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Preliminary Study on the Feeding Schedule of Laboratory Reared of Bonylip barb Larva, *Osteochilus vittatus* Cyprinidae

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Abstract

A preliminary study was conducted on the feeding schedule of laboratory reared larvae of *O. vittatus*. The feeding schedule consisted (1) *Artemia nauplii* from 10 to 15 days, *Moina* sp from 15 to 20 days, *Tubifex* worms from 20 to 40 days, (2) *Artemia nauplii* from 10 to 20 days, *Moina* sp from 20 to 25 days, *Tubifex* worms from 25 to 40 days, (3) *Artemia nauplii* from 10 to 25 days, *Moina* sp from 25 to 30 days, *Tubifex* worms from 30 to 40 days, (4) *Artemia nauplii* from 10 to 30 days, *Moina* sp from 30 to 35 days, *Tubifex* worms from 35 to 40 days. The feeding schedules were significant differences on growth performance of *O.vittatus* larvae and the were no significant differences on survival rate. The results indicated that feeding schedule *Artemia nauplii* from 10 to 15 days, *Moina* sp from 15 to 20 days, *Tubifex* worms from 20 to 40 days showed better growth performance in terms of the parameters measured.

Keywords: Feeding schedules; Live diets; Growth; Survival; *Osteochilus vittatus*; Larvae

Introduction

Bonylip barb fish (*O. vittatus,* Cyprinidae) is a freshwater fishery commodities native to Indonesia [1,2]. This species live in Singkarak Lake, Maninjau Lake and Koto Panjang Reservoir West Sumatra Province [3-5], have a strategic value that is (a) as a source of food non cholesterol for rural cummunity and urban [6], (b) as a source of income for rural community around the area Maninjau Lake [3], Singkarak Lake [7], Arang-Arang Lake [8], Koto Panjang Reservoir [9] and Kampar Kanan River [10], (c) has been successfully used as a biological agent to reduce the blooming of phytoplankton in Maninjau Lake [6], (d) can be applied to restocking and introduction to waters lakes and reservoirs that is experiencing blooming phytoplakton fish farming activities due to floating net cages.

The problems now is (a) there has been a rare of *O. vittatus* in Maninjau Lake [11,12], Singkarak Lake [13,3], Arang-Arang Lake [8], Koto Panjang Reservoir [9], Kampar Kanan River [10], (b) blocking of migration routes, sedimentation of spawning ground in Maninjau Lake [3,14], loss of habitat, spawning and food supply due to fluctuating water level in Singkarak Lake [15], changes in running water into stagnant in the Kampar River for Hydroelectric power plant Koto Panjang [16]. In Kampar Kanan river a major threat to biodiversity of fish, among others damming rivers and sand mining in river water bodies [10], (c) uncontrolled introduction of exotic fishes among others *Oreochromis niloticus*, *Oxyeleotris marmorata, Channa lucius* so that elimination of native species [5].

In order for Bonylip barb (*O.vittatus*) is not endangered from their native habitat, is very important to do aquaculture. The fish aquaculture activities can be started from the process of domestication [17]. A database for domestication of *O.vittatus* are already available, among others morphological characterization [3], genetic variation [4], growth model [18], food habits [19] and aspects of reproduction [5]. Domestication can be started from the larva rearing, fingerling and broodstock. In the larval rearing, live diets is one of the factors that affect the growth and survival [20-23].

Live diets suitable for fish larvae that have full nutrient value, easily digested, and in accordance with the mouth opening, moving its active so that the larvae are stimulated to eat [24,25]. *Artemia nauplii*, *Moina* sp, Dhapnia sp, Tubifek worms, Copepods, Rotifer successful in increasing the growth and survival of several species of fish larvae, among others *Chitala Chitala* larvae [20], *Oncorhynchus mykiss* larvae [26], *Clarias gariepinus* larvae [27,28], *Rachycentron canadum larvae* [29]. *Osphronemous gourami* larvae [30]. The present study focuses mainly on the feeding schedule of live diets on the growth performance and survival of *O. vittatus* larvae.

