Egyptian Journal of Aquatic Biology & Fisheries
Zoology Department, Faculty of Science,
Ain Shams University, Cairo, Egypt.
ISSN 1110 – 6131
Vol. 29(5): 577 – 592 (2025)
www.ejabf.journals.ekb.eg

Stomach Content and Food Habits of Freshwater Fish in the Huai Kho Reservoir, Na Chueak District, Maha Sarakham Province, Thailand

Satienpong Khowhit[1]* Natapol Pumipuntu[2] Narongrit Muangmai[3] Faradina Merican[4]

[1]Faculty of Environment and Resource Studies, Mahasarakham University, Kantharawichai, Thailand
[2]Faculty of Veterinary Sciences, Mahasarakham University, Kantharawichai, Thailand
[3]Faculty of Fisheries, Kasetsart University, Bangkok, Thailand
[4]School of Biological Sciences, Universiti Sains Malaysia, Minden 11800, Penang, Malaysia

[*]Corresponding Author: satienpong.k@msu.ac.th

ARTICLE INFO

Article History:
Received: June 2, 2025
Accepted: Aug. 29, 2025
Online: Sep. 13, 2025

Keywords:
Stomach content,
Food habits,
Freshwater fish,
Huai Kho Reservoir

ABSTRACT

The objective of this study was to determine the stomach content and food habits of freshwater fish in the Huai Kho Reservoir. Fish specimens were collected on three separate occasions: April 2023 (summer), September 2023 (rainy season), and January 2024 (winter). Five fish species, *Clarias batrachus*, *Channa striata*, *Puntius brevis*, *Oreochromis niloticus*, and *Oxyeleotris marmorata*, were deliberately selected for their paramount economic value, critical ecological roles in the aquatic ecosystem, and markedly divergent feeding behaviors. The findings indicate that decapod crustaceans (shrimp/crab) emerged as the most conspicuous dietary group across all samples. Species-specific analysis showed the following predominant stomach contents: *Clarias batrachus*—*Tubiflex* worm (30 %); *Channa striata*—fish (36 %); *Puntius brevis*—macroalgae (69 %); *Oreochromis niloticus*—macroalgae (60 %); and *Oxyeleotris marmorata*—shrimp/crab (40 %). The study further revealed that the reservoir provides an ample natural food base, and 97.20 % of the intestinal tracts examined in all five species contained retained food material, signifying substantial dietary overlap among them.

INTRODUCTION

Statistical records of freshwater fish catches in Thailand's natural water bodies indicate a downward trajectory: 2019 — 116,465.02 tons; 2020 — 116,850.21 tons; 2021 — 112,604.48 tons; 2022 — 105,734.53 tons; 2023 — 114,648.62 tons **(Department of Fisheries, 2024)**. Contemporary aquatic ecosystems are undergoing pronounced environmental shifts, with these perturbations reverberating throughout trophic chains and reshaping fish feeding behaviour. Certain species can revise their dietary spectrum when confronted with environmental variability **(Gauzens *et al.*, 2024; Ouellet *et al.*, 2024)**.

Consistent with previous findings, declines in water temperature can attenuate digestive efficiency by regulating feeding and food intake. Such changes slow the digestive rate, prolong the residence time of ingesta in the alimentary canal, and reduce gastrointestinal evacuation through digestion and absorption. Collectively, these physiological adjustments suppress dietary demand **(Volkoff & Rønnestad, 2020)**. Environmental fluctuations—such as changes in temperature, pH, and turbidity—also influence fish feeding behavior, digestive processes, and associated hormonal machinery, including endocrine networks embedded in the gastrointestinal tract. These hormonal cues either stimulate or suppress food intake and interact with one another to safeguard energy homeostasis **(Volkof, 2024)**. Survival-driven adaptation, therefore, prompts fish to recalibrate their foraging strategies: rescheduling or rerouting excursions, curtailing intake during prey scarcity, or substituting alternative food items when necessary **(Gauzens *et al.*, 2024; Poiesz *et al.*, 2024)**.

Despite its importance, research on stomach-content volume and feeding behavior of freshwater fishes remains comparatively scarce. Such studies require an integrative understanding of aquatic ecology, including the dynamics of fish, benthic fauna, insects, phytoplankton, zooplankton, macrophytes, and macroalgae **(Chittapalapong, 2014)**. Nonetheless, their utility becomes clear wherever they are pursued: they provide critical insights into fish habitats embedded within ecosystems and establish reference baselines for future ichthyological studies. Detailing trophic relationships—specifically, prey items consumed—enhances estimates of population abundance, growth trajectories, and recruitment dynamics. Moreover, this evidence is fundamental for delineating each species' ecological role, whether predator or competitor, since fish adjust their feeding proclivities seasonally and across ontogenetic stages **(Manko, 2016; Li *et al.*, 2024)**.

As fish advance through ontogeny, prey items that once delivered optimal nutrition may lose relevance; consequently, feeding behavior is recalibrated in response to age and body size **(Mazumder *et al.*, 2021)**.

At present, freshwater fish populations in the Huai Kho Reservoir have declined markedly. This makes investigating the stomach-content volume and feeding behavior of the reservoir's species imperative. Such research will provide valuable knowledge on feeding ecology and ecological niches in wild populations **(Abayomi *et al.*, 2024)**, particularly given the absence of comparable studies in nearby reservoirs. While a few locales have undergone limited assessment, they still lack seasonally stratified comparative data, cross-reservoir analyses, and detailed observations of trophic behaviour.

This study therefore seeks to examine the feeding ecology of fishes in the Huai Kho Reservoir, clarifying how species sustain themselves under natural conditions and identifying taxa functioning as dietary specialists. Because food composition reflects ecological niche, any alteration in feeding behavior or prey spectrum observed in fish stomachs yields critical evidence. Such data are indispensable for forecasting habitat use, guiding conservation and restoration programmes, and assessing species' growth potential in relation to prey availability. Furthermore, diet profiles can support allied investigations, such as studies of migratory dynamics, seasonal shifts, or allometric relationships between predator body size and prey size.

MATERIALS AND METHODS

1) Samples collection

Fish specimens were collected at a single sampling station (ST1) in the Huai Kho Reservoir on three occasions: April 2023 (summer), September 2023 (rainy season), and January 2024 (winter) (Fig. 1). Multifilament gill nets were used, with a hanging depth of 1.0– 1.5m and a total length of 150m, incorporating mesh sizes of 2.0, 3.0, 4.0, 5.0, 6.0, and 7.0 cm. Each net array was deployed for 12h, set at approximately 18:00 h and retrieved at 06:00 h the following morning.

