SOME TREMATODES OF FRESHWATER FISHES FROM NORTH VIETNAM WITH A LIST OF RECORDED ENDOHELMINTHS BY FISH HOSTS

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Abstract. The present paper comprises a systematic survey of trematodes collected from 12 species of freshwater fishes from North Vietnam (the Red River near Hanoi). Altogether 16 trematode species (14 adults and 2 juvenile forms) have been recorded. These include: Amurostomum donbrowskianum, Platygordius microstabiuluris, P. macronucleas, Neoladichora multistabiuluris, Carassotrema koreanum, Aspicus huanpuensis, Phyllobothrium clarisim, Phyllobothrium sp., Orientecestum batracophagus, Monodina collis, Dracophalangia ophetik, Dufotrema bagarri sp. n., Proechynchus viuienensis sp. n., Proechynchus sp. juv., Metadema bagarri sp. n., and Isoparorchis hypselobagri juv. Except for the first four named species, all the trematodes are briefly described and illustrated and some problems concerning their taxonomy and geographical distribution are discussed. D. bagarri sp. n. from Bagarius bagarius (catfish) is characterized mainly by location of the mouth opening in anterior half of body, extension of the uterus anteriorly not surpassing vitellaria, number of spines (about 60) on the rynchus, and by other features. Characteristic features of P. viuienensis sp. n. (host B. bagarius) are the structure and shape of the rynchus, equatorial situation of vitellaria, postequatorial distribution of gonads and mouth opening, extension of the uterus, and body measurements, whereas those of M. bagarri sp. n. (host B. bagarius) include the shape (spherical) of the ovary, extent of cases (slightly surpassing testes) and body measurements. Carassotrema gineisenkijanum Kulakova et Ha Ky, 1976 is considered a junior synonym of C. koreanum Park, 1938. Eight species have not yet been reported from Vietnam. The findings include several new host records.

Little information has so far been available on the trematode fauna of freshwater fishes in Vietnam. Oshmarin (1965) was the first to report a single freshwater species, Phyllobothrium megalonemum, from the catfish Clarias bifasciatus in the market in Koman. Later on, in his unpublished thesis, Ha Ky (1969) reported altogether six species of adult and two species of larval digenests as also one aspidogastrean species from North Vietnamese freshwater fishes. Kulakova and Ha Ky (1976) dealt with two Carassotrema species on the basis of a re-examination of Ha Ky's material.

In 1984, during his visit to Vietnam, the junior author (O. Sey) examined for helminths a number of fixed freshwater fishes collected from the Red River near Hanoi in 1960—1975 and deposited in the collections of the Department of Vertebrate Zoology, Hanoi University, in Hanoi. The results of the systematic evaluation of amphibstim trematodes of these materials have already been reported by Sey (1985, 1986), while concerning nematodes and acanthocephalans have been treated in the papers by Moravec and Sey (1988a, b, c, 1989). The results of the systematic evaluation of trematodes are presented in this paper.

MATERIALS AND METHODS

Of a number of fishes examined, originating from the Red River near Hanoi, a total of 12 fish species belonging to 6 families proved to harbour trematodes. Altogether 16 species of trematodes were recorded. The specimens were fixed in situ in 10% formaldehyde; later the specimens were
placed in distilled water for 24 h and then, slightly pressed between two glasses, were re-fixed in 10% formaldehyde. After staining in carmin, the specimens were dehydrated and mounted in Canada balsam as permanent preparations. The specimens have mostly been deposited in the helminthological collection of the Institute of Parasitology, Czechoslovak Academy of Sciences, in České Budějovice, Czechoslovakia; representative specimens also in the Department of Zoology, University of Agricultural Sciences, Keszhely, Hungary, and in the Department of Vertebrate Zoology, Hanoi University, Vietnam. In the following account of the species encountered, measurements are given in millimeters. Yamaguti's (1971) classification of trematodes has been followed.

**REVIEW OF SPECIES**

Fam. Paramphistomidae Fischeoeder, 1901

1. *Amurotrema dombrowskajae* Akhmerov, 1959

*Host:* *Spinibarichthys denticulatus* (Cyprinidae).

*Localization:* Intestine.

*Comments:* — Ha Ky (1969) was the first to report this trematode from Vietnam, from the host *Spinibarichthys denticulatus*. The present material, originating from the same host species, has already been dealt with in the paper by Sey (1985, 1986) and Sey and Moravec (1986).

Originally this species was described from the grass carp, *Ctenopharyngodon idella*, from the Amur River in the Soviet Far East, occasionally it also occurs in *Hypophthalmichthys molitrix*; it was also introduced into the water bodies of Kazakhstan and the Volga Delta in the USSR (see Strelkov 1971, Gvozdev et al. 1986, Bykovskaya, Pavlovskaya and Kulakova 1987). It occurs in *C. idella* also in China (Chen 1973).

2. *Platycladorchis microacetabularis* Sey, 1986

*Host:* *Spinibarichthys denticulatus* (Cyprinidae).

*Localization:* Posterior part of intestine.