Materials and Methods

Broodstock

Adult female and male of *O. vittatus* were obtained from a Kampar Kanan River, Kampar Regency Riau Province and have been kept for >1.5 years in concrete tank size 4 × 2 × 0.7 m, the volume of water 5,600 liters. The average weight of broodstock is 250 ± 25 g/individuals with the stocking density 100 individuals/concrete tank [31]. The concrete tank water comes from ground water to debit 0.2 m^3/second, concrete tank water temperature ranged from 26 to 28°C. Feeding was done twice daily and fish were fed a predetermined ration of 5% body weight/day. During the adaptation of fish fed with commercial (pellets) with proximate composition are water content (% dry weight) 12.0%, crude protein 28.0%, lipid 5.5%, crude fiber 6.2% and crude ash 13.0%. The spawning *O.vittatus* conducted with GnRHa stimulation with dopamine antagonist at a dose of 0.5 ml/kg body weight and conducted artificial spawning. Hatching eggs carried on fiber tubs (200 cm × 80 cm × 40 cm), height of water in the fiber tubs is 20 cm, and water temperature during embryonic development ranged from 28 to 29°C, pH 6.8 to 7 and dissolved oxygen 5.6 to 6.8 mg /L [32].

First feeding of larvae started 5 to10 days post-hatching with

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commercial starter food (Equchi BP) with proximate composition are water content (% dry weight) 4%, crude protein 42%, lipid 14%, and crude ash 7%. This feed in the form of powder and water soluble media and the maintenance needed by larva *O. vittatus*, because larval *O. vittatus* cannot consume *Artemia nauplii*. As the treatment is the gave a schedule the different types of live diets on the growth and survival of fish larvae *O. vittatus* aged 10 to 40 days.

Larva rearing

After 9 days, the larvae hatched, the larvae were taken from the moving plates and were put to the 12 unit aquarium. Size of each aquarium is 40 cm × 20 cm × 20 cm. The water level was about 15 cm depth (water volume of tank, 8 L) and 1n2 hours after, it was recorded that the some larvae began to swim actively. Initial densities of larvae were 15 larvae/L. *Artemia nauplii* and *Moina* sp was offered at the initial amount of 500 individuals/larvae, increasing in equal quantities each five days [33]. Whereas *Tubifex* worms are given 100% (wet weight) of biomass weight/day. Table 1 suggests the proximate value of natural feed of *Artemia nauplii*, *Moina* sp and Tubifek worms. The research consisted of four treatments and three replications with schedule gives natural feed is as follows:

- schedule 1	=	*Artemia nauplii* from 10 to 15 days, *Moina* sp from 15 to 20 days, *Tubifex* worms from 20 to 40 days.
- schedule 2	=	*Artemia nauplii* from 10 to 20 days, *Moina* sp from 20 to 25 days, *Tubifex* worms from 25 to 40 days.
- schedule 3	=	*Artemia nauplii* from 10 to 25 days, *Moina* sp from 25 to 30 days, *Tubifex* worms from 30 to 40 days.
- schedule 4	=	*Artemia nauplii* from 10 to 30 days, *Moina* sp from 30 to 35 days, *Tubifex* worms from 35 to 40 days.

The physico-chemical condition of water including water temperature, pH, dissolved oxygen (DO), total dissolved solids (TDS), were measured early in the morning prior to feeding at a depth of 5 cm by using a multiparameter water analysis instrument. Total alkalinity and total hardness were determined by the sulphuric acid titration method as per APHA [34]. Ammonia and nitrite concentrations were determined at the same time using spectrophotometer kits. Dead larvae were removed and counted twice a day, simultaneously to water changes, to estimate the percentage of survival rate per 24 h. On the last day of the experiment, all the remaining larvae were individually counted for the calculation of actual survival rate.

Indices of growth

Growth parameters were determined using both length and weight.

