Trematodes of the genus *Crepidostomum* (Digenea: Allocreadiidae: Crepidostominae) from freshwater fishes of Japan

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The following digenetic trematodes are described and figured from Japanese freshwater fishes: *Crepidostomum chaenogobii* Yamaguti et Matumura, 1942; *C. farionis* (Müller, 1780) Lühe, 1909; *C. metoecus* (Braun, 1900) Braun, 1900; *C. salmonis* Fujita, 1921, sp. inq.; and *C. uchimii* Fujita, 1920, sp. inq. (Allocreadiidae: Crepidostominae). Data on their hosts, geographical distribution and life cycles are given.

Key words: digeneans, *Crepidostomum*, Allocreadiidae, freshwater fishes, Japan

This paper, the second in a series of studies on the digenetic trematodes of the Japanese freshwater fishes, deals with species of the genus *Crepidostomum* Braun, 1900, in the subfamily Crepidostominae Dawes, 1947, in the family Allocreadiidae Looss, 1902.

The materials and methods and the diagnosis of the Allocreadiidae have appeared in the first paper (Shimazu, 1988).

Subfamily Crepidostominae Dawes, 1947

Synonyms: Stephanophialinae Nicoll, 1909; Crepidostomatinae Dawes, 1947; Crepidostominae Yamaguti, 1958.

Diagnosis. Allocreadiidae. Body oculate or not. Oral sucker possessing one pair of ventrolateral and two pairs of dorsal muscular papillae at its anterior part. Uterus usually pretesticular, rarely extending even into posttesticular region. Uterine eggs not embryonated. Vitellaria distributed from pharyngeal level to posterior end of body, confluent behind posterior testis. Parasites of pyloric ceca and intestine usually of freshwater fishes and rarely of amphibians, reptiles and bats (accidental?).

Ophthalmoxiphidiocercariae produced in daughter rediae in sphaeriid bivalves or lymnaeid snails; flame cell formula reportedly $2[(2+4)+(4+3+3+3)]=38$ or $2[(2+2+2)+(2+2+2)]=24$. Metacercariae

encytsing in aquatic arthropods such as gammarids, mayfly nymphs and crayfish, occasionally attaining sexual maturity to bear eggs while still in them.

Type genus: *Crepidostomum* Braun, 1900.

Discussion. This diagnosis has been based mainly on Yamaguti (1971, 1975) and the present study. Japanese members of the subfamily belong to the genus *Crepidostomum* Braun, 1900.

Genus *Crepidostomum* Braun, 1900

Synonyms: *Acrodactyla* Stafford, 1904; *Stephanophiala* Nicoll, 1909; *Acrolichanus* Ward, 1917.

Diagnosis. Allocreadiidae: Crepidostominae. With the characters of the subfamily.

Type species: *Distomum metoecus* Braun, 1900.

Discussion. Japanese species of the genus have been known only from Hokkaido as follows.

Crepidostomum chaenogobii Yamaguti et Matumura, 1942

(Figs. 1-4)

Material examined. 1) Lot 1. Two gravid whole-mounts (holotype and paratype, MPM Coll. No. 22289) of *C. chaenogobii* of Yamaguti and Matumura (1942) from the intestine of *Chaenogobius annularis urotaenia* [=*Ch. urotaenia*] (Gobiidae) from Sapporo (other data not given).

2) Lot 2. One gravid whole-mount (NSMT-Pl 3072) from the intestine of *Ch. urotaenia* (=*Ch. annularis*, the middle-reaches type) from the Tobetsu River, Kamiiso, on August 26, 1984.

3) Lot 3. Three immature and 76 gravid whole-mounts (NSMT-Pl 1846-1852) of *C. chaenogobii* of Shimazu (1981) from the intestine of *Cottus nozawae* (Cottidae) from the Ashibetsu River near Kushiro on May 10, 1977.

4) Lot 4. Two immature and 6 gravid whole-mounts (NSMT-Pl 3073 and 3074) from the intestine of *Co. amblystomopsis* from the Oono River near Hakodate on August 20, 1984.

5) Lot 5. Eleven gravid whole-mounts (NSMT-Pl 3075) from the pyloric ceca and intestine of *Co. amblystomopsis* from the Tobetsu River on August 26, 1984.

6) Lot 6. Seventy-nine gravid whole-mounts (NSMT-Pl 3076-3085) from the pyloric ceca and intestine of *Co. hangiongensis* from the Tobetsu River on August 26, 1984.

Description. 1) For the original description and figures for *C. chaenogobii*, see Yamaguti and Matumura (1942). They fully described and figured it from the two specimens (lot 1).

2) For lot 3, see Shimazu (1981).

3) From lots 2 and 4-6; 30 adults measured (Figs. 1-4). Body almost cyclindrical, 0.94-1.70 by 0.30-0.52; forebody 0.30-0.52 long, 29-32% of total body length. No eyespots seen even in small immature worms. Gland cells (hypodermic?) well developed in forebody. Oral sucker 0.13-0.20 by 0.14-0.21; ventrolateral papillae conical, small; dorsal ones round, large. Prepharynx short. Pharynx globular, 0.05-0.06 in diameter;

ratio of pharynx width to oral sucker width 1: 0.29–0.47. Esophagus long, bifurcating in front of ventral sucker; intestinal ceca ending about midlevel in posttesticular region. Ventral sucker usually smaller than oral sucker, situated about anterior third of body, 0.12–0.17 by 0.14–0.20; sucker width ratio 1: 0.81–1.19.

