



## Biochemical Composition of Selected low value fish species from Visakhapatnam Fishing Harbour

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**ABSTRACT:** Understanding the biochemical composition of marine fishes is important for evaluating their nutritional value, ecological role, and suitability for human consumption. The present study examined the biochemical characteristics of three commercially important marine species namely, *Thryssa mystax*, *Upeneus sulphureus*, and *Priacanthus hamrur*. Key components such as protein, lipid, and carbohydrate content were analyzed in the species.

The results showed clear differences in nutrient composition between the three fishes. *Thryssa mystax* contained relatively high protein levels with moderate lipid content, which may be related to its active pelagic lifestyle. *Upeneus sulphureus* showed comparatively higher lipid content, suggesting a greater capacity for energy storage associated with its benthic feeding habits. *Priacanthus hamrur* exhibited a more balanced biochemical profile, with moderate levels of protein, lipids, and carbohydrates, reflecting its adaptable feeding behavior. The observed variations highlight how feeding patterns, habitat, and environmental conditions influence biochemical composition. Overall, the findings provide useful information for fisheries management, nutritional evaluation, and potential applications in aquaculture and food industries.

**KEYWORDS:** Biochemical composition, *Thryssa mystax*, *Upeneus sulphureus* and *Priacanthus hamrur*.

### INTRODUCTION

Marine fisheries across the world generate a substantial proportion of low-value, non-target, juvenile, and incidental catch commonly referred to as marine trash fish. Although the term “trash” suggests little worth, these organisms collectively represent a significant fraction of marine biomass and nutrient flow within coastal ecosystems. Globally, bycatch and low-value fish constitute millions of tonnes annually, much of which is either discarded or diverted to low-end uses such as fish meal production (FAO, 2022). From both a nutritional and sustainability perspective, this underutilized resource warrants careful biochemical evaluation rather than neglect.

The biochemical composition of marine trash fish particularly their protein, lipid, moisture, ash, amino acid, and fatty acid profiles provides critical insight into their true biological and economic value. Marine fish are widely recognized as rich sources of high-quality protein containing balanced essential amino acids, as well as long-chain polyunsaturated fatty acids (LC-PUFAs) such as EPA and DHA, which are associated with cardiovascular and cognitive health benefits (Calder, 2015; Mohanty et al., 2016). Even species that are commercially undervalued may possess comparable nutritional richness. Without systematic biochemical analysis, such potential remains scientifically undocumented and practically untapped.

In many developing nations, including India, fish contribute significantly to dietary protein intake and micronutrient security (FAO, 2022). Reassessing marine trash fish through biochemical characterization may reveal opportunities to convert them into affordable protein sources for nutritionally vulnerable populations. Studies have demonstrated that several low-value marine species contain appreciable levels of digestible protein and essential minerals, suggesting that their categorization as “trash” often reflects market perception rather than nutritional inadequacy (Mohanty et al., 2016). Thus, biochemical evaluation can challenge conventional classifications and promote resource revalorization.

Beyond direct human nutrition, the aquaculture sector heavily depends on trash fish for the preparation of raw feed, fish meal, and fish oil. However, feed efficiency and growth performance of cultured shrimp and finfish are directly influenced by the amino acid balance, lipid quality, and energy content of feed ingredients (Tacon & Metian, 2015). Inadequate biochemical profiling may result in suboptimal feed formulation, leading to economic losses and environmental burdens through nutrient wastage. Therefore, detailed compositional studies are essential for developing nutritionally precise and environmentally responsible aquaculture feeds.