Growth absolute weight (mg)	=	(final weight (mg)-initial weight (mg) [35]
Growth absolute length (mm)	=	(final length (mm)-initial length (mm) [35]
Growth rate (mg/day)	=	(final weight (mg)-initial weight (mg)/ time (days) [22]
Growth rate (mm/day)	=	(final length (mm)-initial length (mm)/ time (days) [22]
Specific growth rate (%/day)	=	ln(final weight (mg)-ln(initial weight (mg) × 100/time (days) [28].
Specific growth rate (%/day)	=	ln(final length(mm)-ln(initial length (mm) × 100/time (days) [28].
Survival (%)	=	100 × no. of survivors/no. of initial fish.

Feeds	Protein (%)	Lipid (%)	Ash (%)	Crude fiber (%)	Water Content (%)
Artemia [31]	52.2	18.9	9.7	2.04	81
Moina sp [32]	37.38	13.29	11	11	90.60
Tubifex worms [33]	51.9	22.3	5.3	2.04	87.7

Table 1: Proximate analysis of *Artemia* nauplii, *Moina* sp and *Tubifex* worms.

Statistical analysis

Data were analysed using one way analysis of variance [36] and differences in means were compared using Least Significance Difference at P=0.05. Analysis was done using a statistical software programme (SPSS version 13).

Results

Table 2 shows the results of the different feeding schedule natural feed on the growth of absolute weight, final weight, growth rate and specific growth rate (body weight). The feeding schedule had a significant effect on growth performance ($p<0.05$). The highest values obtained in fish fed with schedule *Artemia nauplii* from 11 to 15 days, *Moina* sp from 15 to 20 days, *Tubifex* worms from 20 to 40 days, While the least values were found in fish fed with schedule *Artemia nauplii* from 11 to 30 days, *Moina* sp from 30 to 35 days, *Tubifex* worms from 35 to 40 days. The result of final length, growth of absolute length, growth rate (length) and specific growth rate (length) is shown in Table 3. A similar trend found for weight measurements was also observed for length measurements. Mortalities occurred in all the treatment aquarium (Tables 2 and 3), survival ranged from 90.00% to 96.67% ($p>0.05$).

Discussion

The results of this study stated that the growth of the weight and length is best *O. vittatus* larvae with *Artemia nauplii* feeding for five days, *Moina* sp for five days and live *Tubifex* worms for 20 days. Researchers have reported success larval rearing fish fed with zooplankton [31]. The zooplankton species include the genus *Moina* sp (Cladocereans) success for feed *Chanos chanos* larvae [37] and *Clarias macrocephalus* larvae [38]. Furthermore, larval rearing European catfish (*Silurus glanis*) success with live *Tubifex* worms [39]. *Artemia nauplii* have also been reported as a good starter diet for freshwater and marine fish [40-44], because of its balanced nutritional composition [29]. An advantage of *Artemia nauplii* is that they can be kept for considerable periods of time. *Moina* sp have also been reported stater diet for fish larva [45,46], Tubifek worms can also be used as an initial feeding fish larvae [30,47]. According to [21] that larval rearing depends on the availability of appropriate sized and nutritionally adequate food for the larvae.

Various researchers have used live feeds for fish larval nutrition with success. These include the use of *Artemia nauplii*, [48,29], Rotifers [49,29], Cladocerans [50], and wild Zooplankton [51]. Fish larvae are attracted to live food by their movement, and the success of the use of live foods depend on a number of factors which include the nutritional composition of the live foods as well as the size of the live foods in relation to the mouth gape of the fish larvae. Small fish larvae tend to prefer prey of small size [28].

