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Food and Feeding Strategy of the Glass Perchlet Fish (*Ambassis macracanthus*) In Benoa Bay Waters, Bali During Two Different Seasons

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Abstract. The Benoa Bay area and its surroundings are a center of biodiversity at the ecosystem level in the southern coastal region of Bali. This area exhibits diverse ecosystems, including mangrove ecosystems, coral reefs, seagrass beds, and tidal flats. This research aims to analyze and describe the feeding ecology of *Ambassis macracanthus* in the waters of Benoa Bay. The study was conducted in May, at the end of the transitional season, and in July and August, during the eastern monsoon season in Benoa Bay Waters. Modified gill nets with mesh sizes of 0.5, 1.0, 1.5, 2.0, 2.5, and 3.0 cm were used for capturing the fish. The fish were caught at three stations representing the characteristic conditions of the Benoa Bay Waters. Out of the 396 individuals caught during the study, only 100 were selected for examination. The average relative fullness gut index (RGI) of *Ambassis macracanthus* ranged from 0.39 to 0.67. The total Important Relative Index (IRI) value for the food of *Ambassis macracanthus* in Benoa Bay Waters was 951.27. *Ambassis macracanthus* in Benoa Bay Waters is an omnivorous species with a tendency towards herbivory, and 21 different organisms were found in its diet, including three classes of phytoplankton and three classes of zooplankton. The feeding strategy developed by *Ambassis macracanthus* in Benoa Bay Waters is generalist. This information about the fish can be used as a fundamental basis for managing fish in the waters of Benoa Bay.

Keywords: *Ambassis macracanthus*; food ecology; omnivore, feeding strategy.

I. INTRODUCTION

The Benoa Bay and its surrounding area constitute a center of biodiversity at the ecosystem level in the South Bali coastal region. This high and diverse ecosystem encompasses mangroves, coral reefs, seagrass beds, and tidal flats. Based on Minister of Marine Affairs and Fisheries Regulation No. 51 of 2019, Benoa Bay is designated as a maritime conservation area. These ecosystems play a vital role in the diversity of flora and fauna and nature conservation and hold significant value for production and tourism [1].

Food is a crucial source of energy for all living organisms. Without food and water, organisms cannot survive [2]. Food availability determines the population size, growth, reproduction, population dynamics, and the condition of fish in a water body [3]. Fish's natural food typically consists of plankton (phytoplankton and zooplankton), worms, aquatic plants, benthic organisms, and other fish or organisms [4]. Based on the variety of food types, fish can be grouped into euryphagic, which are fish that consume a variety of foods; stenophagic, which are fish that consume a limited or narrow range of foods; and monophagic, which are fish that feed exclusively on one type of food [5]. Regarding the diet of the Estuarine Glass Perchlet fish, it is stated that it relies on the estuarine ecosystem as its food sources are abundant in the mangrove area, including crustaceans, small fish, and fish eggs and larvae found in the mangrove vicinity [6].

Feeding strategy refers to the food of fish, which may involve specialized, generalized, or mixed strategies [7]. Studying the feeding pattern strategies is essential for effectively managing aquatic organisms through informed decision-making. The Estuarine Glass Perchlet (*Ambassis macracanthus*) is a fish species found in Benoa Bay Waters, particularly in the Tahura Ngurah Rai area [8]. It is a freshwater demersal fish usually found in brackish estuaries and downstream of freshwater rivers, up to approximately 10 km from the sea [9]. Studying the Estuarine Glass Perchlet fish is crucial as it is classified as a threatened species by the International Union for Conservation of Nature (IUCN) as of 2020 [10]. The Estuarine Glass Perchlet is also categorized as Data Deficient, requiring further research to gather sufficient data [11]. While some research has been conducted on the chemical and physical parameters of the Benoa Bay waters, no studies have specifically focused on the food and feeding strategy, making it important to research the fish's feeding strategy. A comprehensive study of the food and feeding strategy of the Estuarine Glass Perchlet fish in Benoa Bay Waters will complement existing knowledge on its ecology, including growth, reproduction, and feeding, thereby enabling effective management and conservation strategies for this threatened fish species, as classified by the IUCN.

II. RESEARCH METHOD

Time and Place of Research

This research was conducted at three stations in Benoa Bay Waters, Bali. The research was carried out in May, July, and August 2022. The first research station was in Serangan Waters, the second was in Kampung Kepiting Waters, and the third was in Jimbaran Waters.

