GLOBAL INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

https://global-us.mellbaou.com/

Open Access

Cite this article: Mulyani, S., Budi, S., Cahyono, I., & Khaer, M. F. (2024). Natural Feeding to Increase the Growth of Sangkuriang Catfish Fry (Clarias sp). Global International Journal of Innovative Research, 2(2). https://doi.org/10.59613/global.v2i2.93

Received: January, 2024
Accepted: February, 2024

Keywords:
Natural Feeding, Clarias sp, Daphnia sp, Mosquito Larvae, Tubifex sp

Author for correspondence:
Sri Mulyani
e-mail: sri.mulyani@universitasbosowa.ac.id

Natural Feeding to Increase the Growth of Sangkuriang Catfish Fry (Clarias sp)

Sri Mulyani[1], Sutia Budi[2], Indra Cahyono[3], Muhammad Fathul Khaer[4]

[1,2,4,] Department of Fisheries, Faculty of Agriculture, Bosowa University, Makassar, 90231, South Sulawesi, Indonesia

[3]Balik Diwa Institut of maritime Technologi and Business, Makassar, 90245, South Sulawesi, Indonesia

Feed is a major problem in aquaculture because it requires relatively large costs so that it requires alternative food sources in increasing production. This study aims to analyze the use of natural feed to increase the growth of catfish seedlings Sangkuriang Clarias sp. The study was conducted at the Feed Laboratory of the Department of Fisheries, Bosowa University for 31 days with experimental methods and a Complete Randomized Design. Sangkuriang catfish seeds are 1 month old with an average weight of 1.02 – 1.04 g, raised in a 5-liter jar-shaped container, with a density of 40 heads/jar. Feeding in the form of Daphnia sp, mosquito larvae, and Tubifex sp ad libitum three times every day, namely morning, afternoon, and evening. The results showed that the highest specific growth rate was obtained in Tubifex sp feed seeds by 14.91%, the highest mortality was achieved in Daphnia sp feed seeds at 16.6% and the lowest mortality was achieved at Tubifex sp treatment at 10%. Water quality during maintenance still follows the hatchery requirements of catfish Sangkuriang Clarias sp. Natural feeding Tubifex sp is better to give as natural feed because it provides a better daily growth rate compared to Daphnia sp and Mosquito Larvae.

Published by:

GLOBAL SOCIETY PUBLISHING

1. Introduction

Fishery products that have been cultivated and utilized globally in addition to being cultivated in seawater such as seaweed (Mulyani et al 2021), brackish waters such as shrimp (Kasnir et al 2014; Suwoyo et al 2020) are also cultivated in freshwater waters, for example Sangkurian catfish, Clarias sp (Dauda et al, 2018). Catfish farming around the world shows an increase in production from year to year (Anati et al 2021). The national target is estimated to reach 75 tons of catfish consumption per year. In 2020, the Ministry of Marine Affairs and Fisheries targets catfish production of 1.49 million tons, an increase of 16.8% (Ministry of Marine Affairs and Fisheries, 2020). In Malaysia, catfish can rival the production of red tilapia farmed in marine fresh waters (Dauda et al., 2018). Sangkuriang catfish have the advantage of being able to adapt to poor environments and diseases, can live in a low-oxygen environment, and can effectively convert the feed given (Okomoda et al, 2019).

The high demand of consumers makes catfish farmers do business intensively. Catfish farmers apply monoculture to increase production (Naumowicz, Pajdak, Terech-Majewska, &; Szarek 2017). In Indonesia, Catfish has not been widely cultivated in various regions, so the target of Catfish production in Indonesia has not been met every year (Meitiyani et al 2020; Tiamiyu et al 2018).

Feed is a major problem in aquaculture fisheries, especially catfish farming because it requires relatively large costs so it requires alternative food sources in increasing production. Natural feed Catfish hatcheries include Daphnia sp, Mosquito Larvae, Tubifex sp, Artemia sp (Gogoi et al 2016; Mejia-Mejia et al 2021; Oplinger et al 2011). Good natural feeding conditions have high nutritional value, are easy to cultivate, correspond to the opening of the fish's mouth, and do not contain toxins (Holy & Sari, 2020).

