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# FRESHWATER DIGENETIC TREMATODE PARASITES IN VARANASI: AN EPITOMISED REVIEW

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## Abstract

Fish serve as intermediate hosts for different avian digenetic trematodes. From August 2005 to September 2007, a study on 10 different types of freshwater fish belonging to 8 different families from the River Ganga uncovered a total of 10 metacercariae of digenetic trematodes from five different families, for instance. In order to prevent infections, microbes, growths, and other things, the field of parasitology has managed eukaryotic organisms. This is how it will be applied here. The current paper will concentrate on specific biological aspects of the life cycles and life-history strategies used by the Digenea, a different assemblage of platyhelminths that contains precisely 25,000 species. More specifically, the survey will consider the host/parasite communications that exist in middle-aged molluscan hosts and how these connections—or a lack thereof—can organise trematode infracommunities within these molluscan transitional hosts. Predation/contest may act as a powerful organising force for infracommunities in some marine prosobranchs but not others, according to writing in this area. Those transient/spatial elements may act as organising systems in at least some freshwater pulmonates.

The event of digenetic trematode parasites [Complexobursa buxarensis (isotype) and Neoaphanuroides ilishai (isotype) in a new water fish, Hilsa ilisha from Varanasi, U.P., was carried out for one yearly cycle, for instance from December 2018 to December 2019. Complexobursa buxarensis contamination levels were estimated to be higher than 27% and Neoaphanuroides ilishai contamination levels to be higher than 14%. Complexobursa buxarensis had an average contamination level of over two worms per contaminated fish, with the disease showing the greatest intensity in March and the lowest level in October, whereas Neoaphanuroides ilishai had an average contamination level of under two worms per contaminated fish with the disease showing the greatest intensity in June and the lowest in January.

**Keywords:** Freshwater Digenetic, Trematode Parasites, Varanasi, Fishes.

## 1. Introduction

Metacercariae of digenetic trematodes are provided with the expected natural environment by freshwater fish. These metacercariae occupy all of the vital organs of the host body, such as the liver, heart, gills, body cavity, and so forth, and cause severe pathologies to the body tissues. Fishes are used as an optional halfway host by avian digenetic trematodes to complete their life cycles. A pioneering amount of writing is available on the metacercariae of various digenetic trematodes from fishes worldwide. India contributed a significant amount of research on digenetic metacercaria as well. In the current review, ten different metacercariae species representing five different fish families totaled ten different types of fish.

There are about 25,000 different types of digenetic trematodes, or accidents, the adults of which infect vertebrates such as fish, birds, and warm-blooded animals as parasites. No matter what their final hosts are, all trematodes are flat, have a protonephridial osmoregulatory system, a fragmented stomach, and are covered by a syncitial covering, through which at least some supplement resources are consumed. Despite these and other morphological and physiological similarities, there is a wide range in the size, shape, and behaviour of these parasites, as well as the location of contamination within their hosts. Alaria from canine lung, Crepidostomum cooper from rock bass pyloric ceca, and Echinostoma revolutum from Canada geese cloaca are three examples of agent, monoecious accidents and the locations of contamination. Some varieties of Schistosoma, dioecious parasites that inhabit the mesenteric venous systems of humans and other vertebrates, are in contrast to these monoecious parasites.

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The most diverse group of platyhelminths are the genus of trematodes known as accidents (6). It is estimated that there are about 18000 species of them (30), and they are all committed parasites of vertebrates (12). This taxon's extraordinary peculiarity, which sets it apart from other trematode groups, is its convoluted life cycle. Importantly, all digenetic trematodes have at least one parasitic stage in a mollusc and one in a vertebrate during the course of their life cycle (44). Three hosts are typically included in the basic life-cycle example of a digenetic accident (5). According to Cheng (6), a summed-up life cycle is as follows: The parasite enters the last host, a vertebrate, at sexual maturity and produces eggs, which are excreted through dung; each egg develops into a hatchling miracidium, the primary free-living stage of the turn of events, which contaminates the main middle host, a mollusc (typically a snail); in the snail, the hatchling miracidium transforms into a sac-like sporocyst, which undergoes abiogenetic propagation Digenetic trematodes also have the ability to contaminate domesticated animals and people, posing a serious threat to health and the economy, especially in developing countries.

