

ajava

Asian Journal of Animal and Veterinary Advances



Academic
Journals Inc.

www.academicjournals.com

Fecundity and Egg Size of Grey-Eel Catfish *Plotosus canius* (Hamilton, 1822) from the Coastal Waters of Kampong Telok, Negeri Sembilan Peninsular Malaysia

^{1,2}B.I. Usman, ¹S.M.N. Amin, ¹A. Arshad and ³M. Aminur Rahman

¹Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

²Biology Department, School of Sciences, Federal College of Education, Kano, Nigeria

³Marine Biotechnology Laboratory, Institute of Bioscience, Universiti Putra Malaysia, Malaysia

Corresponding Author: S.M.N. Amin, Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia Tel: +60-169180197

ABSTRACT

Despite the vast researches on catfish species in Malaysia, *Plotosus canius*, the grey-eel catfish which is primarily found throughout the coastal seas of Malaysia has been neglected. No single published work on aspects of biology, especially its reproductive biology is available. In this study, fecundity and egg size of *P. canius* from coastal waters of Kampong Telok, Malaysia were studied. A total of 32 gravid females were used in the study. The mean fecundity of the female having a length of 50.28 cm and a wet body weight of 680 g was estimated to be 865 eggs. Fecundity was found to show positive relationship with total length ($r = 0.379$), body weight ($r = 0.494$) and gonad weight ($r = 0.336$) but the values were not statistically significant ($p > 0.05$). Egg diameter (mm) among the various length groups showed a polymodal distribution but the differences were statistically significant ($p > 0.05$). This study being the first attempt to gather information of *P. canius* in Malaysia would form a basis for future works of this catfish.

Key words: *Plotosus canius*, fecundity, coastal seas, egg diameter, Peninsular Malaysia

INTRODUCTION

Plotosus canius (Hamilton, 1822) commonly known as “Grey-eel catfish” belonged to family Plotosidae. It is amphidromous and demersal (Riede, 2004) and dwells primarily in marine environment, mostly coastal seas; but sometimes found in lower parts of rivers in freshwaters or brackish waters (Kuitert and Tono-zuka, 2001). *P. Canius* is native to Asia and Australia. It can be found in countries such as Malaysia (Mohsin *et al.*, 1993), Bangladesh (Rahman, 1989), Australia (Hoese *et al.*, 2006), India (Talwar and Jhingran, 1991), Fiji (Seeto and Baldwin, 2010), Laos (Kottelat, 2001); Papua New Guinea (Kailola, 1987), Thailand; Vietnam (Nguyen and Nguyen, 1994), Singapore, Indonesia, Brunei, Cambodia, Myanmar, Philippines and Sri Lanka (Fischer and Bianchi, 1983). In Malaysia, the fish is commonly known as “Sembilang” or “Gemang”. It is highly priced (RM 15-20 kg⁻¹) and mostly sold fresh in the markets (Mohsin and Ambak, 1996).

Fecundity is the term frequently used to express the capacity of fish in terms of eggs production and has been defined by Gupta and Gupta (2006) as “the number of ripening eggs in the ovaries

of female before spawning". Knowledge of fish fecundity is very important because it has much relevance to fish population studies. It has also been studied to establish relationship with length, weight and ovary weight, to provide relative index of density dependent factors affecting the population size and also to develop numerical relationship between egg production and recruitment (Amin *et al.*, 2009; Sarker *et al.*, 2002). Information on fecundity is also very important in order to evaluate a fish for its commercial potentialities (Lawson, 2011). Fecundity, size/length at sexual maturity, size of egg, sex ratio and gonadosomatic index are very important aspects of life history theory formulation (Mekki and Hassan, 2011). To the best of our knowledge, information on fecundity and egg size of *P. canius* in Malaysia has not yet been reported. Such information is very crucial in conservation and management of the stock and in assessing variations among populations of the fish in various locations. This study therefore, provides the first information on fecundity and egg size of the fish from Malaysian coastal waters. Therefore, the results from this study would serve as an input parameter for further detail studies on this fish species in Malaysia.

