INOC

INOCEM/IIUM

International Conference - المؤتمر الدولي حول

on

Oceanography and Sustainable Marine Production:

A Challenge of Managing Marine Resources under Climate Change

ICOSMaP – 2013

Kuantan - Malaysia, 28-30 October 2013

CONFERENCE PROCEEDİNGS

Edited by

Abdelouahab CHOUIKHI
Inter Islamic Science & Technology Network on Oceanography, Izmir – TURKEY

INOC - January 2014

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE
on
"Oceanography and Sustainable Marine Production: A Challenge of Managing Marine Resources under Climate Change(ICOSMaP – 2013, **Kuantan - Malaysia, 28-30 October 2013**

For Bibliographic purposes, this document should be cited as follows: CHOUIKHI A., (eds). Proceedings of ICOSMaP – 2013.

ISBN 978- 975-7895-8-13

Cover arranged by Dr. Baris AKÇALI

Inter Islamic Science & Technology Network on Oceanography,
Baku Bulvari no: 100, Inciralti- 35340 Izmir –TURKEY
Tel: + 90 232 279 15 22; Fax: + 90 232 278 50 82 ;
E-mail: a.chouikhi@deu.edu.tr
Http://www.inoctr.org

Institute of Oceanography & Maritime Studies
International Islamic University Malaysia
Kg. Cherok Paloh, 26160 Kuantan, Pahang,MALAYSİA.
E-mail: mustafiz@iium.edu.my
Http://www.iium.edu.my

Disclaimer

Authors are responsible for the choice and the presentation of the facts contained in signed articles and for the opinions expressed therein, which are not necessarily those of INOC and do not commit the Network.
The designations employed and the presentation of material throughout this publication do not imply the expression of any opinion whatsoever on the part of INOC concerning the legal status of any country, territory, city or area or of its authorities or concerning the delimitation of its frontiers or boundaries.

Growth, condition factor and gonadosomatic index of Asian Seabass (*Lates calcarifer*) in the coastal water of Pahang

Mohammad Mustafizur Rahman[1,2*], Amira Farzana Binti Samat[1] & Kamaruzzaman Yunus[1,2]

[1]Department of Biotechnology, Kulliyyah of Science, International Islamic University Malaysia (IIUM), Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, 25200 Kuantan, Pahang, Malaysia

[2]Institue of Oceanography and Maritime Studies, IIUM, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, 25200 Kuantan, Pahang, Malaysia

E-mail: mustafiz@iium.edu.my

Abstract

Asian seabass (Lates calcarifer) is a very important target fish for fisherman because it enjoys very high consumer preference and market price. Presently, the total capture production of this fish is decreasing rapidly in Malaysia due to decreasing wild stock. However, necessary information about Asian seabass population in Pahang coastal water is lacking for the proper management of this fish. Therefore, a study was conducted to understand some basic characteristics (growth, condition factor and spawning) of Asian seabass population in Pahang coastal water. Fish samples were collected from different region of Pahang for a period of one year. The growth coefficient was calculated by regression analysis using the logarithmic transformed equation logW = loga + b.logL derived from $W = a.L^b$ (where, W = body weight; L = total length). The condition factor (K) was calculated for each individual fish according to the formula $K = (W/L^3) \times 100$. The gonadosomatic index (GSI) was calculated using the formula, GSI (%) = (GW/W) × 100 (where, GW = gonad weight). The results showed that the growth coefficient varied from 1.6034 (end of July) and 3.4264 (November). Negative allometric growth was observed in Asian seabass in all samplings except in November and in the middle of July. An isometric growth of Asian seabass was observed in the middle of July ($W = 0.0139L^{2.9962}$, $R^2 = 0.9979$, $P<0.01$) and a positive allometric growth was observed in November ($W = 0.002L^{3.4264}$, $R^2 = 0.9974$, $P<0.05$). The condition factor of Asian seabass ranged from 1.195 to 1.505. The significantly lowest mean condition factor was found in the November and the highest was observed in the August. Overall high value of condition factor was observed in smaller fish (less than 46 cm total length) while low value of condition factor was observed in medium size fish (56-70 cm total length). The lowest gonadosomatic index of Asian seabass was observed in October and November. Overall gonadosomatic index of Asian seabass was higher from May to August with a very few exception. Based on this study, the spawning season of Asian seabass in Pahang coastal water might be from May to August but more research is needed to confirm this. The information of this study would be used for both applied and basic use for the management of wild Asian seabass stock in the coastal water of Pahang.

