

GROWTH AND SURVIVAL RESPONSES OF BARRAMUNDI (*Lates calcarifer*) JUVENILES TO DIFFERENT FEED TYPES

Respon Pertumbuhan dan Kelangsungan Hidup Benih Kakap Putih (*Lates calcarifer*) Terhadap Pemberian Pakan Berbeda

Daniel Sinaga^{1*} and Ilham Sayuti Simanjuntak²

¹Aquaculture Study Program, Faculty of Marine Sciences and Fisheries,
Raja Ali Haji Maritime University

²Aquaculture Study Program, Matauli College of Fisheries and Marine Sciences

Daeng Kamboja Street, Senggarang, Tanjungpinang City District, Tanjungpinang City, Riau Islands
29115

*Corresponding Author: danielsinaga@umrah.ac.id

(Received April 18th 2026; Accepted May 26th 2026)

ABSTRACT

The availability of optimal feed is a fundamental factor in supporting the successful cultivation of barramundi (*Lates calcarifer*) fingerlings. A combination of artificial feed, natural feed, and supplementary feed can fulfill the nutritional needs of fish; however, the high cost of artificial feed often hinders production efficiency. This study aimed to evaluate the effects of different types of supplementary feed on the growth and survival rate of barramundi fingerlings. The research was conducted from May to July 2024 in floating net cages (FNC) in the waters of Tapian Nauli I Village, Tapian Nauli Sub-district, using a Completely Randomized Design (CRD) with four treatments: mixed trash fish (P1), squid (P2), marine worms (P3), and krill (P4), each with three replicates. Parameters measured included absolute weight growth, absolute length growth, survival rate, and water quality in the cultivation containers. The results showed that treatment P1 (mixed trash fish) produced the best growth performance, with an average absolute weight of 2.42 g, an average absolute length of 5.76 cm, and optimal survival rates. In conclusion, mixed trash fish can serve as an effective supplementary feed alternative to enhance the growth performance of barramundi fingerlings while supporting feed cost efficiency in aquaculture systems.

Keywords: Barramundi, Supplementary Feed, Growth, Survival Rate, Aquaculture Efficiency.

ABSTRAK

Ketersediaan pakan yang optimal merupakan faktor fundamental dalam mendukung keberhasilan pemeliharaan benih ikan kakap putih (*Lates calcarifer*). Kombinasi penggunaan pakan buatan, pakan alami, dan pakan tambahan dapat memenuhi kebutuhan nutrisi ikan, namun tingginya biaya pakan buatan sering kali menjadi hambatan bagi efisiensi produksi. Penelitian ini bertujuan untuk mengevaluasi pengaruh pemberian berbagai jenis pakan tambahan terhadap pertumbuhan dan tingkat kelulushidupan benih ikan kakap putih. Penelitian

dilaksanakan pada Mei hingga Juli 2024 di Keramba Jaring Apung (KJA) Perairan Desa Tapian Nauli I, Kecamatan Tapian Nauli, menggunakan rancangan percobaan Rancangan Acak Lengkap (RAL) dengan empat perlakuan, yaitu ikan rucah campuran (P1), cumi-cumi (P2), cacing laut (P3), dan udang rebon (P4), masing-masing dengan tiga ulangan. Parameter yang diukur meliputi pertumbuhan bobot mutlak, panjang mutlak, tingkat kelulushidupan, dan kualitas air pada wadah budidaya. Hasil penelitian menunjukkan bahwa perlakuan P1 (ikan rucah campuran) menghasilkan pertumbuhan terbaik dengan bobot mutlak rata-rata 2,42 g dan panjang mutlak rata-rata 5,76 cm, serta tingkat kelulushidupan yang optimal. Kesimpulannya, ikan rucah campuran dapat menjadi alternatif pakan tambahan yang efektif untuk meningkatkan kinerja pertumbuhan benih ikan kakap putih, sekaligus mendukung efisiensi biaya pakan dalam sistem budidaya.

Kata Kunci: Kakap Putih, Pakan Tambahan, Pertumbuhan, Kelulushidupan, Efisiensi Budidaya.

