*Acta Zoologica Academiae Scientiarum Hungaricae 49 (3), pp. 179–200, 2003*

# DIGENETIC TREMATODES FROM MARINE FISHES OFF THE COAST OF KUWAIT, ARABIAN GULF: FELLODISTOMIDAE AND SOME SMALLER FAMILIES, NEW HOST AND GEOGRAPHIC RECORDS

SEY, O.*, NAHHAS, F. M., UCH, S. and VANG, C.

**Department of Zoology, University of Pécs, H-7624 Pécs, Ifjúság u. 6, Hungary*
*E-mail: seyo@freemail.hu*
*Department of Biological Sciences, University of the Pacific*
*Stockton, California, 95211, USA, E-mail: fnahhas@uop.edu*

Nine species of digenetic trematodes are reported: *Lintonium vibex* (LINTON, 1900) STUNKARD et NIGRELLI, 1930 from *Lagocephalus lunaris* (Tetraodontidae), *Complexobursa vjetnamensis* OSHMARIN et MAMAEV, 1963 from *Terapon theraps* (Teraponidae); *Monascus filiformis* (RUDOLPHI, 1819) LOOSS, 1907 (new synonyms: *M. americanus* AMATO, 1982, *M. mediolongiusculus* DING, 1993) from *Selaroides leptolepis* (Carangidae); *Tergestia pauca* FREITAS et KOHN, 1965 from *Alepes djedaba* (Carangidae); *Transverstotrema licinum* MANTER 1970 from *Diplodus noct* (Sparidae); *Treptodemus latus* MANTER, 1961 from *Hemiramphus marginatus* (Hemiramphidae); *Prosogonotrema bilabiatum* PÉREZ VIGUERAS, 1940 from *Epinephelus areolatus* (Serranidae); *Hexangium sigani* GOTO et OZAKI, 1929 from *Siganus canaliculatus* (Siganidae) and *Diphterostomum brusinae* (STOSSICH, 1899) STOSSICH, 1903 from *Argyrops spinifer* (Sparidae). All those species except *Tergestia pauca* and *Hexangium sigani* represent new geographic records.

Key words: Arabian Gulf, Kuwaiti coast, marine fishes, trematodes, Digenea, Fellodistomidae, Transversotrematidae, Bivesiculidae, Prosogonotrematidae, Angiodyctiidae, Zoogonidae, *Lintonium*, *Monascus*, *Complexobursa*, *Tergestia*, *Transversotrema*, *Treptodemus*, *Prosogonotrema*, *Hexangium*, *Diphterostomum*

## INTRODUCTION

This paper is the seventh in a series on digenetic trematodes of marine fishes collected by the first author off the Kuwait coast of the Arabian Gulf (see SEY (1995), SEY & NAHHAS (1997), SEY *et al.* (1998), NAHHAS & SEY (1998, 2002), NAHHAS *et al.* (1998)). It reports or redescribes nine species belonging to six families of Digenea.

## MATERIALS AND METHODS

Collection, preservation and preparation of the specimens are described in SEY and NAHHAS (1997). Hosts, number of fish examined, site of infection, date of collection, prevalence, mean inten-

sity, and abundance as defined by BUSH *et al*. (1997), and accession numbers are presented in Table 1. Measurements are expressed in micrometers and indicated as a range, length followed by width; the mean in parenthesis is calculated for those species with measurements done on three or more specimens; numbers are rounded to the nearest decimal. Drawings were prepared by micro-projection or tracing of photomicrographs taken with a Nikon Eclipse E800 microscope and captured with an Optronics DEI-750 video camera coupled with Image-Pro Plus Software (Media Cybernetics). Details were filled in through microscopic observations. Representative specimens of all species are deposited in the United States National Parasite Collection (USNPC); others in the Parasitology Collection of the University of the Pacific (UOP). Fishes were identified by using the monograph of KURONUMA and ABE (1986), and references to RANDALL (1995), ESCHMEYER (1998) and FROESE and PAULY (2003).

## DESCRIPTION OF SPECIES

### Family Fellodistomidae NICOLL, 1909

### *Lintonium vibex* (LINTON, 1900) STUNKARD et NIGRELLI, 1930 (Figs 1 A-B)

Host: *Lagocephalus lunaris* (BLOCH et SCHNEIDER, 1801) (Tetraodontidae)

Description based on three specimens from three hosts. Body plump, 2,750–3,505 × 1,000–1,125 at acetabular level (3,162 × 1,058); forebody 700–1,025 (883); hindbody 1,500–1,975 (1,767). Tegument smooth, thick. Eyespot pigment absent. Oral sucker 270–380 × 290–430 (320 × 353). Ventral sucker 550–678 × 600–775 (608 × 683) with transverse opening, 60–69% (65%) of body width. Sucker ratio 1:1.79–1:2:05 (1:1.94). Prepharynx absent; pharynx 140–190 × 190–260 (167 × 217); oesophagus 50–150 (100) long; intestinal bifurcation near mid forebody; caeca blind, not reaching posterior end of body. Gonads in mid third of body. Testes symmetrical, chiefly intercaecal ; right testis 190–270 × 130–230 (230 180); left testis 150–220 × 200–260 (180 × 230). Cirrus sac ovoid 240–290 × 70–150 (270 × 110), containing bipartite spherical or ovoid seminal vesicle 80–120 × 78–120 (100 98), posterior segment larger than anterior one; pars prostatica, 125–150 × 63–100 (137 × 65) ovoid to cylindrical; cirrus short. Ovary weakly trilobed, anterior to right testis, 180–200 x 200–210 (190 × 205); seminal receptacle absent; ootype, Mehlis' complex and Laurer's canal not seen; uterus filling all intercaecal space posterior to ovary; metraterm well-developed, extending sinistrally to ventral sucker, entering genital pore near intestinal bifurcation. Vitelline follicles extracaecal extending from near anterior level of ovary to near posterior end of caeca. Eggs numerous, 35 – 45 × 23–28 (40 × 26). Genital pore median, bifurcal or slightly prebifurcal. Excretory vesicle covered by uterus, canals extending to junction of pharynx and oral sucker. .

