

HELMINTHIC PARASITES OF SELECTED FRESHWATER FISHES SOLD AT THE SUPERMARKET OF COTABATO CITY

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ABSTRACT

Parasites play an important role in the ecology of aquatic ecosystem (Moyo and Barson, 2010) while fish play an important role in the human diet (N.B. Salcedo *et. al*, 2009). The study was conducted to identify and determine the prevalence and abundance of parasites of selected freshwater fishes sold at the supermarket of Cotabato City. A total of 20 specimens at four (4) species such as; *Channa striata* (dalag), *Cyprinus carpio rubrofasciatus* (karpa), *Oreochromis niloticus* (tilapia) and *Trichogaster lalius* (gourami) were used in the study. Organs examined were intestine, stomach, gills and muscles. Results of the study revealed 7 species of parasites consisting of 3 genera of nematodes; *Genus Camallanus*, *Genus Capillaria* and *Genus Mononchus* and 4 genera of platyhelminths; *Clinostomum* & *Fasciola* (Trematodes), *Dactylogyrus* (Digenea) and *Diphyllobothrium* (Cestode). Percentage occurrence was 100% on Nematode, Trematode and Monogenea (in 4 selected freshwater fishes) and 15% cestodes on *C. striata*, *O.niloticus* and *C. carpio rubrofasciatus*. Nematodes have an average abundance of 13.55; trematode, 6.05; Monogenea, 2.35 and Cestode, 0.7. For an abundance of parasites in individual freshwater fish, *C. carpio rubrofasciatus* had an average abundance of 37; *T. lalius*, 27.8; *O.niloticus*, 14.4 and *C.striata*, 11.4. Parasites were at their juvenile or larval stages and inhabited nearly every organ of the fish. All female fresh water fishes were highly infested of parasites except the male fish, *C. carpio rubrofasciatus* with an average abundance of 38.5 male, 36 female. Female fish *T. lalius*, *O. niloticus* and *C. striata* have an average abundance of 30.6, 20 & 20 while male fresh water fishes have 23.5, 12 and 5.6 average abundance respectively.

Key words: *helminthic, parasites, freshwater fishes, sold, supermarket, Cotabato City*

INTRODUCTION

Parasites are common in most ecological systems, and all free living organisms can be a potential hosts to parasites (Moyo and Barson, 2010). They play an important role in the ecology of aquatic ecosystems by causing harm to the host by tissue damage and can also make the host more susceptible to secondary infection, by weakening host immunity and subsequent economic losses resulting from mortality [Peek, JL, 2012 & Onyedineke et al., 2010]. Host such as freshwater fish plays a great role in the human diet. With the increased population, fish helps meet the demand for food and directly serves as substitute for beef, pork, and other animal protein, aside from vitamins and minerals and many other essential nutrients suited for human nutritional requirements (N.B. Salcedo et.al 2009).

In spite of an increasing demand on fishes, most people did not focus much attention on fish health situation. Fish products like *Channa striata* or mudfish, *Cyprinus rubrofuscus* or karpa, *Oreochromis niloticus* or tilapia and *Trichogaster lalius* or gourami were commonly sold in the megamarket of Cotabato City. Cotabato City had been criss-crossed by creeks and rivers and also referred to as a city of rivers and islets wherein different freshwater products especially fishes from neighboring municipalities were traded in. Majority of these fish species (mudfish, tilapias, carpa and gouramis) were sold in the megamarket came from neighboring municipalities of Maguindanao (Kabuntalan &Taviran) and seldomly from North of Cotabato (Libungan Tureta of Pigcawayan). All of these fish products were landed on small pier or commonly called Matampay river bank where passenger “bangkas” docked in.

In connection, inhabitants in Cotabato City are patronizing these fish products as their main staple foods particularly those family who are in low to middle income. Food products such as “pastil” or “patel”, kare-kareng dalag, ginatang dalag, “sugba” or ihaw are among the few preferred foods which are almost available everyday and sold in some restaurants and even in school canteens (particularly pastil). As a consequence, there is a great threat concerning the public health in which parasitic disease may be transmitted from fish to man through fish consumption particularly raw fish consumers.

Like any other hosts, freshwater fish acquire a number of parasitic diseases interrupting their normal growth. Effects of parasitism may vary from mild to severe depending upon the intensity of the parasitic load and pathogenicity of the causal agent affecting the fish. It also depends on various environmental factors such as geographical location of the habitat, season of the year, physico-chemical factors of the water, the fauna present in and around the habitat, its age and diet (Rakibuzzaman, Md.et al, 2011). Gupta (1983) added, injury of fishes can carry heavy infection of parasites that cause deterioration in the food consumption of fish and may even result in their mortality.