Natural feed for catfish hatcheries in early stadia using Artemia natural feed is relatively expensive and not available in some areas because it is not easily cultivated (Biswas et al 2018; Olurin et al 2010). Homemade feeding of Catfish hatcheries will affect the growth rate and death of Catfish fry and is expensive

This research is very important to be carried out by feeding natural Daphnia sp, Mosquito Larvae, and Tubifex sp to increase the growth of Sangkuriang Clarias sp Catfish fry in order to find alternative food sources that are easy and cheap in increasing production.

2. Research Method

This research was carried out for two months from January to February 2018 at the Laboratory of the Department of Agricultural Fisheries, Bosowa University, Makassar, including preparation of tools and materials, data collection and data analysis.

Test animals in the form of Sangkuriang catfish seeds (*Clarias* sp) that are healthy and not deformed, aged 1 month with an average weight of 1.02 – 1.04 g / head. Catfish fry from the Maros Freshwater Fish Center of South Sulawesi are kept in jars filled with water 5 l with a density of 40 heads per jar. The number of containers used is 9 containers placed according to treatment. Ad libitum feeding with frequency 3 times a day, namely morning (08.00), afternoon (12.00) and evening (17.00). Natural feed treatments are *Daphnia* sp, Mosquito

Larvae, and *Tubifex* sp. Sangkuriang catfish fry (*Clarias* sp) are maintained for 31 days, Water changes are carried out every 1 week. Observation of the growth rate of catfish fry by measuring the initial and final weight gain of biomass in one container to determine the treatment of various types of natural feed on the growth of Sangkuriang catfish seeds. Dead larvae are counted to determine mortality. The first measurement of growth on the 7th day and the second on the 30th day.

Water Quality Parameters. Water quality measurements including temperature and pH are carried out every morning and evening at 08.00 and 17.00. Temperature measurement using a digital thermometer and pH using a pH meter

The variable being measured.

Specific growth rate and mortality. Daily weight growth of test fish according to (Huisman, 1976) calculated by the formula:

$$SGR = \frac{\ln Wt - W0}{t} \times 100\ \%$$

Information:

SRG : Specific growth rate (laju pertumbuhan harian) (%)
W0 : starting weight at time t = 0 days (gr)
Wt : final weight at time t
T : length of research (days)

Mortality is the percentage of the number of fish that died with the number of fish stocked during the study. Death is calculated based on Efendie (1995) with the formula:

$$Mortality = \frac{\sum \text{dead fish}}{\sum \text{fish kept during the study}} \times 100\%$$

Statistical analysis. This study used an experimental design, with 3 variables, namely *Daphnia* sp, Mosquito Larvae, and Tubifex sp, using a Complete Randomized Design Design (RAL) with three treatments and each treatment was repeated three times. Data were analyzed using Analysis of Variance (ANOVA) at a 95% confidence level.

3. Result and Discussion

Specific Growth Rate

In this study the growth parameter used was the weight of the fish. PLele Sangkurian's seed plants every treatment is incremental.

Observations during maintenance showed that Sangkuriang catfish experienced an average weight gain of 1.02 – 1.04 g to 5.2 – 5.6 g

The Average Specific Growth Rate (%/day) of the weight of Sangkuriang catfish fry maintained for 7 days can be seen in Figure 1.