Remarks. The genus *Lintonium* has a wide distribution having been reported from various parts of the world; this distribution, however, seems to be restricted to a group of hosts belonging chiefly to species of *Spheroides, Tetraodon, Arothron* (Tetraodontidae)*, Abalistes, Balistis* (Balistidae)*, Cantherines*, and *Monacanthus* (Monacanthidae). YAMAGUTI (1971) lists five species in the genus (*L. vibex*

**Table 1.** Prevalence (P), mean intensity (M.I.), abundance (A) of 9 species of digeneans from marine fishes off the Kuwaiti coast

| Host | site of infection | digenean | Collection date | %P | M.I. | A. | Acces-sion No. | @ |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | USNPC | UOP |
| *Lagocephalus lunaris* | intestine | *Lintonium vibex* | 12 Jan. 1994 | 21.4 | 1 | 2 | 93371 | K-275 |
| | | | 27 Oct. 1995 | | | 1 | | K-285 |
| *Terapon theraps* | intestine | *Complexobursa vjetnamensis* | 11 Apr. 1996 | 33 | 6 | 6 | 93372 | K-312 |
| *Selaroides leptolepis* | intestine | *Monascus filiformis* | 25 Jun. 1993 | 66 | 1.5 | 2 | 93373 | K-28 |
| | | | 21 Jun. 1995 | | | 1 | | K-220 |
| *Alepes jedaba* | intestine | *Tergestia pauca* | 22 Jan. 1997 | 33 | 6 | 6 | 93374 | K-365 |
| *Diplodus noct* | beneath scales | *Transversotrema licinum* | 29 Mar.1996 | 100 | 15 | 15 | 93375 | K-296 |
| *Hemiramphus marginatus* | intestine | *Treptodemus latus* | 5 Oct. 1997 | 55 | 5.8 | 5 | 93376 | K-371 |
| | | | | | | 12 | | K-373 |
| | | | | | | 3 | | K-374 |
| | | | | | | 5 | | K-375 |
| | | | | | | 4 | | K-378 |
| *Epinephelus areolatus* | stomach | *Prosogonotrema bilabiatum* | 29 Mar. 1996 | 33 | 2 | 2 | 93377 | K-300 |
| *Siganus canaliculatus* | intestine | *Hexangium sigani* | 10 Oct. 1996 | 100 | 1 | 1 | 93378 | |
| *Argyrops spinifer* | intestine | *Diphterostomum brusinae* | 20 Jul. 1993 | 33 | 1 | 1 | 93379 | |

(LINTON, 1900) STUNKARD et NIGRELLI, 1930, *L. consors* (LÜHE, 1906) CROWCROFT, 1950, *L. laymani*, (LAYMAN, 1930) SKRJABIN et KOVAL, 1957, *L. pulchrum* (JOHNSTON, 1913) SKRJABIN et KOVAL, 1957) and *L. novikovi* BAEVA, 1965. *Lintonium novikovi* from *Cololabis* (*Scomberesox*) *saira* (BREVOORT) (Scomberesocidae) does not belong in the genus and is probably a new sclerodistomid genus according to YAMAGUTI (1971). LAYMAN (1930) reported *Steringotrema pulchrum* from *Cantherines modestus* in the Sea of Japan. SKRJABIN and KOVAL (1957), transferred it to *Lintonium* and renamed it *L. laymani*. SKRJABIN and KOVAL (1957), MANTER and PRITCHARD (1962) and MADHAVI (1975) recognized four species in the genus *Lintonium*: *L. vibex*, *L. consors, L. pulchrum* and *L.*

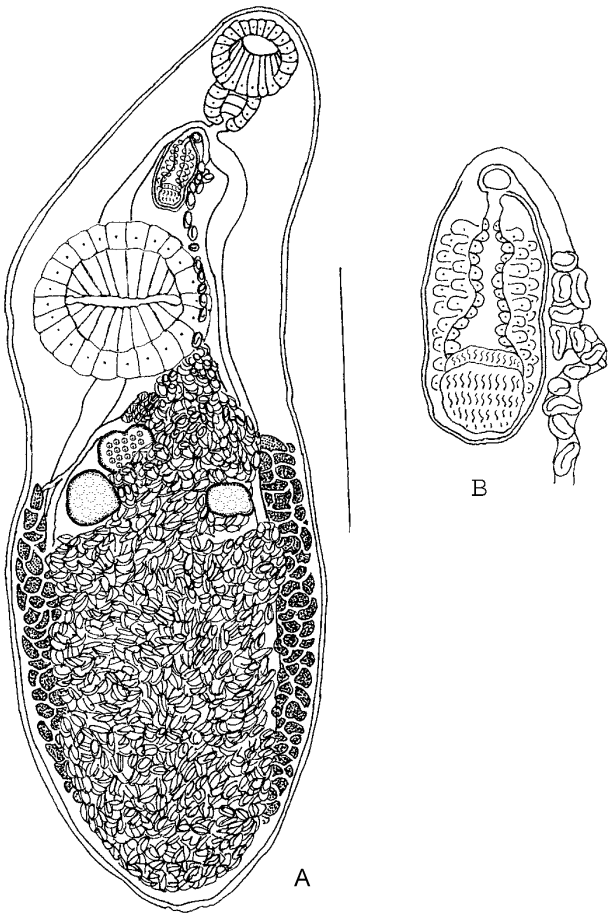


**Fig. 1.** A = *Lintonium vibex* (LINTON, 1900) STUNKARD et NIGRELLI, 1930, from *Lagocephalus lunaris*. Ventral view. Scale 1 mm. B = Cirrus sac free-hand composite drawing

*laymani*. In a key to the species, SKRJABIN and KOVAL (1957) distinguished *L. laymani* from the other three by an equatorial ventral sucker. MANTER and PRITCHARD (1962) reviewed the history of the four species and their characteristics and concluded that "L. vibex" of YAMAGUTI (1934) and CROWCROFT (1950) from Japan and Tasmania, respectively, are actually *L. laymani*. MADHAVI (1975) agreed with MANTER and PRITCHARD's (1962) conclusion. STUNKARD and NIGRELLI (1930) cited a 1928 reference by ODHNER that *L.* (*Steringotrema*) *pulchrum* is identical with *L.* (*Gastris*) *consors*; CROWCROFT (1950) examined one of JOHNSTON's cotypes of *Steringotrema pulchrum* from the Australian Museum in Sidney and indicated that "a comparison of the illustrations of *Gastris consors* and *Steringotrema pulchrum* reveals differences in size and body proportions only" and "Odhner's view is regarded as correct". MACHIDA (1971) considered *L. laymani* a synonym of *L. vibex*. MADHAVI (1975) redescribed *L. vibex* of PARUKHIN and CHIKUNOVA, 1964 from *Abalistes stellaris* (BLOCH et SCHNEIDER) (Balistidae) from South China Sea and renamed it *L. pseudovibex*. MADHAVI's redescription was based on three specimens from one of three *Monacanthus choirocephalus* BLEEKER; She admitted, however, that "*L. pseudovibex* shows characters that are intermediate between *L. vibex* and *L.* laymani". *Lintonium puriensis* GUPTA et AHMAD, 1977 was described from *Tetraodon* (*Lagocephalus*) *lunaris* from Orissa, Bay of Bengal; the latter shows characteristics intermediate between the various species. Two of his figures show two symmetrical testes, close together, intercaecal (as in *L. consors* and *L. pulchrum*) the third diagonal and further apart. KISHORE *et al*. (1989) described the nervous system of *L. pulchrum* from *Lagocephalus lunaris*, but the species itself was not described. Body shape and egg size of *L. vibex* are variable (YAMAGUTI 1934, CROWCROFT 1950). Populations of "L. vibex" reported by the various investigators seem to fall into two egg size groups 45–59 × 23–28 and 26–42 × 13–24, the narrowest, 13–22 was cited by CROWCROFT (1950); YAMAGUTI (1934) listed 42–48 × 24–27 for his specimens.

