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The Growth of Asian seabass (*Lates calcarifer*) at The Marine and Brackish Water Aquaculture Center (BPBALP) Teluk Buo, Padang City, West Sumatra

Pembesaran Ikan Kakap Putih (*Lates calcarifer*) di UPTD Balai Perikanan Budidaya Air Laut dan Payau (BPBALP) Teluk Buo, Kota Padang, Sumatera Barat

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ABSTRACT

Asian seabass (*Lates calcarifer*) is a promising aquaculture commodity at the UPTD Marine and Brackish Water Aquaculture Center (BPBALP) Teluk Buo, Padang City, due to its fast growth and high environmental adaptability. This study aimed to describe the growth techniques of Asian seabass cultured at BPBALP Teluk Buo and was conducted from July to September 2025 using a quantitative descriptive survey method. Growth performance was assessed through direct observation and measurement. The results showed an absolute weight gain of 123.6 g, length gain of 10.19 cm, a specific growth rate of 3.69%, feed efficiency of 68.5%, an FCR of 1.46, and a survival rate of 100%. Water quality remained within optimal ranges, with temperatures of 31–32 °C, pH 7, and salinity of 30–31 ppt.

Keywords: Asian seabass, feed efficiency, specific growth rate, BPBALP Teluk Buo

ABSTRAK

Kakap putih (*Lates calcarifer*) merupakan salah satu komoditas budidaya yang potensial di UPTD Balai Perikanan Budidaya Air Laut dan Payau (BPBALP) Teluk Buo, Kota Padang, karena memiliki pertumbuhan yang cepat dan daya adaptasi lingkungan yang tinggi. Penelitian ini bertujuan untuk mendeskripsikan teknik pertumbuhan kakap putih yang dibudidayakan di BPBALP Teluk Buo dan dilaksanakan pada bulan Juli hingga September 2025 dengan metode survei deskriptif kuantitatif. Kinerja pertumbuhan dianalisis melalui observasi dan pengukuran langsung. Hasil penelitian menunjukkan pertumbuhan bobot mutlak sebesar 49,45 g, pertumbuhan panjang mutlak 10,19 cm, laju pertumbuhan spesifik sebesar 3,69%, efisiensi pakan 68,5%, nilai FCR 1,46, serta tingkat kelangsungan hidup 100%. Kualitas perairan berada dalam kisaran optimal, dengan suhu 31–32 °C, pH 7, dan salinitas 30–31 ppt.

Kata Kunci: Ikan kakap putih, efisiensi pakan, laju pertumbuhan spesifik, BPBALP Teluk Buo

INTRODUCTION

Marine and Brackish Water Aquaculture Center (BPBALP) Teluk Buo is a center for marine and brackish water commodity breeding and cultivation in Padang City, West Sumatra, strategically located in a coastal area with extensive marine and brackish waters. BPBALP was established to support the development of marine aquaculture to meet high market demand and reduce pressure on natural resources, particularly for Asian seabass (*Lates calcarifer*).

The Asian seabass is one of the leading commodities in the fisheries sector, especially marine aquaculture. It is a freshwater fish with morphological characteristics of an elongated, flat body, a pointed head with a concave upper part, convex in front of the dorsal fin, and a broad caudal fin (Windarto et al., 2019). Asian seabass is a high-value commodity with rapid growth and good environmental adaptation, making it a primary target for aquaculture development in various coastal regions of Indonesia. Indonesia's total Asian seabass production in 2023 was 7,746 tons (BPS, 2025). Market demand for Asian seabass, both domestically and for export, continues to increase every year, in line with shifting consumer preferences towards high-quality animal protein sources with low residue risk. This trend reinforces the urgency of increasing production through intensive farming systems based on biological efficiency and modern feed management (Hadijah et al., 2022).

