Final Year Project

Title:

Detection of Parasite in Common Snakehead (*Channa striata*) in Paddy Fields, Bachok, Kelantan

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ABSTRACT

An abstract of the research paper presented to the Faculty of Veterinary Medicine, University Malaysia Kelantan, in partial requirement of the course DVT 55204 - Research Project.

Parasitic infections in wild freshwater fish can serve as important indicators of environmental health and aquaculture-related disease risks. This study investigated the occurrence of ecto- and endoparasites in the common snakehead (*Channa striata*) collected from paddy field ecosystems in Bachok, Kelantan. A total of 20 fish were examined using standard parasitological procedures, including skin scrapings and gill examinations for ectoparasites, followed by organ dissection for endoparasite detection. Only one case of ectoparasitic infection was observed, identified as *Trichodina* sp. In contrast, endoparasite prevalence was comparatively higher: 35% of the fish harboured acanthocephalans, 25% were infected with trematodes, and one fish exhibited nematode infestation. These findings suggest that *Channa striata* inhabiting paddy field environments are predominantly affected by gastrointestinal parasites, while ectoparasitic burdens appear minimal. The parasite profiles observed in this study highlight the need for continued monitoring of wild fish populations in agro-ecosystems to better understand parasite transmission dynamics and potential implications for local aquaculture and food safety.

Keyword: Common snakehead, Ectoparasite, Endoparasite

ABSTRAK

Abstrak daripada kertas penyelidikan yang dibentangkan kepada Fakulti Perubatan Veterinar, Universiti Malaysia Kelantan, sebagai keperluan sebahagian daripada kursus DVT 55204 – Projek Penyelidikan.

Jangkitan parasit dalam ikan air tawar liar boleh berfungsi sebagai petunjuk penting terhadap kesihatan persekitaran serta risiko penyakit berkaitan akuakultur. Kajian ini meneliti kewujudan ektoparasit dan endoparasit dalam ikan haruan (*Channa striata*) yang dikumpulkan dari ekosistem sawah padi di Bachok, Kelantan. Sebanyak 20 ekor ikan telah diperiksa menggunakan prosedur parasitologi standard, termasuk calitan kulit dan pemeriksaan insang untuk pengesanan ektoparasit, diikuti dengan pembedahan organ bagi mengesan endoparasit. Hanya satu kes jangkitan ektoparasit ditemui, dikenal pasti sebagai *Trichodina* sp. Sebaliknya, prevalens endoparasit adalah lebih tinggi: 35% ikan dijangkiti acanthocephalan, 25% dijangkiti trematod, dan satu ikan menunjukkan infestasi nematod. Penemuan ini mencadangkan bahawa *Channa striata* yang menghuni kawasan sawah padi lebih terjejas oleh parasit gastrousus, manakala beban ektoparasit didapati minimum. Profil parasit yang diperhatikan dalam kajian ini menekankan keperluan pemantauan berterusan terhadap populasi ikan liar dalam agroekosistem bagi memahami dinamik penularan parasit serta implikasinya terhadap akuakultur tempatan dan keselamatan makanan.

Istilah utama: Ikan haruan, ektoparasit, endoparasite

Special thanks to those who have given their support, guidance, advice, and aid for the completion of this project paper:

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Dr Tan Li Peng

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Lab assistants of FPV UMK

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DEDICATION

I would like to thank everyone who directly or indirectly supported me in the process of completing this project and thesis. It is my utmost pleasure to acknowledge those who made this project possible.

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Chapter 1

1.0 Introduction

Freshwater ecosystems support a high diversity of fish species that play important ecological, economic, and cultural roles in many Southeast Asian communities. Among these species, the common snakehead (*Channa striata*) is widely distributed across Malaysia and serves as an important food fish for local populations, particularly in rural areas (Hossain et al., 2015). Due to its ability to thrive in stagnant and low-oxygen environments, *C. striata* frequently inhabits paddy fields, wetlands, irrigation canals, and floodplain habitats (Rahman et al., 2018). Such environments, however, are often exposed to fluctuating water quality, agricultural runoff, and diverse intermediate hosts, making them suitable hotspots for parasite transmission (Dey & Miah, 2016).

Parasitic infections in wild fish can influence host growth, physiology, reproductive success, and survival, ultimately affecting fisheries productivity and ecosystem stability (Woo & Buchmann, 2012). Fish parasites are also considered important bioindicators of environmental health because changes in parasite prevalence may reflect ecological disturbances, pollution, or habitat degradation (Marcogliese, 2005). In addition, certain parasites may pose indirect risks to aquaculture and public health, especially in communities where wild fish are consumed or serve as broodstock for culture systems (Paperna, 1996).

