total Alkalinity, Total Hardness, Free Carbondioxide, Dissolved Oxygen, Ammonia nitrogen, Nitrite-nitrogen, PO₄ and Temperature readings at collection sites. Heavy metals (Zinc, Copper and Iron) analysis is reported to the Government of the Union of Myanmar, Myanma Scientific and Technological Research Department.

Seasonality of Spawning

Spawning patterns in fish are commonly defined by changes in gonadosomatic index (GSI) (Welcomme, 1805; Wootton, 1990), which is a measure of the relative size of the gonad with respect to total body (somatic) weight:

$$\text{GSI}\% = \frac{\text{gonad weight}}{\text{total body weight}} \times 100$$

Hepatosomatic index (HSI), which is a measure of the relative size of the liver with respect to total body (somatic) weight:

$$\text{HSI}\% = \frac{\text{liver weight}}{\text{total body weight}} \times 100$$

Statistical analysis

The sex ratio was compared based on Chi-square test (X²). GSI and HSI values graphics were drawn by Excel Programme.

Identification and classification

Diagnostic characteristics of specimens were studied and identified following after Talwar and Jhingran (1991), Rainboth (1996), and Ferraris (1997). Local name and commerical value were informed by the lessee and local people.

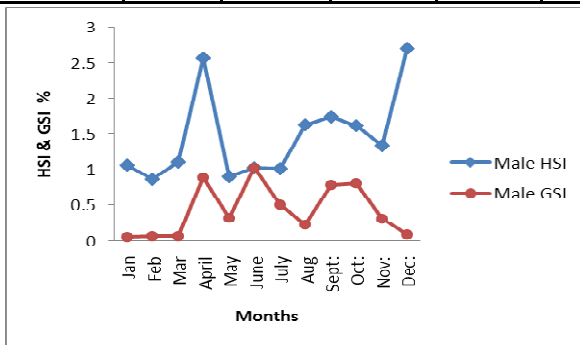
Results

GSI and HIS values of male and female *Notopterus notopterus*

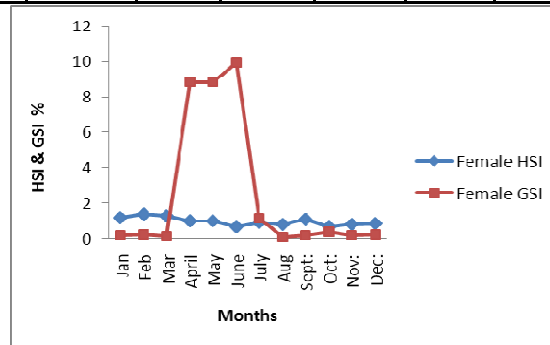
The GSI value of male *N. notopterus* sharply increased in January (1.14 %), March (0.87 %) and June (1.02 %) whereas HSI values were found in January (1.14 %), March (1.74 %) and June (1.02 %) in study period. In female *N. notopterus*, the GSI and HSI values were observed to peak of GSI increased in January (7.32 %). May (9.04 %) and June (13.07 %) whereas HSI values were sharply decreased in January (1.82 %), May (1.06 %) and June (0.65 %).

Table 1. Monthly occurrence between HSI % and GSI % value of *Notopterus notopterus* from three different sites.

