FOLIA PARASITOLOGICA (PRAHA) 23: 217–220, 1976.

# TREMATODES OF DOMESTIC RUMINANTS OF AFGHANISTAN AND THEIR ROLE IN PATHOLOGY

B. KOTRLÁ, K. BLAŽEK and A. AMIN*)

Institute of Parasitology, Czechoslovak Academy of Sciences, Prague, and Veterinary Faculty of the University, Kabul*

**Abstract.** Seven trematode species were found in the bile ducts and rumen of domestic ruminants: *Fasciola gigantica*, *F. hepatica*, *Gigantocotyle explanatum*, *G. siemense*, *Paramphistomum epiclitum*, *Fischoederius cobboldi* and *Gastrothylax cruminifer*. The parasites caused marked pathological changes in the liver and rumen.

Parasite fauna of domestic animals of Afghanistan has not been studied systematically, though parasitoses are an important economic problem in stock breeding in this country. There are only occasional reports dealing with trematode infection in ruminants. Tenora and Baruš (1968) recorded *Fasciola gigantica* from cattle slaughtered at the abattoir in Jalalabad and unidentified trematodes of the family Paramphistomatidae in bile ducts of 3 buffaloes. Specimens from one of the buffaloes were later determined as *Gigantocotyle siamense* (Tenora et al. 1974). This paper presents the results of studies of trematodoses of ruminants carried out in Afghanistan in spring and autumn 1974.

## MATERIAL AND METHODS

Trematode specimens were obtained from animals slaughtered at the abattoir in Kabul. A total of 100 sheep, 300 goats, 100 cattle and 25 buffaloes were examined. The animals originated from the provinces Kundúz, Badachshan, Baghlan, Bamjan, Kabul, Nengrahar, Paktijá and Ghazní. The trematodes were fixed in 4 % formol and the fixed material was used for measurements. Material for the study of the structure of pharynx, genital atrium, acetabulum and other characters was prepared by conventional histological technique. Serial sections were made from 8 trematodes from each host; in case of unsuitable location of the parasite in the paraffin block further 3—5 specimens were used.

## RESULTS

### 1. Family Fasciolidae Railliet, 1895

*Fasciola gigantica* Cobbold, 1856

**Distribution:** This species occurs mainly in the Palaeotropic regions and reaches even to subtropic zones of the Holarctic. In Afghanistan it was frequently found in *Bubalus arnee* f. *bubalis*, more frequently than *F. hepatica*. In about half of the cases of fasciolosis it occurred together with *Fasciola hepatica* in cattle (*Bos taurus*) and in 5 cases in sheep (*Ovis aries*). *F. gigantica* was often recovered together with *Gigantocotyle explanatum* from the bile ducts of buffaloes.

*Fasciola hepatica* (Linné, 1758)

**Distribution:** This species has a cosmopolitan distribution, but in Afghanistan it is less abundant than *F. gigantica*. It was encountered primarily in cattle (*Bos taurus*) and less frequently in sheep (*Ovis aries*) and goats (*Capra hircus*).

**Pathology:** During the infection with *F. gigantica* and *F. hepatica* migration canals (at the stage of migration of the trematode) were observed in the liver or there occurred a marked chronic cholangitis and pericholangitis and occasionally also fibrosis.

2. Family Paramphistomatidae Fischoeder, 1901

As it has already been mentioned in our paper on *G. siamense* (Tenora et al. 1974), taxonomical evaluation of this trematode group is very difficult with regard to a laborious preparation of well orientated histological sections. Since we obtained larger number of trematodes of the genus *Gigantocotyle*, we could compare the species *G. explanatum* and *G. siamense*. In agreement with the opinion expressed in our previous paper, we came to the conclusion that both of them are valid species. They differ in the rate of the acetabulum to the body length, which is 1 : 1.3 — 1 : 1.5 in *G. siamense* and 1 : 1.9 to 1 : 2.9 in *G. explanatum*. The acetabulum is markedly large. On the other hand, the rate of the genital atrium to the length of body is very small in the former species.

*Gigantocotyle explanatum* (Cremplin, 1847)

**Distribution:** This species is distributed in the tropic and subtropic zone. In Afghanistan it parasitizes mainly buffalo (up to 70 %) and occasional infections of cattle were also reported. The parasites are located mostly in the bile ducts, but sometimes also in the rumen. However, in our material the latter location was not observed. The examined animals had massive infection of this species.

*Gigantocotyle siamense* (Stiles et Goldberger, 1910)

**Distribution:** This species was described from *Bos indicus* in Siam. In our material from Afghanistan it was found in the bile ducts of buffalo. The incidence of infection was lower than that of G. *explanatum*, but the intensity was the same.
**Pathology:** Infection with trematodes of the genus *Gigantocotyle*, which was massive in most cases, caused a chronic inflammation of infected bile ducts with hemorrhage into lamina propria of the mucous membrane with local abrasion of the epithelium and marked hyperplasia of mucinous glands of the bile ducts (Plate V, Figs. 1 and 2; Plate VI, Fig. 1).

*Paramphistomum epiclitum* Fischoeder, 1904

**Distribution:** This species was reported from *Bubalus arnee f. bubalis* and *Bos indicus* in Asia. In Afghanistan this species was found in the rumen of *Bubalus arnee f. bubalis;* massive infections were observed in about 20 % of the animals examined.