Studies in Malaysia and neighbouring countries have documented a range of ectoparasites—including *Trichodina*, monogeneans, and protozoan ciliates—as well as endoparasites such as acanthocephalans, trematodes, cestodes, and nematodes infecting freshwater fish (Azrina et al., 2019; Amin, 2013). However, despite the widespread occurrence of *Channa striata* in Kelantan's paddy field ecosystems, parasitological data for this species remain limited, particularly in rural agricultural landscapes such as Bachok. Understanding parasite presence and prevalence in wild *C. striata* is essential to establish baseline health indicators and to assess potential risks to both wild fish populations and local aquaculture operations.

Therefore, this study aims to investigate the occurrence of ecto- and endoparasites in *Channa striata* collected from paddy fields in Bachok, Kelantan. By documenting parasite types and prevalence, this research provides fundamental insights into fish health status in agro-ecosystems and contributes to regional parasitological knowledge essential for environmental monitoring and fisheries management.

1.1 RESEARCH PROBLEM STATEMENT

Wild freshwater fish such as the common snakehead (*Channa striata*) are frequently exposed to diverse parasitic organisms, particularly in agro-ecosystems like paddy fields where water quality, land-use practices, and ecological interactions can influence parasite transmission. However, despite the widespread presence of *Channa striata* in Kelantan's paddy field environments, there is limited scientific information on the diversity and prevalence of parasitic infections affecting this species in the region. The absence of baseline parasitological data hinders effective assessment of fish health, environmental quality, and potential risks to local aquaculture and food safety. Therefore, there is a need to systematically investigate the occurrence of ecto- and endoparasites in *Channa striata* inhabiting paddy fields in Bachok, Kelantan, to address current knowledge gaps and provide essential insights for disease monitoring and management in wild fish populations.

1.2 RESEARCH QUESTIONS

What are the types and prevalence of parasites infecting the common snakehead (*Channa striata*) in paddy fields in Bachok, Kelantan?

1.3 RESEARCH HYPOTHESIS

Channa striata inhabiting paddy fields in Bachok, Kelantan are infected by a measurable prevalence of both ectoparasites and endoparasites.

1.4 RESEARCH OBJECTIVES

To determine the occurrence of ecto- and endoparasites in the common snakehead (*Channa striata*) collected from paddy field ecosystems in Bachok, Kelantan

Chapter 2

2.0 LITERATURE REVIEW

2.1 Ecology and importance of *Channa striata*

The common snakehead (*Channa striata*) is a carnivorous freshwater fish widely distributed in tropical Asia and often associated with floodplains, swamps and paddy fields, where it is valued as a food fish and traditional medicinal resource. (Tanjung,2019) Its ability to tolerate low dissolved oxygen and to utilise air-breathing organs enables it to thrive in shallow, stagnant waters typical of rice-based agro-ecosystems. (Tangjung, 2019) These same environments, however, may favour complex parasite life cycles due to the coexistence of multiple intermediate hosts (molluscs, crustaceans, aquatic invertebrates) and fluctuating water quality associated with agricultural inputs.(Wahab, 2008)

2.2 Fish parasites and environmental health

Fish parasites are now recognised not only as agents of disease but also as integral components of aquatic ecosystems and potential indicators of environmental change. Marcogliese (2005) highlighted that parasite communities can reflect food-web structure, biodiversity and anthropogenic stress, making them useful sentinels of ecosystem health.(Macroglise, 2015) Comprehensive texts on fish parasites emphasise that protozoan and metazoan taxa (including ciliates, trematodes, cestodes, nematodes and acanthocephalans) can impair growth, feed conversion, behaviour and survival in both wild and cultured fish.(Fish Parasites: Pathobiology and Protection | CABI Books, 2011) In addition, some groups, such as acanthocephalans and certain trematodes, may have zoonotic potential when raw or undercooked fish are consumed, underscoring relevance for food safety.(Williams et al., 2023)

2.3 Parasites of *Channa striata*

Across its range, *Channa striata* is frequently reported as a host for a variety of helminths and protozoa. Studies on snakeheads in India and Nepal documented seasonal fluctuations in helminth infections, with trematodes, cestodes and nematodes showing variation according to host size, sex and environmental conditions.(Gautam et al., 2018) In Indonesia, *C. striata* from paddy fields, swamps and ditches were found to carry multiple helminth taxa; work focusing specifically on snakehead helminths from Aceh reported several species of intestinal worms and highlighted the susceptibility of this predator to parasite accumulation along the food chain.(Tanjung, 2019)

Within Peninsular Malaysia, snakeheads from paddy-field environments have attracted particular attention. A study from a paddy field in Kepala Batas (Penang) reported a high intensity of acanthocephalan infection in wild *C. striata* and associated these infections with reduced condition and possible impacts on growth.(Ravi et. al., 2015) Another Malaysian report cited high prevalence of nematode infection in *C. striata* from Kedah, indicating that intestinal nematodes can also be common and potentially damaging in wild snakehead populations.(Oden et. al., 2015)

These findings collectively suggest that *C. striata* is an important focal host for helminth communities in rice-field and floodplain habitats across the region and that paddy-field settings may favour acanthocephalan and nematode transmission through complex food webs.