Studies on faunal parasites on freshwater fishes sold at the supermarket of Cotabato City was scant and recent. Hence, identification of these parasites is, therefore, of paramount importance to prevent it from infecting human and domestic animals. The scope of the study

limited only on organs such as the intestine, stomach, gills and muscles. Identification was up to genus level only.

OBJECTIVES

The main purpose of the study were to identify and investigate the prevalence and abundance of helminthic parasites of the fresh water fishes sold at the supermarket of Cotabato City. The study also observed the variation of infestation in female and male fresh water fishes.

METHODOLOGY

A. Survey and Interview

Survey on wet market or commonly called supermarket was done by conducting a short interview to fish dealers and consumers on the possible time arrival of fish products from other municipalities and what fish species were sold in the market daily.

B. Collection of Selected Freshwater Fishes and Preparation of Materials

The selected fresh water fishes (total of 20 at 4 different species) used in the study such as *Channa striata* (dalag), *Oreochromis niloticus* (tilapia), *Cyprinus carpio rubrofusca* (carp) and *Trichogaster lalius* (gourami) were purchased at the fish stalls of supermarket of Cotabato City, one species at a time based on their availability until the total number needed were met. Selected fresh water fishes were placed in a plastic container and were transported for microscopic examination.

Materials needed for the study were prepared such as: camera, microscope, dissecting set (scissors, needle, scalpel and forceps), knife, weighing scale (200 g cap), ruler and measuring tape (used for larger specimens), hand gloves, sterile small plastic containers, hand lens, working tables (2 at 1m x 1m and 45cm x 100cm), pail and basin.

C. Examination of the selected Fresh Water Fishes

Before the examination of selected fresh water fishes were made, samples were measured (in g and cm, Appendix 3a), washed with tap water (to ensure non-corporation of contaminants) and scales were scraped. Organs to be examined in the study such as intestine, stomach, muscle and gills were taken from the incised body (along mid-ventral part using scissors & scalpel) of selected fresh water fishes and separately placed them in a small sterile plastic containers (Appendix 3j) with saline (7gm NaCl & 1000ml distilled water).

Intestines of the selected fresh water fishes were examined by cutting a portion (an inch size), 3-4x based on the size of the whole intestine, opened longitudinally (with dissecting needle and scissors), scraped (the contents) and compressed slightly between two glass slides and observed under a microscope. Stomachs of the selected fresh water fishes were longitudinally opened, flushed with saline to separate the gut contents, pressed slightly between two slides and examined under the microscope. Muscles of the selected fresh water fishes were cut (about an inch, at the abdominal and caudal part), teased slightly with a scalpel and needle onto the glass

slide (added with saline) and observed. Non-shredded part of the muscles were pressed slightly on the glass slide and examined under the microscope. Gills of selected fresh water fishes were examined by; cutting a portion of a gill arch (using scissors), cut the hair-like structure of the gills, laid them on a glass slide (with the helped of a needle) added with a drop of saline and examined under the microscope.

D. Identification, Documentation and Fixation of Parasites

Recovered macroscopic and microscopic parasites were documented through photomicrography (camera – Cannon 16 mega pixels, zoom lens 8x IS, 5.0 – 40.0 mm) and were identified using the identification key (R. Madhavi, 2007, Hoffman, 1999). Recovered parasites (cestodes & trematodes) were fixed using formalin.

E. Data Analysis

The prevalence and abundance of parasites of the selected fresh water fishes were determined according to Ekanem et al., 2011 and Rumeet Kaur et al.,2012 with the following formulas:

$$\text{Prevalence} = \frac{\text{Total No. of Hosts Infected}}{\text{Total No. Of Hosts Examined}} \times 100\%$$

$$\text{Abundance} = \frac{\text{Total No.of Parasites}}{\text{Total No. Of Hosts Examined}}$$

RESULTS AND DISCUSSION

Identification of parasites and its overall prevalence in host fishes sold at Megamarket, Cotabato City.

The study showed a total of 7 genera of parasites (Table 1) identified in four host fishes, *C.striata*, *O. niloticus*, *C. carpio rubrofuscus* and *T. lalius*. Of these, 3 genera were Nematodes namely *Mononchus*, *Camallanus* and *Capillara* (Figure 1) and 4 species of Platyhelminthes from genera *Clinostomum*, *Fasciola*, *Dactylogyrus* and *Diphyllobothrium* (Figure2).

Table 1 –Parasites identified on selected fresh water fishes sold at Megamarket Cotabato City.