INTRODUCTION

White snapper (*Lates calcarifer*) is a marine fish with high economic value and significant potential in the international market. This fish is exported to various countries, including Europe, the United States, Malaysia, and Thailand. National production data shows an increasing trend from 6,558 tons in 2015 to 7,890 tons in 2016, and reached 8,431 tons in 2017 (KKP, 2017). This high international market demand makes white snapper cultivation a promising opportunity, particularly given the fish's advantages of rapid growth, tolerance to salinity fluctuations, and ease of maintenance (Hardianti, 2016).

One of the main factors influencing the success of white snapper cultivation is the quality of the aquatic environment and the availability of feed that meets the fish's nutritional needs. Common feeds include artificial feed, natural feed, and supplementary feed. However, the high price of artificial feed presents a challenge for farmers. To address this issue, the use of natural feed as supplementary food is an effective solution for improving the growth and survival of white snapper fry.

Several potential supplementary feeds for white snapper include worms, shrimp, small fish, and snails. These supplementary feeds are generally rich in protein, which supports optimal fish growth. However, research on the effectiveness of supplementary feeds on the growth and survival performance of white snapper is still relatively limited, particularly in cultivation in the Central Tapanuli region, on the west coast of North Sumatra. Therefore, this study aims to evaluate the types of supplementary feeds that provide the best performance in supporting the growth and survival of white snapper fry.

RESEARCH METHODS

Place and Time

This research was conducted from May to July 2024 in floating net cages (KJA) located in the waters of Tapian Nauli I Village, Tapian Nauli District, Central Tapanuli Regency. The research design used was an experimental method with a Completely Randomized Design (CRD), consisting of four treatments with three replications. The treatments included: P1 (trash fish), P2 (squid), P3 (marine worms), and P4 (rebon shrimp).

Preparation of Maintenance Container

The maintenance containers were 12 units of net-made hapa measuring 0.8 x 0.5 x 0.5 m³. The hapa were thoroughly washed two days before the study began, then placed in the cages and marked according to their respective treatments.

Fish Seed

The white snapper (*Lates calcarifer*) fry used were obtained from the Brackishwater Aquaculture Center (BPBAP) in Ujung Batee, Aceh. The average initial length of the fry was 4.3 cm, with a total of 120 fry. The fry were stocked the day before the study began. Initial weight and length measurements served as baseline data.

Fish Food

The feeding method uses an ad-satiation system, carried out twice a day, namely at 08.00 WIB and 17.00 WIB. The feed provided includes trash fish, squid, sea worms, and rebon shrimp. Trash fish and rebon shrimp were obtained from local fishermen's catches, while squid was obtained from the fish market, and sea worms were collected from coastal areas. Before being given, trash fish, squid, and sea worms were chopped into small pieces according to the size of the fish's mouth, while the rebon shrimp were given whole.

Data retrieval

Sampling was conducted weekly for eight weeks. Fifty percent of the fish from each hapa were measured for length and weight using a digital scale and ruler to determine absolute weight and length growth.

Water quality in the rearing tanks was monitored weekly, as it is crucial for successful cultivation. Water quality parameters measured included temperature, pH, salinity, and dissolved oxygen (DO).

Data Analysis

The fish fry being raised were measured to determine whether they were growing. The growth parameters used were absolute weight growth using the formula of Devi et al. (2019), absolute length growth using the formula of Imani et al. (2021), Specific Growth Rate (SGR) using the formula of Jaya et al. (2013), and survival rate using the formula of Linayanti et al. (2021).

The measurement data obtained during the study were analyzed using Microsoft Excel 2013 and SPSS Statistics 22 software. Analysis of Variance (ANOVA) was then performed, presented in tables and figures. If there were significant differences between one treatment and another, further testing was carried out using the Student Newman-Keuls test with a 95% confidence interval.

RESULT

Absolute Fish Weight Growth

The results of the study showed that the highest absolute weight growth was obtained in treatment P1 (trash fish) at 2.42 g, followed by P2 (squid) at 1.71 g, P4 (rebon shrimp) at 1.37 g, and the lowest in P3 (sea worms) at 1.15 g. The results of the ANOVA analysis showed that the type of feed had a significant effect ($P < 0.05$) on absolute weight growth. The absolute weight growth of fish seeds fed different feeds during the study is shown in Figure 1 below.