*Comments:* — This species has already been dealt with in the paper by Sey (1986).

3. *Platycladorchis macroacetabularis* Sey, 1986

*Host:* *Liocheilus krempfii* (Cyprinidae).

*Localization:* Posterior part of intestine.

*Comments:* — This species has already been dealt with in the paper by Sey (1986).

4. *Neocladorchis multilobularis* Sey, 1986

*Host:* *Spinibarichthys denticulatus* (Cyprinidae).

*Localization:* Posterior part of intestine.

*Comments:* — This species has already been dealt with in the paper by Sey (1986).

Fam. Waretrematidae Srivastava, 1937

5. *Carassotrema koreanum* Park, 1938

*Syn.:* *Carassotrema gigazoskajae* Kulakova et Ha Ky, 1976.

**Description (6 specimens):** Body elongate-oval, cuticle covered with minute spines, sometimes indistinct on posterior part of body. Length of body 0.93—1.90, maximum width 0.326—0.462. Oral sucker measuring 0.147—0.210 × 0.141—0.210, acetabulum 0.162—0.267 × 0.180—0.225. Muscular pharynx large, size 0.126—0.183 × 0.090 to 0.150, oesophagus very short. Ceca extending posteriorly to level of posterior end of testis. Testis single, triangular, often with depression on its expanded anterior end, size 0.189—0.408 × 0.159—0.272. Small oval ovary, size 0.060—0.136 × 0.033—0.109, situated just in front of testis. Hermaphroditic sac anterodorsal to acetabulum, size 0.099—0.240 × 0.066—0.120. Vitellaria rather tubular, extending from level of acetabulum to end of body. Uterus anterior to ovary. Eggs oval, measuring 0.063—0.084 × 0.039—0.051.

*Host:* *Hemiculter leuciscus*, *Squaliobarbus curriculus* (both Cyprinidae) and *Scardinius erythrophthalmus* (both Cyprinidae).

*Localization:* Intestine.

*Comments:* — *C. koreanum* has already been reported from Vietnam from *Carassius molitor* by Kulakova and Ha Ky (1976). In addition to this species, the authors described from the same localities (Ba Be Lake, Prov. Bak-kan, and Bo River, Prov.

Fig. 1. A, B — *Carassotrema koreanum* Park, 1938 (A — specimen from *H. leuciscus*, B — specimen from *S. erythrophthalmus*); C — *Anguilla japonica* Tanaka, 1928.

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Lao-kai] a new species, *C. ginezinskaja* from *Spinibarbichtys denticaulis*. However, the features by which the new species was distinguished from *C. koreanum* (size of suckers and pharynx, extent of vitellaria and spination of cuticle) are subject to a considerable variability, as it is apparent from our findings. While the size of suckers and that of the pharynx fluctuated considerably in the specimens of the present material (see Table 1), their vitellaria always extended to the end of the body; it is probably associated with the fact that the trematodes were small-sized, with only several eggs in their uterus: the shape of testis was variable too. In view of these facts, we consider *C. ginezinskaja* to be a junior synonym of *C. koreanum*. Kulakova and Ha Ky (1976) have reported the names *Asymphylodora pavlovskaja* Ha Ky, 1969 and *A. ginezinskaja* Ha Ky, 1969 as the junior synonym of *C. koreanum* and the senior synonym of *C. ginezinskaja*, respectively; however, these names are invalid according to the International Code of Zoological Nomenclature.

Also the validity of some other congeneric species described from China (*C. wui*, *C. lwi*, *C. pterochis*, *C. megapharynx*, *C. lamellorchis* — see Tang and Lin 1979, Chen 1973) will have to be verified.

*C. koreanum* had originally been described by Park (1938) from *Carassius auratus* from Korea, later it was found in a number of cyprinids (*Carassius*, *Cyprinus*, *Oncorhyncus*, *Aristichthys*, *Hypophthalmichthys*, *Squaliobarbus*, *Acanthorhodeus*, *Paramis*, *Erythroculenis*, *Mylopharyngodon*, *Culter*, *Hemiculter*) in Japan and China (see Yamaguti 1971, Chen 1973) and it was also reported from *Hypophthalmichthys molitrix* from the R. Amur basin from the USSR (Bykhovskaya-Pavlovskaya and Kulakova 1987) and from *Cortesius molitor* and *Squaliobarbus curriculus* from Vietnam (Ha Ky 1969, Kulakova and Ha Ky 1976). Accordingly, until now only members of the family Cyprinidae have been known as hosts of *C. koreanum*, but our finding of this parasite in *Saurorobus dobhri* shows the possibility of its occurrence even in fishes of a different order (family Gobiidae, Perciformes). The present finds of *C. koreanum* in *H. leuciscus* and *S. dobri* represent new host records for this parasite.

