**REVIEW OF THE JAPANESE SPECIES OF CYSTIDICOLA, METABRONEMA AND RHABDOCHONA (NEMATODA) FROM SALMONOID FISHES**

**L. Margolis**  
(Fisheries Research Board of Canada, Biological Station, Nanaimo, B.C., Canada)

**ABSTRACT:** From a review of pertinent literature on the Japanese species of Cystidicola, Metabronema, and Rhabdochona from salmonoid fishes, the 16 named species have been reduced to 15 and 11 of them have been distributed among three genera as follows: Rhabdochona oncorhynchi (FUJITA, 1921) FUJITA, 1927 (syns. Cystidicola s. F., 1921; Rhabdochona o. FUJITA, 1940), R. fujii (FUJITA, 1921) FUJITA, 1927 (syns. Cystidicola f. F., 1921; Rhabdonema fujii (FUJITA) of KOJAYASHI, 1935, 1936; Rhabdochona fijii FUJITA (? 1941) of RASHEED, 1965), R. salvelini FUJITA, 1927, and R. amago YAMAGUTI, 1935; Cystidicoloides tenuissima (ZEDER, 1800) RASHEED, 1966 (syns. Spiroptera salvelini FUJITA, 1922; Cystidicola s. (F., 1922) FUJITA, 1928; Metabronema s. (F., 1922) BAYLIS, 1935; Cystidicoloides s. (F., 1922) DOLLFUS and CAMPANA-ROGET, 1956; Sterliadochona s. (F., 1922) ROYMAN, in press); Salvelinema salmonicola (ISHII, 1916) MARGOLIS, 1966 (syns. Oxyuris sp. KOSHIKA, 1905; Ancycacanthus s. I., 1916; Cystidicola s. (I., 1916) FUJITA, 1937; Cystidicola chitosensis FUJITA, 1940; "Cystidicola fariones" of ZHUKOV, 1960; Salvelinema cristata TROFIMENKO, 1962; Pseudometabronema sachalinense BOSGANNOVA, 1963), S. iwana (FUJITA, 1928) n. comb. (syns. Cystidicola i. F., 1928; Metabronema i. (F., 1928) FUJITA, 1937, S. oncorhynchi (FUJITA, 1939) n. comb. (syns. Metabronema a. F., 1939; Cystidicola a. (F., 1939) YAMAGUTI, 1961), S. kosugii (FUJITA, 1939) n. comb. (syns. Metabronema k. F., 1939), S. amemasu (FUJITA, 1939) n. comb. (syns. Metabronema a. F., 1939; Cystidicola a. (F., 1939) RASHEED, 1966), S. ishii (FUJITA, 1941) n. comb. (syns. Metabronema salvelini FUJITA, 1939; M. ishii F., 1941; Rhabdochona i. (F., 1941) YAMAGUTI, 1961). The generic position of the remaining four species was left unsettled because of insufficient available morphological information. These are Cystidicola brevicauda FUJITA, 1939, C. chikasuiFUJITA, 1941 (syns. C. minuta FUJITA, 1940; Metabronema minutum (F., 1940) YAMAGUTI, 1961), C. mesopii FUJITA, 1940, and Metabronema laicauda FUJITA, 1939. It is not likely that all species of Salvelinema and possibly of Rhabdochona are valid. Examination of syntype or topotypic material would be necessary to settle questions of synonymy at the specific level.

**INTRODUCTION**

A review of Japanese literature on the parasites of salmonoids, especially of Pacific salmonids (Oncorhynchus), was made in the mid to late 1950’s as part of a study (see INPFC, 1956-1961; MARGOLIS, 1963) on the use of parasites as indicators of the oceanic areas inhabited by the various North American and Asian stocks of Pacific salmonids.

More recently, this literature has been scrutinized more closely in conjunction with the author’s interest in examining the possibility of deriving information on the origin, phylogeny, and ancient routes of dissemination of salmonids in general, and Pacific salmonids in particular, from knowledge of the occurrence and distribution of their parasites.

For both above-stated objectives it is necessary for the identifications of parasite and host to be accurate. Unfortunately, there is considerable taxonomic confusion in the papers by the late Dr. T. FUJITA, who was largely responsible for the Japanese literature on the species of the spirurid nematode genera Cystidicola, Metabronema, and Rhabdochona from salmonoids. Furthermore, in several recent publications in which reference has been made to the original Japanese literature on the species of these genera from salmonoids, there are a number of omissions and inaccuracies concerning the taxonomy and nomenclature, and the hosts, of some species. The immediate purpose of this paper is to review the literature concerned with the Japanese species of spirurid nematodes reported from salmonoid fishes, pointing out, insofar as I have been able to determine, the errors and omissions in these publications. The
species covered are listed in chronological order of their establishment and include not only those known from within the present geographic boundaries of Japan, but also those described by Dr. Fujita from former Japanese territory (e.g., southern Sakhalin Is. and the Kurile Is.) and from Soviet Union territory in which Japan formerly held fishing leases. The literature on each species is also reviewed chronologically.

As a result of this review some taxonomic changes at the generic level are suggested. Revisions at the species level would require re-examination of syntypes or topotypic material.

In summarizing the information from each paper, host names will be given in scientific terminology; in cases where only the Japanese common name was provided by the author, this name will be given in parentheses following the scientific name. A list of Japanese common names with English and scientific equivalents is given below. This list is based primarily on Fukui (1958) and Okada (1960), and is arranged in alphabetical order of the transliterated Japanese common names.

1. Oxyuris sp.; Ancyracanthus salmonicola; Cystidicola salmonicola; Salvelinena cristata; Pseudometabronema sachalinense; Salvelinena salmonicola

Koshida, 1905. Described Oxyuris sp. (lapsus for Oxyuris) from the swimbladder of young Oncorhynchus keta (sake) and Oncorhynchus nerka var. adonis (kabachiepo) from a hatchery in Hokkaido. Gammarus sp. ("yokonomi") was found to be the intermediate host.

Kishida, 1910. Roughly same information as given in Koshida (1905) but the description contained fewer details, the parasite was not assigned to any genus, and the hosts were given as young O. keta (sake), Oncorhynchus masou (masu) and O. nerka var. adonis (himemasu).

Ishii, 1916. Described A. salmonicola n. sp. from the swimbladder of pond-raised
O. masou (as Salmo masou) in Chitose hatchery, Hokkaido, pointing out that Koshida (1905, 1910) had previously found it in the same hatchery and called it Oxyuris sp.


Fujita, 1931. Redescribed C. salmonicola, correcting errors in Ishii's (1916) description, on the basis of material from the swimbladders of the following fishes: Salmo gairdneri (syn. S. irideus) (nijimasu) from Aisaka hatchery in Aomori Prefecture (northern Honshu), O. masou (masu) from a hatchery in Chitose (Hokkaido), and O. keta (sake) from a hatchery in Hokkaido, pointing out that S. gairdneri (syn. S. irideus) or S. pluvius which were cited as hosts by earlier authors. O. kisutch and H. olidus had not been mentioned in previous publications.

White and Cable, 1942. In historical review of members constituting the genus Cystidicola, referred to Ishii's (1916) establishment of Ancyracanthus salmonicola and its subsequent transfer to Cystidicola by Fujita (1927a).

Skjabin et al., 1949. Included C. salmonicola in a list of the species in the genus Cystidicola and gave the hosts simply as “Salmonidae”.

Fukui, 1958. Reviewed the published literature (although Fujita's 1931 and 1943 publications were not mentioned) and gave the hosts of C. salmonicola (p. 622) as O. masou (masu), O. keta (sake), and S. pluvius (iwana); other hosts mentioned by previous authors were omitted. On page 584 the year of publication of Ishii's paper given incorrectly as 1911.


Fukui, 1961a. Reported C. salmonicola, without giving host or locality.