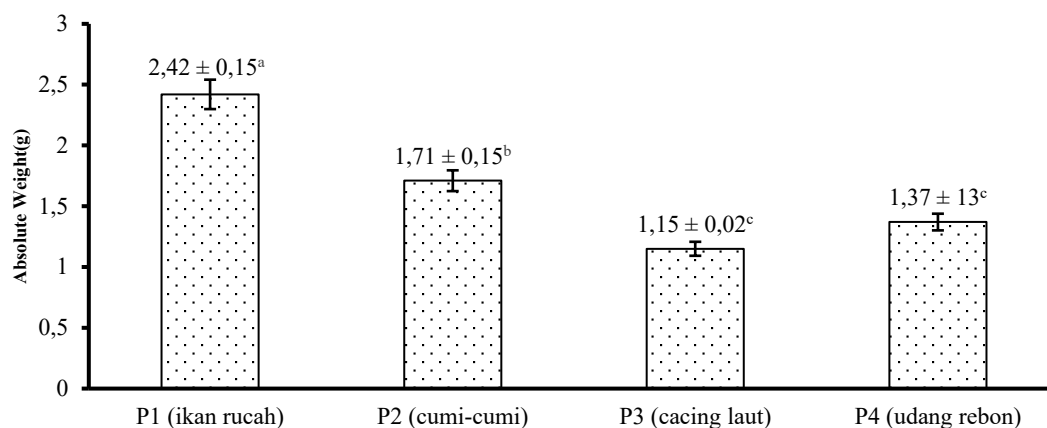


Figure 1. Absolute Weight Growth

Absolute Length Growth of Fish

The highest average absolute length growth was found in treatment P1 at 5.76 cm, followed by P2 at 3.79 cm, P4 at 3.61 cm, and P3 at 3.54 cm. The results of the ANOVA analysis showed that the type of feed had a significant effect ($P < 0.05$) on fish length growth. Further tests showed that P1 was significantly different from the other treatments. The results of absolute length growth are presented in Figure 2 below.

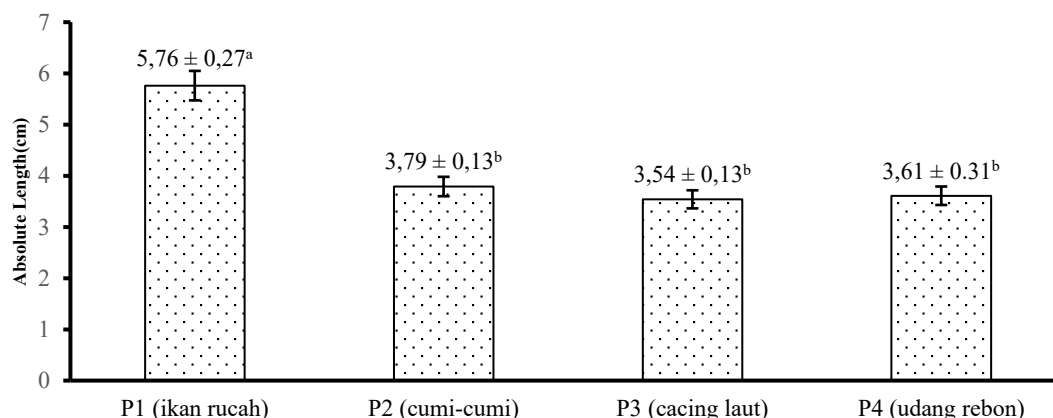


Figure 2. Absolute Length Growth of fish

Specific Growth Rate of Fish

The specific growth rate (SGR) of fish during maintenance ranged from 2.34–3.39%/day. The highest SGR value was obtained in treatment P1 at 3.39%/day, while the lowest value was in treatment P3 at 2.34%/day. ANOVA analysis results showed that feed type had a significant effect ($P < 0.05$) on SGR values. Data from specific growth rate measurements are presented in Figure 3 below.