Chapter 3

3.0 METHODOLOGY AND METHODS

3.1 Sample Collection

A total of 20 live specimens of *Channa striata* were purchased from a fishmonger where the fish are sourced from different paddy fields across Bachok, Kelantan. Fish were placed into aerated containers and transported to the laboratory at Universiti Malaysia Kelantan for parasitological analysis. Standard biometric data including total length (cm) and body weight (g) were recorded for each specimen.

3.2 External Examination for Ectoparasites

3.2.1 Skin Scraping

Skin mucus samples were collected from the lateral body surface using a sterile glass slide. Scrapings were placed on slides with a drop of 0.85% saline solution, coverslipped, and examined under a light microscope at 100× and 400× magnification.

3.2.2 Gill Examination

Gill arches were excised and examined fresh under a stereomicroscope for the presence of any ectoparasites. Wet mounts of gill filaments were prepared for microscopic observation.

Identification of ectoparasites was performed using standard taxonomic keys (Woo & Buchmann, 2012), with attention to morphological structures such as denticulate rings characteristic of *Trichodina* spp.

3.3 Dissection and Organ Examination for Endoparasites

Fish were euthanised humanely following ethical guidelines. The gastrointestinal tract, stomach, intestine, liver, and body cavity were opened and examined for endoparasites.

3.4 Parasite Identification

Parasites were identified to the parasite group using: (1) Shape and size of hooks for acanthocephalans; (2) Body shape, suckers, and reproductive organs for trematodes; (3) Buccal structures and body segmentation for nematodes; and (4) Ciliate disc morphology for *Trichodina* spp. Images were taken for documentation.

3.5 Prevalence and Data Analysis

3.5.1 Prevalence Calculation

Parasite prevalence (%) was calculated as:

Prevalence=(Number of fish infected / Total number of fish examined)×100

3.5.2 Data Presentation

Findings were presented using tables and descriptive statistics. No inferential statistics were used due to the small sample size (n = 20), and results were expressed in terms of observed patterns and prevalence.

Chapter 4

4.0 Results

Table 4.1: The presence of ecto- and endoparasites in *Channa striata*.

Fish	Weight(g)	Length (cm)	*Trichodina sp*	Nematode	Acanthocephala	Trematode with metacercaria
1	282	30	/	X	/	/
2	290	30	X	X	/	X
3	271	28	X	X	X	X
4	260	28	X	X	X	X
5	256	29	X	X	X	/
6	280	31	X	X	/	/
7	174	27	X	X	/	/
8	128	26	X	X	X	X
9	68	21	X	X	X	X
10	211	30	X	X	X	X
11	150	27	X	X	/	X
12	180	30	X	X	/	X
13	200	30	X	X	/	X
14	122	30	X	X	X	X
15	215	27	X	X	X	/
16	165	30	X	X	X	X
17	264	26	X	X	X	X
18	198	27	X	X	X	X

19	165	25	X	X	/	X
20	125	24	X	X	X	X

Keys- /: present; X: absent

Fish 1 was the only fish which had an infestation of *Trichodina sp*., Trematode, Acanthocephalans, and Nematode. *Trichodina sp.*were isolated from the white flesh protruding out from the scales. Trematodes and metacercaria were isolated from the liver and the intestinal surface, with gross lesions of white nodular lessions. Acanthocephalans were isolated from the intestinal content which was milked.