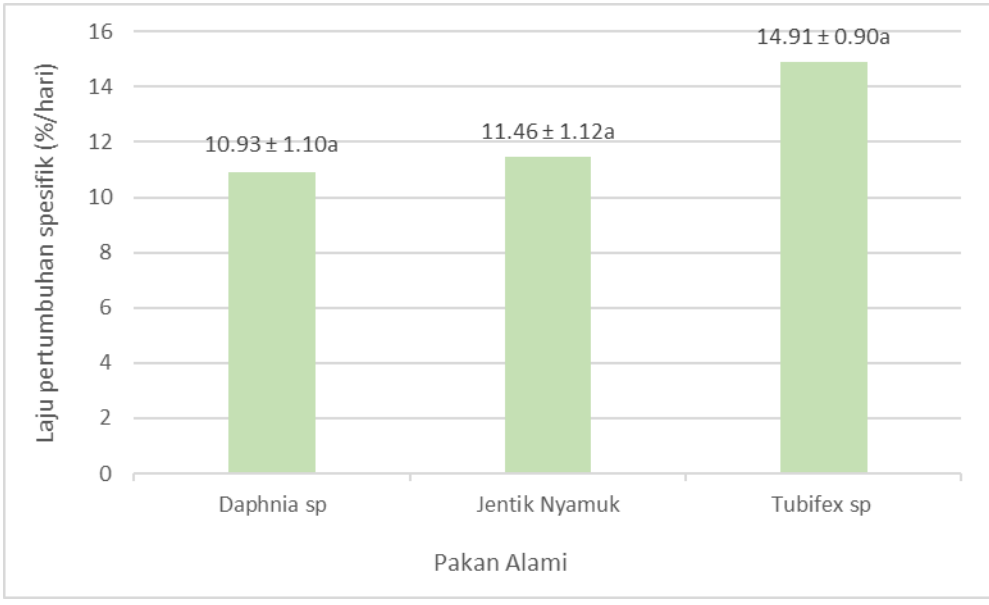

Figure 1. Specific growth rate (%/day) of sangkuriang catfish fry (Clarias sp) day 7

The Average Specific Growth Rate (%/day) of the weight of Sangkuriang catfish fry raised for 30 days is shown in Figure 2.

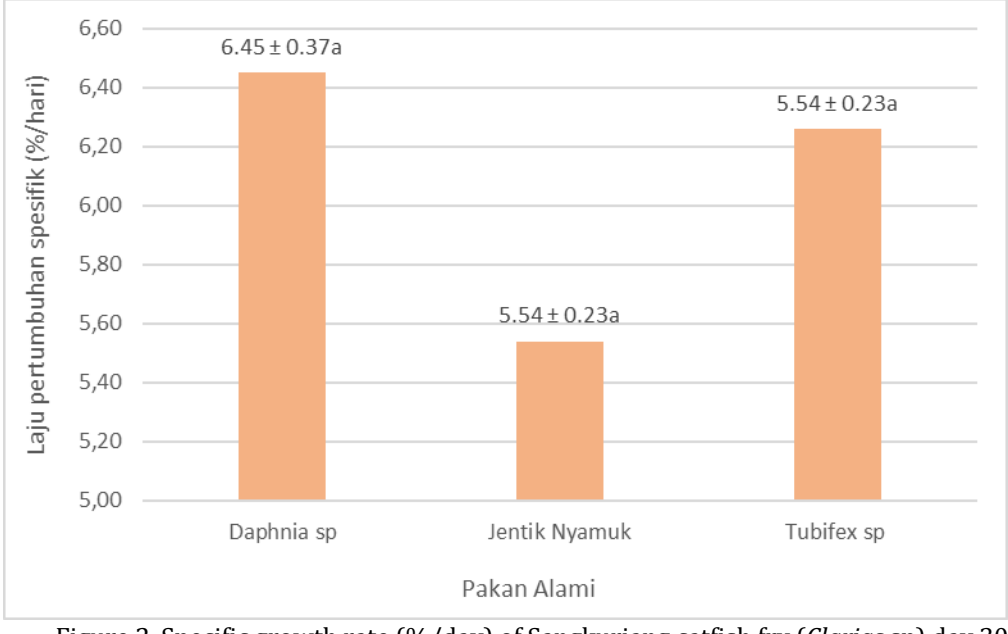

Figure 2. Specific growth rate (%/day) of Sangkuriang catfish fry (*Clarias* sp) day 30

Catfish are superior commodity fish. Catfish has high nutrition, tender meat, high lipoprotein content, has good market value, and is easy to cultivate(Biswas et al 2018; (2010 and 2010) As well as seaweed cultivation (Mulyani et al 2020). The increasing consumption of Catfish nationally causes Catfish farmers in the area to intensively cultivate Catfish by looking for several natural food alternatives. Increasing catfish production targets in Indonesia requires farmers to look for natural feed alternatives that have high nutritional value, are easy to

cultivate, fit fish mouth openings, are non-toxic, and relatively cheap. The cost of catfish farming feed is more than 60% of the production cost, therefore feed management determines the profitability and sustainability of catfish production(Limbu 2019).

Internal factors are factors related to the fish itself such as age, and genetic traits of the fish that include heredity, ability to utilize food, and disease resistance. External factors are factors related to the environment in which fish live which include the physical and chemical properties of water, spatial motion, and food availability in terms of quality and quantity. Zooplankton is a natural feed that is very important in the initial maintenance of fish larvae.