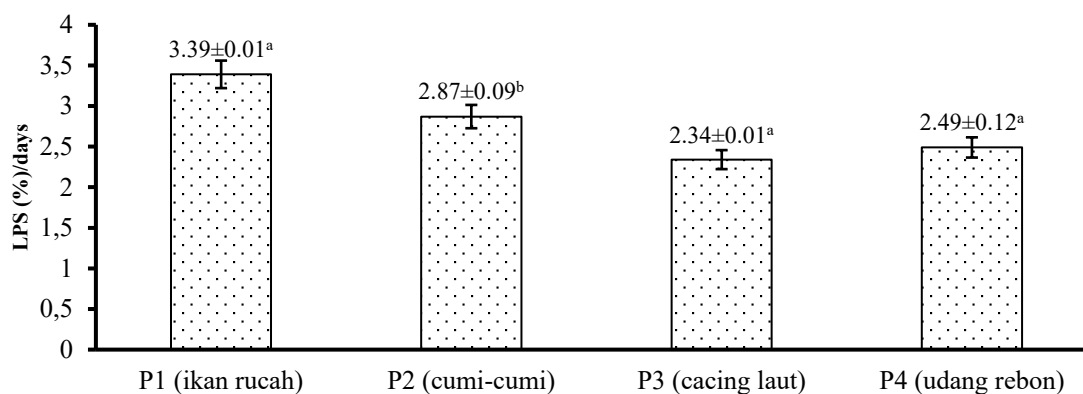


Figure 3. Specific Growth Rate of Fish Seed

Survival Rate (SR)

The highest SR value was obtained in treatment P2 at 77%, followed by P3 and P4 at 73% each, and P1 at 70%. The ANOVA analysis results showed that feed type did not have a significant effect ($P > 0.05$) on SR. The survival rate of white snapper fry is presented in Figure 4 below.

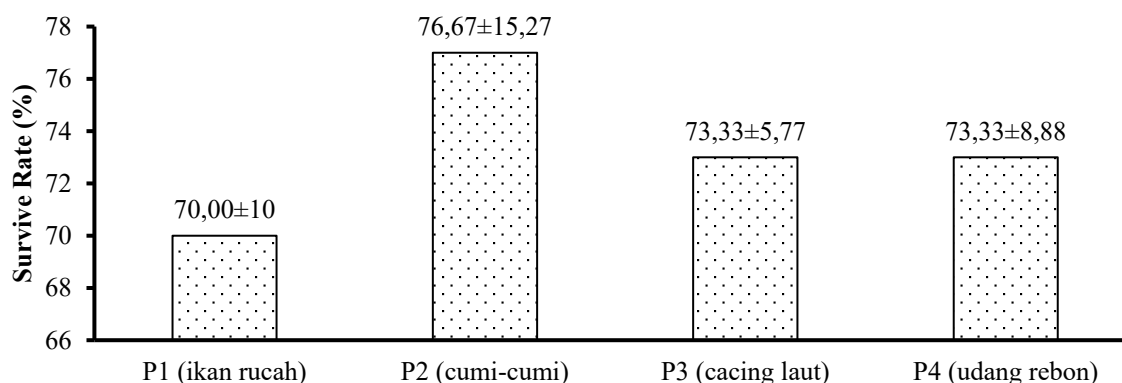


Figure 4. Fish Seed Survival

DISCUSSION

Absolute weight gain is an important parameter for evaluating feed effectiveness in supporting fish growth. In this study, the absolute weight gain of barramundi showed the highest results in treatment P1 (trash fish) at 2.42 g, followed by P2 (squid) at 1.71 g, P4 (rebon shrimp) at 1.37 g, and the lowest in P3 (marine worms) at 1.15 g (Figure 1). ANOVA analysis showed a significant effect of feed type on absolute weight gain ($P < 0.05$), with further Student Newman-Keuls tests confirming a significant difference in treatment P1 compared to the other treatments.

The high weight gain in treatment P1 can be attributed to the high protein content of trash fish, which ranges from 40-65%. High-quality protein supports protein synthesis in fish, thus stimulating optimal weight gain (Akbar et al., 2019). Research by Wannebo et al. (2021) also stated that trash fish feed is more effective than artificial feed in increasing the growth of carnivorous fish such as white snapper. The improved bioavailability of nutrients in natural feed also contributes to accelerated fish growth.