Several studies have reported on the performance of Asian seabass farming in various systems and management approaches. Imani et al. (2021) reported an absolute length growth of 10.92 cm in an open sea cage system with fish meal feed, while Ibrahim et al. (2024) stated that the best protein efficiency ratio and protein retention were found in bovine testis meal, with the best daily growth, absolute growth, survival, and FCR in Asian seabass fry. Hadijah et al. (2022) found that a feeding rate of 5–8% was able to maintain a survival rate above 90%. However, most of these studies did not emphasize the sustainability of concrete pond-based systems with water quality monitoring and did not examine the depth of the implications of feed efficiency on the economic competitiveness of aquaculture. This highlights the urgency of this research, which is to bridge the data gap between actual biological performance in the field and the long-term sustainability of production systems. Market demand for Asian seabass, both domestically and for export, continues to increase every year, in line with shifting consumer preferences towards high-quality animal protein sources with low residue risk. This trend reinforces the urgency of increasing production through intensive aquaculture systems based on biological efficiency and modern feed management (Hadijah et al., 2022). This study aims to analyze the production performance of Asian seabass farming using concrete ponds at the Marine and Brackish Water Aquaculture Center (BPBALP) Teluk Buo.

RESEARCH METHOD

Time and Place

This research was conducted over a period of 50 days at Marine and Brackish Water Aquaculture Center (BPBALP) Teluk Buo in Padang City, West Sumatra.

Tools and Materials

The tools and materials used in this study included four 8x2 m² enlargement tanks, 10-12 cm Asian seabass with an average weight of 20.4 g, fish feed (by catch fish), aeration installation, digital scales, a DO meter, a pH meter, a thermometer, a grading basin, a siphon tool, a sieve, a meter, a freezer, a camera, and stationery.

Research Prosedure

Preparation of research containers

In this study, the containers used were four 8x2 m² intensive ponds. The preparation stage began with cleaning the walls, bottom, and outlet and inlet pipes to remove bacteria, parasites, and algae attached to the pond walls. After cleaning, the containers were dried in the sun for 24 hours to kill any remaining bacteria. Next, seawater was filled from the reservoir through the inlet pipe. In preparing the containers, one thing that must be considered is the installation of aerators. Each pond is equipped with 5 aerator hose points that function to supply dissolved oxygen to support the respiration needs of the fish during growth.

Seed Distribution

The seeds used are high-quality seeds of uniform size, characterized by proportional seed bodies, with no defects in the fins, eyes, or mouth. The body color of the seeds is bright, the scales are well attached, and there are no signs of wounds or red spots indicating bacterial or fungal infection, and the body movements are active and agile (Masyahoro and Setiawan, 2023). The seeds were obtained from the spawning of Asian seabass fish at the BBBALP Teluk Buo, measuring 10-12 cm with an average weight of 20.4 g, with 100 seeds stocked in each pond.

Feeding

In this study, the feed given was fish meal obtained from fishermen's bycatch. Feeding was based on a feeding rate (FR) of 5% of body weight. The fish used were generally pomfret, with a nutritional content of 17–20% crude protein, 5–12% fat, 5–8% ash, and a moisture content of around 70–75% (NRC, 2011).

Water Quality Monitoring

Water quality observations, including temperature, pH, and DO, were conducted using a thermometer, pH meter, and DO meter three times a week in the morning, afternoon, and evening. The measurement results obtained were compared with SNI standards for Asian seabass farming.

Observed parameters

The parameters analyzed in this study included feed intake, absolute length growth, absolute weight growth, specific growth rate, feed conversion ratio, survival rate, and feed efficiency.

1) **Total Feed Consumption**

According to Pereira et al. (2007), total feed consumption is calculated using the following formula:

$$Total\ feed\ consumption = F1 + F2 + \cdots + Fn$$

Keterangan:
FC = Total feed consumption
F1 = First day feed amount (g)
F2 = Amount of feed on the second day (g)
Fn = Amount of feed on day n (g)

2) **Absolute Length Growth**

Absolute length growth (Lm) is determined based on the absolute length increase of fish in each experimental unit. According to Zonneveld et al. (1991), absolute length growth of fish can be calculated using the following formula:

$$Lm = Lt - Lo$$

Keterangan:
Lm = Absolute length growth
Lt = Average length of fish at the end of observation (cm)
Lo = Average length of fish at the start of observation (cm)

3) **Absolute Weight Gain**

Absolute weight gain (Wm) is determined based on the absolute weight gain of fish in each experimental unit. According to Zonneveld et al. (1991), absolute weight gain of fish is calculated using the following formula:

$$Wm = Wt - Wo$$

Keterangan:
Wm = Absolute weight gain (g)
Wt = Fish biomass weight at the end of observation (g)
Wo = Fish biomass weight at the start of observation (g)