Fam. Asygidiidae Odhner, 1911

6. *Asygia hweangtsyui* Tsin, 1933

**Syn.:** *Asygia amurensis* Zemtzev, 1936.

**Description** (7 specimens): Length of body 3.94—5.93, maximum width 0.68—1.01. Oral sucker measuring 0.435—0.798 × 0.530—0.770, acetabulum 0.435—0.558 × 0.435—0.612. Muscular pharynx measuring 0.177—0.245 × 0.177—0.208, length of oesophagus 0.068. Ceca extend posteriorly to short distance in front of body end. Ovary and testis oval or of irregular shape, close to each other, situated in posterior half of body. Size of ovary 0.190—0.299 × 0.231—0.399, of anterior testis 0.204—0.245 × 0.340—0.408, of posterior testis 0.285—0.340 × 0.313—0.320. Cirrus sac spherical, size 0.204—0.258 × 0.136—0.204, situated medially. Uterine loops filling up intercaecal space between genital pore and ovary. Vitellaria multifollicular, reaching posteriorly usually to mid-distance between posterior testis and body end, but sometimes up to ends of intestinal caeca. Size of eggs 0.066—0.066 × 0.030—0.042.

**Host:** *Ophiocephalus macrostaxis* (Channidae).

**Localization:** intestine.

**Comments:** Vietnamese specimens of the present material are noted for the generally smaller body measurements than it is reported for this species e.g. by Tsin (1933)
and Bykhovskaya-Pavlovskaya and Kulakova (1987) and also their acetabulum is distinctly smaller than the oral sucker; these trematodes possibly represent young specimens.

A. kwangtungi is known as the parasite of snakehead, Ophicephalus argus, from China (Tsai 1933, Chen 1973) and from the R. Amur basin from the USSR (Zmeev 1936, Strlko 1971, Bykhovskaya-Pavlovskaya and Kulakova 1987). From North Vietnam it has already been reported from O. maculatus by Ha Ky (1969).

Fam. Gorgoderidae Looss, 1899

7. Phyllobothrium clarisii Dajia, Dingke et Xiaoming, 1986

Description (1 nongravid specimen): Body pear-shaped, 1.09 long, width of its anterior portion 0.354, of posterior one 0.503. Cuticle smooth. Oral sucker 0.186 in diameter, acetabulum preacervular, size 0.225 × 0.219; size ratio of both suckers 1 : 1.2. Oesophagus indistinct. Caeza extending posteriorly nearly to body end. Ovary, vitellarium and testes more or less close to each other, postacetabular, intercaecal. Testes larger than ovary, lobular, situated diagonally; anterior testis at level of ovary. Size of anterior testis 0.099 × 0.099, that of posterior one 0.129 × 0.090. Ovary submedian, slightly lobular, size 0.060 × 0.045. Seminal vesicle saccular, preacetabular. Vitellaria paired, lobed, situated below acetabulum, of about same size (0.039 × 0.018–0.024). Eggs not yet present in uterus.

Host: Clarias fuscus (Clariidae).
Localization: intestine.

Comments: — Only one nongravid specimen was recovered the morphology of which appeared to be in accordance with the description of Ph. clarisii Dajia, Dingke et Xiaoming, 1986. This species has only recently been described from the cloaca of Clarias fuscus from southern China by Dajia et al. (1986). So far it is the second Phyllobothrium species reported from the freshwater fishes of Vietnam (the other species is Ph. megalobium described by Oshmarin (1965) from Osteochilus multirostratus).

8. Phyllobothrium sp.

Description (1 nongravid specimen): Body pear-shaped, 1.55 long with maximum width 0.802. Cuticle smooth. Oral sucker 0.168 × 0.210, acetabulum preacervular, size 0.328 × 0.294; size ratio of both suckers 1 : 1.55. Oesophagus short, caeza extending posteriorly nearly to body end. Testes larger than ovary, lobular, situated diagonally; anterior testis postovarian. Size of anterior testis 0.192 × 0.188, that of posterior one 0.216 × 0.180. Ovary submedian, slightly lobular, size 0.117 × 0.087. Seminal vesicle saccular, preacetabular. Vitellaria paired, lobed, situated below acetabulum, of about same size (0.090 × 0.030). Eggs not yet present in uterus.

Host: Bagorius bagirostris (Siluridae).
Localization: intestine.

Comments: — Although this trematode somewhat resembles the species Ph. megalobium Oshmarin, 1966 described from the catfish in Vietnam, we refrain from assigning it to this species, because only a single nongravid specimen has been available to study.

Fam. Allocreadiidae Loos, 1902

9. Orientocercoides batracoides Tubangui, 1931

Description (2 specimens): Length of body 1.37–1.67, maximum width 0.598–0.680. Cuticle covered with very fine spines, these being dense on anterior end of body and gradually diminishing in number posteriorly. Oral sucker measuring 0.195–0.207 × 0.210–0.223; acetabulum slightly smaller, size 0.180–0.223 × 0.195 to 0.240. Prepharynx distinct in larger specimen only, 0.039 long. Pharynx strongly muscular, measuring 0.126–0.162 × 0.126–0.135. Oesophagus at most 0.045 long. Caeza extending posteriorly to almost end of body. Ovary nearly spherical or irregular in shape, 0.129–0.141 × 0.138–0.141, median, postacetabular. Oval testes tened or somewhat diagonal, postovarian. Cirrus sac about 0.150 × 0.060–0.075; external part of seminal vesicle 0.240 long. Genital pore situated near anterior margin of acetabulum. Uterus reaching to almost posterior end of body. Mature eggs yellow, measuring 0.027–0.030 × 0.018–0.024. Vitellaria follicular, starting approximately at level of posterior margin of acetabulum, extending along sides of body to joint near posterior extremity.

