

REGIONAL INCIDENCE OF TREMATODES OF FROG

BY

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CHAPTER - 1
INTRODUCTION

INTRODUCTION

Amphibians are a relatively small group of animals, mainly comprising frogs and toads, which are commonly found in almost all the inhabited parts of world. They play an important ecological role in nature and constitute food for various reptiles, birds and mammals. In some parts of the world, frogs are also taken as human food. Frogs and toads transmit diseases to various animals and man. For example, it has been proved that in Russia at least 19 species of flukes are transferred to water fowls and other animals through frogs (Vogtkova, 1974). These are a source of human food and thus economically important. Recently it has been reported that Mesocercaria of *Alaria americana* is transmitted to man through infected frogs (Freeman, et al., 1976). Such studies have not been carried out in Paksitan and the above noted instances indicate the necessity of the study of anural parasitic fauna so as to estimate the exact damage caused by the parasitic transmission to different animals of economic importance as well as man. On the other hand frogs are infected with a variety of helminthic parasites. A lot of work has been done on the morphology, anatomy, life cycle and toxonomy of these helminth parasites in other parts of the world (Klein, 1905; Skrjabin, 1961; Li, 1938). In Pakistan two species of frogs (*Rana tigrina* and *Rana cyanophlyctis*)

are commonly found. These are of particular interest to parasitologist, due to their easy availability and high rate of hem¹inthic infection. Bhutta and Khan (1975), Bilqees and Kaikobad (1976) have studied the taxonomy and life cycle of helminth parasite of these frogs. In this region Chaudhry (1978) and Basit (1982) have done some work on protozoon and helminth fauna of these amphibians. Both these researchers have confined their studies to limited areas of Rawalpindi and Lahore. Therefore, there is need to extend this survey to others areas of Pakistan, so as to have a clear picture of the parasitic fauna and more species if available.

The present work deals with the trematode fauna of *R. tigrina* and *R. cyanophylctis* of seven districts of the Punjab and N.W.F.P. Emphasis has been laid on the survey of far flung areas of Dera Ghazi Khan, which have so far been neglected by the earlier workers. Basit (1982) studied Protozoon and helminthic fauna of *R. tigrina* of Lahore and recorded 5 species of the Genus Ganeo. It is interesting to note that such a large variety of parasite of one genus has been recorded by Mehra and Negi (1928), Bhalerao (1936) Pande (1937), Gupta (1954) and Pandey (1973) in different hosts and in different areas of Indo-Pak. Sub-continent. The studies of Basit (1982) have shown that if extensive surveys are taken into consideration, more variety of the

parasite of Genus Ganeo could be observed. It is highly doubtful that a single host may contain such a large variety of the parasites of the same genus. Therefore an attempt has been made to re-arrange the species of the Genus Ganeo so as to reduce the number of species by omitting the intermediate stages which have been identified as different species by different workers.

CHAPTER - 2

REVIEW OF LITERATURE

REVIEW OF LITERATURE

In 1905 Klein established the genus *Ganeo* and described *Ganeo glottoides* from the intestine of *Rana hexadactyla*. Skrjabin (1916) described *G. glottoides africana* from the Ranidae of Africa. Mehra and Negi (1928) described *G. tigrinum* from *Rana tigrina* and *G. glottoides madrasensia* from the same host in India.

Srivastava (1933) described *G. gastricus* and *G. attenuatum* from frogs of India. Bhalerao (1936) studied helminths of India and described *G. korker* from *Rana tigrina*.

Pande (1937) studied some digenetic trematodes from *Rana cyanophlyctis* of Kumaon Hills. He described *G. kumaonensis* from *Rana cyanophlyctis* of India. Li (1938) recovered *Rana regulosa* from *G. glottoides* in canton. Kaw (1950) studied helminth parasite of Kashmir. He raised both *G. glottoides africana* and *G. glottoides madrasensis* to species rank. He also added *G. srinagarensis* from *Rana cyanophlyctis* in Kashmir and redescribed *G. kumaonesis*. Gupta (1954) described a new species, *G. bunjabensis* from *Rana cyanophlyctis* in India.

Fotedar (1959) described a new species, *G. bufonis* in India. *G. lingnaensis* should be synonymized with *G. kumaonensis* according to his suggestion. Pandey (1937) described

G. gazipurensis from *Rana cyanophlyctis*. Bhutta and Khan (1974) described the life cycle of a new species *G. microacetabulus* from *Rana cyanophlyctis* in Lahore, Pakistan.

Nama (1974) redescribed and figured *G. korkei* from specimens in *Rana tigrina* from Agra, India. Sinha and Sinha 1975 recorded a new host, piedmyna, (*sturnopaster contrea*) for *G. tigrinum*. Bhutta and Khan (1975) redescribed *G. kumaonensis* from *Rana cyanophystis* in Lahore, Pakistan. Bilqees and Kaikobad (1976) described *G. macrocotyle* a new species from *Rana tigrina* of Karachi, Pakistan.

Chaudhri (1979) described *G. kumaonsis* from *Rana cyanophylyctis* of Rawalpindi region. Basit described (1982) *G. kumaonensis*, *G. tigrinus*, *G. gastricus*, *G. srinagarensis* from *R. tigrina* of Lahore region.

The Genus *Mehraorchis* was established by Srivastava (1934). He described *Mehroarchis ranarum* as its type species recovered from the cysts in the body cavity of *Rana cyanophlyctis*. Bhalerao (1936) recovered the same species from the bile and gall bladder of *Rana tigrina*. Gupta (1954) also described *M. ranarum* from the stomach of *Rana tigrina*. Dwivedi (1966) has synonymized *M. Chamaeleonis* with *M. ranarum* on the basis of his study on the intra specific variations in *M. ranarum*. Pande (1937) described *M. ranarum* from *Rana cyanophlyctis* from Lucknow. Bhutta and Khan (1975), Bilqees and Kaikobad (1976) have described the same species from the host, *Rana tigrina*.

The genus *Prosotocus* was established by Looss (1899). He described *Prosotocus confusus* as the type species. Later on *P. fluelleborni* was described by Travassos (1930). *P. himalayai* by Pande (1937), *P. indicus* by Mehra and Negi (1928), *P. infrequentus* by srivastava (1933), *P. kashabia* by Kaw (1943) and *P. partapus* was described by Kaw (1950). Yamaguti (1958) has established a new subfamily Prosotocinae to which he has added two genera *Prosotocus* looss, (1899) and *Mehraorchis* Srivastava, (1934). Combes and Knoepffler (1937) recovered *P. fluelleborni* from the duodenum of *Rana ridibunda*. Bhutta and Khan (1975) described *P. partapus* from *Rana cyanophlyctis*.

The genus *Diplodiscus* was established by Diesing (1936) with *Diplodiscus subclavatus* as its type species. Travassos (1934) recognized *Diplodiscus subclvatus* (Goez. 1782) Diesing, (1836). *D. cornu*: Diesing, (1936) and *D. amphichrus* Tabangui, 1933. Srivastava (1934) described a subspecies, *D. amphichrus magnum*. Yamaguti *D. sinicus* from frogs of China Bhalerao (1937) described. *D. amphichrus* from amphibians of India. Pande (1937) described *D. mehrai* described *D. mehrai* from *Rana cyanophlyctis*. Bravo (1941) synonymized *D. sinicus* with *D. melanosticti* from *Bufo melanostictus* in Formosa. Kaw (1950) described *D. mehrai* with two testes from Kashmir. Singh (1954) redescribed *D. amphichrus* from *Rana tigrina* in India.

Yuen (1962) described *D. accolosus* from *Rana crythraea*. Fischthal and Kuntz (1967) described *D. amphichrus* from *Rana limnocharis vitigera* in Philippines. Bhutta and Khan (1975) described *D. amphichrus* from *Rana tigrina* and *D. khyberensis*, a new species from *Rana cyanophlyctis*. Prokopic and Krivarec (1975) have described *D. subclavatus* from *Bufo bufo*.

The genus *Pleurogenes* was established in (1899) by Looss. Klein in (1905) had discovered *Pleurogenes arcanus*. Luhe in (1901) described *P. gastroporus* from an Indian frog *Rana cyanophlyctis*. Klein described in (1905) *P. sphericus* from *R. hexadactyla*. Johnston described in (1912) *P. freycineti* and *P. solus* from Australian frogs. Ozaki in (1926) described *P. labatus* from the bile duct of the Japanese frog *Polypedates buergeri*. Mehra and Negi (1928) described *P. orientalis* and *P. sitapurii* from the gut of *Rana cyanophlyctis* in Northern India.

Looss (1901) erected the family Gorgoderidae with two sub-families, Gorgoderinae and Anaporrhutinae. Looss (1902) placed under the sub-family Gorgoderinae and *Gorgodera looss*, (1899), Pande (1937) considered the genus *Gorgoderina*. Yamoguti (1934-36) described the *Gorgodera japonica* from *Rana esculenta*. Bhalerao (1937) has referred fourteen species of genus *Gorgoderina*, Looss and Sinitzin (1905) described

G. cygnoides from *Rana esculenta* and *Rana temporaria* from Europe and North America. Stafford in (1902) studied *Gorgoderina attenuata* in *Rana catesbiana* from Canada.

Ingles in (1936) described *G. aurora* in *Rana aurora* from North America. Rankin in (1937) discovered *G. biblobota* in *Rana catesbiana* and *Rana pipiens* from North carolina. Joyeux et Baer in (1934) described *G. capensis* in *Rana esculenta* from Tunis. Travossos in (1924) described *G. cryptochis* in *Bufo crucifer* from Paraguay and Brazil. Bravo in (1948) studied *G. megalordis* in *Bufo marinus* from Mexico. Ingles et Langston in (1933) studied *G. multilobata* in *Rana boylei*, *R. pretiosa* and *R. aurora* from colifornia. Stafford in (1905) discovered *G. apaca* in food and frogs from America. Shtron in (1940) studied *G. orientalis* in *Rana esculenta* from Kirghisia Travassos in (1922) described *G. parvicara* in *Rana* and *Bufo* from S. America. Pereiro ecuocolo in (1940) described *G. rocholiman* in *Bufo paracnemis* from Brazil. Pigulevsky in (1953) discovered *G. skarbilovitschi* syn *G. attenauta* in *Rana montezumae* from Mexico. Pigulevsky in (1953) studied *G. skryabini* in *Rana temporaria* from Russia Olsen in (1937) studied *G. tanneri* in *Rana pretiosa* from N. America. Stuffer (1905) discovered *G. translucida* in toads and frogs from Canada. Looss, (1902) described *G. vitelliloda* in *Rana temporaria*, *Rana orvalis* and *Bufo* from Europe.

Haematoloehus Looss, (1899). Syn. Pnevmonoeces
Looss, (1902). Ostiolwm Pratt, (1903). Pnevmobites Ward,
(1917). Skrjabinoeces Sudarikov, (1950). Looss in (1899)
described *H. variegatus* in *Rana esculenta* Khan, M. M.
and Mohiuddin, A. in (1882) described *H. sindensis*
from the Lungs of *Rana cyanophlyctis* in Sind. Tickoo, R.
in (1970) described *H. almorai* (Pande, 1937) from Lungs
of *Rana cyanophlyctis* in Kashmir.

Poracanthium Stossich (1883). After Dollfus, (1948).
Dollfus in (1948) described *Poracanthium furcatum* in fishes
only one species in Recorded. Opisthodiscus Cohn, 1904.
Cohn in (1904) described *Opisthodiscus diplodiscoides* in *Rana*
esculenta in Europe and in *Rana ridibunda* in Morocco. Mehely
in (1929) recovered *O. diplodiscoide nigrivasis* in *Rana ridibunda*
Hungary.

CHAPTER - 3
MATERIALS AND METHODS

MATERIALS AND METHODS

A total 450 frogs (*Rana tigrina* : 204, *Rana cyanophyctis*: 246) were collected with hand-net from different ponds of seven districts of the Punjab and N.W.F.P. for the study of trematodes parasites during May 1980 to Nov. 1980.

The collection of frogs from different regions was made separately and at least 50 frogs from a particular district were examined for flukes. Only one collection of frogs was made from each district.

Collection of Parasites

All the frogs were brought to laboratory and autopsied on the same day. The internal organs like intestine, liver, lungs, spleen and urinary bladder, were taken out and placed in normal saline in petri dishes. The cysts if present were examined similarly. The intestine was cut into 5 different portions viz. esophogus, stomach, duodenum, ileum and rectum were opened separately in different watch glasses for the recovery of parasites. The rest of internal organs as well as cysts were teased in normal saline with the help of dissecting needles to recover any of the parasite present therein.

Preservation of Parasites

The trematode parasites thus recovered were placed in normal saline and washed thoroughly with a camel hair brush to remove the debris, if any which were then transferred to 4% formaline. In another method the trematodes were placed in fresh water for about one hour and then preserved in 4% formaline.

Staining of the Parasites

The recovered helminths were thoroughly washed with distilled water to remove the trace of formaline and later on placed in Gower's carmine for 5 to 30 minutes except for the rectal and lung fluks which were stained in this carmine for 1 to 5 hours. These trematodes were then washed with distilled water and passed through 30%, 50% and 70% Ethanol for at least 5 minutes in each. Seventy percent acidic alcohol was used in case of destaining if required. The flukes were then passed through 70%, 90% and absolute alcohol for complete dehydration. Afterwards these parasites were transferred to a mixture of equal volume of xylen and absolute alcohol then put in pure xylon and in the end treated with clove oil. Flukes were mounted in neutral canadabalsam on clean and dry microscope slides.

The drawings were made with the help of a camera lucida and standard measurements of the body and internal organs were taken using stage micrometer.

Preparation of Stains

Gower's carmine stain

Acetic acid 45%	=	100 CC
Carmine (Merck)	=	10 grams
Acidified carmine (prepared)	=	1 gram
Potassium alum	=	10 grams
Distilled water	=	200 ml
Crystal of Thymol	=	only one

Procedure

10 grams of carmine were dissolved in 100 CC of acetic acid (45%) by heating, allowed to come to boil, cooled and then filtered. Residue left over the filter paper was dried and obtained as an acidified carmine, Ten grams of the prepared acidified carmine and 10 grams of Potassium alum were dissolved in 200 ml of distilled water by heating and then filtered. A crystal of thymol was added to prevent mould growth.

CHAPTER - 4

RESULTS AND DISCUSSIONS

Family LECITHODENDRIIDAE Odhner, 1911

Subfamily GANEONINAE Yamaguti, 1958

Genus GANEO Klein, 1905

Parasite	Ganeo kumaonensis Pande, 1937.
Host	Rana tigrina, R. cyanophlyctis
Habitat	Small intestine
Locality	Rawalpindi, Islamabad, Sialkot, Lahore and Sargodha.

DESCRIPTION

Of all the parasites recorded from the above mentioned localities *Ganeo kumaonensis* is most common trematode infecting *R. tigrina* and *R. cynophlyctis*. The distome lives firmly attached to the wall of the intestine by means of its acetabulum and is light gray in colour. The body is tongue shaped with thin cuticle and spinulate upto the post-erior level of testes. The suckers are well developed and highly muscular and have a circular outline. The subterminal oral sucker is 0.11 x 0.12 mm. The acetabulum is pre-equatorial and is larger than the oral sucker. The pharynx is 0.07 x 0.07 mm in diameter and is situated just posterior to the oral sucker. The oesophagus is 0.12 mm long. The intestinal caeca arise at a distance of 0.27 mm from the anterior extremity. They are broader than the oesophagus and terminate at about one fourth of the body

length from the posterior extremity. The gonads are present in the anterior half of the fluke. The rounded testes are partially tandem. The ovary lies immediately behind the acetabulum and is partially overlapped by the posterior testis. The cirrus sac is well developed and is present on the left side of the body. The seminal vesicle is elongated and is placed transversely at the bottom of the cirrus sac. The genital pore is situated in the marginal genital atrium on the left side of the fluke. The vitellaria are in the form of numerous follicles and are present in the mid-lateral region of the body. These follicles are mostly extracaecal but some are intra-caecal and few are circumcaecal. The uterus is loosely packed and its irregular transverse convolutions are confined between acetabulum and a little before the posterior extremity of the body. The excretory vesicle is v-shaped and excretory pore lies terminally at the posterior end of the fluke. The oval eggs are light brown, numerous and operculate.

The measurements are given in Table 1 & 30.

DISCUSSION

The specimens under study resemble closely with *Ganeo kumanonensis* Pande (1937). This species has already been recorded by Bhutta and Khan (1975) and Bilquees and Kiakabad (1976) from *R. cyanophlyctis*. However the species recorded by Basit (1982) from *R. tigrina* slightly larger

than the species under study. In all other features, arrangements of organs and topography of gonads it resembles *Ganeo kumaonensis* Pande (1937).

Parasite	<i>Ganeo tigrinus</i> Mehra and Negi, 1928 (Fig. 2)
Host	<i>Rana tigrina</i>
Habitat	Small intestine and rectum
Locality	Rawalpindi, Islamabad, Lahore, Sialkot and Sargodha.

DESCRIPTION

The *Ganeo tigrinus* is tongue shaped and whole body surface is covered with small irregularly arranged triangular spines. The suckers are nearly circular in outline. The acetabulum is distinctly larger than the oral sucker which leads into oesophagus. It bifurcate into two intestinal caeca which terminate blindly at about one-fourth from the posterior extremity of the body. The gonads are pre-equatorial in position. The testes are present obliquely behind each other. The anterior testis is situated immediately behind the intestinal bifurcation while posterior lies obliquely a little in front of the acetabulum. The post-acetabular ovary is somewhat pear-shaped. The genital pore is marginal and is situated in the genital atrium on the left side of the fluke. The elongated tubular shaped cirrus sac is present between the acetabulum and the genital

atrium. The seminal vesicle is coiled, bladder shaped and is present at the base of the cirrus sac. The vitalline follicles are present in the mid-lateral side of the fluke. The convolutions of the uterus occupy the space between the intestinal caeca in the posterior two-third of the body. The excretory vesicle is v-shaped and excretory pore is present a little before the posterior extremity of the body. The dark brown eggs are elliptical in shape.

The measurements are given in Table 2 & 30.

DISCUSSION

This species has been identified as *Ganeo tigrinus* Mehra and Negi (1928). This species has also been recorded by Bilquees and Kaikobad (1976) and Basit (1982). In all its essential diagnostic features the present specimens closely resemble *Ganeo tigrinus* Mehra and Negi (1928).

Parasite	<i>Ganeo glottoides</i> var. <i>madrasensis</i> , Mehra and Negi, 1928 (Fig. 3)
Host	<i>Rana tigrina</i> , <i>R. cyanophlyctis</i>
Habitat	Small intestine
Locality	Rawalpindi, Islamabad, Sialkot, Sargodha and Multan.

DESCRIPTION

The *Ganeo glottoides* is thin and transparent. Its internal anatomy could be easily seen under the low power of microscope by applying slight pressure on the cover glass. The body of the fluke is flat and its maximum breadth is at the region containing the acetabulum and gonads. This region gradually tapers towards the posterior end. The suckers are circular in outline and oral sucker is placed terminally. While the acetabulum lies at about one-fourth the length of the body from the anterior end. It is less muscular than the oral sucker. The pharynx is situated behind the oral sucker and leads into a small thin oesophagus. The intestinal bifurcation lies just at about the level of the genital opening. The left intestinal caecum is larger than the right. The rounded gonads are present in the anterior half of the body. The anterior testis is situated on the median line just behind the acetabulum while the posterior testis is placed obliquely on

the left side of the body. The ovary is somewhat oval in shape and is present behind the testes on the median line of the body. The cirrus sac is long and slightly curved consisting of a small basal portion and a long transverse portion. The seminal vesicle could not be observed. The genital opening lies close behind the level of the intestinal bifurcation on the right margin of the body. The vitelline follicles are few in number, some of these follicles are placed in the extracaecal field while others circum as well as intracaecal. The metraterm is absent. The uterus is extensive and is situated between the base of cirrus sac and a little behind in right caecal end. The configuration of uterine coils are present intracaecal as well as circumcaecal but not extracaecal. The excretory pore is not visible. The eggs are elliptical operculate and golden yellow in colour.