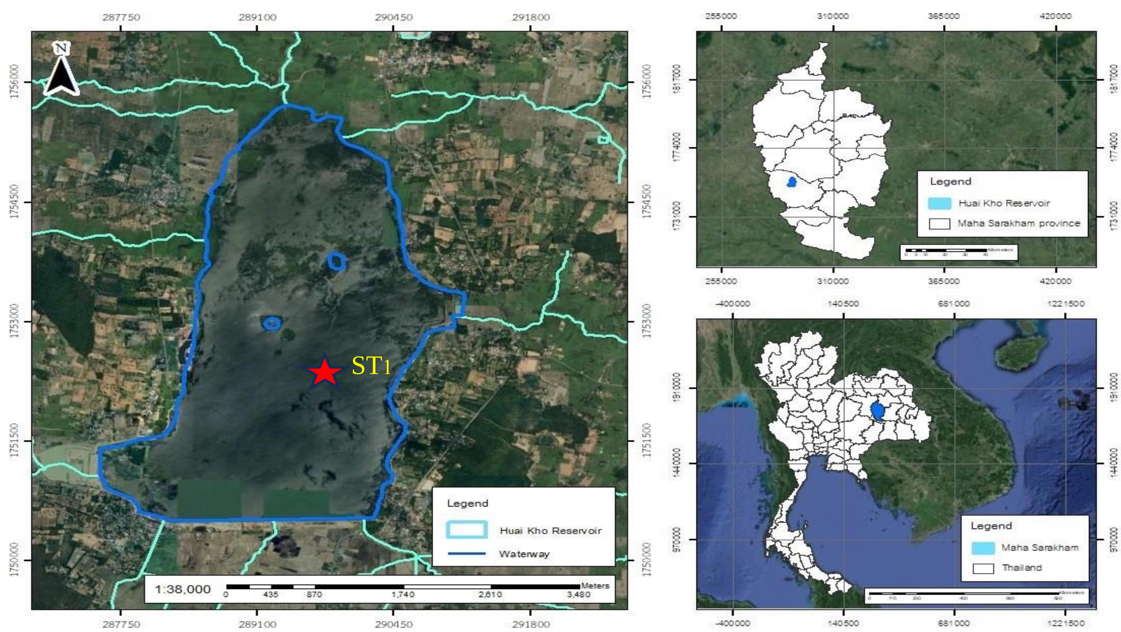


Fig. 1. Sampling stations in Huai Kho Reservoir where fish freshwater samples were collected

2) Laboratory analysis

2.1) Specimen processing

Each captured fish was weighed and measured (10 individuals per species) and then identified following **Rainboth (1996)** and **Vidthayanon (2008)**. For the stomach-content and feeding-habit investigation, species of economic importance in the Huai Kho Reservoir were assigned to three trophic guilds based on diet: (i) herbivorous fish (*Puntius brevis*); (ii) carnivorous fish (*Oxyeleotris marmorata*, *Channa striata*, *Clarias batrachus*); and (iii) omnivorous fish (*Oreochromis niloticus*) (Fig. 1). After taxonomic verification, each specimen's abdominal cavity was opened, and the viscera were fixed in 10% formalin for subsequent analysis.

2.2 Gastrointestinal sample preparation

The gastrointestinal samples were left to air for 5min to allow the formalin to evaporate. Each gut was then gently extended, and its total length recorded. Alimentary contents were first examined under a low-power microscope to classify major food groups. Material that could not be resolved at this magnification, referred to as debris, was randomly subsampled, mounted as permanent slide preparations, and analyzed under high-power microscopy for finer taxonomic resolution **(Chittapalapong, 2014)**.

2.3 Food-group classification

Dietary items were classified with reference to **Chittapalapong (2014)**, resulting in 14 categories: fish; shrimps, krill, and crabs; aquatic oligochaetes; molluscs; amphipods and isopods; terrestrial insects; insect larvae; sponges; bryozoans; hydra; macroalgae; crustacean zooplankton; rotifers; protozoa and phytoplankton.

3. Data analysis

Using the dataset described in Section 2.3, dietary data were analyzed according to the procedures outlined by **Sagar *et al.* (2019)** and **Gbaaondo *et al.* (2025)**.

3.1 Numerical method

All food items in each stomach were identified by type and counted. Results were expressed as the mean number of items in each food group across all stomach samples. The percentage of each food type was calculated as:

$$\%N = 100\ ni / n$$

Where %N = percentage of individual food items or fragments found in the digestive tract

ni = number of items or fragments of food type *i* recorded in the digestive tract.

n = total number of food items or fragments recorded in the digestive tract.

3.2) Frequency of occurrence method

After classifying the stomach contents, the number of stomachs in which each food type appeared was recorded and compared with the total number of stomachs examined. The frequency of occurrence was expressed as:

$$FO\ (\%) = 100\ ni / n$$

Where, ni is the number of stomachs in which item *i* is found, and n is the number of stomachs with food in the sample.

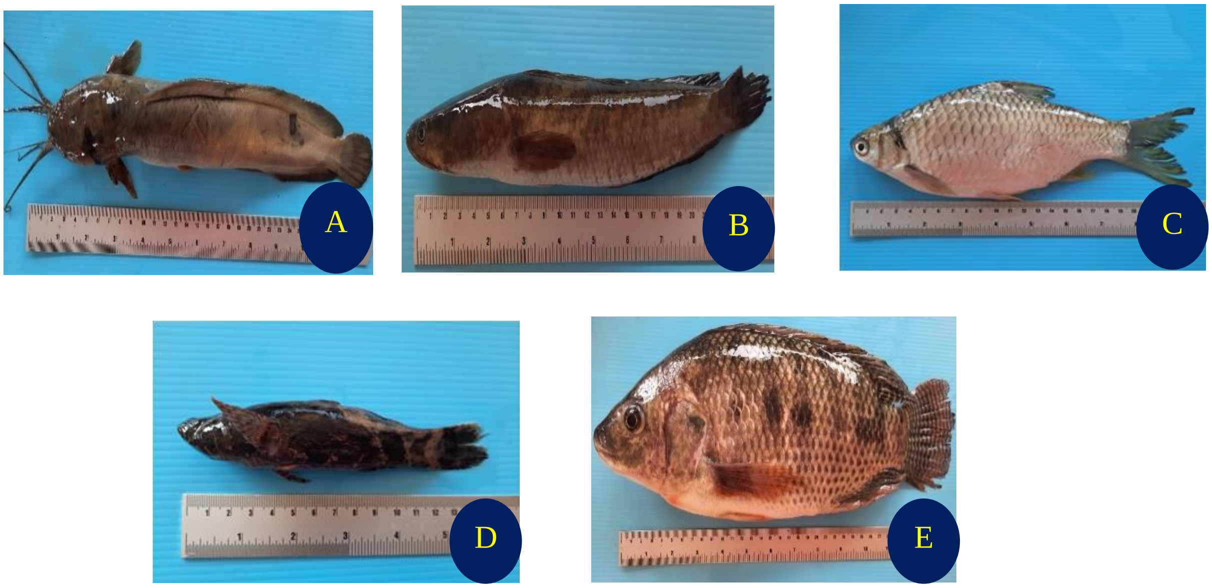


Fig. 2. A) *Clarias batrachus* B) *Channa striata* C) *Puntius brevis* D) *Oreochromis niloticus* E) *Oxyeleotris marmorata*