**Description** (measurements in mm): Body elongated, pyriform, in anterior portion ventrally bent and tapered. Body length 7.0—10.0, maximum width at acetabulum level 2.0—3.0. Pharynx 0.702 to 0.918 long. Its musculature corresponds to basic type of Paramphistomum (Plate I, Fig. 1). Caeca extending along the whole length of body. Acetabulum subterminal and measuring 1.7—2.5. Acetabular index 1: 3.1—4.1. Testes tandem, oval and lobate, measuring 1.0—1.3 × 1.3—1.8. Pars prostatica in long spirals. Genital atrium round in section and relatively small, measuring 0.450. Radial musculature distinct and well developed. Genital papilla large, with slightly marked sphincter (Plate I, Fig. 2), though Fischoeder did not mention it in the original description. Ovary spherical, sometimes slightly oval and measuring 0.488—0.542. It is situated laterally behind posterior testis. Mehlis' gland spherical to oval, measuring 0.171—0.220 and lying close to ovary. Excretory canal large, crossing Laurer's canal and opening 3.0—3.5 from posterior end of body. Opening of Laurer's canal 1.1 from excretory pore. Uterus surrounding posterior testis and extending along the whole length of body. Oval eggs, 0.140—0.154 × 0.088—0.092.

3. Family Gastrothylacidae Stiles et Goldberger, 1910

The members of this family have a characteristic ventral pouch commencing at the level of pharynx and ending bluntly near acetabulum. Genital organs open into this pouch (Plate II shows a section through the ventral pouch.)

*Fischoederius cobboldi* (Poirier, 1883)

**Distribution:** This species has been reported from domestic ruminants of Asia. It was frequently found in the rumen of buffaloes and cattle examined at the abattoir in Kabul.

**Description:** Body elongated, barrel-shaped, tapering at both ends and measuring 6.5—10.4 in length and 3.0—4.0 in maximum width. Ventral side flatter than dorsal. Triangular ventral pouch extending from middle part of pharynx to anterior margin of ventral sucker and reaching up to region of testes (Plate II). Pharynx 0.535—0.675 long, passing to oesophagus of the same length. It is divided into two caeca reaching up to acetabulum. Acetabulum terminal, measuring 0.963—1.1 Excretory bladder large, dorsal to ventral sucker. Genital pore 0.482 from entrance into ventral pouch at its dorsal side at level of intestinal bifurcation. Male genital organs formed by 2 large testes not markedly lobed and measuring 0.804—1.0. Dorsal testis situated on right side, ventral testis on left side. Pars prostatica markedly developed and lying in middle line dorsally to uterus. Oval ovary, 0.293—0.380, situated on lateral side of body in front of excretory bladder. Mehlis' gland close to ovary. Opening of Laurer's canal anterior to excretory pore. Uterus running along the median line between ovary and posterior testis and extending forward on dorsal side of body. Vitellaria in form of compact follicles, ventrally on lateral sides of body. They commence at intestinal bifurcation and terminate in posterior part near testes and ovary. Oval eggs, 0.128—0.136 × 0.074—0.079.

*Gastrothylax cruminifer* (Cremplin, 1847)

**Distribution:** This species was reported from the rumen of various domestic ruminants of Asia. Our specimens were recovered from cattle from the provinces Kabul and Kundúz.

**Description:** Body oval, acorn-shaped, sometimes more spherical (Plate III), measuring 4.8—7.0 in length and 3.8—5 in width. Ventral pouch triangular, reaching to acetabulum and opening 0.540 to 0.623 from anterior end of body. Acetabulum terminal, measuring 1.4—1.8. Pharynx measures 0.567 to 0.810 × 0.540; oesophagus without bulb, passing to long caeca which extend up to margin of anterior testis. Genital pore in ventral pouch, anterior to intestinal bifurcation, 0.810 from anterior margin. Testes oval, divided into several lobes and situated on both sides of sheath. Size of testes 1.0 to 1.4 × 0.945—1. Pars prostatica well developed. Oval ovary posttesticular, dorsal to testes, measuring 0.405 × 0.432. Mehlis' gland more or less spherical, dorsal to ovary and measuring 0.378. Laurer's canal opening in front of excretory pore. Uterus runs along the whole length of body, crossing from one side to another without keeping the median line as in the foregoing species (Plate IV shows a section through uterus). Vitellaria extend not only on lateral sides of body, but cover also the whole ventral side from intestinal bifurcation to acetabulum. Large excretory bladder dorsal, near acetabulum, behind testes. Eggs 0.135—0.140 × 0.070—0.074.

**Pathology:** The hosts carried heavy infections of trematodes of the genera *Paramphistomum*, *Fischoederius* and *Gastrothylax*. The parasites adhered to the mucous membrane of rumen and covered large areas without any marked predilection. Histological examination revealed inflammatory infiltration of lamina propria of the mucous membrane of various intensity and immigration of leucocytes into the epithelial layer (Plate IV, Fig. 2).