Testes spherical, large, tandem, contiguous, about posterior third of body, posterior one always larger than anterior, 0.13–0.24 in diameter. Cirrus pouch long, rather thick-walled, occasionally reaching to anterior testis, 0.30–0.55 long. Seminal vesicle usually divided into two plump parts. Pars prostatica elongated. Cirrus long, slightly protrusible. Genital atrium small, cup-shaped. Genital pore nearly bifurcal. Ovary globular to elliptical, submedian or almost lateral, 0.09–0.16 in diameter. Ootype complex submedian, postovarian. Seminal receptacle 0.04–0.08 by 0.04–0.05. Laurer's canal short. Uterus forming a few pretesticular loops; metraterm well developed, thick-walled, 0.05–0.16 long. Eggs fewer than 20, 60–72 by 40–48 μm in balsam. Vitelline follicles large, extending forward slightly beyond bifurcal level, sometimes interrupted at levels of ventral sucker, ovary and testes. Excretory vesicle extending anteriorly a little farther than anterior testis or to seminla receptacle; excretory pore posteroterminal.

Discussion. Lots 2–6 are morphologically consistent with lot 1 and the description and figures for *C. chaenogobii* by Yamaguti and Matumura (1942). This species seems to be unique among known species of the genus in having a cylindrical body, no eyespots, well-developed gland cells in the forebody, larger papillae of the oral sucker and a well-developed metraterm.

The species has been recorded from *Chaenogobius urotaenia*, *Cottus amblystomopsis*, *Co. hangiongensis* and *Co. nozawae* of Hokkaido (Yamaguti and Matumura, 1942; Shimazu, 1981; this paper). Its life cycle is unknown.

Crepidostomum farionis (Müller, 1780) Lühe, 1909

(Figs. 5–9)

Synonyms: *Fasciola farionis* Müller, 1780; *F. truttae* Froelich, 1789; *Distomum laureatum* Zeder, 1800; *Stephanophiala vitelloba* Faust, 1918; *C. ussuriense* Lyaĭman, 1930; *C. nemachilus* Krotov, 1959.

Material examined. 1) Lot 1. Three gravid whole-mounts (NSMT-Pl 2174) of *C. farionis* of Shimazu (1981) from the pyloric ceca of *Salvelinus leucomaenis*(Salmonidae)from the Ashibetsu River near Kushiro on May 10, 1977.

2) Lot 2. Eleven gravid whole-mounts (NSMT-Pl 3086) from the intestine of *Oncorhynchus masou masou* (Salmonidae) from the Onishibetsu River, Sarufutsu, on July 15, 1984.

3) Lot 3. One immature and 1 gravid whole-mount (NSMT-Pl 3087 and 3088) from the intestine and rectum (accidental?) of *O. masou masou* from the Shokanbestu River, Mashike, on August 1, 1984.

4) Lot 4. One immature and 8 gravid

whole-mounts (NSMT-Pl 3089-3091) from the intestine of *O. masou masou* from the Nobusha River, Mashike, on August 2, 1984.

5) Lot 5. One gravid whole-mount (NSMT-Pl 3092) from the intestine of *Noemacheilus toni* (Homalopteridae) from the Shokanbetsu River on July 31, 1984.

Description. 1) For lot 1, see Shimazu (1981).

2) From lots 2-4, 11 adults of lots 2 and 3 and 8 adults of lot 4 (measurements in parentheses) measured (Figs. 5-8). Body elongated-obovate in lots 2 and 3, oblong in lot 4, 3.00-4.60 by 0.94-1.20 (1.50-2.00 by 0.70-0.90); forebody 0.80-1.10 (0.54-0.70) long, 24-32 (31-37) % of total body length. Eyespot pigments dispersed. Oral sucker small, 0.27-0.31 by 0.27-0.33 (0.20-0.22 by 0.20-0.21); papillae small, semi-elliptical, ventrolateral ones slightly larger than dorsal ones. Prepharynx short. Pharynx large, 0.16-0.20 by 0.19-0.21 (0.12-0.14 by 0.12-0.13); ratio of pharynx width to oral sucker width 1: 0.64-0.77 (1: 0.59-0.62). Esophagus long, bifurcating just in front of ventral sucker; intestinal ceca ending a little away from posterior end of body. Ventral sucker located about anterior third of body, 0.35-0.47 by 0.35-0.45 (0.25-0.31 by 0.27-0.31); sucker width ratio 1: 1.25-1.51 (1: 1.33-1.53).