Fukui, 1961b. Again reviewed published literature, but with somewhat less detail than in 1958 paper and reported C. salmonicola from the swimbladder of O. keta (sake) from Aomori Prefecture and provided figures. In the literature review, stated that the host of Yamaguti's specimens of C. salmonicola was Oncorhynchus rhodurus (amago) whereas Yamaguti had given the host as S. malma. The date of publication of Ishii's paper again given (pp. 38, 39).
erroneously as 1911; on page 63, Fukui corrected this to 1916.

Yamaguti, 1961. Only Salmo (i.e., Oncorhynchus) masou and S. malma listed as hosts of “C. salmonicola (Ishii, 1916) Fujita, 1931”. Yamaguti incorrectly indicated that the transfer of Ishii’s species to Cystidicola was made by Fujita in 1931, whereas it was made in 1927.


Bogdanova, 1963. Described Pseudometabronema sachalinense gen. nov., sp. nov. from the swimbladders of O. masu (sic), S. malma, and Salvelinus leucomaenis from various rivers in southern Sakhalin.


Skribin et al., 1967. Listed C. salmonica in review of Cystidicola and gave only S. malma as a host. Noted that “Margolis (1966) and Roytman (in press)” referred this species to Salvelinena. The source of Fig. 297 was incorrectly given as Fujita (1931) instead of Ishii (1916). C. chitosensis and S. cristata treated as independent species, but P. sachalinense not mentioned. (However, Pseudometabronema regarded (p. 307) as a synonym of Salvelinena.)


Margolis and Karata, 1967. Described the structure of the buccal region in the genus Salvelinena, based partly on the material of S. salmonicola from British Columbia, Alaska, and Japan which Margolis (1967) used to redescribe this species.

2. Cystidicola oncorhynchi; Rhabdochna oncorhynchi

Fujita, 1921. Described Cystidicola oncorhynchi nov. sp. from the intestine of fry of Oncorhynchus keta from brooks in Sapporo, Hokkaido.


Fujita, 1937, 1943. Gave condensed version of the original (Fujita, 1921) description, under the name Rhabdochna (sic) oncorhynchi; host, O. keta (sake).

Fujita, 1940. Described Rhabdochna oncorhynchi sp. nov. from the intestine of O. keta from Sapporo, Hokkaido, and included R. oncorhynchi from O. keta in his summary table of nematodes from salmonoids of Japan; it is not evident whether this tabular listing refers to the species described in 1940 or that described in 1921.

Yamaguti, 1941. Used the combination R. oncorhynchi (Fujita, 1921) in making comparisons with a new species, R. tridentigeris.

Skribin, et al., 1949. Included R. oncorhynchi Fujita, 1940, from O. keta, in a list of the species in the genus Rhabdochna. Authors apparently were unaware of R. oncorhynchi (Fujita, 1921) Fujita 1927.

SAIDOV, 1953. In revision of *Rhabdochona* and proposal to establish two subgenera, *R. oncorhynchi* FUJITA, 1940, assigned to subgenus *Rhabdochona*.

FUJITA, 1958. Following literature review, "Rh. oncorhynchi (FUJITA, 1921) FUJITA, 1927 (=Cystidicola oncorhynchi)" listed (p. 624) as parasitic in *O. keta* (sake).

FUJITA, 1961a. Reported *Rhabdochona oncorhynchi*, without information on host or specific locality.

FUJITA, 1961b. Correcting an omission in his 1958 review of salmonoid parasites, FUJITA listed (p.66) "Rh. oncorhynchi (FUJITA, 1921) O. keta, 1938–40" from *O. keta* (sake). He considered (p. 43) *R. oncorhynchi* FUJITA, 1940, identical with *R. oncorhynchi* (FUJITA, 1921) FUJITA, 1927 and (p. 44) reported *R. oncorhynchi* from the intestine of *O. keta* (sake fry from Aisaka hatchery, Aomori.

YAMAGUTI, 1961. Listed "*R. oncorhynchi* (FUJITA, 1921), syn. *Cystidicola o. F.*", with *O. keta* as the host, and stated "*R. oncorhynchi* FUJITA, 1940, undoubtedly a young form of this species".

RASHEED, 1965. Mentioned *R. oncorhynchi* FUJITA, 1940, as being known from apparently immature female (male not known). RASHEED appeared to be unaware of *R. oncorhynchi* (FUJITA, 1921) FUJITA, 1927.


3. *Cystidicola fujii; Rhabdochona fujii*

FUJITA, 1921. Described *Cystidicola fujii* nov. sp. from the intestine of *Oncorhynchus nerka* and *Salvelinus kundscha* (syn. of *S. leucommaenis*) from Shikotsu Lake, Hokkaido.

FUJITA, 1927a. *C. fujii* transferred to *Rhabdochona* (lapsus for *Rhabdochona*).

KOBAYASHI, 1935, 1936. Based on FUJITA's record, *Rhabdonema fujii* (FUJITA) (lapsus for *Rhabdochona fujii*) listed as a parasite of *O. nerka* var. *adonis*.

FUJITA, 1937. Abbreviated description, based on the original, of *Rhabdochona* [sic] *fujii*; hosts, *O. nerka* var. *adonis* (himemasu) and *S. leucommaenis* (ame-masu).

CHOQUETTE, 1951a. Listed *Rhabdochona fujii* from *O. nerka* and *S. kundscha*, Japan.

SAIDOV, 1953. In revision of *Rhabdochona* and proposal to establish two subgenera, *R. fujii* [sic] assigned to the subgenus *Rhabdochona*.

FUJITA, 1958. Following review of literature, in which *Cystidicola fujii* incorrectly said (p. 585) to have been described by FUJITA from *O. nerka* var. *adonis* (himemasu) and *Oncorhynchus rhodurus* (amago) instead of *O. nerka* var. *adonis* and *S. leucommaenis*, FUJITA listed (p.624) "Rh. fujii (FUJITA, 1921) FUJITA, 1927 (=Cystidicola oncorhynchi)" as parasitic in *O. nerka* var. *adonis* (himemasu) and *S. leucommaenis* (ame-masu).

FUJITA, 1961b. Referred to FUJITA's report of *C. fujii* and the transfer to *Rhabdochona*, but incorrectly stated (p. 38) that the hosts were *O. nerka* var. *adonis* (himemasu) and *O. rhodurus* (amago) instead of *O. nerka* var. *adonis* and *S. leucommaenis* (ame-masu).

YAMAGUTI, 1961. Listed "*R. fujii* [sic] (FUJITA, 1921), syn. *Cystidicola f. F.*" as a parasite of *O. nerka*, Japan. *S. leucommaenis* (or *kundscha*) not included as a host.

RASHEED, 1965. Stated "*R. fijii* FUJITA (? 1941) probably belongs to the *Cystidicola*. The description of this species is not complete". This reference presumably is to *R. fujii* (FUJITA, 1921) FUJITA, 1927, the description of which clearly indicates *Rhabdochona* is the correct generic allocation.

SKRJABIN et al., 1967. *R. fujii* [sic] listed in review of *Rhabdochona* as parasitic
in O. nerka and "S. kundscha=S. leucomaenis", Japan.

4. *Spiroptera salvelini*; *Cystidicola salvelini*; *Metabronema salvelini*; *Cystidicoloides salvelini*; *Cystidicoloides tenuissima*; *Sterliadochona salvelini*

FUJITA, 1922. Described *Spiroptera salvelini* nov. sp. from the intestine of *Salvelinus kundscha* (syn. of *S. leucomaenis*), amemasu, and *Oncorhynchus nerka*, himemasu, from Shikotsu Lake, Hokkaido. (Associated with *Cystidicola* (i. e., *Rhabdochona* fujii).) Japanese common names of the hosts given in the Japanese text and scientific names of hosts given in the English summary.

