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GROWTH AND MAINTENANCE OF BARRAMUNDI (Lates Calcarifer) FED WITH COMMERCIAL FEED AT BPBAP SITUBONDO

Pertumbuhan Dan Pemeliharaan Ikan Kerapu (Lates calcarifer) Yang Diberi Pakan Komersial Di BPBAP Situbondo

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ABSTRAK

Penelitian ini mengevaluasi kinerja pertumbuhan dan pemeliharaan ikan kerapu (*Lates calcarifer*) yang diberi pakan komersial di BPBAP Situbondo. Sebagai komoditas akuakultur bernilai tinggi dengan permintaan pasar yang terus meningkat, budidaya ikan kerapu menghadapi tantangan dalam produksi benih dan optimalisasi pertumbuhan. Penelitian ini memantau parameter pertumbuhan, tingkat kelangsungan hidup (SR), dan kualitas air selama periode pemeliharaan 4 bulan (Februari-Juni 2024) di bak beton (2,5×4×1,2 m). Hasil penelitian menunjukkan bahwa pakan komersial (Megami/Skretting) yang diberikan melalui metode ad-satiation (3-4x/hari untuk juvenil <7cm, 2x/hari untuk ikan 8-14cm) mendukung pertumbuhan, meskipun variasi ukuran memicu kanibalisme. Parameter kualitas air tetap optimal (pH 7,49-8,17; salinitas 33-34‰; amonia 0,011-0,026 mg/L) per standar SNI 8036:2014, yang berkontribusi pada 83,98% SR. Temuan utama menekankan peran penting pemeringkatan rutin untuk mencegah kanibalisme, manajemen pakan yang ketat untuk meminimalkan akumulasi limbah beracun (TAN mencapai puncaknya pada 1,397 mg/L), dan penggantian air harian (penggantian 100%). Studi ini menyimpulkan bahwa manajemen pakan-air terpadu secara signifikan meningkatkan produktivitas ikan kerapu putih, merekomendasikan penelitian lebih lanjut tentang formulasi pakan khusus nutrisi dan sistem filtrasi canggih untuk mengatasi tingkat kematian 16%.

ABSTRACT

This study evaluated the growth performance and maintenance of white seabass (*Lates calcarifer*) fed with commercial feed at BPBAP Situbondo. As a high-value aquaculture commodity with increasing market demand, white seabass farming faces challenges in seed production and growth optimization. The research monitored growth parameters, survival rate (SR), and water quality during a 4-month rearing period (February-June 2024) in concrete tanks (2.5×4×1.2 m). Results showed that commercial feeds (Megami/Skretting) administered via *ad-satiation* method (3-4x/day for juveniles <7cm, 2x/day for 8-14cm fish) supported growth, though size variation triggered cannibalism. Water quality parameters remained optimal (pH 7.49-8.17; salinity 33-34‰; ammonia 0.011-0.026 mg/L) per SNI 8036:2014 standards, contributing to an 83.98% SR. Key findings emphasize the critical role of routine grading to prevent cannibalism, strict feed management to minimize toxic waste accumulation (TAN peaked at 1.397 mg/L), and daily water exchange (100% replacement). The study concludes that integrated feed-water management significantly enhances white seabass productivity, recommending further research on nutrient-specific feed formulations and advanced filtration systems to address the 16% mortality rate.

Kata Kunci	*Ikan Kerapu Putih, Pakan Komersial, Kinerja Pertumbuhan, Kualitas Air, Kelangsungan Hidup*
Keywords	*White Seabass, Commercial Feed, Growth Performance, Water Quality, Survival Rate*
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INTRODUCTION

Barramundi (*Lates calcarifer*) is a strategic fisheries commodity with increasing market demand, both nationally and internationally. As a premium seafood, barramundi contains 20% protein, 5% fat, and high omega-3 levels (Sahputra et al., 2017). However, production still faces significant challenges, with 70% of supply relying on declining wild catches (KKP, 2017). This situation underscores the need for intensive aquaculture development, particularly in growth and nursery rearing using commercial feed, which is the focus of this study at BPBAP Situbondo.

The nursery and growth phases of barramundi play a critical role in determining aquaculture success. Research at BPBAP Situbondo indicates that the use of commercial feed (Megami/Skretting) with an ad satiation feeding method can optimize length growth, though challenges such as size variation leading to cannibalism persist. This aligns with the findings of Juharni (2022), who stated that fish growth is influenced not only by feed quality but also by husbandry management factors such as regular grading and water quality control. In this context, research on growth patterns and rearing techniques becomes highly relevant.