4) **Specific Growth Rate (SGR)**

Specific Growth Rate (SGR) is determined based on the daily growth of fish. According to Effendie (1997), the specific growth rate of fish can be calculated using the following formula:

$$SGR = \frac{(ln\ ln\ Wt\ - ln\ ln\ Wo\ )}{t} \times 100\%$$

Keterangan:
SGR = Specific Growth Rate (%/hari)
Wt = Average weight of fish at the end of observation (g)
Wo = Average weight of fish at the start of observation (g)
t = Maintenance time (hari)

5) **Feed Conversion Ratio (FCR)**

Feed Conversion Ratio (FCR) indicates the total amount of feed required to produce 1 kg of fish. According to Effendie (1997), the Feed Conversion Ratio (FCR) value can be calculated using the following formula:

$$FCR = \frac{F}{(Wt + D) - Wo}$$

Keterangan:
FCR = Feed Conversion Ratio
Wt = Fish biomass weight at the end of observation (g)
Wo = Fish biomass weight at the start of observation (g)
D = Weight of fish that died during maintenance (g)
F = Total amount of feed given (g)

6) Survival Rate (SR)

Survival rate is the ratio between the number of individuals alive at the end of the experiment and the number of individuals at the beginning of the experiment. According to Effendi (1997), the Survival Rate (SR) formula is:

$$SR = \frac{Nt}{No} \times 100\%$$

Keterangan:

SR = Survival rate (%)
Nt = Number of fish at the end of the observation (ekor)
No = Number of fish at the start of the observation (ekor)

7) Feed Efficiency (FE)

Feed efficiency (FE) indicates the percentage of feed intake that contributes to growth in fish weight and length. According to Zonneveld et al. (1991), feed efficiency (FE) can be calculated using the following formula:

$$FE = \frac{(Wt + D)}{F} \times 100\%$$

Keterangan:

FCR = Feed conversion ratio
D = Weight of fish that died during maintenance (g)
F = Total amount of feed given (g)

Data Analysis

The data obtained during the study were tabulated in Microsoft Excel 2016. The parameters of absolute weight gain, absolute length gain, specific growth rate, feed conversion ratio, survival rate, and feed efficiency will be analyzed descriptively and presented in tabular form.

RESULTS AND DISCUSSION

Weight and Length Growth

The results obtained during 50 days of Asian seabass maintenance showed fairly good research variable values. The growth development of Asian seabass, as seen from the length and weight measurements, showed an increase, as can be seen in Figures 1 and 2.

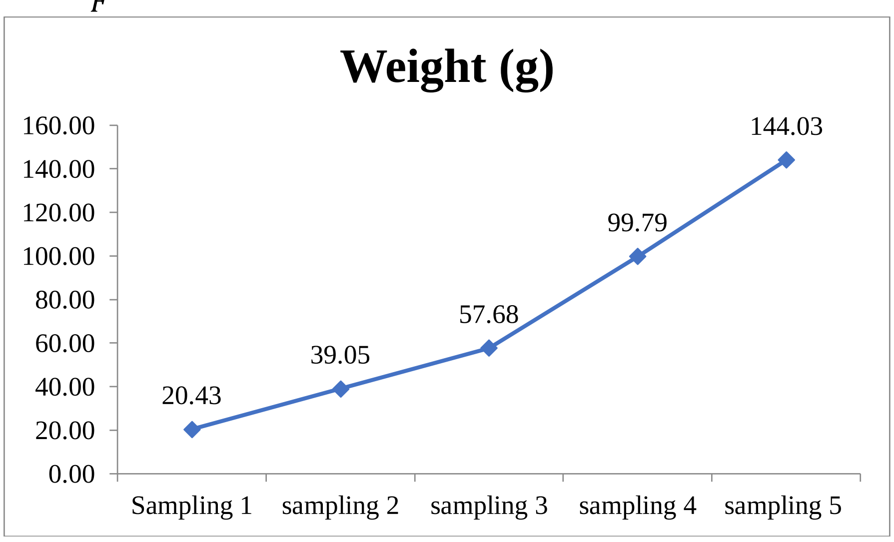

Figure 1. Graph of average weight of Asian seabass Fish (g)
Source: Data Processing