Testes round, small, oblique or tandem, slightly postequatorial, 0.23-0.51 by 0.24-0.44 (0.21-0.31 by 0.26-0.39). Cirrus pouch claviform, 0.55-0.79 (0.29-0.41) long, sometimes extending posteriorly slightly beyond ventral sucker. Seminal vesicle thick and convoluted in proximal two-thirds, and thin and slender in distal third. Pars prostatica oval, small; prostatic cells many. Cirrus long, protrusible. Genital atrium shallow. Genital pore opening between pharynx and midlevel of esophagus, occasionally ventral to pharynx. Ovary globular or elliptical, submedian, preequatorial, 0.25-0.39 by 0.23-0.29 (0.16-0.24 by 0.17-0.20). Ootype complex median, preequatorial, lying side by side with ovary. Seminal receptacle small, usually postovarian. Laurer's canal short. Uterus usually pretesticular, rarely extending more posteriorly along anterior testis; metraterm fairly well formed, almost as long as cirrus pouch. Eggs many, 72-82 by 44-50 (70-80 by 42-50) μm in balsam. Vitelline follicles large, distributed densely from oral sucker to posterior end of body. Excretory vesicle extending forward to anterior border of anterior testis or to seminal receptacle; excretory pore almost posteroterminal.

3) From lot 5 (Fig. 9). Body elongated-obovate, 4.60 by 1.20; forebody 1.30 long. Oral sucker 0.33 in diameter. Pharynx 0.16 in diameter; ratio of pharynx width to oral sucker width 1: 0.46. Ventral sucker 0.51 by 0.53; sucker width ratio 1: 1.56. Testes tandem, large, 0.56-0.71 by 0.47-0.63. Cirrus pouch long, reaching ovary, 0.95 long. Ovary small, 0.30 by 0.31. Eggs smaller, 54-58 by 46-58 μm in balsam. Vitelline follicles smaller, thinner.

Discussion. The excretory vesicle is somewhat variable in anterior extent in these specimens, ending dorsal to the anterior testis or reaching to the seminal receptacle.

A similar variation has been noted in the British form of this species (Brown, 1927; Thomas, 1958). In other European and North American forms, the organ usually extends to the seminal receptacle or ovary (Hopkins, 1934; Ślusarski, 1958).

Lot 5 slightly differs from the other lots in smaller eggs and smaller, thinner vitelline glands. In these features it is regarded as *C. nemachilus* Krotov, 1959, which was originally named from *Nemachilus barbatus* [sic] [=*Noemacheilus toni*] from Sakhalin (Krotov, 1959). *C. nemachilus* may possibly be valid. If not so, it is possible that the above-mentioned features are host-induced intraspecific variations within *C. farionis*. The trematode needs further studies. For the time being, I follow Skrjabin and Koval' (1966) who synonymized *C. nemachilus* with *C. ussuriense* from *Salvelinus* sp. (Salmonidae) of Peter the Great Bay off Vladivostok, Primorye, USSR, and Hopkins (1934) and Bykovskaya-Pavlovskaya (1962) who reduced *C. ussuriense* to a synonym of *C. farionis*.

Seki (1975) reported trematodes under the name *C. farionis* from the intestine of *S. leucomaenis* from Panketo (a lake), Akan, and of *Salmo gairdneri irideus* [=*Salmo gairdneri*=*Oncorhynchus mykiss*] (Salmonidae) from Lake Shikaribetsu neak Kamishihoro. I reexamined a part (32 slides containing 98 specimens) of his material (No. 374; June 20, 1974) from *O. mykiss*. It was composed of 21 *C. farionis*; 61 *C. metoecus* (Braun, 1900) Braun, 1900 (including the specimen figured as *C. farionis* by him, plate I, fig. 2); 13 *Allocreadium tosai* Shimazu, 1988; and 3 *Azygia perryii* Fujita, 1918. Other slides need reexamination as well. He also recorded *C. metoecus* from the intestine of *Salvelinus malma* [=*S. malma malma*] from Lake Shikaribetsu. A part (32 slides containing 82 specimens) of his material (No. 375; August 30, 1974) proved to consist of 10 *C. farionis* and 72 *C. metoecus*. These 31 specimens of *C. farionis* morphologically agreed well with those of lots 2-4. Seki obtained an unidentified specimen of *Crepidostomum* from the intestine of *S. malma malma* of Lake Shikaribetsu. Shimazu (1981) considered it (No. 376; August 30, 1974) to be *C. farionis* though the uterus did descend into the intertesticular space, as described and figured by Seki. I found another specimen whose uterus occupied all available space of the hindbody in Seki's material of *C. farionis* (No. 374).

This species is a common and widespread parasite of the pyloric ceca and intestine of salmonids and some other fishes in the Holarctic region. Useful information on its life cycle appears in Yamaguti (1975), Moravec (1982) and Margolis and Moravec (1982). In Japan, it has been recorded from *Oncorhynchus masou masou*, *O. mykiss*, *Salvelinus leucomaenis* and *S. malma malma* and possibly *Noemacheilus toni* of Hokkaido (Seki, 1975; Shimazu, 1981; this paper), but its life cycle is unknown.

Crepidostomum metoecus (Braun, 1900) Braun, 1900

(Figs. 10-19)

Synonyms: *Distomum metoecus* Braun, 1900; *C. suecicum* Nybelin, 1932; *C. brumpti* Dinulescu,

1942; *C. faeroense* Bovien, 1932.

Material examined. 1) Lot 1. Sixty-one gravid whole-mounts, part of Seki's (1975) specimens of *C. farionis* (No. 374) from the intestine of *Oncorhynchus mykiss* (Salmonidae) from Lake Shikaribetsu (see above).