Significant to the Indian geological region are water bodies. As a result, it benefits the Indian economy. Fish make up a sizable portion of marine life. Oceanic life forms have been found to contain a variety of parasites. Fish are home to a wide variety of pathogenic specialists' protozoa, helminthes, infections, and microorganisms, among others. They affect fish health and the qualitative and quantitative production of fish. Trematodes account for a sizable portion of fish disease. Digenetic trematodes have two hosts, including fish, on which they can finish their life cycle. The fish Channa punctatus is frequently transported in freshwater. They are easily accessible in Jaunpur's fish market. They depend on animal food because they are fish that eat meat. The helminth parasites, which are primarily found in freshwater fish and finish their life cycle in the middle of the road, A total of 296 fishes were examined, of which 60% were contaminated. We are trying to look at them.

## 2. Diversity of Life-Cycles

The majority of digenetic trematodes infect three hosts at some point in their life cycle. However, some animal species have a four-host life cycle and need an additional host in order to reach sexual development. A few members of the Halipegus variety have been observed to

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contaminate four hosts while they were developing, which has illustrated the challenging development of Halipegus occidualis. This species is found in North America and is a parasite of green frogs.

Frogs remove the eggs, which snails then consume. When the cercaria leaves the mollusc, it enters the shellfish in the optional middle of the road (ostracods). For dragonfly hatchlings, the scavengers are a prime source of food, according to the third middle ground. However, it was discovered that the bug hatchling is not a physiological requirement for the trematode's further development but rather a natural requirement for the trematode to reach the ultimate host (green frogs do not benefit from ostracods but feed on dragonfly hatchlings). Additionally, four hosts have been used by Halipegus eccentricus during its life cycle. In contrast to its relative H. occidualis, H. eccentricus taints damselfly hatchlings rather than relying on dragonfly hatchlings to connect the trophic hole. The trematode Lecithocladium excisum, a common parasite of Scomber spp., also has a four-have life cycle. As a necessary host, the miracidium infects an opistobranch snail.

Copepods, tiny scavengers, then consume the cercaria. Other zooplanktonic organisms, such as ctenophores or young polychaetes, eat the copepods after which they are consumed by fish.

Different species have instead evolved much simpler life cycles. In some circumstances, a two-host or even a single host lifecycle design has been observed. Although the exact cause of this shortening is unknown, there are benefits to having fewer hosts. For example, if one of the hosts becomes temporarily uncommon due to other natural causes, skipping one parasitic stage considers the conclusion of the turn of events; in addition, having fewer hosts results in a lower risk of failure during the host exchanging stage. There are five fundamental ways trematodes can complete less challenging lifecycles, according to Poulin and Cribb.

The main method is referred to as progenetic advancement, in which the metacercaria intelligently develops into an adult after becoming encysted inside the subsequent halfway host, reaching sexual maturity and ovulating. Examples of this development include a few animal groups in the genus Alloglossidium, where all trematodes lay eggs in their second and last hosts, which may be parasites or shellfish.

A second type of truncation entails using the main intermediate host, the mollusc, as the next halfway host. Cercariae do not leave the mollusc; instead, they develop into metacercariae inside the primary host and hang on until the final host consumes them. It has been observed that members of the Lissorchiidae family, like Asymphylodora tincae, follow this life-cycle pattern.

Include the following middle of the road host as a conclusive host as well to further achieve a reduction in the life-cycle. The third host stage is eliminated as a result of this interaction, in line with progenetic improvement. For instance, Haplometra cylindracea cercariae enter the frogs' oral depression where they develop into metacercariae in the buccal mucosa. After a short period of time, the blisters containing the metacercariae burst and the trematodes moved to the frogs' lungs, where they mature to adult stage. The fourth type of truncation occurs when adult worms develop inside rediae or sporocysts within the mollusc and produce eggs, which are then transformed into miracidia. At that point, another mollusc will become contaminated by the miracidium. This life cycle belongs to a single host. Plagioporus sinitsini has the ability to switch from a typical three-host life cycle to a solitary host one in the event that the fish it infects is absent from the environment, according to Barger and Each (1).