RESULTS

1) Body length and mass

The mean body length and mass of the sampled species are summarized as follows:

- *Clarias batrachus*: 23.70 ± 5.78 cm; 146.86 ± 108.25 g
- *Channa striata*: 23.46 ± 4.59 cm; 108.83 ± 52.97 g
- *Puntius brevis*: 15.91 ± 2.95 cm; 63.58 ± 42.37 g
- *Oreochromis niloticus*: 15.37 ± 3.94 cm; 68.16 ± 57.55 g
- *Oxyeleotris marmorata*: 15.62 ± 1.89 cm; 51.71 ± 16.75 g

(Table 1).

2) Stomach contents and feeding habits of freshwater fish

Food accumulation was assessed in five species, with 30 individuals per species, totaling 150 specimens. The mean incidence of alimentary residues within the intestinal tract was 97.20%. *Clarias batrachus, Puntius brevis,* and *Oreochromis niloticus* each showed 100% gut fullness, while *Channa striata* and *Oxyeleotris marmorata* registered 97% (Table 2 & Fig. 4). The feeding behaviour of each species is detailed below.

2.1 Clarias batrachus

Stomach contents were dominated by Tubifex worms (30%), followed by terrestrial insects (26%), insect larvae (23%), fish (13%), shrimp/crabs (7%), and zooplankton (1%) (Fig. 3A).

2.2 Channa striata

Fish accounted for the largest fraction of the diet (36%), followed by shrimp/crabs (27%), terrestrial insects (22%), shellfish (5%), insect larvae (4%), Tubifex worms (2%), and amphibians (1%) (Fig. 3B).

2.3 Puntius brevis

Macroalgae dominated the diet (69%), with shrimp/crabs (24%), terrestrial insects (12%), zooplankton (3%), and phytoplankton (2%) contributing smaller proportions (Fig. 3C).

2.4 Oreochromis niloticus

Macroalgae formed the predominant dietary component (60%), followed by phytoplankton (23%) and zooplankton (8%) (Fig. 3D).

2.5 Oxyeleotris marmorata

Shrimp/crabs represented the largest dietary fraction (40%), followed by fish (36%), terrestrial insects (16%), Tubifex worms (7%), and zooplankton (1%) (Fig. 3E).

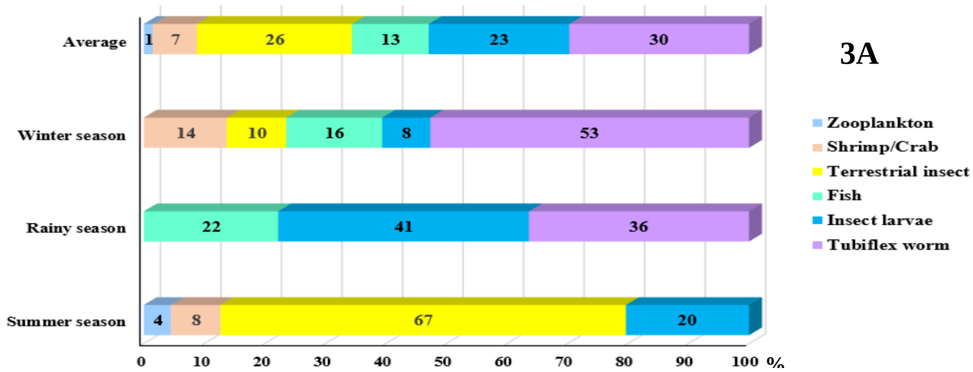
Table 1. Fish examined for weight (g) and length (cm)

Season	***Clarias batrachus***	***Channa striata***	***Puntius brevis***	***Oreochromis niloticus***	***Oxyeleotris marmorata***
Summer					
Weight (g)	163.4± 59.90	163.40±59.90	73.96±64.27	103.30±83.26	53.38±14.59
Length (cm)	27.58±5.53	27.96±4.65	16.79±4.14	16.87±4.33	15.86±1.53
Rainy					
Weight (g)	152.10±88.53	69.80±15.09	71.13±14.76	45.20±22.90	47.20±18.40
Length (cm)	24.44±5.20	19.84±2.16	15.96±1.11	12.99±3.46	15.35±2.21
Winter					
Weight (g)	71.00±47.31	99.13±36.20	49.87±18.20	58.00±38.94	54.64±17.42
Length (cm)	19.48±3.77	22.90±3.46	15.06±2.06	16.10±3.29	15.64±2.00
Total Average					
Weight (g)	146.86±108.25	108.83±52.97	63.58±42.37	68.16±57.55	51.71±16.75
Length (cm)	23.70±5.78	23.46±4.59	15.91±2.95	15.37±3.94	15.62±1.89

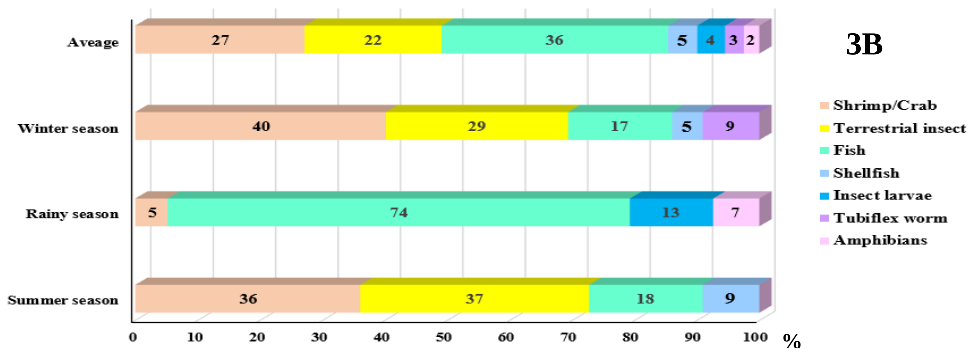
Table 2. Fish examined for stomach content