The effectiveness of natural feed, such as trash fish, is also influenced by its suitability to the feeding patterns of white snapper as a predator. White snapper is known to digest protein more efficiently than other nutrients such as fat and carbohydrates (Agustono et al., 2009).

Therefore, feed that meets the physiological needs of fish contributes significantly to optimal growth.

Measurement of absolute fish length also provides important information about the effectiveness of feed on linear growth. Based on Figure 2, the highest average absolute length growth was found in P1 (trash fish) at 5.76 cm, followed by P2 (squid) at 3.79 cm, P4 (rebon shrimp) at 3.61 cm, and P3 (marine worms) at 3.54 cm. ANOVA analysis showed that feed type significantly influenced fish length growth ($P < 0.05$), with P1 showing a significant difference compared to the other treatments.

The high length growth in P1 also indicates that the feed's nutritional profile matches the specific needs of barramundi. The natural habitat of these fish, which are accustomed to consuming small fish, contributes to the high length growth rate in this treatment (Nurmasyitah et al., 2018). Animal protein in trash fish supports not only weight gain but also bone and soft tissue elongation.

Good length growth also indicates sufficient energy availability to support the fish's structural growth. According to Nurmasyitah et al., (2018), predatory fish such as barramundi utilize energy from protein to support metabolic activities and growth. Length growth can also be influenced by stocking density and water quality. The results of this study indicate that the rearing conditions met optimal standards, so environmental factors did not hinder fish length growth.

Specific growth rate (SGR) reflects the efficiency of fish in utilizing feed for growth. Based on Figure 3, the highest SGR value was found in treatment P1 (trash fish) at 3.39%/day, while the lowest value was found in P3 (marine worms) at 2.34%/day. The results of the ANOVA analysis showed a significant effect of feed type on SGR values ($P < 0.05$), with treatment P1 significantly different from the other treatments.

The high SGR in P1 can be explained by the protein content of trash fish, which supports the metabolic efficiency of carnivorous fish (Agustono et al., 2009). According to Sahputra et al., (2017), fish require high protein for growth. Furthermore, trash fish protein has a balance of essential amino acids that closely matches fish requirements, thus reducing energy wasted on additional metabolism (Wannebo et al., 2021). Furthermore, variations in SGR between treatments demonstrate the importance of feed formulations that meet fish nutritional needs. Feeds with lower protein content or less bioavailability, such as marine worms, result in slower growth. Developing alternative animal protein-based feeds with efficiency equivalent to trash fish could be a strategic step to minimize dependence on natural feed.

Fish survival rate (SR) is an important indicator of successful rearing. The results showed that the highest SR was found in P2 (squid) at 77%, followed by P3 (marine worms) and P4 (rebon shrimp) at 73% each, and P1 (trash fish) at 70% (Figure 4). ANOVA analysis showed that differences in feed type did not significantly affect SR ($P > 0.05$). The main factors influencing SR are environmental quality and maintenance management. According to Sahputra et al. (2017), high SR is influenced by environmental suitability, such as temperature, pH, and salinity, which support optimal physiological conditions for the fish. Furthermore, adequate feed availability also supports the survival rate of barramundi.

The decrease in SR in P1 was caused by increased cannibalism due to uneven growth. Nazlia et al. (2021) stated that mortality in fish often occurs due to significant size differences, which encourage cannibalism. Differences in white snapper survival rates are due to factors such as fish immunity, environmental stress levels, and feeding (Surnawati et al., 2020). SR optimization can be achieved by ensuring adequate feed availability, reducing stress, and maintaining a stable environmental quality.