The longer the *Tubifex* worms given to the larvae *O.vittatus*, the higher the growth rate, feeding Tubifek worms during the 20-days average growth rate was 0.29 ± 0,03 mg/day, for 15 days was 0.14 ± 0.02 mg/day, for 10 days was 0.11 ± 0.02 mg/day) and for 5 days was 0.06 ± 0.04 mg/day. *Chitala chitala* larvae fed live Tubifek worms during the 28-days average growth rate was 2.40 ± 0.72 g /day, followed by larvae fed fish eggs was 2.15 ± 0.71 g/day, dried *Tubifex* worms was 2.12 ± 0.40 g/day, larvae Chironomous was 1.91 ± 0.44 g/day, Spirulina was 1.79

Parameter	Schedule 1	Schedule 2	Schedule 3	Schedule 4
Initial weight (mg)	1.6 ± 0	1.6 ± 0	1.6 ± 0	1.6 ± 0
Final weight (mg)	10.42 ± 1.62[a]	5.94 ± 0.507[b]	4.85 ± 0.67[c]	3.25 ± 0.67[d]
Growth of absolute weight (mg)	8.82 ± 1,61[a]	4.34 ± 0.51[b]	3.25 ± 0.67[b]	0.49 ± 0.15[c]
Growth rate (mg/day)	0.29 ± 0,03[a]	0.14 ± 0.02[b]	0.11 ± 0.02[b]	0.06 ± 0.04[c]
Specific growth rate (%/day)	6.24 ± 0,33[a]	4.37 ± 0.18[b]	3.69 ± 0.31[c]	2.36 ± 0.18[d]
Survival (%)	96.67 ± 4,33[a]	93.05 ± 6.14[a]	90.00 ± 9.01[a]	96.11 ± 3.76[a]

Table 2: Growth of weight and survival (means ± S.E) of *O. vittatus* larvae reared with different feeding schedules.

Parameter	Schedule1	Schedule2	Schedule3	Schedule4
Initial length (mm)	5 ± 0	5 ± 0	5 ± 0	5 ± 0
Final lenght (mm)	20.13 ± 1.00[a]	16.93 ± 0.54[b]	13.71 ± 0.37[c]	11.35 ± 0.24[d]
Growth absolute lenght (mm)	15.13 ± 1.00[a]	11.93 ± 0.54[b]	8.71 ± 0.37[c]	6.35 ± 0.24[d]
Growth rate (mm/day)	0.50 ± 0.03[a]	0.40 ± 0.01[b]	0.29 ± 0.01[c]	0.21 ± 0.06[d]
Specific growth rate (%/day)	4.64 ± 0.11[a]	4.06 ± 0.08[b]	3.36 ± 0.05[c]	2.73 ± 0.06[d]
Survival (%)	96.67 ± 4.33[a]	93.05 ± 6.14[a]	90,00 ± 9.01[a]	96.11 ± 3.76[a]

Table 3: Growth of lenght and survival (means ± S.E) of *O.vittatus* larvae reared with different feeding schedules.

± 0.38 g/day, Daphnia was 1.42 ± 0.79 g/day and Plankton was 1.37 ± 0.77 g/day [20].

Some researchers have recorded positive results with live *Tubifex* worms especially in freshwater fish larval culture [20,23,30]. *Tubifex* worms are reported to be of better nutritional value with proximate composition are water content (mg/100 mg wet weight) 87.19 ± 0.83, crude protein 57 ± 0.58, lipid 13.3 ± 0.06, ash 3.60 ± 0.16 and higher amino acids was 7.28 mg/100 mg dry weight, i.e lysine, leucine, arginine, valine, threonine, phenylalanine, isoleucine, tyrosine, histidine, and methionine, but it also contains the total fatty acid content was 7.28 mg/100 mg dry weight [51,52].

All the water parameters were under the tolerance limit of fish and they did not exhibit any distress during the experiment. Dissolved oxygen (DO) is the key factor in rearing of larvae because larvae need optimum level of oxygen for maintaining their physiological condition [20]. In the present study, mean dissolved oxygen level in the recirculatory fish aquarium was 8.6 ± 0.21 mg/L at 10.00 h. The water pH was 7.8 ± 0.5 during rearing period, a higher level whereas mean free CO_2 was 0.50 ± 0.04 mg/L. In the daytime, fish consumed more oxygen while their carbon dioxide excretion reduced the pH range.