The measurements are given in Table 3 & 31.

DISCUSSION

The worm under study resembles *Ganeo glottoides* var. *madrasensis*, Mehra and Negi (1928) in all essential features and has been identified as such. This is, however, a new record from Pakistan.

Parasite	<i>Ganeo srinagarensis</i> Kaw, 1950 (Fig. 4)
Host	<i>Rana cyanophlyctis</i>
Habitat	Small intestine
Locality	Rawalpindi, Lahore and Dera Ghazi Khan.

DESCRIPTION

The body of this fluke is flat and more or less oval with a broadly rounded posterior end. The terminal rounded oral sucker opens into a thin small prepharynx which leads into a globular muscular pharynx. The esophagus is thin and long. The intestinal bifurcation commences at a distance of 0.38 mm from the anterior extremity. The intestinal caeca are slightly broader than the oesophagus and run posteriorly, terminating at about one sixth of the body length from the posterior end. The acetabulum is pre-equatorial being at a distance of 0.18 mm from the intestinal bifurcation and is smaller than the oral sucker. The leaf shaped anterior testis is present at intestinal bifurcation while the oblong posterior testis lies obliquely behind the anterior testis towards the right caecum. The large and somewhat rounded ovary is situated behind the anterior testis and covers the acetabulum. The cirrus sac is well developed with dilated oblong basal portion. The tubular seminal vesicle is nearly u-shaped. The genital opening is situated at the left margin a little above the level of intestinal bifur-

cation. The vitellaria are in the form of many follicles, placed on the mid-lateral sides of the fluke. The vitellaria on the right side are more extensive than on the left. Most of these are placed in the extracaecal field while some are circumcaecal but not intracaecal. The uterus is extensive and mostly occupies the intracaecal field, while at some places it becomes circumcaecal. The uterine coil attains extracaecal configuration in the posterior part of the body. The excretory vesicle is v-shaped and excretory pore is situated at a distance of 0.12 mm from the posterior end of the fluke. The oval eggs are golden yellow or light brown in colour and operculate.

The measurements are given in Table 4 & 32.

DISCUSSION

This species has been identified as *Ganeo srinagarensis* Kaw (1950) and it is also recorded by Bilqees and Kaikobad (1976) and Basit (1982). The dimensions of *Ganeo srinagarensis* recorded in the present study are slightly larger than Bilqees and Kaikobad (1976) while equal to Basit (1982).

Parasite	<i>Ganeo gastricus</i> Srivastava, 1933 (Fig. 5)
Host	<i>Rana tigrina</i> , <i>R. cyanophlyctis</i>
Habitat	Small intestine
Locality	Lahore, Sialkot and Multan.

DESCRIPTION

The body of *Ganeo gastricus* is tongue shaped. The cuticle is thin and spinulated upto the level of gonads. The oral sucker is rounded and terminal in position. The rounded acetabulum is situated on the central axis at a little distance behind the first third of the body length. It is larger than the oral sucker. Pharynx is in the form of two lobes placed together longitudinally. The oesophagus is 0.17 mm long. The intestine bifurcation commences at a distance of 0.23 mm from the anterior end of the fluke. The caeca are of equal length and end at about at one-fourth the length of the body from the posterior extremity. The testes are rounded and present obliquely one on each side of the median line. They are separated transversely from each other by a distance of 0.12 mm. The right testis is partially overlapping the respective intestinal caecum. The small rounded ovary is present on the left side of the fluke while its anterior small portion is covered by basal part of left testis. The well developed cirrus sac is present on the left side of the body. It starts from the top of acetabulum and end at genital atrium. The seminal

vesicle is tubular and roughly L-shaped while seminal receptacle is present below the ovary. The metraterm is well developed and prominent. The vitellaria are follicular and are present in the mid-lateral fields of the body. The number of follicles on the right side is more than of the left. The vitellaria are mostly extracaecal while some are circumcaecal. The uterus is very extensive and is intracaecal upto the posterior level of the vitellaria while extracaecal in the post vitellarian region. The excretory vesicle is v-shaped and excretory bladder cornua is clearly visible upto the level of gonads. The uterus is full of small, aperculate oval eggs of golden yellow to dark brown colour.

The measurements are given in Table 5 & 33.

DISCUSSION

The fluke under study closely resembles *Ganeo gastricus* Srivastava (1933) in all essential features and has been identified as such. This worm has also been recorded by Bilqees and Kaikabad (1976) and Basit (1982).

Parasite	<i>Ganeo attenuatum</i> Srivastava, 1933 (Fig. 6)
Host	<i>Rana tigrina</i>
Habitat	Small intestine
Locality	Islamabad.

DESCRIPTION

This fluke is thin, transparent with a flate attenuated body and bluntly pointed at the both ends. It is longer than broad. The cuticle is thin and spinulate upto the posterior level of the ovary. The subterminal oral sucker and acetabulum are nearly equal in size and circular in outline. The pre-equatorial acetabulum lies among the gonads. A very short pre-pharynx is present. The pharynx is oval in outline and smaller than the oral sucker. The oesophagus is narrow and fairly long. The intestinal fork lies at a distance of 0.39 mm from the anterior extremity of the fluke. The left intestinal caecum is much broader than the oesophagus. The intestinal caeca terminate at about a little behind the half of the body length. The gonads are intracaecal and lie in the anterior half of the body. The testes are roughly pear-shaped. The anterior testis is present just above the acetabulum and is 0.08 mm away from the place of intestinal bifurcation. The posterior testis is situated obliquely behind the anterior testis. It is partially covered by acetabulum and right intestinal caecum. The

seminal vesicle and seminal receptacle could not be observed. The genital pore lies in the marginal genital atrium which is in the form of a cleft and is situated a little above the level of intestinal bifurcation. The vitelline follicles are medium sized and lie mid-laterally between the acetabulum and the posterior end of the intestinal caeca. The uterus is extensive and is present behind the ovary and upto 0.28 mm from the posterior extremity. The uterine coiled configuration is similar to other *Ganeo* species. The excretory vesicle is v-shaped and the excretory pore is situated at a distance of 0.06 mm from the posterior extremity. The operculate oval eggs are light brown in colour.

The measurements are given in Table 6 & 34.

DISCUSSION

The specimens under study resemble *Ganeo attenuatum* Srivastava (1933) in all essential features except that the present specimens are slightly larger with proportionately larger organs. It is being reported first time from Pakistan.

Parasite	<i>Ganeo microacetabulus</i> Bhutta and Khan, 1974 (Fig. 7)
Host	<i>Rana tigrina</i> , <i>R. cyanophlyctis</i>
Habitat	Small intestine
Locality	Lahore.

DESCRIPTION

The body of *Ganeo microacetabulus* is elongated with a broadly rounded posterior end and comparatively blunt narrow anterior extremity. The cuticle is thin and spinulate upto the level of acetabulum. The oral sucker is subterminal and rounded in outline. It is followed by a thin inconspicuous prepharynx. The small rounded acetabulum is present at a distance 0.25 mm from the intestinal fork. The pharynx is well developed and oval in shape. It leads into a narrow elongated oesophagus. The intestinal bifurcation starts just a little above the level of genital opening. The intestinal caeca are thick and terminate at about the one-fifth the length of body from the posterior extremity. The gondas are situated in the anterior half of the body. The anterior testis is roughly rounded and present in the intestinal fork. The round posterior testis is large and is situated obliquely below the anterior testis on the right caecum. The oval ovary is comparatively small, and lies just below posterior testis. The cirrus sac is distinctly visible and present on the left side of the fluke.

The seminal vesicle is small and kidney shape. The metraterm could not be observed. The vitellaria are very extensive, post acetabular, and terminate a little before the distal end of caeca. The uterus extends intracaecally in the post-acetabular region and ends a little distance before the excretory pore. The excretory pore lies at a distance of 0.02 mm from the posterior end. The excretory vesicle is u-shaped. The eggs are light brown in colour and oval in shape.

The measurements are given in Table 7.

DISCUSSION

This species has been identified as *Ganeo microacetabulus* Bhutta and Khan (1975). This fluke has also been recorded by Basit (1982). In all essential features this worm resemble the specimens of Bhutta and Khan except that the present specimens are slightly larger.

Parasite	<i>Ganeo</i> sp. ¹ (Fig. 8)
Host	<i>Rana cyanophlyctis</i>
Habitat	Small intestine
Locality	Peshawar.

DESCRIPTION

The fluke is elongated. It's anterior and posterior ends are broad and roughly rounded. The cuticle is thin and spinulate upto the base of acetabulum. The muscular rounded oral sucker is subterminal in position. The pharynx is small and oval. It leads into a very short narrow oesophagus and bifurcates at a distance of 0.07 mm from the base of pharynx. The caeca are long, uniformly thick and extend upto posterior one-fourth of the body length. The genital opening lies in the genital atrium on the margin of right side at the level of intestinal bifurcation. The gonads as well as acetabulum are present in the pre-equatorial zone of the fluke. The anterior testis is oval and is situated at a little behind the intestinal fork while posterior testis is roughly pear-shaped and is present towards the right caecum. The small ovary is approximately rounded in shape and is situated just below the posterior testis. The acetabulum is larger than the oral sucker. It overlaps half of the ovary and posterior testis alongwith a small basal portion of the

anterior testis. The cirrus sac is well developed. Seminal vesicle is tubular and cup-shaped. It is present on the right side of acetabulum. The vitellaria are absent. The uterus is not much extensive. In the posterior region of the fluke the uterus extend extracaecally. The excretory vesicle is u-shaped and its coranu is visible upto the level of gonads. The excretory pore is situated at 0.09 mm from the posterior end. The eggs retain all the characteristic of genus *Ganeo*.

The measurements are given in Table 8.

Parasite	<i>Ganeo</i> sp. ² (Fig. 9)
Host	<i>Rana tigrina</i>
Habitat	Small intestine
Locality	Multan.

DESCRIPTION

The fluke is flat, elongated with rounded broad posterior end and slightly narrow blunt anterior end. The cuticle is thin and spines are present into the anterior half of the worm. The oral sucker is subterminal and circular in outline. It leads into an inconspicuous minute prepharynx. The pharynx is in the form of two prominent lobes placed together longitudinally. The oesophagus is narrow and long. It bifurcates after at a distance of 0.18 mm from the pharynx base. The intestinal caeca are not uniform in thickness. The right caecum is much dilated than the left one. The gonads are nearly irregular in shaped. The anterior testis, ovary

and acetabulum are present in the anterior half of the body while posterior testis is present at the equator. The acetabulum is slightly larger than the oral sucker and is present transversely between the both testes. The ovary is smaller than the testes and is present on the left side at the top of the posterior testis. The cirrus sac and metraterm are well developed and are present on the right side of the body. The seminal vesicle is tubular and more or less J-shaped. The vitellaria consist of extracaecal and circumcaecal small follicles scattered between the base of the ovary and a little distance from the posterior end of intestinal caeca. The uterus is extensive, postacetabular and occupies much of the posterior portion of the body. The excretory vesicle is v-shaped and prominent excretory pore is present at a distance of 0.06 mm from posterior end. The eggs like other species of genus *Gaeno*. Table 9.

Parasite	<i>Gaeno</i> sp. ³ (Fig. 10)
Host	<i>Rana cyanophlyctis</i>
Habitat	Small intestine
Locality	Dera Ghazi Khan

DESCRIPTION

The body of this fluke is oval and elongated. It is longer than broad. The cuticle is provided with spines which are scattered in the anterior two third of the body. The rounded oral sucker is subterminal. It leads into a small

prepharynx which opens into oval pharynx. Both the rounded suckers are of almost equal size. The acetabulum is present in the anterior half of the body. The oesophagus is narrow and long. The intestinal bifurcation lies at a distance of a 0.28 mm from the anterior end of the fluke. The caeca are broader than the oesophagus and terminate at a little distance before the posterior extremity. The roughly rounded obliquely placed testes are pre-equatorial in position. The small anterior testis is present in the intestinal fork while the large posterior testis is present on the right caecum. The small oval ovary is present behind the posterior testis and on the right caecum. The genital opening lies at the level of intestinal bifurcation on the left margin of the body. The cirrus sac and seminal vesicle are well developed. The muscular metraterm runs alongwith the lower side of the cirrus sac. The vitellaria are much extensive and are mostly scattered extracaecally while some are circumcaecal and a few on the left side are intracaecal. They are confined between the acetabulum and terminal end of caeca. The uterus is extensive and post-acetabular and extends to a little in front of the posterior end of the body. The excretory vesicle is u-shaped and excretory pore is situated at a little distance before the posterior end. The eggs are small, numerous, operculate and light brown in colour.

The measurements are given in Table 10

Parasite	Ganeo sp. ⁴ (Fig. 11)
Host	Rana tigrina
Habitat	Small intestine
Locality	Sialkot.

DESCRIPTION

The distome is slightly pear shaped. The cuticle is thick and the anterior half of the body is covered with spines. The large elongated oral sucker is terminal in position. It opens in a small oval pharynx. The oesophagus is narrow and long. The intestinal bifurcation lies at a distance of 0.32 mm from the anterior end of the body. The broad caeca terminate a little before the posterior end of the fluke. The terminal blind end of caeca is highly wavy. The acetabulum is situated almost in the middle of the body. The rounded anterior testis is placed in the fork of intestinal bifurcation. The posterior testis is obliquely placed behind the anterior testis and on the right side of the body. The ovary is present behind the acetabulum on the median line of the fluke. The genital opening is present in the marginal genital atrium at the level of intestinal bifurcation. The cirrus sac is long and muscular and is present on the left side of the body. The vitellaria are present extracaecally as well as circumcaecally behind the mid-lateral region of the body. The post-ovarian uterus is small and intracaecal. It extends

upto a little distance before the posterior extremity of the worm. The excretory pore and tube could not be observed. The eggs are oval operculate and golden yellow in colour.

The measurements are given in Table 11.

Parasite	Ganeo sp. ⁵ (Fig. 12)
Host	Rana tigrina
Habitat	Intestine
Locality	Rawalpindi.

DESCRIPTION

The body of this distome is thin, transparent, flat and conical in shape. The cuticle is thin and spinulate upto the middle of the body. The small rounded oral sucker is terminal in position. The rounded large acetabulum is pre-equatorial in position. The pre-pharynx is not well developed while pharynx is oval and prominent. It is in the form of two lobes placed together longitudinally. The oesophagus is narrow thin and long. The intestinal bifurcation lies at a distance of 0.44 mm from the anterior extremity of the body. The blind caeca terminate at 0.45 mm from the posterior end of the fluke. The testes are roughly pear-shaped and are present in the anterior half of the distome. The anterior testis is present intracaecally at 0.06 mm from the intestinal bifurcation while the posterior testis is placed obliquely behind the anterior testis on the

left caecum. The ovary is present intracaecally below the posterior testis and on the left side of the acetabulum. The genital opening is present in the genital atrium which is situated marginally on the antero-lateral side of the body. The seminal vesicle is long oval in shape and present transversely between the anterior testis and acetabulum. The cirrus sac is well developed and is present on the right side of the body. The vitellaria are in the form of small follicles which are present extracaecally as well as circumcaecally in the middle one third of the body. The excretory pore and excretory vesicle could not be observed. The eggs are golden yellow and oval in shape.

The measurements are given in Table 12.

Parasite	Ganeo sp. ⁶ (Fig. 13)
Host	Rana cyanophlyctis
Habitat	Small intestine
Locality	Dera Ghazi Khan.

DESCRIPTION

The fluke is flat, elongate and its maximum breadth is at the middle of the body. The cuticle is thick and is covered with spines upto the anterior half of the fluke. The anterior portion is narrow and blunt while posterior end is straight. The small rounded oral sucker is subterminal and is present in the anterior projection of

the body. The pharynx leads into a narrow oesophagus. The intestinal bifurcation is present at a distance of 0.20 mm from the anterior end of the body. The narrow thin caeca terminate at a little distance behind the anterior half of the body length. The gonads are present in anterior half of the worm. The anterior testis is present in the intestinal fork while posterior testis is behind the anterior testis on the right side of the body and it is partially covered by the acetabulum. The slightly large ovary is present behind the posterior testis. The genital opening is present on the margin of left side in the genital atrium, a little above the level of intestinal bifurcation. The cirrus sac is well developed and starts from the centre of acetabulum. The seminal vesicle could not be observed. The vitellaria are in the form of large follicles which are mostly extracaecal while some are circumscaecal and a few intracaecal. On the right side they are scattered between the posterior testis and the blind end of caeca while on the left side they are present between the ovary and blind end of left caecum. The uterus is loosely packed, post-acetabular and extracaecally. The uterine coils extend upto a distance of 0.12 mm from the posterior extremity of the body. The u-shaped excretory vesicle and excretory pore are prominent. The uterine coranu is visible upto the level of vitellaria. The small oval and ope^yculate eggs are golden yellow in colour.

The measurements are given in Table 13

Parasite	Ganeo sp. ⁷ (Fig. 14)
Host	Rana tigrina
Habitat	Small intestine
Locality	Multan.

DESCRIPTION

The shape of this fluke is oval, elongated and it is covered with spine upto the anterior half of the body length. The oral sucker is rounded and subterminal in position which is followed by a oval pharynx. The oesophagus is small and narrow. The large rounded acetabulum is situated in anterior half of the body. The testes are tandem, rounded and pre-equatorial in position. The anterior testis is present in the intestinal fork while the posterior testis overlaps the anterior testis and the ovary. The ovary is present behind the acetabulum. The genital pore is situated on the antero-lateral margin on the right side of the body. The cirrus sac is well developed and elongated. The intestinal bifurcation lies at a distance of 0.19 mm from the anterior end of the body and intestinal caeca terminate at a little distance behind the vitellaria. The vitellaria are in the form of very small follicle and are present on the mid-lateral sides of the fluke. The uterus is small and less extensive confinding between excretory pore and mid of the body length. The excretory vesicle is v-shaped and coranu is visible upto

the gonads. The excretory pore is present at a little distance before the posterior extremity of the body. The eggs are small, oval, operculate and brown in colour.

The measurements are given in Table 14.

Parasite	Ganeo sp. ⁸ (Fig. 15)
Host	Rana cyanophlyctis
Habitat	Small intestine
Locality	Sargodha.

DESCRIPTION

This distome is slightly oval in outline. The spines are present upto the anterior of the body. The sub-terminal oral sucker is circular in outline. It opens in an oval shaped pharynx which is in the form of two kidney shaped lobes placed together longitudinally. The oesophages is small and narrow. The intestinal bifurcation lies at a distance of 0.34 mm from the anterior end of the worm. The rounded acetabulum is pre-equatorial in position. The intestinal blind end terminates at a distance of 0.30 mm from the posterior extremity of the distome. The irregular testes are present in the anterior half of the body. The large anterior testis is placed obliquely in the fork of intestinal bifurcation but slightly towards the right caecum. The posterior small testis is situated below the anterior testis and overlaps the respective caecum. The small oval shaped ovary is

placed on the equator of the body behind the acetabulum. The genital pore is situated on the left antero-lateral margin of the body at the level of pharynx. The elongated cirrus sac is well developed and starts from behind the acetabulum. The vitellaria are large present on the mid-lateral sides of the body. They are distributed extracaecally, intracaecally and circumcaecally. The uterus is small and is confined between the acetabulum and the blind end of the caeca. The excretory vesicle and excretory pore could not be observed. The eggs are oval, operculate and golden yellow in colour.

The measurements are given in Table 15.