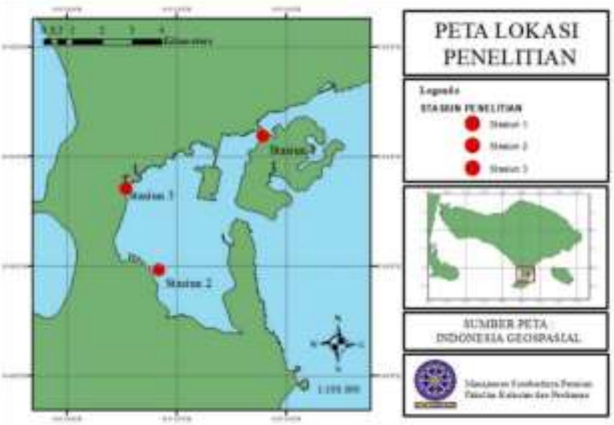

Figure 1. Research Location Map

Method

Determining sampling points and collecting fish samples uses the purposive sampling method, which involves selecting samples based on specific considerations. This method considers the community's activities and the river's environmental conditions. The research on the analysis of feed and food strategy in Benoa Bay Waters is a study that collected data through observation. The sample of the Estuarine Glass Perchlet was obtained from the fishing area.

The captured fish samples (100 samples) were dissected, and the contents of their stomachs were removed and placed into 2 ml microtubes (Eppendorf tubes) filled with 70% alcohol for a single dilution process. A 1 ml sample of the diluted stomach content was taken and dropped into the Sedgewick Rafter Counting cell (SRC-cell) until full, without any bubbles. Subsequently, the food organisms were observed using a microscope with a non-repetitive census method, and the organisms found in the food were identified. The technique used in the sampling process is the clean sweep technique, where 1000 cells on the Sedgewick Rafter Cell are identified.

Data Analysis Method

Important Relative Index (IRI) and feeding strategy that have been analyzed are presented in the form of graphs and tables after being processed using the Ms. Excel program, then interpreted descriptively. The formula for calculating the relative importance index is as follows:

$$\mathrm{IRI} = (\mathrm{N} + \mathrm{V})\ \mathrm{F}$$

IRI : Important Relative Index
N : Total amount of a single type of food (%)
V : Volume of a single type of food (%)
F : Frequency of occurrence of a single type of food

The formula for calculating the feeding strategy is as follows:

$$Pi = \frac{\sum Si}{\sum Sti} \times 100$$

Pi : Specific abundance of the x^{th} food organism
Si : Proportion of the digestive tract containing x^{th} food organism
Sti : Total content of the digestive tract from individuals containing the x^{th} food organism

III. RESULT AND DISCUSSION

It is stated that food is an ecological factor that plays a crucial role in the growth and population of fish. These ecological conditions are closely related to food availability and water quality. Fish living freely in the waters can consume whatever they encounter; however, their feeding activities are closely linked to their eating preferences and ultimately determine the amount of food consumed [12, 13].

Analysis of the estuarine glass perchlet's stomach contents in Benoa Bay Waters revealed 21 species of organisms from four phytoplankton and two zooplankton classes. Phytoplankton classes included Bacillariophyceae (6 genera), Oligotrichea (5 genera), Cyanophyceae (3 genera) and Coccolithophyceae (1 genera). Dominant zooplankton classes were Copepoda (5 genera), and Malacostraca (1 genera).

To identify the dominant food types in the digestive tract of estuarine glass perchlet fish, an analysis of the Important Relative Index (IRI) is conducted based on the quantity of food found. This method helps determine the

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dominant food types for estuarine glass perchlet fish based on their abundance in the digestive tract.

TABLE 1
FOOD ORGANISMS FOUND IN FISH GUT

Class	Type of Organism
Phytoplankton	
Bacillariophyceae	*Stenopterobia* sp., *Surirella* sp., *Synedra ehrenberg*, *Tabellaria* sp., *Thalassionema nitzschioides*, *Triceratium formosum*
Cyanophyceae	*Aphanocapsa conferta*, *Aphanothece stagnina*, *Oscillatoria* sp.
Oligotrichea	*Favella campanula*, *Tintinnopsis cylindrical*, *Tintinnopsis kofoidi*, *Tintinnopsis radix*, *Undella hyaline*
Coccolithophyceae	*Michaelsarsia splendens*
Zooplankton	
Copepoda	*Cyclopoid bicuspidatus*, *Macrosetella gracilis*, *Microcyclops varicans*, *Microsetella rosea*, *Nauplius* sp.
Malacostraca	*Euphausiacea* sp.