Host: Clarias fuscus (Clariidae).
Localization: intestine.

Comments: — This species was originally described from Clarias batracus from the Philippines (Tubangui 1931); Beverley-Burton (1962) synonymized with this species several other members of the genus which had been described from silurid fishes from India. O. batracoides has also been reported from Clarias fuscus from China (Tang and Lin 1973) and from Clarias spp. from Africa and Israel (see Moravec 1977, Shottter 1980). This is the first record of this parasite from Vietnam.

Fam. Mawenidae Yamaguti, 1954
10. *Masiaena collata* Chatterji, 1933

**Description** (5 specimens): Body ovoid or oval, its posterior half usually broader than anterior one. Length of body 0.57–0.95, maximum width 0.313–0.476. Cuticle spinose; spines indistinct on posterior extremity. Oral sucker large, funnel-shaped, provided with two transverse rows of spines; its size 0.068–0.153 x 0.108–0.159. Acetabulum near mid-length of body, its size 0.144–0.162 x 0.165–0.174. Pharynx oval, 0.045–0.054 x 0.036–0.054. Oesophagus indistinct, intestinal bifurcation just in front of acetabulum. Caeceae short, extending posteriorly to level of half of posterior tests. Ovary transversely oval, size 0.061–0.087 x 0.099–0.101, situated on right side just below acetabulum. Testes oval, postvarianarian, diagonal, one after another; size of anterior testis 0.072–0.075 x 0.105–0.135, of posterior one 0.075–0.090 x 0.105–0.120. Genital pore preacetabular. Size of cirrus sac 0.174–0.195 x 0.060–0.069. Eggs operculated, size 0.024–0.030 x 0.012–0.018. Vitellaria forming two lateral groups of follicles at acetabulum level, extending posteriorly to level of anterior tests.

**Host:** *Clarias fuscus* (C. fuscus).

**Location:** intestine.

**Comments:** — Only several not well preserved specimens were obtained which corresponded by the morphology to the species *M. collata*. This species was originally described from *Clarias batrachus* from Burma (Chatterji 1933). The present find is the first record of *Masiaena* species from Vietnam and *C. fuscus* is a new host for this parasite.

Fam. Bucephalidae Poche, 1907

11. *Bucephalopsis osakii* Nagay, 1937

**Description** (based on 10 specimens from *P. osakii*): Body ovoid, usually distinctly broader in posterior half. Length of body 0.79–1.24, maximum width 0.490–0.612. Cuticle densely covered with marked spines, their density and size decreasing in posterior half of body; spines completely absent from posterior extremity; size of spines in anterior part of body 0.012–0.015, in posterior part of body 0.009. Anterior sucker subterminal, size 0.222–0.361 x 0.192–0.282. Pharynx relatively large, size 0.105–0.123 x 0.105–0.135, situated slightly in front of mid-length of body. Oesophagus very short. Intestine sacular, bent posteriorly, its posterior end somewhat exceeding posterior margin of pharynx. Ovary and testes situated on right side in middle part of body. Ovary almost spherical, size 0.096–0.120 x 0.105–0.132, situated laterally on right side from pharynx. Ovoid or oval testes tandem or diagonal, close to each other, being situated just below ovary; size of anterior testis 0.120–0.153 x 0.111–0.120, of posterior one 0.120–0.165 x 0.102–0.120. Genital pore ventral, at slight distance from posterior extremity. Cirrus sac (length 0.330–0.390, width 0.069–0.078) located near left side of body, its anterior end reaching to level of posterior end of posterior tests. Uterus very long, its loops filling up almost whole space of body from oral sucker to posterior extremity. Eggs numerous, yellow, oval-shaped; their size 0.027–0.033 x 0.015–0.018. Vitellaria forming two compact lateral groups of follicles (11–16) situated near posterior margin of oral sucker, mostly extending anteriorly up to level of posterior half of the sucker.

**Host:** *Pseudobagrus osakii* (Bagridae) and *Bucephalobus dolgoi* (Ochridae).

**Location:** intestine.

Comments: — The genus *Bucephalopsis* Diesing, 1855 includes a large number of species parasitizing both marine and freshwater fishes; freshwater forms are known mostly from the region of eastern and southern Asia where they are parasitic largely in fishes of the order Siluriformes.