Water quality parameters during cultivation are within the optimal range for white snapper growth, with a temperature of 28-31.5°C, pH 7.4-7.6, salinity 29-31 ppt, and dissolved oxygen (DO) 4.2-5.3 mg/L. The National Standardization Agency (BSN, 2014) determined

that this range of water quality parameters is optimal for white snapper growth and survival. According to Jerry (2014), the optimal temperature for white snapper cultivation is 27-33°C. In general, DO should be around 5 ppm or higher, and should not be less than 4 ppm for pelagic fish and should not be less than 3 ppm for demersal fish cultivated in marine cages (Shubhi et al., 2017). A pH range of 7-7.8 is still within the normal limits for marine fish cultivation (Windarto et al., 2019).

Good water quality supports fish metabolism and reduces physiological stress, thus maximizing feed efficiency (Putri et al., 2018; Aslamiah et al., 2019). Appropriate salinity is also important for maintaining the osmotic balance of marine fish, allowing them to allocate their energy to growth rather than osmotic regulation. This indicates that barramundi have the ability to adjust the osmotic pressure in their bodies to their habitat through osmoregulation (Masyahoro & Setiawan, 2023).

Water quality control should be a priority in aquaculture, as fluctuations in environmental parameters can negatively impact fish health. Regular monitoring of water quality can improve the success of cultivation, as a note, these results show the importance of integration between feed management and environmental quality to support optimal fish growth and survival.

CONCLUSION

Different feeds given to white snapper (*Lates calcarifer*) fry significantly affected the growth of absolute weight, absolute length, and specific growth rate (SGR), with the best results obtained from the trash fish treatment (P1), namely a weight of 2.42 g, a length of 5.76 cm, and a SGR of 3.39%/day. The survival rate (SR) was not significantly affected by the type of feed, with the highest survival rate of 77% in the squid treatment (P2). The results of this study emphasize the importance of high-quality feed and good environmental management to support optimal growth and survival of fish.

ACKNOWLEDGEMENT

The author expresses his appreciation to all parties who have assisted in the process of conducting research, collecting data, and preparing the manuscript, including institutions and related parties who have provided facilities and technical support during the research process.

REFERENCES

- Agustono., Sari, W. P., & Cahyoko, Y. (2009). Pemberian Pakan yang Berbeda Terhadap Pertumbuhan Benih Ikan Kerapu Tikus (*Cromileptes altivelis*). *Jurnal Ilmiah Perikanan dan Kelautan*, 1(2), 149-156.
- Akbar, T. A., Moeda, B. I., & Pujaningsih, R. I. (2019). Mikrobiologi Tepung Ikan Rucah yang Diberi Ekstrak Daun Kersen sebagai Antibakteri pada Berbagai Lama Penyimpanan. *Jurnal Sain Peternakan Indonesia*, 14(3), 312-318.
- Aslamiah, S.B, Aryawati, R. & Putri W. A. (2019). Laju Pertumbuhan Benih Ikan Kakap Putih (*Lates calcarifer*) dengan Pemberian Pakan yang Berbeda. *Jurnal Penelitian Sains*, 21(3), 112-117.
- Badan Standarisasi Nasional. (2014). *Ikan Kakap Putih (Lates calcarifer, Bloch 1790) Bagian 4: Produksi Benih*. SNI No. 6145.4:2014. Badan Standarisasi Nasional. Jakarta.
- Devi, S., Raza'I, T. S., & Wulandari, R. (2019). Efisiensi Pakan dengan Penambahan Probiotik Terhadap Kelangsungan Hidup Benih Ikan Kakap Putih (*Lates calcarifer*). *Intek Akuakultur*, 3(1), 80-91.
- Hardianti, Q., Rusliadi, & Mulyadi. (2016). Effect of Feeding Made with Different Composition on Growth and Survival Seeds of Barramundi (*Lates calcalifer*, Bloch). *Jurnal Online Mahasiswa*, 3(2), 1-10.