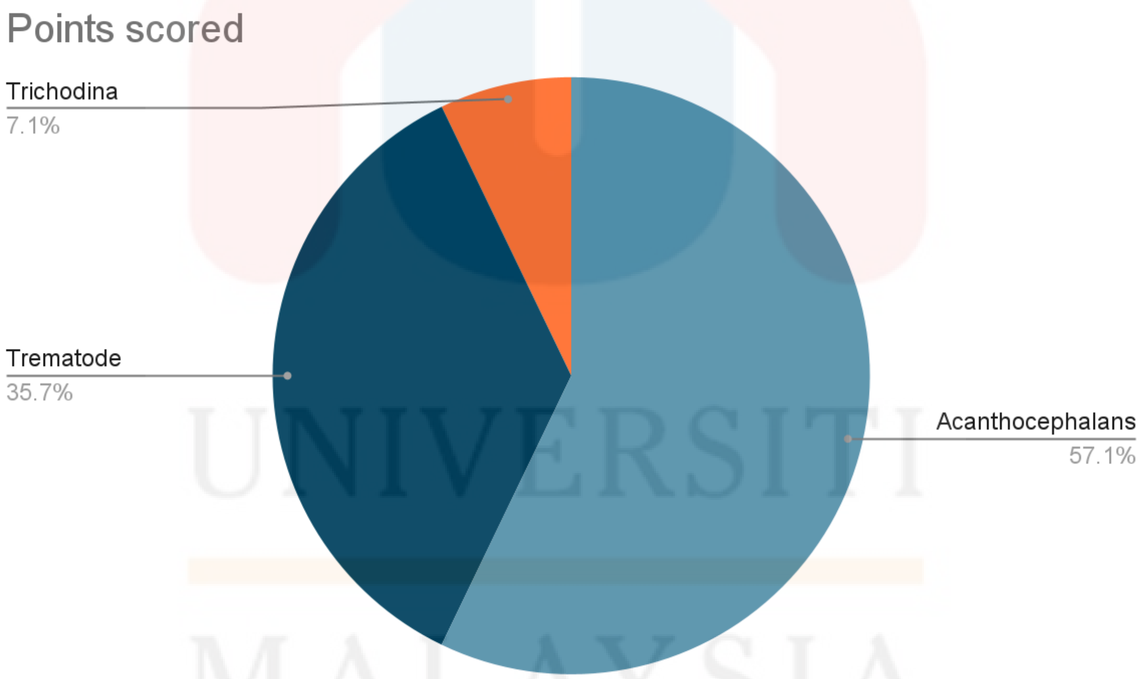

Figure 4.1: The total prevalence of parasites Discovered.

Protozoal infection caused by *Trichodina sp*. *Trichodina sp*. are round and saucer or bell shaped with a ring or cilia on the margins (Figure 4.1). The convex site possesses an attachment organ, which is known as adhesive disk. The disk has a complicated tooth structure which helps attachment towards the fish

Figure 4.2: Picture on the left shows a *Channa striata* with white flesh and the picture on the right indicative of *Trichodina sp*.

Most of the fish showed the gross lesion of white nodular lesions on the liver and the surfaces of intestines (Figure 4.3).