MADHAVI (1975) suggested that *Paradiplangus* GUPTA, 1968 and *Paradiplobulbus* BILQEES, 1972 are synonyms of *Lintonium*, a suggestion accepted by BRAY (2002). MADHAVI (1975) collected specimens from *Gastrophysus* (*Lagocephalus) lunaris* which she identified as *L. pulchrum* and indicated that GUPTA's specimens "agree in many respects" with her *L. pulchrum*.

At least one other species has been added to the genus, *L. srivastavai* LAMOTHE-ARGUMEDO, 1969 from the intestine of *Spheroides annulatus* (Jenyns) from Oaxaca, Mexico. LAMOTHE-ARGUMEDO (1969) distinguished his species, based on one specimen, from *L. vibex* by the round shape of the ovary, and from *L. consors* by well-separated testes, tubular seminal vesicle, uterine coils that extend extracaecally, two caeca of unequal length, and asymmetrical distribution of

vitelline follicles, one group extending posterior to the right (longer) caecum, reaching almost to the posterior end of the body, the other group slightly posterior to the left shorter caecum.

*Paradiplobulbus heterorchis* and *P. isorchis* from *Tetraodon* (*Lagocephalus*) *lunaris* were described by BILQEES (1972) from the Karachi coast. *P. heterorchis* has a plump shape, symmetrical or subsymmetrical testes, symmetrical distribution of vitelline follicles, and eggs 30–35 × 28–30. *P. isorchis* was described as having a fusiform body, slightly oblique testes (her illustration shows definitely oblique testes), unequal distribution of vitelline follicles, and eggs 50 × 30. MADHAVI (1975) transferred the two species to *Lintonium* becoming *L. heterorchis* and *L. isorchis*. There is a great deal of confusion in the literature relating to all these species. Our review of the literature suggests that there are probably only two valid species *L. vibex* and *L. consors* which can be distinguished from each other by the presence of an indentation posterior to the acetabulum, testes relatively closer to each other, relatively shorter caeca, and vitelline follicles that do not extend to the posterior end of the caeca compared with those of *L. vibex*. The figures of *L. consors* illustrated by MANTER and PRITCHARD (1962) and BRAY (2002) show some differences; they differ in the position of the ventral sucker, location of the gonads relative to the ventral sucker, and the anterior extent of the excretory canals (the ventral sucker in the anterior body third and not filling the entire body width, the gonads in the mid hindbody, and the excretory canals extending to the junction of the oral sucker and the pharynx compared with a ventral sucker occupying almost the entire midbody width, the gonads near the ventral sucker and the excretory canals reaching only to the posterior level of the pharynx in BRAY's illustration. Features common to both which characterize the species are the indentation posterior to the ventral sucker, and intercaecal testes that are close to each other.

## *Complexobursa vjetnamensis* OSHMARIN et MAMAEV, 1963
(Figs 2 A-B)

Host: *Terapon theraps* (CUVIER, 1829) (Teraponidae)

Description based on six specimens, measurements on one. Body elongate, 2,550 × 480 at ventral sucker; forebody 100; hindbody 2,175. Tegument smooth. Eyespot pigment absent. Oral sucker terminal, 80 × 83. Ventral sucker 200 × 190. Sucker ratio 1:2.38. Prepharynx 5; pharynx 50 × 48; oesophagus 100; intestinal bifurcation at about anterior level of cirrus sac; caeca blind, posterior extent covered by uterus. Testes in mid third of body, smooth, tandem; anterior testis 200 × 190; posterior testis 230 × 160; intertesticular space 50; posttesticular space 1200. Cirrus sac 350 × 179, containing bipartite seminal vesicle, proximal part small, spherical, distal part long, convoluted; pars

prostatica long and wide, about two thirds length of distal segment of seminal vesicle; cirrus short. Ovary trilobed, 145 × 103, pretesticular, 170 from anterior level of anterior testis; anterior lobe near posterior level of cirrus sac; seminal receptacle absent; ootype-Mehlis' complex, Laurer's canal not seen; uterus filling all space posterior to posterior testis; metraterm well-developed, sinistral to ventral sucker, entering genital atrium near intestinal bifurcation. Genital atrium large, complex, containing globular structure with radiating fibers. Relationship of globular structure to terminal male and female components not clear. Genital pore median, bifurcal or slightly prebifurcal. Vitelline fol-

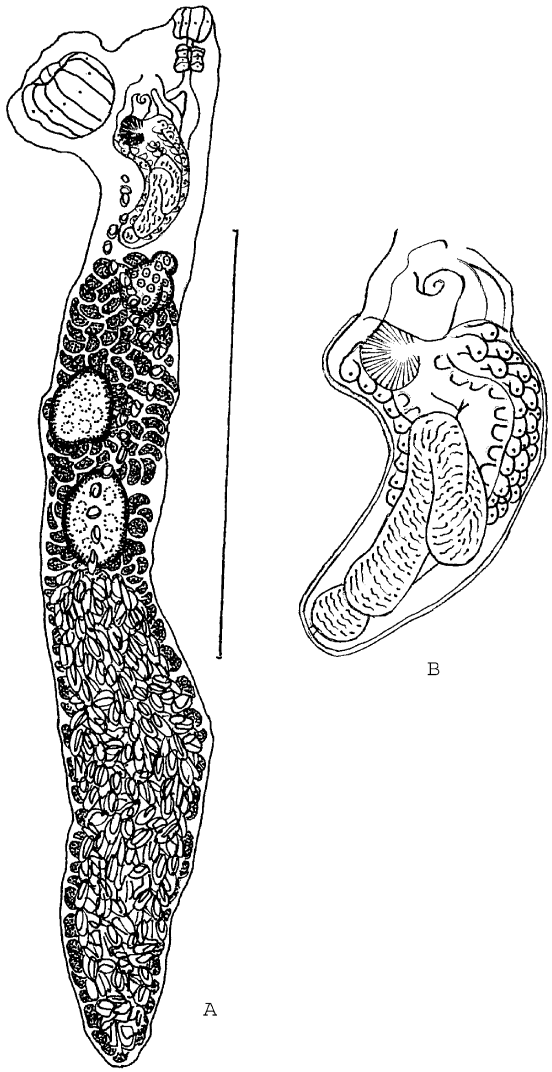


**Fig. 2.** A = *Complexobursa vjetnamensis* OSHMARIN et MAMAEV, 1963, from *Terapon theraps*. Ventrolateral view. Scale 1 mm. B. Cirrus sac free-hand drawing

licles extending from near anterior level of ovary to posterior end of body, confluent in ovario-testicular and intertesticular space. Eggs numerous, 35–45 × 23–28 (43 × 27). Excretory vesicle covered by uterus.