## DISCUSSION

It is generally known that the determination of trematodes of the family Paramphistomatidae is sometimes very difficult. During the study of our material of Gastrothylacidae we observed a great variability of some taxonomic characters, similarly as in Paramphistomatidae. Therefore, e.g., in the opinion of Dollfus (1963) the shape of the ventral pouch is the main criterion for the specific determination and some other characters, as size of eggs, have no importance. We assume that there occur considerable changes in the morphology of individual anatomic formations during the whole development of the trematode. Therefore their determination based on morphological and metrical characters is very difficult and the results may be influenced also by the prepa-

ration of specimens and technique of embedding. These facts partly explain the errors and inexactness of some authors.

In our studies we found only 7 trematode species, but it is possible that also some other species may occur in Afghanistan, as it is the case in neighbouring Asian countries — providing that no synonyms are involved (Näsmark 1937, Mukherjee 1963, 1966a, b, c, Horak 1971). It is possible that specimens of some other species of Paramphistomatidae and Gastrothylacidae (in polyvalent infection) were omitted while collecting the material, since usually they cannot be differentiated macroscopically.

Pathologic changes produced by *Fasciola* and *Gigantocotyle* trematodes in the liver are usually so large that there is no doubt about the functional insufficiency of liver and unfavourable influence of infection on the general state of the animal. However, the pathologic changes produced by these genera are different: trematodes of the genus *Fasciola* produce chronic cholangitis and chronic pericholangitis and frequently also calcification of the mucous membrane of bile ducts. Trematodes of the genus *Gigantocotyle* produce chronic and sometimes granulomatous cholangitis with hemorrhages in the mucous membrane and marked hyperplasia of mucinous glands (Tenora et al. 1974).

Pathologic changes in the rumen produced by trematodes of the genera *Fischoederius*, *Gastrothylax* and *Paramphistomum* were also marked and we assume therefore that these infections may result in a disfunction of proventriculi, especially in cattle.

## ТРЕМАТОДЫ ДОМАШНИХ ЖВАЧНЫХ АФГАНИСТАНА И ИХ РОЛЬ В ПАТОЛОГИИ

Б. Котрла, К. Блажек и А. Амин

**Резюме.** В желчных протоках и рубце домашних жвачных животных были найдены следующие виды трематод: *Fasciola gigantica*, *F. hepatica*, *Gigantocotyle explanatum*, *G. siamense*, *Paramphistomum epiclitum*, *Fischoederius cobboldi* и *Gastrothylax cruminifer*. Эти виды трематод причиняли выразительные патологические изменения в печени и рубце.

## REFERENCES

DOLLFUS R. PH., Hôtes et lieux de récolte de quelques Trématodes digénétiques de Vertébrés de la Collection du Musée royal de l'Afrique central. Rev. Zool. Bot. Afr. 68: 323—357, 1963.

HORAK I. G., Paramphistosomiasis of domestic ruminants. Adv. Parasit. 9: 33—72, 1971.

MUKHERJEE R. P., On two new species of amphistome from India sheep and goat. Ind. J. Helm. 15: 70—76, 1963.

—, *Calicophoron cauliorchis* (Stiles and Goldberger, 1910) Näsmark, 1937 from Indian buffalo. Ind. J. Helmint. 18: 1—4, 1966a.

—, Studies on the life history of *Fischoederius elongatus* (Poirice, 1883) Stiles and Goldberger, 1910, an amphistome parasite of cow and buffalo in India. Ind. J. Helmint. 18: 5—14, 1966b.

—, On some amphistomes of India. Ind. J. Helmint. 18: 94—103, 1966c.

NÄSMARK K. E., A revision of the Trematode family Paramphistomidae. Zoologiska Bidrag, fran Uppsala 16: 301—566, 1937.