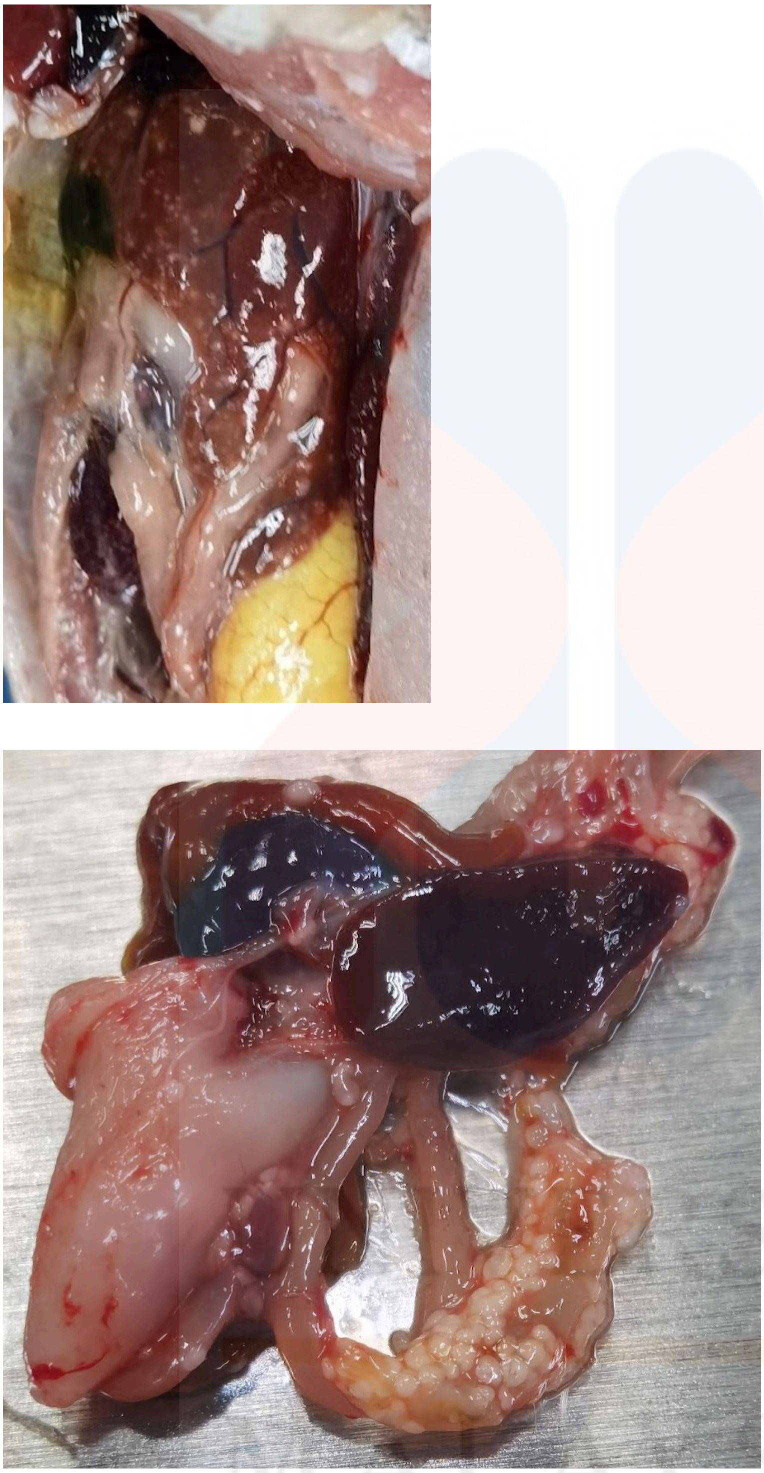

Figure 4.3: The left and right picture showing the gross lesion of white nodular lesions on the liver and the surfaces of intestines.

All trematodes are isolated from the nodular lesions from spleen, liver and surfaces of intestines. Characteristics of trematode metacercaria are elliptical, there is presence of brownish to yellowish colouration of the worm (Figure 4.4).

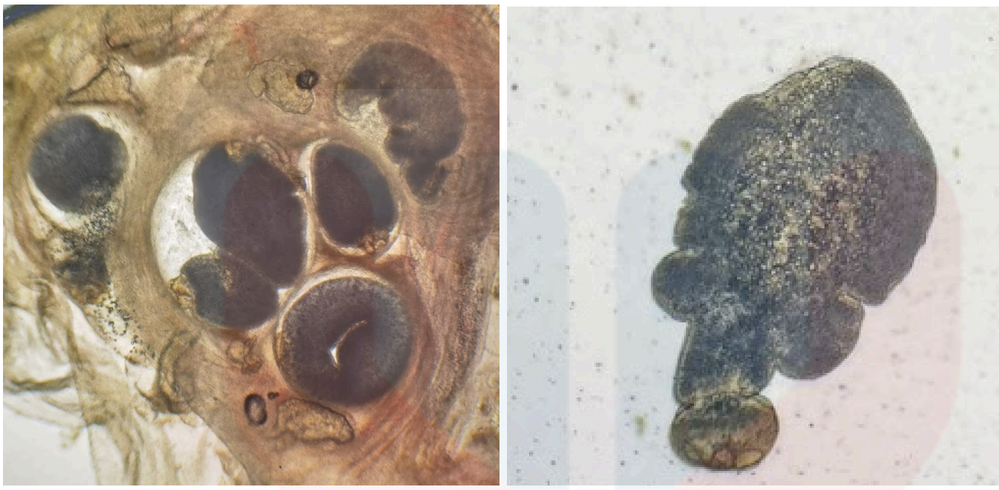

Figure 4.4: Microscopic examination of trematodes with eggs in the liver, spleen and intestinal surfaces.

All acanthocephalans are isolated and acquired from the intestinal content of the fishes. The characteristics of Acanthocephalan are bilaterally symmetrical and vermiform . The body has a thorny head. The body cavity is a pseudocoelom with no digestive tract. The proboscis is eversible with hooks which are critical for attachment (Figure 4.5).

Figure 4.5: Acanthocephalan isolated from the intestinal contents.

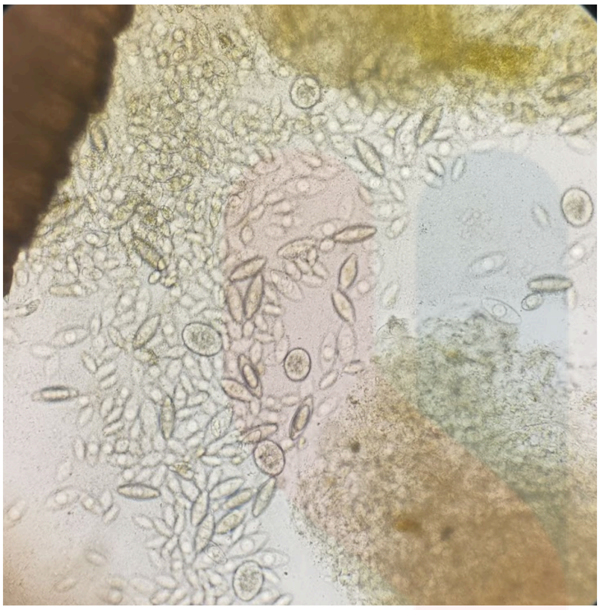

Figure 4.6: Acanthocephalan with eggs from intestinal content.