The biochemical attributes of marine trash fish also influence post-harvest quality and preservation strategies. High moisture content accelerates microbial spoilage, while elevated lipid levels increase susceptibility to oxidative rancidity (Huss, 1995). The characterization of amino acid and fatty acid profiles allows researchers and feed technologists to design feed formulations for aquaculture species notably shrimp and finfish ensuring balanced nutrition and optimal growth (Yadav et al., 2025). In parallel, advances in sustainable feed development emphasize valorizing all available biomass, including fish waste streams, to reduce reliance on finite wild fish stocks traditionally harvested for fishmeal (Yadav & Paul et al., 2025). Knowledge of proximate composition thus aids in selecting appropriate processing methods such as drying, freezing, fermentation, or ensiling. This scientific understanding reduces post-harvest losses, enhances product stability, and supports value-added processing.

Moreover, evaluating biochemical composition contributes to sustainable fisheries management. Discarding large quantities of bycatch not only wastes nutrients but also disrupts trophic dynamics and ecosystem efficiency (Kelleher, 2005). By identifying nutritional and industrial applications for marine trash fish, fisheries can transition toward more holistic utilization models that minimize waste and align with blue economy principles. Resource optimization, supported by compositional analysis, transforms bycatch from an ecological liability into a productive asset.

In a broader scientific context, biochemical profiling also provides insight into seasonal variation, feeding ecology, reproductive status, and environmental adaptation of marine organisms. Variations in lipid reserves, for instance, often reflect spawning cycles or environmental stress (Love, 1980). Traditionally overlooked, these species represent a large proportion of coastal marine catch and constitute a potentially valuable source of macro- and micronutrients (Roy et al., 2023). Evaluating their biochemical composition including protein levels, lipid profiles, essential amino acids, fatty acids, ash, and micronutrient content is critical for transforming them from perceived waste to meaningful biological resources. Thus, compositional studies extend beyond economic valuation to ecological and physiological interpretation. Recent research highlights that many marine by-products once considered “trash” contain high-quality proteins and bioactive compounds with antioxidant, antimicrobial, and anti-inflammatory properties (Prabha & Srija, 2025). Such biochemical profiling reveals not only nutritive value but also functional biomolecules that hold promise for use in human nutrition, aquaculture feeds, and health-enhancing ingredients. Without detailed analytical data, the true potential of these resources remains obscured, perpetuating inefficient utilization patterns in marine fisheries.

Thus, the evaluation of the biochemical composition of marine trash fish is not merely a laboratory exercise but a foundational step toward nutritional security, feed optimization, post-harvest management, sustainable fisheries, and ecosystem-based resource utilization. What is traditionally dismissed as waste may, through rigorous biochemical assessment, emerge as a strategically important component of marine food systems.

The primary objective of the present study was to quantitatively evaluate the major biochemical constituents of muscle tissue by estimating total protein, carbohydrate, and lipid content using standard and widely accepted analytical methods. *Thryssa mystax* is a small pelagic marine fish commonly occurring along the Visakhapatnam coast. Seasonal and monthly variations in biochemical composition are closely associated with feeding intensity, reproductive cycle, environmental factors, and energy metabolism. Understanding month-wise fluctuations in protein, lipid, carbohydrate content helps in assessing nutritional value, reproductive physiology, and potential for value addition.

## MATERIALS AND METHODS

Fresh low commercial value fishes namely *Thryssa mystax*, *Upeneus sulphureus* and *Priacanthus hamrur* were collected from the Visakhapatnam harbour during the study period of January 2025 to December 2025. The collected samples were immediately transported for further analysis.

### Biochemical estimation

The biochemical constituents of the muscle tissue were quantified using well-established analytical procedures to ensure accuracy and reliability. The total protein content was determined by adopting the classical Lowry's method (1951), a widely accepted and sensitive technique for estimating protein concentration in biological samples. Carbohydrate levels were measured using a Dubois standard colorimetric method, 1956 in which the intensity of colour developed during the reaction was directly proportional to the amount of carbohydrate present in the tissue extract.