FUJITA, 1928. Transferred *Spiroptera salvelini* to *Cystidicola* and reported it from Lake Biwa. In the Japanese text he gave the host name as iwana (i.e., *Salvelinus pluvius*) which, however, he called *Salvelinus malma* in the English summary. Considering the locality, *S. pluvius* would appear to be the correct host. FUJITA’s use of *S. malma* presumably stemmed from the confusion in taxonomy and nomenclature of Japanese salmonids and the apparent consideration at one time (see KOBAYASHI, 1935) that "iwana" was merely a variety or subspecies of *S. malma*. In the English summary, FUJITA incorrectly cited the year of publication of the original description as 1920. This error led to considerable confusion in publications of later authors.

KOBAYASHI, 1935. Apparently based on FUJITA’s (1928) report, *Cystidicola salvelini* was cited as a parasite of "Salvelinus malma var. pluvius" (Hilgendorf), iwana" (i. e., *S. pluvius*).

YAMAGUTI, 1935. Described *Cystidicola salvelini* (FUJITA, 1920) FUJITA, 1928, from the stomach and intestine of *S. malma* from Lake Biwa; 1920 as year of publication of original description by FUJITA was an error. Considering the locality, the host may well have been *S. pluvius*. BAYLIS, 1935. Transferred *Spiroptera* (*Cystidicola*) *salvelini* to *Metabronema*. Year of publication of FUJITA’s original description was given correctly as 1922 and the hosts were given as *S. kundscha*, *S. malma*, and *O. nerka*. These host names apparently were taken from the English summaries in FUJITA’s (1922, 1928) papers. KOBAYASHI, 1936. Same information as in KOBAYASHI (1935) with addition of statement that BAYLIS (1935) transferred *Cystidicola salvelini* to *Metabronema*.

FUJITA, 1937. Gave condensed version of original (FUJITA, 1922) description under the name *Cystidicola salvelini*. Hosts given as amemasu, *S. kundscha*; and himemasu, *O. nerka* (both Japanese vernacular and scientific terminology used by FUJITA). These host names taken from FUJITA’s 1922 paper. Information from his 1928 paper apparently was not included.

FUJITA, 1939. Noted that in 1922 he described *C. salvelini* from landlocked *O. nerka* and *S. kundscha* from Lake Shikotsu, Hokkaido. FUJITA, 1940. In a table summarizing nematodes from Japanese salmonids, *Metabronema* (or *Cystidicola*) *salvelini* (FUJITA, 1922) seems to have been omitted; a *Metabronema salvelini* from *S. kundscha* is listed, but it probably refers to *M. salvelini* FUJITA, 1939 (i. e., *M. ishii* FUJITA, 1941).

WHITE and CABLE, 1942. In historical review of members constituting the genus *Cystidicola*, referred to FUJITA’s (1920, lapsus for 1922) establishment of *Spiroptera salvelini* and his subsequent (FUJITA, 1928) transfer of it to *Cystidicola*.

FUJITA, 1943. Same information as FUJITA (1937) except that host names given only in Japanese vernacular, i. e., amemasu and himemasu.

CHOQUETTE, 1948. Considered "*Metabronema harwoodi* CHANDLER, 1931", "*Metabronema canadense* SKINKER, 1931", and "*Metabronema truttae* BAYLIS, 1935" as synonyms of "*Metabronema* (=*Spiroptera*)
salvelini Fujita, 1920". Choquette quoted Fujita as reporting the char hosts as S. malma in 1920 (sic) and S. kundscha in 1928; actually the char host given in Fujita’s 1922 paper is S. kundscha and that in the English summary of the 1928 paper is S. malma. Also, Choquette incorrectly stated that Yamaguti (1935) amplified the description under the name "Metabronema (Cystidicola) salvelini", whereas Yamaguti used the name Cystidicola salvelini. 

Skjenke et al., 1949. Included M. salvelini (Fujita, 1922) in a list of the species in the genus Metabronema. Hosts: S. kundscha, S. malma, and O. nerka. M. canadense, M. harwoodi, and M. truttae treated as independent species. “Spiroptera salvelini” Fujita, 1922”, “Rhabdochona salvelini” (Fujita, 1922) Fujita, 1927, 1928”, and “Cystidicola salvelini” (Fujita, 1922) Yamaguti, 1935 listed as synonyms of M. salvelini. Rhabdochona salvelini is a distinct species, described by Fujita in 1927, and should not be included in the synonymy of M. salvelini. Also, Fujita (1928) and not Yamaguti (1935) was responsible for the combination Cystidicola salvelini (Fujita).

Choquette, 1951b. Gave the hosts of “M. salvelini” (Fujita, 1920)” (lapsus for 1922) in Japan as S. kundscha, S. malma, and O. nerka. These host names are those given in the English summaries in Fujita (1922, 1928).

Campagna-Rouget, 1955. Mentioned “M. salvelini” (Fujita, 1920)” (sic) with the same three synonyms as proposed by Choquette (1948), but concluded that this species was not a Metabronema.

Dollfus and Campagna-Rouget, 1956. Transferred Spiroptera salvelini (Fujita, 1920) (sic) to Cystidicoloides and gave the hosts in Japan as S. malma and S. kundscha; O. nerka omitted as a host. Cystidicoloides salvelini was considered, pro tem, distinct from Cystidicoloides harwoodi (Chandler, 1931) Skinker, 1931 (syn. M. canadense Skinker, 1931) and Cystidicoloides truttae (Balyis, 1935) n. comb. Cystidicoloides was distinguished from Metabronema.

Fukui, 1958. Reviewed published Japanese literature and gave (p. 622) the hosts of “Spiroptera salvelini” (Fujita) (= Spiroptera salvelini Fujita) as S. pluvius (iwana), S. leucomaenis (amemasu), and O. nerka var. adonis (himemasu); and the hosts of “Metabronema truttae” Baylis, 1935 (=M. salvelini)” as S. leucomaenis (amemasu), O. nerka (benimasu), and S. malma (oshorokoma). The latter three hosts seem to have been based on Baylis’ (1935) citation of S. kundscha (=leucomaenis), O. nerka, and S. malma as hosts of M. salvelini (Fujita, 1922) in Japan. The hosts given for Cystidicola salvelini (Fujita) apparently were based on the records of Fujita (1922, 1928) and Yamaguti (1935), with the interpretation that the S. malma cited by these authors as a host in Lake Biwa actually was S. pluvius.

Fukui introduced confusion in listing C. salvelini and M. salvelini as separate species. In reviewing the literature, Fukui erroneously stated (p. 585) that Fujita originally reported Spiroptera salvelini from Oncorhynchus rhodurus (amago) and O. nerka var. adonis (himemasu) whereas Fujita actually gave the hosts in the Japanese text as S. leucomaenis (amemasu) and O. nerka var. adonis (himemasu) (or S. kundscha and O. nerka in the English summary).

Mamaev et al., 1959. Reported Metabronema salvelini (Fujita, 1922) from S. malma from Primore (Japan Sea coast of USSR), the Pacific Ocean in the vicinity of the Kurile and Komandorski islands, and southern Kamchatka; and from S. leucomaenis and Hucho taimen from Primore.

Zukov, 1960. Described Metabronema salvelini (Fujita, 1922) from S. leucomaenis from Shikotan Is. (southern Kurile Is.).

Fukui, 1961b. Reviewed previously published Japanese literature, but in less
YAMAGUTI, SPASSKY, RASHEED, 1966. In agreement with DOLLFUS BYKHOVSKAYA-PAVLOVSKAYA BOGDANOVA, 30 M. M. S. leucomaenis therefore is an objective synonym of Spiroptera salvelini. SYNONMY provided for Suggested SKRJABIN species, from FUJITA (1922), i.e., M. rhodurus appeared in his 1958 paper, i.e., Spiroptera salvelini (FUJITA, 1920) identical with that given by ZEDER, 1800), of the latter being a new combination for S. tenuissima (ZEDER, 1800). RASHEED gave a list of synonyms of C. tenuissima (ZEDER, 1800) n. comb.