Temperature plays an important role in larval rearing. An average water temperatures ranged from 27 to 29°C respectively. The results of the mean values of other water quality parameters in the recirculatory systems were as follows; alkalinity 33.51 ± 0.15 mg/L, hardness 110.86 ± 6.40 mg/L, total dissolved solids 152.22 ± 2.34 mg/L. Ammonia and nitrite concentration were on the lower side and ranged between 0.005 to 0.007 mg/L, and 0.03 to 0.06 mg/L respectively.

It is concluded that provide *Artemia nauplii*, *Moina* sp, *Tubifex* worms with different schedules for 30 days significantly affected the growth of *O. vittatus* larvae.

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References

1. Weber M, de Beaufort LF (1916) The fishes of the Indo-Australian Archipelago III Ostariophysi II Cyprinoidea Apodes Synbranchii Brill Ltd Leiden, p. 455.
2. Kottelat M, Whitten AJ, Kartikasari SN, Wirjoatmodjo S (1993) Freshwater Fishes of Western Indonesia and Sulawesi. Periplus Edition (HK), Jakarta pp. 247-261.
3. Syandri H, Azrita, Junaidi (2014a) Morphological characterization of asang fish (Osteochilus vittatus CYPRINIDAE) in Singkarak Lake Antokan River and Koto Panjang Reservoir West Sumatra Province Indonesia. Journal of Fisheries and Aquaculture 1: 158-162.
4. Azrita, Syandri H, Junaidi (2014) Genetic variation among asang fish (Osteochilus vittatus) populations using random amplified polymorphic DNA (RAPD) markers. International Journal of Fisheries and Aquatic Studies 1: 213-217.
5. Syandri H, Azrita, Junaidi (2015) Fecundity of Bonylip barb (Osteochilus vittatus) Cyprinidae in different waters habitats. International Journal of Fisheries and Aquatic Studies 2: 157-163.
6. Syandri H (2004) The use of Osteochilus vittatus and Puntius javanicus as an of biological agent in Maninjau. Lake Journal of Natur Indonesia 6: 87-91.
7. Syandri H, Junaidi, Azrita (2011) Management of resources bilih fish (Mystacoleucus padangensis) based on local wisdom in Singkarak Lake. Journal of Indonesia Fisheries Policy 3: 11-18.
8. Samuel, Adjie S, Nasution Z (2002) Environmental and biological aspects of fish in Arang-Arang Lake Jambi Province. Journal of Research and Fisheries Indonesia 1: 1-13.
9. Warsa A, Nastiti AS, Krismono, Nurfiarini A (2009) Fisheries Resources in Koto Panjang Reservoir Bawal 2: 93-97.
10. Aryani N (2015) Native species in Kampar Kanan River Riau Province Indonesia. International Journal of Fisheries and Aquatic Studies 2: 213-217.
11. Syandri H (2003) Cages culture and problems in Maninjau Lake West Sumatra Province. Journal of Fisheries and Maritime Affairs 8: 74-81.
12. Sulastri, Hartoto DI, Yuniarti I, (2012) Environmental condition fish resources and management of Maninjau Lake of West Sumatera. Journal of Indonesian Fisheries Research 1: 1-12.
13. Uslichah, Syandri H (2003) Reproduction aspects of sasau (Hampala sp.) and lelan (Osteochilus vittatus) in Singkarak Lake. Journal of Ichtiology Indonesia 1: 41-48.
14. Junaidi, Syandri H, Azrita (2014) Loading and distribution of organic materials in Maninjau Lake West Sumatera Province Indonesia. Journal Aquactic Research Development 7: 1-4.
15. Syandri H, Azrita, Aryani N (2013) Size distribution reproduction and spawning habitat of bilih fish (Mystacoleucus padangensis) in Singkarak Lake Bawal 5: 1-8.
16. Krismono ASN, Nurfiarini A, Kartamihardja ES, Sunarno MS (2009) Conformity assessment of prospective reserves fisheries in Koto Panjang Reservoir Bawal 2: 193-202.
17. Azrita, Basri Y, Syandri H (2015) EA Preliminary study on domestication of bluespotted Snakehead (Channa lucius, Channidae) in concrete tank. J Aquac Res Development 6: 1-5.