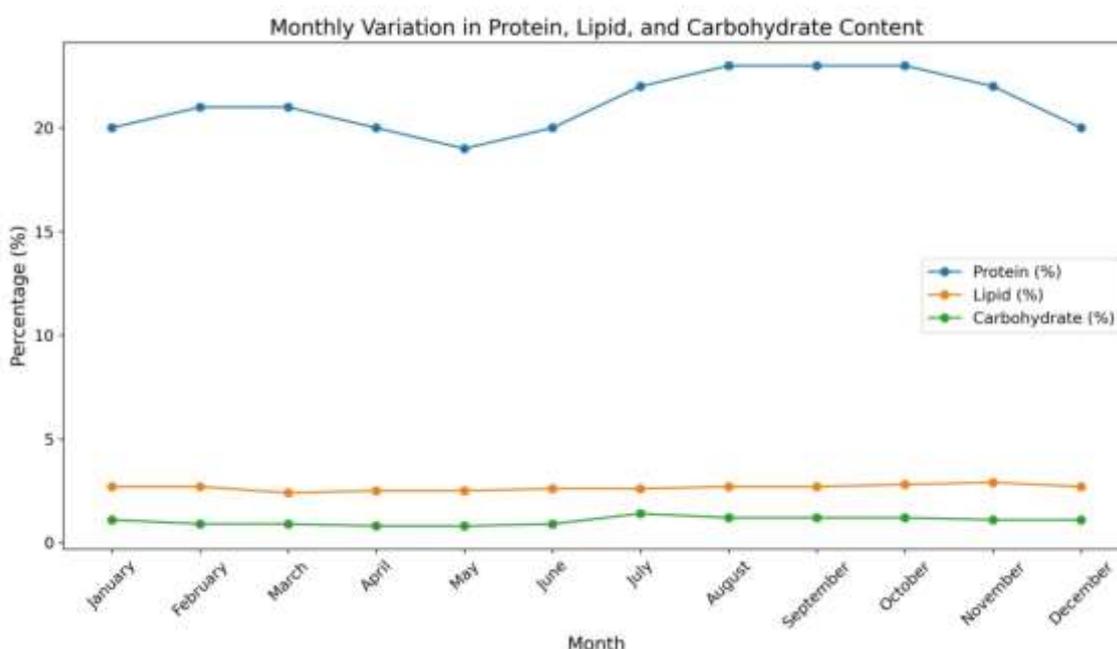
For lipid estimation, total fats were extracted from the dried muscle samples using the method described by Folch et al. (1957), a widely recognized solvent extraction procedure known for its efficiency in isolating total lipids from biological tissues. Prior to extraction, the samples were carefully dried to remove moisture, thereby improving the accuracy of lipid recovery.

To maintain precision and reproducibility, each analysis was performed in triplicate. The results obtained from these replicates were averaged, and the biochemical constituents were expressed as a percentage of the tissue's weight. This approach ensured statistical reliability and provided a clear representation of the proximate composition of the muscle tissue.

- a) Estimation of carbohydrate =  $(\text{Conc. of standard} \times \text{OD of the sample}) / \text{OD of the standard}$
- b) Estimation of Protein (mg/gm) =  $(\text{Conc. of standard} \times \text{OD of the sample}) / \text{OD of the standard}$
- c) Estimation of Lipid =  $(\text{Conc. of standard} \times \text{OD of the sample}) / \text{OD of the standard}$

Biochemical Composition of *Thryssa mystax*

Month	Protein (%)	Lipid (%)	Carbohydrate (%)
January	20	2.7	1.1
February	21	2.7	0.9
March	21	2.4	0.9
April	20	2.5	0.8
May	19	2.5	0.8
June	20	2.6	0.9
July	22	2.6	1.4
August	23	2.7	1.2
September	23	2.7	1.2
October	23	2.8	1.2
November	22	2.9	1.1
December	20	2.7	1.1