Parameter	***Clarias batrachus***	***Channa striata***	***Puntius brevis***	***Oreochromis niloticus***	***Oxyeleotris marmorata***
Number of fish examined (individual)	30	30	30	30	30
Total of stomach with food (%)	100	93	100	100	93
Total of empty stomach (%)	-	7		-	7
Summer season (%)	100	80	100	100	100

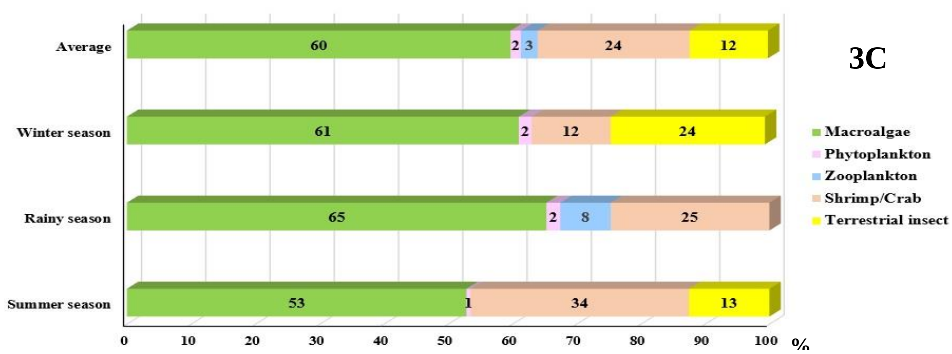
Rainy season (%)	100	100	100	100	80
Winter season (%)	100	100	100	100	100