18. Syandri H, Azrita, Junaidi (2014 b) Biological parameters of Bonylip barb Osteochilus vittatus Cyprinidae Proceedings of the National Seminar on Incentive Research SINas Ministry for Research and Technology Republic of Indonesia.

19. Syandri H, Azrita, Junaidi (2014 c) Food habits of Bonylip barb (Osteochilus vittatus Cyprinidae) Proceedings of the Annual National Seminar XI Fisheries and Marine Research. Department of Fisheries - Faculty of Agriculture University of Gajahmada.

20. Sarkar UK, Lakra WS, Deepak PK, Negi RS, Paul SK, Srivastava A (2006) Performance of different types of diets on experimental larval rearing of endangered Chitala chitala (Hamilton) in recirculatory system. Aquaculture 261: 141-150.21. JagadisI, IgnatiusB, Kandasami D, Khan MDA (2011) Larval rearing trials of the honeycomb grouper Epinephelus merra Bloch under laboratory conditions. Indian J Fish 58: 33-37.

21. Le Y, Yun YS, Ming ZX, Min Liu, Yi LJ, Chang WK (2011) Effect of temperature on survival development growth and feeding of larvae of Yellowtail clownfish Amphiprion clarkia (Pisces: Perciformes). Acta Ecologica Sinica 31: 241-245.

22. Aggraeni NM, Abdulgani M (2013) The effect of natural food and artificial feed for fish growth of Oxyeleotris marmorata larvae in laboratory conditions Journal of Sains and Seni Pomits 1: 197-201.

23. Chumaidi, Suprapto (1986) Population Tubifex sp in the media mix chicken faeces and mud pond Bulletin of Inland Fisheries Research 5: 6-11.

24. Roo J, Cruz CMH, Borrero Schuchardt D, Palacios HF (2010) Effect of larval density and feeding sequence on meager (Argyrosomus regius Asso 1801) larval rearing. Aquaculture 302: 82-88.

25. Akbary P, Hosseini SA, Imanpoor M, Sudagar M, Makhdomi NM (2010) Comparison between live food and artificial diet on survival rate, growth and body chemical composition of Onchorynchus mykiss larvae Iranian. Journal of Fisheries Sciences 9: 19-32.

26. Mukai Y, Lim LS (2011) Larval rearing and feeding behavior of African catfish Clarias gariepinus under dark conditions. Journal of Fisheries and Aquatic Science 1-7.

27. Olurin KB, Iwuchukwu PO, Oladapo O (2012) Larval rearing of African catfish (Clarias gariepinus) fed decapsulated Artemia wild copepods or commercial starter diet . African Journal of Food Sience an Technology 3: 182-185.

28. Gopakumar G, Nazar AKB, Tamilmani G, Sakthivel M, Kalidas C, et al. (2012) First experience in the larviculture of cobia (Rachycentron canadum Linnaeus 1752) in India. Indian J Fish 59: 59-63.

29. Indra R, Iriana D, Herawati T (2013) The effect of Tubifex sp Chironomus sp Moina sp , sp Daphnia against growth of Osphoronemus gourami larvae Journal of Fisheries and Marine Resources 3: 283-290.

30. Wattanabe TC, Kitajima S, Fujita (1983) Nutrisional value of live organism used in Japan for mass propagation of fishes review Aquaculture 34: 114-143.

31. Chumaidi, Djajadireja (1982) Moina sp mass culture in the pool by using chicken manure fertilizer Bull Inland Fisheries Research 3: 6-11.

32. Fish Nutrition Laboratory of Freshwater Fisheries Research Institute (2000) Proximate analysis tubifek worms levels for fish larvae feed Freshwater Fisheries Research Institute Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia.

33. APHA American Water Works Association and Water Pollution Control Federation (1989) Standard Methods for the Examination of Water and Wastewater (17thedn.) APHA, New York, USA.