SKRJABIN et al., 1967. Description given of M. salvelini (FUJITA, 1922), based on ZHUKOV'S (1960) account from S. leucomaenis. Hosts listed as “S. kundscha = S. leucomaenis”, S. malma, and O. nerka, but distribution given only as “USSR (Japan and Okhotsk Sea basins, and Pacific Ocean)”. Listed same synonyms as in earlier compilation (SKRJABIN et al., 1949), with same inaccuracies. M. canadense, M. harwoodi, and M. truttae treated as independent species. In historical review of Metabronema, SKRJABIN et al. (p. 447) stated that “ROYTMAN (in press)” transferred M. salvelini to Sterliadochaona and that he agreed with CHOQUETTE (1948) that M. canadense, M. harwoodi, and M. truttae are synonyms of M. salvelini (FUJITA, 1922) (i.e., Sterliadochaona salvelini).

Note: This species seems to be widely distributed among salmonids in Europe, Asia, and North America. Except for a few Soviet reports of M. salvelini (FUJITA, 1922) from territory which is adjacent to Japan or even at one time constituted part of Japan, the literature reviewed here only covers that which actually dealt with the Japanese records or has a bearing on questions of synonymy or taxonomy of the species. In particular, the extensive literature on Sterliadochaona tenuissima and its synonyms was not reviewed.

5. Rhabdochona salvelini

FUJITA, 1927a, 1927b. Described Rhabdochona (lapsus for Rhabdochona) salvelini nov. sp. from the body cavity of Salveli-
**6. Cystidicola iwana; Metabronema iwana**

**Fujita, 1928.** Described *Cystidicola iwana* nov. sp. from Lake Biwa; in the Japanese text the host was given as *Salvelinus pluvius* (iwana) but in the English text the host was given as *Salvelinus malma*. Presumably Fujita regarded the scientific name of iwana to be *S. malma*. The parasite was found in the “pleural cavity” of its host.

**Kobayashi, 1935, 1936.** Based on the original record, *C. iwana* listed as a parasite of *S. malma var. pluvius* (syn. of *S. pluvius*), iwana. Scientific and common names of host were given.

**Fujita, 1937.** Without explicitly stating so, *C. iwana* was transferred to *Metabronema* as *M. iwana* (Fujita) and an abbreviated description of this species, based on Fujita (1928), was presented. The host was given as *S. pluvius* (iwana).

**Fujita, 1939.** Remarked, incorrectly, that *M. iwana* from *S. malma* from Lake Biwa was the sole species of *Metabronema* known from salmonoid fishes.

**White and Cable, 1942.** *C. iwana* Fujita, 1928, included in historical review of species assigned to *Cystidicola*.

**Fujita, 1943.** Abbreviated description of *M. iwana* (Fujita), based on the original, was given. The host was not mentioned.

**Choquette, 1951a.** Listed *R. salvelini* Fujita, 1927, as parasitic in *S. fluvius* (sic), Japan.

**Saidov, 1953.** In revision of *Rhabdochna* and proposal to establish two subgenera, *R. salvelini* assigned to subgenus *Rhabdochna*.

**Fukui, 1958.** In literature review, referred (p. 585) to Fujita’s (1927a, b) description and listed (p. 624) *S. pluvius* (iwana) as host of *R. salvelini*.

**Zhukov, 1960.** Briefly described *R. salvelini* from *Salvelinus leucomaenis* from Shikotan Is. (southern Kurile Is.) and gave host of Fujita’s (1927a, b) specimens as *Salvelinus malma curilus* (Pallas).
made by Fujita (1937).

Fukui, 1958. Following review of Japanese literature (pp. 585, 587–589), Cystidicola hwana Fujita and Metabronema hwana (Fujita) are listed (p. 622) separately as parasites of Salvelinus pluvius (iwana).

Fukui, 1961b. Japanese literature reviewed again and Cystidicola hwana Fujita, 1928 recognized (pp. 39, 41) as having been transferred to Metabronema by Fujita in 1937.

Yamaguti, 1961. Listed C. hwana Fujita, 1928, as a parasite of S. malma, Japan. Yamaguti's notation that the original description was based on larval specimens is not borne out by Fujita's (1928) description and figures. No mention made of the fact that Fujita had transferred this species to Metabronema.

Rasheed, 1966. Agreed with Choquette (1951b) that the Metabronema hwana mentioned by Fujita in 1939 is the same species described by Fujita (1928) as Cystidicola hwana. Further, Rasheed stated that Yamaguti's (1961) retention of this species in Cystidicola "seems to be correct".

Skribin et al., 1967. C. hwana listed in review of Cystidicola with the host and locality given as S. malma, Japan.


7. Rhabdorchona amago

Yamaguti, 1935. Described Rhabdorchona amago n. sp. (♀ only) from the intestine of Oncorhynchus rhodurus (amago), Tazimai Province. Yamaguti did not provide the scientific name of the host, stating that it "is not settled".

Kobayashi, 1935. Based on the original record, R. amago listed as a parasite of Oncorhynchus miltschitsch var. macrostomus ( Günther), amago. Both scientific and common names of the host were given. The scientific name for "amago" is now recognized as O. rhodurus (or O. rhodurus var. macrostomus; see Tanaka, 1965).

Kobayashi, 1936. Based on the original record, R. amago listed as a parasite of O. rhodurus (amago).

Yamaguti, 1941. Described R. amago in greater detail (both ♀ and ♂) from the intestine of Salvelinus malma, Ozaida, Toyama Prefecture; and from Mogurnda obscura (a non–salmonoid fish), Obama, Hukui Prefecture.

Skribin, 1949. Included R. amago in a list of the species in the genus Rhabdorchona and gave the hosts as Salmonidae sp. and S. malma; M. obscura was not included.

Choquette, 1951a. In review of the genus Rhabdorchona, R. amago listed as a parasite of O. rhodurus (amago), S. malma, and M. obscura, Japan.

Saidov, 1953. In revision of Rhabdorchona and proposal to establish two subgenera, R. amago assigned to the subgenus Rhabdorchona.

Fukui, 1958. Based on Yamaguti's (1935) original record (p. 586), R. amago listed (p. 624) as a parasite of O. rhodurus (amago). No reference made to Yamaguti's later (1941) report.

Osmanov, 1958, 1959. Reported R. amago from Aral Sea basin, USSR. Hosts not mentioned in the 1959 paper but given in 1958 by their Russian common names as Barbus brachycephalus (Aral barbel), Barbus capito conocephalus (Turkestan barbel), and Pseudoscapirhynchus sp. ("lopatonos", a species of shovelnose sturgeon, which Skribin et al. (1967, footnote p. 318) considered to be P. kauffmani).

Mamaev et al., 1959. Reported R. amago from Primore (Japan Sea coast of USSR), in landlocked Oncorhynchus masu [sic] and S. malma.

Fukui, 1961b. In literature review of Japanese species of Rhabdorchona, Fukui referred to Yamaguti's (1935) original description of R. amago but not to his (Yamaguti, 1941) later, more detailed description.
YAMAGUTI, 1961. Listed *R. amago* from *S. malma* (which he incorrectly considered to be the scientific name of amago), Japan. Oddly enough, *Mogurnda obscura*, which was reported as a host in YAMAGUTI (1941), was not included in the Systema Helminthum.