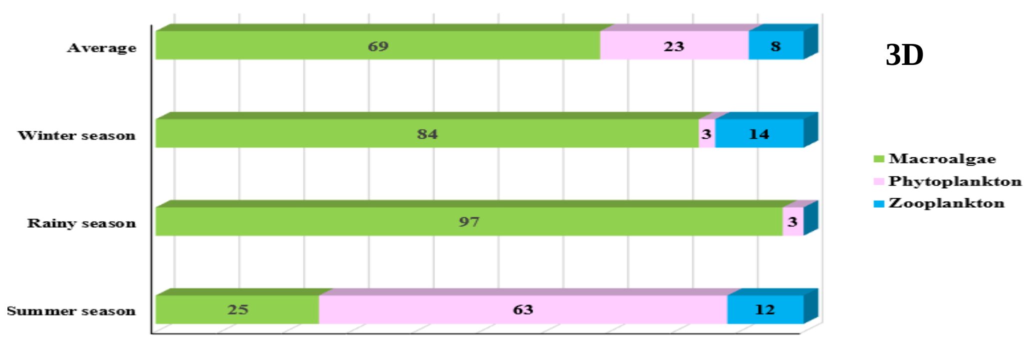
Clarias batrachus



Channa striata



Puntius brevis



Oreochromis niloticus

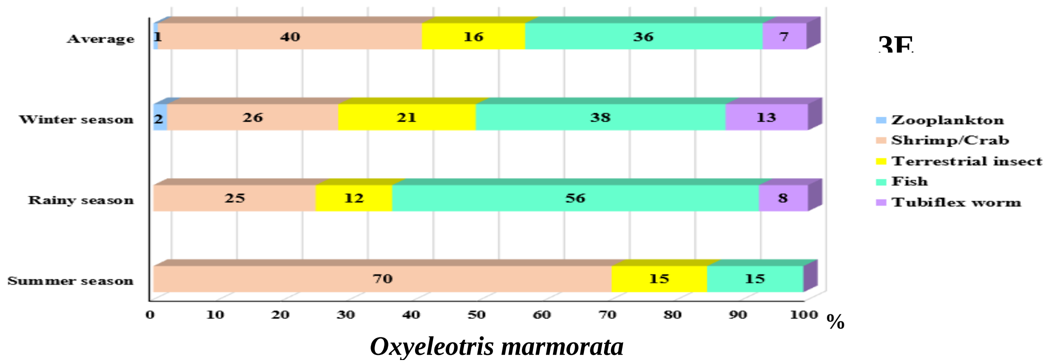


Fig. 3. Food and feeding habits of fish freshwater

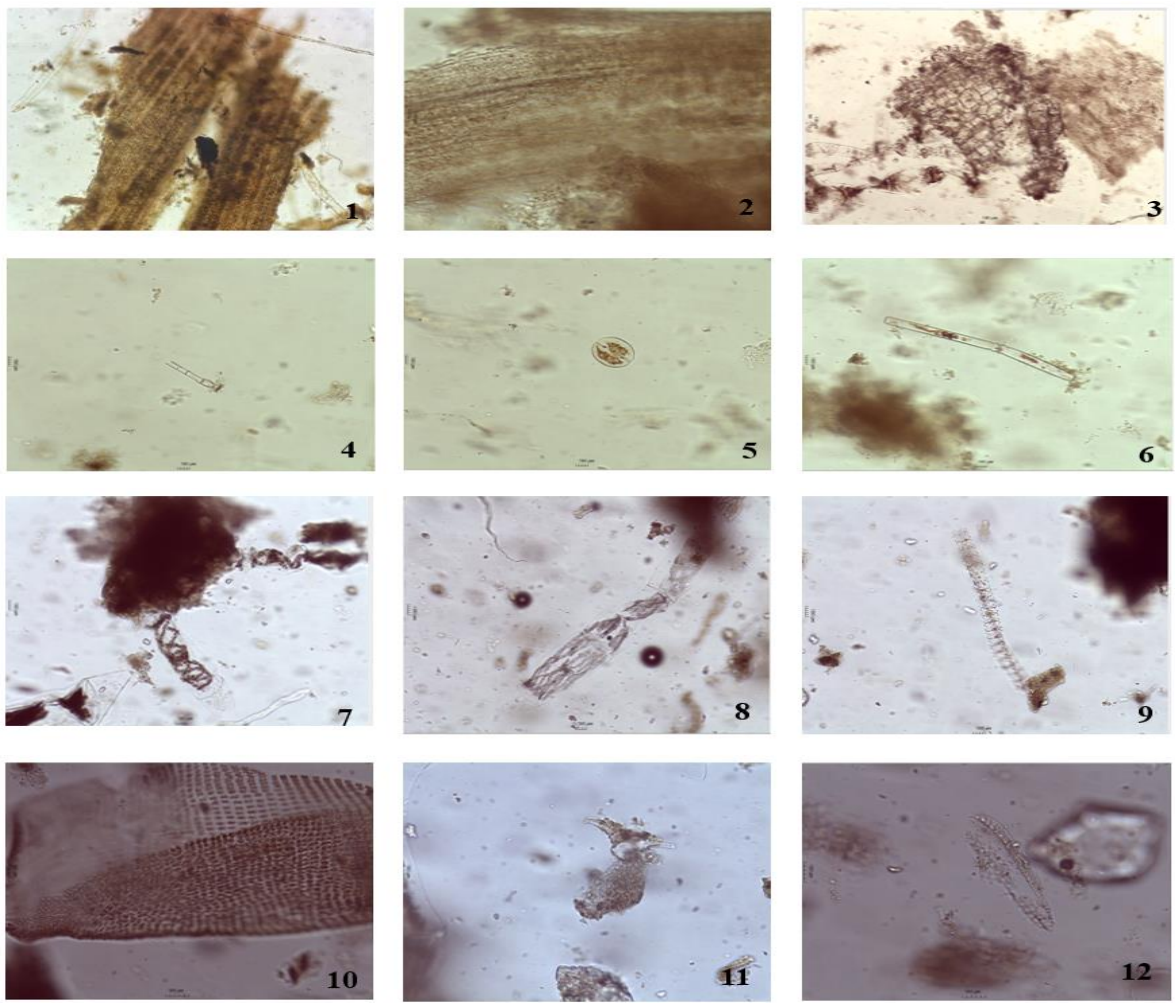


Fig. 4. Stomach content and food habits of fish freshwater: 1-3) Macroalgae, 4) *Oedogonium* sp., 5) *Cosmarium* sp., 6) *Pleurotaenium* sp., 8-7) *Spirogyra* sp. 9) *Desmidium* sp., 10) *Merismopedia* sp., 11) *Stuaurastrum* sp., 12) *Surirella* sp.

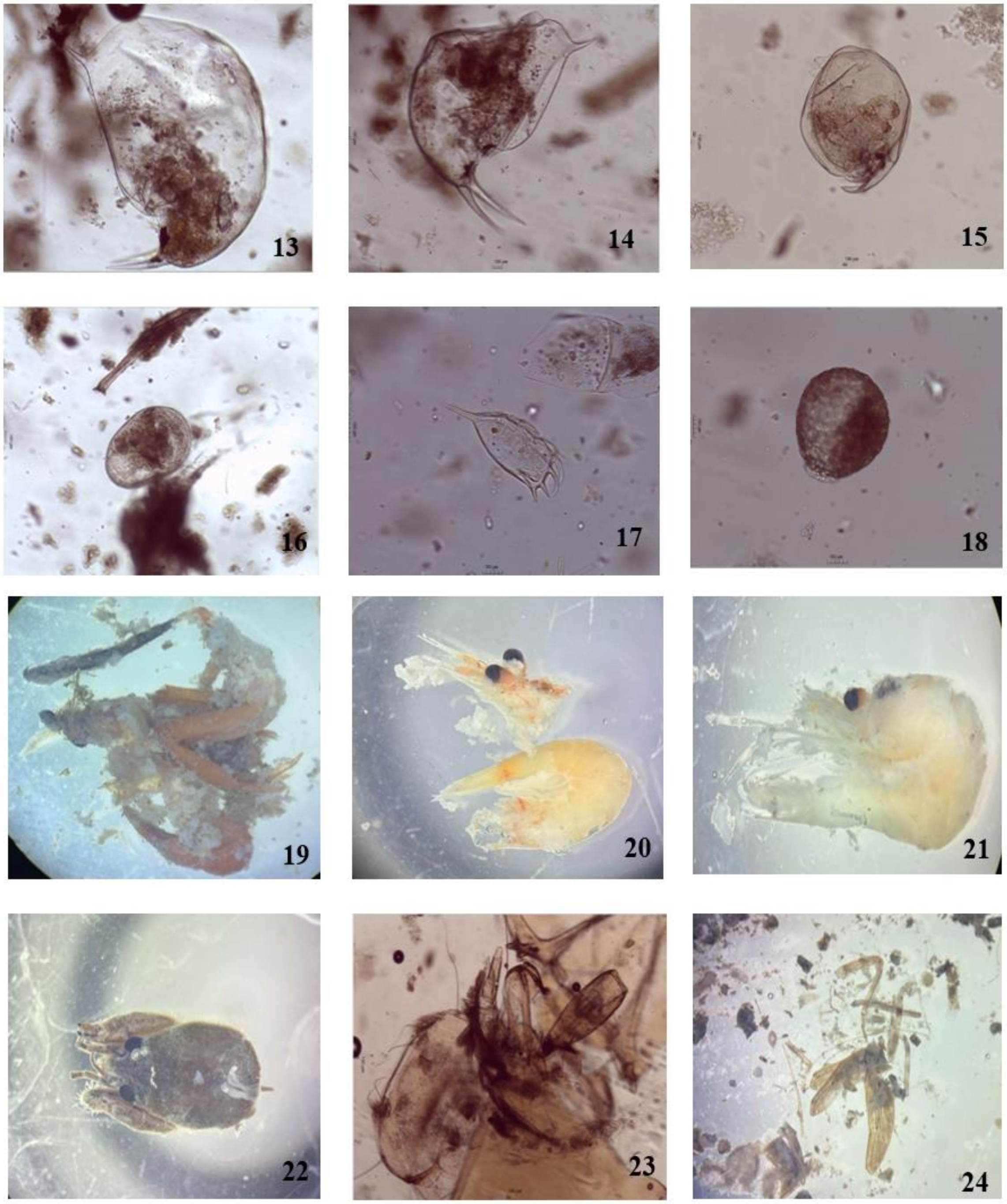


Fig. 4. Stomach content and food habits of fish freshwater (continue): 13-15) *Moina micrura*, 16) Ostracod 17) Rotifera, 18) Protozoa, 19) Crab, 20-21) Shrimp, 22-24) Terrestrial insect

