CORPUS PUBLISHERS

Environmental Sciences and Ecology: Current Research (ESECR)

Volume 3 Issue 4, 2022

Article Information

Received date : May 29, 2022

Published date: June 07, 2022

*Corresponding author

Hugo Leandro dos Santos, Federal University of Sergipe, Department of Fisheries Engineering, Brazil

Keywords

Larvae; Tropical Fish; Precocious; Altricial; Anzymes

Mini-Review

Larva Culture for Fish Species

Hugo Leandro dos Santos[1], Amanda Silva Carvalho[2], Juliana Matos Araújo[3], Peterson Emmanuel Guimarães Paixão[4] and Higo Andrade Abe[5]

[1]*Federal University of Sergipe, Department of Fisheries Engineering, Brazil*

[2]*Federal University of Sergipe, Department of Fisheries Zootechnics, Brazil*

[3]*Tiradentes University, Post Graduate Program of Health and Environment, Brazil*

[4]*Federal University of Bahia, Post Graduate Program in Zootechnics, Brazil*

[5]*Federal University of Pará, Post Graduate Program in Animal Science, Brazil*

Mini-Review

After hatching eggs, during the consumption of yolk sac, fish larvae are commonly named as yolk larvae. When beginning the exogenous feeding (commonly with artemia), they are only named larvae. In this moment, despite the active swimming behavior to looking for food, system and internal organs still are forming. After that period (at least 15 days after hatching) labeled "larvaculture" with total development of all external and internal structures (excluding reproductive organs), the fish larvae became a juvenile [1,2]. There are two forms of development to fish larvae: precocious larvae – they pass for a long time of endogenous feeding, ensuring an adequate time to develop internal organs. When they reach juvenile stage, its digestive system has a pattern such as an adult (stomach with gastric glandules and enzymatic activity). For altricial larvae-they have a short yolk sac (during only 2 or 3 days) depending on water temperature. Larvae have a rapid development before total consumption of yolk sac, open mouth and anus, functional swim bladder, eyes and rudimentary digestive system. Due to the inability of some fish larvae to reach metabolic maturity of digestive system, there are two hypotheses to explain its digestive process. At the beginning, scientific academy believed that larvae could use some digestive enzymes from the autolyze of exogenous living feed. However, nowadays, this first hypothesis is not so much accepted because some fish larvae has demonstrated alkaline enzymatic activity, ensuring the digestive process without the factor "autolyze" [3-5]. There are some reports which can corroborates with the statement "larvae do not need of exogenous enzymes to digestive process" such as Clupea harengus [6], Sardinops sagax [7] and Dicentrarchus labrax [8]. According to larvae with three days after hatching have zymogen granules in the pancreatic duct and clearly enzymatic activity (trypsin) [8] also reported elevated activity of the enzyme amylase and trypsin in flounder larvae at the time of mouth opening, and the presence of enzymatic capacity before the first exogenous feeding suggests that these activities were not induced by feeding. The use of living feed still represents a high investment for fish farmer, but profitable if applied in intensive systems of production. Nonetheless, it could be reduced (costs) with the early feeding transition passing the living feed to inert diet. According to Portella and [8], this period (feeding transition) is a critical point for most of fish species affecting growth and survival. Therefore, an adequate feeding during the larval development and transition play an important role because the different nutritional needs for each stage. Vitamins and minerals are an important part of the diet to ensure an adequate cellular metabolism and animal development. These nutrients participate of all important metabolic process (protein, carbohydrate and lipids) and functions of coenzymes, enzymes, hormones, DNA, RNA, NADP and CoA forming [9-11].

These nutrients (vitamins and minerals) can aid in weight gain, specific growth rate, apparently feeding conversion and immunological response, if provided at adequate concentration. When observed an unbalanced diet, not what the proportion (more or less nutrient), can occur problems as bad body formation, immunosuppression and poor growth performance [11-14]. Chose the better living feed depends on the fish species as well as its nutritional needs during the larvaculture. The main factor to be considered is the size (size of a living feed must be lower than mouth size of larvae), ranging from the 0.003 to 1cm. For some small fish larvae at the beginning (mainly small ornamental fish), they need to eat some species of microalgae (Nannochloropsis sp or Tisochrysis sp) [15]. Rotifer and ciliated protists are the second stage regarding about size, still representing an initial feeding during the larvaculture. The next, and most used for all fish larvae reared in captivity is artemia saline, representing the better nutritional feed for marine or freshwater fish species [16-22].