PARASITES	
3 Nematoda	4 Platyhelminthes
<i>Genus Camallanus</i> Family Camallanidae Class Secernentea	<i>Genus Clinostomum</i> Family Clinostomidae Class Trematode
<i>Genus Mononchus</i>	<i>Genus Fasciola</i>

Family <i>Mononchidae</i> Class <i>Enoplea</i>	Family Fasciolidae Class Trematode (Subclass Digenea)
Genus <i>Capillaria</i> Family Capillariidae Class Adenophorea	Genus <i>Dactylogyrus</i> Family Dactylogyridae Class Monogenea
	Genus <i>Diphyllbothrium</i> Family Diphyllbothriidae Class Cestoda

Of four fresh water fishes, Table 2 showed 100% over all prevalence of nematode, trematode and monogenea in all hosts while cestodes showed only 15% prevalence (3 of 20 hosts) except *T.lalius*. Infestation of parasites occurred at different organs of the fresh water fishes. The high prevalence of parasites particularly in *C.carpio rubrofuscus* & *T. lalius* can be due to the period of collection of samples. Intermediate hosts (snails) were abundant during rainy days and lead to rapid multiplication of parasites in fishes.

Table 2- Prevalence of parasites on the four (4) selected fresh water fishes sold at the Supermarket Cotabato City.

Host Fishes	PARASITES							
	Cestodes		Nematodes		Trematode		Monogenea	
	No. Infested	Prevalence (%)	No. Infested	Prevalence (%)	No. infested	Prevalence (%)		Prevalence (%)
<i>Channa striata</i>	1	20	5	100	5	100	5	100
<i>Oreochromis niloticus</i>	1	20	5	100	5	100	5	100
<i>Cyprinus carpio rubrofuscus</i>	1	20	5	100	5	100	5	100
<i>Trichogaster lalius</i>	0	0	5	100	5	100	5	100
Total Infested Host	3		20		20		20	100

The range of snail habitat is large and they can adapt to freshwater thus, an increase in number of intermediate hosts greatly affect the positive occurrence of parasites. Experimental fresh water fishes were originated from Kabuntalan area of Maguindanao, where, Tamontaka River (Datu Odin, Maguindanao) and Mindanao River (Cotabato river) meet along Northern Kabuntalan passing the vast marsh of Libungan and inter-connecting Pulangi river down to Liguasan marsh area. Residents residing along these municipalities particularly along the rivers may be had different sanitary and/or livelihood practices that might anthropogenically triggered fish inhabitants. In addition, intensive and semi-intensive type of farming in the area stresses the fish which may account for the presence of parasites. Stress can trigger multiplication of parasites because the immune system of fishes may be lowered (Salcedo, N.B. & Gonzaga, E.A. 2009).

Numerical abundance of parasites and prevalence of infestations in relation to sexes of fresh water fishes.

Table 3.1 showed an average abundance of parasites per fresh water fish in relation to sexes in which generally, female fresh water fishes have high occurrence of parasites except in male fish, *C. carpio rubrofuscus*, 38.5 while female hosts, 36. Among the rest of the fresh water fishes, female fishes, *T. lalius*, *O. niloticus* and *C. striata* have 30.6, 20 & 20 while male fishes have 23.5, 12 and 5.6 average occurrence respectively. Recent study showed similar results on Gupta *et al.* on population dynamics of *Pallisentis* (Acanthocephala), in relation to host sex (*Channa striatus*, n= 319) overall prevalence of *Pallisentis* in *C. striatus* was higher in females (67.78%) as compared to males (63.52%). Considering the individual fresh water fishes, *C. carpio rubrofuscus* had an average abundance of 37; *T.lalius*, 27.8; *O.niloticus*, 14.4 and *C.striata*, 11.4 (refer table 3.1). Most of these parasites were at their juvenile or larval stages and usually inhabit nearly every organ of the hosts.

Table 3.1 – Numerical abundance of parasites per freshwater fish in relation to sexes.

Hosts species	Sex	Total endoparasites	Total Host per Sex	Ave. abundance per sex	No.endoparasites per Host	Total per host species	Ave. abundance per Host
<i>C.striata</i>	Female	40	2	20	57	5	11.4
	Male	17	3	5.6			
<i>C.carpio rubrofuscus</i>	Female	108	3	36	185	5	37
	Male	77	2	38.5			
<i>O.niloticus</i>	Female	60	4	15	72	5	14.4
	Male	12	1	12			
<i>T.lalius</i>	Female	92	3	31	139	5	27.8
	Male	47	2	23.5			
Total		453	20		453	20	22.7

Twenty (20) fresh water fishes have 22.7 average abundance of parasites of which 13.55 nematode; 6.05, trematode, 2.35, Monogenea and 0.7 Cestode (refer Table 3.2).

Table 3.2 – Numerical abundance of parasites from 20 freshwater fishes sold at Supermarket Cotabato City.