BYKHOVSKAYA-PAVLOVSKAYA et al., 1962. Abbreviated description of *R. amago*, apparently based on YAMAGUTI (1941), was given. Hosts in USSR given in the text (p. 536) by their Russian common names as “mal’ma”, “golets” and “zhiloi” form of “sima”. According to the list of Russian common names and their scientific equivalents (pp. 685, 687, 689) the first and third of these fishes refer to *S. malma* and *O. masu* (sic) (landlocked form). The common name “golets” has a dual meaning; it may be a char (*Salvelinus alpinus* or *S. malma*) or a loach (*Nemachilus barbatulus*). In the host-parasite list (pp. 694, 695, 718) *O. masu* (sic), *S. malma*, and *N. barbatulus* are given as hosts of *R. amago*. Both *S. malma* and *O. masu* (sic) had been reported as hosts by MAMAEV et al. (1959) but the source of the *N. barbatulus* host record is unknown to me. It is tempting to speculate that the inclusion of this European loach as a host had its origin in the dual meaning of “golets” and arose from an error in transcribing records. In providing their records from *S. malma*, MAMAEV et al. (1959) gave “mal’ma” and “golets” as alternative common names of this fish. (The text (p. 634) of the published English translation of BYKHOVSKAYA-PAVLOVSKAYA et al. gave only “dolly varden char” (*S. malma*) and “cherry salmon” (*O. masu*) as hosts but the host-parasite list (pp. 822, 824, 848) included *N. barbatulus* as well.) Distribution in USSR was given as basins of the Aral and Japan seas, but OSMANOV’s (1958) Aral Sea hosts were not mentioned.

BODGANova, 1963. Described *R. amago* from *O. masu*, *S. malma*, and *Salvelinus leucomaenis* from Sakhalin.


SKRJABIN et al., 1967. Descriptions given of *R. amago*, based on YAMAGUTI (1941) and BELOUS (1952, unpublished thesis). Hosts: “amago”, *S. malma*, *Mogurnda obscura*, and *Leuciscus brandti* (a cyprinid)—the latter host taken from BELOUS’ thesis; *S. leucomaenis*, reported by BODGANova (1963), and *O. masou*, reported by MAMAEV et al. (1959) and BODGANova (1963), were omitted. SKRJABIN et al. did not include OSMANOV’s (1958, 1959) records from the Aral Sea basin because they felt (p. 318, footnote) that the species identification required verification.

8. *Metabronema oncorynchi*; *Cystidicola oncorynchi*

FUJITA, 1939. Described *M. oncorynchi* nov. sp. from the body cavity of young form of *Oncorhynchus masou*, yamabe, from Rausu, Etorofu Is. (southern Kurile Is.). Both scientific and common names of host were given.

FUJITA, 1940. *M. oncorynchi* from *O. masou* was included in table of nematodes parasitic in salmonoid fishes from Japan.

FUJITA, 1943. Abbreviated description of *M. oncorynchi*, based on the original, was given; host, *O. masou* (yamabe).

CHOQUETTE, 1951b. Listed *M. oncorynchi* as a parasite of *Oncorhynchus masou* (sic), Japan.

DOLLFUS and CAMPAÑA-ROUGET, 1956. Believed that *M. oncorynchi* belonged to *Cystidicola*.

FUKUI, 1961b. Noted (p. 65) that in his earlier review (FUKUI, 1958) of Japanese literature he omitted FUJITA’s (1939) paper in which *M. oncorynchi* was described from *O. masou* (yamabe), and in review of Japanese species of *Metabronema*, FUKUI referred (p. 41) to this species from *O. masou* (masou).

YAMAGUTI, 1961. Transferred *M. oncorynchi* to *Cystidicola* as *C. oncorynchi* (FUJITA, 1939). Indicated that the species was based on larval forms; this is not borne out by the original description, although
the eggs probably were not fully developed. Host, *O. masou*.

**Rasheed, 1966.** Considered *M. oncorhynchi* identical with *Cystidicola chitosensis* Fujita, 1930 (*lapsus* for 1940), both from *O. masou*; both species considered synonymous with a third species of *Cystidicola*, which she did not name.

**Skrjabin et al., 1967.** Listed *M. oncorhynchi* in review of *Metabronema*; host, *O. masou* (*sic*).

**Margolis and Kabata, 1967.** Suggested *M. oncorhynchi* likely belongs to *Salvelinema* and possibly is synonymous with either *S. salmonicola* (Ishii, 1916) or *S. walkeri* (Ekbaum, 1935).

### 9. *Metabronema kosugii*

**Fujita, 1939.** Described *M. kosugii* nov. sp. from the body cavity of *Salvelinus kundscha* (syn. of *S. leucomaenis*) from Rausu, Etorofu Is. (southern Kurile Is.).

**Fujita, 1940.** *M. kosugii* from *S. kundscha* was included in table of nematodes parasitic in salmonoid fishes from Japan.

**Choquette, 1948.** In review of literature on the species of *Metabronema* parasitic in trout and chars, Choquette cited Fujita’s report of *M. kosugii* from *S. kundscha*.

**Choquette, 1951b.** Listed *M. kosugii* as parasitic in *S. kundscha*, Japan.

**Campana-Rouget, 1955.** In review of *Metabronema*, listed *M. kosugii* but considered that it belonged to some other genus.

**Dollfus and Campana-Rouget, 1956.** Retained *M. kosugii* from *S. kundscha*, Japan, in the genus *Metabronema* and noted that *M. ishii* Fujita, 1939 (*lapsus* for 1941) (*=M. salvelini* Fujita, 1939) may be synonymous with it.

**Fukui, 1961b.** Noted (p. 65) that in his earlier review (Fukui, 1958) of Japanese literature he omitted Fujita’s (1939) paper in which *M. kosugii* was described from *S. leucomaenis* (amemasa), and in review of Japanese species of *Metabronema*, Fukui referred (p. 41) to this species from *S. leucomaenis* (amemasa).

**Yamaguti, 1961.** Listed *M. kosugii* from *S. kundscha*, Etorofu Is.

**Rasheed, 1966.** Considered that *M. kosugii* probably belonged to *Cystidicola*.

**Skrjabin et al., 1967.** Based on Fujita (1940), *M. kosugii* Fujita, 1940 (*lapsus* for 1939) listed in review of *Metabronema* as a parasite of “*S. kundscha=* *S. leucomaenis*”.

**Margolis and Kabata, 1967.** Suggested *M. kosugii* likely belongs to *Salvelinema* and possibly is synonymous with either *S. salmonicola* (Ishii, 1916) or *S. walkeri* (Ekbaum, 1935).

### 10. *Metabronema amemasa; Cystidicola amemasa*

**Fujita, 1939.** Described *M. amemasa* (♀ only) from the intestine of *Salvelinus kundscha* (syn. of *S. leucomaenis*), Rausu, Etorofu Is. (southern Kurile Is.).

**Fujita, 1940.** *M. amemasa* from *S. kundscha* was included in table of nematodes parasitic in salmonid fishes from Japan.

**Fujita, 1943.** Abbreviated description of *M. amemasa*, based on the original, was given; host, *S. leucomaenis* (amemasa).

**Choquette, 1948.** In review of literature on the species of *Metabronema* parasitic in trout and chars, Choquette cited Fujita’s report of *M. amemasa* from *S. kundscha*.

**Choquette, 1951b.** Listed *M. amemasa* as parasitic in *S. kundscha*, Japan.

**Campana-Rouget, 1955.** In review of *Metabronema*, listed *M. amemasa* but considered it belonged to another genus.

**Dollfus and Campana-Rouget, 1956.** Retained *M. amemasa* from *S. kundscha*, Japan, in the genus *Metabronema*.

**Fukui, 1961b.** Noted (p. 65) that in his earlier review (Fukui, 1958) of Japanese literature he omitted Fujita’s (1939) paper in which *M. amemasa* was described from *S. leucomaenis* (amemasa), and in review of Japanese species of *Metabronema*, Fukui referred (p. 41) to this species from *S. leucomaenis* (amemasa).