The factors affecting fish growth can be classified into two factors: internal and external: (Hernowo et al 2020). Internal factors are factors related to the fish itself such as age, and genetic traits of the fish that include heredity, ability to utilize food, and disease resistance. External factors are factors related to the environment in which fish live which include the physical and chemical properties of water, spatial motion, and food availability in terms of quality and quantity. Zooplankton is a natural feed that is very important in the initial maintenance of fish larvae(Herawati et al 2018; Paray & Al-Sadoon 2016)

Feed catfish fed include Daphnia sp, which has quite high nutrition (El-Feky & Abo-Taleb 2020). Feed Daphnia sp. It has advantages, among others, according to the mouth opening of fish larvae, easily digested by fish because it contains digestive enzymes. Daphnia sp is one of the natural feeds for the maintenance of fish larvae(Gogoi et al 2016).

Mosquito larvae are used as a fairly nutritious alternative feed. Mosquito larvae are recommended to be given to the cultivation of fish larvae (Mejia-Mejia et al 2021). Mosquito larvae contain 43.5% protein, 9.5% lipids, and 5.2% carbohydrates (Pham et al 2014). Tubifex sp is one type of natural feed that is widely used by fish in addition to containing high nutritional value. Tubifex sp is the best natural food for fish and shrimp because of its size and nutritional content that suits its needs. As revealed from research by(Rech et al 2013) The nutritional content of Tubifex sp includes protein (50-55%), fat (8-10%), crude fiber (2-5%), ash content (4-7%), and water (8-10%). Tubifex sp is also easily digested (Mariom et al 2016). Tubifex sp contains 41.4% protein and 20.9% fat (Yustysi et al 2017). Compared to other natural foods such as Daphnia sp, the nutritional content of Tubifex sp is higher and has the same nutritional quality compared to Artemia sp (Oplinger et al 2011). Of the three types of natural feed Daphnia sp, Mosquito Larvae, and Tubifex sp, in this study Tubifex sp natural feed provided the highest daily growth rate at the beginning of larval rearing of 14.91 gr. The increase in daily growth rate by Tubifex sp is because Tubifex sp is reported to contain a higher amino acid profile. This shows that Sangkuriang Catfish seeds can utilize feed nutrients to be stored in the body and convert them into energy. This energy is used by Sangkuriang Catfish seeds for basic metabolism, movement, production of sexual organs, treatment of body parts and turnover of cells that have been damaged and the excess is used for growth.

The growth of fish is primarily due to an increase in muscle protein mass. Muscle growth is due to the presence of proteins present throughout the body of the fish. Protein and fat are needed by larvae, especially in early stadia because protein is very functional to repair and maintain cell tissue. High protein content in feed affects the speed of seed growth, this is due to the energy used for the transition process of food utilization from egg yolk (endogenous) to external feed utilization (exogenous feeding). Lack of protein in the feed can lead to stunted growth(Arsenault & Brown 2017) Protein utilization for fish growth is influenced by several factors including size, protein quality, feed energy content, water temperature, and feed level. This energy is used by Sangkuriang Catfish seeds for basic metabolism, movement, production of sexual organs, treatment of body parts as well as cell turnover that has been damaged and the excess is used for growth(Yeti Marlida 2017).

Mortalitas

The mortality of Sangkuriang catfish seeds maintained for 31 days in the treatment of various natural feeds ranged from 10%-16.6%. The highest mortality rate is achieved in feed treatment *Daphnia* SP was 16.6% and the lowest mortality rate was achieved in natural feed treatment *Tubifex* SP by 10%. The average mortality value of Sangkuriang catfish fry (Clarias sp) during the study can be seen in Figure 2. Death occurs at the beginning of the spread, this is because the fish is still adapting to its living environment. Meitiyani et al 2020 confirmed that catfish fry mortality below 20% still shows a good range during the rearing period. Factors that affect seed mortality are food availability, both quality and quantity and water quality. Catfish experience many deaths in the early days of growth (Meitiyani et al 2020). In addition, mortality can occur due to insufficient nutritional content of feed as an energy source (Wijayanti, 2010).