By their morphology and measurements, the Vietnamese specimens of the present material are most similar to *B. osakii*, a species described by Nagay (1937) from the catfish *Parasilururus asai* from Korea. However, in contrast to the original description, our specimens are noted for somewhat greater relative length of the cirrus sac and sexual glands, vitellaria and anterior uterine loops are shifted more anteriorly in most specimens; but it may be due to different ways of fixation of the specimen, i.e., greater body contraction in the Vietnamese specimens which were only subsequently re-fixed under the coverslip (see Materials and Methods). A slightly greater length of eggs in *B. osakii* in comparison with the present specimens (0.037–0.039 mm versus 0.030–0.033 mm) can be considered to be within the limits of intraspecific variability and, therefore, we consider both the forms conspecific.

In 1980, Wang described from *Pseudobagrus rachelli* from China a new species, *Bucephalopsis pseudobracheli*. This species differs from *Bucephalopsis* specimens of the present material in many important morphological features, namely in the shape of body, position of vitellaria and sexual glands, and in the relative size of the cirrus sac. Another species, *Bucephalopsis borsarii* was reported from *Pseudobagrus rachelli* from China by Tang and Tang (1976), but the assignment of their specimens, that were similar to those of the present material, to this species is rather doubtful.

*B. osakii* of the present material was recorded in large numbers from *Pseudobagrus rachelli*, whereas only a single specimen exhibiting somewhat smaller body measure...
ments (0.707 × 0.408 mm) and less numerous eggs in the uterus was found in *Sinuroprinus dolgy*. Both the fish species represent new host records. This is the first record of this species from Vietnam.

12. *Doljufrestra bagarii* sp. n.

**Description** (10 specimens; measurements of holotype in brackets): Body elongate, its maximum length about twice its maximum width at its middle third; posterior end of body obtusely rounded. Cuticle covered with scale-shaped spines, these being dense in anterior half of body, but their density gradually decreasing from middle of body; spines completely lacking on posterior extremity. Maximum size of spinules (0.006–0.009 (0.006)) at level of vitellaria, their size near anterior end of body 0.003–0.005 (0.003). Length of body 0.612–0.802 (0.639), maximum width 0.192 to 0.271 (0.190). Rhynchos relatively small, muscular, inserted conical with rounded end, provided with triple crown of spines; length of rhynchus 0.042–0.075 (0.060), its width 0.042–0.063 (0.048). Crown spines (some 20 in each circle) of first circle 0.003–0.005 (0.003) long, those in following two circles of approximately double size (length 0.006–0.009 (0.006)). Mouth opening in middle third of body, approximately ovary level; size of ovary muscular pharynx 0.050–0.054 × 0.030–0.034 (0.033 × 0.045). Intestines short, serpentine. Oval and testes situated on right side in middle third of body length. Size of ovary 0.045–0.075 × 0.048–0.075 × 0.060 (0.048). Testes postovarian, tandem, size of anterior testis 0.057–0.075 × 0.051–0.090 (0.060 × 0.051), of posterior one 0.045–0.078 × 0.047–0.105 (0.066 × 0.060). Genital pore ventro-terminal. Cirrus sac located on left side of body, its length 0.195–0.261 (0.195), width 0.045–0.099 (0.045); it contains oval seminal vesicle, elongate prostatic part and ejaculatory duct opening into genital atrium. Uterus long, its loops filled in with numerous eggs occupying almost whole space of body below vitellaria, usually overlapping partly also sexual glands and cirrus sac; uterine loops anteriorly not reaching vitellaria. Eggs oval, 0.021–0.042 (0.021 to 0.024) long and 0.012–0.016 (0.012–0.013) wide. Vitelline follicles usually forming anastomosing networks. Genital group consisting of about 50–55 follicles; rarely follicles divided into two lateral groups.

**Type host**: *Bapurus bagarius* (Siuroidae, Siluriformes).

**Localization**: Intestine.

**Type locality**: Red River near Hanoi, Vietnam (date of collection not exactly determined — 1960–1975).

**Deposition of type specimen**: Institute of Parasitology, Czechoslovak Academy of Sciences, Český Budějovice, Helm. Coll. Cat. No. D-216 (holotype and paratypes; additional paratypes in Department of Zoology, University of Agricultural Sciences, Keshtehy, Hungary, and in Department of Vertebrate Zoology, Hanoi University, Vietnam).

**Etymology**: The specific name of this species has been derived from the generic name of its fish host.

**Comments**: — At present the genus *Doljufrestra* Eckmann, 1934 comprises a total of 8 species* parasitic both in freshwater and marine fishes (see Skryabin and Gushanskaya 1971, Wang 1985). Of them, *D. bagarii* sp. n. somewhat resembles only two freshwater species, *D. siniperca* (Peng, 1930) and *D. siniperca* Wang, 1985, both described from perciform fishes of the genus *Siniperca* from China; the other species, all parasitizing marine fishes, are noted, in contrast to *D. bagarii* sp. n., for the uteruses extending anteriorly to space in front of vitellaria, reaching up to rhynchus, for the comparatively large and broad rhynchus, location of the mouth opening in the posterior half of body and for other features, namely the situation of sexual glands and the character of vitellaria; the ovary is intertesticular in *D. bipapillatum*, *D. californiae*, *D. gravidum* and *D. strombokhrynam* (pretesticular in *D. bagarii* sp. n.).