Parasite	Ganeo sp. ⁹ (Fig. 16)
Host	Rana tigrina
Habitat	Small intestine
Locality	Sargodha

DESCRIPTION

This fluke is oval in outline. The cuticle is thick and is covered with spines. The spherical oral sucker is subterminal in position. The Pharynx is large and is in the form of two kidney shaped lobes placed together, while the oesophagus is small. The intestinal bifurcation lies at a distance of 0.23 mm from the anterior end of the body. The intestinal caeca terminate at a distance of 0.30 mm

from the posterior end of fluke. The rounded pre-equator acetabulum is larger than oral sucker. The gonads are present in the anterior half of the body. The large rounded anterior testis is present in the intestinal fork, while the posterior rounded testis is present extracaecally on the right side of the fluke. The intracaecal oval ovary is present below the posterior testis and to the right side of acetabulum. The genital opening is present in the genital atrium on left side of the worm. The well developed, prominent cirrus sac is present on the left side of the body. It starts from the acetabulum and ends in the genital atrium. The seminal vesicle and seminal receptacle could not be observed. The vitellaria are in the form of follicles are present in the mid-lateral regions of the body. They are intracaecal, extracaecal and circumcaecal in distribution. The vitellaria on the left side are more than the right side. The postacetabular uterus is not very extensive. The uterin coils are confined intracaecally upto the excretory pore. The excretory vesicle is v-shaped and is present sub-posteriorly. The oval, operculate eggs are light brown in colour.

The measurements are given in Table 16.

Parasite	Ganeo sp. ¹⁰ (Fig. 17)
Host	Rana tigrina
Habitat	Small intestine
Locality	Multan.

DESCRIPTION

The shape of this fluke is more or less rounded. The body is covered with thick cuticle provided with spines. The anterior portion is slightly narrow. The small oral sucker is terminal in position. It directly leads into a small globular pharynx. The large oval acetabulum is present in the anterior half of the body. The oesophagus is narrow and long. The intestinal bifurcation lies at a 0.27 mm from the anterior extremity of the fluke. The caeca are narrow long and terminate at a little behind the middle of the distome. The gonads are pre-equatorial, large and slightly pear-shaped. The anterior testis is situated in the intestinal bifurcation while the posterior testis is present obliquely on the right side of the body. The ovary is placed on the median line of the fluke behind the testes. The cirrus sac is large and is present on the left side of the body. The seminal vesicle is tubular and large. It is situated obliquely at the base of cirrus sac. The position of the genital opening is like other species of the genus Ganeo.

The seminal receptacle is well developed and pear-shaped. It is situated below the ovary. The vitellaria are in form of large follicle present laterally behind the acetabulum upto the blind end of caeca. The uterus is very extensive and is confined between the post-acetabular region and posterior extremity of the distome. The excretory pore and vesicle could not be observed. The eggs are oval operculate and golden yellow in colour.

The measurements are given in Table 17.

Family LECITHODENDRIIDAE Odhner, 1911

Subfamily PROSOTOCINAE Yamaguti, 1958

Genus PROSOTOCUS Looss, 1899

Parasite	Prosotocus partapus Kaw, 1950 (Fig. 18)
Host	Rana tigrina
Habitat	Small intestine
Locality	Sialkot.

DESCRIPTION

The distome is small in size and roughly rounded in appearance. The cuticle is thin and the whole body surface is covered with small spines. The oral sucker is subterminal, oval in shape and located transversely. The acetabulum is slightly larger than the oral sucker and similar in shape. It is situated pre-equatorially in the fork of the intestine. The pharynx is small and oval shaped. The esophagus is narrow and short. The intestinal bifurcation is at about one-third of the body length and the caeca do not extend beyond the acetabulum. The gonads are pre-equatorial in position. The testes are placed extracaecally on either side of the oesophagus. The testes are pear-shaped and the left testis is a larger than the right testis. The small triangular ovary is situated on the respective caecum just behind the left testis. The cirrus sac is prominent and its posterior end is covered by acetabulum while its terminal part is bent inward extending

almost to the antero-lateral margin of the fluke in front of the right testis. The genital opening lies at the antero-ventral right side and a little above the right testis. The seminal vesicle and seminal receptacle could not be observed. The vitellaria are confined only in the antero-lateral left part of the body and are situated between the oral sucker and the left testis. Some follicles are also present on the left caecum. The uterus is less extensive and is thrown into a few irregular coils which are mainly confined to the post-acetabular region. The excretory vesicle is v-shaped and is inconspicuous. The eggs are large and oval in shape.

The measurements are given in Table 18 & 36 .

DISCUSSION

Worm under present study resemble Prosotocus partapus Kaw (1950) in all essential diagnostic features except that the present specimens are slightly smaller. This species has also been reported by Bhutta and Khan (1975) and Basit (1982).

Family LECITHODENDRIIDAE Odhner, 1911

Subfamily PLEUROGENETINAE Looss, 1899

Genus PLEUROGENES Looss, 1896

Parasite	Pleurogenes gastroporus Luhe, 1901 (Fig. 19)
Host	Rana cyanophlyctis
Habitat	Small intestine
Locality	Sargodha and Lahore.

DESCRIPTION

The intestinal fluke has a more or less oval outline. Its anterior portion is narrow and blunt while posterior is broadly rounded. The colour is white grey and the cuticle of the whole body is closely covered with small pointed back-wardly directed spines. The oral sucker is subterminal and rounded. The acetabulum is situated for the greater part of its diameter in the posterior half of the body. It is larger than the oral sucker. The pharynx is absent while the oesophagus is very small. The intestinal bifurcation starts at a distance of 0.14 mm from the anterior extremity of the fluke. The caeca are broad and extend upto the anterior end of the testes. The testes are present on either side of the acetabulum just at the end of caeca. The left testis is oblong and large while right testis is rounded. The slightly pear-shaped small ovary is placed in the anterior half of the body above the acetabulum. Its

small portion overlaps the left caecum. The cirrus sac has thick muscular wall and its base covers a small portion of the acetabulum. The uterus form a convoluted mass filling the posterior half of the body beyond the testes. The vitellaria are composed of fairly large follicles, and they are present in the antero-lateral region of the body. Most follicles are spread extracaecal while some are intracaecal. The excretory vesicle and excretory pore could not be observed. The eggs are small and oval.

The measurements are given in Table 19 & 37.

DISCUSSION

The present distome resemble Pleurogenes gastroporus Luhe (1901) in all essential diagnostic features and has been identified as such. This species has also been reported by Bhutta and Khan (1976) and Basit (1982).

Parasite	<i>Pleurogenes orientalis</i> Srivastava, 1933(Fig.20)
Host	<i>Rana cyanophlyctis</i>
Habitat	Small intestine
Locality	Sargodha.

DESCRIPTION

The thin and transparent body is ovoid in shape with both rounded ends. The suckers are large and muscular with spherical outline. The oral sucker is subterminal in position and the acetabulum lies on equator of the body. The oesophagus is absent and the pharynx is immediately followed by the intestinal bifurcation. The intestinal caeca extend upto the anterior half of the body. The testes are present in the middle of the body. The irregular shaped testes are placed symmetrically on each side of the acetabulum. The right testis is larger than the left. The roughly rounded ovary is present below the oral sucker and above the left testis. The genital pore is present on the margin of antero-lateral right side of the fluke. The cirrus sac is well developed, cylindrical, and is present between the suckers. The vitellaria are present on the lateral side and extend upto the anterior half of the fluke. The uterus is not extensive and is present only in the posterior half of fluke. The uterine coils are full of operculate golden yellow eggs. The excretory pore and vesicle could not be observed. The measurements are given in Table 20.

DISCUSSION

The worm under study resemble Pleurogenes orientalis Srivastava (1933) in all essential diagnostic features except that the present flukes are slightly larger with proportionately larger organs. It is being reported for the first time from Pakistan.

Parasite	<i>Pleurogenes shafakensis</i> n. sp. (Fig. 21)
Host	<i>Rana cyanophlyctis</i>
Habitat	Small intestine
Locality	Sargodha.

DESCRIPTION

The body of the fluke is roughly oval. The subterminal oral sucker is circular in outline. The large spherical pharynx is situated just behind the oral sucker, consisting of two lobes placed together. The pharynx leads into a small narrow oesophagus. The intestinal bifurcation lies at a distance of 0.32 mm from the anterior extremity of the distome. The muscular oblong acetabulum is situated at the equator and approximately equal in size to the oral sucker. The extracaecal gonads are present in the middle of the body. The irregularly shaped testes are placed obliquely on the either side of the acetabulum. The left testis is larger than the right. The small, slightly rounded ovary is present above the left testis. The thin narrow intestinal caeca pass downwards on the lateral sides of acetabulum. The

caeca terminate at a little distance behind the posterior testis. The genital opening is situated in the genital atrium on the left body margin near the oral sucker. The cirrus sac is large, highly muscular and is almost inverted L-shaped. Its posterior portion is much dilated and starts above the acetabulum reaches upto the genital atrium. The vitelline follicles are few in numbers and are present laterally between the oral sucker and testes. The vitellarian follicles on the right side are more than of the left. The uterus arises from the right side of the acetabulum, passes downwards and forms a compact convoluted mass in the post acetabular region. The seminal vesicle could not be observed. The uterus is packed with numerous small operculate eggs of a light brown colour.

The measurements are given in Table 21.

DISCUSSION

The specimens under discussion differs from all the known eleven species of genus *Pleurogenes* in shape and size of pharynx and oesophagus, size and position of intestinal caeca., and location of gonads. The present species resembles to the *P. medians* Olss (1894) and *P. claviger* Rudolphi (1894) only in oesophagus size but differ in all other above mentioned features. In view of all these differences, the species under study is considered new to science and name proposed for it is *Pleurogenes Shafakensis*.

Family LECITHODENDRIIDAE Odhner, 1911

Subfamily Prosotocinae Yamaguti, 1958

Genus Mehraorchis Srivastava, 1934

Parasite	Mehroarchis ranarum Srivastava, 1934 (Fig. 22.a, b, c, d and e)
Host	Rana cyanophlyctis
Habitat	Flukes present in cysts located in the body cavity, mostly in the pancreatic region.
Locality	Multan and Lahore.

DESCRIPTION

This fluke is thick and dirty brown in colour. The body of the fluke is oval in shape. The maximum breadth is at about the equator of the body. The cuticle is thick. The oral sucker is terminal in position and rounded in outline. The pharynx is well developed and is in the form of two kidney shaped longitudinal big lobes placed together. The oesophagus is medium in size. The intestinal bifurcation commences at a distance of 0.40 mm from the anterior extremity of the body. The intestinal caeca are broader than the oesophagus and terminate at a distance of 0.12 mm from the posterior extremity of the fluke. The acetabulum is larger than the oral sucker and is pre-equatorial in position. The testes are present on either side of the oesophagus. These are roughly triangular in

shape and the right testis is slightly larger than the left. The approximately rounded ovary is present intracaecally towards the right side of the distome. It is partially covered by the acetabulum. The cirrus sac is well developed and lies on the right side of the body. It starts above the acetabulum and opens in the marginal genital atrium. The seminal vesicle and seminal receptacle could not be observed. The vitellaria are follicular and are situated in the antero-lateral fields of the body around and over the testes. The uterus is not very extensive and uterine coils extend extracaecally in the mid-lateral region of the fluke. The excretory pore and vesicle could not be observed. The eggs are operculate and light yellow in colour.

The measurements are given in Table 22 & 38.

DISCUSSION

The worm under study resembles Mehraorchis ranarum Srivastava (1934) in all essential diagnostic features and has been identified as such. This distome has also been recorded by Bhutta and Khan (1976) and Basit (1982).

Parasite	<i>Mehraorchis kakakhailensis</i> n.sp. (Fig. 23)
Host	<i>Rana cyanophlyctis</i>
Habitat	Flukes present in cysts located in the body cavity, mostly in the pancreatic region.
Locality	Peshawar.

DESCRIPTION

This distome is rounded in shape. The cuticle is thick and the whole body is covered with short spines. The suckers are small and have spherical outline. The subterminal oral sucker is slightly larger than the acetabulum. The well developed oval pharynx is present just behind the oral sucker. It leads into a long narrow oesophagus which bifurcate after a distance of 0.30 mm into two intestinal caeca. The thin narrow caeca terminate at a little distance before the posterior end of the worm. The elongate oval testes are present symmetrically in the antero-lateral sides of the fluke. The right testis is slightly larger than the left and touches the respective caecum while left testis is situated on the left caecum. The small, intracaecal, roughly dumb-bell-shaped ovary is present in the anterior half of the body and to the left side of the acetabulum. The genital opening is present in the genital atrium and is situated antero-ventrally near the oral sucker. The cirrus sac is very prominent and is

present between the suckers. Its central portion is dilated. The seminal vesicle and seminal receptacle could not be observed. The vitellaria are confined in the antero-lateral regions of the body. The vitelline follicles are spread over and around the right testis while of the left side are between the left testis and oesophagus. The post-acetabular uterus is much extensive and is present extracaecally as well as intracaecally. The well differentiated excretory pore is present at the posterior margin. The operaculate oval eggs are light golden in colour.

The measurements are given in Table 28.

DISCUSSION

Mehroarchis ranarum Srivastava (1934) is the only species of the genus Mehroarchis ranarum Srivastava (1934) reported from Rana cyanophlyctis of India and Pakistan. The specimens under study differ from M. ranarum in the shape and size of the body, size of oral sucker and acetabulum, smaller pharynx and larger narrow oesophagus, narrow and larger intestinal caeca, size of the gonads, cirrus sac, vitelline follicles and having a more extensive uterus. However, the size and shape of eggs are similar in both the cases. The above noted differences are sufficient to justify the creation of a new species for the present fluke for which Mehraorchis kakakhailensis name is proposed.

Family PLAGIORCHIIDAE Ward, 1917

Subfamily HAEMATOLOECHINAE

Genus HAEMATOLOECHUS. looss, 1899

Parasite	Haematoloechus sindensis Khan and Mohiuddin, 1982. (Fig. 23)
Host	Rana cyanophlyctis
Habitat	Lungs
Locality	Multan and D. G. Khan

DESCRIPTION

The fluke is soft, flat, with rounded broad posterior portion. The aspinuated body contains oral sucker which is rounded and subterminal in position. The pharynx is well developed and is in the form of two longitudinal kidney shaped lobes placed together. The oesophagus is absent and pharynx leads into the intestinal caeca. The intestinal caeca diverge downwards in slightly wavey manner and terminate at about one-fourth of the posterior portion of the body. The acetabulum could not be observed. Testes are large rounded, tandem and are situated in the posterior half of the fluke. The pre-equatorial ovary is oblong and is placed in the median line of the distome. Its right side overlaps the respective caecum. The genital opening is not clear. The vitellaria are in the form of large oval follicles grouped together like bunches of grape, extend from the end of the first quarter of the body to about one-eighth

of the body length from the posterior extremity. Mostly the follicles are arranged along the caeca for the entire length but some of the anterior and posterior groups are placed intercaecally.

Measurements are given in Table 23 & 39.

DISCUSSION

This lung fluke closely resembles Haematoloechus sindensis, Khan and Mohiuddin (1982) in all its essential diagnostic features and is identified as such.

Family GORGODERIDAE Looss, 1901

Genus GORGODERINA Looss, 1902

Parasite	Gorgoderina khawarensis n. sp. (Fig. 25)
Host	Rana cyanophlyctis
Habitat	Urinary bladder
Locality	Sargodha

DESCRIPTION

The fluke is transparent and whitish. The body is covered with a thin cuticle and is without spines. The oral sucker is almost spherical and terminal in position. The acetabulum is larger than the oral sucker. It is circular in outline and lies at a little distance behind the oral sucker. The pharynx is absent while the oesophagus is short. The intestinal caeca after passing round the acetabulum terminate at a short distance from posterior extremity of the body. The gonads are present in the posterior half of the body. The testes are large, lobed and postacetabular. The left testis is larger than the right testis. The ovary is roughly rounded in shape and is placed above the left testis. The cirrus sac is cylindrical in shape and transversely located above the right testis. The genital opening is present in the fork of intestinal caeca. The vitellaria are in the form of spherical follicles distributed throughout the post-

acetabular region except the gonadal zone. The excretory bladder and excretory pore could not be observed. The uterus is narrow and less extensive.

The operculate eggs are oval, large and light yellow in colour.

Measurements are given in table 24 & 40.

DISCUSSION

The specimens under study differ from all known in species of genus *Gorgoderina*, i.e. *G. parva* Travassos (1920), *G. tanneri* Olsen, *G. copensis* Joyeux and Baer (1934), *G. aurora* Ingles (1936), *G. attenuata* stafford (1902), *G. translucida* stafford (1902), *G. multilobata* ingles and langston (1933), *G. cryptorchis* trovassos (1924), *G. bilobata* Rankin (1937), *G. tenua* Rankin (1937), *G. intermedia* Hall (1928), *G. carli* Baer (1930), *G. simplex* Loos (1902), *G. cedroi* Travassos (1924) in shape and size of body, position of acetabulum, absence of Pharynx, presence of small oesophagus and shape, size and location of testes. In the present species the vitellaria are present in the form of follicles in the post-acetabular region. While in all known species they are present in the form of compact mass or labolar form in pre-testicular region. In view of all these differences it is obvious that this a new species and the proposed name for it is *Gorgoderina khawarensis*. It is reported for the first time in Indo-Pakistan subcontinent.

Family PARAAMPHISTOMIDAE Fischöder, 1910

Subfamily DIPLODISCINAE Cohn, 1904

Genus DIPLODISCUS. Diesing, 1836

Parasite	Diplodiscus peshawarensis n. sp. (Fig. 26)
Host	Rana cyanophlyctis
Habitat	Rectum
Locality	Peshawar

DESCRIPTION

The body of this rectal fluke is elongated and conical in shape. The anterior end is comparatively narrower than the posterior end. The cuticle is thick and without spines. The small spherical sub-terminal oral sucker has no oral diverticula. The large acetabulum lies postero-ventrally and its wall in the centre is thickened to form an additional sucker having its own depression. The oesophagus is long and possesses a distinct bulb at its posterior end. The intestinal bifurcation starts at a distance of 0.48 mm from the anterior end and terminating a little distance inside the posterior sucker. The genital opening is just post-bifurcal and median. The single testis is roughly rounded and is present in the middle of the body. The small rounded ovary is situated between the testis and posterior sucker. The cirrus sac and seminal vesicle could not be observed. The large vitellarian follicles are different in shape and size. They are scattered

along the entire length of intestinal caeca.

The measurements are given in Table 25 & 41.

DISCUSSION

The specimens under study is different from all known species of genus *Diplodiscus*. It differ from *D. amphichrus tubangui* (1933) in shape and size of body, absence of oral sucker diverticula, position of genital opening, size of location of gonads and vitellaria. *D. khyberensis* Bhutta and Khan (1975) also differ in shape and size of body, shape and size of posterior sucker. *D. magolochrus* Johnston (1912) has similar position of the genital pore but differ from present species in size and shape at body, measurements and position of gonads, sucker and vitellaria. It also differ from *D. doyeri* in topography of gonads and other principal organs. *D. saccolosus* differ in the form of intestinal caeca and size of body and eggs. The under study species also differ from *D. subclavatus* in having larger eggs and vitellaria which is restricted to the lateral sides of the body. These differences are of sufficient importance to justify the creation of a new species for the present fluke for which the name *Diplodiscus peshawarensis* is proposed.

Family ALLOCREADIIDAE Stossich, 1903

Genus PORACANTHUS Dolfus, 1958

Parasite *Poracanthium sialkotiensis*, n. sp. (Fig. 27)
Host *Rana cyanophlyctis*
Habitat Small Intestine
Locality Sialkot

DESCRIPTION

The worm is elongated while both ends are slightly rounded. The body is covered with a spiny thick cuticle. The oral sucker is subterminal in position and circular in outline. The pharynx is well developed and is in the form of two kidney shaped lobes placed together overlaps the basal posterior portion of the oral sucker. The acetabulum is the player globular in shape and larger than the oral sucker. It is situated between the intestinal caeca in the anterior half of the body. The oesophagus is small and intestinal bifurcation lies at a distance of 0.22 mm from the anterior end of the body. The intestinal caeca are thin, narrow and terminate at a little distance beyond the right testis. The genital opening is present in the intestinal fork. The cirrus sac is oblong and is covered by acetabulum. The elongated and oval shaped almost tendem testes are placed in the middle of the fluke. The ovary is oval in outline and is situated at a short

distance behind the acetabulum and is submedian in position. It partially overlaps the right caecum. The vitellaria are placed laterally between the acetabulum and the margin of ovary. The vitellaria of the right side are mostly extra-caecal, while they are mostly intracaecal on the left side. The uterus is much convoluted and is thrown into numerous irregular coils behind the testes upto the posterior margin of the worm. The excretory bladder and excretory pore could not be observed. The oval eggs are fairly numerous and light yellow in colour.