TABLE 2
IRI RESULTS ALL FOOD TYPES FOUND

No	Organism	Relative Importance Index (IPR)
1.	*Synedra Ehrenberg*	177.89
2.	*Stenopterobia* sp.	103.82
3.	*Tintinnopsis radix*	97.11
4.	*Favella campanula*	96.25
5.	*Aphanocapsa conferta*	90.70
6.	*Euphausiacea* sp.	52.52
7.	*Aphanothece stagnina*	48.40
8.	*Tintinnopsis kofoidi*	41.53
9.	*Surirella* sp.	40.62
10.	*Microcyclops varicans*	40.27
11.	*Macrosetella gracilis*	31.23
12.	*Tintinnopsis cylindrical*	27.77
13.	*Microsetella rosea*	25.93
14.	*Undella hyaline*	25.31
15.	*Nauplius* sp.	18.66
16.	*Cyclopoid bicuspidatus*	14.41
17.	*Thalassionema nitzschioides*	5.68
18.	*Triceratium formosum*	5.14
19.	*Oscillatoria* sp.	4.49
20.	*Tabellaria* sp.	2.93
21.	*Michaelsarsia splendens*	0.60
	Total	951.27

The total value of the Important Relative Index (IRI) for estuarine glass perchlets based on their abundance in the digestive tract in Benoa Bay Waters, Bali, during the 2 different seasons is 951.27. The phytoplankton with the highest IRI value is *Syendra Ehrenberg*, followed by *Stenopterobia* sp. with a value of 177.89 and 103.82 from the Bacillariophyceae class. *Tintinnopsis radix* comes in third position with a value of 97.11 from the Oligotrichea class. Meanwhile, the zooplankton with the highest IRI value is *Euphausiacea* sp. with a value of 52.52 from the Malacostraca class, followed by *Microcyclops varicans* and *Macrosetella gracilis* with values of 40.27 and 31.23 from the Copepoda class.

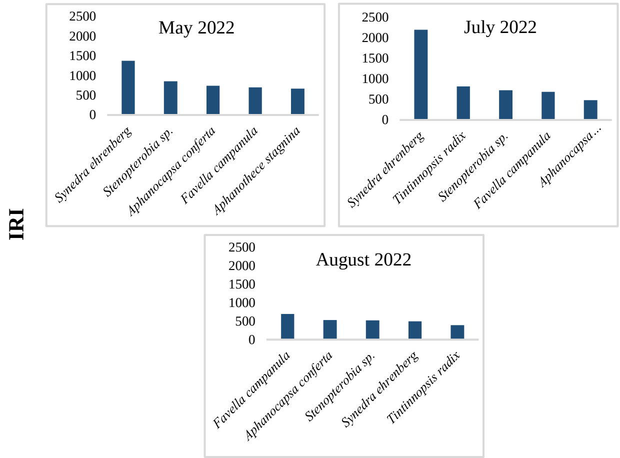

Figure 2. Comparison of five food species with the highest IRI during the first transitional season (May) and the eastern monsoon season (July and August) in 2022 in Benoa Bay Waters, Bali.

Based on the analysis of food strategy patterns in May, July, and August shows that the Estuarine Glass Perchlet in Benoa Bay developed a generalist. In May, the diagram shows that the specific food abundance is below 50%, but the occurrence frequency is above 50%. This indicates that the estuarine glass perchlet consumes various types of food without any specific preference. In July, the Estuarine Glass Perchlet adopted the same generalist food strategy, utilizing diverse types of feed. This can be observed from the diagram's position, where specific food abundance is below 50%, but the frequency of occurrence is slightly above 50%. In August, the Estuarine Glass Perchlet continued with the generalist food strategy, but the frequency of occurrence was rare, as evident from the diagram's position, showing specific food abundance and frequency of occurrence below 50%. This occurs due to the seasonal transition from the first transitional season to the eastern monsoon season.

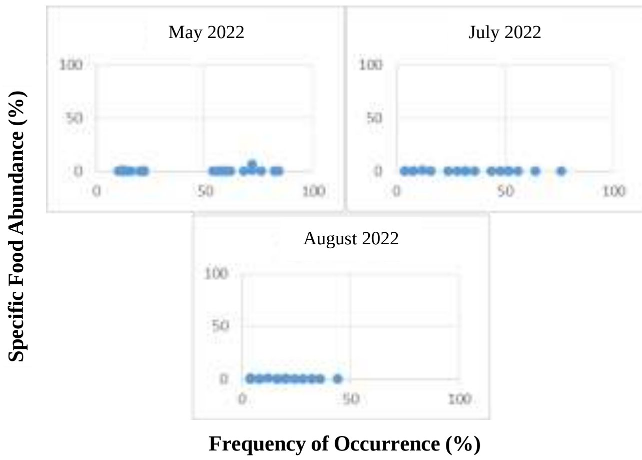

Figure 2. Food strategy of the Estuarine Glass Perchlet in Benoa Bay Waters, Bali during the first transitional season

(May) and the eastern monsoon season (July and August) in 2022.