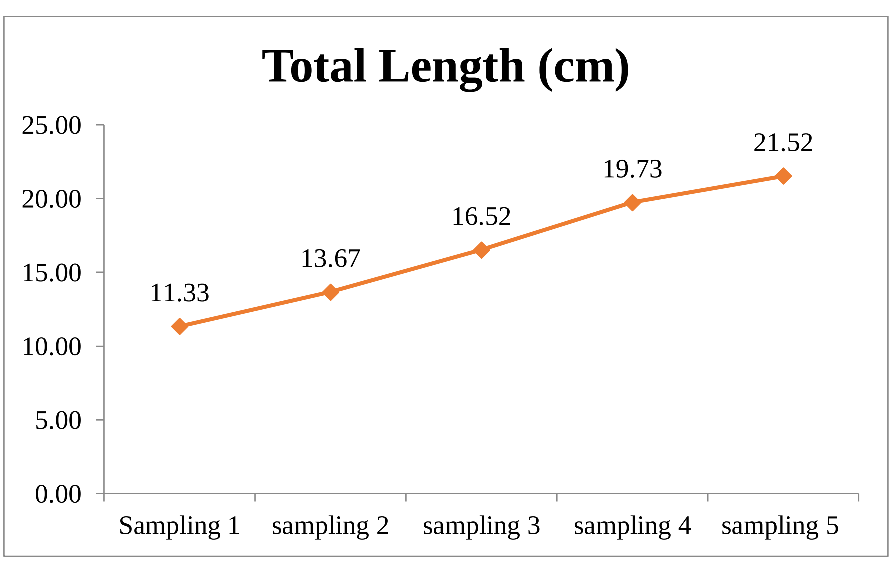

Figure 2. Graph of the average length of Asian seabass Fish (cm)
Source: Data Processing

The growth in weight and length of Asian seabass fish during the internship showed a significant increase during the two-month maintenance period. Based on sampling results conducted every ten days, the average weight of the fish increased from 20.43 g at the start of maintenance to 144.03 g. Meanwhile, the average length increased from 11.33 cm to 21.52 cm at the end of maintenance. The graph in the image above shows a consistent upward trend at each sampling stage, indicating that the fish feed provided was able to support optimal biomass growth. Therefore, based on the growth pattern of Asian seabass in this study, it can be concluded that Asian seabass experienced sufficient weight and size gains.

Feed Consumption

Feed consumption is the total amount of feed eaten by fish during the rearing period. The following data shows the calculation of feed consumption given during 50 days of Asian seabass rearing.

Tabel 1. Amount of Feed During Activities

No	Maintenance Period (hari)	Amount of feed (kg)
1.	0-10	4.08
2.	11-20	7.81
3.	21-30	11.53
4.	31-40	19.95
5.	41-50	28.80
Total		72.17

Source: Data Processing

Feeding in this study was based on FR, which is feeding according to the calculated amount of feed. The amount of feed given was 5% of the seed biomass with a feeding frequency of twice a day (morning and evening). The amount of feed given was adjusted according to the sampling results of the weight development of the Asia seabass. The results showed that the amount of feed given always increased due to the higher weight of the fish, which required more feed. In addition to calculation of feed consumption, the results of other observation variables can be seen in Table 2.

Table 2. Observation results of variables

No	Variable	Unit	Value
1.	Absolute weight gain	g	123.6
2.	Absolute length growth	cm	10.19
3.	Specific growth rate	%/hari	3.69
4.	Survival Rate	%	100
5.	Feed Conversion Ratio (FCR)	-	1.46
6.	Feed Efficiency (FE)	%	68.5

Source: Data Processing

Absolute Weight Gain

Absolute weight gain is the difference between the biomass weight of fish at the end of a given period and the biomass weight of fish at the beginning of that period. This provides an overview of how much weight the fish have gained during the grow-out period. Based on the results of the study, the average weight gain of Asian seabass at the beginning of cultivation was 20.4 g and the average final weight was 144.03 g (Figure 1). Meanwhile, the absolute weight gain of Asian seabass was 123.6 g, which is considered good. This is reinforced by Novriadi et al. (2014), who stated that the specific growth rate and absolute weight gain of Asian seabass during good growth are 0.51%/day and range from 50-60 g.