Measurements are given in Table 25.

DISCUSSION

Only one species of the genus Poracanthium Stossich (1883) has been reported in the whole world, which is Poracanthium furcatum stossich (1883) from fish. The specimen under discussion is different from Poracanthium furcatum stossich (1883) in shape and size of body, position and ratio of suckers, location of genital opening, shape and size of cirrus sac, shape of testes and position of ovary, size and site of vitellaria, and configuration of uterine coils. On the basis of these differences the species under study is regarded as distinct from Poracanthium furcatum stossich (1883). It further differs in parasitizing a different host. Hence it is regarded as new to science and proposed name is Poracanthium sialkotiensis.

Family OPISTHORCHIIDAE Braun, 1901

Genus OPISTHODISCUS

Parasite	Opisthodiscus diplodiscoides Cohn, 1904. (Fig.28)
Host	Rana cynophlyctis
Habitat	Ræctum
Locality	Multan and Dera Ghazi Khan

DESCRIPTION

The body of the rectal fluke is dorsoventrally flattend, oval in outline with broad posterior and narrow anterior end. The body is covered with thick cuticle and is without spines. Freshly recovered specimes are thick and translucent. The oral sucker is well developed, muscular, rounded and subterminal in position. It is situated in the anterior projection of the body. At the base of oral sucker two medium size rounded, auxillary sucker are present. The oesophagus is thin and short. It bears a distinct oesophageal bulb at its posterior end. Pharynx is absent. The large, thick walled posterior sucker is present postero-ventrally and its wall in the centre is thickened to form an additional sucker having its own depression. The intestinal-bifurcation starts at a distance of 0.44 mm from the anterior extermity of the body. The caeca are much broader than the oesophagus. The common genital opening lies on the intestinal bifurcation. The intracaecal testes

are of different shape and size and lie just behind the equator of the fluke. The roughly rounded ovary is present between the testes and posterior sucker and on the right side of the fluke. The cirrus sac is not clear. The vitellaria are in the form of a number of round or oval follicles which are scattered between the oesophagus and the middle of posterior sucker except in the intracaecal region which is occupied by goands. The uterus contains few eggs and lies intracaecally.

The eggs are oval, light yellow and operculate. Measurements are given in table. 27 & 42.

DISCUSSION

The worm under study closely resembles Opisthodiscus diplodiscoides Cohn (1904) in all its essential diagnostic features and has been identified as such. It differs slightly in size and measurements. However, this species is being first time reported from Indo-Pakistan.

TABLE-1

Measurements of *Ganeo kumaonensis* Pande, 1937.

Parameter		Measurements (mm)
Body	L	2.81
	B	1.06
Oral sucker	L	0.11
	B	0.11
Acetabulum	L	0.11
	B	0.15
Pharynx	L	0.07
	B	0.05
Oesophagus	L	0.24
	B	0.00
Intestine	L	1.22
Anterior testis	L	0.22
Posterior testis	L	0.23
	B	0.25
Ovary	L	0.21
	B	0.21
Vitellaria	L	0.03
	B	0.02
Eggs	L	0.02
	B	0.01

(L, length; B, breath; mm, millimeters.)

TABLE-2,

Measurements of *Ganeo tigrinus* Mehra and Negi, 1928.

Parameter		Measurements (mm)
Body	L	1.75
	B	0.79
Oral sucker	L	0.10
	B	0.11
Acetabulum	L	0.11
	B	0.15
Pharynx	L	0.07
	B	0.07
Oesophagus	L	0.20
Intestine	L	0.85
Anterior testis	L	0.14
	B	0.12
Posterior testis	L	0.12
	B	0.16
Ovary	L	0.15
	B	0.18
Vitellaria	L	0.04
	B	0.02
Eggs	L	0.02
	B	0.01

(L, length; B, breadth; mm, millimeter.)

TABLE-3.

Measurements of *Ganeo glottoides madrasensis* Mehra and Negi, 1928.

Parameter		Measurements (mm)
Body	L	2.05
	B	0.84
Oral sucker	L	0.15
	B	0.17
Actabulum	L	0.14
	B	0.17
Pharynx	L	0.09
	B	0.06
Oesophagus	L	0.12
Intestine	L	0.89
Anterior testis	L	0.17
	B	0.19
Posterior testis	L	0.14
	B	0.19
Ovary	L	0.12
	B	0.16
Vitellaria	L	0.03
	B	0.01
Eggs	L	0.02
	B	0.01

(L, length; B, breadth; mm, millimeters.)

TABLE-4

Measurements of *Ganeo srinagarensis* Kaw, 1950.

Parameter		Measurements (mm)
Body	L	1.31
	B	1.01
Oral sucker	L	0.12
	B	0.14
Acetabulum	L	0.14
	B	0.18
Pharynx	L	0.09
	B	0.08
Oesophagus	L	0.11
Intestine	L	0.97
Anterior testis	L	0.12
	B	0.14
Posterior testis	L	0.14
	B	0.18
Ovary	L	0.10
	B	0.16
Vitellaria	L	0.03
	B	0.02
Eggs	L	0.02
	B	0.01

(L, length; B, breadth; mm, millimeters.)

TABLE-5

Measurements of *Ganeo gastricus* Srivastava, 1933

Parameter		Measurements (mm)
Boby	L	1.72
	B	0.89
Oral sucker	L	0.11
	B	0.13
Acetabulum	L	0.12
	B	0.13
Pharynx	L	0.06
	B	0.09
Oesophagus	L	0.17
Intestine	L	0.91
Right testis	L	0.16
	B	0.20
Left testis	L	0.19
	B	0.17
Ovary	L	0.12
	B	0.16
Vitellaria	L	0.03
	B	0.01
Eggs	L	0.08
	B	0.05

(L, length; B, breadth; mm, millimeters)

TABLE- 6

Measurements of *Ganeo attenuatum* Srivastava, 1933

Parameter		Measurements (mm)
Boby	L	2.32
	B	0.62
Oral sucker	L	0.11
	B	0.12
Acetabulum	L	0.12
	B	0.13
Pharynx	L	0.10
	B	0.09
Oesophagus	L	0.26
Intestine	L	0.92
Anterior testis	L	0.12
	B	0.20
Posterior testis	L	0.12
	B	0.16
Ovary	L	0.12
	B	0.16
Vitellaria	L	0.05
	B	0.03
Eggs	L	0.02
	B	0.01

(L, length; B, breadth; mm, millimeters)

TABLE-7

Measurements of *Ganeo microacetabulus* Bhutta and Khan, 1974.

Parameter		Measurements (mm)
Body	L	6.72
	B	3.92
Oral sucker	L	0.67
	B	0.56
Pharynx	L	0.35
	B	0.33
Oesophagus	L	1.29
In, C.	L	2.86
Anterior testis	L	0.78
	B	0.67
Posterior testis	L	0.73
	B	0.50
Acetabulum	L	0.39
	B	0.45
Vitellaria	L	0.22
	B	0.06
Eggs	L	0.06
	B	0.03

(L, length; B, breadth; mm, millimeters)

TABLE- 8
Measurements of Ganeo Species¹

Parameter		Measurements (mm)
Body	L	1.70
	B	0.80
Oral sucker	L	0.15
	B	0.20
Acetabulum	L	0.22
	B	0.20
Pharynx	L	0.05
	B	0.05
Oesophagus	L	0.07
Intestinal caeca	L	0.99
Anterior testis	L	0.19
	B	0.14
Posterior testis	L	0.14
	B	0.16
Ovary	L	0.07
	B	0.10
Eggs	L	0.02
	B	0.08

(L, length; B, breadth; mm, millimeters)

TABLE- 9
 Measurements of Ganeo Species²

Parameter		Measurements (mm)
Body	L	2.59
	B	1.76
Oral sucker	L	0.14
	B	0.15
Acetabulum	L	0.15
	B	0.18
Pharynx	L	0.09
	B	0.09
Oesophagus	L	0.32
Intestinal caeca	L	1.50
Anterior testis	L	0.37
	B	0.46
Posterior testis	L	0.39
	B	0.41
Ovary	L	0.16
	B	0.15
Vitellaria	L	0.05
	B	0.02
Eggs	L	0.01
	B	0.07

(L, length; B, breadth; mm, millimeters)

TABLE-10
Measurements of Ganeo Species³

Parameter		Measurements (mm)
Body	L	7.39
	B	3.02
Oral sucker	L	0.50
	B	0.56
Acetabulum	L	0.90
	B	0.67
Pharynx	L	0.39
	B	0.34
Oesophagus	L	0.90
	B	0.16
Intestine	L	4.03
Interior testis	L	0.61
	B	0.90
Posterior testis	L	0.85
	B	0.67
Ovary	L	0.61
	B	0.34
Vitellaria	L	0.11
	B	0.07
Eggs	L	0.04
	B	0.03

(L, length; B, breadth; mm, millimeters)

TABLE- 11
Measurements of Ganeo Spocies⁴

Parameter		Measurements (mm)
Body	L	8.01
	B	4.42
Oral sucker	L	1.01
	B	0.06
Acetabulum	L	0.67
	B	0.78
Pharynx	L	0.22
	B	0.17
Oesophagus	L	1.06
	B	0.14
Intestine	L	4.09
	B	0.14
Anterior testis	L	1.06
	B	0.90
Posterior testis	L	0.84
	B	0.90
Ovary	L	0.67
	B	1.01
Vitellaria	L	0.17
	B	0.11
Eggs	L	0.11
	B	0.06

(L, length; B, breadth; mm, millimeters)

TABLE- 12

Measurements of Ganeo Species⁵

Parameter		Measurements (mm)
Body	L	2.45
	B	1.06
Oral sucker	L	0.08
	B	0.06
Pharynx	L	0.06
	B	0.05
Oesophagus	L	0.26
Intestinal caeca	L	1.30
Actabulum	L	0.12
	B	0.16
Anterior testis	L	0.10
	B	0.19
Posterior testis	L	0.20
	B	0.14
Ovary	L	0.19
	B	0.12
Vitellaria	L	0.04
	B	0.02
Eggs	L	0.03
	B	0.01

(L, length; B, breadth; mm, millimeters)

TABLE-13

Measurements of Ganeo Species⁶

Parameter		Measurements (mm)
Body	L	1.85
	B	0.76
Oral sucker	L	0.11
	B	0.11
Acetabulum	L	0.16
	B	0.19
Pharynx	L	0.10
	B	0.07
Oesophagus	L	0.16
	B	0.04
Intestine	L	0.87
Anterior testis	L	0.14
	B	0.15
Posterior testis	L	0.14
	B	0.19
Ovary	L	0.16
	B	0.22
Vitellaria	L	0.06
	B	0.03
Eggs	L	0.03
	B	0.01

(L, length; B, breadth; mm, millimeters)

TABLE-14

Measurements of Ganeo Species⁷

Parameter		Measurements (mm)
Body	L	1.45
	B	0.62
Oral sucker	L	0.14
	B	0.12
Acetabulum	L	0.14
	B	0.14
Pharynx	L	0.08
	B	0.06
Oesophagus	L	0.13
	B	0.04
Intestine	L	0.71
Interior testis	L	0.16
	B	0.16
Posterior testis	L	0.19
	B	0.17
Ovary	L	0.14
	B	0.14
Vitellaria	L	0.03
	B	0.02
Eggs	L	0.02
	B	0.01

(L, length; B, breadth; mm, millimeters)

TABLE- 15

Measurements of Ganeo Species⁸

Parameter		Measurements (mm)
Body	L	6.89
	B	5.04
Oral sucker	L	0.67
	B	1.06
Acetabulum	L	0.61
	B	0.80
Pharynx	L	0.33
	B	0.39
Oesophagus	L	0.56
	B	0.18
Intestine	L	4.25
Anterior testis	L	0.78
	B	1.18
Posterior testis	L	0.80
	B	1.01
Ovary	L	0.39
	B	0.78
Vitellaria	L	0.18
	B	0.08
Eggs	L	0.06
	B	0.04

(L, length; B, breadth; mm, millimeters)

TABLE-16
Measurements of Ganeo Species⁹

Parameter		Measurements (mm)
Body	L	2.41
	B	1.86
Oral sucker	L	0.16
	B	0.17
Acetabulum	L	0.17
	B	0.20
Pharynx	L	0.08
	B	0.06
Oesophagus	L	0.12
	B	0.04
Intestine	L	0.95
Anterior testis	L	0.16
	B	0.19
Posterior testis	L	0.16
	B	0.22
Ovary	L	0.14
	B	0.18
Vitellaria	L	0.05
	B	0.03
Eggs	L	0.02
	B	0.01

(L, length; B, breadth; mm, millimeters)

TABLE-17

Measurements of Ganeo Species¹⁰

Parameter		Measurements (mm)
Body	L	1.91
	B	1.30
Oral sucker	L	0.06
	B	0.09
Acetabulum	L	0.12
	B	0.18
Pharynx	L	0.05
	B	0.06
Oesophagus	L	0.20
	B	0.04
Intestine	L	1.15
Anterior testis	L	0.17
	B	0.31
Posterior testis	L	0.17
	B	0.29
Ovary	L	0.15
	B	0.25
Vitellaria	L	0.05
	B	0.02
Eggs	L	0.02
	B	0.01

(L, length; B, breadth; mm, millimeters)

TABLE-18

Measurements of *Prosotocus partapus* Kaw, 1950.

Parameter		Measurements (mm)
Body	L	9.56
	B	3.98
Oral sucker	L	0.67
	B	0.90
Acetabulum	L	0.62
	B	0.01
Pharynx	L	0.22
	B	0.22
Oesophagus	L	1.23
Intestinal caeca	L	1.79
Right testis	L	0.62
	B	0.01
Left testis	L	0.73
	B	1.06
Ovary	L	0.45
	B	0.67
Vitellaria	L	0.03
	B	0.02
Eggs	L	0.02
	B	0.01

(L, length; B, breadth; mm, millimeters)

TABLE-19

Measurements of *Pleurogenes gastroporus* Luhe, 1901.

Parameter		Measurements (mm)
Body	L	1.08
	B	0.64
Oral sucker	L	0.18
	B	0.19
Actabulum	L	0.21
	B	0.21
Intestinal caeca	L	0.32
Right testes	L	0.16
	B	0.16
Left testis	L	0.22
	B	0.12
Ovary	L	0.11
	B	0.12
Vitellaria	L	0.04
	B	0.02
Eggs	L	0.02
	B	0.01

(L, length; B, breadth; mm, millimeters)

TABLE- 20

Measurements of *Pleurogenes orientalis* Srivastava, 1933.

Parameter		Measurements (mm)
Body	L	7.84
	B	5.26
Oral sucker	L	1.52
	B	1.62
Acetabulum	L	1.79
	B	1.06
Pharynx	L	0.56
	B	0.73
Oesophagus	L	0.92
Intestinal caeca	L	3.24
	B	2.74
Right testis	L	1.06
	B	1.18
Left testis	L	1.51
Ovary	L	0.84
	B	1.00
Vitellaria	L	0.04
	B	0.03
Eggs	L	0.04
	B	0.03

(L, length; B, breadth; mm, millimeters)

TABLE- 21

Measurements of *Pleurogenes shafakensis* n. sp.

Parameter		Measurements (mm)
Body	L	8.12
	B	6.05
Oral sucker	L	2.05
	B	2.80
Acetabulum	L	2.02
	B	2.13
Pharynx	L	1.06
	B	1.01
Intestinal caeca	L	2.63
Right testis	L	1.18
	B	1.40
Left testis	L	1.11
	B	1.18
Ovary	L	0.17
	B	0.11
Eggs	L	0.03
	B	0.01

(L, length; B, breadth; mm, millimeters)

TABLE-22

Measurements of *Mehraorchis ranarum* Srivastava, 1933.

Parameter		Measurements (mm)
Body	L	2.05
	B	1.21
Oral sucker	L	0.32
	B	0.31
Acetabulum	L	0.24
	B	0.25
Pharynx	L	0.18
	B	0.09
Oesophagus	L	0.17
Intestinal caeca	L	1.27
Right testis	L	0.25
	B	0.16
Left testis	L	0.27
	B	0.20
Ovary	L	0.24
	B	0.25
Vitellaria	L	0.06
	B	0.04
Eggs	L	0.02
	B	0.01

(L, length; B, breadth; mm, millimeters)

TABLE- 23

Measurements of *Haematoloechus sindensis* Khan and Mohiuddin,
1982.

Parameter		Measurements (mm)
Body	L	3.84
Body breadth	B	1.46
Oral sucker	L	0.31
	B	0.27
Pharynx	L	0.14
	B	0.15
Intestine	L	2.45
Anterior testis	L	0.42
	B	0.39
Posterior testis	L	0.47
	B	0.37
Ovary	L	0.50
	B	0.21
Vitellaria	L	0.06
	B	0.04
Eggs	L	0.05
	B	0.02

(L, length; B, breadth; mm, millimeters)

TABLE- 24

Measurements of *Gorgoderina khawarensis* n.sp.

Parameter		Measurements (mm)
Body	L	1.62
	B	0.59
Oral sucker	L	0.29
	B	0.27
Acetabulum	L	0.34
	B	0.32
Intestinal caeca	L	1.06
Right testis	L	0.25
	B	0.16
Left testis	L	0.27
	B	0.12
Ovary	L	0.15
	B	0.10
Vitellaria	L	0.05
	B	0.04
Eggs	L	0.05
	B	0.02

(L, length; B, breadth; mm, millimeters)

TABLE- 25

Measurements of *Diplodiscus peshawarensis* n. sp.

Parameter		Measurements (mm)
Body	L	3.83
	B	1.89
Oral sucker	L	0.47
	B	0.52
Posterior sucker	L	0.61
	B	1.29
Esophagus	L	0.17
Intestine	L	2.71
Testis	L	0.27
	B	0.19
Ovary	L	0.09
	B	0.17
Vitellaria	L	0.27
	B	0.21

(L, length; B, breadth; mm, millimeters)

TABLE - 26

Measurements of *Poracanthium sialkotiensis* n. sp.

Parameter		Measurements (mm)
Body	L	2.37
	B	0.76
Oral sucker	L	0.22
	B	0.25
Acetabulum	L	0.27
	B	0.29
Pharynx	L	0.10
	B	0.14
Oesophagus	L	0.10
	B	0.04
Intestine	L	1.31
Anterior testis	L	0.16
	B	0.34
Posterior testis	L	0.15
	B	0.40
Ovary	L	0.25
	B	0.19
Vitellaria	L	0.04
	B	0.02
Eggs	L	0.02
	B	0.01

(L, length, B, breadth; mm, millimeters)

TABLE-27

Measurements of *Opisthodiscus diplodiscoides* Cohn, 1904.

Parameter		Measurements (mm)
Body	L	1.44
	B	0.89
Oral sucker	L	0.16
	B	0.19
O, A, S,	L	0.11
	B	0.10
I, C.	L	0.60
	B	0.72
V. C.	L	0.47
	B	0.72
T	L	0.10
	B	0.21
Ovary	L	0.11
	B	0.10
Vitellaria	L	0.09
	B	0.09
Eggs	L	0.09
	B	0.04

(L, length; B, breadth; mm, millimeters)

TABLE - 27

COMPARISON OF MORPHOLOGICAL CHARACTERS OF M. ranarum (Srivastava, 1934) WITH OF M. kakakhailensis NEW SPECIES

33

	<u>M. ranarum (Srivastava, 1934)</u>	<u>M. kakakhailensis new species</u>
Host	Rana cyanophlyctis	Rana cyanophlyctis
Habitat	Pancreatic cyst	Liver cyst
Locality	Multan and Lahore	Peshawar
Shape of body	Elongated, Narrow antero-posteriorly. maximum breadth at equator.	Rounded. maximum breadth at equator.
Length	2.05 mm	3.17 mm
Breadth	1.21 mm	2.50 mm
Oral sucker		
i) Shape	Globular	Circular
ii) Size	0.32 x 31 mm. larger than acetabulum.	0.27 x 0.29 mm.
Acetabulum		
i) Shape	Rounded	Rounded
ii) Size	0.24 x 0.25 mm.	0.27 x 0.28 mm.
Pharynx		
i) Shape	Elongated, cylindrical	Rounded
ii) Size	0.18 x 0.12 mm.	0.12 x 0.12 mm.