Finally, the fifth method, a single host improvement, only occurs in a few members of the Cyathocotylidae family, like Mesostephanus haliasturis. This cycle allows the sporocyst inside the mollusc to directly release miracidia, which are remembered to infect a different snail and thus continue the life cycle.

## 3. Diversity of Trematodes In Humans

A staggering variety of digenetic trematodes are prepared to infect humans. Sometimes trematodes only attack humans (like in case 18), other times contamination occurs unintentionally (for example 9).

A person's accident disease will manifest differently depending on the trematode species involved and the environment they are living in inside the host. In order to categorise trematodes according to their location within the contaminated life form, Parija came up with four distinct

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groups: the blood accidents, the living in the veins, the liver accidents, the lung accidents, and the digestive accidents.

Blood trematodes of the genus Schistosoma are responsible for the tropical illness schistosomiasis or bilharzia. S. haematobium, found in Africa and Arabia, S. mansoni, found in Africa, South America, and Arabia promontory, and S. japonicum, found in South-East Asia, are the main species that infect people. Working or washing in water where the snail have is available can cause contamination. Effectively searching humans, cercariae enter the host through the skin. The other two species are to blame for gastrointestinal and hepatosplenic irritations, while S. haematobium aggravates and impairs the urinary system.

In 74 countries, the majority of which are developing ones, schistosomiasis is endemic, and both population growth and unfortunate illnesses could contribute to the disease's further spread.

Food-borne illnesses called liver accidents are brought on by eating contaminated food. Fasciola hepatica, Clonorchis sinensis, and Opistorchis viverrini are among the most well-known.

Fascioliasis, which was once thought to be primarily a veterinary problem but is now widely recognised as a serious human infection with the highest rate of cases in developing countries, is caused by the bacterium F. hepatica. There are two stages of perceived obsession: a severe stage associated with the movement and development of the metacercaria in the hepatic tissue, which disturbs and irritates those tissues, and a persistent stage associated with the trematode's establishment in the bile pipes, which produces a few side effects like fever, stomach pain, sickness, and gastrointestinal unsettling influence.

The two members of the Opisthorchiidae family, C. sinensis and O. viverrini, are widely distributed in south-east Asia. The primary symptoms of the infection are epigastric pain, diarrhoea, fever, loss of appetite, general discomfort, and an increased risk of cholangiocarcinoma, a deadly bile channel disease. The two parasites are contaminated by eating raw freshwater fish that has metacercariae attached to it.

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Opistorchis felineus, a close relative of Opistorchis viverrini, is typically found in east Europe and is responsible for the majority of liver helminthiases. In any case, southern European countries like Spain and Italy have recently kept this species.

The absolute most frequent types of lung accidents are Paragonimus spp. More than 30 species have been represented in this class, but only seven of them are capable of contaminating humans. The most significant and widespread variety of the species, found in South America, Asia, and Africa is P. westermani. Human contamination occurs when raw meat from paratenic warm-blooded animals or contaminated shellfish are consumed.

The trematode develops in the lungs of many species, aggravating the respiratory system. It is also possible for Paragonimus spp. to cause cerebral paragonimiasis, which is more dangerous than typical paragonimiasis and has more severe side effects, including migraine, visual aggravation, seizures, engine and physical aggravation, and mental crumbling.

Two examples of gastrointestinal mishaps are Gastodiscoides hominis and Echinostoma spp. Although gastrodiscoidiasis, which is caused by G. hominis, rarely results in death, it can cause stomach pain and digestive problems because of the parasite's mechanical and poisonous effects. Instead, echinostomiasis is a serious gastrointestinal condition that affects the mucosa of the digestive tract and causes catarrhal irritation and widespread duodenal disintegration.

The illness's primary side effects are pallor, migraine, stomach ache, underweight, urinary incontinence, and gastric pain.

## 4. Economic Impact of Trematodes

Digenetic trematodes pose a serious threat to practical activities involving vertebrate taxa, such as fishing, hydroponics, and creature cultivation, because they can contaminate every single vertebrate gathering. Indicate that parasitic contaminations are to blame for significant financial losses in hydroponics, as well as decreased fish growth and an increase in fish mortality, as well as endeavours for adequate farming techniques and essential synthetic drugs used to prevent and fend off diseases.