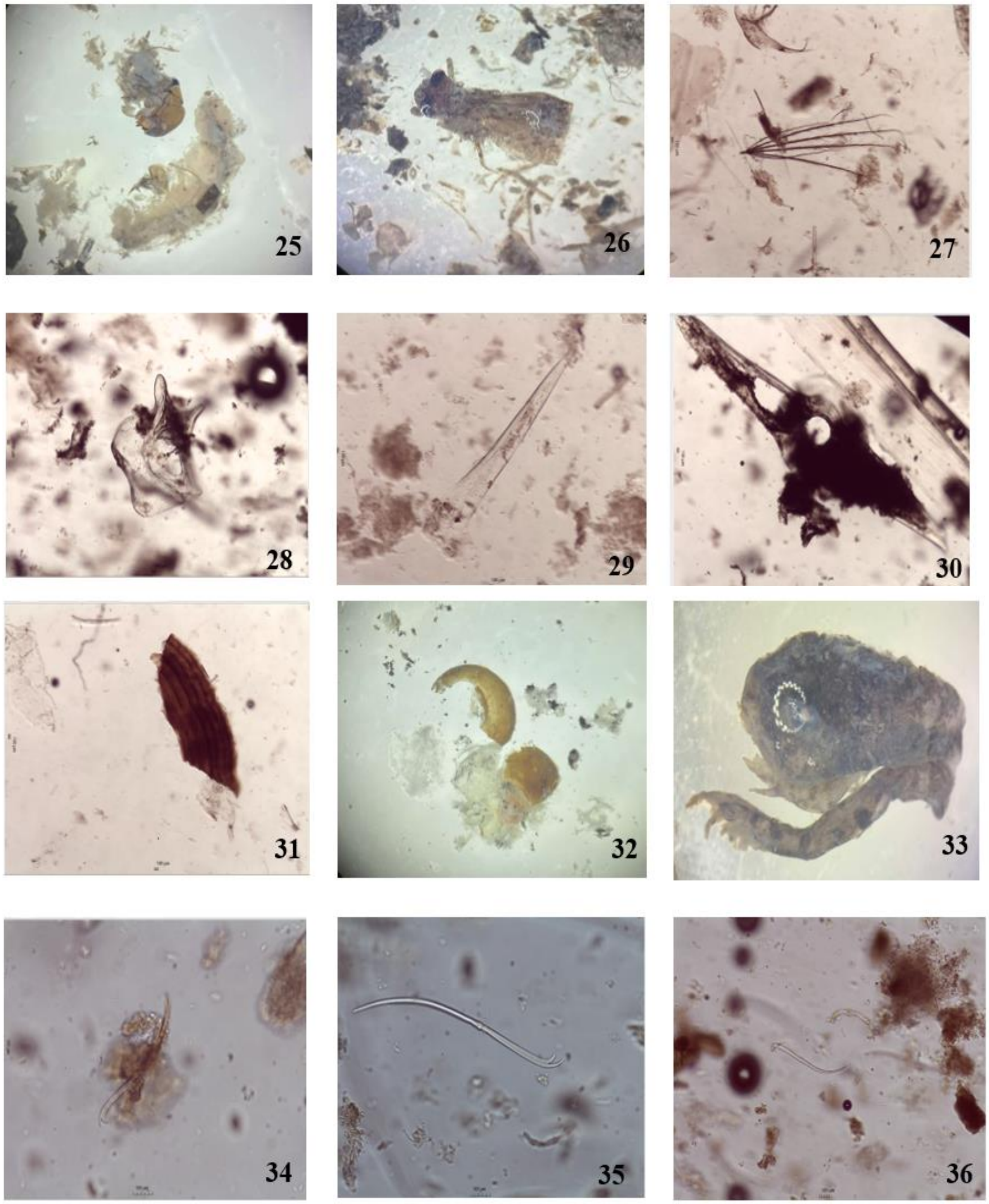


Fig. 4. Stomach content and food habits of fish freshwater (continue): 25-27) Insect larvae, 28-30) Fish, 31) Shellfish, 32-33) Amphibians, 34-36) Tubiflex worm

DISCUSSION

The investigation of stomach-content accumulation and feeding behavior in five freshwater species showed the following highest mean proportions: *Clarias batrachus* — Tubifex worms (30%); *Channa striata* — fish (36%); *Puntius brevis* — macroalgae (69%); *Oreochromis niloticus* — macroalgae (60%); and *Oxyeleotris marmorata* — shrimp/crabs (40%) (Figs. 3, 4). Notably, shrimp/crabs emerged as the most conspicuous dietary element recurring across the species examined. This finding aligns with a recent survey of species diversity in the Huai Kho Reservoir, which revealed that carnivorous fish represent both the dominant and most abundant component of the reservoir's ichthyofauna **(Khowhit *et al.*, 2024b)**.

The findings confirm that the Huai Kho Reservoir sustains a plentiful natural food base, with all five species displaying broadly similar dietary patterns. Among them, *Oxyeleotris marmorata* was the most conspicuous. Naturally carnivorous, this species preys upon aquatic organisms, including small fishes and aquatic insects. During periods of food scarcity, *O. marmorata* exhibits cannibalistic behavior, with larger individuals consuming smaller conspecifics and other small aquatic organisms **(Lim *et al.*, 2018; Yusoff *et al.*, 2021)**. The Huai Kho Reservoir provides a distinctive ecological setting characterized by dense stands of macrophytes such as *Hydrilla verticillata*, *Utricularia aurea*, *Spirogyra* sp., *Typha angustifolia*, and *Nelumbo nucifera*. These plants function as shelters where *O. marmorata* ambushes prey and also serve as habitats for small organisms—fish fry, shrimps, crabs, molluscs, and aquatic insects—that constitute its diet **(CMARE, 2020; Khowhit *et al.*, 2024a)**.

Comparisons with other reservoirs in Maha Sarakham Province showed similar but species-specific patterns. The highest mean stomach-content proportions were observed as follows: *Hampala dispar* — zooplankton (43%); *Pristolepis fasciata* — macroalgae (83%); *Notopterus notopterus* — phytoplankton (62%); *Anabas testudineus* — insect larvae (57%); and *Channa striata*. Phytoplankton emerged as the most prominent dietary element consistently recovered across species **(Sawasdee & Thowanna, 2019)**.

This study also demonstrated that freshwater fish accumulated the greatest amount of food during winter, with considerably lower levels in summer and the rainy season. Seasonal environmental dynamics likely drive this pattern. In winter, water bodies are more stable, with reduced turbidity and slower current, creating conditions that enhance organic matter deposition and increase the availability of key food resources such as plankton, aquatic vegetation, and benthic invertebrates. Fish benefit from these favorable feeding conditions while experiencing reduced metabolic rates due to cooler water temperatures, thereby conserving energy. The substantial winter accumulation may thus represent an ecological strategy to build energy reserves for reproduction, which typically coincides with the onset of seasonal flooding **(Heng *et al.*, 2018; Keva *et al.*, 2019; Volkoff & Rønnestad, 2020; Versteeg *et al.*, 2021)**.