Oesophogus

i) Size 0.17 x 0.10 mm.

0.25 x 0.8 mm.

Intestinalcaeca

i) Size 1.27 x 0.12 mm.

2.07 x 0.10 mm.

Testes

i) Shape Rounded triangular

Elongated

ii) Position Extracaecally

Roughly circumcaecal.

iii) Size 0.25 x 0.16 mm. and 0.27 x 0.20 mm.

0.57 x 0.32 and 0.65 x 0.43 mm.

Ovary

i) Shape Rounded

Dum-bell shaped

ii) Position Intracaecal

iii) Size 0.26 x 0.24 mm.

0.20 x 0.39 mm.

Cirrus sac

i) Size 0.59 x 0.14 mm.

0.47 x 0.32 mm.

Genital opening

Marginal

Ventral

Vitellaria

Large follicles around the testes

Small follicles, around the right testis and in front of left testis.

Uterus

Not much extensive

Very extensive. Extends to some distance beyond the blind end of caeca.

TABLE-29

PERCENTAGE OF PARASITIC INFECTION IN VARIOUS VISCERAL ORGANS OF FROGS IN DIFFERENT REGION
OF THE PUNJAB AND N.W.F.P.

95

Region	Int.	Rec.	Mes.	U.bl.	Lgs.	Liv.
Rawalpindi/ Islamabad.	52.25	2.00	8.50	-	-	4.33
Sialkot	44.50	-	-	-	-	-
Multan	36.00	2.00	2.50	-	-	-
Lahore	35.00	20.33	-	4.00	-	-
Sargodha	20.00	4.50	2.00	12.00	-	-
Peshawar	08.50	14.00	-	-	-	-
D. G. Khan	20.00	-	-	-	15.00	-

Abbreviations. Int.: Intestine; Rec.: Rectum; Mes.: Mesentery; U.bl.:Urinary bladder;
Lgs.: Lungs; Liv.: Liver.

TABLE-30

Measurements of *Ganeo kumaonensis* Pande, 1937.

96

Parameter			$\bar{X} \pm SE$	O.R.	95% C-I	C.V.
Body length	L	7	2.067 \pm 0.491	2.02 - 2.91	1.577 - 2.558	23.754
Body breadth	B	7	1.478 \pm 0.357	1.12 - 1.86	1.121 - 1.835	24.154
Oral sucker	L	7	0.101 \pm 0.017	0.11 - 0.14	0.084 - 0.118	16.832
	B	7	0.110 \pm 0.016	0.11 - 0.14	0.094 - 0.126	14.545
Acetabulum	L	7	0.187 \pm 0.096	0.11 - 0.18	0.091 - 0.283	51.337
	B	7	0.150 \pm 0.015	0.13 - 0.17	0.135 - 0.165	10.000
Pharynx	L	7	0.063 \pm 0.009	0.05 - 0.07	0.054 - 0.072	14.286
	B	7	0.064 \pm 0.001	0.05 - 0.08	0.063 - 0.065	01.565
Oesophagus	L	7	0.244 \pm 0.112	0.11 - 0.37	0.132 - 0.336	45.902
	B	7	0.050 \pm 0.015	0.03 - 0.07	0.035 - 0.065	03.000
Anterior testis	L	7	0.154 \pm 0.037	0.10 - 0.22	0.117 - 0.191	20.671
	B	7	0.179 \pm 0.030	0.13 - 0.22	0.149 - 0.209	16.760
Posterior testis	L	7	0.159 \pm 0.039	0.12 - 0.23	0.120 - 0.198	24.528
	B	7	0.171 \pm 0.043	0.13 - 0.25	0.128 - 0.214	25.146
Ovary	L	7	0.149 \pm 0.041	0.11 - 0.21	0.128 - 0.214	27.517
	B	7	0.160 \pm 0.041	0.13 - 0.21	0.108 - 0.190	25.146
Vitellaria	L	7	0.044 \pm 0.009	0.03 - 0.06	0.035 - 0.530	20.455
	B	7	0.033 \pm 0.009	0.02 - 0.05	0.024 - 0.042	27.273
Egg	L	7	0.024 \pm 0.005	0.02 - 0.03	0.109 - 0.029	20.833
	B	7	0.013 \pm 0.004	0.01 - 0.02	0.009 - 0.017	30.760

(n, number of specimens; $\bar{X} \pm SE$ mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C. V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

TABLE-31

Measurements of *Ganeo tigrinus* Mehra and Negi, 1928.

97

Parameter		n	$\bar{X} \pm$ SE	O.R	95% C-I	C.V.
Body length	L	4	2.300 \pm 0.767	1.75 - 3.40	1.080 - 3.520	33.348
Body breadth	B	4	1.178 \pm 0.526	0.79 - 1.95	0.342 - 2.014	44.652
Oral sucker	L	4	0.120 \pm 0.018	0.10 - 0.14	0.091 - 0.149	15.000
	B	4	0.125 \pm 0.019	0.10 - 0.15	0.095 - 0.155	15.200
Acetabulum	L	4	0.132 \pm 0.021	0.11 - 0.16	0.099 - 0.165	15.909
	B	4	0.143 \pm 0.009	0.13 - 0.15	0.129 - 0.157	06.294
Pharynx	L	4	0.088 \pm 0.013	0.07 - 0.09	0.167 - 0.109	14.772
	B	4	0.060 \pm 0.014	0.05 - 0.08	0.038 - 0.082	23.333
Oesophagus	L	4	0.225 \pm 0.025	0.20 - 0.26	0.185 - 0.265	11.111
	B	4	0.055 \pm 0.006	0.05 - 0.06	0.046 - 0.165	10.909
Anterior testis	L	4	0.165 \pm 0.041	0.11 - 0.21	0.100 - 0.230	24.898
	B	4	0.175 \pm 0.025	0.14 - 0.20	0.135 - 0.215	14.286
Posterior testis	L	4	0.173 \pm 0.035	0.12 - 0.19	0.117 - 0.229	20.231
	B	4	0.163 \pm 0.005	0.14 - 0.17	0.155 - 0.171	03.067
Ovary	L	4	0.143 \pm 0.009	0.13 - 0.15	0.129 - 0.157	06.293
	B	4	0.135 \pm 0.033	0.11 - 0.18	0.083 - 0.188	24.444
Vitellaria	L	4	0.048 \pm 0.009	0.04 - 0.06	0.034 - 0.062	18.750
	B	4	0.035 \pm 0.010	0.03 - 0.04	0.019 - 0.051	28.570
Egg	L	4	0.025 \pm 0.006	0.02 - 0.03	0.016 - 0.035	24.000
	B	4	0.015 \pm 0.006	0.01 - 0.02	0.006 - 0.025	40.000

(n, number of specimens; $\bar{X} \pm$ SE mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C.V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

TABLE-32

Measurements of *Ganeo glottoides madrasensis*, 1928.

86

Parameter		n	$\bar{X} \pm SE$	O.R.	95% C-I	C.V.
Body length	L	3	1.783 \pm 0.306	1.45 - 2.05	1.023 - 2.543	17.162
Body breadth	B	3	0.740 \pm 0.111	0.62 - 0.84	0.344 - 1.016	15.000
Oral sucker	L	3	0.133 \pm 0.021	0.11 - 0.15	0.081 - 0.185	15.789
	B	3	0.133 \pm 0.032	0.11 - 0.17	0.115 - 0.151	24.060
Acetabulum	L	3	0.136 \pm 0.015	0.13 - 0.14	0.099 - 0.173	11.029
	B	3	0.160 \pm 0.026	0.13 - 0.19	0.099 - 0.222	16.250
Pharynx	L	3	0.087 \pm 0.015	0.07 - 0.10	0.078 - 0.096	17.241
	B	3	0.076 \pm 0.015	0.06 - 0.09	0.039 - 0.113	19.736
Oesophagus	L	3	0.133 \pm 0.023	0.12 - 0.16	0.076 - 0.190	17.293
	B	3	0.037 \pm 0.005	0.03 - 0.04	0.025 - 0.049	13.513
Anterior testis	L	3	0.157 \pm 0.015	0.14 - 0.17	0.120 - 0.194	09.554
	B	3	0.170 \pm 0.020	0.15 - 0.19	0.120 - 0.219	11.764
Posterior testis	L	3	0.150 \pm 0.017	0.14 - 0.17	0.108 - 0.192	11.333
	B	3	0.187 \pm 0.029	0.17 - 0.22	0.015 - 0.259	15.508
Ovary	L	3	0.140 \pm 0.020	0.12 - 0.16	0.090 - 0.189	14.285
	B	3	0.160 \pm 0.020	0.14 - 0.18	0.110 - 0.209	12.250
Vitellaria	L	3	0.043 \pm 0.012	0.03 - 0.05	0.013 - 0.073	27.906
	B	3	0.027 \pm 0.012	0.02 - 0.04	0.003 - 0.057	44.444
Egg	L	3	0.023 \pm 0.005	0.02 - 0.03	0.011 - 0.035	21.739
	B	3	0.013 \pm 0.005	0.01 - 0.02	0.006 - 0.025	38.461

(n, number of specimens; $\bar{X} \pm SE$ mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C.V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

TABLE-32

Measurements of *Ganeo srinagarensis* Kaw, 1950.

99

Parameter		n	$\bar{X} \pm SE$	O.R.	95% C-I	C.V.
Body length	L	6	1.945 \pm 0.740	1.29 - 3.01	1.168 - 2.722	38.046
Body breadth	B	6	1.303 \pm 0.445	1.00 - 2.09	0.836 - 1.770	34.152
Oral sucker	L	6	0.132 \pm 0.026	0.10 - 0.14	0.105 - 0.159	19.697
	B	6	0.145 \pm 0.032	0.12 - 0.20	0.179 - 0.111	22.069
Acetabulum	L	6	0.155 \pm 0.031	0.11 - 0.29	0.122 - 0.188	20.000
	B	6	0.178 \pm 0.028	0.14 - 0.22	0.149 - 0.207	15.730
Pharynx	L	6	0.085 \pm 0.016	0.07 - 0.10	0.068 - 0.102	18.823
	B	6	0.073 \pm 0.012	0.06 - 0.09	0.060 - 0.086	16.438
Oesophagus	L	6	0.247 \pm 0.098	0.15 - 0.39	0.144 - 0.349	39.676
	B	6	0.038 \pm 0.007	0.04 - 0.08	0.031 - 0.045	18.421
Anterior testis	L	6	0.178 \pm 0.071	0.11 - 0.38	0.103 - 0.253	39.888
	B	6	0.222 \pm 0.098	0.15 - 0.40	0.119 - 0.325	44.144
Posterior testis	L	6	0.208 \pm 0.096	0.14 - 0.34	0.107 - 0.309	46.154
	B	6	0.228 \pm 0.076	0.13 - 0.35	0.149 - 0.307	32.895
Ovary	L	6	0.185 \pm 0.066	0.16 - 0.28	0.116 - 0.254	35.676
	B	6	0.201 \pm 0.053	0.14 - 0.25	0.154 - 0.266	25.238
Vitellaria	L	6	0.045 \pm 0.014	0.03 - 0.06	0.030 - 0.059	31.111
	B	6	0.032 \pm 0.009	0.03 - 0.06	0.023 - 0.041	28.125
Egg	L	6	0.025 \pm 0.005	0.01 - 0.02	0.198 - 0.030	20.000
	B	6	0.012 \pm 0.004	0.01 - 0.02	0.008 - 0.016	33.333

(n, number of specimens; $\bar{X} \pm SE$ mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C.V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

TABLE-34

Measurements of *Ganeo gasticus* Srivastava, 1933.

Parameter		n	$\bar{X} \pm SE$	O. R.	95% C-I	C.V.
Body length	L	5	2.938 \pm 0.717	1.72 - 3.60	2.048 - 3.828	24.404
Body breadth	B	5	1.316 \pm 0.435	0.89 - 2.02	0.776 - 1.856	33.055
Oral sucker	L	5	0.138 \pm 0.029	0.11 - 0.18	0.101 - 0.174	21.014
	B	5	0.140 \pm 0.019	0.12 - 0.16	0.116 - 0.163	13.571
Acetabulum	L	5	0.180 \pm 0.016	0.16 - 0.20	0.160 - 0.199	08.888
	B	5	0.184 \pm 0.040	0.15 - 0.24	0.134 - 0.233	21.739
Pharynx	L	5	0.106 \pm 0.011	0.10 - 0.15	0.192 - 0.119	11.000
	B	5	0.068 \pm 0.008	0.06 - 0.11	0.058 - 0.077	11.765
Oesophagus	L	5	0.232 \pm 0.052	0.17 - 0.30	0.167 - 0.296	22.414
	B	5	0.062 \pm 0.019	0.04 - 0.09	0.038 - 0.085	30.645
Anterior testis	L	5	0.210 \pm 0.052	0.17 - 0.30	0.145 - 0.274	24.762
	B	5	0.198 \pm 0.047	0.17 - 0.22	0.139 - 0.256	23.737
Posterior testis	L	5	0.200 \pm 0.051	0.15 - 0.28	0.136 - 0.263	25.500
	B	5	0.198 \pm 0.055	0.16 - 0.29	0.129 - 0.266	27.778
Ovary	L	5	1.540 \pm 0.036	0.11 - 0.18	0.109 - 0.198	23.377
	B	5	0.156 \pm 0.030	0.11 - 0.19	0.118 - 0.193	19.231
Vitellaria	L	5	0.036 \pm 0.011	0.03 - 0.06	0.022 - 0.049	30.555
	B	5	0.028 \pm 0.008	0.02 - 0.04	0.018 - 0.037	28.571
Egg	L	5	0.028 \pm 0.008	0.01 - 0.03	0.037 - 0.037	28.571
	B	5	0.018 \pm 0.008	0.01 - 0.02	0.008 - 0.027	44.444

(n, number of specimens; $\bar{X} \pm SE$ mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C.V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

TABLE-35

Measurements of *Ganeo attenuatum* Srivastava, 1933.

Parameter		n	$\bar{X} \pm SE$	O.R	95% C-I	C.V.
Body length	L	4	3.698 \pm 2.444	2.05 - 7.30	0.663 - 6.734	66.089
Body breadth	B	4	1.420 \pm 1.093	0.62 - 3.02	0.062 - 2.778	76.972
Oral sucker	L	4	0.210 \pm 0.130	0.11 - 0.40	0.049 - 0.371	61.905
	B	4	0.200 \pm 0.102	0.12 - 0.38	0.073 - 0.327	51.000
Acetabulum	L	4	0.282 \pm 0.218	0.14 - 0.45	0.011 - 0.542	77.305
	B	4	0.288 \pm 0.212	0.14 - 0.50	0.020 - 0.551	73.611
Pharynx	L	4	0.170 \pm 0.147	0.09 - 0.20	0.013 - 0.353	86.470
	B	4	0.148 \pm 0.129	0.06 - 0.18	0.012 - 0.308	87.162
Oesophagus	L	4	0.315 \pm 0.168	0.12 - 0.56	0.106 - 0.524	53.333
	B	4	0.075 \pm 0.030	0.50 - 0.11	0.038 - 0.112	40.000
Anterior testis	L	4	0.278 \pm 0.225	0.12 - 0.50	0.512 - 0.557	80.935
	B	4	0.285 \pm 0.183	0.20 - 0.61	0.058 - 0.512	64.210
Posterior testis	L	4	0.275 \pm 0.189	0.12 - 0.55	0.040 - 0.510	68.727
	B	4	0.286 \pm 0.191	0.15 - 0.57	0.049 - 0.523	66.783
Ovary	L	4	0.240 \pm 0.185	0.12 - 0.51	0.008 - 0.472	77.083
	B	4	0.233 \pm 0.187	0.16 - 0.34	0.001 - 0.465	80.258
Vitellaria	L	4	0.205 \pm 0.090	0.05 - 0.11	0.094 - 0.317	43.902
	B	4	0.045 \pm 0.024	0.02 - 0.08	0.016 - 0.075	53.333
Egg	L	4	0.040 \pm 0.008	0.03 - 0.05	0.031 - 0.050	20.000
	B	4	0.030 \pm 0.008	0.02 - 0.04	0.021 - 0.040	26.667

(n, number of specimens; $\bar{X} \pm SE$ mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C. V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

TABLE-36

Measurements prosotocus partapus Kaw, 1950.

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Parameter		n	$\bar{X} \pm SE$	O.R.	95% C-I	C.V.
Body length	L	4	8.148 \pm 1.032	7.11 - 9.56	6.506 - 9.789	12.666
	B	4	5.305 \pm 0.576	3.98 - 6.05	3.747 - 6.862	18.452
Oral sucker	L	4	1.355 \pm 0.576	0.67 - 2.05	0.438 - 2.271	42.510
	B	4	1.500 \pm 0.469	0.90 - 2.00	0.753 - 2.246	31.266
Acetabulum	L	4	1.205 \pm 0.591	0.62 - 2.02	0.264 - 2.145	49.045
	B	4	1.495 \pm 0.493	1.01 - 2.13	0.710 - 2.279	32.976
Pharynx	L	4	0.280 \pm 0.049	0.22 - 0.34	0.202 - 0.357	17.500
	B	4	0.280 \pm 0.050	0.22 - 0.34	0.200 - 0.359	17.857
Oesophagus	L	4	0.933 \pm 0.235	0.67 - 1.16	0.559 - 1.306	25.188
	B	4	0.158 \pm 0.017	0.14 - 0.18	0.130 - 0.185	10.759
Anterior testis	L	4	1.095 \pm 0.349	0.62 - 1.46	0.539 - 1.650	31.872
	B	4	1.108 \pm 0.199	0.96 - 1.40	0.791 - 1.424	17.960
Posterior testis	L	4	1.040 \pm 0.216	0.73 - 1.23	0.696 - 1.383	20.769
	B	4	0.998 \pm 0.191	0.73 - 1.18	0.694 - 1.301	19.138
Ovary	L	4	0.828 \pm 0.288	0.45 - 1.15	0.369 - 1.286	34.783
	B	4	0.813 \pm 0.164	0.67 - 1.00	0.552 - 1.073	20.172
Vitellaria	L	4	0.190 \pm 0.018	0.17 - 0.21	0.161 - 0.218	09.474
	B	4	0.143 \pm 0.021	0.13 - 0.16	0.109 - 0.176	14.685
Egg	L	4	0.100 \pm 0.016	0.08 - 0.12	0.074 - 0.125	16.000
	B	4	0.070 \pm 0.014	0.06 - 0.09	0.047 - 0.092	20.000

(n, number of specimens; $\bar{X} \pm SE$ mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C.V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

TABLE-37

Measurements of *Pleurogenes gastroporus* Luhe, 1901.