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In a study looking at the parasite fauna of eight commercially important flatfishes in Northern Spain, a few authors discovered 13 digenetic trematode species contaminating the fish; this revelation should encourage better hydroponics across the board since Northern Spain is one of the main exporters of flatfishes in Europe. It has been determined that Northern Bluefin Tuna, the most important species in hydroponics, also carries a wide range of trematode parasites that affect human growth and endurance. Additionally, it is estimated that the financial losses caused by waterfalls in farmed Atlantic salmon (Salmo salar) caused by trematodes of the type Diplostomum total 27 million Euros just in Europe.

Additionally, parasitic infections contribute to illness and decreased productivity in animal farming operations all over the world. Fasciolosis, which is caused by the helminthiase Fasciola gigantica, has been observed to be a source of these side effects in ruminants. It is well known that helminthiases can cause impeded development and increase death rate. Furthermore, Ross found that contaminations with fascioliasis in steers can reduce milk production by 14%. Fascioliasis may result in financial losses related to meat boycotts.

A study conducted by Swai and Ulicky in slaughterhouses in Tanzania demonstrated that benefits losses due to meat rejection due to fascioliasis can amount to significant sums of money even in a single slaughterhouse.

## 5. Material And Methods:

The period covered by the current review was December 2018 to December 2019. Fish were obtained alive from the Varanasi fish markets of Chaukaghat and Dashashwamedh. Fish instinctive organs were removed and individually examined in petri dishes containing 0.7 percent saline for the analysis of various parasites. Samples were then fixed in an AFA arrangement (half alcohol, formalin, and acidic corrosive in the ratio of 100:6:2.5), protected in 70 percent alcohol with 5 percent glycerine, stained with acidic alum carmine, separated in corrosive water, dried

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out in an evaluated series of alcohol, and finally cleared in clove oil Practically everything done in the zoology lab of the D.A.V. School in Kanpur after the parasite assortment. The graphs were created using camera Lucida as a guide, and stage micrometre was used to take measurements (in millimetres).

## 6. Result And Discussion:

Variation from time to time in the frequency and severity of disease (table and diagram I and II) Tables I and II

Between December 2018 and December 2019, 145 Complexobursa buxarensis (isotype) worms from 81 unique hosts and 222 Neoaphanuroides ilishai (isotype) worms from 95 Hilsa ilisha individuals were collected for disease irregularity investigation. The mean number of examples per contaminated fish of the parasite species goes through irregular variations. In general, disease rates varied throughout the year's months. Despite the fact that Complexobursa buxarensis contamination was found in a large number of hosts and demonstrated the greatest pervasiveness. The rate of disease gradually decreased between March and November, peaking in January and June.

Neoaphanuroides ilishai was contaminated throughout the year, but the summer was when the disease was most prevalent (April to June). The rate of contamination gradually slowed and was at its lowest in the winter (December and January)

**Table: 1.** Seasonal variations in the incidence and intensity of infection of Complexobursa buxarensis and Neoaphanuroides ilishai