**Yamaguti, 1961.** Considered *M. amemasa* a synonym of *M. canadense* Skinker, 1931. (Note: Van Cleave and Mueller...
Rasheed, 1966. Tentatively assigned *Metabronema ishii* to the genus *Cystidicola* by Skrinker (1931), the founder of the latter genus. Baylis (1934) considered *M. harwoodi* and *M. canadense* as synonyms of "*Metabronema (=Spiroptera) salvelini* Fujita, 1920" (lapses for 1922). For review of other papers in which the synonymy and taxonomy of *M. canadense* are considered see the following references under *Metabronema* (originally *Spiroptera*) salvelini (Fujita, 1922); Dollfus and Campana-Rouget, 1956; Bykhovskaya-Pavlovskaya et al., 1962; Bogданова, 1963; Rasheed, 1966.)

Rasheed, 1966. Tentatively assigned *M. amemasu* to *Cystidicola*.

Skrjabin et al., 1967. Based on Choquette (1948), *M. amemasu* listed in review of *Metabronema* as a parasite of "*S. kundscha*=*S. leucomaenis*”, Japan.

Margolis and Kabata, 1967. Suggested *M. amemasu* likely belongs to *Salvelinema* and possibly is synonymous with either *S. salmonicola* (Ishii, 1916) or *S. walkeri* (Ekbaum, 1935).

11. *Metabronema salvelini; M. ishii; Rhabdochona ishii*

Fujita, 1939. Described *M. salvelini* from the intestine of *Salvelinus kundscha* (syn. of *S. leucomaenis*), Rausu, Etorofu Is. (southern Kurile Is.); and from the intestine of *Onchorhynchus keta* from Tarandomari, Sakhalin (formerly known also as Karafuto).

Fujita, 1940. This species, rather than *M. salvelini* (Fujita, 1922), is probably the one included under the name *M. salvelini* (from *S. kundscha*) in table of nematodes parasitic in salmonoid fishes from Japan.

Fujita, 1941. *M. salvelini* Fujita, 1939, renamed *Metabronema ishii* because the former name was pre-occupied by *M. salvelini* (Fujita, 1922) Baylis, 1935.

Choquette, 1948. In review of literature on the species of *Metabronema* parasitic in trouts and chars, Choquette cited Fujita’s (1939) report of *M. salvelini* from *S. kundscha* and his (Fujita, 1941) subsequent change of the name to *M. ishii* (sic).

Skrjabin et al., 1949. *M. ishii* (sic) included in a list of the species in the genus *Metabronema*.

Choquette, 1951b. Listed *M. ishii* Fujita, 1939 (lapse for *M. ishii* Fujita, 1941) as parasitic in *S. kundscha* and *O. keta*, Japan.

Campana-Rouget, 1955. In review of *Metabronema*, listed *M. ishii* Fujita, 1939 (sic) but considered it belonged to another genus.

Dollfus and Campana-Rouget, 1956. Retained *M. ishii* Fujita, 1939 (sic) from *S. kundscha*, Japan, in the genus *Metabronema* and suggested it may be a synonym of *M. kosugii*.

Fukui, 1961b. Noted (p. 65) that in his earlier review (Fukui, 1958) of Japanese literature he omitted Fujita’s (1939) paper in which *M. salvelini* was described from *S. leucomaenis* (amemasu) and *O. keta* (sake), and in review of Japanese species of *Metabronema*, Fukui referred (p. 41) to this species from *S. leucomaenis* (amemasu) and *O. keta* (sake). He noted that the name *M. salvelini* had been used by Baylis (1935) for *Cystidicola salvelini* (Fujita, 1922) but did not mention that Fujita (1941) renamed the *M. salvelini* Fujita, 1939, as *M. ishii*.

Yamaguti, 1961. Transferred *M. ishii* (syn. *M. salvelini* Fujita, 1939, nec 1922) to *Rhabdochona* as *R. ishii* (Fujita, 1941); hosts and locality, *S. kundscha* and *O. keta* from Sakhalin (Saghalien). This transfer is without justification as the species certainly is not a *Rhabdochona*.

Rasheed, 1966. Incorrectly stated that Yamaguti (1961) had assigned *M. ishii*
[sic] to *Cystidicola* and indicated that *Cystidicola* was the correct generic allocation for this species.

**SKRJABIN et al., 1967.** Based on FUJITA (1941), *M. ishii* [sic] listed in review of *Metabronema*.

**MARGOLIS and KABATA, 1967.** Suggested *M. ishii* [sic] likely belongs to *Salvelinema* and possibly is synonymous with either *S. salmonicola* (ISHII, 1916) or *S. walker* (EKBAUM, 1935).

### 12. *Metabronema laticauda*

**FUJITA, 1939.** Described *M. laticauda* nov. sp. (♀ only) from intestine of *Oncorhynchus nerka* from Kavacha, Kamchatka (USSR).

**FUJITA, 1940.** *M. laticauda* from *Oncorhynchus keta* (probably *lapsus* for *O. nerka*) was included in summary table of nematodes parasitic in salmonoid fishes from Japan.

**CHOQUETTE, 1951b.** Listed *M. laticauda* as parasitic in *O. nerka*, incorrectly giving the locality as Japan.

**DOLLFUS and CAMPANA-ROUGET, 1956.** Stated that *M. laticauda* could well be an *Ascarophis*.

**FUKUI, 1961b.** Noted (p. 65) that in his earlier review (FUKUI, 1958) of Japanese literature he omitted FUJITA’S (1939) paper in which *Cystidicola* was described from *S. malma* (oshorokoma), and in review of Japanese species of *Cystidicola*, FUKUI referred (p. 41) to this species from *S. malma* (oshorokoma).

**YAMAGUTI, 1961.** Listed *C. brevicauda* from *S. malma*, Rausu, but stated “It is not quite certain in the absence of the male that this species belongs to *Cystidicola*”.

**SKRJABIN et al., 1967.** *C. brevicauda* listed in review of *Cystidicola* as parasitic in *S. malma*, Japan.

### 13. *Cystidicola brevicauda*

**FUJITA, 1939.** Described *Cystidicola brevicauda* nov. sp. (♀ only) from the intestine of *Salvelinus malma*, Rausu, Etorofu Is. (southern Kurile Is.)

**FUJITA, 1940.** *C. brevicauda* from *S. malma* was included in table of nematodes parasitic in salmonoid fishes from Japan.

**WHITE and CABLE, 1942.** *C. brevicauda* was included in historical review of species assigned to *Cystidicola*.

**DOLLFUS and CAMPANA-ROUGET, 1956.** Stated “could well be an *Ascarophis*”.

**FUKUI, 1961b.** Noted (pp. 65, 66) that in his earlier review (FUKUI, 1958) of Japanese literature he omitted FUJITA’S (1939) paper in which *C. brevicauda* was described from *S. malma* (oshorokoma), in review of Japanese species of *Cystidicola*, FUKUI referred (p. 39) to this species from *S. malma* (oshorokoma).

**YAMAGUTI, 1961.** Listed *C. brevicauda* from *S. malma*, Rausu, but stated “It is not quite certain in the absence of the male that this species belongs to *Cystidicola*”.

**SKRJABIN et al., 1967.** *C. brevicauda* listed in review of *Cystidicola* as parasitic in *S. malma*, Japan.

### 14. *Cystidicola minuta; Cystidicola chika; Metabronema minutum*

**FUJITA, 1940.** Described *Cystidicola minuta* sp. nov. (♀ only) from the body cavity of *Hypomesus* (as *Mesopus*) *olidus*, Ishikari River, Hokkaido.

**FUJITA, 1941.** *Cystidicola minuta* FUJITA, 1940, renamed *Cystidicola chika* because the former name was preoccupied by *C. minuta* RHODAIN and VUYLSTEKE, 1934.

**WHITE and CABLE, 1942.** In historical review of species assigned to *Cystidicola*, FUJITA’S description of *C. minuta* and the subsequent renaming as *C. chika* was mentioned.

**FUJITA, 1943.** Abbreviated description of *C. chika*, based on original description of *C. minuta* FUJITA, 1940, was given;
host, *H. olidus* (wakasagi).