Absolute Length Growth

Absolute length growth is the difference between the length of the fish from the tip of the head to the tip of the tail at the end of cultivation and the length of the body at the beginning of cultivation. The length of Asian seabass at the beginning of cultivation was 11.33 cm and the final length of the fish was 21.52 cm (Figure 2). Thus, the absolute length growth of Asian seabass was 10.19 cm. This result is considered good and is in line with the research by Imani et al. (2021), which found that the absolute length growth of Asian seabass during the rearing stage should reach 10.92 cm. This is because the feed given was fresh fish offal, which has a high protein content and is suitable for the characteristics of Asian seabass as carnivorous fish, and the water quality management was controlled so that the fish were not stressed and their appetite remained stable.

Specific Growth Rate

The specific growth rate is determined based on the daily growth increase of the fish. Based on the results of the study, the specific growth rate shows a value of 3.69%. A good specific growth rate for Asian seabass is in the range of 2-4% per day, depending on feed management and environmental conditions. This is supported by research conducted by Imani et al. (2021), which found that the specific growth rate of Asian seabass is around 3%, which is classified as a moderate growth rate.

Survival Rate (SR)

Survival Rate (SR) is an important indicator in aquaculture activities used to determine the percentage of fish that survive during a certain maintenance period. The survival rate during the study was 100%. The SR value obtained is supported by previous research conducted by Hadijah et al., (2022), where the survival rate of Asian seabass fry with FR 5% and 8% yielded a very high SR ranging from 90-100%. Based on the SR results obtained, this study is classified as very good for fish survival rates because during the aquaculture activities, water quality, feed, fish health, and the environment were well controlled.

Feed Conversion Ratio (FCR)

FCR is a measure that expresses the ratio of feed required to produce 1 kg of fish. The lower the FCR value, the higher the feed efficiency, which means that fish are able to convert feed into biomass more effectively (Adi & Nilwan, 2024). The calculation results obtained an FCR value of 1.46, which indicates that 1.46 kg of feed is needed to produce 1 kg of fish weight gain. This result is also close to the FCR value obtained by Sukmawati (2020) of 1.42 in a KJA cultivation system with fresh fish-based feed. In other words, 68.5% of the feed given was successfully utilized by the fish to produce meat, while the rest was lost in the form of energy, waste, or uneaten feed. This value is considered quite good and efficient, as the ideal FCR range for many types of farmed fish is usually between 1.2 and 2.0.

Feed Efficiency

Feed Efficiency (FE) is a parameter in aquaculture used to measure how much of the feed provided can be utilized by fish for their growth. FE values are usually expressed as a percentage, calculated from the ratio between the increase in fish biomass weight and the total amount of feed provided. An EP value of 68.5% is classified as near-optimal feed efficiency. This means that of all the feed provided, approximately 68.5% was successfully utilized by the fish to increase their body weight, while the remaining 31.5% was lost in the form of energy for fish activity, waste, or uneaten feed. According to the classification of feed efficiency in aquaculture, an EP value in the range of 50–90% is considered good (NRC, 2011), so the results of this study indicate an optimal level of efficiency. This is in line with the results of a study by Pratama et al. (2020) on Asian seabass, which obtained an EP of 70.71% when fed the optimal amount of feed.

Water Quality

Good water quality will support the success of Asian seabass farming activities. To maintain optimal water quality, it is important to monitor water quality regularly. Water quality measured in Asian seabass farming includes pH, temperature, and DO. The results of water quality measurements in the broodstock pond can be seen in Table 3.

Tabel 3. Hasil pengukuran kualitas air

No	Parameter	Result	SNI
1.	Temperature (°C)	31 - 32 °C	28 - 32 °C
2.	Salinity (ppt)	30-31 ppt	27.5 - 34 ppt
3.	pH	7	7 - 8.5

Source: Data Processing

Based on the measurement results obtained in Table 3, the water quality during the Asian seabass cultivation period shows that the water quality parameters are still in good condition. The temperature measurements obtained ranged from 31-32 °C, which is still tolerable in the Asian seabass farming environment. This is in accordance with the opinion of Putra and Maman (2014), where the optimal temperature range for Asian seabass farming is between 28-32°C. The salinity measurement results obtained ranged from 30-31 ppt. This is in accordance with the opinion of Hendriansyah et al. (2018), where the appropriate salinity for Asian seabass cultivation is 28-35 ppt. Meanwhile, the pH range obtained in this study was 7. The results showed ideal values, thus providing good results for Asian seabassgrowth. According to Hardianti et al. (2016), the ideal pH range for Asian seabass cultivation is 7-8.5. Overall, the water quality measurement results for Asian seabass cultivation show good results and support Asian seabass growth at the BPBALP Teluk Buo, Padang City, West Sumatra.