MATERIALS AND METHODS

Fish sampling and laboratory preparation: About 30-35 samples of fresh fishes were collected during full moon from the fishermen of the coastal region of Kampong Telok Negeri Sembilang for a period of four months (from February to May, 2012). After collection, samples were immediately preserved in ice box and transported to the Marine Biotechnology Laboratory, Institute of Bioscience, Universiti Putra Malaysia. In total, 32 gravid female fishes were used for the four months study period. Before dissecting, the body weight for each fish was measured to the nearest gram (g) using digital electronic balance; and total length was measured to the nearest millimeter (mm). The fish was then dissected and the ovary was taken out and immediately preserved in 5% formalin in labelled vials for subsequent analyses.

Fecundity: Fecundity studies were performed for both ovary lobes together by washing the preserved ovaries and dried using blotting paper and finally weighed to the nearest 0.001 g. For each ovary, sub-samples were collected from three positions (fore, middle and rear), each sub-sample was then measured to the nearest 0.001 g and the number of eggs in each individual was then counted. Fecundity was estimated using the following formula described by Gupta and Gupta (2006):

$$F = \frac{wx(N1 + N2 + N3)}{(W1 + W2 + W3)}$$

Where:

- F = Fecundity
- W = Total weight of ovary
- W1, W2 and W3 = Weights of each sub-samples
- N1, N2 and N3 = Egg counts in each sub-samples

Egg size: Measurement of the egg size was done by measuring the egg diameter in millimeter (mm) using KEYENCE digital microscope (VHX-500). For each female fish, fifteen eggs were collected from each of the anterior, middle and posterior region of the ovary and the diameter measured.

Statistical analysis: A scatter diagram was used to determine the relationship between fecundity and total length, fecundity and body weight as well as fecundity and gonad weight. All statistical analyses were considered significant at 5% ($p < 0.05$) and were done using SPSS computer software version 20. Mean values were compared using one way analysis of variance (ANOVA) followed by Duncan's multiple range test.

RESULTS

Fecundity: A total of 32 gravid female specimens of *P. canius* measuring from 41.23 to 60.00 cm and weighing from 439 to 906 g were used for the study (Table 1). Fish with a mean total length of 50.28 cm and total weight of 680 g produced an average of 865 eggs and has 9 eggs per unit of ovary weight. Maximum fecundity of 1276 was observed in fish with a total length and body weight of 60.00 cm and 777.00 g, respectively.

The relationships between fecundity and total length, fecundity and body weight and fecundity and ovary weight were analyzed using models of linear and exponential regression. The results showed that no significant relationship ($p > 0.05$). These results are summarised in Fig. 1. Figure 1 shows the relationship between fecundity and total length. A linear regression provided the best fit curve with a positive result. The relationship is not significant at 5% ($p > 0.05$). A linear regression was also obtained for the relationship between fecundity and body weight (Fig. 2). Analysis of the relationship between fecundity and ovary weight also revealed a positive linear relationship (Fig. 3). The relationship also found not significant at 5% ($p > 0.05$).

Egg size: Measurement of egg growth was done by measuring Egg Size (ES). In this study, ES was ranged from 3.71 to 5.94 mm. The highest ES was found in fish between 52- 55 cm total

Table 1: Average counts of fecundity and egg size at various length ranges of *P. canius*

Length range (cm)	Total length (cm)	Body weight (g)	Ovary weight (g)	Fecundity	No. of ova per ovary weight
40-44	41.23±0.69	439.33±1.04	79.55±1.73	631±1.65	9.0±0.10
43-46	44.68±0.67	560.08±1.10	102.90±6.30	703±2.89	8.0±0.09
46-49	47.20±1.56	575.50±2.06	79.54±3.16	932±5.36	12.0±0.10
49-52	50.20±1.23	698.67±2.8	66.28±1.91	915±3.22	17.0±0.40
52-55	52.83±2.83	906.00±8.94	205.63±3.93	1118±1.10	5.0±0.03
55-58	55.80±0.07	802.00±4.88	108.48±2.14	478±1.29	4.0±0.07
58-61	60.00±0.01	777.00±0.01	45.54±0.01	1276±0.01	28.0±0.01