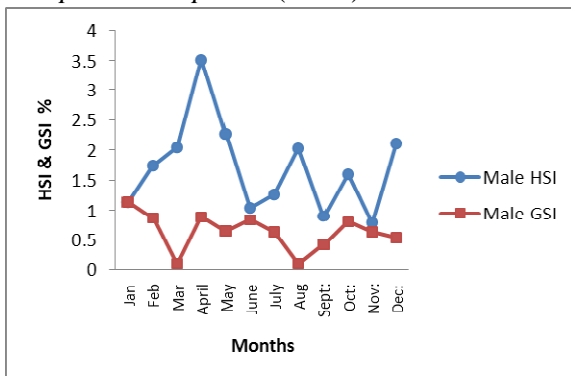
Months	Site -1				Site -2				Site -3			
	Male		Female		Male		Female		Male		Female	
	HSI %	GSI %	HSI %	GSI %	HSI %	GSI %	HSI %	GSI %	HSI %	GSI %	HSI %	GSI %
Jan	1.06	0.05	1.18	0.16	1.14	1.14	1.01	0.05	1.22	0.81	1.82	7.32
Feb	0.86	0.06	1.35	0.19	1.74	0.87	1.21	0.06	1.89	0.47	0.66	0.33
Mar	1.11	0.06	1.25	0.13	2.04	0.10	0.92	0.06	1.74	0.87	1.31	0.65
April	2.56	0.89	0.98	8.80	3.51	0.88	1.18	0.29	1.67	0.47	1.18	0.39
May	0.90	0.32	0.98	8.81	2.27	0.64	1.06	9.04	1.02	0.68	1.95	6.49
June	1.02	1.02	0.63	9.9	1.04	0.83	0.99	8.02	1.09	0.73	0.65	13.07
July	1.01	0.50	0.89	1.1	1.26	0.63	1.31	1.31	1.72	0.52	1.19	0.30
Aug	1.63	0.23	0.76	0.08	2.03	0.10	1.22	0.55	1.29	0.06	1.80	0.63
Sept:	1.74	0.78	1.06	0.18	0.90	0.42	0.76	0.19	1.33	0.22	1.97	0.25
Oct:	1.61	0.81	0.65	0.33	1.6	0.8	1.82	0.91	2.11	0.11	1.69	0.85
Nov:	1.34	0.31	0.80	0.16	0.79	0.63	0.62	1.24	1.83	0.46	1.28	0.21
Dec:	2.70	0.09	0.85	0.21	2.11	0.53	1.76	4.69	1.66	0.83	1.67	5.33



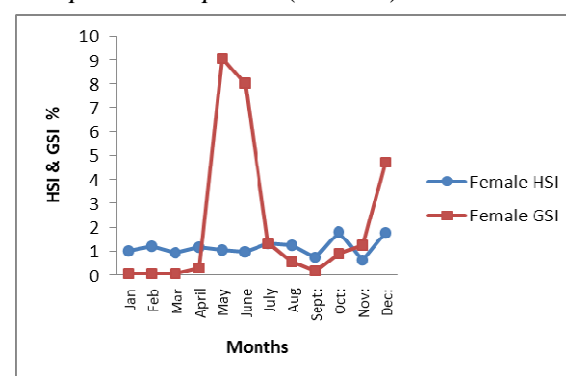
HSI% and GSI% values of *Notopterus notopterus* (Male) from site 1



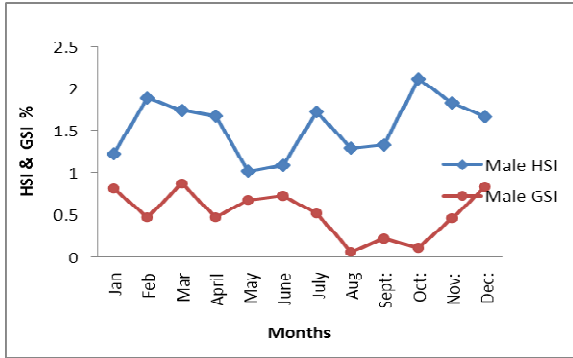
HSI% and GSI% values of *Notopterus notopterus* (Female) from site 1



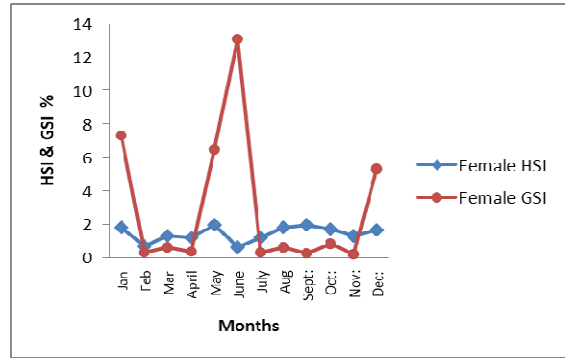
HSI% and GSI% values of *Notopterus notopterus* (Male) from site 2