Chapter 5

5.0 Discussion

From the study, all the *Channa striata* are wild caught from different paddy fields throughout Bachok, Kelantan. Only Fish 1 showed the presence of 4 different parasites in the skin and internal organs. It is 282g and 30 cm, the heaviest and the longest fish, respectively . This aligns with the parasitic ecological concept which larger, older fish represent a larger habitat with more space and nutrients (Muñoz et. al., 2005) At the same time the fish had more time to accumulate parasites through their feeding history. The heavy parasitic load causes the fish to be immunocompromised due to damage to the intestinal epithelium and damages to the liver. (Iwanowicz, 2011) This condition leads to the fish more susceptible to secondary infestation of trichodina or trematodes.

5.1 Acanthocephalans.

There are few predisposing factors for Acanthocephala infestation, firstly is seasonal variation, Acanthocephalans infection are higher in incidences on hotter days, lower on rainy season (Dey et al., 2022), which can be seen in this study as this study conducted on August 2025 till early November 2025, before the start of rainy seasons in Kelantan.

Secondly, there is a positive correlation between size (length and weight) of the host fish and intensity of acanthocephalan infection. Larger fish tend to have more infestation intensity, in smaller fish only 1 parasite was harvested, while larger fish up to 3 of the parasites. This condition is due to the presence of a larger habitat environment for the parasite to thrive in.

Lastly is the nutritional condition of the fish, malnourished fish does not have a well developed immune system, the immunocompromised condition may lead to opportunistics organisms infestation, in this case acanthocephalans.

In the present study, only 35% of the examined *Channa striata* were infected with acanthocephalans. This prevalence is substantially lower than that reported in previous studies, such as the 98% prevalence recorded by Rajiv and Zary (2015) in Penang and the 100% prevalence reported by Wahad and Mutaqin (2008) in Kedah. Such discrepancies may be attributed to geographical and ecological variations, as the environmental conditions in Bachok, Kelantan are unlikely to be identical to those in Kedah or Penang.

The life cycle of acanthocephalans depends on the presence of suitable intermediate hosts, including amphipods, isopods, and aquatic insect larvae. (Benesh & Valtonen, 2007)Agricultural activities such as pesticide application, fertilizer use, and differing farming practices can alter the species composition and population density of these invertebrates (Claydon, 2021). A reduced or absent intermediate host population would interrupt the acanthocephalan life cycle, thereby limiting transmission to the definitive fish host. (Benesh & Valtonen, 2007)

Although broad environmental parameters such as temperature and pH may be similar across regions, other water-quality factors—including dissolved oxygen levels, water hardness, and organic matter content—can vary considerably. These variables influence both the survival of parasite eggs in the environment and the viability of intermediate host populations.(Budria & Candolin, 2013)

Another factor contributing to the lower prevalence observed in this study is the relatively small sample size (n = 20), compared to the sample size of 100 used in previous studies. A larger sample size would provide a more reliable estimate of true prevalence within the population (Wahab, 2008)

Furthermore, the current study was conducted between August and November, coinciding with the transition into the rainy season. If acanthocephalan infections peak during hotter months, it is possible that the highest prevalence occurs between April and June (Dey et al., 2022). Seasonal fluctuations may therefore also explain the lower infestation rate observed in the present study.

5.2 Trematodes

The few predisposing factors leading to trematodes infestations as stated by (Soldánov et. al., 2010): Firstly, the first intermediate host are mammals or birds with trematode eggs released from the feces and infect snails, and travel and encysts as metacercaria in fishes. As the fishes are wild caught near paddy fields, there are abundances of snails in paddy fields therefore exponentially increases the risk of infestation of acanthocephalans. Lastly is the water quality, in paddy fields, periodic fertilization of the fields is done and leading to eutrophication which alters the pH and oxygen content of the water. Eutrophic condition enhances the development of trematode communities (Soldánov et. al., 2010). Eutrophication leading to algae blooms which act as the primary source of food for snails, the blooming of the population of snails increases the probability of trematodes transmission.