| **months December (2018-19)** | **fish examined** | | **fish infected** | | **number of parasites** | | **% of infection** | | **mean no. of parasite per infected fish** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **C. buxarensis** | **N. ilishai** | **C. buxarensis** | **N. ilishai** | **C. buxarensis** | **N. ilishai** | **C. buxarensis** | **N. ilishai** | **C. buxarensis** | **N. ilishai** |
| **December** | 14 | 16 | 6 | 3 | 11 | 4 | 27.64 | 13.00 | 3.00 | 2.40 |
| **January** | 16 | 17 | 5 | 4 | 7 | 5 | 36.01 | 17.57 | 2.40 | 2.11 |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **February** | 13 | 14 | 6 | 5 | 8 | 9 | 32.55 | 20.67 | 2.70 | 2.57 |
| **March** | 20 | 30 | 7 | 8 | 16 | 18 | 50.00 | 54.00 | 3.05 | 2.77 |
| **April** | 18 | 18 | 9 | 14 | 16 | 43 | 74.71 | 67.74 | 2.18 | 3.06 |
| **May** | 16 | 13 | 8 | 11 | 14 | 52 | 64.55 | 99.30 | 2.58 | 4.01 |
| **June** | 17 | 16 | 6 | 14 | 8 | 52 | 41.52 | 68.06 | 2.90 | 4.51 |
| **July** | 16 | 18 | 6 | 12 | 8 | 72 | 22.22 | 46.06 | 2.90 | 3.54 |
| **August** | 19 | 21 | 8 | 12 | 11 | 25 | 47.77 | 44.00 | 2.24 | 3.81 |
| **September** | 18 | 16 | 8 | 9 | 11 | 16 | 53.71 | 35.03 | 2.24 | 2.78 |
| **October** | 30 | 30 | 8 | 7 | 13 | 12 | 54.00 | 40.00 | 2.44 | 2.38 |
| **November** | 16 | 14 | 9 | 4 | 18 | 6 | 35.22 | 32.70 | 3.21 | 2.55 |
| **December** | 14 | 16 | 6 | 3 | 11 | 4 | 83.64 | 41.10 | 3.00 | 2.05 |

**Table: 2.** showing Seasonal variations and the Percentage of infection of parasites

| | **% Infection of C. Buxa** | **% Infection of N. Ilishai** |
|---|---|---|
| **January** | 27.64% | 13.00% |
| **February** | 36.01% | 17.57% |
| **March** | 32.55% | 20.67% |
| **April** | 50.00% | 54.00% |
| **May** | 74.71% | 67.74% |
| **June** | 64.55% | 99.30% |
| **July** | 41.52% | 68.06% |
| **August** | 22.22% | 46.06% |
| **September** | 47.77% | 44.00% |
| **October** | 53.71% | 35.03% |
| **November** | 54.00% | 40.00% |
| **December** | 35.22% | 32.70% |
| | 83.64% | 41.10% |

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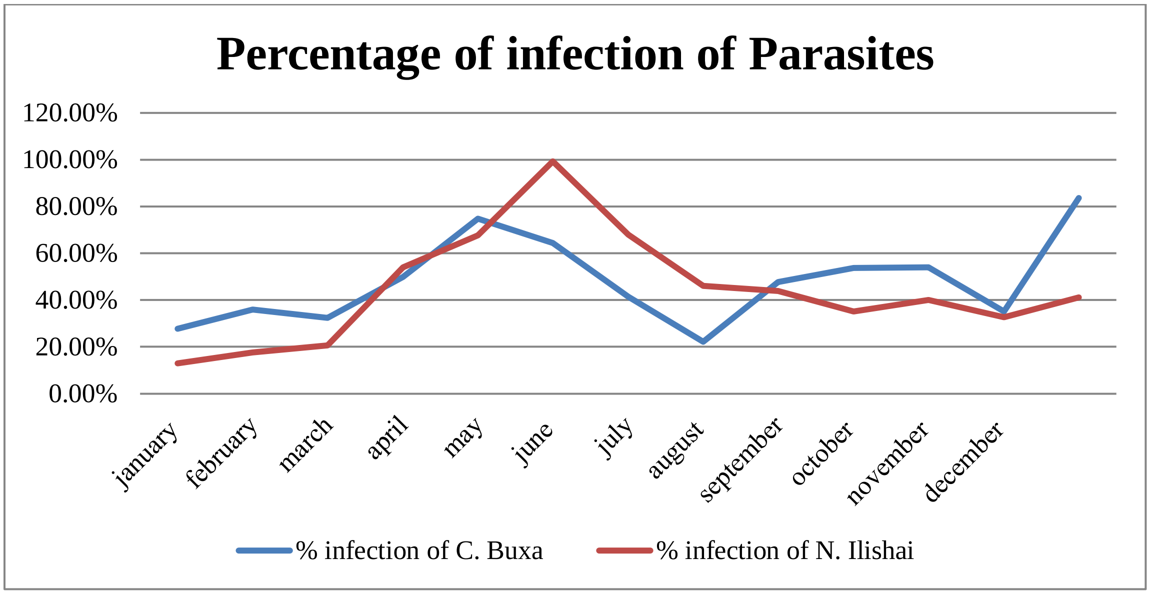