2) Lot 2. Seventy-two gravid whole-mounts, part of Seki's (1975) specimens of *C. metoecus* (No. 375) from the intestine of *Salvelinus malma malma* (Salmonidae) of Lake Shikaribetsu (see above).

3) Lot 3. Nine immature and 25 gravid whole-mounts (NSMT-Pl 2174 and 2175) of *Bunodera luciopercae* (Müller, 1776) Lühe, 1909, of Shimazu (1981) from the pyloric ceca and intestine of *Salvelinus leucomaenis* from the Ashibetsu River near Kushiro on May 19, 1977.

4) Lot 4. Eight immature and 28 gravid whole-mounts (NSMT-Pl 1846-1849) of *B. luciopercae* of Shimazu (1981) from the intestine of *Cottus nozawae* (Cottidae) from the Ashibetsu River on May 19, 1977.

5) Lot 5. Five immature and 26 gravid whole-mounts (NSMT-Pl 3066 and 3067) collected by Nagasawa from the intestine of *Chaenogobius urotaenia* (the freshwater type) (Gobiidae) from the Shin River, Hamanaka, on May 28 and June 11, 1981.

6) Lot 6. Eighty-eight gravid whole-mounts (NSMT-Pl 3056-3065) from the intestine and rectum (accidental?) of *Ch. urotaenia* (the freshwater type) from Lake Toro near Kushiro on June 28, 1984.

7) Lot 7. One immature and 10 gravid whole-mounts (NSMT-Pl 3068) collected by Nagasawa from the intestine of *Ch. laevis* from the Shin River on May 28, 1981.

Description. 1) From lots 1 and 2; 30 better-prepared adults measured (Figs. 10-14). Body elongate, 1.00-5.20 by 0.30-1.40; forebody 0.36-1.50 long, 27-40% of total body length. Eyespot pigments solid or scattered. Oral sucker large, 0.15-0.21 by 0.16-0.27; papillae semielliptical, large, nearly equal in size. Prepharynx short. Pharynx oval, small, 0.06-0.11 by 0.05-0.13; ratio of pharynx width to oral sucker width 1: 0.32-0.48. Esophagus bifurcating about midway between two suckers; intestinal ceca terminating near posterior end of body. Ventral sucker located about anterior third of body, 0.20-0.40 by 0.22-0.38; sucker width ratio 1: 1.27-1.59.

Testes usually irregular in outline, large, in tandem, usually contiguous, rarely separated by uterus, located at posterior third of body, 0.11-0.47 by 0.16-0.50. Cirrus pouch claviform, large, extending backward farther than ventral sucker and occasionally to anterior testis, 0.24-0.91 long. Seminal vesicle long, sinuous or convoluted. Pars prostatica oval, small. Cirrus long, protrusible. Genital atrium indistinct. Genital pore about bifurcal. Ovary round, submedian, 0.13-0.31 by 0.11-0.24. Ootype complex about median, at about ovarian level. Seminal receptacle elliptical, postovarian, 0.10-0.20 by 0.08-0.20. Laurer's canal short, dilated proximally. Uterus usually pretesticular, rarely reaching to posterior testis; metraterm weakly formed. Eggs few or many, not embryonated, 66-72 by 40-50 μm in balsam. Vitellaria distributed from pharyngeal level to posterior end of body.

Excretory vesicle ending dorsal to anterior testis; excretory pore posteroterminal.

2) From lots 3-7; 10 adults of lot 3 and 30 adults of lots 4 and 5 (measurements in parentheses) measured (Figs. 15-19). Body 0.95-1.87 by 0.34-0.51 (0.70-1.90 by 0.30-0.54). Eyespot pigments solid or dispersed. Gland cells present in cervical region. Oral sucker 0.13-0.19 by 0.15-0.20 (0.11-0.20 by 0.12-0.22); papillae small, semicircular, nearly equal in size. Prepharynx short. Pharynx small, 0.04-0.08 (0.05-0.09) in diameter; ratio of pharynx width to oral sucker width 1: 0.28-0.40 (1: 0.30-0.44). Esophagus bifurcating about midway between two suckers; intestinal ceca shorter, ending between level of posterior border of posterior testis and midlevel of posttesticular region. Ventral sucker located about anterior third of body, 0.17-0.28 in diameter (0.13-0.23 by 0.17-0.27); sucker width ratio 1: 1.11-1.40 (1: 1.11-1.46).

Testes round, large, tandem, in middle third of hindbody, 0.13-0.21 by 0.17-0.24 (0.12-0.23 by 0.18-0.31). Cirrus pouch claviform, curved or not, short, 0.15-0.30 (0.16-0.31) long, usually anterolateral to ventral sucker, rarely extending to posterior border of ventral sucker or farther backward than it when fully stretched. Seminal vesicle tubular, winding. Pars prostatica elongated. Cirrus long, protrusible. Genital atrium small. Genital pore about bifurcal. Ovary triangular or rounded, submedian, 0.11-0.17 by 0.09-0.13 (0.09-0.20 by 0.11-0.16). Seminal receptacle oval, large, between ovary and anterior testis, 0.10-0.15 by 0.06-0.09 (0.11-0.12 by 0.04-0.05). Laurer's canal short, dilated proximally. Uterus usually restricted pretesticular, sometimes entering inter- or post-testicular space. Eggs many, not embryonated, 55-65 by 33-44 (56-70 by 36-48) μm in balsam. Vitelline follicles distributed from pharyngeal level to posterior end of body. Excretory vesicle extending to midlevel of anterior testis; excretory pore posteroterminal.