Remarks. Five of our specimens were in bad condition; although measurements are not reported, some information was obtained from them to enhance the description, especially that of the cirrus sac. The description and measurements agree well with those of OSHMARIN and MAMAEV (1963) from the same host species in Vietnam except, perhaps, in the interpretation of certain aspects of the cirrus sac. There is no reason for us, however, to conclude that we have a different species. BRAY (2002) examined specimens of *C. vjetnamensis* from *Pelates quadrilineatus* CUVIER (Teraponidae) from Moreton Bay, Australia. He gave a somewhat different interpretation of the terminal genitalia stating "There is a bipartite seminal vesicle, with the distal part much longer than the proximal, which leads into a long, recurved pars prostatica filled with anuclear cell-like bodies. The ejaculatory duct is short, narrow and inconspicuous but leads into a more or less hemispherical chamber, which has been considered the pars prostatica by earlier workers. This organ is prominent and filled with radiating fibers. I interpret this organ as an outgrowth of the genital atrium, the remainder of which has a completely wrinkled wall". Our interpretation of the cirrus sac and its structures vesicle is similar to his, except for the pars prostatica which seems to be a straight and wide sac-like structure.

## *Monascus filiformis* (RUDOLPHI, 1819) LOOSS, 1907
## (Figs 3 A-B)

Synonyms: (see: BRAY and GIBSON, 1980 – 12 synonyms), *Karachitrema trilobata* BILQEES, 1973, *Monascus trilobatus* (BILQEES, 1973) HAFEEZULLAH, 1984, *M. americanus* AMATO, 1982 (new synonym), *M. mediolongiusculus* DING, 1993 (new synonym)
Host: *Selaroides* (*Caranx*) *leptolepis* (CUVIER, 1833) (Carangidae)

Description based on three specimens. Body elongate 1,618–2,700 x 490–675 (2,264 × 597); forebody 490–675 (597); hindbody 1,050–1,925 (1,550). Tegument smooth. Oral sucker subterminal, 153–230 × 95–170 (188 × 138) with a longitudinal aperture; ventral sucker 78–150 × 88–125 (117 × 111); sucker ratio length 1: 0.60. Prepharynx absent; pharynx 123–140 × 90–128 (131x110); intestine single, extending to near posterior end of body; anus not evident. Testes two, elongate, tandem, entire; anterior testis 83–125 × 65–95 (111x83); posterior testis 95–140 × 50–78 (112 × 69); intertesticular space 70–200 (160); posttesticular space 270–450 (390); cirrus sac immediately anterior to and overlapping ventral sucker, 140–188 × 65–128 (164 × 97), containing bipartite seminal vesicle, posterior part spherical, anterior larger and somewhat ovoid, connecting to long cylindrical pars prostatica lined with striations in its anterior half (cirrus?); spermatophore not evident. Ovary entire, 103 – 125 × 55–88 (110 × 76); ovario-testicular space 88–190 (160); Mehlis' gland, ootype,

Laurer's canal not seen; uterine coils extending to near posterior end of body and anteriorly entering genital atrium near cirrus. Prostatic cells filling entire cirrus sac. Genital atrium large spherical; pore median. Vitelline follicles lateral, extending from near posterior level of acetabulum to mid level between testes. Eggs 27–37 × 19–21 (33 × 18). Excretory vesicle not evident, pore terminal.

Remarks. As far as we can determine nine nominal species have been reported in the genus *Monascus* up to 1993: *M. filiformis* (RUDOLPHI, 1819) from *Cepola rubescens* LINNAEUS (Cepolidae) initially at Rimini, Italy; *M. typicus*

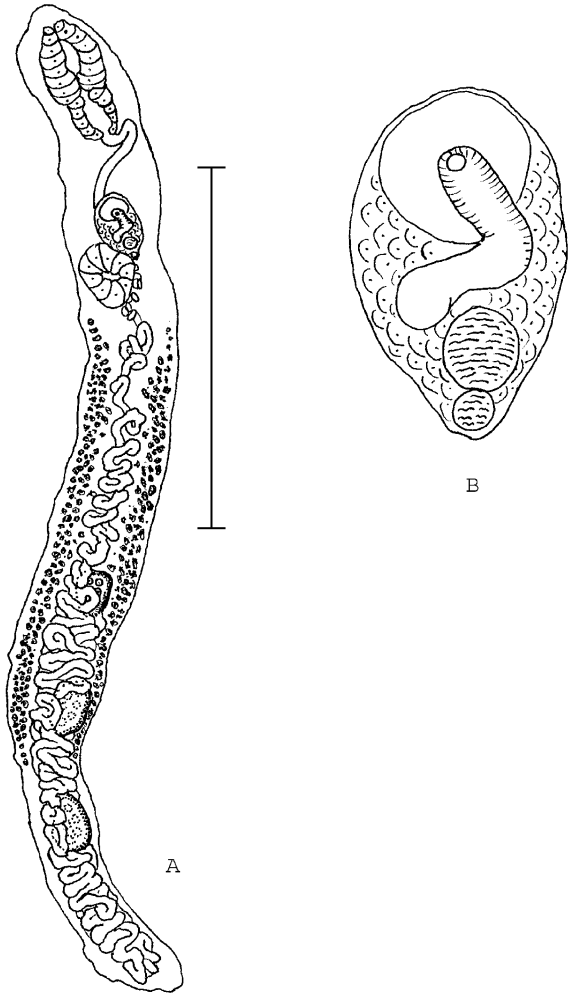


**Fig. 3.** A = *Monascus filiformis* (RUD., 1819) from *Selaroides leptolepis*. Ventral view. Scale 1 mm. B = Cirrus sac free-hand composite drawing

(ODHNER, 1911) from *Caranx trachurus* LINNAEUS (Carangidae) at Palermo and Trieste; *M. minor* (ODHNER, 1911) from *Pleuronectes limanda* (LINNAEUS) (Pleuronectidae) at Kristineberg, Sweden; *M. monenteron* LOOSS, 1907 from an unknown host; *M. orientalis* (SRIVASTAVA, 1941) from *Synaptura orientalis* (BLOCH et SCHNEIDER) (Soleidae) from Bay of Bengal; *M. netoi* TRAVASSOS, FREITAS et BÜHRNHEIM,1965 from *Oligoplites saurus* (BLOCH et SCHNEIDER) (Carangidae) from Brazil; *M. chauhani* VASANTHA KUMARI, 1975 from 2 unnamed species of *Pampus* (Stromateidae) from India; *M. americanus* AMATO, 1982 from *Trachurus lathami* (NICHOLS) (Carangidae) from Brazil; and *M. mediolongiusculus* DING, 1993 from *Mugil ophuyseni* BLEEKER (Mugilidae) from Guangdong Province, China. Another species, *Karachitrema trilobata* BILQEES, 1973 from *Caranx affinis* (RÜPPELL) (Carangidae) in the Arabian Sea also belongs to this group.