*D. sinipercae* resembles *D. bagarii* sp. n. by having uterine loops not extending anteriorly to space in front of vitellaria but situated in it in the location of the mouth opening (in posterior half of body below level of posterior testis in *D. siniperca* and in anterior half of body at level of ovary in *D. bagarii* sp. n.). A relatively smaller cirrus sac, larger measurements of the body (length 1.12–1.44 mm versus 0.61 to 0.80 mm) and eggs (0.038–0.042 × 0.021–0.024 mm versus 0.021–0.024 × 0.012 to 0.015 mm) and in the character of vitellaria; moreover, the number of spines of the rhynchus of *D. siniperca* is substantially greater (108) than that in *D. bagarii* sp. n. (about 60), these being, in contrast to the latter species, equal in size. *D. vulgaris* (h ere referred to as *D. vulgaris* sp. n.) and *D. siniperca* differ from *D. bagarii* sp. n. also in the host types (Perciformes versus Siluriformes).

*Doljufrestra bagarii* was collected in large numbers from the specimens of *B. bagarius* examined.

13. *Prosorhynchus vietnamensis* sp. n.

**Description** (5 specimens; measurements of holotype in brackets): Body elongated, 0.30–1.25 (1.06) long and 0.313–0.408 (0.381) wide. Cuticle covered with scale-shaped spines, these being dense and large in anterior half of body, but their density and size decreasing in posterior half of body; size of spines on anterior region of body 0.006–0.024 (0.006–0.015), length of rhynchus 0.120–0.150, its width 0.075–0.090. Mouth opening postequatorial, at anterior testis level; size of ovary muscular pharynx 0.042–0.078 × 0.042–0.063 (0.069 × 0.069). Intestines directed anteriorly. Oval and testes situated on right side in posterior half of body. Oval shape, size 0.060–0.105 × 0.060–0.090 (0.090 × 0.060), partly overlapping anterior testis. Testes tandem or diagonal; size of anterior testis 0.090–0.192 × 0.072–0.156 (0.093 × 0.075), of posterior one 0.096–0.165 × 0.075–0.096 (0.096 × 0.096). Genital pore ventro-terminal. Cirrus sac located on left side of body, its length 0.340 to 0.408 (0.340), width 0.095–0.125 (0.122); it contains bipartite seminal vesicle, elongate prostatic part and ejaculatory duct opening into genital atrium. Uterus long, its loops filled in with numerous eggs occupying most space below vitellaria and anteriorly extending far in front of vitellaria. Mature eggs opecurlated, oval in shape, 0.027 to 0.033 (0.027–0.030) long and 0.015–0.018 (0.015) wide. Vitellaria forming equatorial transverse row of 22–24 follicles at intestinal level.

**Type host**: *Bapurus bogarius* (Siuridae, Siluriformes).

**Localization**: Intestine.

**Type locality**: Red River near Hanoi, Vietnam (date of collection not exactly determined — 1960–1975).

**Deposition of type specimen**: Institute of Parasitology, Czechoslovak Academy of Sciences,
Comments: — In spite of the presence of minute spines on the rhynchos, this species has been assigned to Prosohynchus Odhner, 1905 and not to Dolfusotrema Eckmann, 1934, because the latter genus is characterized by the rhynchos provided with the triple crown of spines that are larger than those of the body surface (see Yamasu 1971).

Out of many species of Prosohynchus (see Kryabin and Gushanskaia 1962, Yamasu 1971, Wang 1985), largely parasitic in marine fishes, the new species is most similar to P. synanceiae Wang, 1985, especially when the situation of the vitellaria and the mouth, distribution of gonads and extention of the uterus are considered. However, the body of the latter is approximately four-times larger than that in P. vietnamensis sp. n. (4.00–4.32 mm versus 0.95–1.25 mm) and the relative size of its cirrus sac to the length of body is much smaller. Moreover, the hosts of both these species belong to two different orders (Siluriformes versus Scorpiformes). From other congers P. vietnamensis sp. n. differs in a number of features, from most of them e.g. in the equatorial position of vitellaria and postequatorial distribution of the mouth opening and gonads, character of the rhynchos, extent of the uterus, size of eggs, etc. P. vietnamensis sp. n. is the first Prosohynchus species described from a freshwater fish in Vietnam. In the host fish it occurred along with Dolfusotrema bagarri, being, however, much less frequent.

14. Prosohynchus sp. juv.

Description (15 specimens): Body ovoid, oval or elongate-ovoid; length 1.06–2.80, maximum width 0.476–0.612. Whole body surface spines, scale-shaped spines very dense on anterior half of body and scarce on posterior one; maximum size of spines (0.018–0.624) in region between posterior end of rhynchos and proximal end of intestine. Rhynchos relatively small, funnel-shaped, provided with 4–5 transverse rings of minute spines; length of rhynchos 0.084–0.144, its width 0.075–0.132. Mouth opening postequatorial, at anterior testis level; size of ovum muscular pharynx 0.105–0.150 × 0.096–0.150. Intestine large, directed anteriorly. Ovary intertesticular or pretesticular, size 0.066–0.186 × 0.066–0.186. Size of anterior testis 0.150–0.252 × 0.114–0.270, of posterior testis 0.135–0.219 × 0.135–0.192. Genital pore ventroterminal. Cirrus sac located on left side of body, anteriorly reaching

Fig. 4. A, B — Prosohynchus vietnamensis sp. n. (A — general view; B — anterior sucker); C — Metatembus bagarri sp. n.; D — Phylodistomum sp. from B. bagarri.