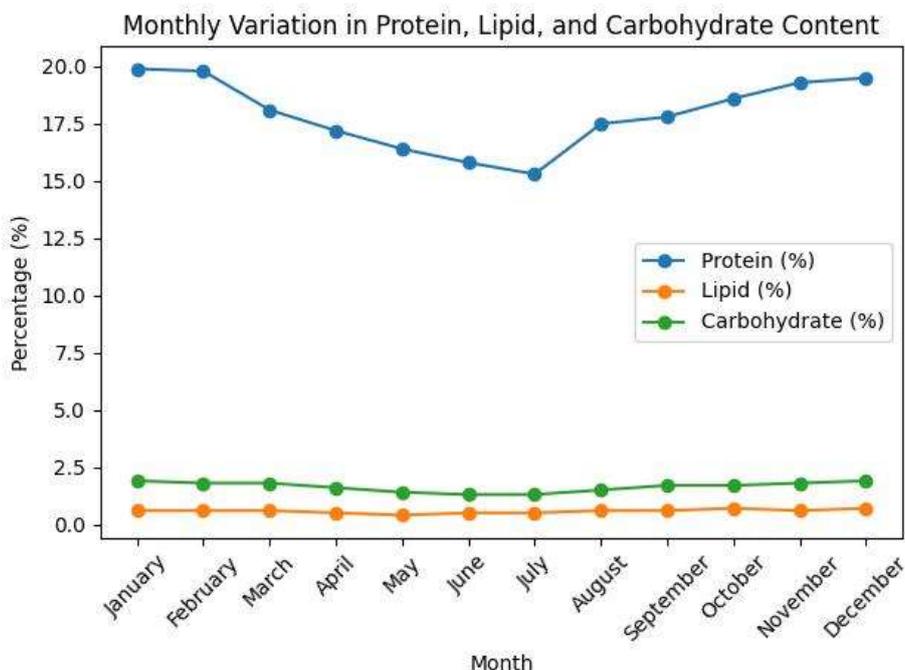


**Biochemical variation in *Thryssa mystax* during January 2025 – December 2025**

In *Thryssa mystax*, Protein content showed noticeable monthly variation, with the highest value recorded during August, September and October months and the lowest during May. Lipid content peaked in November possibly indicating pre-spawning energy accumulation, while a decline was observed during March, April, May suggesting utilization of stored reserves during reproductive activity. Carbohydrate levels remained comparatively low throughout the study period but showed slight elevation during July.

**Biochemical Composition of *Upeneus sulphureus***

Month	Protein (%)	Lipid (%)	Carbohydrate (%)
January	19.9	0.6	1.9
February	19.8	0.6	1.8
March	18.1	0.6	1.8
April	17.2	0.5	1.6
May	16.4	0.4	1.4
June	15.8	0.5	1.3
July	15.3	0.5	1.3
August	17.5	0.6	1.5
September	17.8	0.6	1.7
October	18.6	0.7	1.7
November	19.3	0.6	1.8
December	19.5	0.7	1.9