Keywords: *Lates calcarifer*, Growth, Condition Factor, Gonadosomatic Index, Malaysia

1. Introduction

Asian seabass (*Lates calcarifer*) is very popular fish in many countries including Malaysia, where it is locally called Siakap Putih. It is an economically important food fish especially in the Pahang region. This fish is a catadromous but widely distributed in the tropical Indo-Pacific region. They usually inhabit coastal, estuarine and freshwater areas from Arabian Gulf through Southeast Asia to

Northern Australia. Seabass is a euryhaline (Lim et al., 1986), protandric hermaphrodite (Grey, 1987) with an opportunistic feeding character. They eat anything that lives in or around water including insects, spiders, prawns and fish (Davis, 1986).

In Malaysia, the total production of Asian seabass in 2004 was 5.7 thousand MT while in 2009 it was nearly 16 thousand MT (FAO, 2011). However, total production of Asian seabass from capture fisheries is decreasing rapidly in Malaysia due to decreasing wild stock. Therefore, study and management of wild seabass stock in Malaysian water is necessary. Many studies have been done on the development of seabass aquaculture in Malaysia but the study on the wild seabass population in the Malaysian water is lacking. Adequate information about population parameters is prerequisite for the management of any wild fish stock (Rahman and Hafzath, 2012; Gopalakrishnan et al., 2014). Therefore, this research was conducted to quantify some population parameters namely growth pattern, condition factor, and gonadosomatic index of Asian seabass in the coastal water of Pahang. The temporal variation of water temperature and food composition are different in different geographic location, which significantly affect growth, condition factor, survival, sexual maturity of Asian seabass (Rahman et al., 2008; Rahman and Verdegem, 2010). The objectives of the study were to know the temporal variation of (i) growth pattern, (ii) condition factor, and (iii) gonadosomatic index of Asian bass in the coastal water of Pahang.

2. Methodology:

Asian seabass (*Lates calcarifer*)) samples were collected from fishermen from different places of Pahang region for a period of twelve months. Capture methods, area and time of capture were collected from fisherman. After collection, they were immediately preserved with ice in an ice box and transported to the laboratory. In the laboratory, length was measured to the nearest centimeter. Gonad was collected carefully by dissecting the abdominal part of the fish. Body weight (W) and gonad weight (GW) were done with a digital balance to the nearest gram. Growth status was estimated from the length-weight relationship using the conventional formula $BW = a.L^b$, where coefficient a is the intercept in the y-axis, and the regression coefficient b is an exponent indicating isometric growth when close to 3. The statistical significance level of coefficient of determination was estimated ($P<0.05$) and the parameters a & b were estimated by linear regression on the transformed equation, $\log W = \log a + b.\log L$. The status of growth was estimated based on one-sample t-test ($P<0.05$): $t_s = (b-3)/S_b$, where t_s is the t-test value, b the slope and S_b the standard error of the slope (b). The comparison between obtained t_s values and the respective tabled critical values allowed for the determination of the b values statistically significant, and their inclusion in the isometric range ($b = 3$) or allometric range (negative allometric; $b < 3$ or positive allometric; $b > 3$). The Fulton's condition factor was calculated for each individual fish according to the formula $K = (W/L^3) \times 100$, where K is condition factor, W is the body weight and L is total length of fish. The gonadosomatic index was calculated using the formula, $GSI (\%) = (GW/W) \times 100$, where GSI is the gonadosomatic index and GW is the gonad weight of fish. Spawning season was determined by plotting monthly mean GSI values (Y axis) along the X axis (month).

3. Results

Sampling-wise growth pattern of Asian seabass is presented in Table 1. The growth coefficients (b value) vary from 1.6034 (end of July) and 3.4264 (November). Length-weight relationships of each sampling month was significant (*$P<0.05$*). Negative allometric growth (b value significantly less than 3) was observed in Asian seabass in all samplings (1st sampling (October): $W = 0.029L^{2.7828}$; 3rd (May): $W = 0.0484L^{2.6614}$; 4th (June): $W = 0.4626L^{2.0113}$; 5th (early July): $W = 0.1577L^{2.9657}$; 7th (late July): $W = 2.0417L^{1.6036}$; 8th

Table 1: Descriptive statistics and estimated regression parameters (length-weight relationship) of Asian seabass in the coastal water of Pahang.

Sampling	Regression parameters		R^2	Significance (p value)	Growth
	a	b			
1st	0.0290	2.7828	0.9250	*	A-
2nd	0.0020	3.4264	0.9974	*	A+
3rd	0.0484	2.6614	0.8632	**	A-
4th	0.4626	2.0113	0.5603	**	A-
5th	0.1577	2.9657	0.8066	**	A-
6th	0.0139	2.9962	0.9979	**	I
7th	2.0417	1.6036	0.4938	**	A-
8th	0.3255	2.1570	0.5620	**	A-
Overall	0.3187	2.7759	0.9702	**	A-

ns, not significant; *, P<0.05; **, P<0.01; a, intercept; b, slope ; R^2, coefficient of determination; A-, negative allometric growth; I, isometric growth; A+, positive allometric growth.