References

1. Santos KSRD (2021) Incubação de ovos e desenvolvimento de larvas vitelinas do peixe-anjo-anão Centropyge aurantonotus em diferentes salinidades.
2. Mejri SC, Tremblay R, Audet C, Wills PS, Riche M (2021) Essential fatty acid requirements in tropical and cold-water marine fish larvae and juveniles. Frontiers in Marine Science 8: 680003.
3. Portella, MC, Dabrowski K (2008) Diets, physiology, biochemistry and digestive tract development of freshwater fish larvae. Feeding and digestive functions of fishes. Enfield: Science Publishers 227-279.
4. Lauff M, Hofer R (1984) Proteolytic enzymes in fish development and the importance of dietary enzymes. Aquaculture 37(4): 335-346.
5. Moyano FJ, Diaz M, Alarcón FJ, Sarasquete MC (1996) Characterization of digestive enzyme activity during larval development of gilthead seabream (Sparus aurata). Fish Physiology and Biochemistry 15(2): 121-130.
6. Pedersen BH, Nilssen EM, Hjelmeland K (1987) Variations in the content of trypsin and trysinogen in larval herring (Clupea harengus) digesting copepod nauplii. Marine Biology 94(2): 171-181.
7. Kurokawa T, Shiraishi M, Suzuki T (1998) Quantification of exogenous protease derived from zooplankton in the intestine of Japanese sardine (Sardinops melanotictus) larvae. Aquaculture 161(1-4): 491-499.
8. Ribeiro L, Zambonino-Infante JL, Cahu C, Dinis MT (1999) Development of digestive enzymes in larvae of Solea senegalensis, Kaup 1858. Aquaculture 179(1-4): 465-473.
9. Woodward B (1994) Dietary vitamin requirements of cultured young fish, with emphasis on quantitative estimates for salmonids. Aquaculture (124): 133-168.
10. Fracalossi DM, Cyrino JEP (2013) Nutriaqua: nutrição e alimentação de espécies de interesse para a aquicultura brasileira.
11. Sakomura NK, Silva JHV, Costa FGP, Fernandes JBK, Hauschild L (2014) Nutrição de Não Ruminantes.

12. Saffari S, Keyvanshokooh S, Zakeri M, Johari SA, Pasha-Zanoosi H, et al. (2018) Effects of dietary organic, inorganic, and nanoparticulate selenium sources on growth, hemato-immunological, and serum biochemical parameters of common carp (Cyprinus carpio). Fish Physiol Biochem.

13. Wang RF, Zhu LM, Zhang J, An XP, Yang YP, et al. (2020) Developmental toxicity of copper in marine medaka (Oryzias melastigma) embryos and larvae. Chemosphere.

14. Ghazi S, Diab AM, Khalafalla, MM, Mohamed RA (2021) Synergistic effects of selenium and zinc oxide nanoparticles on growth performance, hemato-biochemical profile, immune and oxidative stress responses, and intestinal morphometry of nile tilapia (Oreochromis niloticus). Biol Trace Elem Res 200(1):364-374.

15. Mai TD, Lee-Chang KJ, Jameson ID, Hoang T, Cai NBA, et al. (2021) Fatty acid profiles of selected microalgae used as live feeds for shrimp postlarvae in Vietnam. Aquac J 1: 26-38.

16. Pan YJ, Dahms HU, Hwang JS, Souissi S (2022) Recent Trends in Live Feeds for Marine Larviculture: A Mini Review. Frontiers in Marine Science 9.

17. Dabrowski K (1984) The feeding of fish larvae: present «state of the art and perspectives. Reproduction Nutrition Développement 24(6): 807-833.

18. Infante JZ, Cahu CL, Peres A, Quazuguel P, Le Gall MM (1996) Sea bass (Dicentrarchus labrax) larvae fed different Artemia rations: growth, pancreas enzymatic response and development of digestive functions. Aquaculture 139(1-2): 129-138.

19. Lee, KW, Choi, YU (2016) Population growth of a tropical tintinnid, Metacylis tropica on different temperature, salinity and diet. J Korea Acad Ind Coop Soc 17: 322-328.

20. Prabu E, Felix S, Felix N, Ahilan B, Ruby P (2017) An overview on significance of fish nutrition in aquaculture industry. Int J Fish Aquat (5) 349-355.

21. Song ZX, Jiang WD, Liu Y, Wu P, Jiang J, et al. (2017) Dietary zinc deficiency reduced growth performance, intestinal immune and physical barrier functions related to NF-κB, TOR, Nrf2, JNK and MLCK signaling pathway of young grass carp (Ctenopharyngodon idella). Fish Shellfish Immunol 66:497-523.

22. Teles A, Salas Leiva J, Alvarez González CA, Tovar-Ramírez D (2019) Changes in digestive enzyme activities during early ontogeny of Seriola rivoliana. Fish physiology and biochemistry, 45(2): 733-742.