*Monascus filiformis*, a parasite described by RUDOLPHI in 1819 as *Distoma filiformis*, was transferred to the genus *Monascus* by LOOSS (1907) without a generic diagnosis, and designated as its type species. ODHNER (1911) created the genus *Haplocladus* for a new species, *H. typicus*. A review of the relationship of these 2 genera and their species was discussed by a number of investigators including DOLLFUS (1947), DAWES (1947, 1956), SKRJABIN and KOVAL (1957), FISCHTHAL and KUNTZ (1963), FISCHTHAL and THOMAS (1968) and NAHHAS and POWELL (1971). *Monascus typicus* (ODHNER, 1911) YAMAGUTI, 1954, mostly from carangids, is very similar to *M. filiformis* and was suspected to be a synonym of the latter by many of these investigators and recognized as such by BRAY and GIBSON (1980).

BRAY and GIBSON (1980) listed 12 taxa as synonyms of *M. filiformis* and HAFEEZULLAH (1984) eight. The latter named seven and later in the discussion added *M. chauhani* (its figure labeled *M. ovilobatus*). Not included in the synonymy are *M. americanus* AMATO, 1982 and *M. mediolongiusculus* DING, 1993. HAFEEZULLAH (1984) referred to a number of issues relating to several of the taxa. Among them the presence of one or two caeca, whether the ovary is round or trilobed, and whether there is an anus or a connection between the intestine and the excretory vesicle. Other issues are the extent, especially the posterior extent, of the vitelline follicles relative to the testes and allometric changes that occur during development. HAFEEZULLAH (1984) referred to the work of KOIE (1979), who worked out the life cycle of *M. filiformis* and showed the presence of two caeca in the cercaria and the adult; according to that study, the bifurcation of the pseudoesophagus occurs between the ventral sucker and the ovary; the right caecum extends to the posterior end of the body but the left caecum remains short and reduced. The right caecum is the one that is seen by most investigators and has led to the assumption that only one caecum is present. Similar finding was reported

by MARTORELLI and CREMONTE (1998). As to the shape of the ovary of *M. filiformis* most investigators describe it as round, entire, or smooth. Specimens of *M. filiformis* studied by DOLLFUS (1947) had "more or less oval" ovaries. None of these reports {DAWES (1947,1956), SKRJABIN and KOVAL (1957), FISCHTHAL and KUNTZ (1963), FISCHTHAL and THOMAS (1968) and NAHHAS and POWELL (1971)} described or reported a lobed ovary. The Kuwaiti specimens reported in this paper also have an entire ovary. The same is true of *M. typicus*. Exceptions to this are reports of *M. typicus* by LAMOTHE-ARGUMEDO (1969) from *Trachurops crumenophthalmus* (BLOCH) and *Caranx hippos* (LINNAEUS) (Carangidae) from the Mexican Pacific, and *M. filiformis* of NASIR and GOMEZ (1977) from *Trachurus lathami* from Venezuela that were described as having trilobed ovaries. HAFEEZULLAH (1984) also reported that "two of the three specimens recovered from *Formio* (*Stromateus, Parastromateus, Apolectus*) *niger* (Carangidae) from Gopalpur have trilobed ovary". He also indicated that KOIE's (1979) specimens from the dab included specimens with trilobed ovaries. HAFEEZULLAH (1984) apparently was not aware of the description of *M. americanus* AMTO, 1982 which was characterized by a slightly lobed ovary in the young forms and trilobed in the adult. AMATO (1982) considered a trilobed ovary an important species characteristic that led him to synonymize *M. typicus* of LAMOTHE-ARGUMEDO (1969) and *M. filiformis* of NASIR and GOMEZ (1977) with *M. americanus. M. americanus* was compared with *M. netoi* but not with *M. filiformis* or with *M. typicus*. Except for this feature, all the characteristics of *M. americanus* fit well with the various descriptions of *M. filiformis* or *M. typicus* and hence becomes another synonym of *M. filiformis*.

The description, measurements and topography of the gonads of *Monascus mediolongiusculus* DING, 1993 are in agreement with one or more of the various descriptions of *M. filiformis.* DING (1993) compared it only with *M. orientalis*. This species is here considered another synonym of *M. filiformis*. BILQEES (1973) erected the genus *Karachitrema* to accommodate *K. trilobata*, a species from *Caranx affinis* (RÜPPELL) (Carangidae) from the Karachi coast. BRAY (2002) re-examined the holotype (BMNH 1982.5.13.13) of *K. trilobata* and confirmed an earlier opinion (BRAY, 1983) and that of HAFEEZULLAH (1984) that *Karachitrema* is a synonym of *Monascus*. It should be noted, however, that BILQEES's description of *K. lobata* does not agree with those of *M. filiformis* in at least two respects, one the "bifurcation" of the intestine anterior to the ventral sucker and the second is the presence of two caeca that extend to the posterior end of the body. Her drawing, however, shows neither bifurcation of the oseophagus nor any caeca extending to the posterior end of the body.

As to the presence or absence of an anus in species of *Monascus*, the various reports are also conflicting (see BRAY 2002). The same is true of the distribution of the vitelline follicles. Most reports describe the follicles extending from near the posterior level of the ventral sucker (an exception is *M. chauhani*), but differ in the posterior extent relative to the testes. This species was distinguished " from all the known species of the genus in the larger size of the body, in the oral sucker having an oval opening instead of a slit like elongated opening, and in having a distinctly lobed ovary" and from " *M. orientalis* (SRIVASTA, 1941) in the absence of cuticular spines and in the extension of the vitellaria". VASANTHA KUMARI (1975) described the forebody to hindbody ratio as 1:12.3, eggs "0.024–0.008 × 0.012–0,332" (sic); the illustration, labeled *Monascus ovilobatus*, shows an equatorial ovary and vitelline follicles from the "middle of acetabulovarian zone to anterior margin of anterior testis". *M. chauhani* and *M. orientalis* were recognized as synonyms of *M. filiformis* by BRAY and GIBSON (1980).

Various allometric changes were also described in *M. filiformis* by DOLLFUS (1947), in *M. typicus* by FISCHTHAL and THOMAS (1968) and in *M. americanus* by AMATO (1982). These chiefly relate to relative positions of the ventral sucker and testes in the young compared with adults.