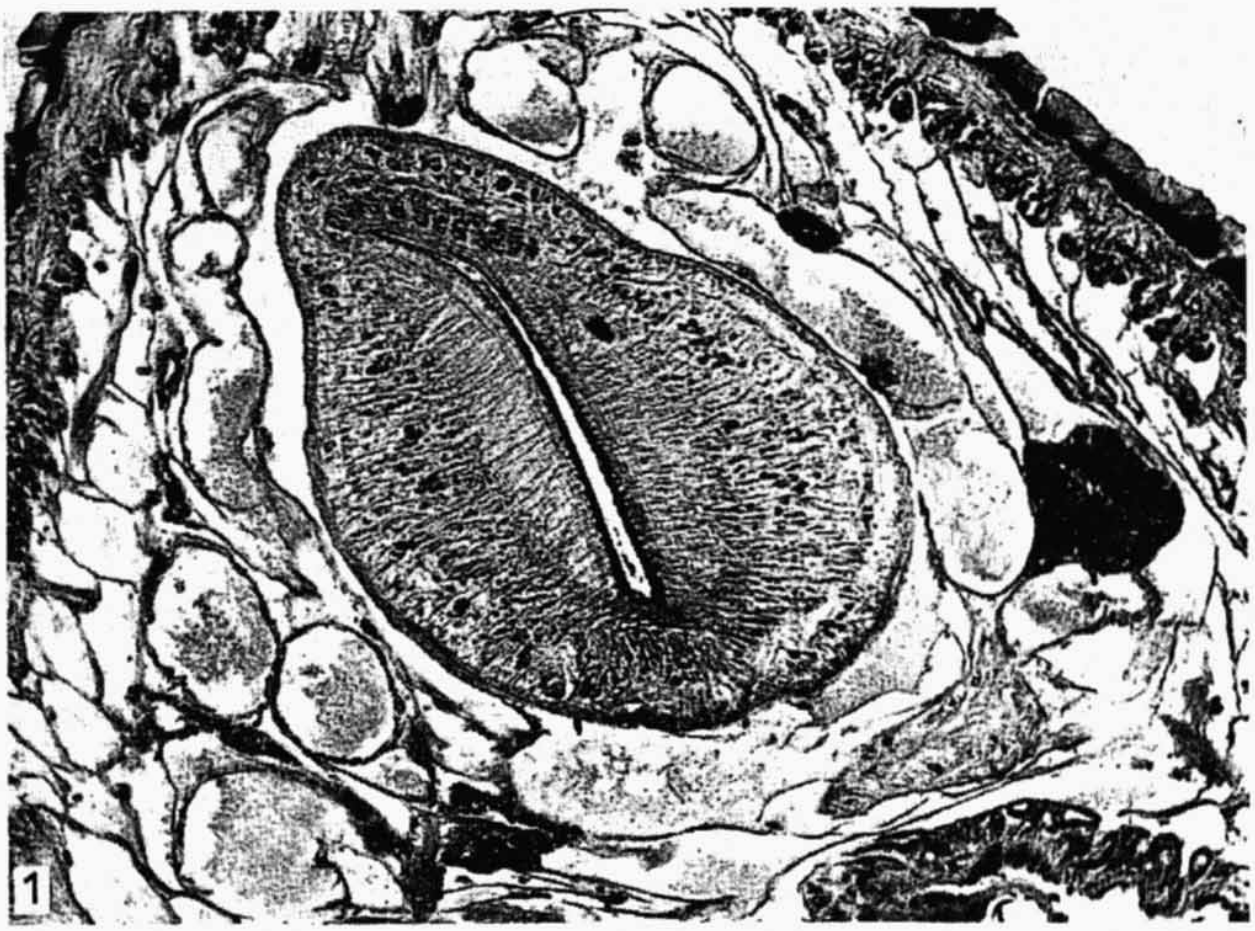
TENORA F., BARUŠ V., Occasional findings of helminths in some domestic and free-living mammals of Afghanistan. Acta Univ. Agriculturae (Brno), 16: 327—336, 1968.

—, KOTRLÁ B., BLAŽEK K., Finding of the trematode *Gigantocotyle siamense* (Stiles et Goldberger, 1910) in buffalo in Afghanistan. Acta vet. Brno 43: 111—116, 1974.

YAMAGUTI S., Synopsis of Digenetic Trematodes of Vertebrates. Tokio, 1074 pp., 1971.

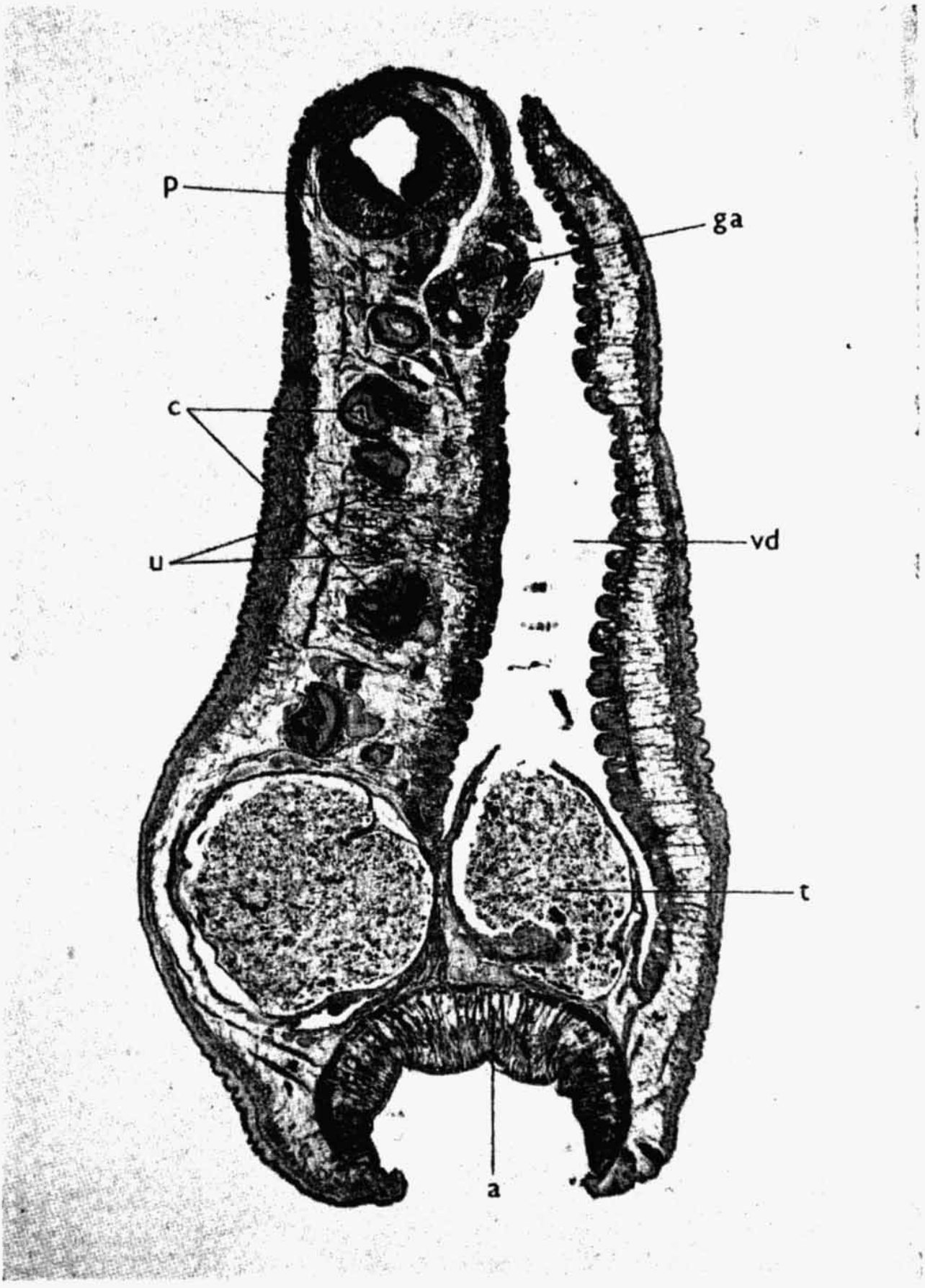
Received 29 January 1976.