Fig. 5. A, B — Prosohynchus sp. juv. from G. leporeus (A — general view; B — posterior part of a specimen with distinctly pretesticular position of ovary); C — Isoparichthys hypsobatis (Bület, 1898) juv.
level of posterior testes; its length 0.313–0.490, width 0.109–0.163. Eggs not yet present. Vitellaria forming transverse row of 20–30 follicles at intestine level.

**Hosts:** Gymnostomum leptura, Squilla japonica, Citharinus molairella (all Cyprinidae) and Hemibagrus elongatus (Bagridae).

**Localization:** intestine.

**Comments:** — Only young, non-gravid forms were obtained; the most advanced specimens originated from *G. leptura*.

**Fam.**: Cryptogonimidae (Ward, 1917)

15. *Metadena bagari* sp. n.

**Description** (1 specimen): Body oval, spinulately, 0.625 long and 0.313 wide. Oral sucker sub-terminal, larger than acetabulum, size 0.090 × 0.093; acetabulum small; 0.075 in diameter, embedded in body parenchyma; size ratio of both suckers 1:1.22. Pharynx large, size 0.090 × 0.063; osophagus indistinct; caeca terminating somewhat below posterior ends of testes, 0.111 from posterior end of body. Testes large, symmetric, almost postequatorial, overlapping caeca. Seminal vesicle not extending posterior to acetabulum. Genital pore immediately postacetabular. Ovary small, size 0.030 × 0.033, almost spherical, situated slightly to left of median line behind acetabulum. Vitellaria multifollicular, extending in lateral and dorsal areas from level of pharynx to that of posterior margin of acetabulum. Only several eggs present in uterus, their size being 0.015–0.018 × 0.009.

**Type host:** Bagarius bagarius (Siuroridae, Siuriniformes).

**Localization:** intestine.

**Type locality:** Red River near Hanoi, Vietnam (date of collection not exactly determined — 1969–1975).

**Deposition of type specimen:** Institute of Parasitology, Czechoslovak Academy of Sciences, České Budějovice, Helm. Coll. Cat. No. D-223 (holotype).

**Etymology:** The specific name of this species has been derived from the generic name of its fis host.

**Comments:** — This trematode has been tentatively assigned to the genus *Metadena* Linton, 1910, but its appurtenance to this genus will have to be verified by subsequent studies based on more numerous material. As far as we know, this is the first *Metadena* species hitherto described from a freshwater fish; all other congeneric species are known exclusively from marine fishes. This new species also shows affinities with the related genus *Eozorichia* Kobayashi, 1915 with the only species *E. oiformis* Kobayashi, 1915 from the freshwater catfish *Parasitus asias* in Japan and China, differing from it, however, mainly in the situation of testes and in the character of vitellaria (the latter caeca and vitellaria forming two lateral groups of follicles in *Eozorichia*). Of several species of *Metadena*, all originating from marine fishes, *M. bagari* sp. n. is closest to *M. crassulata* Linton, 1910, differing from it mainly in the shape of the ovary (transverse, multilobed ovary in *M. crassulata* versus almost spherical ovary in *M. bagari* sp. n.), extent of caeca (caeca extending posteriorly to body end in *M. crassulata* and only slightly below testes in *M. bagari* sp. n.) and in the body measurements (body length 1.83 mm versus 0.63 mm). From *M. erystoma* Oshmarin, 1965, a species described from a marine scinid fish in Vietnam, *M. bagari* sp. n. differs mainly in the shape of the oral sucker; the latter forms a special extension at its posterior end in *M. erystoma*; the body length of this species is much greater (1.8 mm).

**Fam.** Isoparorchidae Travassos, 1922
LIST OF VIETNAMESE ENDOHELMINTHS BY HOST FISHES
RECORDED BY PRESENT AUTHORS

(T = Trematoda; A = Acanthocephala; N = Nematoda)

Order Cypriniformes
Fam. Cyprinidae:

Opsiarchithys uncirostris:
A — Dendronucleata petruschewskii

Squaliobarbus curriculatus:
T — Carassotrema koreanum, Prosorhynchus sp. juv.; A — Dendronucleata petruschewskii, Pseudorhadinorhynchus vietnammensis; N — Rhabdochona sp. 1

Spinibarbichthys denticulatus:
T — Amurotrema dombrowskajae, Platycladorchis microacetabularis, Neoditrichis multilobularis; N — Spironoura babei, Hakygnema vietnammensis

Lissocladius kremphi:
T — Platycladorchis macroacetabularis; N — Spironoura kaverii

Gymnostomus lepturus:
T — Prosorhynchus sp. juv.; A — Dendronucleata petruschewskii; N — Rhabdochona hakyi

Erythroculturetac recurvirostris:
A — Cleaveius longirostris

Hemiculter leuciscus:
T — Carassotrema koreanum; A — Dendronucleata petruschewskii; N — Rhabdochona jiangtensis, Rk. hakyi

Cirrhina molitorella:
T — Prosorhynchus sp. juv.; A — Dendronucleata petruschewskii, Cleaveius longirostris; N — Rhabdochona sp. 2 juv.