### *Tergestia pauca* FREITAS & KOHN, 1965

Host: *Alepes djedaba* ( FORSSKÅL, 1775) (Carangidae) (new host record)

This species was reported by NAHHAS *et al*. (1998) from *Trachurus trachurus* LINNAEUS, 1758 and *Scomberoides commersonianus* LACEPÈDE, 1802 (Carangidae); an additional, carangid host, *Alepes djedaba* is here added.

## Family Transversotrematidae YAMAGUTI, 1954

### *Transversotrema licinum* MANTER, 1970
(Fig. 4)

Host: *Diplodus noct* (VALENCIENNES, 1830) (Sparidae) new host record

Description based on 10 specimens. Body transversely elongate, dorso-ventrally flattened, 500–875 × 1,625–2,250 (740x1,970); body length to width ratio 1:2.37–1:3.25 (1:2.62); forebody 250–460 (370); hindbody 135–350 (283). Tegument spiny; spines small, extending along entire body length. Eyespots two, 190–290 (226) apart. Oral sucker lacking; ventral sucker near midbody, 78–100 × 83–105 (88 × 103). Pharynx midventral, 75–110 × 88–120 (95 × 109); oesophagus 30–80

(57); caeca form cyclocoel, surrounding gonads. Testes two, symmetrical, deeply lobed; right testis 170–240 × 190–310 (210 × 251); left testis 150–250 × 190–300 (218 × 243); seminal vesicle anterior to right testis, bipartite, posterior part globular, anterior segment tubular, and winding; pars prostatica poorly developed terminating as small ejaculatory duct. Ovary 100–170 × 110–190 (135x156), smooth to slightly irregular, sinistral and anterior to left testis; uterus extending between testes and anterior limbs of caeca, joining ejaculatory duct at genital pore in mid anterior margin of body. Laurer's canal opening dorsally near left testis; seminal receptacle absent, few sperm seen near proximal part of uterus; vitelline follicles numerous, few in intercaecal region lateral to gonads, but mostly extracaecal and confluent in posterior body; anteriorly follicles restricted to about one third body width on each side. Eggs 80–100 × 30–50 (96 × 44). Excretory vesicle short, tubular; pore terminal.

Remarks. This species was first described by MANTER (1970) from *Scorpis* sp and *Microcanthus strigatus* (CUVIER) (Kyphosidae) from Moreton Bay, Australia. CRIBB *et al.* (1992) reviewed the family Transversotrematidae, redescribing the species in detail, based on material obtained from several species of fish belonging to 7 host families. ABDUL-SALAM and SREELATHA (1992) recovered it from *Diplodus sargus* (Sparidae) from the Kuwaiti coast and described its surface topography and ultrastructure. The distinguishing features of this species, compared with *T. haasi* WITENBERG, 1944 according to CRIBB *et al*. (1992) and confirmed in our study, are the restricted distribution of the vitelline follicles anterior to the caeca and the length-width ratio.

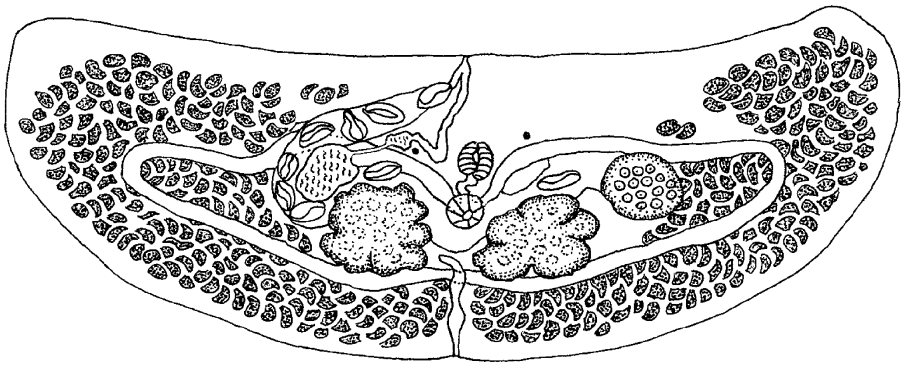

**Fig. 4.** *Transversotrema licinum* MANTER, 1970 from *Diplodus noct.* Ventral view. Scale 1.00 mm

## Family Bivesiculidae YAMAGUTI, 1934

### *Treptodemus latus* MANTER, 1961
(Fig. 5)

Host: *Hemiramphus marginatus* (FORSSKÅL, 1775) Hemiramphidae (new host and geographic record)

Description based on 29 specimens, measurements on 18. Body 200–600 x 780–1,600 (430 × 1,235); ratio of length to width 1: 2.1–3.00 (1:2.62). Tegument aspinose; eyespot pigment small, diffuse, not evident in some. Oral and ventral suckers absent. Mouth small opening at mid anterior edge; prepharynx 0–15 (5) long; pharynx 45–73 × 28–55 (59 × 44); oesophagus 20–105 (43); caeca extending laterally, arching around reproductive structures and excretory canals, ending blindly, near posterior end of body. Testis single, oval, 120–260 x 180–340 (205 × 258) in mid left half of body. Cirrus sac spherical to oval, 150–230 × 170–290 (194–259), in middle of right half of body; seminal vesicle internal, occupying one half to two thirds of cirrus sac; pars prostatica not evident; cirrus thick-walled relatively short. Ovary spherical to oval, 70–130 × 90–138 (107 × 129), median to submedian, immediately posterior to intestinal bifurcation; seminal receptacle spherical to oval, 100–130 × 130–220, postovarian, near midbody; Mehlis' gland and ootype submedian, closer to cirrus sac in some; uterus extending to left side anterior to testis, then turning dorsally to right side; metraterm thick-walled, anterior to cirrus sac, entering genital atrium from left side; seminal receptacle 55–98 × 80–103, just posterior to Mehlis'gland. Vitelline follicles irregular in shape, circumcaecal, confluent at oesophageal level. Genital atrium large, pore slightly dextral and anterior to midbody, surrounded by muscular sphincter with radiating fibers. Eggs 68–83 × 25–45 (72 × 35) non-embryonated, often collapsed. Excretory system consisting of 2 wide canals, extending anteriorly to near level of seminal receptacle then laterally, one to about midlevel of testis, the other to midlevel of cirrus sac, and connecting posteriorly with thin short tube to terminal excretory pore.