**Skrjabin et al., 1949.** Included *C. chika* in a list of the species of the genus *Cystidicola.* Host given incorrectly as "Salmonidae".

**Yamaguti, 1961.** Transferred *C. minuta* Fujita, 1940, to *Metabronema,* as *M. minutum* (Fujita, 1940), claiming there was no need of a new specific name because the species is a *Metabronema* and not a *Cystidicola*; host, *Mesopus olidus*; locality, Japan. Under the species listings for *Cystidicola,* Yamaguti incorrectly indicated that "*C. chika* Fujita, 1941, for *C. minuta* Fujita, 1940" was based on larval forms; Fujita (1940) described and figured eggs with vermiform larvae in the distal part of the vagina.

**Skrjabin et al., 1967.** Description given of *C. chika*, based on Fujita (1940); host and locality, "*Mesopus olidus=Hypomesus* (sic) olidus", Ishikari R. (Japan).

**15. Cystidicola mesopi**

**Fujita, 1940.** Described *Cystidicola mesopi* sp. nov. from the intestine of *Hypomesus* (as *Mesopus*) olidus, Lake Toro, Hokkaido.

**White and Cable, 1942.** *C. mesopi* was included in historical review of species assigned to *Cystidicola*.

**Skrjabin et al., 1949.** Included *C. mesopi* in a list of the species of the genus *Cystidicola.* Host given incorrectly as "Salmonidae".

**Yamaguti, 1961.** Listed *C. mesopi* Fujita, 1940 [sic] as parasitic in *O. masou,* Japan.

**Rasheed, 1966.** Considered *Metabronema oncorhynchi* Fujita, 1939, synonymous with *C. chitosensis* Fujita, 1930 [sic] and both species synonymous with a third species of *Cystidicola* which she did not name.

**MARGOLIS, 1966, 1967.** After re-examining the syntypes of *C. chitosensis,* this species was considered a synonym of *Salvelinema salmonicola* (Ishii, 1916), a newly proposed combination for *Cystidicola salmonicola* (Ishii, 1916).

**Skrjabin et al., 1967.** Description given of *C. chitosensis,* based on Fujita (1940); host and locality, *O. masu* [sic], Chitose R. (Hokkaido, Japan).


**17. Metabronema sp.**

**Fukui, 1958.** *Metabronema* sp. reported, but not described, from *Oncorhynchus nerka* (benimasu) caught at unspecified locality in the North Pacific Ocean or Bering Sea.

**Fukui, 1960.** Reported incomplete specimens of *Metabronema* sp., which he said "are probably *M. truttae* Baylis, 1933", from unspecified *Oncorhynchus* sp. taken
in the North Pacific region. Presumably this report includes the material mentioned in 1958.

Fukui, 1961a. Again mentioned Metabronema sp. from unspecified salmonoid fish and stated: "my specimens are all female and I cannot decide the species". This report apparently is based on the same collections referred to in Fukui's 1958 and 1960 papers.

Fukui, 1961b. Briefly described and figured Metabronema sp. (♀ only) from O. nerka, North Pacific Ocean.

18. Rhabdochona sp.

Fukui, 1958. Reported, without description, Rhabdochona sp. from Oncorhynchus nerka (benimasu) from unspecified locality in the North Pacific Ocean or Bering Sea.

Fukui, 1961b. Referred to his 1958 report of Rhabdochona sp.

Discussion and Conclusions

Of the 16 named species included in this review, 14 were described by the late Dr. T. Fujita and one previously known species was also studied by him. No new species of Cystidicola, Metabronema, or Rhabdochona from Japanese salmonoids have been proposed since his death, at which time the 16 species were distributed among the three genera as follows: 4 in Rhabdochona, 7 in Metabronema, and 5 in Cystidicola. (However, Fujita (1940, Table 2) himself, in one of his last papers, tabulated only 5 species of Metabronema, 5 of Cystidicola and 1 of Rhabdochona from Japanese salmonoid fishes; 2 species of Metabronema and 3 of Rhabdochona were omitted.) In recent years there have been several attempts to re-examine critically the taxonomic status of these species. These efforts have been seriously handicapped by the unsatisfactory quality of many of the descriptions and figures provided by Fujita for his new species, and a final solution to questions of taxonomy and synonymy must await restudy of the syntypes or topotypic material. Nevertheless, another reassessment of the generic position of the various species will be attempted. The species are listed below under five genera (Cystidicola, Metabronema, Cystidicolaoides, Salvelinema, and Rhabdochona) to which they have been previously or newly assigned. For species which are or appear to be included under their correct genus, a list of their synonyms and hosts are given; for incorrectly assigned species reference is made to their proper genus when such could be determined with reasonable certainty. A few species which defy generic assignment on the basis of available information are grouped together under the heading of "Generic position uncertain".

Cystidicola

   See Salvelinema salmonicola.

2. C. oncorhynchi Fujita, 1921.
   See Rhabdochona oncorhynchi.

3. C. fujii Fujita, 1921.
   See Rhabdochona fujii.

4. C. salvelini (Fujita, 1922) Fujita, 1928.
   See Cystidicolaoides tenuissima.

5. C. iwana Fujita, 1928.
   See Salvelinema iwana.

   See Salvelinema oncorhynchi.

   See Salvelinema amemasu.

8. C. brevicauda Fujita, 1939.
   See "Generic position uncertain".

9. C. minuta Fujita, 1940.
   See Cystidicola chika under "Generic position uncertain".

10. C. chika Fujita, 1941 nom. nov. for C. minuta Fujita, 1940.
    See "Generic position uncertain".

11. C. mesopi Fujita, 1940.
    See "Generic position uncertain".

12. C. chitosensis Fujita, 1940.
    See Salvelinema salmonicola.

Metabronema

1. Metabronema salvelini (Fujita, 1922).
MARGOLIS, L.

BAYLIS, 1935.
See Cystidicoloides tenuissima.

See Salvelinema iwana.

3. Metabronema oncorhynchi FUJITA, 1939.
See Salvelinema oncorhynchi.

See Salvelinema kosugii.

5. Metabronema amemasu FUJITA, 1939.
See Salvelinema amemasu.

See Salvelinema ishiii.

7. Metabronema laticauda FUJITA, 1939.
See “Generic position uncertain”.

See Cystidicola chika under “Generic position uncertain”.

9. Metabronema ishiii FUJITA, 1941 nom. nov. for M. salvelini FUJITA, 1939.
See Salvelinema ishiii.

See “Generic position uncertain”.

Rhabdochona

1. R. oncorhynchi (FUJITA, 1921) FUJITA, 1927.
Syns.: Cystidicola oncorhynchi FUJITA, 1921; Rhabdochona oncorhynchi FUJITA, 1940.
Host: Oncorhynchus keta.

2. R. fujii (FUJITA, 1921) FUJITA, 1927.
Syns.: Cystidicola fujii FUJITA, 1921; Rhabdonema fujii (FUJITA) of Kobayashi, 1935, 1936; Rhabdochona fujii FUJITA (?1941) of Rasheed, 1965.
Hosts: Oncorhynchus nerka var. adonis, Salvelinus leucomaenis (syn. S. kundscha).

Hosts: Salvelinus pluvius, Salvelinus leucomaenis.

4. R. amago YAMAGUTI, 1935. (Rasheed, 1965, considered this species a synonym of R. zacconis.)
Hosts: Oncorhynchus rhodurus, Oncorhynchus masou, Salvelinus malma, Salvelinus leucomaenis, Mogurnda obscura (a non-salmonid), Leuciscus brann- 

Cystidicoloides

Syns.: Spiroptera salvelini FUJITA, 1922; Cystidicola salvelini (FUJITA, 1922) FUJITA, 1928; Metabronema salvelini (FUJITA, 1922) BAYLIS, 1935; Cystidicoloides salvelini (FUJITA, 1922) DOLLFUS and CAMPANA-ROUGET, 1956; Sterliadochona salvelini (FUJITA, 1922) ROYTMAN, in press. (NOTE: Only names used in association with the original Japanese specimens are listed in the synonymy. For other synonyms, see RASHEED 1966.)
Hosts: Oncorhynchus nerka var. adonis, Oncorhynchus masou, Salvelinus leucomaenis (syn. S. kundscha), Salvelinus pluvius, Salvelinus malma, Hucho taimen. (NOTE: Only fishes from Japan or adjacent territory of the USSR from which the parasite was recorded under one of the synonyms listed above are included here.)