BPBAP Situbondo, as a leading brackishwater aquaculture center, has developed an intensive rearing system with strict water quality parameter controls (Kusumanti et al., 2022). Research data show that key parameters—pH (7.49–8.17), salinity (33–34‰), and ammonia levels (0.011–0.026 mg/L)—were maintained within optimal ranges according to SNI 8036:2014. However, challenges remain due to fluctuations in nitrite (0.006–0.028 mg/L) and total ammonia nitrogen (TAN: 0.159–1.397 mg/L), affecting survival rates (83.98%). These conditions indicate the need for feed management refinements.

Commercial feed, as the primary variable in this study, shows promising results in supporting fish growth but also presents challenges. Firdausi and Mubarak (2021) warn that overfeeding increases residual feed accumulation, which converts into toxic compounds. Meanwhile, Santika (2021) emphasizes the importance of matching feed pellet size to fish mouth size (B2 for fry <7 cm, B3 for fry 8–14 cm). These findings highlight the need for a comprehensive evaluation of commercial feeding strategies at BPBAP Situbondo, including feeding frequency (3–4 times/day for small fry, 2 times/day for larger fry).

This study on barramundi growth and rearing with commercial feed at BPBAP Situbondo holds dual significance. The objectives are: To evaluate the length growth of barramundi fed commercial feed during the rearing period, To analyze the survival rate of barramundi fry in the nursery system, To monitor water quality (pH, salinity, nitrite, and ammonia) to ensure optimal growth conditions. Additionally, this study aims to identify critical factors such as cannibalism, feed management, and grading techniques that influence aquaculture success.

METHODS

Study Site and Preparation

The research was conducted at the Brackishwater Aquaculture Development Center (BPBAP) in Situbondo, East Java, from February 19 to June 21, 2024. This location was selected due to its comprehensive facilities and resources for rearing barramundi (*Lates calcarifer*) and supporting data collection processes.

Materials and Equipment

The study utilized equipment categorized by function: grading tools (benches, basins, buckets, fish sieves), supporting instruments (aeration systems, thermometers, cleaning supplies), and materials including rearing media (seawater/freshwater), barramundi fry, water quality maintenance agents (activated charcoal), disinfectants, commercial feed, and harvest supplies (ice, packing plastics).

Rearing Tank Preparation

Concrete rectangular tanks (2.5 m × 4 m × 1.2 m; 12,000 L capacity) with light-blue painted interiors and rounded corners were used to minimize waste accumulation and optimize water circulation. Each tank featured inlet/outlet channels and approximately 10 aeration points to maintain dissolved oxygen levels. Prior to use, tanks underwent rigorous cleaning with detergent solution and scrubbing to remove algal growth, followed by disinfection with 100 ppm chlorinated lime (60% active chlorine). After air-drying to eliminate pathogens, tanks were thoroughly rinsed to remove residual disinfectant.

Water Management System

Sterilized tanks were filled with filtered seawater from the Madura Strait, processed through a multi-stage filtration system (pumice, gravel, activated charcoal, sand, and palm fiber) to remove physical, chemical, and biological contaminants (Firdausi, 2021). Activated charcoal was particularly effective for eliminating bacteria and pathogens. Continuous aeration was maintained to ensure oxygen saturation. The nursery protocol encompassed tank preparation, fry stocking, feed management, water quality control, disease prevention, size grading, growth monitoring, and harvest procedures.

Fry Stocking and Feed Management

Data Collection

Data were collected through two primary approaches. Primary data were obtained through direct observation of research subjects, interviews with relevant stakeholders at the research site, and active researcher participation in all cultivation processes. Secondary data were gathered from various literature sources including books, journals, research reports, and online publications to supplement and verify field data.

Fry Stocking Procedures

The nursery phase commenced with fry stocking using barramundi (*Lates calcarifer*) fingerlings sourced from the hatchery division of BPBAP Situbondo. Stocking was conducted in the morning hours to minimize stress on fry, as lower morning temperatures help prevent thermal fluctuations that could induce stress and increase susceptibility to bacterial infections (Muarif, 2016).

Prior to transfer from hatchery to nursery units, fry underwent rigorous selection. According to Faizin (2022), healthy fry were identified through visual assessment and stress resistance tests. Selection criteria included: uniform size, disease-free condition, active swimming behavior, positive feeding response, bright scales, and absence of physical deformities. Visual examination focused on movement patterns, body shape, and fin condition.

Fry (3-4 cm) were stocked at a density of 1 individual/L, totaling 2,500 fry per rectangular concrete tank (2.5 m × 4 m × 1.2 m). Temperature acclimation was performed for approximately 15 minutes prior to stocking to reduce stress and mortality rates.

The nursery utilized commercial sinking pellets (Megami and Skretting brands), with size specifications matched to fish mouth gape:

- B2 (2 mm) for fry <7 cm
- B3 (3 mm) for fry 8-14 cm

Feeding frequency was adjusted based on developmental stage:

- 3-4 times daily for 3-7 cm fry
- 2 times daily (10:00 and 15:00 WIB) for >7 cm fry

Feed ration was calculated at 5-7% of biomass, considering age, weight, mouth size, and total biomass. The ad-satiation feeding method was employed, where feed was administered incrementally until satiation was observed (cessation of feeding response), ensuring complete consumption without residual accumulation that could compromise water quality.