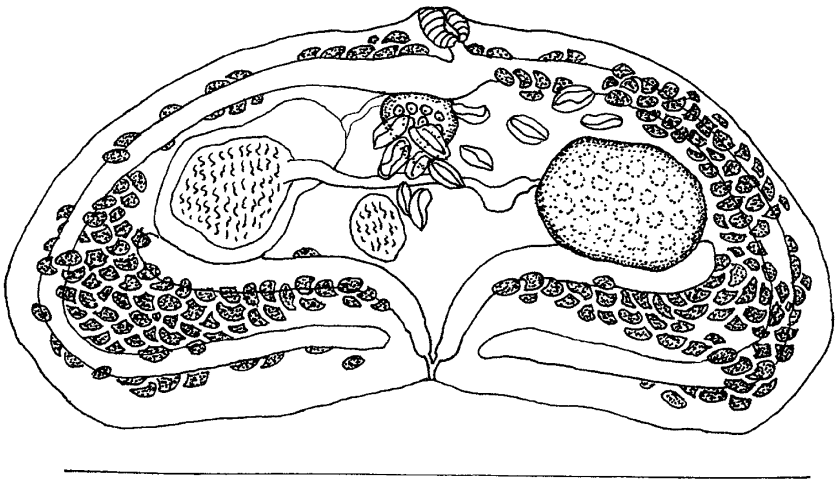

**Fig. 5.** *Treptodemus latus* MANTER, 1961 from *Hemiramphus marginatus.* Ventral view. Scale 1.00 mm

Remarks. MANTER (1961) described this species from a single specimen recovered from "a half beak, probably *Hemiramphus* sp." (Hemiramphidae) from Fiji. He assigned it to the family Bivesiculidae based on absence of suckers, single testis, 2 vasa efferentia, and 2 excretory vesicles. YAMAGUTI (1971) erected the family Treptodemidae to accommodate this monotypic genus, but CRIBB (2002) retained it in the family Bivesiculidae. MANTER's description is remarkably accurate. We have followed MANTER's descriptions on every specimen and found that collectively the details agree with his. Differences we observed are the somewhat narrower eggs and vitelline follicles that are confluent at the oesophageal level. In several specimens, the intestinal contents consist of a black pigment suggestive of digested hemoglobin (?). *Treptodemus latus* was also reported and briefly described by MACHIDA and KURAMOCHI (2000) from *Hemiramphus far* from Okinawa, Japan and Mactan, Philippines. The differences they cited included an ovary that is occasionally lobed, tegument with fine spines, eyespot pigments that are scattered around the pharynx and the oesophagus, presence of a pars prostatica with a pair of diverticula, and surrounded by glandular cells. In their specimens from Nago, Okinawa "five specimens had much wider bodies" and "testis with one or two deep longitudinal incisions at posterior margin". They considered these features as variations. We cannot confirm these characteristics in our Kuwaiti specimens; some of our specimens contain one or two very small pigments suspected to be remnants of eyespots. The Kuwaiti material may not have been as fresh as that of MACHIDA and KURAMOCHI (2000) which could explain absence of tegumental spines. We have no reason to suspect that their specimens or the Arabian Gulf material represent a new species. As far as we can determine, this is the third report of this species and the finding represents new geographic and host records.

## Family Prosogonotrematidae PÉREZ VIGUERAS, 1940

### *Prosogonotrema bilabiatum* PÉREZ VIGUERAS, 1940
(Fig. 6)

Synonyms: *Prosogonotrema clupea* YAMAGUTI, 1952, *P. carangis* VELASQUEZ, 1961, *P. subequilatum* PRITCHARD, 1963, *P. abalisti* PARUCHIN, 1964, *P. symmetricum* OSHMARIN, 1965, *P. pritchardae* HAFEEZULLAH, 1970, *P. zygaenae* ALI et BAGWAN, 1971

Host: *Epinephelus areolatus* (FORSSKÅL, 1775) (Serranidae) (new host and geographic record)

Description based on one mature specimen: body 4,675 × 1,875 at ventral sucker; forebody 2,375; hindbody 1,050. Pre-oral lip undivided. Tegument thick, smooth. Preoral lobe 100. Oral sucker subterminal 400 × 500; ventral sucker 1,250 × 1,375, surrounded by tegumental fold; sucker ratio 1: 2.9. Prepharynx absent; pharynx 220 × 280; oesophagus absent; caeca extending to posterior

end of body. Testes two, entire, slightly diagonal, about midway between oral sucker and ventral sucker, separated by uterine coils; right testis 250 × 300, left testis 250 × 255; seminal vesicle long tubular, coils extending intertesticularly and anteriorly; pars prostatica tubular, extent not determined. Genital cone somewhat cylindrical, 410 × 160. Genital pore median at base of pharynx. Ovary 250 × 350, dextral, overlapping anterior edge of ventral sucker; uterine coils chiefly preovarian, overlapping tubular seminal vesicle and pars prostatica; metraterm joining seminal vesicle at base of genital cone, to form hermaphroditic duct. Seminal receptacle absent. Vitellaria tubular, slender, 3–4 on each side, extending from middle of body just anterior to ventral sucker to close to body margins. Eggs 25–28 × 10–13. Accessory excretory tube (?) dorsal to excretory vesicle; pore terminal.

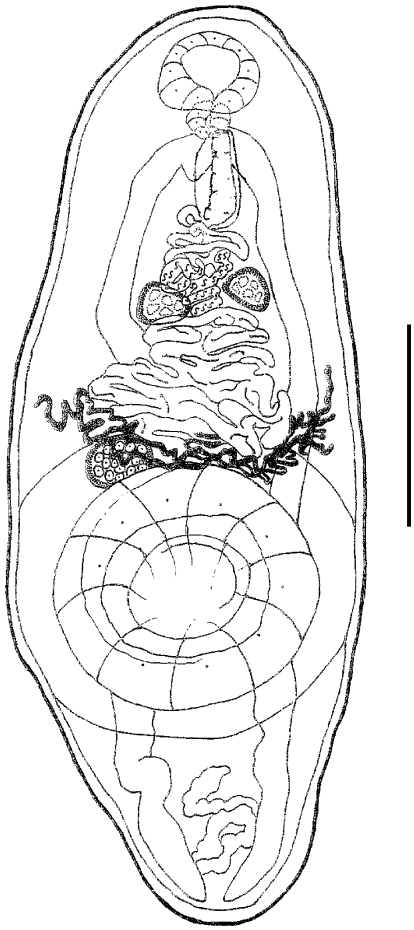

**Fig 6.** *Prosogonotrema bilabiatum* PÉREZ VIGUERAS, 1940 from *Epinephelus areolatus*. Ventral view. Scale 1 mm

Remarks. Sixteen species have been reported in the genus *Prosogonotrema*, seven of which were considered synonyms of *P. bilabiatum* by NASIR (1973) (see synonyms above). Criteria used to distinguish among the species included differences in body size, position of the ventral sucker, location of the ovary in relation to the ventral sucker, and differences in egg size and host affiliation. At least 9 additional species have been described since 1973 including *P. plataxum* GU et SHEN, 1979 from *Platax orbicularis* (FORSSKÅL) (Ephippidae) and *P. caesionis* GU et SHEN, 1979 from *Caesio erythrogaster* (Caesionidae) from China*; P. karachiensis* BILQEES et DURRANI,1980 From *Lutjanus johnii* (Lutjanidae) and *P. diacanthi* Bilqees et Durrani, 1980 from *Pseudosciaena diacanthi* (Sciaenidae) from the Karachi coast, Arabian Sea; *P. arabica* YADAV, 1980 and *P. posterouterina* YADAV, 1980 both from *Stromateus niger* (Stromateidae) from Ratnagiri, Maharashtra, India; *P. pavasi* LOKHANDE, 1990 from the same host species and location, and *P. nickoli* BILQEES et KHAN, 1992 from *Labeo rohita* (Cyprinidae) a fresh water fish in India. Some of these (*P. plataxum, P. caesionis, P. karachiensis*, and *P. diacanthi*), based on NASIR's analysis, may also be synonyms of *P. bilabiatum*. Our limited material, however, does not allow us to make a definitive judgement.