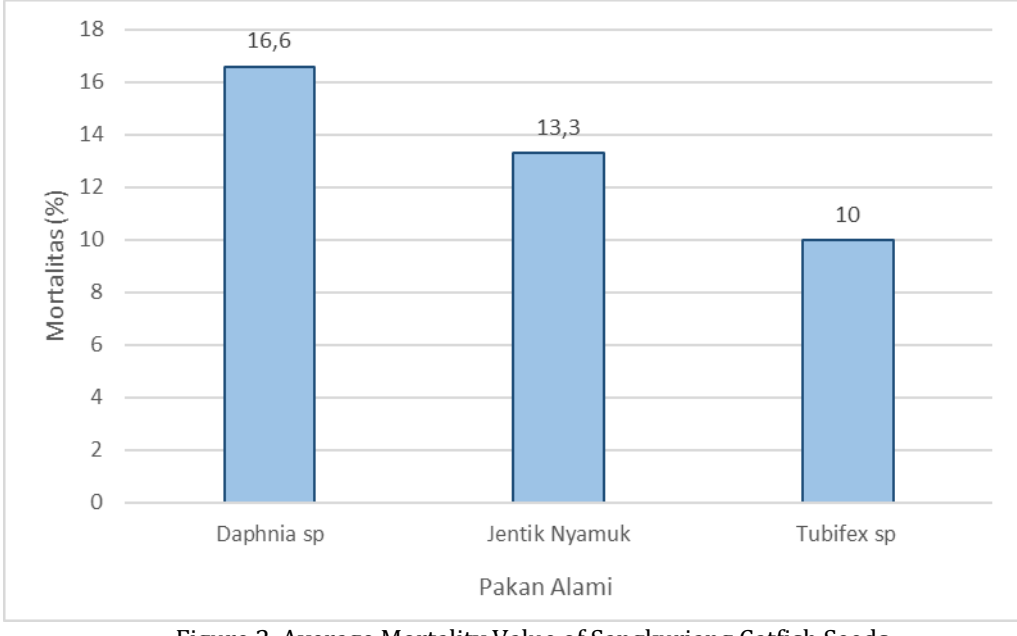

Figure 2. Average Mortality Value of Sangkuriang Catfish Seeds

Water Quality Parameters.

The water quality parameters observed during the study were temperature and pH with the following measurement results in Table 2:

Table 2 Average value of water quality with SNI quality standards during the study

Pakan Alami	Water Quality Parameters Research results		Water Quality Feasibility According to SNI	
	Temperature (oC)	pH	Temperature (oC)	pH
Dapnia sp	25 - 28	6.5 - 7	25 - 30	6.5 - 8
Mosquito Larvae	25 - 28	6.5 - 6	25 - 30	6.5 - 8
Tubifax	25 - 28	6.	25 - 30	6.

sp	5 - 7	5 - 8

Source: Processed primary data and SNI

Water as a living medium for aquatic organisms is a very important factor to be considered in aquaculture efforts, including in controlled containers. It aims to provide support to the organism in carrying out all its life activities. The water quality parameters observed during the study were water temperature and pH. From the table above, the temperature during maintenance ranges from 25-280C, which is relatively the same between treatments. This temperature range falls within the limits of the optimal range for the maintenance of catfish fry(RC Mukti et al 2021). High temperatures can cause the metabolic rate to speed up so it is expected that fish growth is also higher. Data from water pH measurements during the study were 6.5-7. The pH of the water in this range is good and quite ideal for the maintenance of Catfish because of this circumstance Catfish can grow well.

4. Conclusion

Tubifex sp natural feeding is better given as natural feed because it provides a better daily specific growth rate compared to Daphnia sp and Mosquito Larvae. The mortality rate of Tubifex sp (10%) is lower than the mortality rate of Daphnia sp (16.6%) and Mosquito Larvae (14.9%). These natural feeds can be used as fish feed ingredients because they contain high protein but it can also reduce feed prices (Artemia sp).

5. References

Anati, N. J., Siti Roha, A. M., & Normah, I., 2021 African catfish (Clarias gariepinus) visceral protease: Its specific activity and molecular weight at different purification stages. Food Research, 5(2), 120–128. https://doi.org/10.26656/fr.2017.5(2).447

Arsenault, J. E., & Brown, K. H., 2017 Effects of protein or amino-acid supplementation on the physical growth of young children in low-income countries. 75(9), 669–717. https://doi.org/10.1093/nutrit/nux027

Biswas, P., Jena, A. K., Saha, H., & Chowdhury, T. G., 2018 Induced breeding and seed production of Pabda: a species with potential for aquaculture diversification in northeast India. World Aquac, (22). Retrieved from https://www.researchgate.net/profile/Alok_Kumar_Jena/publication/323695960_Induced_Breeding_and_Seed_Production_of_Pabda_A_Species_with_Potential_for_Aquaculture