HSI% and GSI% values of *Notopterus notopterus* (Female) from site 2



HSI% and GSI% values of *Notopterus notopterus* (Male) from site 3



HSI% and GSI% values of *Notopterus notopterus* (Female) from site 3

Sex ratio of *Notopterus notopterus*

In the present study, the total catch of 1184 specimens, 182 male (15.37 %) and 1002 female specimens (84.62 %) were recorded in the year 2010. Chi-Square (X^2 test), showed significant differences ($P < 0.05$) between number of males and females was (1:5.5) for the year 2010. (Table.1)

Table 2. Sex ratio of *N. notopterus* in 2010

Year	Male		Female		Chi-square	Sex ratio
	No.	%	No.	%		
2010	182	15.37	1002	84.62	567.905	1:5.5



Notopterus notopterus (Pallas, 1769) (Male)



Notopterus notopterus (Pallas, 1769)(Female)



Opened the abdomen of *N. notopterus* (Gravid -Female)



Extracted eggs of *N. notopterus*



A pair of genital ducts of *N. notopterus* (Female)



A pair of genital ducts of *N. notopterus* (Male)

Reproductive performance of *Otolithoides pama*

According to the survey, a total of five species were recorded as economically important species. Among them, in order Osteoglossiformes sample fish species as *Notopterus notopterus* (Pallas, 1769) and in order Perciformes, the sample fish species as *Otolithoides pama* (Hamilton, 1822) were recorded at three different segments in Ngamoeyeik creek.

Gonadosomatic index (GSI) and hepatosomatic index (HSI) values of both male and female *Otolithoides pama* and their sex ratio were investigated in twice per month in three study sites in the year, 2010.

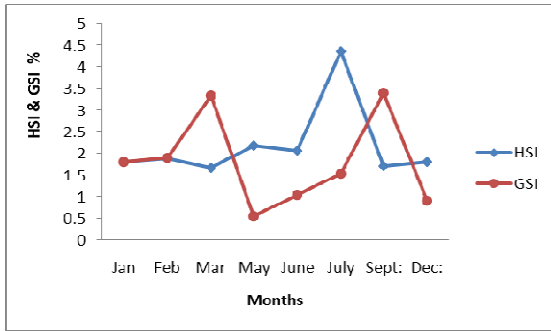
GSI and HSI values of male and female *O. pama*

In male *O. pama*, the peak of GSI value February (3.08 %). March (1.25 %) and September (3.39 %) respectively while HSI values in February (1.54 %), March (1.56 %) and September (1.69 %) in study period.

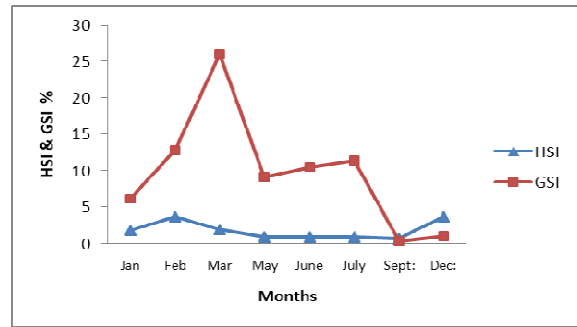
In female *O. pama*, the GSI values sharply increased in March (25.93 %) and June (25.95 %) while HSI values were sharply decreased in March (1.85 %) and June (1.85 %).

Table 3. Monthly occurrence between HSI % and GSI % value of *Otolithoides pama* from three different sites.