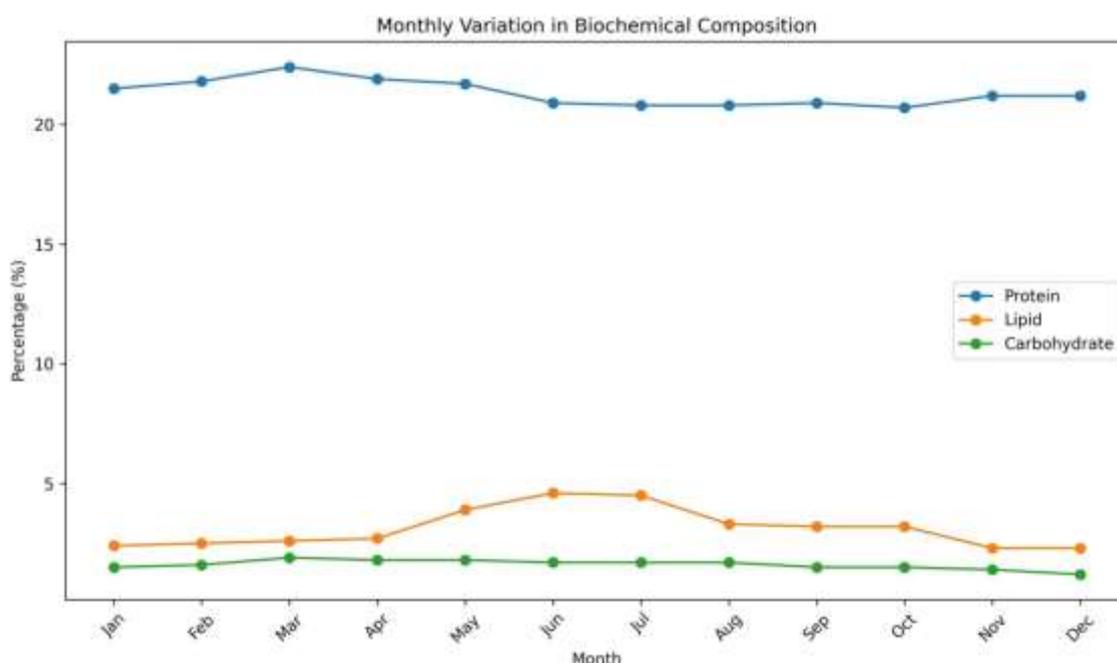
**Biochemical variation in *Upeneus sulphureus* during January 2025 – December 2025**

In *Upeneus sulphureus*, Protein content with the highest value was recorded during January month and the lowest during July. Lipid content peaked in October possibly indicating pre-spawning energy reserve, while a decline was observed during April,

May suggesting utilization of stored reserves during reproductive activity. Carbohydrate levels remained comparatively low throughout the study period but showed slight elevation during December and January.

**Biochemical Composition of *Priacanthus hamrur***

Month	Protein (%)	Lipid (%)	Carbohydrate (%)
January	21.5	2.4	1.5
February	21.8	2.5	1.6
March	22.4	2.6	1.9
April	21.9	2.7	1.8
May	21.7	3.9	1.8
June	20.9	4.6	1.7
July	20.8	4.5	1.7
August	20.8	3.3	1.7
September	20.9	3.2	1.5
October	20.7	3.2	1.5
November	21.2	2.3	1.4
December	21.2	2.3	1.2



**Biochemical variation in *Priacanthus hamrur* during January 2025 – December 2025**

In *Priacanthus hamrur*, Protein content with the highest value was recorded during March month and the lowest during October. Lipid content peaked in June possibly indicating spawning energy reserve, while a decline was observed during November and December suggesting utilization of stored reserves during reproductive activity. Carbohydrate levels remained very low throughout the study period but showed slight elevation during March, April and May.



## DISCUSSION

Marine fisheries along the east coast of India, particularly around the Visakhapatnam region, yield a large proportion of bycatch non-targeted, juvenile, or low-market-value fish collectively referred to as “trash fish.” Traditionally regarded as discard, these fish groups have attracted research interest due to their potential nutritional value, especially in terms of protein, carbohydrates and lipids, which are key determinants of fish quality and utilization potential (Sasikala, Manjulatha & Raju, 2020). Such biochemical profiles are crucial not only for nutritional evaluation but also for exploring alternative uses, including fishmeal production, nutraceutical extracts, and value-added products.

A foundational study conducted on three edible bycatch fishes (*Leiognathus equulus*, *Upeneus vittatus*, and *Trichiurus lepturus*) collected from the Visakhapatnam Fishing Harbour quantified essential proximate biochemical constituents. Results revealed that these bycatch species contained appreciable levels of protein, carbohydrates and lipids, indicating that even low-value species can offer substantial nutrient value beyond their market price classification (Sasikala et al., 2020). This aligns with broader proximate composition ranges documented for fish tissues, where moisture constitutes the major component followed by protein and variable lipid content. Protein in marine fish typically ranges from ~10–22% and lipids from ~1–20% of wet weight, suggesting that bycatch species are not inherently nutritionally inferior (Vijaya & Yedukondala Rao, 2023). This is in accordance with the results of the present study.