The present assessment of body weight and length across herbivorous, carnivorous, and omnivorous species demonstrated alimentary residues in 97.20% of intestinal tracts. Thus, stomach-content accumulation and feeding behavior bore no relationship to body length, body mass, or season. This outcome indicates that the Huai Kho Reservoir's unique environmental conditions and extensive macrophyte stands provide a continuous supply of small organisms, ensuring year-round food availability and broadly similar diets. This finding accords with **Abayomi *et al.* (2024)**, who likewise detected no relationship between gut fullness and fish length, weight, or season in reservoir populations. However, it contrasts with studies reporting that stomach-content accumulation is influenced by dietary specialisation, ecological niche, season, sex, or fish size **(Mehanna *et al.*, 2017; Grzybkowska *et al.*, 2018; Heng *et al.*, 2018; Mustakim *et al.*, 2020; Mazumder *et al.*, 2021; Mohammed *et al.*, 2021; El-Sadek *et al.*, 2022; Ali *et al.*, 2024; Delain *et al.*, 2025; Farjadzadeh *et al.*, 2025; Gbaaondo *et al.*, 2025)**. Collectively, these factors can significantly influence stomach-content accumulation in freshwater fishes.

CONCLUSION

The aggregate stomach-content analysis of the five freshwater species revealed that macroalgae (28%) accounted for the largest dietary share, followed by terrestrial insects (21%), shrimp/crabs (16%), zooplankton (10%), fish (8%), phytoplankton (5%), insect larvae (5%), shellfish (1%), and amphibians (1%). Among these, shrimp/crabs emerged as the most consistently recovered dietary component across the stomachs and intestines of the specimens analyzed. Furthermore, stomach-content accumulation and feeding behavior showed no significant association with body length, body mass, size class, or season. This suggests that if future ecological shifts—such as contamination, invasion by non-native species, or habitat degradation—alter feeding patterns or prey availability, the scarcity of principal diet items may be buffered. Freshwater fishes in the Huai Kho Reservoir appear capable of adjusting to secondary prey, with shrimp/crabs serving as a reliable alternative food resource.

ACKNOWLEDGEMENTS

This research project was financially supported by Mahasarakham University.

ETHICS STATEMENT

This research project has been approved by the Ethical Principles and Guidelines for the Use of Animals No. 17/2023 of Mahasarakham University, Thailand.

REFERENCES

Abayomi, O. J.; Funmi, O. D. and Oluwaseun, A. (2024). Food and feeding habits of two dominant fish species in Ureje Reservoir Ado-Ekiti, Ekiti State, Nigeria., 26 (9): 99-108. DOI: https://doi.org/10.9734/ajfar/2024/v26i9809

Ali, M. E.; Danba, E. P.; Useni, S. S.; Nandom, N.; and Dauda, I. (2024). Preliminary study on the food and feeding habits of *Raiamas senegalensis* (Steindachner, 1870) from Chakawa Reservoir, Mayo – Belwa, Adamawa State, Nigeria. Afropolitan Journals. 17(1): 174-179. DOI: https://doi.org/10.62154/ajasfr.2024.017.010552

Chittapalapong, T. (2014). Analysis of fish food intake. Central Administrative Office. Department of Fisheries, Thailand. [Thailand]

Climate Changes Mitigation and Adaptation Research Unit (CMARE). (2020). Climate change adaptation for nachueakpittayasan school. Nachueak subdistrict, Nachueak district, Mahasakham Province. CMARE Publisher, Kantharawichai district, Faculty of Environment and Resources Studies, Mahasakham University, Thailand. 239 pp. [Thailand]

Delain, S.A.; Dawald, C. R. and Ward, N. K. (2025). Seasonal variation in dietary overlap between Yellow Perch (*Perca flavescens*) and Bluegill (*Lepomis macrochirus*) in Backwater Lakes of a Large River. J. Freshw. Ecol. 40(1): 2491472. DOI: https://doi.org/10.1080/02705060.2025.2491472
Department of Fisheries, Thailand. [Thailand]

Department of Fisheries. (2024). Statistics of the freshwater animals captured from natural sources IN 2023. No. 7/2024. Fisheries Statistics Group, Fisheries Development Policy and Planning Division, Department of Fisheries Ministry of Agriculture and Cooperatives, Thailand. [Thailand]

El-Sadek, A. M.; Hassan, A-K. M.; El-Naggar, H. A.; Khalaf-Allah, H. M. M. and El-Ganiny, A. A. (2022). Feeding ecology of the Rabbit Fish, *Siganus luridus* inhabiting coral reef and algae habitats in Aqaba Gulf, Egypt. Egypt. Aquat. Biol. Fish., 26(3): 459 - 473. DOI: 10.21608/EJABF.2022.243185

Farjadzadeh, E.; Safaie, M. and Abdoli, L. (2025). Feeding habits of Striped Piggy Fish, *Pomadasys stridens* (Forsskål, 1775) in the Persian Gulf. Turk. J. Fish. & Aquat. Sci. TRJFAS25346. DOI: https://doi.org/10.4194/TRJFAS25346
feeding in fishes. Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences. 379(1898):20220503. DOI: 10.1098/rstb.2022.0503.
feeding. Songklanakarin J. Sci. Technol., 43(5): 1408-1413.

Gauzens, B.; Rosenbaum, B.; Kalinkat, G.; Boy, T.; Jochum, M.; Kortsch, S.; O'Gorman, E.J. and Brose, U. (2024). Flexible foraging behaviour increases predator vulnerability to climate change. Nature Climate Change.,14: 387-392. DOI: https://doi.org/10.1038/s41558-024-01946-y

Grzybkowska, M.; Dukowska, M.; Leszczyńska, J.; Lik, J.; Szczerkowska-Majchrzak, E. and Przybylski, M. (2018). The food resources exploitation by small-sized fish in a riverine macrophyte habitat. Ecol. Indic., 90: 206-214. DOI: https://doi.org/10.1016 /j.ecolind.2018.02.021

Heng, K.; Chevalier, M.; Lek, S. and Laffaille, P. (2018). Seasonal variations in diet composition, diet breadth and dietary overlap between three commercially important fish species within a flood-pulse system: The Tonle Sap Lake (Cambodia). PLoS ONE. 13(6): e0198848. DOI: https://doi.org/ 10.1371/ journal.pone.0198848.