B. K., Parasitologický ústav ČSAV, Flemingovo n. 2, 166 32 Praha 6, ČSSR

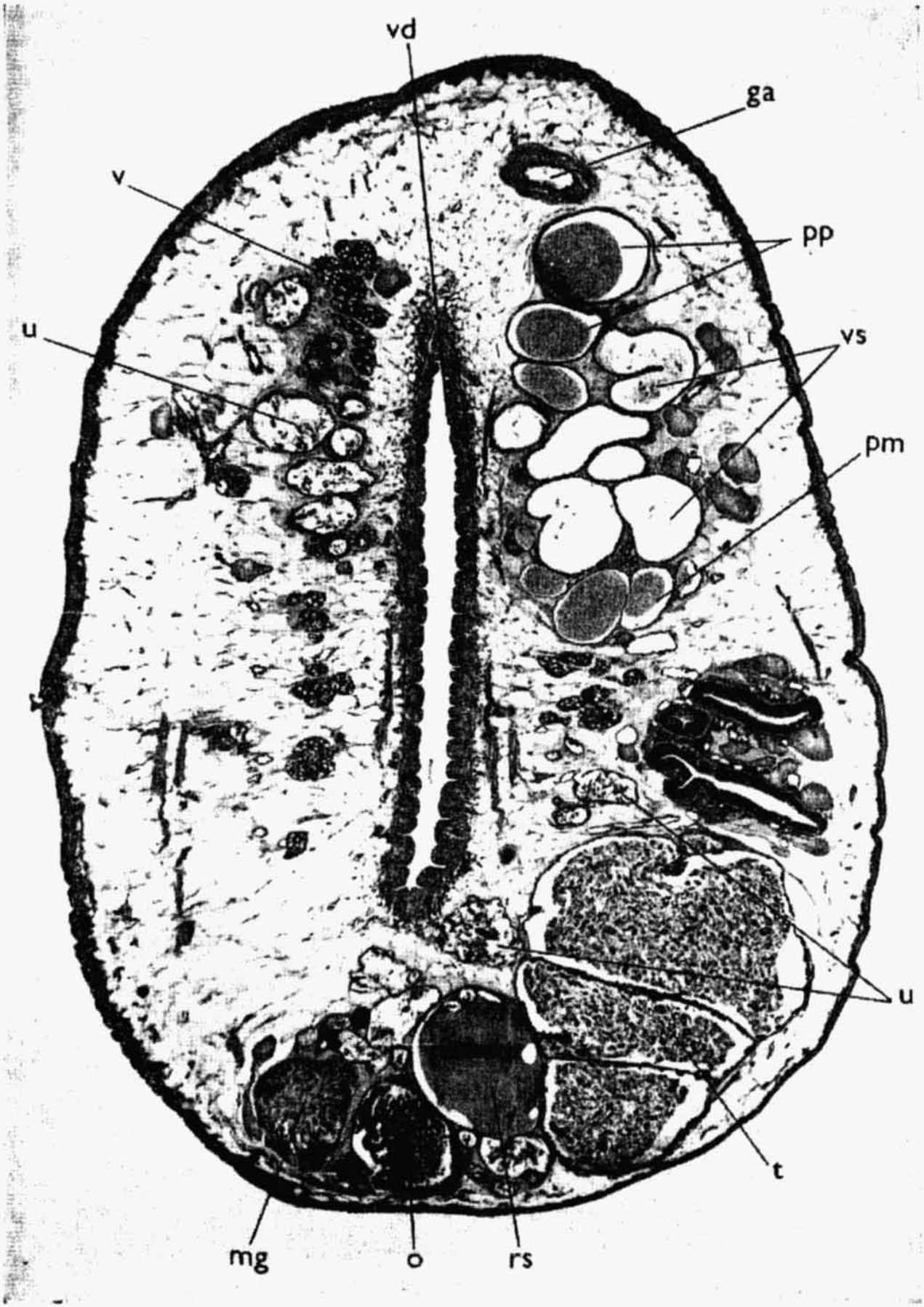




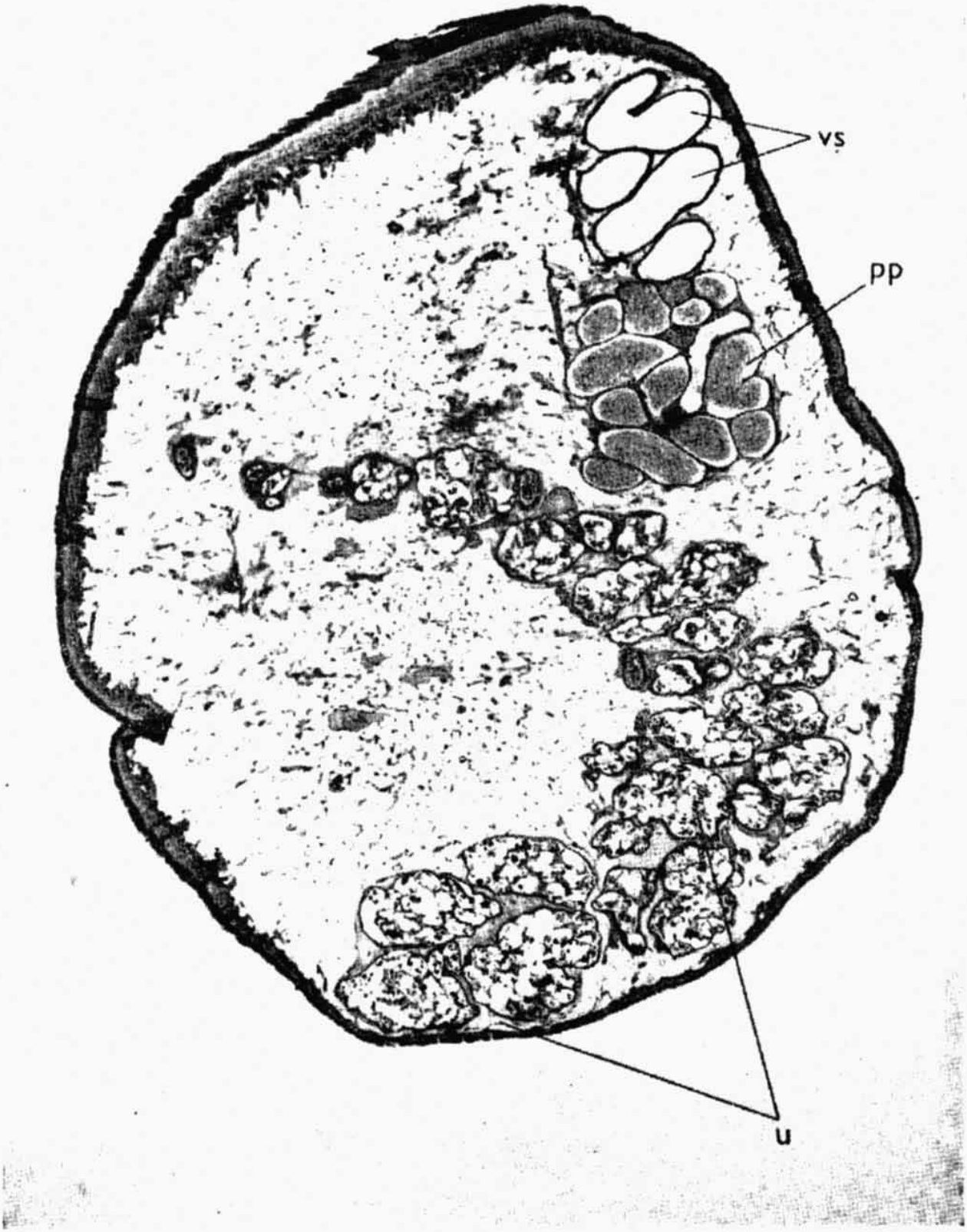
*Paramphistomum epiclitum* Fischoeder, 1901. **Fig. 1.** Pharynx of *Paramphistomum* type (120×). **Fig. 2.** Genital atrium of *Epiclitum* type (250×).