Specific studies in the Visakhapatnam context further support this view. A comprehensive proximate analysis of dolphinfish (*Coryphaena hippurus*) a common species in the coastal fishery demonstrated that muscle biochemical content varied seasonally, with protein levels between 16.21–23.04% and lipid content between 0.26–2.76%. These results highlight both the nutritive capacity of marine fish and the influence of seasonal dynamics on biochemical composition (Vijaya & Yedukondala Rao, 2023). Although dolphinfish are not bycatch, such species serve as benchmarks for expected biochemical trends among coastal marine fishes, including trash fish assemblages.

In addition, broader explorations into fish proximal composition in Indian marine ecosystems reveal consistent patterns where protein predominates, lipids are moderate to low, and carbohydrate levels remain minor fractions of wet weight. Proximate studies on various demersal and pelagic fishes from the Gulf of Mannar reported protein values ranging approximately 18–21% and lipids between ~1–3.5%, with essential amino acids and fatty acids such as DHA and palmitic acid present in significant proportions (Ajeeshkumar et al., 2015). These findings reinforce that marine bycatch despite its low economic status, can possess biochemical profiles comparable to commercially valued fish.

The concept of utilizing bycatch and fishery discards as nutrient sources has also been addressed in broader international research, which highlights that fishery wastes often contain substantial proteins, lipids, amino acids and other bioactive compounds. Although this research extends beyond the Indian context, it confirms the principle that even components classified as waste can be rich sources of nutritionally valuable biomolecules (Ghaly et al., 2018).

Additionally, research outside Visakhapatnam but within the Indian marine context such as proximate analysis of deep-sea demersal fishes in the Arabian Sea demonstrates that non-traditional fish resources may provide proteins up to ~17% and lipids around ~1–7%, further suggesting that underexploited fish groups have meaningful nutrient content (Nihal et al., 2023). While these studies are regionally broader, they offer supporting evidence for the nutritional potential inherent in low-value fish resources similar to those found in Visakhapatnam’s bycatch.

The biochemical composition of 3 low value marine fish from Visakhapatnam indicates that these low-value species are nutritionally significant. Their proximate profiles demonstrate notable protein and lipid content and measurable carbohydrates, challenging the perception that bycatch lacks quality. Integrating such findings supports ongoing research into sustainable utilization strategies, including conversion to value-added nutritional products, fishmeal, and bioactive extracts, which aligns with broader fishery management and food security goals.

## CONCLUSION

The biochemical evaluation of trash fish is not merely an academic exercise; it is a critical step toward redefining how we perceive and utilize marine resources. Traditionally categorized as low-value or discard material, trash fish constitute a substantial portion of the total marine landings along the Visakhapatnam coast. Without systematic biochemical assessment, these resources remain undervalued, underutilized, and often wasted. Proximate and biochemical analyses including estimation of moisture, protein,



lipid, ash, carbohydrate content, amino acid profile, fatty acid composition, and mineral content provide scientific evidence of their true nutritional and industrial potential.

For Visakhapatnam specifically, the relevance is both ecological and economic. The Visakhapatnam Fishing Harbour is one of the major landing centers on the east coast of India, generating significant quantities of bycatch from trawl and multi-gear fisheries. Much of this biomass is either sold at minimal prices or diverted to low-grade fishmeal production. Through biochemical characterization, it becomes possible to classify trash fish based on nutritional value rather than market demand. Such data can support development of value-added products from underutilized species, enhancement of income for fisherfolk through diversified utilization, reduction of post-harvest losses and sustainable fishery management strategies. Thus, the biochemical evaluation of trash fish is vital for unlocking their hidden nutritional value.