For human consumption, the fish infected with acanthocephalans and trematodes can be consumed by the public with the precautions of thoroughly cooking the meat of the fish. All the internal organs are removed and discarded. Undercooked meat or raw meat can lead to severe conditions such as gastrointestinal diseases, and liver diseases as the diseases are of zoonotic potential.(Hung et al., 2015)

5.3 *Trichodina sp.*

Trichodina is a facultative parasite, which flares up when the fish are stressed, injured, which compromises their protective mucous layer. They are opportunistic organisms. The absence of Trichodina in most of the fishes indicates the wild-caught snakeheads are healthy.

5.4 Future recommendation

Future studies should include a larger sample size to obtain a more robust and representative estimate of parasite prevalence in *Channa striata*. A larger dataset would also allow for more reliable statistical comparisons across seasons, habitats, and parasite groups.

Since parasite transmission can vary across seasons, continuous sampling throughout the year—including dry, wet, and transitional seasons would help identify peak infection periods for acanthocephalans, trematodes, nematodes, and ectoparasites. Seasonal trends would provide deeper insights into environmental drivers of parasite load.

Beyond prevalence, future studies should quantify parasite intensity (parasite load per fish) and evaluate associated pathological changes in host tissues. This would clarify the severity of infections and their potential impact on fish health, growth, and survival.

Recording water temperature, pH, dissolved oxygen, conductivity, hardness, ammonia, nitrate levels, and organic content would enable correlations between parasite occurrence and water quality. Identifying environmental thresholds could help predict parasite outbreaks.

Chapter 6

6.0 Conclusion and suggestion

6.1 Conclusion

This study provides baseline information on the parasitic infections of Channa striata inhabiting paddy fields in Bachok, Kelantan. The overall findings indicate that endoparasites were more prevalent than ectoparasites, with acanthocephalans (35%) and trematodes (25%) forming the dominant parasite groups, while only a single case of *Trichodina* sp. was detected externally. The comparatively lower prevalence of acanthocephalans and other helminths compared to studies in Penang and Kedah suggests that geographical, ecological, and seasonal factors may influence parasite transmission in paddy-field ecosystems. Although the small sample size limits broad generalisations, the results highlight the presence of an active parasite community in the study area and underscore the ecological complexity of agro-aquatic environments.

6.2 Suggestions

To strengthen future investigations, it is recommended that studies:

1. Increase sample size to improve accuracy of prevalence estimates.
2. Conduct year-round sampling to capture seasonal variations in parasite load.
3. Monitor environmental parameters such as dissolved oxygen, pH, and organic matter to evaluate their influence on parasite survival and transmission.
4. Assess intermediate host populations, especially snails and aquatic invertebrates, which play crucial roles in helminth life cycles.

5. Employ molecular techniques for more precise parasite identification and to detect potential zoonotic species.

These enhancements will provide a more comprehensive understanding of parasite ecology in Channa striata and support better management of fish health in paddy-field ecosystems.

7.0 APPENDIX

Figure 7.1: The above figure shows Fish 1 with reddish-greenish discoloration on the pectoral side of the fish.

Figure 7.2: Shows the in-situ view of the abdominal cavity.