_Diversification_in_Northeast_India/links/5aa673d1458515b3e5c133bb/Induced-Breeding-and-Seed-P

Dauda, A. B., Natrah, I., Karim, M., Kamarudin, M. S., & Bichi, A. u H., 2018 African Catfish Aquaculture in Malaysia and Nigeria: Status, Trends, and Prospects. Fisheries and Aquaculture Journal, 09(01), 1–5. https://doi.org/10.4172/2150-3508.1000237

El-Feky, M. M. M., & Abo-Taleb, H., 2020 Effect of feeding with different types of nutrients on the intensive culture of the water flea, Daphnia Magna Straus, 1820. Egyptian Journal of Aquatic Biology and Fisheries, 24(1), 655–666. https://doi.org/10.21608/EJABF.2020.76554

Gogoi, B., Safi, V., & Das, D. N., 2016 The cladoceran as live feed in fish culture: a brief review. Research Journal of Animal, Veterinary and Fishery Sciences, 4(3), 7–12.

Herawati, V. E., Pinandoyo, Hutabarat, J., & Karnaradjasa, O., 2018 The effect of nutrient content and production of Daphnia magna mass cultured using various wastes processed with different fermentation times. AACL Bioflux, 11(4), 1289–1299.

Hernowo, I. A., Pinandoyo, P., Hutabarat, J., & Herawati, V. E., 2020 The Effect of Addition of Indian Copperleaf Flour and Taoge Flour Combination in Artificial Feed on Feed Utilization Efficiency and Growth of Tilapia (Oreochromis niloticus). Aquaculture Indonesiana, 21(1), 32. https://doi.org/10.21534/ai.v21i1.168

Holy, N. H., & Sari, L. A., 2020 The effect of catfish and chicken cultivation waste on Daphnia sp. culture. IOP Conference Series: Earth and Environmental Science, 441(1). https://doi.org/10.1088/1755-1315/441/1/012057

Huisman, E. A., 1976 Food conversion efficiencies at maintenance and production levels for carp, Cyprinus carpio l., and rainbow trout, salmon gairdneri Richardson. Aquaculture, 9(July 2015), 259–273. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/0044848676900685?via%3Dihub

Kasnir, Muhammad, H., & Rosmiati, A., 2014 Water Quality Parameter Analysis for the Feasibility of Shrimp Culture in Takalar Regency, Indonesia. Journal of Aquaculture Research & Development, 05(06), 5–7. https://doi.org/10.4172/2155-9546.1000273

Kementrian Kelautan dan Perikanan., 2020 [ncrease Catfish Production]. TROBOS Aqua. Retrieved from http://trobosaqua.com/detail-erita/2020/07/15/44/13242/naikkan-produksi-benih-lele-

Limbu, S. M., 2019 The effects of on-farm produced feeds on growth, survival, yield, and feed cost of juvenile African Sharptooth catfish (Clarias gariepinus). Aquaculture and Fisheries, 5(1), 58–64. https://doi.org/10.1016/j.aaf.2019.07.002

Mariom, -, Liza, S. N., & Mollah, M. F. A., 2016 Identification of genera of tubificid worms in

Bangladesh through morphological study. Asian Journal of Medical and Biological Research, 2(1), 27–32. https://doi.org/10.3329/ajmbr.v2i1.27565

Meitiyani, Ratika, E., Dharma, A. P., & Annisa, R., 2020 Combination of Hermetia illucens L Maggot Flour with Fish Feed against Growth of Sangkuriang Catfish (Clarias sp). Systematic Reviews in Pharmacy, 11(1), 529–535. https://doi.org/10.5530/srp.2020.1.66

Mejia-Mejia, M., Arce, E., García-Rodríguez, J., & Burciaga, L. M., 2021 Effect of feeding mosquito larvae on the coloration of siamese fighting fish (Betta splendens) during grow-out. International Aquatic Research, 13(1), 71–79. https://doi.org/10.22034/iar.2021.1916191.1116

Mulyani, S., Tuwo, A., Syamsuddin, R., & Cahyono, I. J. J., 2020 Effect of kappaphycus alvarezii mariculture on the recruitment of scleractinian corals. AACL Bioflux, 13(3), 1746–1757.