34. Effendie MI (1978) Fisheries Biology Faculty of Fisheries. Bogor Agricultural University, p. 102.

35. Steel GD, Torrie JH (1981) Principles and Procedures of Statistics (2ndedn.) McGraw-Hill Book Company Inc., NY, pp. xxi-633.

36. Villegas CT (1990) The effects on growth and survival of feeding water fleas (Moina macrocopa) and Rotifer (Branchionus plicatilis) to milk fish (Chanos chanos Forskal) fry. Bamidgeh 42: 10-17.

37. Fermin AC, dan Boliver MEC (1991) Larval rearing of the Philippine freshwater catfish Clarias macrocephalus (Ghunter) fed live zooplankton and artificial diet a preliminary study. Bemidgeh 43: 87-94.

38. Ronyai A, Ruttkay A (1990) Growth and food utilization of Wels fry (Silurus glanis) fed with Tubifex. Aquacult Hung (Szarvas) VI: 193-202

39. Yilmaz E (2005) The effect of two chemo-attractants and different first feeds on the growth performances of African catfish (Clarias gariepinus, Burchell, 1822) at different larval stages. Turk J Vet Anim Sci 29: 309-314

40. Palazzi R, Richard J, Bozzato G, Zanella L (2006) Larval and juvenile rearing of common sole (Solea solea L.) in the Northern Adriatic (Italy). Aquaculture 255: 495-506.

41. Memis D, Ercan E, Celikkale MS, Timur M, Zarkua Z (2009) Growth and survival rate of Russian Sturgeon (Acipenser gueldentaedtii) larvae from fertilized eggs to artificial feeding Turkish Journal of Fisheries And Aquatic Science 9: 47-52.43. Hassan A, Hai TN, Chatterji A, Sukumaran M (2011) Preliminary Study on the feeding regime of Laboratry Reared Mud Crab Larva Scylla serrata (Forsskal 1775).World Applied Sciences Journal 14: 1651-1654.

42. Hung LT, Tam BM, Cacot P, Lazard JE (1999) Larval rearing of the Mekong catfish Pangasius bocourti (Pangasiidae Siluroidei) Substitution of Artemia nauplii with live and artificial feed. Aquatic Living Resources 3: 229-232.

43. Hung LT, Tuan NA, Cacot P, Lazard J (2002) Larval rearing of the Asian Catfish Pangasius bocourti (Siluroide Pangasiidae) Alternative feeds and weaning time. Aquaculture 212: 115-127.

44. Agusnimar, Rosyadi (2013) The influence of a combination of natural and artificial feed to the survival and growth of Kryptopterus lais larvae. Journal of Dinamika Pertanian 3 (XXVIII): 255-264.

45. Sorgeloos P, Dhert P, Candreva P (2001) Use of brine shrimp Artemia spp in marine fish larviculture 200: 147-159.

46. Polo A, Yufera M, Pascual E (1992) Feeding and growth of gilthead seabream (Sparus aurata L.) larvae in relation to size of the rotifer strain used as food Aquaculture 79: 157-161.

47. Adeyemo AA, Oladosu GA, Ayinla AO (1994) Growth and survival of fry of African catfish species Clarias gariepinus Burchell Heterobranchus bidorsalis Geoffrey and Heteroclarias reared on Moina dubia in comparison with other first feed sources Aquaculture 49: 209-221.

48. Naess T, Germain HM, Naas KE (1995) First feeding of Atlantic halibut (Hippoglossus hippoglossus) using different combinations of Artemia and wild zooplankton.Aquaculture 130: 235-250.

49. Subandiah S, Satyani D, Aliyah (2003) Effect of substitusion of live food (Tubifex) with artificial feed (Pellet) to fire Eel (Mastacembelus erythrotaenza) Growt Rate Journal of Ichthyology Indonesia 2: 67-72.

50. Mahmut Y, Yasemen Y, Ayçe GM (2003) Tubifex (Annelidae) in Besin Kompozisyonu Journal of Fisheries and Aquatic Sciences 20: 103-110.