The smallest three of immature specimens examined were: body 0.22-0.82 by 0.10-0.23; oral sucker 0.06-0.13 by 0.06-0.12; pharynx 0.03-0.05 by 0.02-0.05; ventral sucker 0.04-0.13 by 0.07-0.14; and sucker width ratio 1: 0.88-1.16. The cirrus pouch was small and still anterolateral to the ventral sucker.

Discussion. Lots 3 and 4 were tentatively identified as *B. luciopercae* by Shimazu (1981) mainly because the uterus descended into the posttesticular region in some of them. However, smaller specimens with the pretesticular uterus are closely similar to *C. metoecus*; the two suckers are larger; the sucker width ratio is likely to become gradually larger from less than 1: 1 to more than 1: 1.3 with growth of worms; the tandem testes are larger; the uterine eggs are unsegmented and smaller than those of *B. luciopercae* (Hopkins, 1934; Ślusarski, 1958; Moravec, 1969; Cannon, 1971); and the excretory vesicle ends dorsal to the anterior testis. In *B. luciopercae*, the ventral sucker is equal in size to or somewhat smaller than the oral sucker even in gravid worms; the uterine eggs are at different stages of development or occasionally fully embryonated to miracidia; and the

excretory vesicle extends forward as far as the seminal receptacle (Hopkins, 1934; Ślusarski, 1958; Cannon, 1971). At present I consider that lots 3 and 4 as well as the others belong in a single species, or *C. metoecus*, because they seem to fall within the range of morphological variation of this species (Skrjabin and Koval', 1966). Lots 3 and 4 include the largest specimens (more than 4 mm long) that have ever been recorded as the species. Minor differnces are seen between lots 1 and 2 and the others in the size of the body, the posterior extent of the intestinal ceca, the size of the cirrus pouch, and the number of the uterine eggs. Ślusarski (1958) observed a wide morphological variation in the specimens of *C. metoecus* from Polish salmonids.

The following five lots are also assigned to *C. metoecus* because they are morphologically similar to lots 3-7: (1) 25 immature and 3 gravid whole-mounts (NSMT-Pl 2176) of Shimazu (1981) from the intestine of *Hucho perryi* (Salmonidae) from the Settsuri River near Kushiro on April 10, 1976; (2) more than 60 whole-mounts(NSMT-Pl 3069) collected by Nagasawa from the intestine of *S. leucomaenis* from Lake Toro on May 15, 1981; (3) 6 gravid whole-mounts (NSMT-Pl 3070) collected by Nagasawa from the intestine of *Oncorhynchus keta* (smolt) (Salmonidae) from the Shin River on June 11, 1981; (4) 1 gravid whole-mounts (NSMT-Pl 3071) collected by Nagasawa from the intestine of *Gasterosteus aculeatus aculeatus* (Gasterosteidae) from Lake Shirarutoro near Lake Toro on September 19, 1981; and (5) 1 immature and 2 gravid whole-mounts (MPM Coll. No. 30010) labeled "*Crepidostomum uchimii*" in Dr. Ozaki's collection from "*Pungitius tymensis*" [=*P. pungitius tymensis*] (Gasterosteidae) from Hokkaido (other data not given). In the last, the eyespot pigments were present; the ventral sucker was fairly posterior to the intestinal bifurcation; the genital pore was just postbifurcal; and four eggs were 60-68 by 36-40 μm. These respects separate them from *C. uchimii* Fujita, 1920 (Fujita, 1920; this paper).

This trematode is also widely distributed in the Holoarctic region and lives in the pyloric ceca and intestine of salmonids and some other fishes and bats (possibly accidental hosts). Its entire life cycle has been elucidated in nature and experimentally (Awachie, 1968; Margolis and Moravec, 1982; Moravec, 1982; Sten'ko, 1982; Yamaguti, 1975). In Japan, it occurs in *Chaenogobius laevis*, *Ch. urotaenia* (the freshwater type), *Cottus nozawae*, *Gasterosteus aculeatus aculeatus*, *Pungitius pungitius tymensis*, *Hucho perryi*, *Oncorhynchus keta*, *O. mykiss*, *Salvelinus leucomaenis* and *S. malma malma* of Hokkaido (Seki, 1975; Shimazu, 1981; this paper), but its life cycle is unknown.

Crepidostomum salmonis Fujita, 1921, sp. inq.

(Fig. 20)

This trematode has been known only from the original description and figures for it by Fujita (1921). According to him, it was very rarely found in the intestine of *Oncorhynchus keta* (fry) (Salmonidae)

from brooks near Sapporo from April to June at that time.

Description. From the original description and figures for *C. salmonis* by Fujita (1921) with slight alterations (Fig. 20). Body elongated elliptical, 1.42 by 0.41, broadest at ventral sucker. Tegment smooth, thin, 0.003 thick; circular hypodermic muscles somewhat well developed, others poorly developed. Eyespot pigments small, [solid in fig. 1], one on each side of pharynx. Suckers unequal in a moderate distance. Oral sucker anteroterminal, transversely oblong, 0.12 by 0.15, bearing 6 fleshy, papilliform processes at its anterior margin. Pharynx short, 0.06 by 0.05. Esophagus inconspicuous, bifurcating in front of genital pore [or ventral sucker in fig. 1]; intestinal ceca almost straight, narrow, 0.05 thick, about 1 long, termminating 0.14 away from posterior end of body. Ventral sucker transversely oval, slightly preequatorial, 0.19 by 0.21.

