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Sex Ratio of Oriental River Prawn, *Macrobrachium nipponense* (De Haan, 1849) in Soon Lun Reservoir, Myingyan Township, Mandalay Region

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Abstract

Sex ratio of Oriental River Prawn, *Macrobrachium nipponense* was investigated in Soon Lun Reservoir from June 2009 to May 2010. A total of 955 males and 1252 females were collected during the study period. The overall annual sex ratio was found to be 1:1.3 (males:females). A test showed that the total number of females was significantly more than males in the samples throughout the sampling period ($p < 0.05$). The present work provides the estimation of population of *Macrobrachium nipponense* in Soon Lun Reservoir.

Key words: *Macrobrachium nipponense*, sex ratio

Introduction

The freshwater prawns, *Macrobrachium*, are the largest genus of the family palaemonidae. About 200 species have been described in this genus (FAO, 2002). It is widely distributed and abundant macro-invertebrate in most aquatic system (Cook *et al.*, 2002).

The ratio of sexually active males to receptive females is the immediate cause determining the direction and intensity of competition for mates (Emlen and Oring, 1977).

Deviations from the ratio 1:1 may arise in different taxa from differential sex ratios at birth or metamorphosis (Komdeur *et al.*, 1997). Sex ratio may become biased due to sex differences in age/size of sexual maturity in relation to life expectancy and differential mortality related to sex-roles (Koga *et al.*, 2001). In the case of hermaphroditic species, the timing and cues of sex change also play an important role (Gherardi and Calloni, 1993).

The Oriental river prawn *Macrobrachium nipponense* is exploited in Soon Lun reservoir, Myingyan Township and also found in Shan State, Ayeyarwady drain and Mu-se. The present study emphasizes on sex ratio of

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M. nipponense and suitable for spawning and hatching of egg in Soon Lun reservoir at Myingyan Township, Mandalay Region. The objective of this study is:

- to determine the sex ratio of *Macrobrachium nipponense* from Soon Lun reservoir in Myingyan Township, Mandalay Region

Materials and Methods

Study Area

The Soon Lun reservoir is located in Myingyan Township, Mandalay Region and situated at N 21° 27' 2.9" and E 95° 23' 19.7" (Fig. 1). It is an earthen dam. Dam is 945.5 m in length and 18.6 m in breadth (Plate 1).



Fig. 1 Location map of Soon Lun reservoir in Myingyan Township

Source: Department of Geography, University of Mandalay



Plate 1 Study area of Soon Lun reservoir

During the study period lasted from June 2009 to May 2010. Samples of *Macrobrachium nipponense* were collected monthly from the study area and were captured by bamboo traps with the help of local fishermen. Specimens were preserved in 5% formalin immediately after collection and some were transported alive to the laboratory of Zoology Department, University of Mandalay for further analysis. Collected specimens were identified according to Holthuis (1950), Jayachandran (2001), Cai and Ng (2002) and Salman *et al.* (2006).

Sex ratio

The species of *M. nipponense* were separated into male and female on the presence of an appendix masculine on second pleopod in males. Sex ratio was monthly calculated and the result was tested by Chi-square analysis (χ^2 test) for the differences from the hypothetical ratio of 1:1.

Results

Sex Ratio

The number of male, female and percentage occurrence of female were calculated throughout the study period (Table 1, Fig.2 and Fig.3). Male and female of *Macrobrachium nipponense* were shown in Plate 2 and 3.

Of the 2207 specimens examined, 955 (43.27%) were males and 1252 (56.73%) females. The relative proportions of males and females were

calculated by pooling the monthly recorded data based on Chi-square test. From this result, sex ratio of males and females showed that the highest predominant of females was found in May (1:7.8) and then followed by (1:6.5) in April, (1:2.6) in March, (1:1.6) in July, (1:1.3) in January. The lowest value of female (1:0.2) was found in October. On the other hand, the ratios of males were predominant over females especially in August, September, October, November and December (Fig. 3). The overall sex ratio was 1:1.3 (Table1). Chi-square test revealed that the total number of females was significantly greater than males in the samples throughout the sampling period ($\chi^2 = 389.60$, d.f = 11) although the sex ratio varied from month to month.

Table 1 Chi-square test of monthly sex-ratio between males and females of *Macrobrachium nipponense* (June 2009 - May 2010)

Month	M _o	F _o	M + F	M _e	F _e	χ^2	M : F	Ratio of Female (%)
Jun.,09	98	88	186	80.48	105.52	6.720**	1:0.8 9	47.31
July.,09	45	70	115	49.76	65.24	0.81	1:1.6	60.87
Aug.,09	32	53	85	36.78	48.22	1.09	1:1.6	62.35
Sep.,09	41	33	74	32.02	41.98	4.44*	1:0.8	44.59
Oct., 09	44	10	54	23.37	30.63	32.10**	1:0.2	18.51
Nov., 09	136	77	213	92.17	120.83	36.74**	1:0.6	5
Dec., 09	167	45	212	91.73	120.27	108.86**	1:0.3	21.23
Month	M _o	F _o	M + F	M _e	F _e	χ^2	M : F	Ratio of Female (%)
Jan., 10	145	191	336	145.39	190.61	0.002	1:1.3	56.85

Month	M _o	F _o	M + F	M _e	F _e	χ^2	M : F	Ratio of Female (%)
Feb., 10	132	139	271	117.27	153.73	3.26	1:1.0	51.29
Mar., 10	61	156	217	93.9	123.1	20.32**	1:2.6	71.89
Apr., 10	24	155	179	77.46	101.54	65.05**	1:6.5	86.59
May, 10	30	235	265	114.67	150.33	110.21**	1:7.8	88.68
Total	955	1252	2207	955	1252	389.60	1:1.3	56.73