Salvelinema

Hosts: Oncorhynchus masou, Oncorhynchus keta, Oncorhynchus nerka, Oncorhynchus nerka var. adonis, Salmo gairdneri (syn. S. irideus), Salvelinus pluvius, Salvelinus leucomaenis, Salveli-

2. Salvelinema iwana (Fujita, 1928) n. comb.
Syns.: Cystidicola iwana Fujita, 1928; Metabronema iwana (Fujita, 1928) Fujita, 1937.
Host: Salvelinus pluvis (called S. malma by Fujita, 1928).

The structure of the buccal cavity, as shown in Fujita’s (1928) figure 11, and the presence of a series of coupled precloacal papillae in the male clearly indicate that this species is a Salvelinema.

3. Salvelinema oncorhynchi (Fujita, 1939) n. comb.
Syns.: Metabronema oncorhynchi Fujita, 1939; Cystidicola oncorhynchi (Fujita, 1939) Yamaguti, 1961.
Host: Oncorhynchus masou.

The structure of the buccal cavity, as shown in Fujita’s (1939) figure 17, and the presence of a series of coupled precloacal papillae in the male clearly indicate that this species is a Salvelinema.

4. Salvelinema kosugii (Fujita, 1939) n. comb.
Syn.: Metabronema kosugii Fujita, 1939.

Host: Oncorhynchus masou.

The structure of the buccal cavity, as shown in Fujita’s (1939) figure 20, is typical for Salvelinema. I assume that Fujita erred in describing the precloacal papillae in the male as single rather than coupled. In another paper (Margolis, 1967) I have noted that Fujita made a similar error in describing the precloacal papillae in Cystidicola chitosensis (syn. of Salvelinema salmonicola).

5. Salvelinema amemasu (Fujita, 1939) n. comb.
Syns.: Metabronema amemasu Fujita, 1939; Cystidicola amemasu (Fujita, 1939) Rasheed, 1966.
Host: Salvelinus leucomaenis (syn. S. kundscha).

The structure of the buccal cavity, as shown in Fujita’s (1939) figure 23, is typical for Salvelinema.

6. Salvelinema ishiii (Fujita, 1941) n. comb.
Syns.: Metabronema salvelini Fujita, 1939; Metabronema ishiii Fujita, 1941; Rhabdochona ishiii (Fujita, 1941) Yamaguti, 1961.
Hosts: Salvelinus leucomaenis (syn. S. kundscha) and Oncorhynchus keta.

The structure of the buccal cavity, as shown in Fujita’s (1939) figure 26, is typical for Salvelinema. I assume that Fujita erred in describing the precloacal papillae in the male as single rather than coupled. See comment under S. kosugii.

**Generic position uncertain**

Hosts: Salvelinus malma.

This species cannot be accurately assigned generically until the structure of the buccal region is better known and the male is discovered. However, on the basis of Fujita’s (1939) figure (32) of the head end it is not a Salvelinema but could be a Cystidicoloides.

2. Cystidicola chika Fujita, 1941.
Syns.: Cystidicola minuta Fujita, 1940; Metabronema minutum (Fujita, 1940) Yamaguti, 1961.
Host: Hypomesus olidus (syn. Mesopus olidus).

This species cannot be accurately assigned generically until the structure of the buccal region is better known and the male is discovered. However, on the basis of Fujita’s (1940) figure (7A) of the anterior end it is not a Salvelinema but could be a Cystidicoloides although the eggs were said to bear filaments.

3. Cystidicola mesopi Fujita, 1940.
Host: Hypomesus olidus (syn. Mesopus olidus).

This species may well be a Cystidicola but a final decision must await better knowledge of the struc-
Host: *Oncorhynchus nerka*.

The male of this species is unknown and FUJITA'S (1939) figure (29) of the anterior end does not give a clear indication of the generic affinities of this species although it could be a *Salvelinema*.

Host: *Oncorhynchus nerka*.

The male is unknown and FUKUI's (1961b) figure (8A) of the anterior end does not give a clear indication of the generic affinities of this species.

From the above list it can be seen that the original 16 species have been reduced to 15 and that 11 of them have been distributed among three genera (4 *Rhabdochona*, 1 *Cystidicoloides*, 6 *Salvelinema*) with the generic position of four species remaining uncertain. Of the latter four, one may be a true *Cystidicola*, one may be a *Salvelinema*, and two may belong to *Cystidicoloides*.

None of the species reviewed here are true *Metabronema* although eight species had been assigned to this genus, mainly by FUJITA (1937, 1939). FUJITA'S species of *Metabronema* are principally *Salvelinema*.

Within the genus *Salvelinema*, and possibly *Rhabdochona* as well, it is unlikely that all species are valid. MARGOLIS and KABATA (1967) have expressed the opinion that the *Salvelinema* species are possibly synonyms of one of the two species which MARGOLIS (1967) recognized in this genus. Perhaps all the Japanese species of this genus are synonyms of *S. salmonicola*.

**REFERENCES**

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29) KOBAYASHI, H. (1936): [Parasites of Japane

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ADDENDUM

Since this paper was submitted for publication two other recent publications dealing with species reviewed here have come to the author’s attention. These are summarized below.


Independently of Rasheed (1966), Moravec reduced Sterliadochona to the synonymy of Cystidicoloides, and Cystidicoloides salvelinii (FUJITA, 1920 [sic]) DOLLFUS and CAMPANA-ROUGET, 1956, was treated as a synonym of Cystidicoloides tenuissima (ZEDER, 1800) comb. n. Complete synonymy of C. tenuissima was listed, which included Spiroptera salvelinii FUJITA, 1920 [sic], Cystidicola harwoodi CHANDLER, 1931, Metabronema canadense SKINKER, 1931, and Metabronema truttae BAYLIS, 1935. Rasheed’s (1966) paper appeared while Moravec’s paper was in the process of being published and in an addendum.
Moravec recognized Rasheed's priority in establishing the combination *C. tenuissima*.


**RESEARCH NOTE . . .**

**One more case of human infection with Diplogonoporus grandis**

56 year old man in Shizuoka Prefecture discharged a tapeworm in the beginning of April of 1967. Before the discharge, the patient suffered from diarrhoe, loss of weight and fatigue. The patient was treated with Bitin 15 tab. and magnesium sulfate 15 gr, and discharged a worm 100 cm in length. On the 6th of July, he was again treated with the same medicine, and discharged the same type of worm. Structure; Scolex absent. The body length 195 cm in the fixed material with formalin. The width 7-14 mm, the thickness 1.5-2 mm. The length of one segment 0.25-0.8 mm. The furrows of the body surface and the structure of the genital organs agree with *Diplogonoporus grandis*. Each segment always possessed two pairs of genital organs. Sometimes, a third pair was observed. The uteri had nearly attained full growth, so the eggs were observed. However, sometimes an immature uterus was recognized in those segments having three pairs of genital organs. The egg is 56.3—65×40—45 μ in size (20 eggs calculated). Marine fishes are a favorite dish of the patient. Usually, he eats the fish raw, particularly butterfish and sunfish.

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Atsuo Ichihara, Satoru Kamegai (Meguro Parasit. Museum, Tokyo), Tsuyoshi Suguro (Kannami Hospital) & Noriji Suzuki (Department of Parasitology, National Institute of Health, Tokyo)