Values are Mean±SD

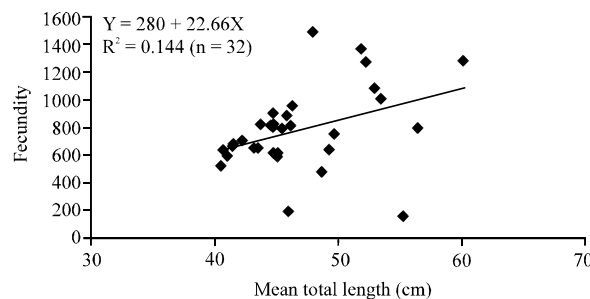


Fig. 1: Linear relationships between fecundity and total length of *P. canius*

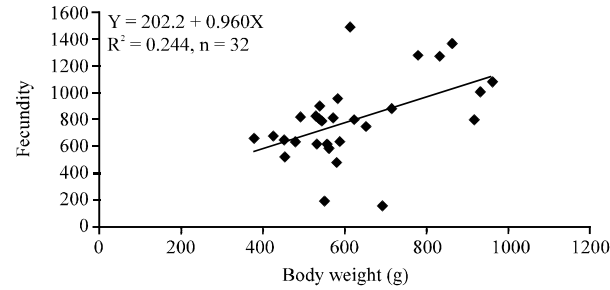


Fig. 2: Linear relationships between fecundity and body weight of *P. canius*

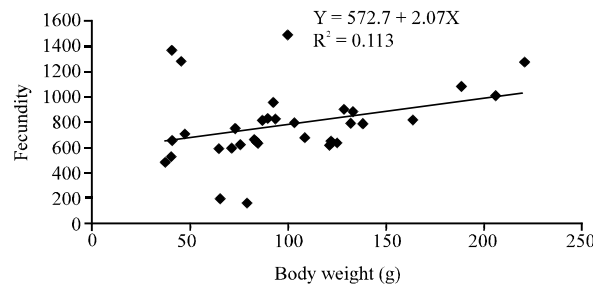


Fig. 3: Linear relationships between fecundity and ovary weight of *P. canius*

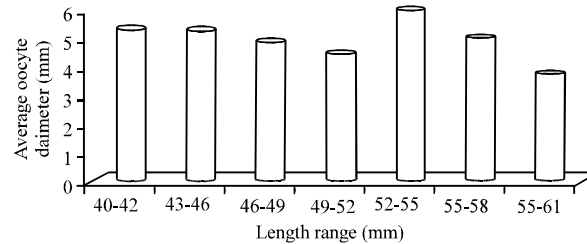


Fig. 4: Variations in egg diameter among various lengths of *P. canius*

length, while the lowest was recorded in fish between 58- 61 cm (Fig. 4). The pattern in the ES frequency distribution of *P. canius* showed polymodal distribution (Fig. 5). The difference between the means at various ranges of length was found to be statistically significant ($p < 0.05$).

DISCUSSION

The present study represents the first attempt to examine the fecundity and egg size of *P. canius* from the coastal waters of peninsular Malaysia. These parameters are very important to understand the life history traits, breeding biology and ontogenic development which will ultimately facilitate for the development of aquaculture management and conservation of this important catfish species. The mean fecundity of 32 females of *P. canius* was 865 eggs. The maximum number of ova is estimated to be 1276 in females that ranged from 58- 61 cm. While the minimum numbers of eggs were 476 in females of 55-58 cm in length. However, Khan *et al.* (2002) reported higher fecundity values from 1228 to 1867 in this fish having the size ranges from 36.5-40.5 to 65.2-69.2 cm, respectively. From their findings, older fishes were found to produce fewer ova per unit weight of ovary than younger fish. It is somewhat surprising that in this study, the opposite trend is found. However, this result may be explained by the fact that differences in