Parameter		n	$\bar{X} \pm$ SE	O. R.	95% C-I	C.V.
Body length	L	3	6.590 \pm 1.946	4.54 - 8.12	2.006 - 11.174	28.012
Body breadth	B	3	4.926 \pm 1.250	3.58 - 6.05	1.822 - 08.030	25.376
Oral sucker	L	3	1.333 \pm 0.820	0.44 - 2.05	0.516 - 03.370	61.515
	B	3	1.520 \pm 0.884	0.56 - 2.30	0.675 - 3.715	58.158
Acetabulum	L	3	1.290 \pm 0.682	0.07 - 2.02	0.403 - 2.983	52.868
	B	3	1.473 \pm 0.740	0.67 - 2.13	0.364 - 3.310	50.238
Pharynx	L	3	0.540 \pm 0.459	0.22 - 1.06	0.600 - 1.679	85.000
	B	3	0.507 \pm 0.444	0.17 - 0.01	0.595 - 1.610	87.574
Oesophagus	L	3	0.087 \pm 0.427	0.62 - 1.46	0.107 - 2.147	39.282
	B	3	0.093 \pm 0.541	0.34 - 1.40	1.250 - 1.436	58.172
Anterior testis	L	3	0.898 \pm 0.238	0.63 - 1.20	0.588 - 0.788	27.050
	B	3	0.760 \pm 0.387	0.34 - 1.17	0.010 - 7.600	34.459
Posterior testis	L	3	0.101 \pm 0.283	0.69 - 1.23	0.601 - 0.803	28.020
	B	3	0.767 \pm 0.396	0.39 - 1.18	0.011 - 1.615	36.897
Ovary	L	3	1.007 \pm 0.241	0.73 - 1.17	0.086 - 0.140	24.269
	B	3	0.313 \pm 0.323	0.44 - 1.00	0.065 - 0.115	39.269
Vitellaria	L	3	0.113 \pm 0.011	0.10 - 0.12	0.030 - 0.030	09.735
	B	3	0.090 \pm 0.010	0.08 - 0.10	0.020 - 0.020	
Egg	L	3	0.030 \pm 0.000	0.03 - 0.03	0.409 - 1.605	00.000
	B	3	0.020 \pm 0.000	0.02 - 0.02	0.216 - 1.750	00.000

(n, number of specimens; $\bar{X} \pm$ SE mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C.V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

TABLE-38

Measurements of *Mehraorchis ranarum* Srivastava, 1934.

104

Parameter		n	$\bar{X} \pm SE$	O.R.	95% C-I	C.V.
Body length	L	4	2.465 \pm 0.283	2.05 - 2.69	2.015 - 2.915	11.490
Body breadth	B	4	1.763 \pm 0.376	1.21 - 2.04	1.357 - 2.361	21.327
Oral sucker	L	4	0.315 \pm 0.053	0.24 - 0.36	0.231 - 1.906	16.825
	B	4	0.320 \pm 0.045	0.27 - 0.38	0.248 - 0.328	13.354
Acetabulum	L	4	0.265 \pm 0.041	0.22 - 0.30	0.200 - 0.330	15.471
	B	4	0.268 \pm 0.026	0.24 - 0.29	0.227 - 0.309	09.701
Pharynx	L	4	0.190 \pm 0.008	0.16 - 0.20	0.177 - 0.202	04.210
	B	4	0.148 \pm 0.027	0.12 - 0.18	0.105 - 0.191	18.243
Oesophagus	L	4	0.175 \pm 0.054	0.13 - 0.22	0.089 - 0.126	30.857
	B	4	0.060 \pm 0.022	0.05 - 0.10	0.025 - 0.095	36.666
Anterior testis	L	4	0.293 \pm 0.142	0.18 - 0.50	0.067 - 0.519	48.464
	B	4	0.268 \pm 0.125	0.16 - 0.47	0.069 - 0.467	46.641
Posterior testis	L	4	0.333 \pm 0.126	0.20 - 0.49	0.133 - 0.533	37.837
	B	4	0.295 \pm 0.109	0.18 - 0.44	0.122 - 0.469	36.949
Ovary	L	4	0.265 \pm 0.077	0.16 - 0.34	0.142 - 0.388	29.057
	B	4	0.298 \pm 0.103	0.17 - 0.40	0.134 - 0.462	34.563
Vitellaria	L	4	0.063 \pm 0.013	0.05 - 0.08	0.042 - 0.084	20.635
	B	4	0.043 \pm 0.005	0.04 - 0.05	0.035 - 0.051	11.628
Egg	L	4	0.025 \pm 0.005	0.02 - 0.03	0.017 - 0.032	20.000
	B	4	0.010 \pm 0.000	0.01 - 0.01	0.000 - 0.001	00.000

(n, number of specimens; $\bar{X} \pm SE$ mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C.V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

TABLE- 39

Measurements of *Haematoloechus sindensis*, Khan and Mohiuddin 1982.

105

Parameter		n	$\bar{X} \pm SE$	O. R.	95% C-I	C.V.
Body length	L	5	4.244 \pm 0.782	3.84 - 5.46	3.283 - 5.114	18.426
Body breadth	B	5	1.442 \pm 0.041	1.39 - 1.50	1.391 - 1.492	02.843
Oral sucker	L	5	0.318 \pm 0.026	0.29 - 0.35	0.285 - 0.350	08.176
	B	5	0.268 \pm 0.019	0.25 - 0.30	0.244 - 0.291	07.089
Pharynx	L	5	0.130 \pm 0.014	0.11 - 0.14	0.117 - 0.147	10.526
	B	5	0.128 \pm 0.015	0.11 - 0.15	0.109 - 0.146	11.719
Anterior testis	L	5	0.406 \pm 0.018	0.39 - 0.42	0.383 - 0.428	04.433
	B	5	0.286 \pm 0.061	0.23 - 0.39	0.210 - 0.361	21.329
Posterior testis	L	5	0.406 \pm 0.052	0.35 - 0.47	0.341 - 0.470	14.286
	B	5	0.364 \pm 0.056	0.32 - 0.44	0.294 - 0.433	15.385
Ovary	L	5	0.476 \pm 0.095	0.38 - 0.63	0.358 - 0.593	19.958
	B	5	0.278 \pm 0.044	0.21 - 0.31	0.223 - 0.332	15.327
Vitellaria	L	5	0.100 \pm 0.010	0.09 - 0.11	0.087 - 0.112	10.000
	B	5	0.054 \pm 0.005	0.05 - 0.06	0.047 - 0.060	09.259
Egg	L	5	0.040 \pm 0.000	0.02 - 0.04	0.040 - 0.040	00.000
	B	5	0.020 \pm 0.000	0.02 - 0.02	0.020 - 0.020	00.000

(n, number of specimens; $\bar{X} \pm SE$ mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C.V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

TABLE-40
Measurements of *Gorgoder khawarensis* n. sp.

Parameter		n	$\bar{X} \pm SE$	O.R.	95% C-I	C.V.
Body length	B	6	2.203 \pm 0.393	1.62 - 2.55	1.790 - 2.615	17.839
Body breadth	L	6	0.777 \pm 0.157	0.90 - 0.94	0.612 - 0.941	20.206
Oral sucker	B	6	0.348 \pm 0.086	0.25 - 0.45	0.257 - 0.438	24.741
	L	6	0.318 \pm 0.065	0.24 - 0.40	0.249 - 0.386	20.440
Acetabulum	B	6	0.447 \pm 0.112	0.30 - 0.60	0.329 - 0.564	35.220
	L	6	0.313 \pm 0.049	0.28 - 0.56	0.261 - 0.364	10.962
Anterior testis	B	6	0.313 \pm 0.048	0.25 - 0.38	0.262 - 0.363	15.335
	L	6	0.238 \pm 0.062	0.13 - 0.34	0.172 - 0.303	26.050
Posterior testis	B	6	0.418 \pm 0.116	0.19 - 0.50	0.296 - 0.539	27.751
	L	6	0.238 \pm 0.057	0.16 - 0.30	0.178 - 0.297	23.950
Ovary	B	6	0.172 \pm 0.036	0.10 - 0.20	0.134 - 0.209	20.930
	L	6	0.098 \pm 0.048	0.06 - 0.09	0.047 - 0.148	48.980
Vitellaria	B	6	0.047 \pm 0.008	0.04 - 0.06	0.038 - 0.055	17.021
	L	6	0.022 \pm 0.013	0.01 - 0.03	0.008 - 0.035	59.091
Egg	B	6	0.030 \pm 0.000	0.03 - 0.03	0.030 - 0.030	00.000
	L	6	0.012 \pm 0.000	0.01 - 0.01	0.012 - 0.012	00.000

(n, number of specimens; $\bar{X} \pm SE$ mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C.V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

TABLE-41

Measurements of *Diplodiscus peshawarensis* n. sp.

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Parameter		n	$\bar{X} \pm SE$	O.R.	95% C-I	C.V.
Body length	L	4	2.725 \pm 1.188	1.15 - 3.83	1.250 - 4.200	43.596
Body breadth	B	4	1.468 \pm 0.443	1.07 - 1.89	0.918 - 2.018	30.177
Oral sucker	L	4	0.340 \pm 0.126	0.20 - 0.47	0.184 - 0.496	37.059
	B	4	0.528 \pm 0.203	0.43 - 1.29	0.276 - 0.780	38.446
Acetabulum	L	4	0.810 \pm 0.363	0.59 - 1.35	0.359 - 1.261	44.314
	B	4	0.528 \pm 0.203	0.43 - 1.29	0.276 - 0.780	38.446
Pharynx	L	4	0.340 \pm 0.079	0.25 - 0.40	0.242 - 0.438	05.588
	B	4	0.153 \pm 0.005	0.15 - 0.16	0.147 - 0.159	03.268
Oesophagus	L	4	0.343 \pm 0.106	0.26 - 0.49	0.211 - 0.475	30.904
	B	4	0.413 \pm 0.311	0.19 - 0.87	0.027 - 0.800	75.302
Anterior testis	L	4	0.185 \pm 0.037	0.16 - 0.24	0.139 - 0.231	20.000
	B	4	0.150 \pm 0.047	0.09 - 0.20	0.092 - 0.208	31.333
Posterior testis	L	4	0.150 \pm 0.029	0.12 - 0.19	0.114 - 0.186	19.333
	B	4	0.103 \pm 0.040	0.07 - 0.16	0.052 - 0.152	38.334
Ovary	L	4	0.090 \pm 0.000	0.09 - 0.09		
	B	4	0.080 \pm 0.000	0.08 - 0.08		

(n, number of specimens; $\bar{X} \pm SE$ mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C.V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

TABLE-42

Measurements of *Opisthodiscus diplodiscoides* Cohn, 1904.

Parameter		n	$\bar{X} \pm$ SE	O.R.	95% C-I	C.V.
Body length	L	6	1.400 \pm 0.128	1.21 - 1.60	1.266 - 1.534	91.436
Body breadth	B	6	0.825 \pm 0.072	0.70 - 0.89	0.749 - 0.900	08.735
Oral sucker	L	6	0.185 \pm 0.047	0.15 - 0.27	0.136 - 0.234	25.410
	B	6	0.242 \pm 0.046	0.19 - 0.32	0.194 - 0.290	19.018
Acetabulum	L	6	0.748 \pm 0.062	0.67 - 0.81	0.683 - 0.813	08.290
	B	6	0.475 \pm 0.068	0.41 - 0.59	0.407 - 0.543	13.683
Pharynx	L	6	0.128 \pm 0.013	0.11 - 0.14	0.114 - 0.142	10.165
	B	6	0.115 \pm 0.018	0.10 - 0.15	0.096 - 0.134	15.654
Oesophagus	L	6	0.140 \pm 0.022	0.11 - 0.17	0.117 - 0.163	15.717
	B	6	0.110 \pm 0.006	0.10 - 0.12	0.104 - 0.166	05.463
Anterior testis	L	6	0.122 \pm 0.018	0.10 - 0.14	0.103 - 0.141	14.746
	B	6	0.115 \pm 0.011	0.10 - 0.13	0.103 - 0.127	09.573
Posterior testis	L	6	0.128 \pm 0.017	0.10 - 0.15	0.110 - 0.146	13.284
	B	6	0.120 \pm 0.019	0.10 - 0.15	0.100 - 0.140	15.832
Ovary	L	6	0.177 \pm 0.020	0.15 - 0.20	0.157 - 0.198	11.309
	B	6	0.170 \pm 0.031	0.14 - 0.21	0.137 - 0.203	18.245
Vitellaria	L	6	0.142 \pm 0.031	0.10 - 0.18	0.109 - 0.175	21.832
	B	6	0.092 \pm 0.012	0.08 - 0.10	0.079 - 0.105	13.043
Egg	L	6	0.087 \pm 0.005	0.08 - 0.09	0.082 - 0.029	05.747
	B	6	0.067 \pm 0.005	0.06 - 0.09	0.000 - 0.072	07.462

(n, number of specimens; $\bar{X} \pm$ SE mean plus minus standard error of the mean; O.R., observed range; C.I., confidence interval at 95% level of confidence; C.V., coefficient of variation; L, length; B, breadth. All measurements are in millimeters.)

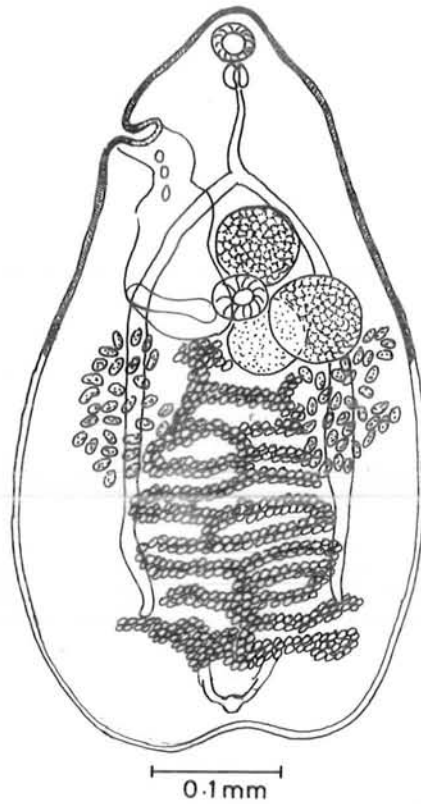


Fig. 1: *Ganeo kumaonensis* Pande, 1937.

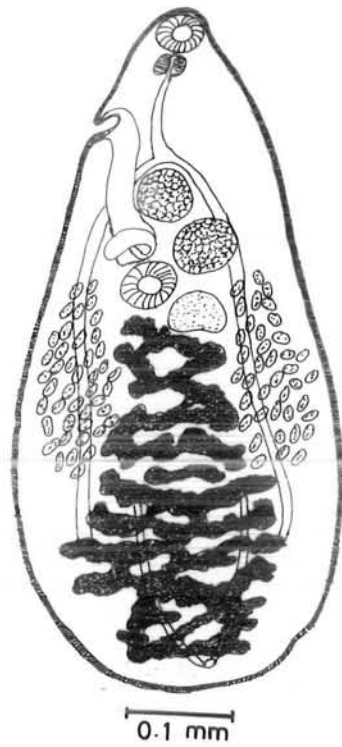


Fig. 2: *Ganeo tigrinus* Mehra and Negi, 1928.

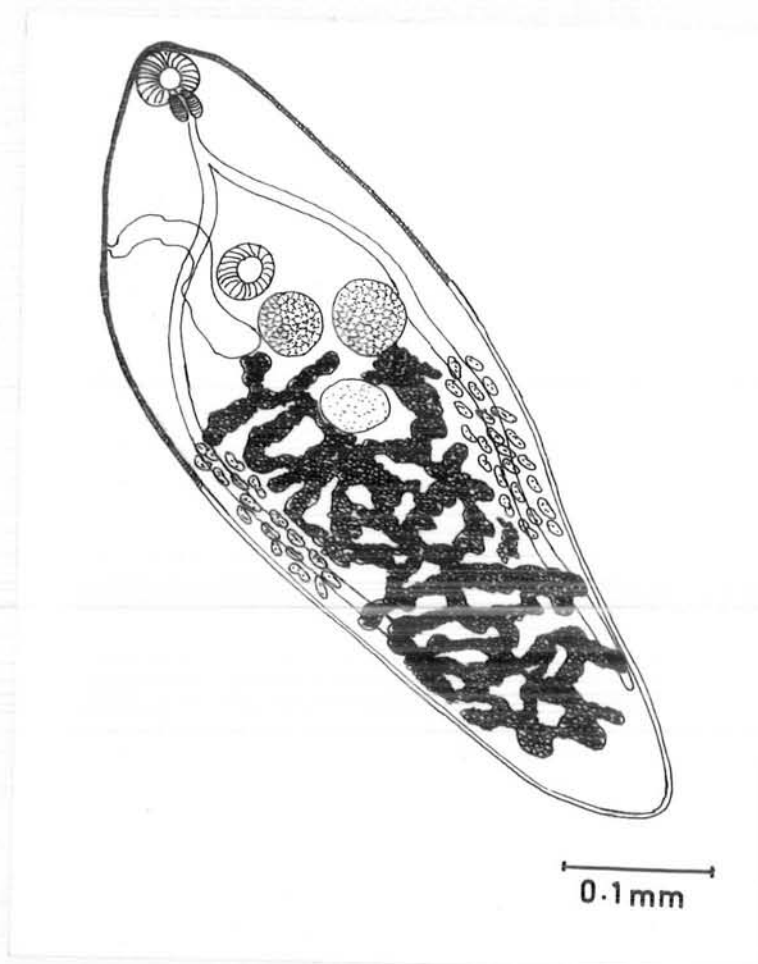


Fig. 3: *Ganeo glotloides* var. *madrasensis*,
Mehra and Negi, 1928.

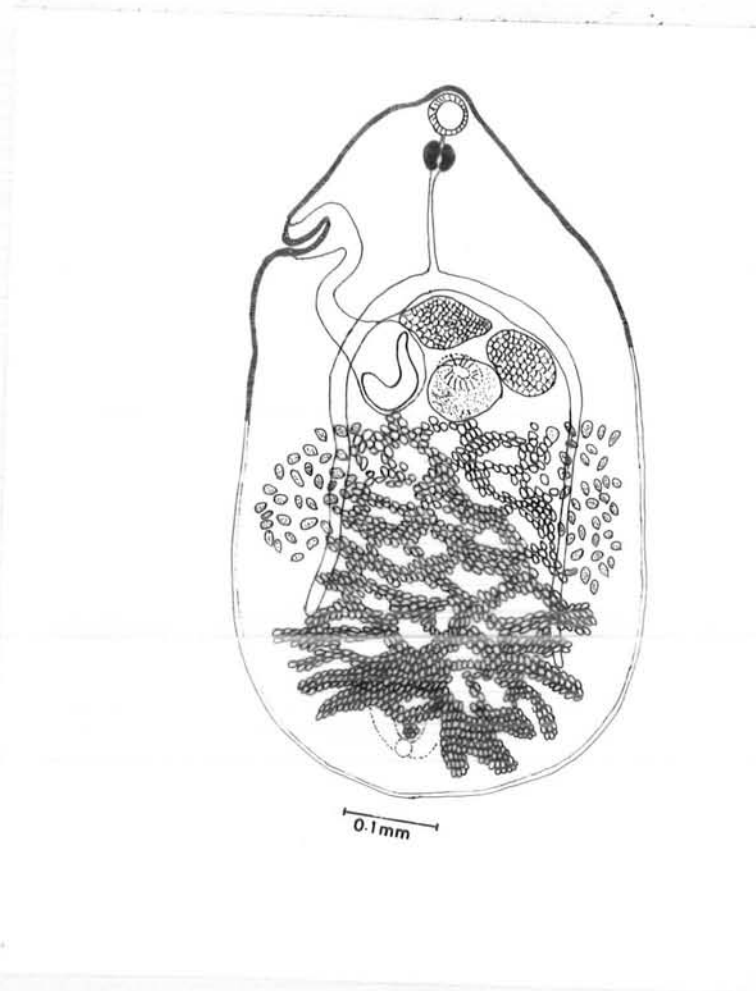


Fig. 4: *Gæneo srinagarensis* Kaw, 1950.

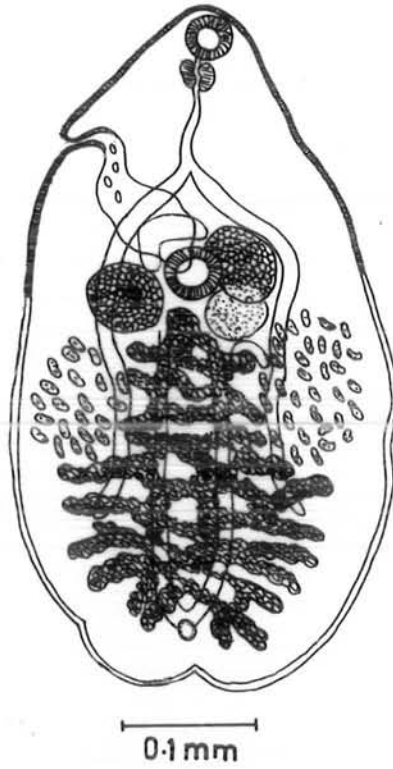


Fig. 5: *Ganeo gastricus* Srivastava, 1933.