CONCLUSION

The production performance of Asian seabass farming using concrete ponds resulted in a weight gain of 123.6 g and a length gain of 10.19 cm, a survival rate of 100%, feed utilization efficiency of 68.5%, an FCR value of 1.46, and a specific growth rate of 3.69%/day.

RECOMMENDATIONS

Based on these findings, further research is recommended to evaluate the long-term sustainability and scalability of Asian seabass farming in concrete ponds by examining different stocking densities, feeding strategies, and culture durations. Future studies should also incorporate water quality dynamics and economic analyses to determine optimal management practices that can enhance growth performance, maintain high survival rates, and improve feed efficiency while ensuring cost-effectiveness and environmental sustainability of the production system.

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REFERENCES

Adi, C. P., & Nilwan, T. (2024). Teknik pemeliharaan benih ikan kakap putih (*Lates calcarifer*) di Balai Perikanan Budidaya Air Payau (BPBAP) Situbondo (Techniques for maintaining Asian seabass (*Lates calcarifer*) seeds at the Situbondo Brackish Water Aquaculture Center (BPBAP). Cendekia: Jurnal Ilmu Pengetahuan, 4(2), 203–211.

BPS (Badan Pusat Statistik). (2025). Produksi Perikanan Budidaya Menurut Komoditas Utama (Ton), 2023 (Aquaculture Production by Main Commodity (Tons), 2023). BPS RI

Chudasama, R. V., Patel, P. H., Bhola, G. K., Zala, N. A., & Devaliya, J. D. (2023). A short review of Asian Seabass (*Lates calcarifer*) cultivation, Ind. J. Pure App. Biosci. 11(3), 17-35. doi: http://dx.doi.org/10.18782/2582-2845.8980

Divu, D. N., Mojjada, S.K., Sudhakaran PO, Sundaram, S. L. P, Menon, M., George, G., Tade, M. S, Mojjada R. K., Radhakrishnan K.,Vishwambharan, V.S., Shree, J., Subramanian, A,, Ignatius, B., Raghavan, S. V. and Gopalakrishnan, A. (2024) Implications of feed and seed costs in Asian seabass mariculture in the face of climate change. Front. Sustain. Food Syst. 8:1352131. doi: 10.3389/fsufs.2024.1352131

Effendie, M. I. (1997). Biologi Perikanan (Fisheries Biology). Yayasan Pustaka Nusantara, Yogyakarta.

Hadijah, S., Abubakar, J., Hamdilah, A., and Yunus, M. (2022). Analisis penggunaan keong emas sebagai pakan untuk mensubtitusi pellet pada ikan kakap putih (*Lates calcarifer*) (Analysis of the use of golden snails as feed to substitute pellets in Asian seabass (*Lates calcarifer*)). Journal of Indonesian Tropical Fisheries, 5(1), 12–26.

Hardanu, W., Hanggono, B., Suriawan, A., Mahardika, K., Syahidah, D., Subaidah, S., Sumarwan, J., Muzaki, A., Ismi S., Mastuti I., Astuti N. W. W., Zafran, Suprapto R., Dharma T. S., Mindarwati E., (2025). Growth performance, survival rate and economic efficiency of barramundi cultured in HDPE-lined ponds with high densities. AACL Bioflux 18(1):477-488

Hardianti, Q., Rusliadi., Mulyadi. (2016). Effect Of feeding made with different composition on growth and survival seeds of Barramundi (*Lates calcarifer*, Bloch). Faculty of Fisheris and Marine Science University of Riau

Hendriansyah, A., Putra, W. K. A., Miranti, S. (2018). Rasio konversi pakan benih ikan kerapu cantang (Epinephelus fuscoguttatus x Epinephelus lanceolatus) dengan pemberian dosis recombinant growth hormone (rGH) yang berbeda (Feed Conversion Ratio of Grouper Fry (Epinephelus fuscoguttatus x Epinephelus lanceolatus) with Different Doses of Recombinant Growth Hormone (rGH)). Jurnal Intek Akuakultur. 2 (2): 1-12.