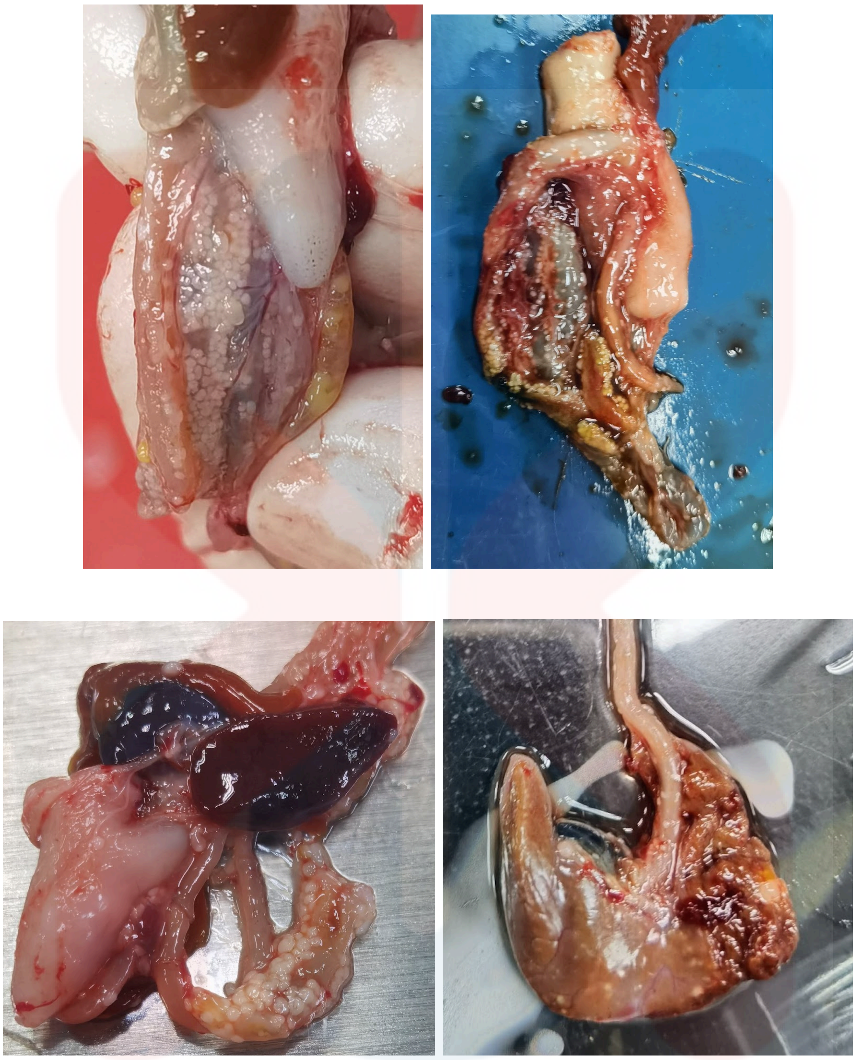

Figure 7.3: Both of the figures show the white nodular lesions on the surfaces of all the organs.

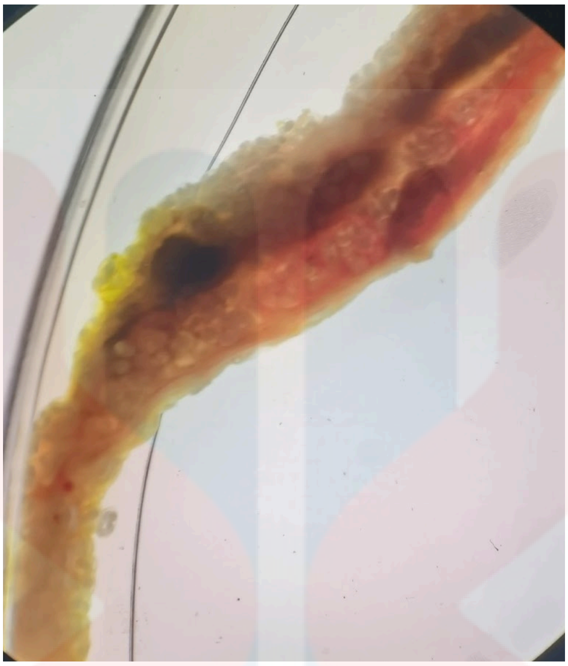

Figure 7.4: Observation of the white nodular lesions from stereo microscope.

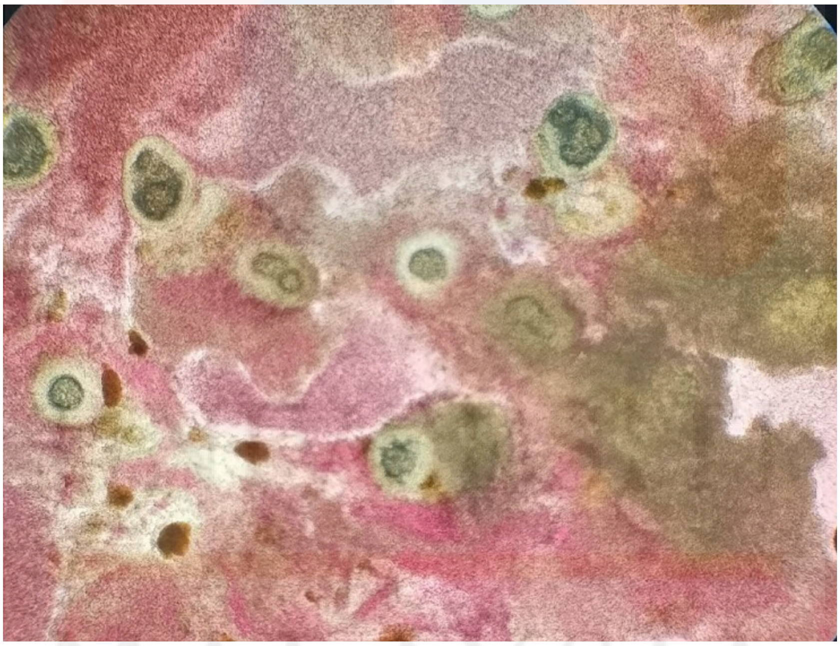

Figure 7.5: Trematodes egg seen from the spleen. (squash smears observed under compound microscope)

Figure 7.6: Trematode observed under the compound microscope. (x10 magnification)

Figure 7.7: The above figure shows acanthocephalans isolated from the intestines. (x10 magnification)

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