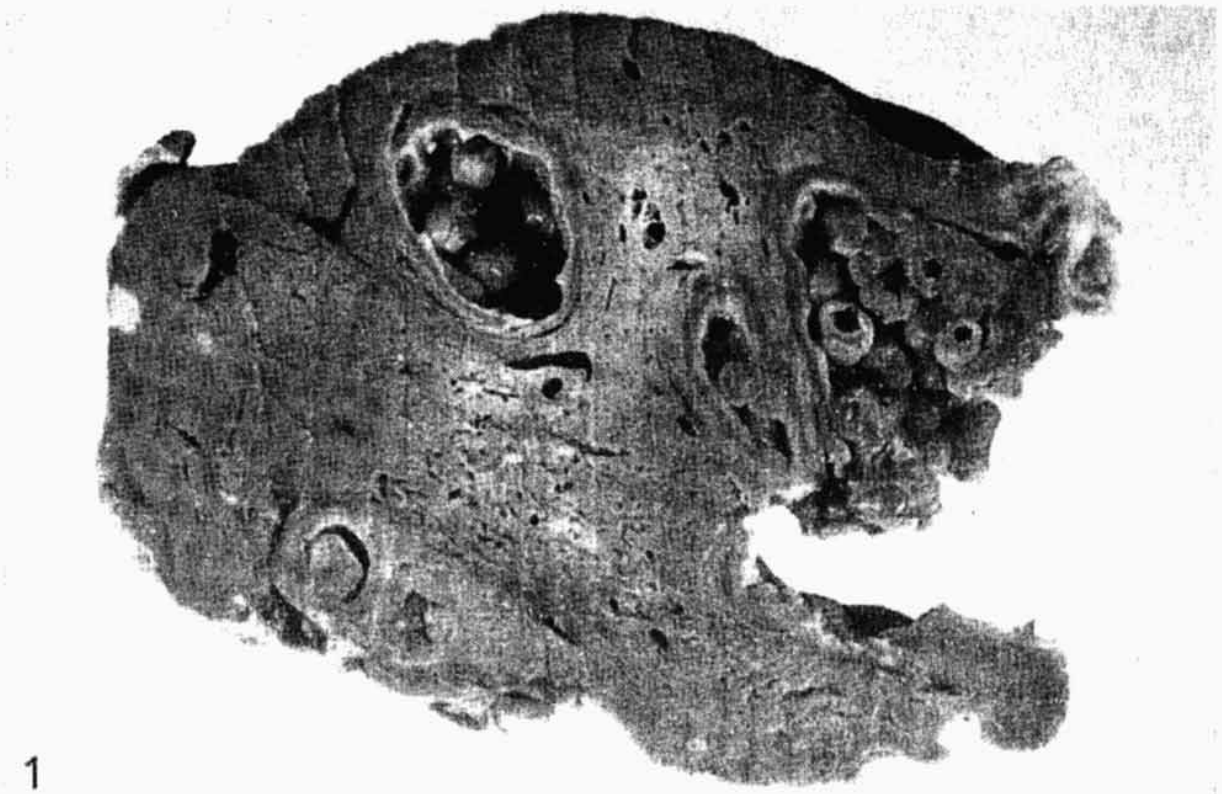

*Fischoederius cobboldi* (Poirier, 1883). Sagittal section (70×). a — acetabulum, c — caecum, ga — genital atrium, p — pharynx, t — testes, u — uterus, vd — ventral pouch.