(August): $W = 0.3255L^{2.1570}$) except 2nd (November) and 6th (middle of July) samplings. A positive allometric growth of Asian seabass was observed in the 2nd sampling (November) ($W = 0.002L^{3.4264}$). An isometric growth of Asian seabass was observed in the 6th (middle of July) sampling ($W = 0.0139L^{2.9962}$). The condition factor (K) of Asian seabass ranged from 1.195 (November) to 1.505 (August) (Fig. 1-A). Condition factor of Asian seabass was significantly different between samplings ($P < 0.05$). The mean condition factor of 3rd to 8th samplings (May to August) were significantly higher than 1st and 2nd samplings (October and November). The mean condition factors was statistically same from 3rd to 8th samplings (May to August). Similarly, there was no significant difference between the condition factors of October and November. Overall higher condition factor was observed in smaller fish (less than 46 cm total length) while lower condition factor was observed in medium size fish (56-70 cm of total length) (Fig. 1-B). Changes of mean gonadosomatic index (GSI) of Asian seabass in different samplings are presented in Fig. 2. The lowest GSI of Asian seabass was observed in 1st (October) and 2nd (November) samplings. Overall GSI of Asian seabass was higher from May to August except in June. However, highest GSI of Asian seabass was observed in May. A significant positive relationship ($r = 0.81$, $P<0.05$) was observed between GSI and condition factor of Asian seabass

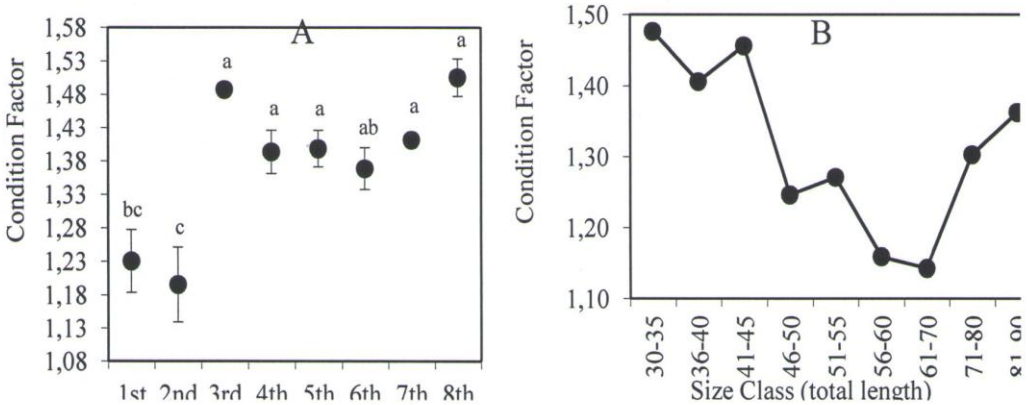

Figure 1: Mean condition factor (± standard error) of Asian seabass in different samplings (A) and different size class (B). Mean with no letter in common differ significantly (P<0.05).

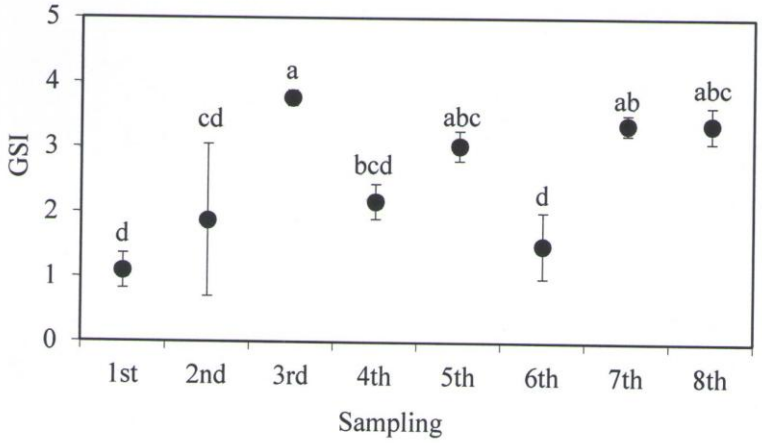

Figure 2: Mean gonadosomatic index (GSI) (± standard error) of Asian seabass in different samplings. Mean with no letter in common differ significantly ($P<0.05$).