χ^2	=	Chi-square
M _o	=	Observed value of male
F _o	=	Observed frequency of female
M + F	=	Male + Female
M _e	=	Excepted frequency of male
F _e	=	Excepted frequency of female
M : F	=	Male : Female
*	=	p < 0.05
**	=	p < 0.01



Plate 2 *Macrobrachium nipponense* (Male)



Plate 3 *Macrobrachium nipponense* (female)

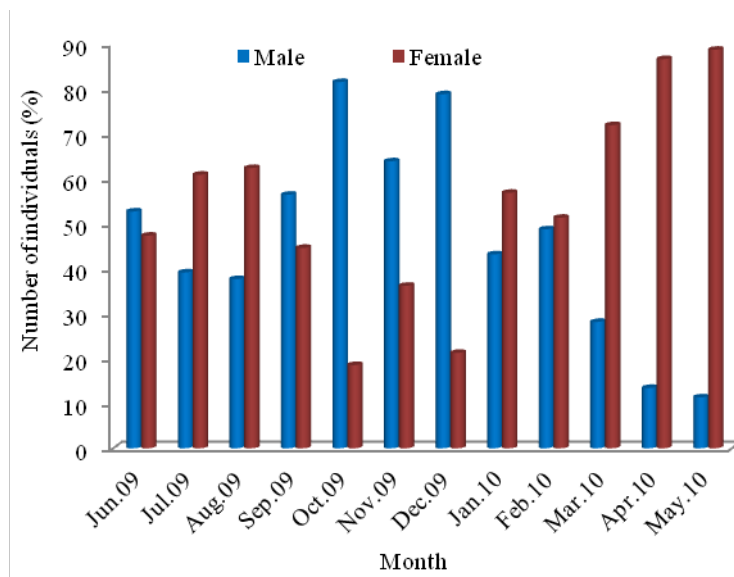


Fig. 2 Monthly percentage occurrence male and female of *M. nipponense* (June 2009 – May 2010)

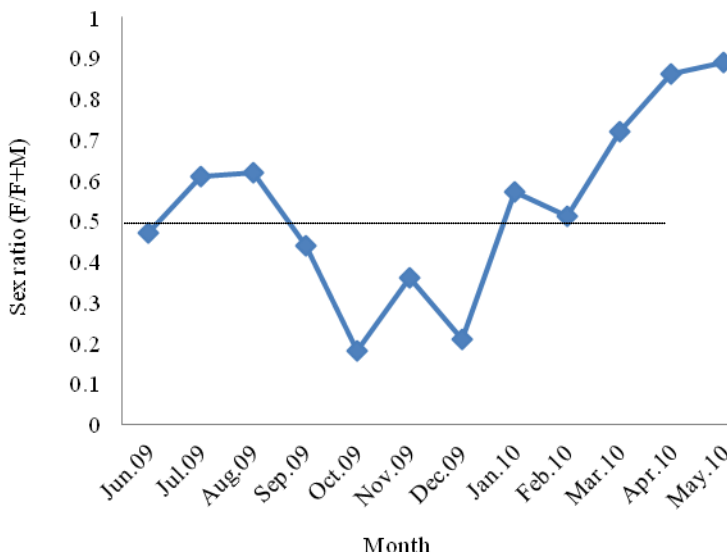


Fig. 3 Monthly variation of sex ratio of *M. nipponense* (June 2009 – May 2010)

Discussion

Cai and Dai (1999) reported that *Macrobrachium nipponense* is commonly found in various kinds of inland water bodies in main islands of Japan, Korea, China, Taiwan and Vietnam. Cai and Ng (2002) also recorded this species to be distributed in Shan State, Ayeyawady drain and Mu-Se of Myanmar although the occurrence of *M. nipponense* has not yet been recognized by Myanmar researchers.

The monthly sex ratio of *M. nipponense* in the Soon Lun reservoir was found to be approximately 1:1 except in March, April, May and July when the ratio was in favour of females. The overall sex ratio for *M. nipponense* was not significantly different from the theoretical 1:1 ratio. Fisher (1958) reported that in general, sex ratio is known to be closed to 1:1 (males : females) in nature. Courtney *et al.* (1996) presented that a possible explanation for the preponderance of one sex in the catch could be differences in the selectivity of the mesh size between sexes and may also be due to the variety of gears used for *M. nipponense*. In fact that in the male/female ratio encountered in this study, the females were predominant over the males.

The overall yearly sex ratio was found to be 1:1.31 (males:females) in this study the ratio was closed to the expected ratio of 1:1. Fisher (1958) reported that sex ratio is known to be close to 1:1 (male:female) in nature. A similar sex ratio has been reported by Inyang (1981) for *M. felicinum*, for *M. vollehoveni* and *M. macrobrachion* by Marioghae (1982) and for *M. dux* by Arimoro and Meye (2007). Amin *et al.* (2009) studied that the sex ratio in the *Acetes indicus* population in coastal waters of Malacca was 1:2.10 (male:female). A skewed sex ratio can be caused by different mortalities between sexes and different factors such as distribution, berried females, sex reversal, temperature and crowding (Kim, 2005).

The sex ratio varied seasonally, and the causes of such seasonal variations are unknown. It can be influenced by the growth, mortality, and behavior of populations. The faster growth of females leads to biased proportions toward females because of their greater sizes, and hence dominance especially in commercial catches (Xiao and Greenwood, 1993).

It may be concluded that the overall sex ratio of present species close to the expected ratio of 1:1. Therefore, the population of *M. nipponense* in Soon Lun reservoir is stable.

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