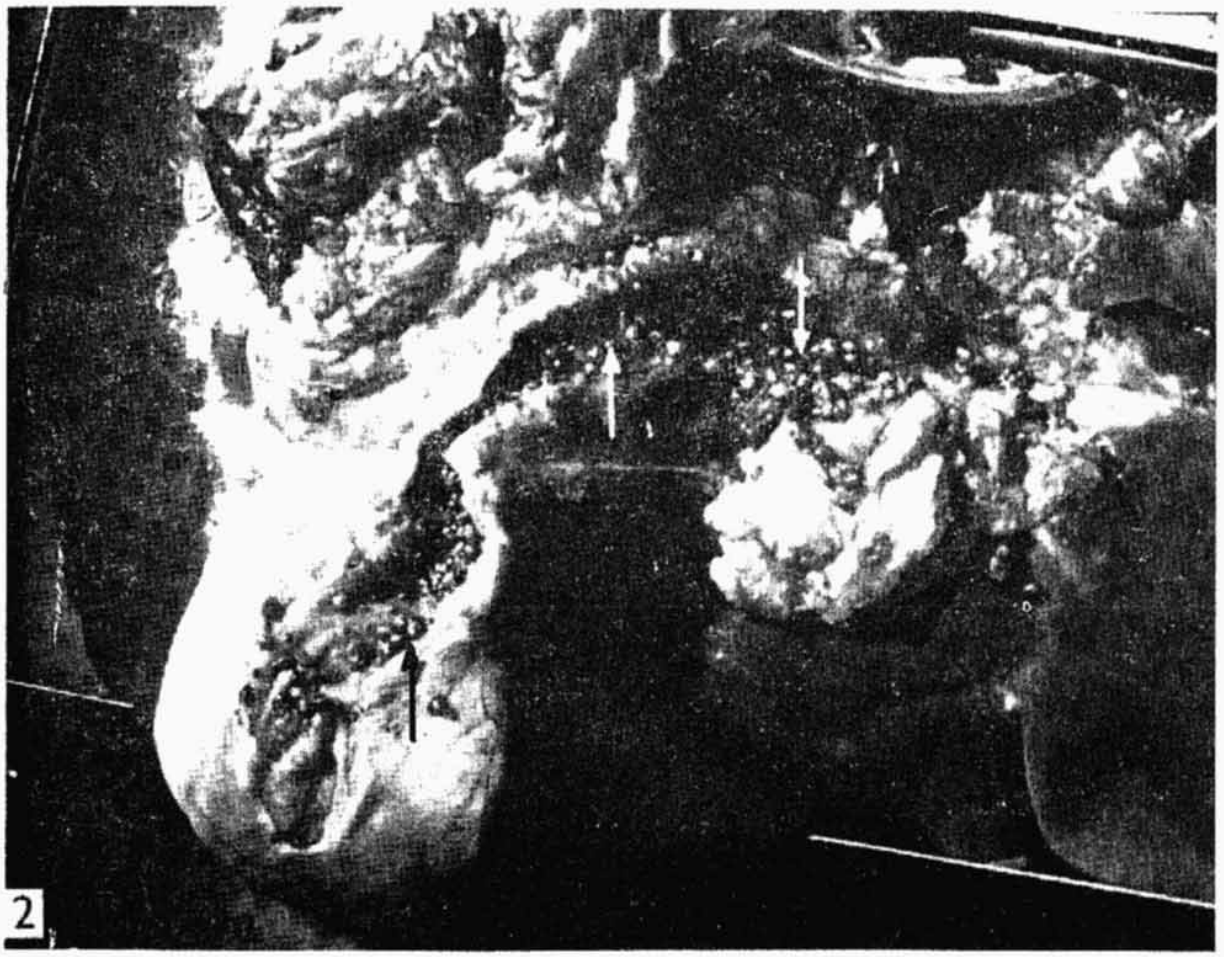

*Gastrothylax cruminifer* (Cremplin, 1847). Sagittal section (40×). ga — genital atrium, mg — Mehlis' gland, o — ovary, pp — pars prostatica, pm — pars musculosa, rs — receptaculum seminis, t — testes, u — uterus, v — vitellaria, vd — ventral pouch, vs — vesicula seminalis.




*Gastrothylax cruminifer* (Cremplin, 1847). Section through (40 ×) uterus crossing from one side of body to another, not along the median line. pp — pars prostatica, u — uterus, vs — vesicula seminalis.



1



2