4. Discussion

In this study, the growth coefficient (b-value) of the Asian seabass at the end of July was very low compared to other month. The factors that influenced the growth of Asian seabass at the end of July are unknown. However, this might be influenced by environmental or habitat factors (Rahman and Verdegem, 2007; Rahman et al., 2009; Khatune-Jannat et al., 2012). Therefore, more research is needed including analyzing environmental or habitat factors to understand the cause of low growth coefficient at the end July in the Pahang coastal water. Overall condition factor varied from 1.195 to 1.505 that represented a fair and acceptable condition of Asian Seabass in the coastal water of Pahang (Charles and Alan, 2003). Overall, gonadosomatic index and condition factor of Asian seabass were high from May to August with a few exception. Based on this study, the spawning season of Asian seabass in Pahang coastal water might be from May to August. However, this observation concurs a literature indicating the spawning season of Asian seabass is between September and March. However, the spawning season of Asian seabass in Pahang coastal water may fall within the period between September and March but more investigation is needed to confirm this. The results of this study would be used for the management of wild Asian seabass stock in the coastal water of Pahang.

5. References

[1] Charles, B.P.S.M., Alan, B. (2003). Condition factor, K, for Salmonid fish. Department of Primary Industries, State of Victoria, Australia.

[2] David Kingston, S., Manikandavelu, D. (1996). Potential fish species for aquaculture diversification and their culture prospects. *Seafood Export Journal*, 4:11-16.

[3] FAO (2011). Fishstat plus. Rome, Italy.

[4] Gopalakrishnan, A., Rajkumar, M., Rahman, M.M., Sun, J,. Antony, P.J., Venmathi maran, B.A., Trilles, J.P. (2013). Length–weight relationship and condition factor of wild, grow-out and 'loose-shell affected' giant tiger shrimp, *Penaeus monodon* (Fabricius, 1798) (Decapoda: Penaeidae). *Journal of Applied Ichthyology* (in press), doi: 10.1111/jai.12269.

[5] Grey, D.L. (1987). An overview of *Lates calcarifer* in Australia and Asia. In: Management of wild and cultured seabass Barramundi (*Lates calcarifer*) (ed. J.W. Copland and D.L. Grey), pp. 15-21. Proceedings of an international workshop Darwin, 24-30 September, 1986.

[6] Khatune-Jannat, M., Rahman, M.M., Bashar, M.A. Hasan, M.D., Ahamed, F., Hossain, M.Y. (2012). Effects of Stocking Density on Survival, Growth and Production of Thai Climbing Perch (*Anabas testudineus*) under Fed Ponds. *Sains Malaysiana,* 41, 1205-1210.

[7] Lim, L.C., Heng, H.H., Lee, H.B. (1986). The induced breeding of seabass, *Lates calcarifer* (Bloch) in Singa-pore. Singapore *Journal of Primary Industries*, 14:81-95.

[8] Rahman, M.M., Hafzath, A. (2012). Condition, Length-Weight Relationship, Sex Ratio and Gonadosomatic Index of Indian Mackerel (*Rastrelliger Kanagurta*) captured from Kuantan Coastal Water. *Journal of Biological Science,* 12: 426-432.

[9] Rahman, M.M., Hossain, M.Y., Jo, Q., Kim, S.K., Ohtomi, J., Meyer, C.G. (2009). Ontogenetic shift in dietary preference and low dietary overlap in rohu (*Labeo rohita* Hamilton) and common carp (*Cyprinus carpio* L.) in semi-intensive polyculture ponds. *Ichthyological Research,* 56, 28–36.

[10] Rahman, M.M., Verdegem, M., Nagelkerke, L., Wahab, M.A., Milstein, A., Verreth, J. (2008). Effects of common carp *Cyprinus carpio* (L.) and feed addition in rohu *Labeo rohita* (Hamilton) ponds on nutrient partitioning among fish, plankton and benthos. *Aquaculture Research,* 39, 85–95.

[11] Rahman, M.M., Verdegem, M.C.J. (2010). Effects of intra- and interspecific competition on diet, growth and behaviour of *Labeo calbasu* (Hamilton) and *Cirrhinus cirrhosus* (Bloch). *Applied Animal Behaviour Science,* 128: 103-108.

[12] Rahman, M.M., Verdegem, M.C.J. (2007). Multi-species fishpond and nutrients balance. In: ven der Zijpp A.J., Verreth, A.J.A., Tri, L.Q., ven Mensvoort, M.E.F., Bosma, R.H., Beveridge, M.C.M. (eds.). *Fishponds in farming systems.* Wageningen Academic Publishers, Netherlands. pp. 79–88.