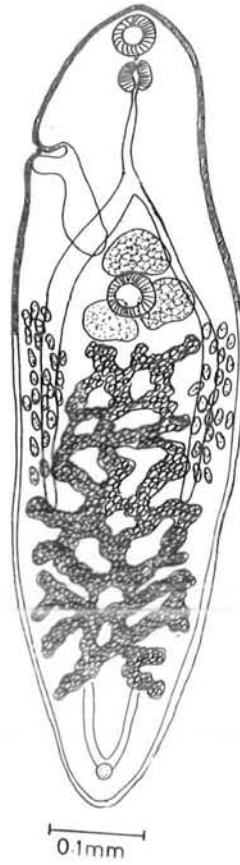


Fig. 6: *Ganeo attenuatum* Srivastava, 1933.

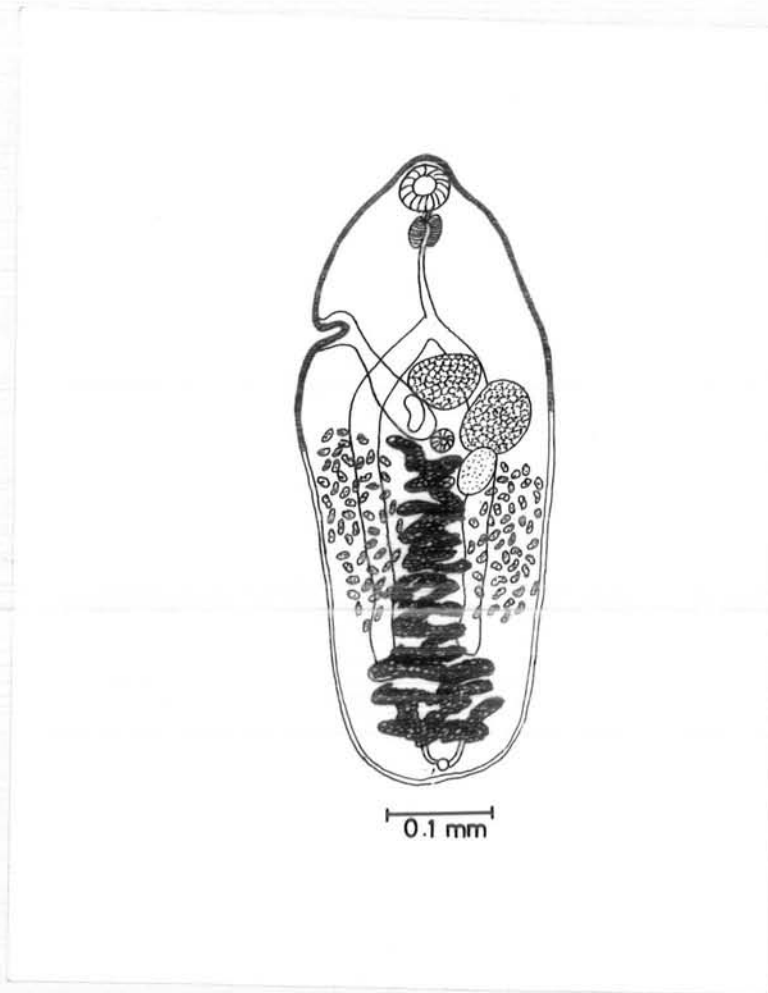


Fig. 7: *Ganeo microacetabulus* Bhutta and Khan, 1974.



Fig. 8: Ganeo species¹

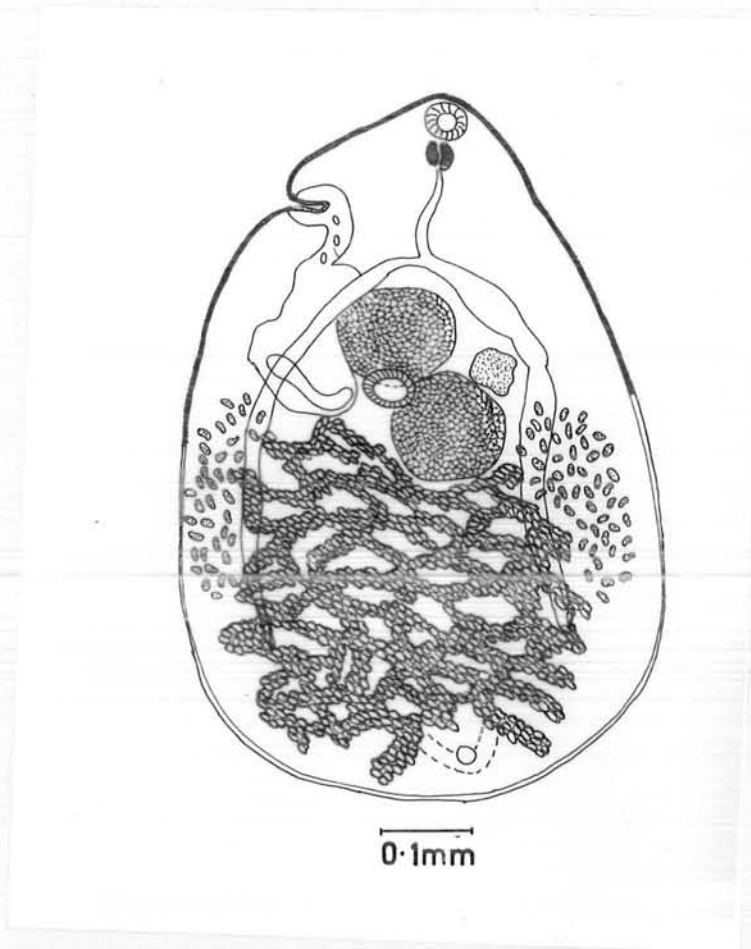


Fig. 9: Ganeo species²

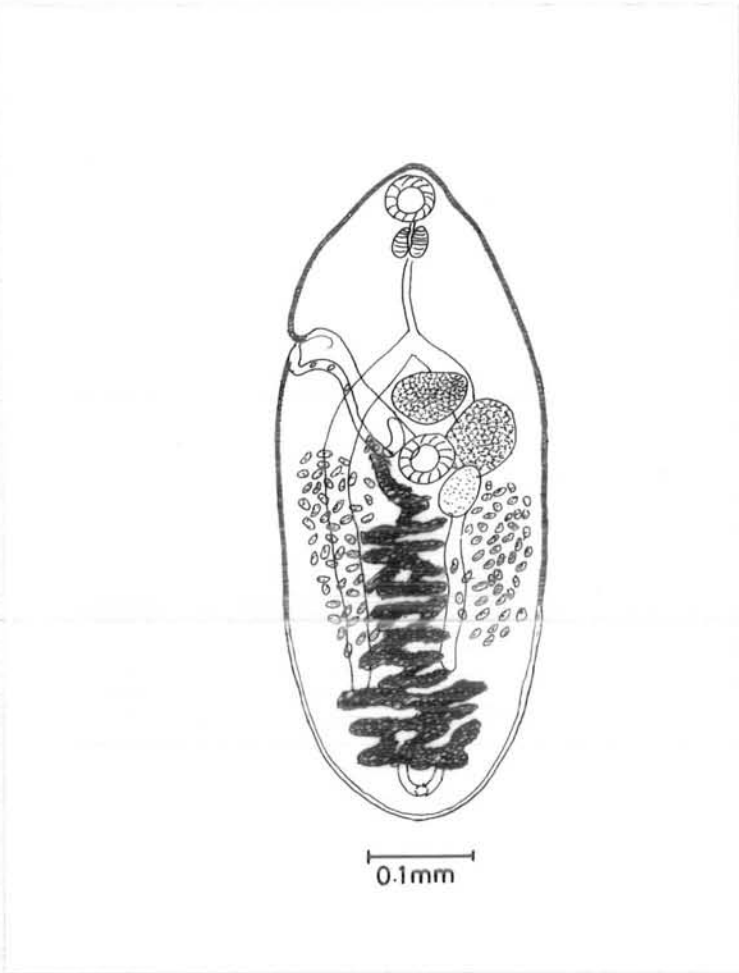


Fig. 10: Ganeo Species³

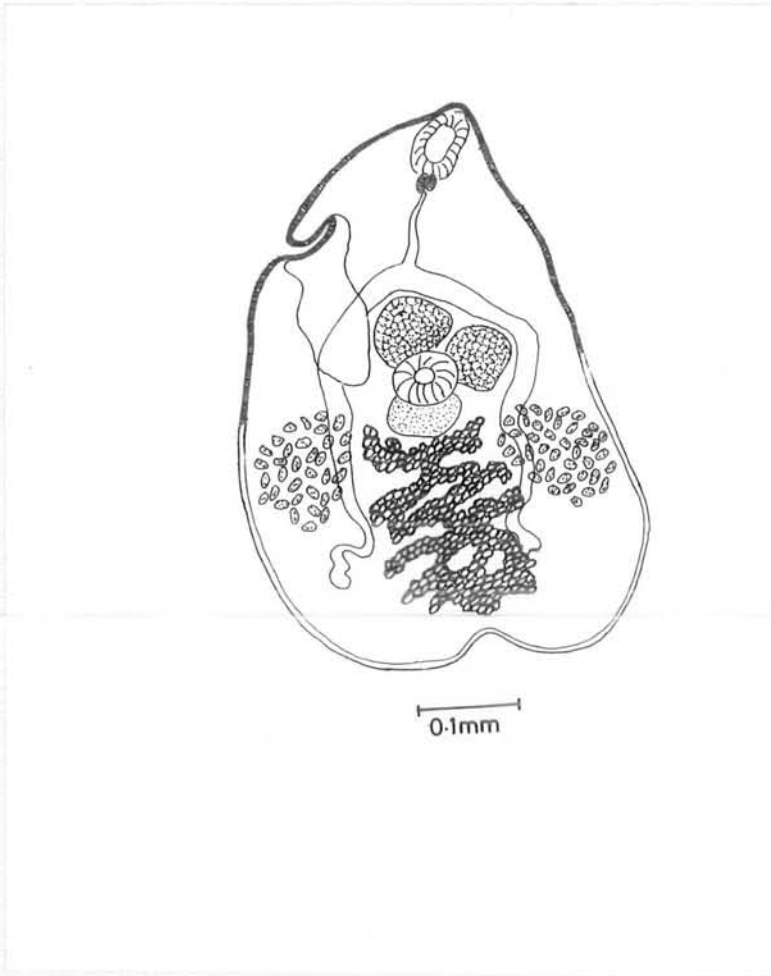


Fig. 11: Ganeo Species⁴

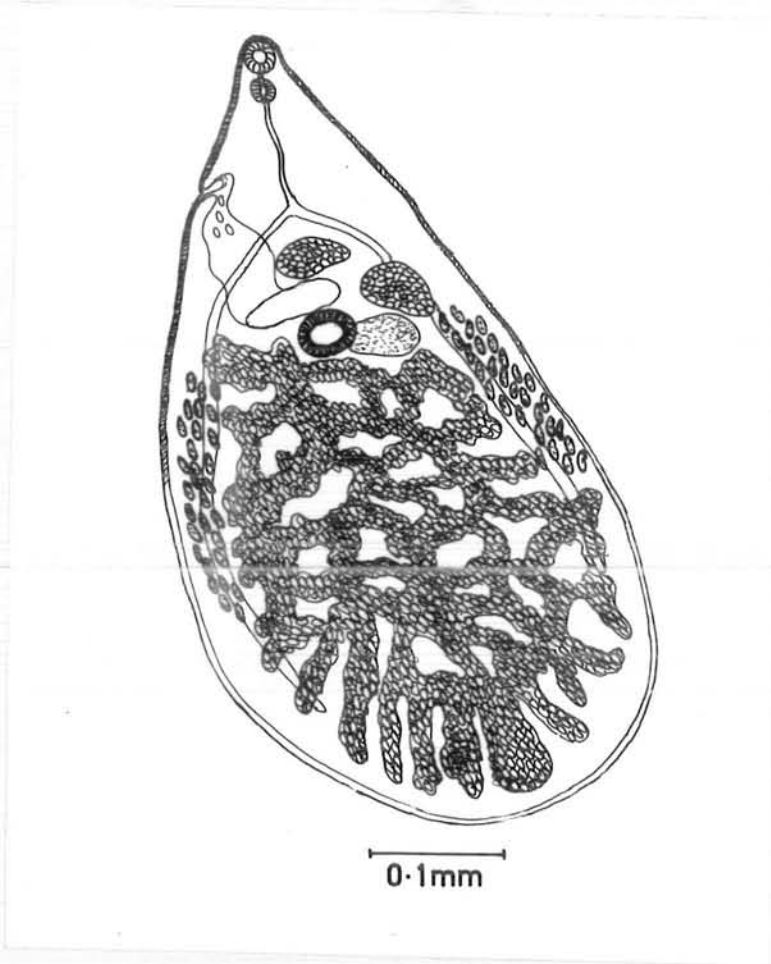


Fig. 12: Ganeo Species⁵

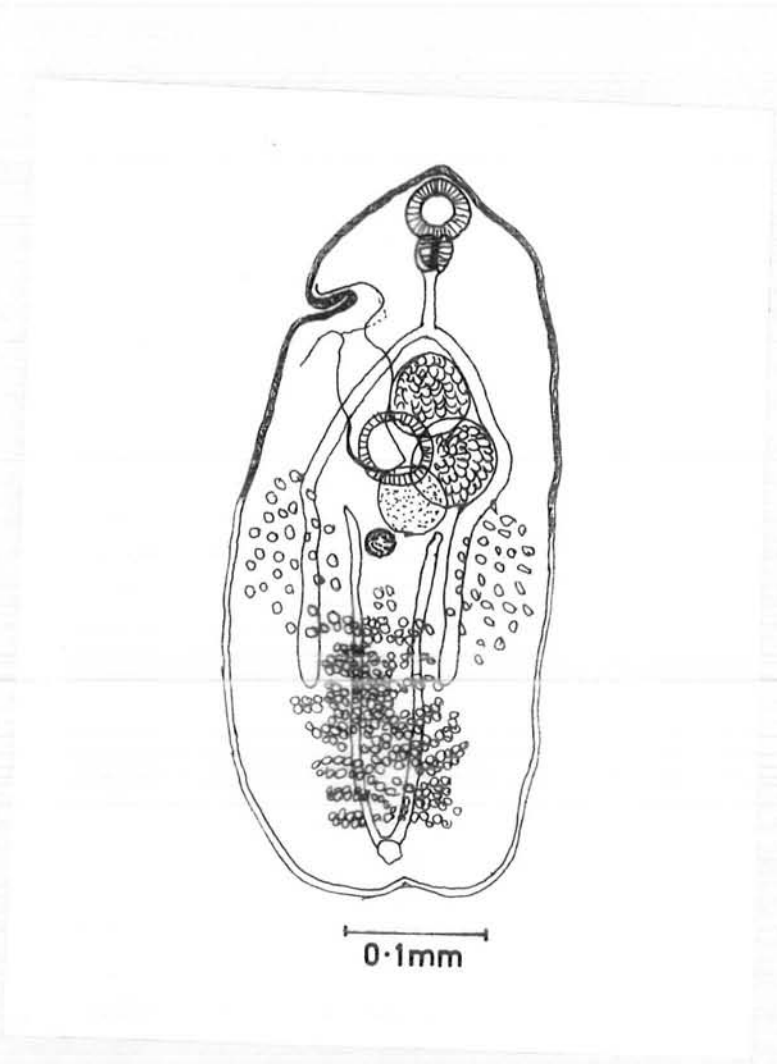
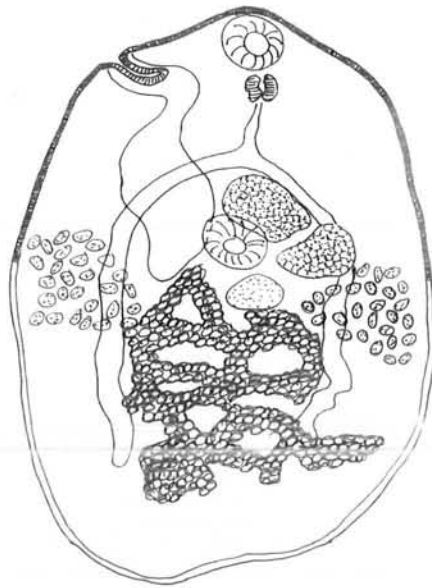


Fig. 14: Ganeo Species⁷



0.1 mm

Fig. 15: Ganeo Species⁸



Fig. 16: Ganeo Species⁹

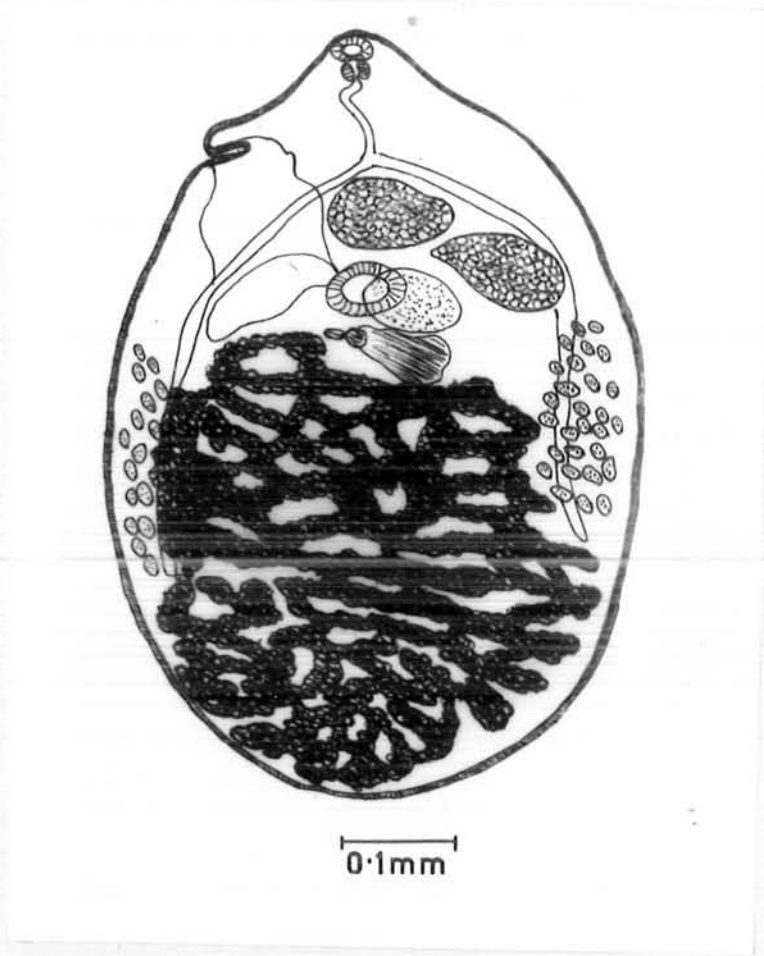


Fig. 17: Ganeo Species¹⁰

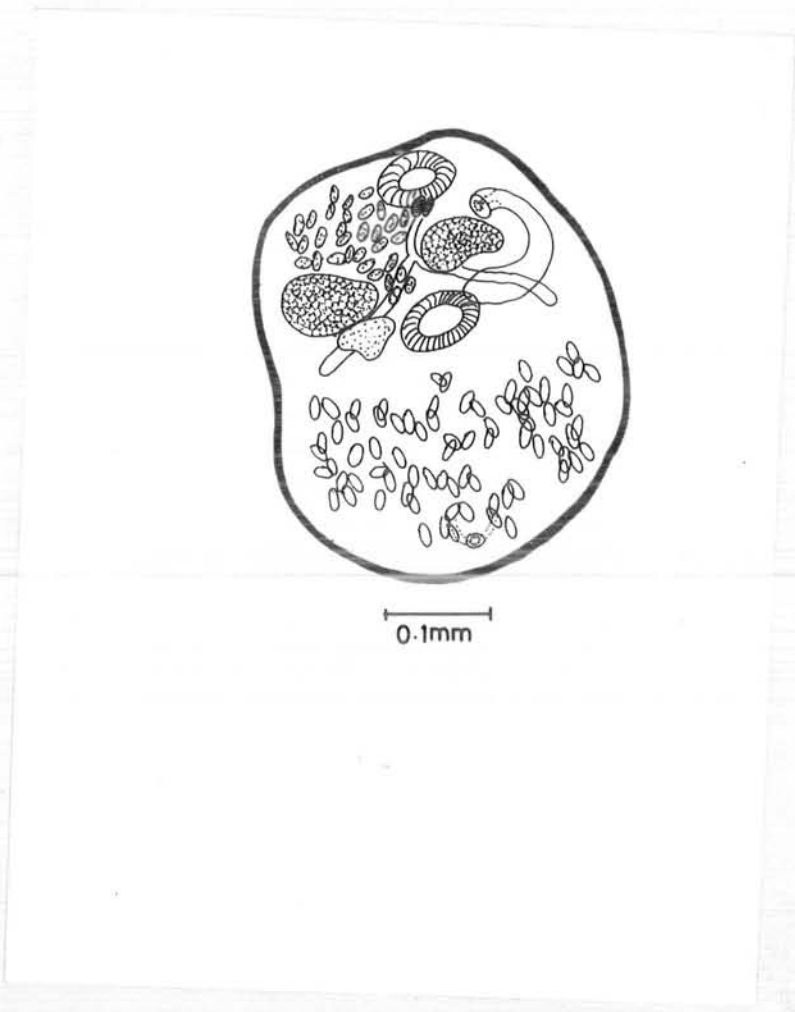


Fig. 18: *Prosotocus partapus* Kaw, 1950.