Mulyani, S., Tuwo, A., Syamsuddin, R., & Jompa, J., 2021 Relationship of the viscosity of carrageenan extracted from Kappaphycus alvarezii with seawater physical and chemical properties at different planting distances and depths. AACL Bioflux, 14(1), 328–336.

Naumowicz, K., Pajdak, J., Terech-Majewska, E., & Szarek, J., 2017 Intracohort cannibalism and methods for its mitigation in cultured freshwater fish. Reviews in Fish Biology and Fisheries, 27(1), 193–208. https://doi.org/10.1007/s11160-017-9465-2

Okomoda, V. T., Aminem, W., Hassan, A., & Martins, C. O., 2019 Effects of feeding frequency on fry and fingerlings of African catfish Clarias gariepinus. Aquaculture, 511. https://doi.org/10.1016/j.aquaculture.2019.734232

Olurin, K. B., & Oluwo, A. B., 2010 Growth and survival of African catfish (Clarias gariepinus) larvae fed decapsulated artemia, live daphnia, or commercial starter diet. Israeli Journal of Aquaculture - Bamidgeh, 62(1), 50–55.

Oplinger, R. W., Bartley, M., & Wagner, E. J., 2011 Culture of tubifex: Effect of feed type, ration, temperature, and density on juvenile recruitment, production, and adult survival. North American Journal of Aquaculture, 73(1), 68–75. https://doi.org/10.1080/15222055.2010.549028

Paray, B., & Al-Sadoon, M., 2016 Utilization of Organic Manure for Culture of Cladocerans, Daphnia carinata, Ceriodaphina carnuta and Copepod, Thermocyclops decipiens under laboratory conditions. Indian Journal of Geo-Marine Sciences (IJMS), 45(03), 399–404.

Pham, M. A., Byun, H. G., Kim, K. D., & Lee, S. M., 2014 Effects of dietary carotenoid source and level on growth, skin pigmentation, antioxidant activity, and chemical composition of juvenile olive flounder Paralichthys olivaceus. Aquaculture, 431, 65–72. https://doi.org/10.1016/j.aquaculture.2014.04.019

Rawat, P., Biswas, P., Jena, A. K., Patel, A. B., & Pandey, P. K., 2019 Effect of dietary incorporation

of natural attractants on growth and survival during seed rearing of Indian butter catfish, Ompok bimaculatus. Journal of Environmental Biology, 40(4), 661–667. https://doi.org/10.22438/jeb/40/4/MRN-907

RC Mukti, M Amin, and Y., 2021 Utilization of alternative ingredients as combination feed on the growth of catfish (Clarias sp) Utilization of alternative ingredients as combination feed on the growth of catfish (Clarias sp). IOP Conference Series: Earth and Environmental Science. https://doi.org/10.1088/1755-1315/819/1/012005

Rech, K. C., Guereschi, R. M., de Oliveira Nuñer, A. P., & Sticca, S. C., 2013 Density and organic matter influence egg-laying and hatching of Branchiura sowerbyi (oligochaeta). Journal of the World Aquaculture Society, 44(2), 267–272. https://doi.org/10.1111/jwas.12026

Suwoyo, H. S., Sahabuddin, Sahrijanna, A., Septiningsih, E., & Mulyaningrum, S. R. H., 2020 Grow-out of transfection and non transfection black tiger shrimp broodstock, Penaeus monodon in concrete pond. IOP Conference Series: Earth and Environmental Science, 584(1). https://doi.org/10.1088/1755-1315/584/1/012015

Tiamiyu, L. O., Okomoda, V. T., & Agbo, H. E., 2018 The effect of different feeding rates and restriction on the growth performance of Clarias gariepinus. Iranian Journal of Fisheries Sciences, 17(4), 840–847. https://doi.org/10.22092/ijfs.2018.116811

Yeti Marlida, F. N. J. J., 2017 The effect of fermented coconut waste on the growth of catfish (ClariasSp). International Journal of Agricultural Sciences, 1(1), 21. https://doi.org/10.25077/ijasc.1.1.21-27.2017

Yustysi, D.P, Basuki, Fajar, Susilowati, T., 2017 [Effect of addition of chicken manure, tofu waste and tapioca flour in culture media on biomass, population and nutritional content of silkworms (Tubifex sp.)] . Journal of Aquaculture Management and Technology, 4(4), 95–100.