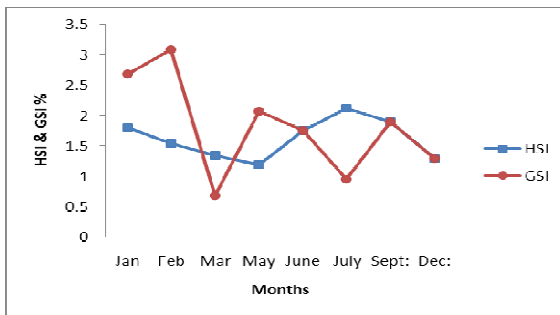
Month	Site -1				Site -2				Site -3			
	Male		Female		Male		Female		Male		Female	
	HSI %	GSI %	HSI %	GSI %	HSI %	GSI %	HSI %	GSI %	HSI %	GSI %	HSI %	GSI %
Jan	1.79	1.79	1.74	6.09	1.79	2.68	1.75	0.87	3.38	0.69	1.75	0.88
Feb	1.87	1.89	3.64	12.73	1.54	3.08	3.33	4.44	2.06	0.72	2.08	8.33
Mar	1.67	3.33	1.85	25.93	1.33	0.67	3.64	5.45	1.56	1.25	3.85	3.85
May	2.17	0.54	0.81	9.03	1.18	2.06	3.33	11.67	1.8	1.8	3.51	12.28
June	2.06	1.03	0.87	10.43	1.75	1.75	0.90	10.86	1.2	1.8	1.85	25.93
July	4.35	1.52	0.81	11.29	2.11	0.95	0.71	9.96	1.75	0.88	1.82	3.64
Sept:	1.69	3.39	0.68	0.34	1.89	1.89	0.98	0.98	0.45	1.21	0.68	0.34
Dec:	1.8	0.90	3.64	0.91	1.29	1.29	1.85	0.65	2.63	0.53	4.08	8.16



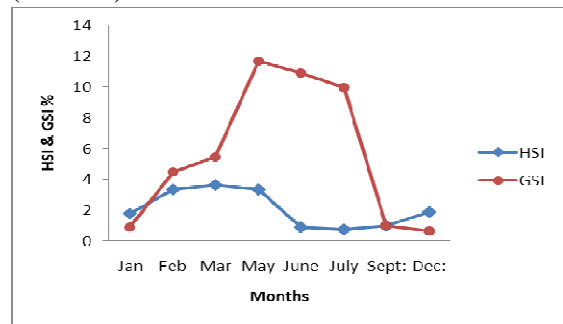
HSI% and GSI% values of *Otolithoides pama* (Male) from site 1



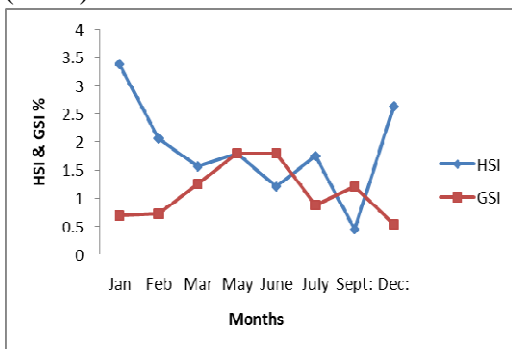
HSI% and GSI% values of *Otolithoides pama* (Female) from site 1



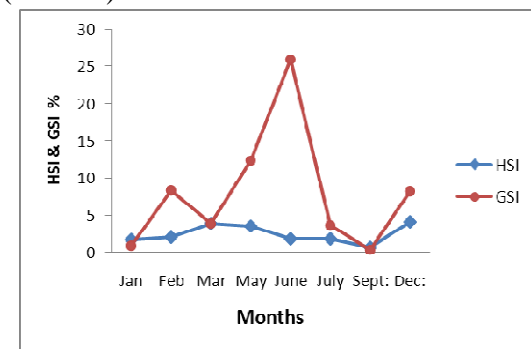
HSI% and GSI% values of *Otolithoides pama* (Male) from site 1



HSI% and GSI% values of *Otolithoides pama* (Female) from site 1



HSI% and GSI% values of *Otolithoides pama* (Male) from site 3



HSI% and GSI% values of *Otolithoides pama* (Female) from site 3

Sex ratio of *Otolithoides pama*

During the study year 2009, among the total catch of 1383 individuals 198 males (14.31 %) and 1185 females (85.7 %) were recorded.