Testes spherical, large, oblique, contiguous, ventral, at posterior third of body, 0.24 in diameter. Cirrus pouch cone-shaped, dorsal to ventral sucker, not muscular, 0.08 by 0.05. Seminal vesicle thin-walled, divided into elongated oval proximal (0.06 by 0.03) and S-shaped distal portion. Pars prostatica winding, 0.11 by 0.02, with many prostatic cells around it. Ejaculatory duct slender, thin, muscular. Genital atrium absent. Genital pore in front of ventral sucker, behind intestinal bifurcation. Ovary spherical, dextrally submedian between ventral sucker and anterior testis, 0.18 in diameter, a little smaller than testes. Ootype median at postovarian level, surrounded densely by Mehlis' gland. Seminal receptacle oval, large, closely behind ovary, 0.24 in diameter. Laurer's canal running transversely. Uterus narrow, short in few convolutions between ventral sucker and posterior edge of anterior testis; metraterm short, 0.03 wide. Eggs elliptical, a few in number, 0.08 by 0.07. Vitelline follicles irregular in shape, distributed in lateral, dorsal and ventral sides of whole length of body [or between oral sucker and posterior end of body in fig. 1]; vitelline reservoir not well pronounced. Excretory vesicle in posterodorsal portion, club-shaped [or I-shaped], 0.47 long, extending anteriorly beyond posterior testis [or ending at posterior one-third of anterior testis in fig. 1].

Discussion. According to Fujita (1921), this species is different from *C. farionis* in the position of the genital pore, though similar to it in the presence of the eyespots; and from *C. uchimii* Fujita, 1920, in the relative position of the ventral sucker and digestive tract, the uterine area, the presence of the eyespots and the egg size. Margolis (1982) stated that it is a synonym of *C. metoecus*. It certainly resembles the present specimens of lots 3-7 of *C. metoecus* in a small size of the body, small papillae of the oral sucker, the position of the genital pore, a large seminal receptacle and the anterior extent of the excretory vesicle. However, I prefer to retain it as a species inquirenda until Fujita's original material is restudied. I found no specimen of *C. salmonis* in Dr. Fujita's collection deposited at the Department of Applied Zoology,

Faculty of Agriculture, Hokkaido University, Sapporo, in August 1984.

Crepidostomum uchimii Fujita, 1920, sp. inq.

(Fig. 21)

This trematode has also been known only from the original description and figures for it by Fujita (1920). He described it from the intestine of *Oncorhynchus masou* [=*O. masou masou*] (Salmonidae) from the Nishibetsu River near Nemuro.

Description. From the original description and figures for *C. uchimii* by Fujita (1920) with slight alterations (Fig. 21). Body oblong, broadest at posterior third of body, 1.0-1.5 by 0.5. Tegument smooth, 0.006 thick; neither circular nor longitudinal hypodermic muscles well developed. [Eyespot pigments dispersed on both sides of pharynx in fig. 1.] Many unicellular glands opening outside at body surface, surrounding oral sucker. Suckers transversely oval, lying near together. Oral sucker subventral, 0.13 by 0.24, with 6 anterior processes 0.04 long. Prepharynx short. Pharynx elongated-oval, 0.18 by 0.10. Esophagus 0.24 by 0.03, bifurcating at midlevel of ventral sucker; intestinal ceca narrow, terminating about 0.18 away from posterior end of body. Ventral sucker 0.35 away from anterior end of body [or about anterior quarter of body in fig. 1], a little larger than oral, 0.20 by 0.35.

Testes elliptical, large, median, dorsal, tandem, contiguous; anterior one 0.64 away from anterior end of body[or about posterior third of body in fig. 1], 0.13 by 0.25; posterior one 0.17 by 0.27. Cirrus pouch clavate, thin-walled, not muscular, [extending posteriorly a little beyond ventral sucker in fig. 1], 0.18 by 01.10 [sic]. Seminal vesicle thin-walled, S-shaped. Pars prostatica 0.08 long, surrounded compactly by large prostatic cells. Ejaculatory duct 0.21 long. Genital atrium absent. [Genital pore ventral to posterior half of pharynx in fig. 1.] Ovary spherical, to right of median line between ventral sucker and testes, smaller than testes, 0.15 in diameter. Seminal receptacle oval, huge [but small in figs. 1 and 5], postovarian, 0.04 by 0.03. Laurer's canal running transversely, almost as long as a quarter of body width. [Ootype complex postovarian in fig. 5.] Uterus folding between ovary and posteroventral side of posterior testis; metraterm 0.21 by 0.02. Eggs 0.08 by 0.04 by 0.03 [sic]. Vitelline follicles marginal, [distributed from pharyngeal level to posterior end of body in fig. 1], uniting in posttesticular region. Excretory vesicle I-shaped, extending forward beyond anterior testis.