Megalobrama terminalis:
A — Dendronucleata petruschewskii; N — Rhabdochona sp. 2 juv., Rhabdochona sp. 3 juv.

Megalobrama hoffmani:
N — Proleptinae gen. sp. larv.

Elopichthys bambusa:
N — Meterakis japonica

Acanthorhodeus fortemanus:
A — Palisentis ophiocephali juv.; N — Pinguic irsinus, Spinicipes sp. juv.

Order Siluriformes
Fam. Bagridae:

Hemibagrus elongatus:
T — Prosorhynchus sp. juv.; A — Dendronucleata petruschewskii; N — Procamallanus fulvidraconis, Spinicipes ranar, Rhabdochona hakyi, Paragendria sp.

Pseudobagrus fulvidracus:
N — Procamallanus peterea, (? Spinicipes ophiocephali

Pseudobagrus vachelli:
T — Bucephalopis ozaki; A — Dendronucleata petruschewskii

Fam. Cranoglanidiidae:

Cranoglanis sinensis:
N — Procamallanus fulvidraconis, Rhabdochona vietnammensis, Rh. hakyi

Fam. Pangasiidae:

Pangasius pangasius:
N — Hysterophysacium fluviatile larv.

Fam. Sisorididae:

Bagarius bagarius:
T — Dolichostoma bagarius, Prosorhynchus vietnammensis, Metadema bagarius, Phyllodistum sp.; A — Cathagacanthus bagarius; N — Camallanus cotti, Procamallanus bagarius, Spinicipes sp. juv. Rhabdochona hakyi juv.

Fam. Claridae:

Clarias fuscus:
T — Phyllodistum claridae, Orientocreadium batrachoides, Masenidae pollata, N — Proleptinae gen. sp. larv.

Fam. Ariidae:

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Arius sinensis; 
A — Paradentirincus longirocapracus; N — Rhabdodona hakyi juv.
Order Synbranchiformes
Fam. Synbranchidae:

Monopterus albus: 
A — Neosetis celadus
Order Perciformes
Fam. Gobiidae:

Glossogobius giuris: 
A — Cleaveus longirostris

Rhinohippus hadropurus: 
A — Cleaveus longirostris; N — Rhabdodona vietnamensis, Rh. hakyi juv.

Saurogobius dobyri: 
T — Carassotema koreanum, Bucephalopsis osakii
Fam. Channidae:

Ophichopus maculatus: 
T — Asyuga hongkongii, Isosporhacis hypselobagri juv.; A — Palisena ophiophagei; N — Spinnosus ophiophagei; (1) Neoscmallanus ophiophagei, Pinguis sinensis, Gnaothoata hispidum larv.

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The phylogenetic relation between man and nonhuman primates enables a transvulsion of different microorganisms and other pathogenic agents during their mutual contacts at various levels. Although the monkeys and apes are more threatened with catching the microorganisms indigenous to man than contrariwise, outbreaks of true zoonoses with nonhuman primates as the source of infection have occurred. Human infections of simian origin may be caused by several viruses, bacteria, fungi or endoparasites; ectoparasites are of little importance. In spite of the fact that this represents a risk to human health, the information concerning the different agents transmissible between man and simian has been too disseminated for practical use. That is the reason why Dr. Manfred Brack of the German Primate Centre at Göttingen (FRG) compiled this book containing all present knowledge of this topic from various scientific disciplines such as, e.g., virology, bacteriology, parasitology and laboratory animal science.

The volume is divided into nine main chapters dealing with individual groups of agents (viruses, molluscs, bacteria, fungi, Plasmodium vivax, protozoans, nematodes, trematodes, and cestodes). Each chapter contains details on general aspects, pathogenesis, characteristics of cycles, geographic spread, clinical symptoms and morphological changes in simians and man; where it is possible, an advice for the therapy is given. The book is well arranged, as a very good professional level, the text is supplemented with numerous illustrations, photographs, tables, and extensive references and bibliography. It is to be regretted that the scientific names of parasites are not in accord with the valid International Code of Zoological Nomenclature (capital letters are used for the specific names, the spelling of some names is absolute (S. felleborni should be written S. felleborni), and in some cases (e.g., in some helminths) new taxonomic papers are not considered and older specific or generic names are used (e.g., Capillaria hepatica).

Regardless of these shortcomings, the book is recommended as a useful and important source of information for physicians, veterinarians, parasitologists and biologists working with nonhuman primates, since it presents the results of an interdisciplinary research in this field.

Dr. F. Morave, DSc.