**Fig. 1.** Infection with *Gigantocotyle* trematodes. Section through buffalo liver. Bile ducts enlarged, with markedly thickened wall; lumen filled with numerous trematode specimens adhering to mucous membrane. **Fig. 2.** Infection of buffalo with *Gigantocotyle explanatum*. Numerous trematodes (arrows) on mucous membrane of main bile duct, ductus cysticus and bile duct bladder. Minimized.

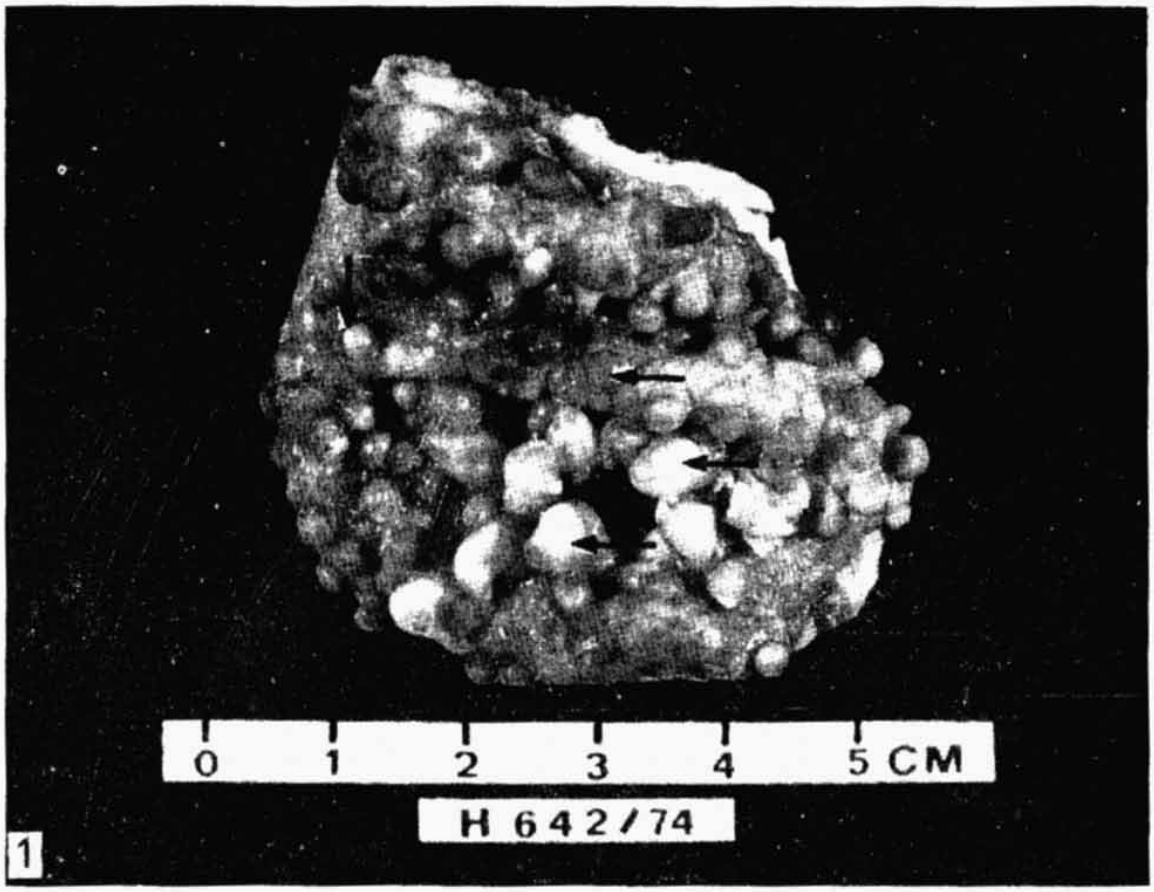




**Fig. 1.** Detail of *G. explanatum* adhering to mucous membrane of bile duct (arrows). **Fig. 2.** Inner surface of rumen of cattle. Trematodes adhering to wide areas of mucous membrane (arrows).