Discussion. According to Fujita (1920), this species differs from *C. farionis* and *C. cornutum* (Osborn, 1903) Stafford, 1904, in the intestinal bifurcation being dorsal to the ventral sucker, the cirrus pouch being not muscular, the body being smaller, the eggs being a little larger and the position of the genital pore [being ventral to the posterior half of the pharynx]. Margolis (1982) stated that it may be synonymous with *C. farionis*. It does resemble this species in a large pharynx, the position of the genital pore, the ventral sucker being larger

than the oral, a small seminal receptacle, the anterior extent of the excretory vesicle and the species of the host fish. However, it should remain a species inquirenda until Fujita's original material is reexamined.

In August 1984, I found three specimens in a vial (No. III-10) labeled "[*Crepidostomum uchimii* Fujita; Intestine of *Oncorhynchus masou*; the Nijibetsu River, Hokkaido; September 1918]" in Dr. Fujita's collection. They must have been part of the type series of *C. uchimii*. Unfortunately I failed to observe thier detailed morphology and to take their measurements at that time, because they were stored unstained in a preservative fluid. Later I wrote the curator to lend me the specimens and to permit me to make them into stained whole-mounts for reexamination, but he did not respond at all for some unknown reason.

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Explanation of Figures

Figs. 1-4. *Crepidostomum chaenogobii* in lot 6. 1: Adult, entire worm, ventral view. 2: Anterior part of body, dorsal view. 3: Terminal genitalia, ventral view. 4: Ovarian complex, dorsal view.

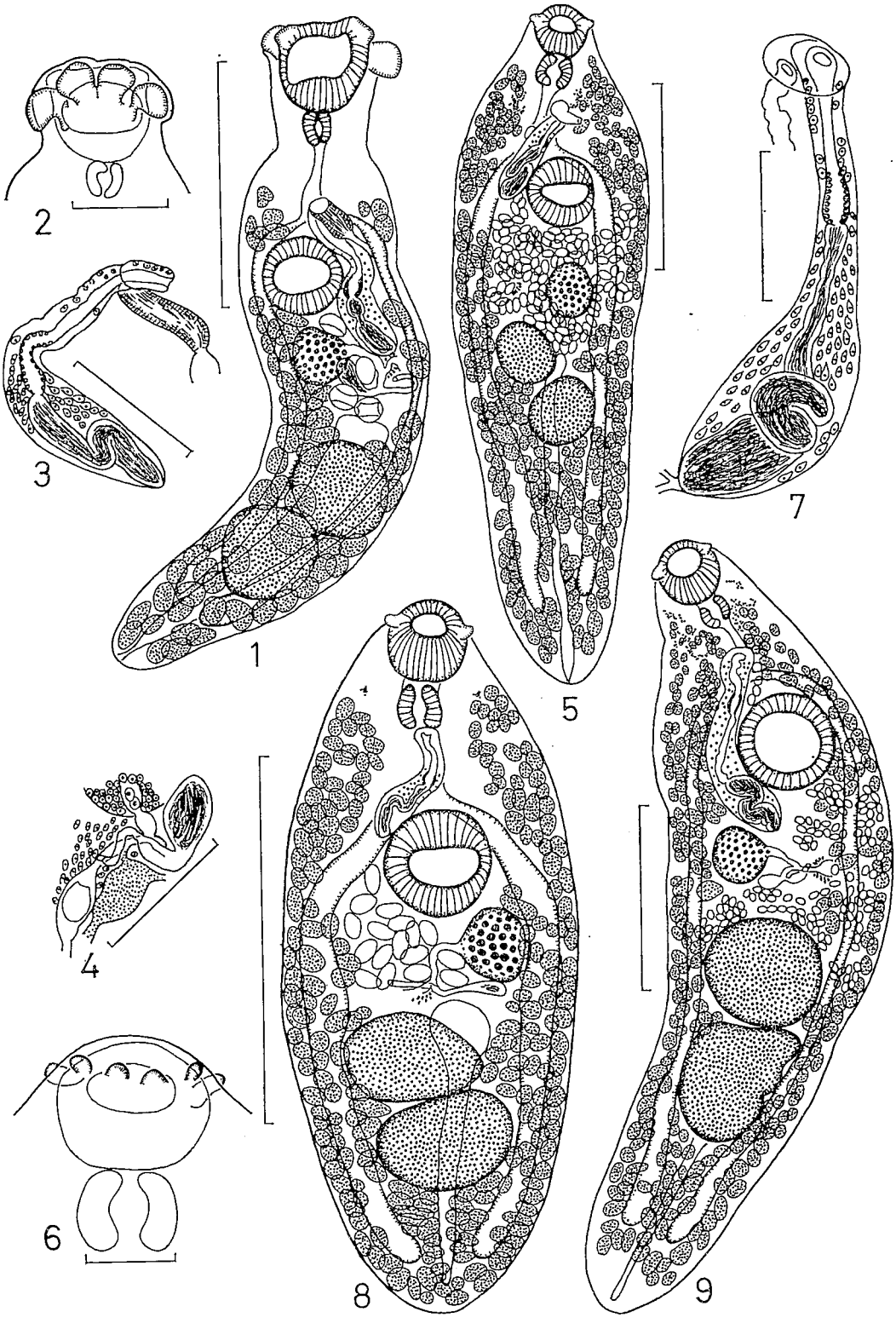
Figs. 5-9. *C. farionis*. 5: Adult in lot 2, entire worm, ventral view. 6: Anterior part of body in lot 2, dorsal view. 7: Terminal genitalia in lot 2, dorsal view. 8: Adult in lot 4, entire worm, ventral view. 9: Adult in lot 5, entire worm, ventral view.