**Figure: 1.** showing Seasonal variations and the Percentage of infection of parasites

| | Mean No./Infected Fish In C. Buxarensis | Mean No./Infected Fish In N. Ilishai |
|---|---|---|
| **January** | 1.0 | 1.2 |
| **February** | 0.5 | 2.5 |
| **March** | 0.2 | 3.4 |
| **April** | 0.3 | 2.6 |
| **May** | 0.4 | 3.8 |
| **June** | 0.5 | 4.9 |
| **July** | 0.6 | 1 |
| **August** | 0.4 | 0.1 |
| **September** | 0.8 | 0.7 |
| **October** | 0.7 | 7.1 |
| **November** | 0.9 | 9.2 |
| **December** | 0.2 | 0.7 |

**Table: 3.** Seasonal variations and Mean no. of parasites per infected fish

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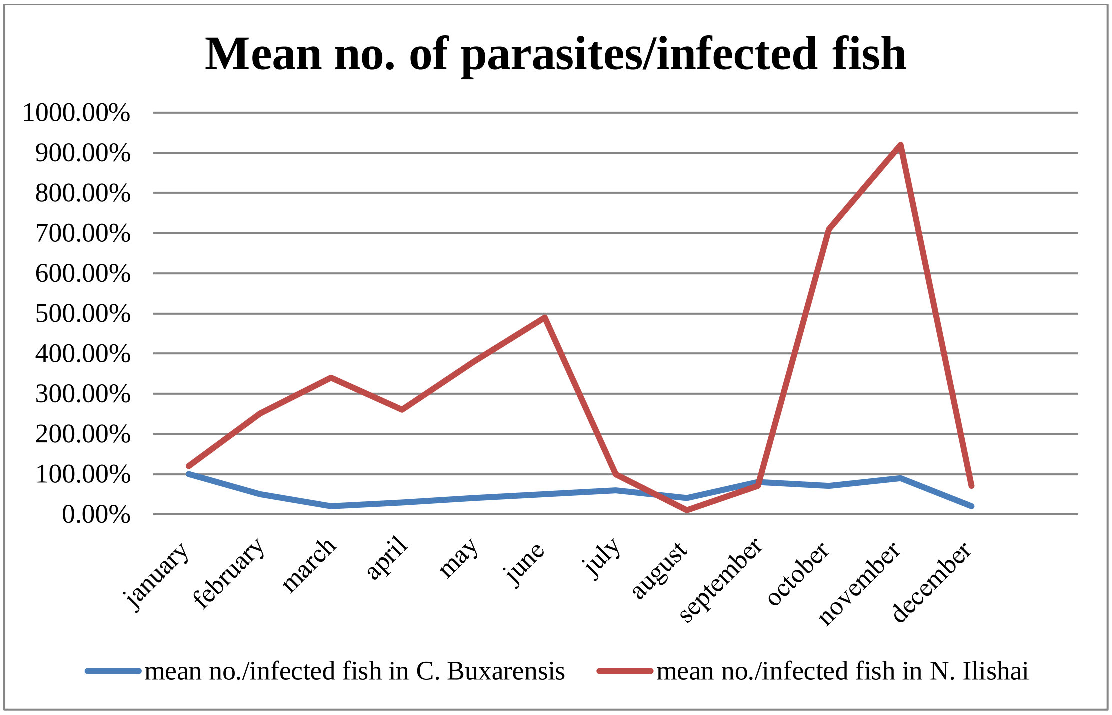


**Figure: 2.** showing Seasonal variations and Mean no. of parasites per infected fish

## 7. Conclusion

The investigation of digenetic trematodes of freshwater fish collected from Varanasi and neighbouring districts of Bihar is included in the current proposal. Taking new information into account, the proper location of some species has been reevaluated. A key to the class types is also given in a few new structures. Additionally, an overview, a succinct review of the literature on the digenetic trematodes of new water fishes of Varanasi and Bihar, materials and techniques, and a list of hosts and parasites have been provided.

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