Ibrahim, I., Budi, S., Mulyani, S. (2024). Performa pertumbuhan dan sintasan benih ikan kakap putih *Lates Calcarifer* dengan sumber protein yang berbeda (Growth performance and survival of Asian seabass *Lates Calcarifer* fry with different protein sources). J. of Aquac. Environment, 6(2): 90-95, Juni 2024 DOI: 10.35965/jae.v6i2.2720

Imani D. N., Santoso L., Supriya. (2021). Peforma pertumbuhan ikan kakap putih (*Lates calcarifer*) pada fase pembesaran yang diberi pakan dengan penambahan lisin berbeda (Growth performance of Asian seabass (*Lates calcarifer*) in the grow-out phase fed diets supplemented with different levels of lysine). Jurnal Akuakultur, 6(1)

Masyahoro, A., Setiawan, M.A.D. (2023). G rowth of Asian Seabass (*Late calcarifer*, Bloch 1790) fry at various salinitiesand shrimp head waste feed doses in controlled containers. Jurnal Ilmiah AgriSains. 24 (2): 103-113.

Novriadi, R., T. Hermawan., Ibtisam, Dikrurrahman, M. Kadari., M. Herault., V. Fournier., P. Seguin. (2014). Kajian respons kekebalan tubuh dan performa pertumbuhan ikan kakap putih *Lates calcarifer* Bloch melalui Suplementasi Protein Hidrolisis pada Pakan (Study of immune response and growth performance of Asian seabass *Lates calcarifer* Bloch through hydrolyzed protein supplementation in feed). Jurnal Akuakultur Indonesia. 13(2): 182 191.

NRC (National Research Council). (2011). *Nutrient Requirements of Fish and Shrimp*. The National Academies Press, Washington, D.C.

Pereira, L., Riquelme, T., & Hosokawa, H. (2007). Effect of three photoperiod regimes on the growth and mortality of the Japanese abalone (*Haliotis discus hanaino*). Skripsi. Kochi University, Aquaculture Department, Laboratory of Fish Nutrition, Japan, p. 763-767

Putra dan Manan. (2014). Monitoring Kualitas Air Pembesaran Pada Tambak. Jurnal Ilmiah Perikanan dan Kelautan (Monitoring Water Quality in Fish Ponds. Scientific Journal of Fisheries and Marine Sciences). 6 (2)

Sukmawati, H. (2020). Pembenihan Dan Pembesaran Ikan Kakap Putih *Lates Calcarifer* Di Balai Besar Riset Budidaya Laut Dan Penyuluhan Perikanan, Gondol, Bali. (Breeding and rearing of Asian seabass Lates Calcarifer at the Center for Marine Aquaculture Research and Fisheries Extension, Gondol, Bali). Skripsi. Institut Pertanian Bogor. Bogor.

Takeuchi, T.1988. Laboratory Work Chemical Evaluation of Dietary Nutrients. In: Fish Nutrition and Mariculture.T. Watanabe (Ed.). Departement of Aquatic Bioscience. Tokyo University of Fisheries. JICA : 179-225

Walusi, R. 2019. Pengaruh Padat Tebar Terhadap Pertumbuhan Dan Kelulushidupan Benih Ikan Kakap Putih (*Lates calcarifer* Bloch, 1790) (The effect of stocking density on the growth and survival of Asian seabass fry (*Lates calcarifer* Bloch, 1790)). Skripsi. Riau, Fakultas Perikanan Dan Ilmu Kelautan. Pekanbaru

Windarto, S., Hastuti, S., Subandiyono, S., Nugroho, R. A., & Sarjito, S. (2019). Performa Pertumbuhan Ikan Kakap Putih (*Lates Calcarifer*

Bloch, 1790) Yang Dibudidayakan Dengan Sistem Keramba Jaring Apung (KJA) (Growth Performance of Farmed Asian seabass (*Lates calcarifer Bloch*, 1790) Using Floating Net Cage Systems (KJA). Sains Akuakultur Tropis, 3(1).

Zonneveld NEA, Huisman, Boon JH. 1991. Prinsip-prinsip budidaya ikan (Principles of fish farming). Jakarta: Gramedia pustaka utama.