Growth Monitoring

Growth parameters were assessed weekly for four weeks by measuring body length (n=10 fish/tank) using a calibrated measuring pipe. Regular sampling enabled tracking of growth performance and identification of size variations to prevent cannibalism through timely size grading.

Harvesting Procedures

The nursery phase aimed to grow barramundi (*Lates calcarifer*) fry from initial stocking size to marketable size (8-15 cm) or according to buyer specifications. At BPBAP Situbondo, harvesting was conducted only upon buyer request, utilizing two distinct transport systems: open and closed methods. Prior to harvest, fry were fasted for 1-2 days to reduce metabolic activity (a process known as conditioning), thereby maintaining water quality during transport by minimizing ammonia production from excretion (Sifatullah, 2023).

Harvesting Protocol:

Tank water was gradually lowered to 30 cm depth. Fry were collected using dip nets and sorted by size at counting stations. For closed systems: Fry were packed in oxygenated plastic bags (30-40 cm water height, 1/3 bag volume). Stocking density: 100-150 fry/bag (8-9 cm size). Water treatment: Temperature reduced to 24°C using ice and activated charcoal added to bind toxic compounds. Oxygenation: Ambient air replaced with pure oxygen (2/3 bag volume). Packed fry were placed in insulated polystyrene boxes with ice packs. Boxes were sealed with tape and covered with tarpaulins for weather protection

Open System Transport

Utilized aerated tanks ("blong") filled with ambient water, following similar pre-harvest procedures. After counting, fry were transferred directly to transport tanks containing aerated water, with subsequent addition of ice and activated charcoal matching the closed system protocol. *Closed system* has advantage due to superior water quality control and stress reduction (Sifatullah, 2023). While, *Open system* has advantage for Cost-effective but higher disease/stress risks.

Water Quality Management

Water quality management represents a critical component in barramundi (*Lates calcarifer*) nursery operations, serving both as a growth medium and limiting factor for successful aquaculture. Optimal water conditions must maintain physical, chemical, and biological parameters within species-specific requirements (Faizin, 2022). Key influencing factors include: Source water contaminants, Accumulated feed residues and fecal matter, Weather-dependent water parameter fluctuations, Oxygen solubility determinants (pH, salinity, temperature, and organic content) (Sidabutar et al., 2019)

Operational Protocols at BPBAP Situbondo:

1. **Daily water exchange** (07:00-10:00 WIB): Complete (100%) system replacement with pre-filtered seawater. Concurrent tank scrubbing to remove organic deposits
2. **Drainage system operation**: Strategic pipe removal creates hydraulic pressure for complete waste expulsion. System reassembly and refilling with filtered seawater/freshwater blend
3. **Filtration process**: Multi-stage filtration of Madura Strait seawater and Mechanical removal of particulate matter

Data Analysis Methodology

A dual analytical approach was implemented: **Descriptive analysis** (Aulia & Diamahesa, 2024; Nisa et al., 2024): Comprehensive process documentation and Qualitative evaluation of operational protocols**. Quantitative statistical analysis**: Manual calculations with Microsoft Excel verification. Key performance indicators: Growth, Survival Rate (%), Water quality parameters: pH and salinity ranges, Nitrite concentrations, Total Ammonia Nitrogen (TAN), Free ammonia levels. This integrated analytical framework ensured both procedural accuracy and robust evaluation of cultivation outcomes, with Excel-based validation enhancing data reliability. The methodology aligns with contemporary aquaculture research standards as demonstrated by Diamahesa & Masumoto (2023) and related studies.

RESULTS AND DISCUSSION

Result

Growth Performance

The longitudinal growth of barramundi (*Lates calcarifer*) fed with commercial feed is presented in **Figure 1**.

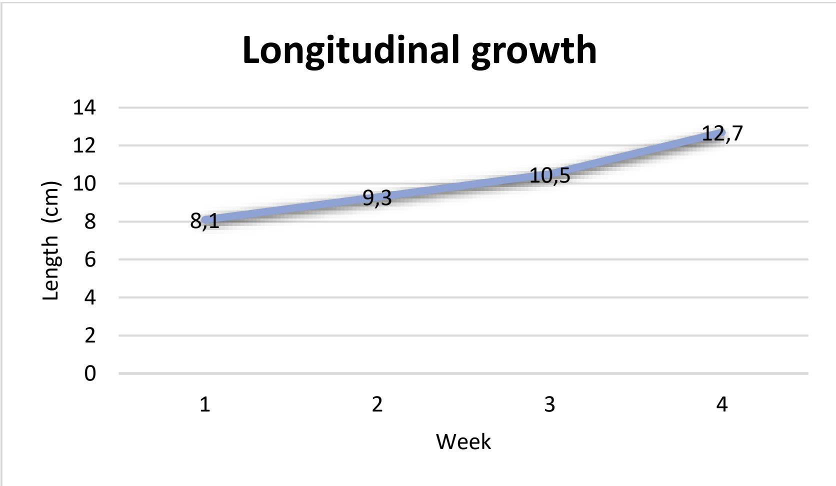

Figure 1. Length growth of barramundi (Lates calcarifer) fed with commercial feed

Water Quality Parameters

Water quality monitoring results during the one-month rearing period at BPBAP Situbondo are summarized in Table 1.