Keva, O.; Tang, P.; Käkelä, R.; Hayden, B.; Taipale, S. J.; Harrod, C. and Kahilainen, K. K. (2019). Seasonal changes in european whitefish muscle and invertebrate prey fatty acid composition in a Subarctic Lake. Freshw. Biol., 64 (11): 1908-1920. DOI: https://doi.org/10.1111/fwb.13381

Khowhit, S.; Tanee,T.; Khowhit, D.; Pumipuntu, N.; Muangmai, N. and Musiri P. (2024a). Population dynamics of Marble Goby, *Oxyeleotris marmorata* (Bleeker, 1852) for conservation and sustainability in Huai Kho Reservoir, Na Chueak District, Maha Sarakham Province, Thailand. Egypt. Aquat. Biol. Fish., 28(4):867-883. DOI: https://doi.org/10.21608/ejabf.2024.369539

Khowhit, S.; Tanee,T.; Khowhit, D.; Pumipuntu, N.; Muangmai, N. and Musiri P. (2024b). Population dynamics of Eye-Spotted Barb (*Hampala dispar*: Cyprinidae) in Huai Kho Reservoir, Na Chueak District, Maha Sarakham Province, Thailand. BIODIVERSITAS., 25(9):3095-3104. DOI: https://doi.org/10.13057/biodiv /d250931

Li, L.; Shao, H., Mikheev, P. B.; Zhang, Z.; Jin, H. and Lu, W. (2024). Age, growth, sex composition, and diet of the Burbot, Lota lota, the only freshwater species of the family lotidae in the Amur (Heilongjiang) River, Northeast China. Fishes. 9(11): 428. DOI: https://doi.org/10.3390/fishes9110428

Lim, L-S.; Teoh, C-F.; Kawamura, G.; Yong, A. S-K. and Shapawi, R. (2018). Feeding performance of juvenile Marble Goby (*Oxyeleotris marmorata* Bleeker, 1852) fed acidified diets. Fish. Aquat. Life., 26: 211-216. DOI: https://doi.org/10.2478/ aopf-2018-0023

Manko, P. (2016). Stomach content analysis in freshwater fish feeding ecology. Publisher: Vydavateľstvo Prešovskej university. ISBN: 978-80-555-1613-4
Marble Goby, *Oxyeleotris marmorata* (Bleeker, 1852) larvae under delayed initial

Mazumder, S. K.; Kunda, M.; Iqbal, M. M.; Basak, L. R. and Das, S.K. (2021). Seasonal dynamics of stomach contents, trophic level, length-weight relationship and condition factor of *Mystus bleekeri* (Day, 1877). Sains Malays., 50(4): 907-918. DOI: https://doi.org/10.17576/jsm-2021-5004-03

Mehanna, S.; El-Gammal, F.I.; Mahmoud, U.M.; El-Mahdy, S. and El-Mahdy, S. (2017). Food and feeding habits of two-bar seabream, *Acanthopagrus bifasciatus* (Forsskål, 1775) from Southern Red Sea, Egypt. Egypt. Aquat. Biol. Fish., 21(2):67-78. DOI: 10.21608/ejabf.2017.3534

Mohammed, Y. M.; Abubakar, M. D.; Muhammad, A. M.; Muhammad, A. S.; Umar, B. L.; Hadizat, M. and Achebe, A.C. (2021). Stomach content of *Tillapia zilli* and *Oreochromis nilocticus* from Wanzun River, Lavun Local Government, Niger State Nigeria. Asian J. Fish. Aquat. Res., 13(5):15-20. DOI: https://doi.org/10.9734/AJFAR/2021/v13i530276

Mustakim, M.; Anggoro, S.; Purwanti, F. and Haeruddin. (2020). Food habits and trophic level of *Anabas testudineus* in floodplain Lake, Lake Semayang, East Kalimantan. E3S Web of Conferences 147, 02024. DOI: https://doi.org/10.1051/e3sconf/202014702024

Ouellet, V.; Fullerton, A. H.; Kaylor M.; Naman, S.; Bellmore, R.; Rosenfeld, J.; Rossi, G.; White, S.; Rhoades, S.; Beauchamp, D.A.; Liermann, M.; Kiffney, P. and Sanderson, B. (2024). Food for fish: challenges and opportunities for quantifying foodscapes in river networks. Wiley Interdisciplinary Reviews: Water. 12(6): 1-29. DOI: https://doi.org/10.1002/wat2.1752

Poiesz, S. S. H.; Witte, J. I. J. and Van der Veer, H. W. (2024). Stomach content analysis indicates multi decadal trophic stability in a temperate coastal fish food web, western dutch Wadden Sea. Estuarine. Coast. Shelf Sci., 308 (15): 108912. DOI: https://doi.org/10. 1016/j.ecss.2024.108912

processes in fish. Temperature. 18;7(4):307-320. DOI: https://doi.org/10.1080/23328940.2020.1765950.

Rainboth, W. J. (1996). Fishes of the cambodian mekong. FAO Species Identification Field Guide for Fishery Purposes. FAO, Rome, 265 p.

Sagar, M. V.; Nair, R. J. and Gop, A. (2019). Stomach content analysis techniques in fishes. CAR-Central Marine Fisheries Research Institute.

Sawasdee, B. and Thowanna, C. (2019). A study of natural food in the stomach contents of freshwater fish in Nong Bor Reservior, Mahasarakham Province. Faculty of Agricultural Technology, Rajabhat Maha Sarakham University. [Thailand]

Versteeg, E. J.; Fernandes, T.; Guzzo, M. M.; Laberge, F.; Middel, T.; Ridgway, M. and McMeans, B. C. (2021). Seasonal variation of behavior and brain size in a freshwater fish. Ecol. Evol., 11(21). 14950-14959. DOI: https://doi.org/10.1002/ece3.8179

Vidthayanon, C. (2008). Field guide to fishes of the mekong delta. Mekong River Commission, Vientiane, Laos.

Volkoff, H. (2024). The effects of environmental changes on the endocrine regulation of feeding in fishes. Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences. 379(1898):20220503. DOI: 10.1098/rstb.2022.0503.

Volkoff, H. and Rønnestad, I. (2020). Effects of temperature on feeding and digestive processes in fish. Temperature. 18;7(4):307-320. DOI: https://doi.org/10.1080/ 23328940.2020.1765950.

Yusoff, S. F. M.; Fui, C. F. and Senoo, S. (2021). Survival, growth, and feeding ability of Marble Goby, *Oxyeleotris marmorata* (Bleeker, 1852) larvae under delayed initial feeding. Songklanakarin J. Sci. Technol., 43(5): 1408-1413.