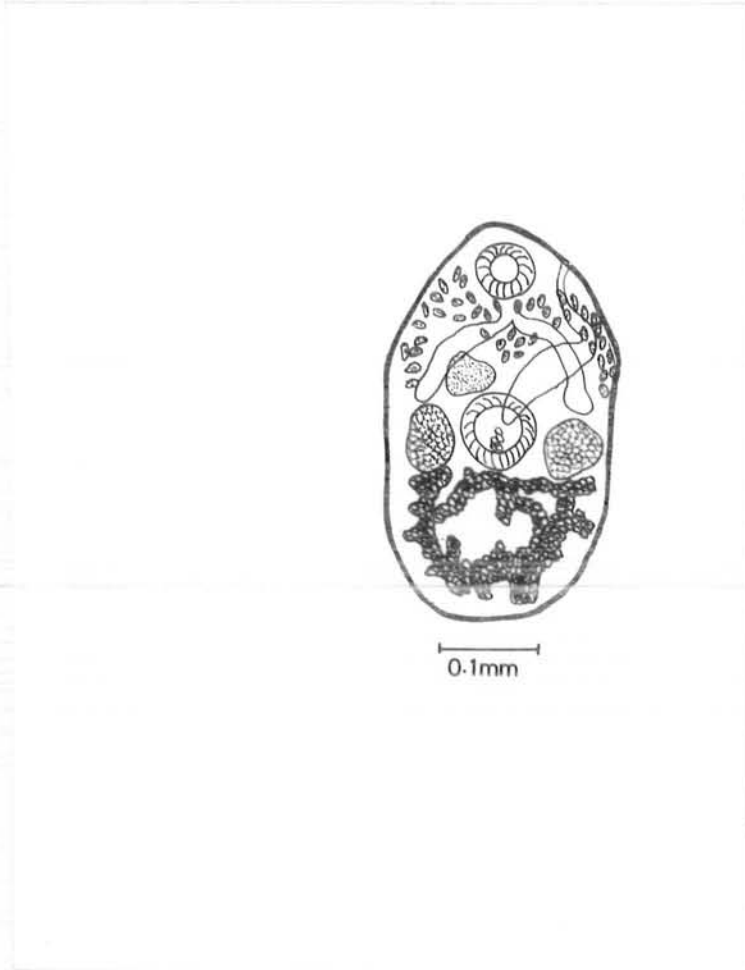


Fig. 19: *Pleurogenes gastroporus* Luhe, 1901. 1933.

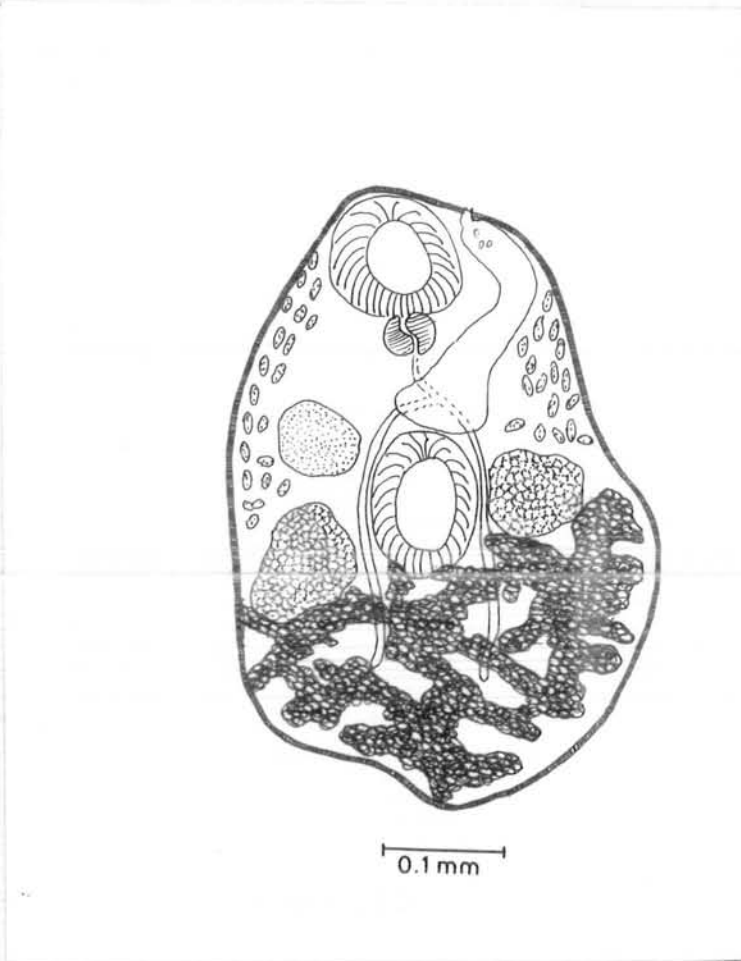
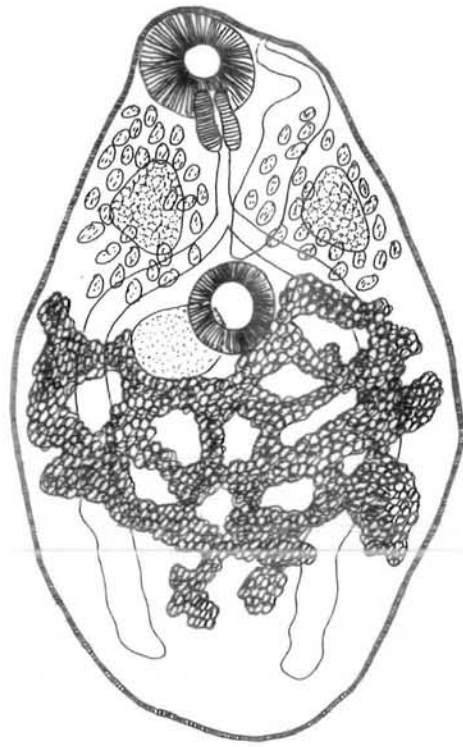


Fig. 21: *Pleurogenes shafakensis* n. sp.



0.1mm

Fig. 22: *Mehroarchis ranarum* Srivastava, 1934.

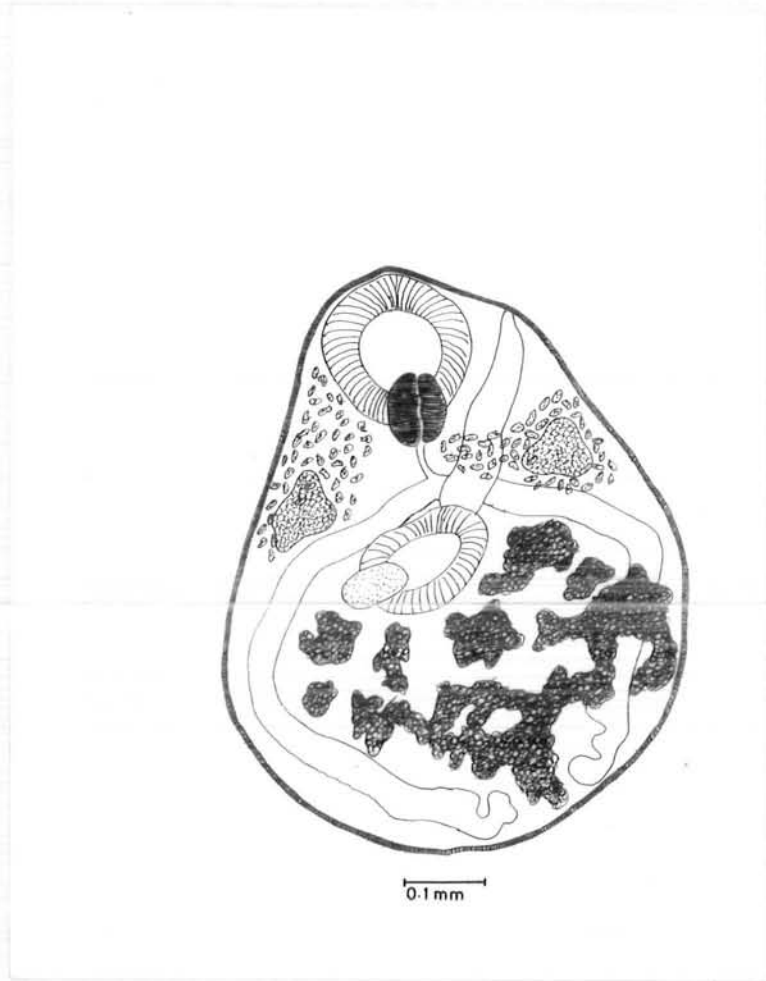


Fig. 22c: *Mehroarchis ranarum* Srivastava, 1934.



Fig. 22d: *Mehroarchis ranarum* Srivastava, 1934.

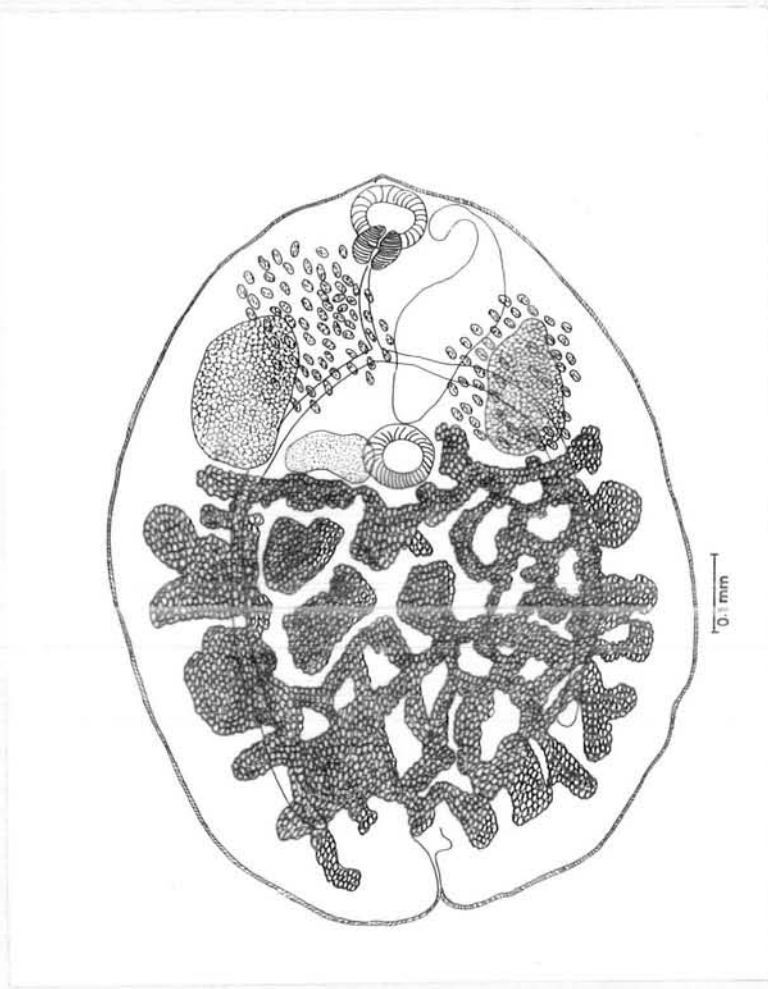


Fig. 23: *Mehroarchis kakakhailensis* n.sp.

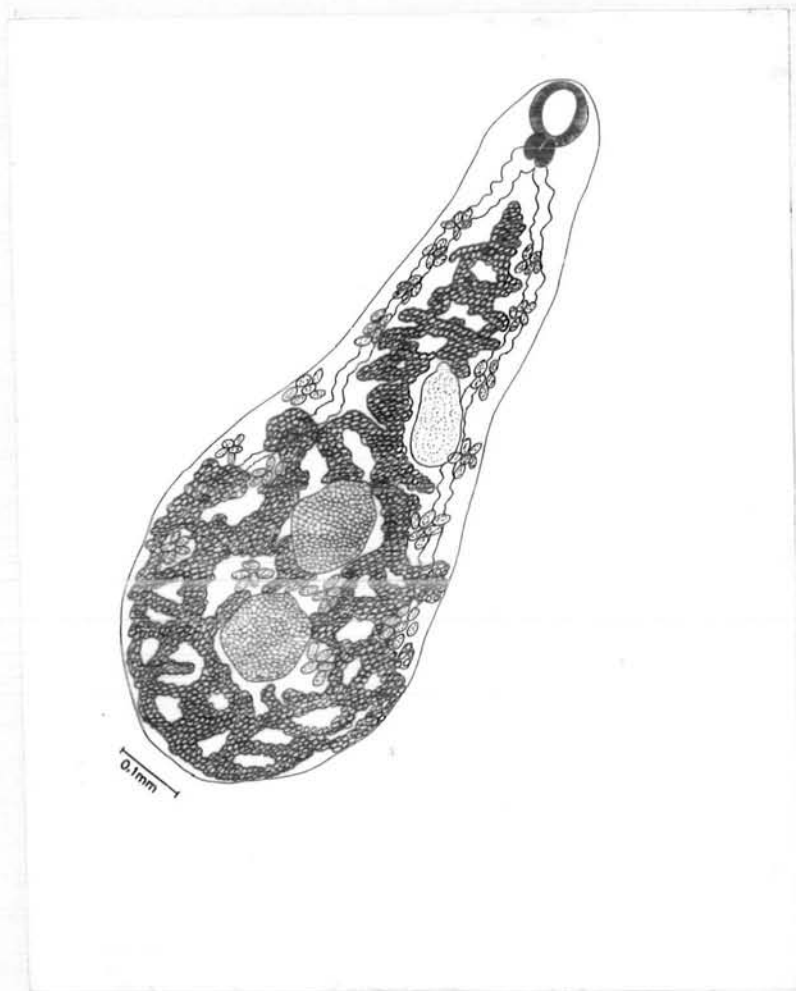


Fig. 24: *Haematoloechus sindensis* Khan and Mohiuddin, 1982.

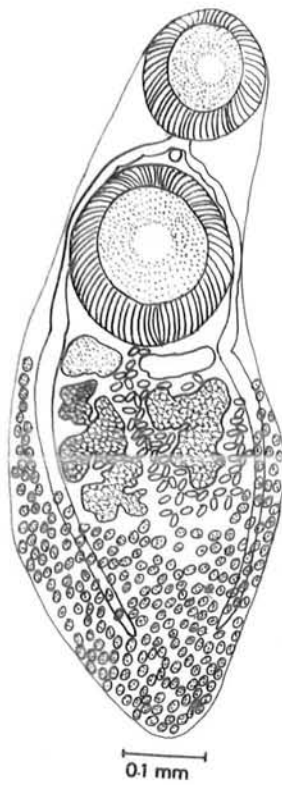


Fig. 25: *Gorgoderina khawarensis* n. sp.



Fig. 27: *Poracanthus sialkotiensis* n.sp.

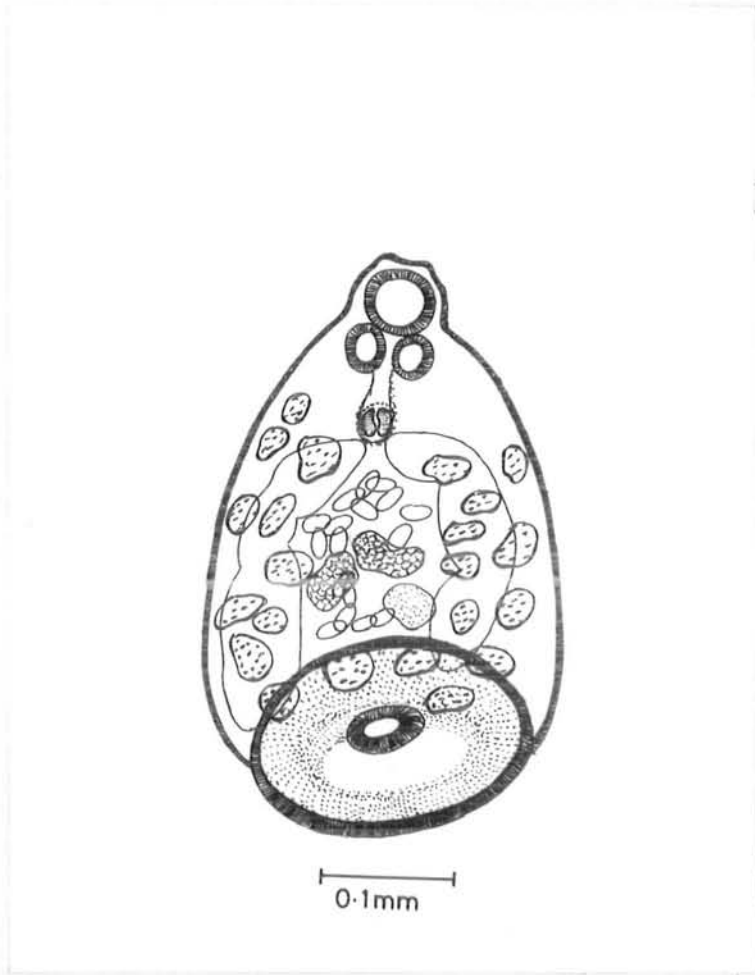


Fig. 28: *Opisthodiscus diplodiscoides* Cohn, 1904.

CHAPTER - 5

SUMMARY

SUMMARY

1. A total of 450 frogs (*Rana tigrina* : 204 and *Rana cyanophlyctis* : 246) from different regions of Pakistan were autopsied and examined for the presence of trematodes.
2. A total of 28 species of 9 different genera have been recovered. Seventeen species of genus *Ganeo* were reported, out of these 7 were identified and 10 were unidentified species. *Ganeo attenuatum* and *Ganeo glattoides* were recovered first time in Pakistan.
3. Three species of genus *Pleurogenes* and two species of genus *Mehraorchis* were observed.
4. One species each of genera *Prosotocus*, *Haematoloechus*, *Gorgoderina*, *Diplodiscus Poracanthium*, *Optisthodiscus*, have been discovered.
5. Out of these 5 species are new to science. *Pleurogenes shafakensis*, *Mehraorchis kakakhailensis*, *Gorgoderina khawarensis*, *Diplodiscus peohaverensis* and *Poracanthium sialkotiensis*.

6. In addition to these *Opisthodiscus diplodiscoides* Cohn, 1904, was first time being reported in Indo-Pak sub-continent.

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