Table 1. Water quality monitoring data

No.	Parameter	Unit	Standard Requirement *)	Results			
				Week 1	Week 2	Week 3	Week 4
1.	pH	-	7,5-8,5	7,49	8,17	7,86	7,89
2.	Salinity	$^{0}/_{00}$	28-33	33	33	33	34
3.	Nitrite (NO_2^-)	mg/L	<1	0,012	0,006	0,028	<0,001
4.	TAN	mg/L	-	1,397	0,159	0,422	0,433
5.	Free Ammonia	mg/L	<0,3	0,026	0,011	0,014	0,015

*) *Based on SNI 8036.1:2014 for hybrid grouper (Epinephelus fuscoguttatus* × Epinephelus lanceolatus).*

Survival Rate (SR)

The survival rate (SR) of barramundi was calculated as follows:

SR *(Survival Rate)*

$$SR = \frac{\mathrm{Nt}}{\mathrm{N0}} \times 100\%$$

$$= \frac{80.005}{95.265} \times 100\% = 83{,}98\%$$

Where:

- N_t = Final number of fry after rearing
- N_0 = Initial number of stocked fry

Discussion

The longitudinal growth of barramundi (*Lates calcarifer*) fed commercial feed demonstrated satisfactory performance (Figure 1), confirming the nutritional adequacy of the formulated diet. However, as noted by Juharni (2022), while feed quality is paramount, growth rates are concurrently influenced by consumption quantity, water quality parameters, and the fish's genetic-physiological characteristics. Our findings align with contemporary aquaculture studies emphasizing multifactorial growth determinants.

Regular size-grading emerged as a critical husbandry practice, effectively mitigating cannibalism and unequal feeding competition. Sifatullah (2023) corroborates that periodic sorting prevents physical damage while promoting uniform growth, as dominant specimens often monopolize feed resources. The absence of grading protocols invariably results in growth suppression among smaller individuals due to trophic competition.

The 83.98% survival rate (SR) indicates generally favorable rearing conditions, though the 16% mortality warrants investigation. Potential causative factors include: Size-dependent aggression (cannibalism), Pathogen exposure, Suboptimal environmental fluctuations. This contrasts with Fitrinawati & Astuti's (2023) 100% SR in floating net cages, likely attributable to their use of larger stocking size (10-16 cm). Juharni (2022) emphasizes that survival rates directly reflect husbandry quality, particularly stocking density, feed management, and water quality control.

Water quality parameters remained within optimal ranges throughout the trial (Table 1): pH: 7.49-8.17 (Saputra & Eko 2020's recommended 7-9 range for marine aquaculture). Salinity: 33-34‰ (Astuti 2023's optimal 15-34 ppt for barramundi.Toxic compounds: Nitrite: <0.001-0.028 mg/L and Free ammonia: 0.011-0.026 mg/L (below 0.3 mg/L toxicity threshold)

Notably, ammonia concentrations, while within safe limits, require vigilance given their oxygen-depleting potential and ecosystem destabilization risks at elevated levels (Hamuna et al. 2018). Azhari & Tomasoa (2018) further caution that suboptimal pH reduces dissolved oxygen, increasing respiratory stress and suppressing appetite.

Feed management proved pivotal in cultivation success. Santika (2021) underscores the necessity of nutritionally complete, size-appropriate formulations matching fish mouth gape. Our ad-satiation feeding protocol (Firdausi & Mubarak 2021) minimized residual feed accumulation, while vitamin supplementation (Rifai et al. 2022) enhanced immunological resilience.

CONCLUSION

The study demonstrates that: Commercial feeds effectively support barramundi growth when complemented by optimal water quality (pH 7.49-8.17; salinity 33-34‰ per SNI standards). The 83.98% SR reflects competent husbandry, though further reductions in cannibalism- and stress-related mortality are achievable. Key success factors include: Routine size-grading, Ad-satiation feeding regimes, and Daily water exchange protocols.

For enhanced productivity, we recommend: Genetic selection of superior broodstock, Intensive disease prevention measures, Stocking density optimization, Advanced water filtration technologies, Species-specific feed formulations.

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