- Imani, D. N., Santoso, L., & Supriya. (2021). Performa Pertumbuhan Ikan Kakap Putih (*Lates calcarifer*) pada Fase Pembesaran yang Diberi Pakan dengan Penamahan Lisin Berbeda. *Journal of Aquatropica Asia*, 6(1), 13-20.
- Jaya, B., Agustriano, F., & Isnaini. (2013). Laju Pertumbuhan dan Tingkat Kelangsungan Hidup Benih Ikan Kakap Putih (*Lates calcarifer*) dengan Pemberian Pakan yang Berbeda. *Journal Maspari*, 5(1), 56-63.
- Jerry, D. R. (2014). *Biology and culture of Asian seabass Lates calcarifer*. CRC Press, Taylor & Francis Group. London. New York. p 325.
- Kementerian Kelautan Perikanan. (2017). *Statistik perikanan tangkap, perikanan budidaya, dan ekspor-impor setiap provinsi seluruh Indonesia*. Pusat Data Statistik dan Informasi. Sekretariat Jenderal Kementerian Kelautan dan Perikanan.
- Linayanti., Rizkyansyah. B., Mardiana, T. Y., & Yahya, M. Z. (2021). The Addition of Honey Bee to the Feed to Increase the Growth of White Snapper Seeds (*Lates calcarifer*). *Journal of Aquaculture and Fish Health*, 10(3), 15-20.
- Masyahoro, A & Setiawan, M. A. B. (2023). Pertumbuhan Benih Ikan Kakap Putih (*Lates calcarifer*, Bloch 1790) pada Berbagai Salinitas dan Dosis Pakan Limbah Kepada udang dalam Wadah Terkontrol. *Jurnal Ilmiah AgriSains*, 24(2), 103-113.
- Nazlia, S., Munandar, T. H., Thaib, A., & Ridwan, T. (2021). Pengaruh Penggunaan Berbagai Jenis Shelter Terhadap Kelangsungan Hidup dan Pertumbuhan Benih Ikan Kakap Putih (*Lates calcarifer*). *Jurnal Tilapia*, 2(1), 29-35.
- Nurmasyitah., Defira, C. N., & Hasanuddin. (2018). Pengaruh Pemberian Pakan Alami yang Berbeda Terhadap Tingkat Kelangsungan Hidup Larva Ikan Kakap Putih (*Lates calcarifer*). *Jurnal Ilmiah Mahasiswa Kelautan dan Perikanan Unsyiah*, 3(1), 56-65.
- Putri, D. F., Santoso, L., & Saputra, S. (2018). Pengaruh Pemberian Pakan dengan Kadar Protein Berbeda Terhadap Pertumbuhan Ikan Kakap Putih (*Lates calcarifer*) yang Dipelihara di Bak Terkontrol. *Berkala Perikanan Terubuk*, 46(2), 89-96.
- Sahputra, I., Khalil, M., & Zulfikar. (2017). Pemberian Jenis Pakan yang Berbeda Terhadap Pertumbuhan dan Kelangsungan Hidup Benih Ikan Kakap Putih (*Lates calcarifer*. Bloch). *Jurnal Acta Aquatica*, 4(2), 68-75.
- Shubhi, M. Z. A., Kusumadewi, Y. S., & Suswati, D. (2017). Study of Suitability and Environmental Carrying Capacity for Barramundi (*Lates calcarifer*, Bloch) Culture in Waters of Lemukutan Island and Penata Besar Island, Bengkayang Region, West Kalimantan. *Aquasains*, 5(2), 475-487.
- Surnawati, S., Nurliah, N., & Surnawati, F. A. (2020). Pertumbuhan dan Kelangsungan Hidup Benih Ikan Kakap Putih (*Lates calcarifer*, Bloch) dengan Pemberian Dosis Probiotik yang Berbeda. *Jurnal Ruaya: Jurnal Penelitian Dan Kajian Ilmu Perikanan dan Kelautan*, 8(1), 38-44.
- Wamnebo, M.I., & Ulat, M.A. 2021. Pengaruh Pemberian Pakan Rucuh dan Pakan Pellet terhadap Pertumbuhan Juvenil Ikan Kerapu Bebek (*Chromileptes altivelis*). *Jurnal Airaha*, 10(2), 171-176.
- Windarto, S., Hastuti, S., Nugroho, R. A., & Sarjito. (2019). Performa Pertumbuhan Ikan Kakap Putih (*Lates calcarifer* Bloch, 1790) yang Dibudidayakan dalam Sistem Keramba Jaring Apung (KJA). *Jurnal Sains Akuakultur Tropis*, 3(1), 56-60.