Parasites	Total abundance	Total Hosts Examined	Average abundance
<i>Cestodes</i>	14	20	0.7
<i>Monogenea</i>	47	20	2.35
<i>Nematodes</i>	271	20	13.55
<i>Trematodes</i>	121	20	6.05
Total	453		22.7

Nematodes, being most abundant, are parasites of almost every species animal, including humans and plant and cause enormous social and economic damage. In humans, some 30 species of nematodes are of medical importance and are responsible for diseases such as elephantiasis and river blindness, and include the intestinal roundworm (*Ascaris*), the pin worm (*Enterobius*) and the hook worms (*Necator*), and capillariasis (*Capillaria*). *Capillaria philippinensis* (Figure

1, d) marked by diffuse abdominal pain and chronic diarrhea due to visceral larval migration (Ko 2009). Ko, 2009 added that in fish, this can cause intestinal obstruction, anorexia, cachexia, skin protrusion, and death. This parasite commonly occurs in the gut mucosa of freshwater fish in SE Asia and can infect humans eating undercooked whole fish.

Figure 1 – Nematodes identified from four (4) selected freshwater fishes sold at supermarket of Cotabato City : *Genera a& b, Mononchus*; *c, Camallanus* and *d, Capillaria*.

Nematode are found in wide variety of habitat and considered as free-living, found in soil, freshwater and marine sands and muds most specifically *Genus Mononchus*. *Genus Mononchus* (Figure 1 a & b) not just animal-parasitic nematode, but entomo-pathogenic and plant-parasitic in general (European Society of Nematologists, 2009). Abundance of *Genus Mononchus* in *C. carpio rubrofuscus* may be due to feeding nature of the host species. Diet of the host has been attributed to be the main factor determining the structure of the parasite community (Ogbeibu, Anthony A. et al., 2014).

Generally, *Genus Mononchus* are omnivorous. They feed herbivorous diet of water plants, but prefer to scavenge the bottom for insects, crustaceans (including zooplankton), crawfish, and benthic worms. They are important in soil nutrient cycle and are considered as non-parasitic predatory nematodes. Young *Mononchus* eat microscopic creatures, such as protists, while adult nematodes attack protists as well as rotifers, water bears, aquatic worms, and other nematodes.

Figure 2 – Platyhelminths identified from selected fresh water fishes sold at Supermarket of Cotabato City: a) *Genus Fasciola*, b) & d) *Genus Diphyllbothrium* (egg), (c) *Genus Clinostomum* and e) *Genus Dactylogyrus*.

Flukes in *Genera Fasciola and Clinostomum* (Figure 2 a & c) were most abundant in the intestine followed by stomach and few in the muscles, were generally, in egg and juvenile forms, except in live adult flukes recovered from the outer lining of stomach and intestine of *T.lalius* and *C. carpio rubrofuscus* (Appendices 1, b & c). Larval metacercariae, though less host specific than adult, is in pathogenic stage and may affect growth and survival of the hosts. On the other hand, *Genus Clinostomum*, particularly *Clinostomum complanatum*, causes laryngitis or pharyngitis (Hara et al., 2013). Human laryngitis caused by *C. complanatum* is a rare disease; however, in Japan, Korea, and other Asian countries where eating raw fish is a tradition, it is possible for individuals to become infected by this intestinal parasite (Park, C.W. et al., 2009). If a person consumes a raw freshwater fish infected by the larvae of this parasite, the larvae will excyst in the stomach, migrate through the esophagus, and attach to the throat and mature, causing parasitic pharyngitis or laryngitis (Hara et al., 2013). In fact, Hara described a patient's case with laryngitis caused by *C. complanatum* after eating fresh water fish sashimi.

On the other hand, one (1) adult and few eggs of cestode (*Genus Diphyllbothrium*) were recovered in the stomach (embedded in the tissue muscle, the later on the outer lining) of *C. striata*, Appendix 1-A, a & d. Salcedo, N.B. and Gonzaga, E.A., 2009 stated, the presence of tapeworms may be attributed to the habitat of fish. Fish reared close to residential houses and animal barns and sheds are likely to be infected with tapeworms. Human and animal wastes can be the source of parasites that carry the immature stages of tapeworms. Monogenea (*Genus Dactylogyrus*) were prevalent in all fresh water fishes but specifically abundant in *C.carpio rubrofuscus*, 16 and *O.niloticus*, 15 (Appendix 1-C, d).

CONCLUSION AND RECOMMENDATION

In this study, parasitic helminths were present and prevalent in all four (4) selected fresh water fishes sold in Cotabato City supermarket. These parasites were present in all organs examined. In fresh water fish *Cyprinus carpio rubrofuscus* and *Trichogaster lalius*, prevalence of nematodes and trematodes were high. Some nematodes were found to be beneficial.

It is therefore recommended that freshwater fishes sold at supermarket of Cotabato City must be cooked thoroughly to prevent infecting human and animals. Eating raw or kinilaw of this kind is thereby discouraged especially *Cyprinus carpio rubrofuscus* and *Trichogaster lalius* based on facts and results of the study.

Furthermore, identification of parasites should be done in one host species at which 50% or more part of organ/s will be included in the investigation to intensively study the prevalence of infection of such parasites.

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