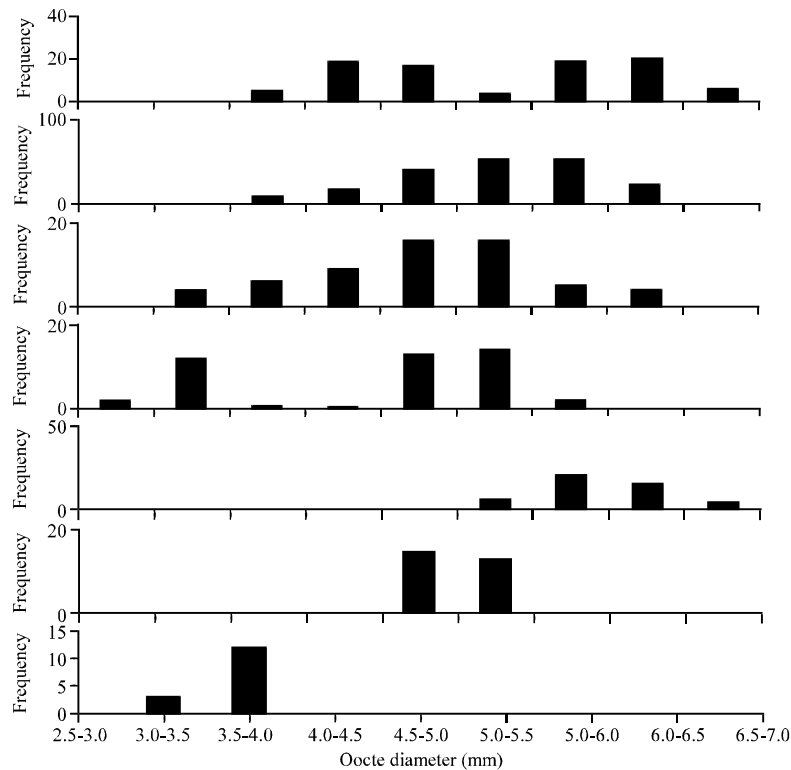


Fig. 5(a-g): Egg diameter-frequency distribution of *P. canius* female with length (a) 40-43 mm, (b) 43-46 mm, (c) 46-49 mm, (d) 49-52 mm, (e) 52-55 mm, (f) 55-58 mm and (g) 58-61 mm

the environmental factors such as availability of food, ambient water temperature and population densities could contribute to this. More research in this direction is suggested. Increase in fecundity with increase in total length and body weights were observed. Similar reports were shown by Khan *et al.* (2002) in *P. canius*, Rahman *et al.* (2002) in *Liza parsia* and Sarker *et al.* (2002) in *Mystus gulio*. However these findings can not be extrapolated to all *P. canius* population in Malaysian waters, because this research is the preliminary in such direction, as such further work needed to be conducted to establish this.

A characteristic of life history of species is that is diverse is the size of egg in that species and this could determine the reproductive patterns and life history traits by mode of energy allocation to either single embryos or brood output (Clarke *et al.*, 1985). The polymodal nature of egg size frequency distribution in almost all the length ranges predicted that the species may spawn once or more over a long period of season. These findings could be supported by the works of Ahmed and Haque (2007) which reported a long period of spawning in this fish; between April-July. Khan *et al.* (2002) mentioned *P. canius* also have a long spawning period between April-August. However, in Malaysia future work is suggested for this to be investigated.

In conclusion, the present study provides some basic information on fecundity and egg size of the fish from waters of Peninsular Malaysia. A number of possible future studies using the same fish from different coastal waters of Malaysia are apparent and believed to be a good fishery management measures for *P. canius*.

ACKNOWLEDGMENT

The present study is part of a Ph.D research work. Funded by the Universiti Putra Malaysia under Research Universiti Grant Scheme (RUGS) with the Grant No. 01-01-11-1120RU, Vot. No. 9199729. The help of Mohammad Hazmadi Bin Zakariya of the Department of Aquaculture, Universiti Putra Malaysia for the fish sampling and laboratory preparation is gratefully acknowledged. Also, we would like to extend our appreciations to all the staff and students of Marine Biotechnology Laboratory, Institute of Bioscience, Universiti Putra Malaysia who are too numerous to mention for their help and support during the laboratory work.