## REFERENCES

1. Ajeeshkumar, K. K., Vishnu, K. V., Remyakumari, K. R., Navaneethan, R., Asha, K. K., Ganesan, B., Niladri, S. C., Anandan, R., & Suseela, M. (2015). Biochemical composition and heavy metal content of selected marine fish from the Gulf of Mannar, India. *Fishery Technology*, 52(3), 164–169.
2. Calder, P. C. (2015). Marine omega-3 fatty acids and human health. *Biochimica et Biophysica Acta (BBA) - Molecular and Cell Biology of Lipids*, 1851(4), 469–484.
3. Dubois, M., Gilles, K. A., Hamilton, J. K., Rebers, P. A., & Smith, F. (1956). Colorimetric method for determination of sugars and related substances. *Analytical Chemistry*, 28(3), 350–356.
4. FAO. (2022). *The State of World Fisheries and Aquaculture 2022: Towards Blue Transformation*. Food and Agriculture Organization of the United Nations.
5. Folch, J., Lees, M., & Sloane Stanley, G. H. (1957). A simple method for the isolation and purification of total lipides from animal tissues. *Journal of Biological Chemistry*, 226(1), 497–509.
6. Huss, H. H. (1995). *Quality and quality changes in fresh fish*. FAO Fisheries Technical Paper No. 348. FAO.
7. Kelleher, K. (2005). *Discards in the world's marine fisheries: An update*. FAO Fisheries Technical Paper No. 470. FAO.
8. Love, R. M. (1980). *The chemical biology of fishes*. Academic Press.
9. Lowry, O. H., Rosebrough, N. J., Farr, A. L., & Randall, R. J. (1951). Protein measurement with the Folin phenol reagent. *Journal of Biological Chemistry*, 193(1), 265–275.
10. Mohanty, B. P., Mahanty, A., Ganguly, S., Mitra, T., Karunakaran, D., Anandan, R., ... Sharma, A. P. (2016). Amino acid compositions of 27 food fishes and their importance in clinical nutrition. *Journal of Amino Acids*, 2014, 1–7.
11. Nihal, D., Vidya, M., Abhirami, N., Vishnu, K. V., Aneesh Kumar, K. V., & Manjebraayakath, H. (2023). Nutritional variability in selected deep-sea fish species from the southeastern Arabian Sea: A comparative proximate analysis. *Indian Journal of Geo-Marine Sciences*, 52(11).
12. Prabha, Y. S., & Srija, V. J. S. (2025). A review on untapped potential of Visakhapatnam's trash fish for bioactive peptide applications. *Asian Journal of Fisheries and Aquatic Research*, 27(6), 57–67.
13. Roy, V. C., Islam, M. R., Sadia, S., Yeasmin, M., Park, J.-S., Lee, H.-J., & Chun, B.-S. (2023). *Trash to Treasure: An up-to-date understanding of the valorization of seafood by-products*. *Marine Drugs*, 21(9), 485.
14. Sasikala, T., Manjulatha, C., & Raju, D. V. S. N. (2020). Organic composition of three edible bycatch species from Visakhapatnam Fishing Harbour. *International Journal of Fauna and Biological Studies*, 7(2), 09–15.
15. Tacon, A. G. J., & Metian, M. (2015). Feed matters: Satisfying the feed demand of aquaculture. *Reviews in Fisheries Science & Aquaculture*, 23(1), 1–10.
16. Vijaya, G., & Yedukondala Rao, P. (2023). Muscle proximate composition and mineral content of dolphin fish (*Coryphaena hippurus*) from coastal waters of Visakhapatnam. *Journal of Survey in Fisheries Sciences*, 10(1).
17. Yadav, N. K., Paul, S., Patel, A. B., ... et al. (2025). The role of biofloc technology in sustainable aquaculture: nutritional insights and system efficiency. *Blue Biotechnology*, 2, 7.

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