Fish tend to adopt a specialist feeding strategy when food is abundant in the waters, whereas if the food is scarce, fish are more likely to adopt a generalist feeding strategy. Food and feed availability in the waters also influence the differences in fish feeding strategies [14, 15]. The generalist feeding pattern indicates that the Estuarine Glass Perchlet in Benoa Bay Waters does not have a specific food as its main consumption. This is related to the results of the feeding strategy analysis, which shows low specific food abundance for each genus (≤ 50%). In May and July, the feeding pattern of the estuarine glass perchlet developed into a generalist, with low specific abundance (≤ 50%), but there is a tendency for the *Syendra ehrenberg* to become the dominant food consumed. The feeding pattern in August still demonstrates a generalist with low specific abundance (≤ 50%), but there is a tendency for *Favella campanula* to become the dominant food consumed.

VI. CONCLUSION

Based on the research on the food ecology of Estuarine Glass Perchlet (*Ambassis macracanthus*) in Benoa Bay Waters, the following conclusions are drawn:

1. In the first transition season, the main food of Estuarine Glass Perchlet is dominated by phytoplankton from the Bacillariophyceae class (*Syendra ehrenberg*), Oligotrichea class (*Tintinnopsis radix*) and in the east monsoon season, there is different species of Oligotrichea class (*Favella campanula*).
2. The feeding strategy developed by the Estuarine Glass Perchlet (*Ambassis macracanthus*) in Benoa Bay Waters during the first transition season and the east monsoon season is generalist, where the fish consume various types of food without any specific preferences.

REFERENCES

[1] Putra, R. W., Firmansyah, R.M., Wagianto, W., Gunansyah, G., and Kamal, E. 2021. Kajian Pengelolaan Wilayah Pesisir dan Laut Indonesia (Review: Reklamasi Teluk Benoa). Acta Aquatica: Aquatic Sciences Journal, 8(3), 175-180.
[2] Lagler, K.F. 1972. Freshwater Fishery Biology. USA: WM. C. Brown Company
[3] Nikolsky, G.V. 1963. The Ecology of Fishes. Academic Press, London and New York, 352 p.
[4] Mudjiman. 1989. Budidaya Udang Putih. Penebar Swadaya. Jakarta.
[5] Effendie, M.I. 2002. Biologi Perikanan. Yayasan Pustaka Nusantara, Yogyakarta
[6] Zahid, A., Rahardjo, M.F., Nurhakim, S. and Sulistiono. 2011. Variasi makanan ikan seriding Ambassis nalua (Hammilton, 1822) di ekosistem estuari Segara Menyan, Jawa Barat. Iktiologi Indonesia, 11(2), pp. 159 – 168.
[7] Costello, M. J. (1990). Predator feeding strategy and prey importance: a new graphical analysis. Journal of Fish Biology 36, 261–263.
[8] Adiguna, I. G. A. B. P., Restu, I. W., and Ekawaty, R. (2018). Struktur Komunitas Ikan Di Muara Sungai Badung Kawasan Mangrove Taman Hutan Raya (Tahura) Ngurah Rai, Bali. Current Trends in Aquatic Science, 1, 72-79.
[9] Kapoor, D., R. Dayal and A.G. Ponniah, 2002. Fish biodiversity of India. National Bureau of Fish Genetic Resources Lucknow, India.775 p.
[10] FishBase. 2011. *Ambassis macracanthus*.[accessed frequently]. https://www.fishbase.se/Summary/SpeciesSummary.php?id=24793&lang =english. [Diakses tanggal 5 Juni 2022]
[11] Larson, H., Torres, A.G. & Kesner-Reyes, K. 2021. Ambassis macracanthus. The IUCN Red List of Threatened Species 2021: e.T195501A147518452. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T195501A147518452.en. Accessed on 24 July 2023.
[12] Affandi, R., Sjafei, D. S., and Rahardjo, M.F. 2009. Fisiologi Ikan, Pencernaan dan Penyerapan Makanan. Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan Institut Pertanian Bogor. Bogor, 215
[13] Anisa, Y., Zulfikar, A., and Raza'i, T.S. 2015. Kebiasaan makanan ikan tamban (*Sardinella fimbriata*) di Desa Malang Rapat Kabupaten Bintan Provinsi Kepulauan Riau. Maritim Raja Ali Haji University Journal, 9(4): 1-11.
[14] Bay, S.S. 2018. Makanan dan strategi pola makan ikan kuniran *Upeneus sulphureus*, Cuvier (1829) di perairan Teluk Kendari, Sulawesi Tenggara. Jurnal Iktiologi Indonesia, 18(1), 23-39.
[15] Hinz, H., Kroncke, I., Ehrich, S. 2005. The feeding strategy of dab limanda limanda in the Southern North Sea: linking stomach contents to prey availability in the environment. Journal of Fish Biology, (67): 125–145.