REFERENCES

- Ahmed, S.U. and A. Haque, 2007. Studies on the fishery, Biology and domestication of Gang Magur, *Plotosus canius*. BFRI Annual Progress Report 6, Bangladesh Fisheries Research Institute, Myemensingh, Bangladesh, pp: 76-79.
- Amin, S.M.N., A. Arshad, J.S. Bujang, S.S. Siraj and S. Goddard, 2009. Reproductive biology of the sergestid shrimp *Acetes indicus* (Decapoda: Sergestidae) in coastal waters of Malacca, Peninsular Malaysia. Zool. Stud., 48: 753-760.
- Clarke, A., A. Skadsheim and L.J. Holmes, 1985. Lipid biochemistry and reproductive biology in two species of Gammaridae (Crustacea: Amphipoda). Mar. Biol., 88: 247-263.
- Fischer, W. and G. Bianchi, 1983. FAO species identification sheets for fishery purposes: Western Indian ocean (fishing area 51). Food and Agriculture Organization of the United Nations, Rome, Italy.
- Gupta, S.K. and P.C. Gupta, 2006. General and Applied Ichthyology: Fish and Fisheries. S. Chand and Co. Ltd., Ram Nagar, New Delhi, India, ISBN-13: 9788121926294, Pages: 1130.
- Hoese, D.F., D.J. Bray, J.R. Paxton and G.R. Allen, 2006. Fishes. In: Zoological Catalogue of Australia, Beasley, O.L. and A. Wells (Eds.). Vol. 35. ABRIS and CSIRO Publishing, Australia.
- Kailola, P.J., 1987. The fishes of Papua New Guinea: A revised and annotated checklist. Vol. 2, Scorpaenidae to Callionymidae. Research bulletin No. 41. Department of Fisheries and Marine Resources, Papua New Guinea.
- Khan, M.S.A., M.J. Alam, S. Rheman, S. Mondal and M.M. Rahman, 2002. Study on the fecundity and GSI of brackishwater catfish *Plotosus canius* (Hamilton-Buchanan). J. Biol. Sci., 2: 232-234.
- Kottelat, M., 2001. Fishes of Laos. WHT Publications, Colombo, Sri Lanka, ISBN-13: 9789559114253, Pages: 198.
- Kuiter, R.H. and T. Tonozuka, 2001. Pictorial Guide to Indonesian reef fishes. Part 1: Eels-Snappers, Muraenidae-Lutjanidae. Zoonetics Publ., Australia, pp: 304-622.
- Lawson, E.O., 2011. Length-weight relationships and fecundity estimates in mudskipper, *Periophthalmus papilio* (Bloch and Schneider, 1801) caught from the mangrove swamps of Lagos Lagoon, Nigeria. J. Fish. Aquat. Sci., 6: 264-271.
- Mekkawy, I.A.A. and A.A. Hassan, 2011. Some reproductive parameters of *Synodontis schall* (Bloch and Schneider, 1801) from the River Nile, Egypt. J. Fish. Aquat. Sci., 6: 456-471.
- Mohsin, A., M.A. Ambak and M.N.A. Salam, 1993. Malay, English and scientific names of the fishes of Malaysia. Faculty of Fisheries and Marine Science, Division of Information Management, Universiti Putra Malaysia, Selangor, Malaysia.
- Mohsin, A.K.M. and M.A. Ambak, 1996. Marine Fishes and Fisheries of Malaysia and Neighbouring Countries. Universiti Pertanian Press, Serdang, Malaysia, ISBN-13: 9789839319040, Pages: 744.

- Nguyen, H.P. and N.T. Nguyen, 1994. Check List of Marine Fishes of Vietnam, Volume 2: Osteichthyes-from Elopiformes to Mugiliformes. Science and Technics Publishing House, Vietnam, Pages: 270.
- Rahman, A.K.A., 1989. Freshwater Fishes of Bangladesh. Zoological Society of Bangladesh, Dhaka, Bangladesh, Pages: 364.
- Rahman, S., M.L. Islam, M.M.R. Shah, S. Mondal and M.J. Alam, 2002. Observation on the fecundity and gonadosomatic index (GSI) of Grey mullet *Liza parsia* (Ham.). J. Biological Sci., 2: 690-693.
- Riede, K., 2004. Global register of migratory species from global to regional scales. Final Report of the R and D-Project 80805081, Federal Agency for Nature Conservation, Bonn, Germany, pp: 329.
- Sarker, P.K., H.K. Pal, M.M. Rahman and M.M. Rahman, 2002. Observation on the fecundity and gonado-somatic index of *Mystus gulio* in brackishwaters of Bangladesh. J. Biological Sci., 2: 235-237.
- Seeto, J. and W.J. Baldwin, 2010. Fishes of Fiji and a bibliography of Fijian fish. Technical Report No. 1/2010, Division of Marine Studies School of Islands and Oceans, Faculty of Science, Technology and Environment, The University of South Pacific Suva Campus, Fiji.
- Talwar, P.K. and A.G. Jhingran, 1991. Inland Fishes of India and Adjacent Countries. Taylor and Francis, Rotterdam, The Netherlands, ISBN-13: 9789061911647, pp: 135-136.