Figs. 10-19. *C. metoecus*. 10: Adult in lot 1, entire worm, ventral view. 11: Anterior part of body in lot 1, dorsal view. 12: Terminal genitalia in lot 1, ventral view. 13: Ovarian complex in lot 1, dorsal view. 14: Adult in lot 2, entire worm, ventral view. 15: Adult in lot 3, entire worm, ventral view. 16: Anterior part of body in lot 3, dorsal view. 17: Cirrus pouch in lot 3, ventral view. 18: Ovarian complex in lot 3, dorsal view. 19: Adult in lot 6, entire worm, ventral view.

Fig. 20. *C. salmonis*, redrawn from Fujita (1921).

Fig. 21. *C. uchimii*, redrawn from Fujita (1920).

(Scale bars: 1 mm in Figs. 5, 8-10 and 14; 0.5 mm in Figs. 1, 15 and 19; 0.2 mm in Figs. 2-4, 6, 7, 11-13, 16 and 17; 0.1 mm in Fig. 18.)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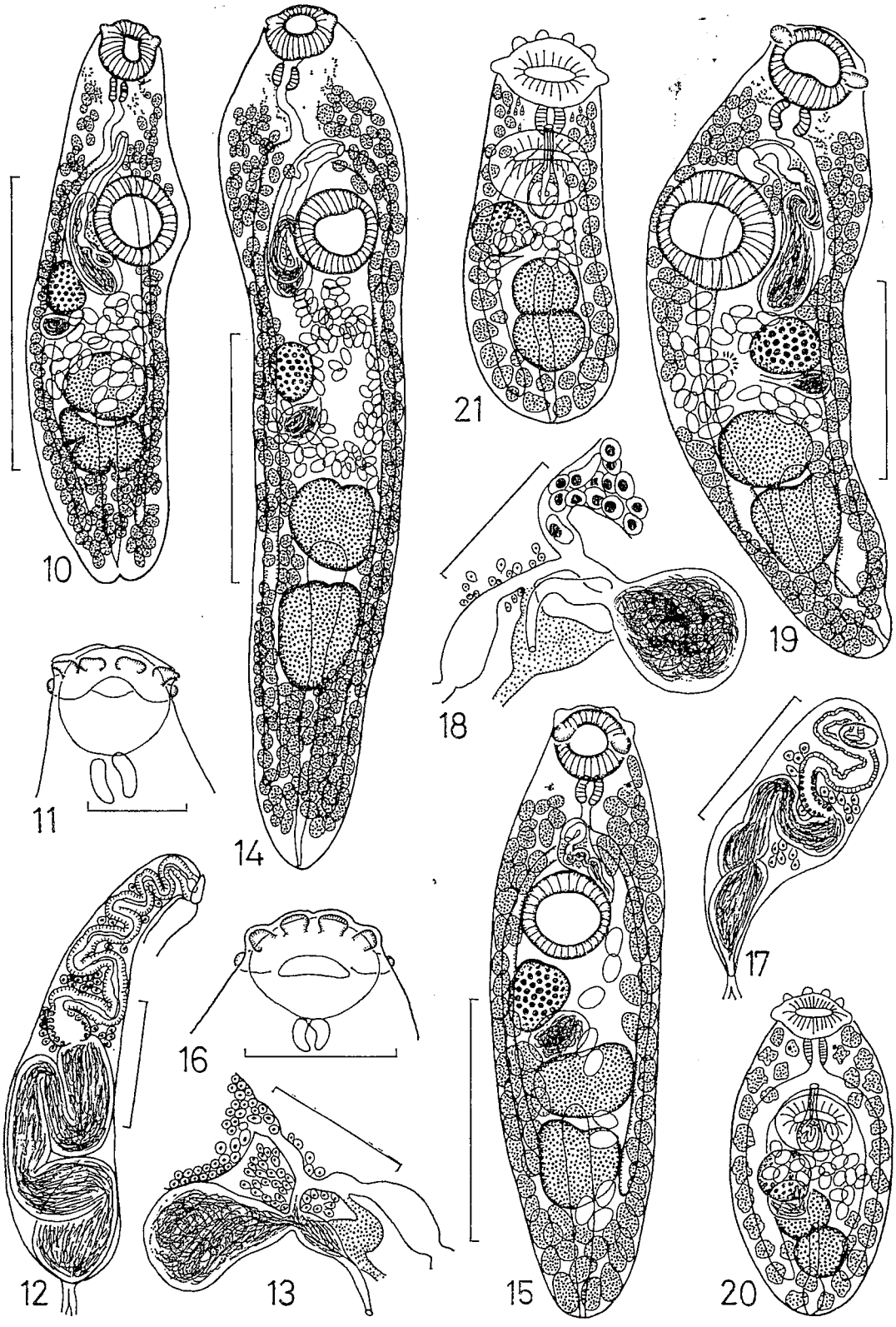
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