Chi-square (X^2) test showed the sex ratio of male and female was (1:5.98) in 2009. The number of male and female was significantly different ($P < 0.05$) in year (Table.2).

Table 4. Sex ratio of *Otolithoides pama* in 2010

Year	Male		Female		Chi-square	Sex ratio
	No.	%	No.	%		
2010	198	14.31	1185	85.68	704.388	1:5.98



Otolithoides pama (Hamilton, 1822) (Male)



Otolithoides pama (Hamilton, 1822)(Female)



Opened the abdomen of *O. pama*
(immature gravid female)



Extracted ovaries of *O.pama*



A pair of mature eggs of *O.pama*



The gonad and liver opened from abdomen
of *O.pama* (gravid-female)

Gonadosomatic index (GSI) and Hepatosomatic index (HSI) values, of both male and female *Notopterus notopterus* and their sex ratio were investigated in twice per month in three study sites of year, 2009.

Discussion

A total of five species of fish were collected from three study sites among which five most abundant species of *Channa striata*, *Notopterus notopterus*, *Otolithoides pama*, *Mystus cavasius* and *Taenioides buchanami* were investigated for reproductive performance and length-weight relationship. In all the selected sites of the present study, two abundant of species (*Notopterus notopterus* and *Otolithoides pama*) were found throughout the year in Ngamoeyeik Creek.

This study finds that *Notopterus notopterus* and *Otolithoides pama* are spawned more than once in a single spawning season as revealed from collected data of GSI and HSI and from the presence of matured eggs in the ovary. Lagler (1962) stated that several fish species spawn more than once a year and more or less continually. These are many advantages of multiple spawning in teleosts. It increases the total number of eggs produced in a single spawning season and spreads the risk of egg and larval predation over a long period.

The values of GSI increased as the defined of the gonads in both males and females, until gonads, were fully ripe and HSI decreased. The GSI declined sharply during and after spawning, after which HSI increased. Gonadosomatic Index (GSI) and Hepatosomatic Index (HSI) values were inversely related.

Tin Hnin Wai (2010) studied the reproductive biology of *Otolithoides pama* in Patheingyi River, the high values of GSI were observed during the period from January to May with a peak in March. Based on the present study, *O. pama*, studied the spawning season to be from January to December with the peak spawning months were reported February, March and September. GSI values showed marked increased in March and July *O. pama*. The peak of the GSI values of *N. notopterus* were reported in July (Toe Toe Soe, 2009).

In present of females, the peak spawning month for *N. notopterus* was found in April, May and June. The GSI of *O. pama* was found to peak in March, April, May, June and July. The gonads of the yellow perch before spawning may make up more than 20 per cent of the body weight of the female and more than 8 per cent of the body weight of the male; after spawning the ovaries or testes have shrunk to about 1 percent or less of the body weight (Lagler, *et al.*, 1962).

The sex ratio in the majority of species is close to unity, despite some variation between population of species. Previously, females and males ratio (2:1) was recorded for *Otolithoides pama* (Tin Hnin Wai, 2010). Tin Htay Yu (2009) stated that the females to males sex ratio (2:1) was observed for *Notopterus notopterus*.

According to the present study work, the sex ratio of mature of females and males was found at (5:1) for *N. notopterus* and *O. pama* respectively.

The highest GSI values and population number of the studied fishes were recorded during their respective spawning seasons. The female were noted to predominate among the studied species throughout the year during the present study. The findings indicate slight variation in the time of GSI peaks during the spawning season of the respective studied period.

Conclusion

Among fishes, *Notopterus notopterus* and *Otolithoides pama* were abundantly distributed in round year. Breeding times of the former was in March, May, June, July and September. Those of the latter were in August, October, December and February. GSI was more fluctuated than HSI in the male fish. In the female, GSI was gradually higher up to the peak and declined just after egg laying.

Acknowledgement

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- Tin Hnin Wai**, 2010 studied the reproductive biology of *Otolithoides pama* (Ham-buch, 1822), Pama croaker in Patheingyi River, Ayeyarwady Division, *Ph.D Thesis*, Zoology Department, University of Yangon.