MACHIDA and UCHIDA (1990) found *P. bilabiatum* in the stomach of *Naso hexacanthus* (BLEEKER), agreed with NASIR (1973), but made no comments on those species described between 1979 and 1990.

## Family Angiodictyidae LOOSS, 1902

### *Hexangium sigani* GOTO et OZAKI, 1929

Synonyms: *Hexangium affinum* TUBANGUI et MASILUNGAN, 1944, *H. secundum* ANNEREAUX, 1947, *Arthurloosia loossi* NAGATY, 1954, *Hexangium loossi* (NAGATY, 1954) YAMAGUTI, 1958

Host: *Siganus canaliculatus* (PARK, 1797) (Siganidae)

Measurements on one specimen. Length 4,175; width 975. Oral sucker 210 × 235. Prepharynx 500; pharynx 140 × 108; oesophagus very short. Anterior testis 480 × 450; posterior testis 470 × 420. Ovary 180 × 210. Eggs 72–75 × 40–43.

Remarks. This species was reported and figured from the same host species from the Kuwaiti coast, Arabian Gulf by AL-YAMANI and NAHHAS (1981).

## Family Zoogonidae

### *Diphterostomum brusinae* (STOSSICH, 1888) STOSSICH, 1903
(Figs 7 A-B)

Synonyms: (Refer to BRAY and GIBSON, 1986)
Host: *Argyrops spinifer* (FORSSKÅL) Sparidae (new host and geographic record)

Description based on one specimen. Length 1,160 × 300; fore-body 540, hind-body 400, tegument spiny, spines large, extending to mid level of ventral sucker, becoming sparse posteriorly. Eyespot pigment absent. Oral sucker 125 in diameter; ventral sucker 220 × 230, with ventral lips. Sucker ratio 1:1.8. Prepharynx absent; pharynx 45 × 55; oesophagus 113; intestinal bifurcation midway between suckers; caeca short, extending to about midlevel of ventral sucker. Testes two, slightly diagonal; right testis 115 × 63; posterior testis 123 × 73. Cirrus sac arcuate, sinistral to and anterior to

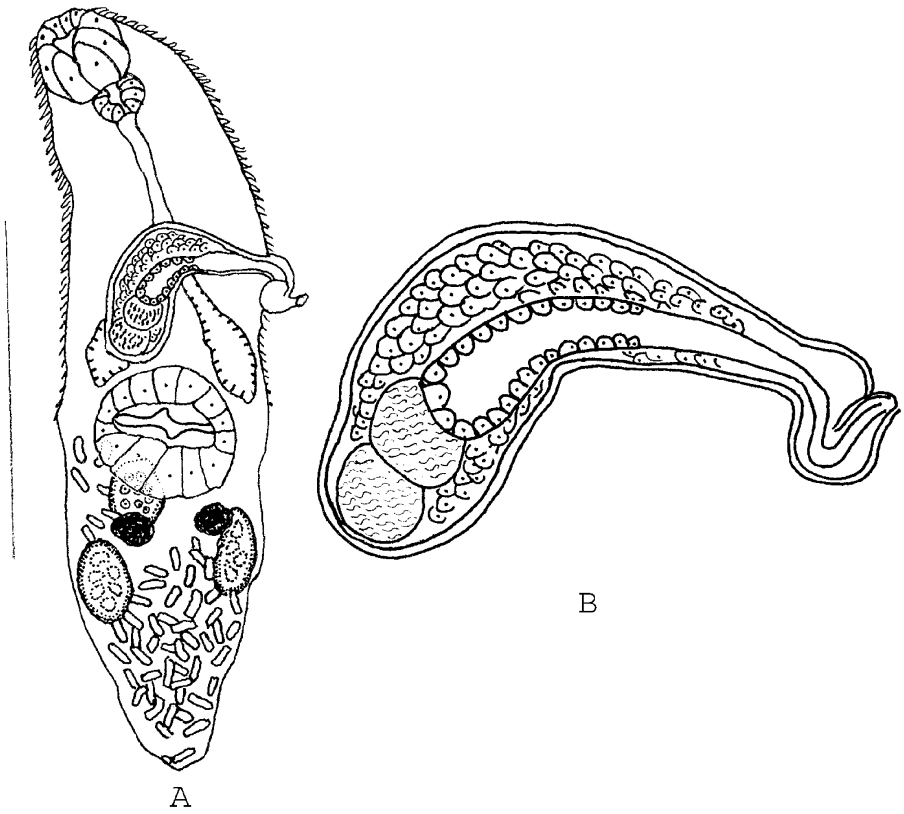


**Fig. 7. A-B.** A. *Diphterostomun brusinae* (STOSSICH, 1888) STOSSICH, 1903 from *Argyrops spinifer*. Ventral view. Scale 0.5 mm. B. Cirrus sac free-hand drawing

ventral sucker, 250 × 90; containing bipartite seminal vesicle, distal segment 38 × 55, proximal 45 × 40; pars prostatica elongated, 150 long and cirrus about 100. Genital atrium marginal, pore sinistral. Ovary pretesticular, dorsal to and overlapping posterior edge of ventral sucker 100 × 88; seminal receptacle very small; uterus occupying all post-gonadal space; vitelline glands two, somewhat symmetrical, about 30 in diameter each. Eggs elongated-oval, thin-shelled, 37–40 × 12–18. Excretory pore terminal.

Remarks. BRAY and GIBSON (1986) placed 16 species, including some cercariae, among the synonyms of *Diphterostomum brusinae*. Also included are six species of *Diphterostomum*: *D. sargus-annularis* (VLASENKO, 1931) in *Sargus annularis* (BLEEKER) (Sparidae) from the Black Sea, *D. spari* (YAMAGUTI, 1938) in *Sargus longispinnis* (*Chrysophrys longispinnis* = *Acanthopagrus berda*) (CUVIER) (Sparidae) from Japan, *D. macrosaccum* (MONTGOMERY, 1957) in *Neoclinus uninotatus* HUBBS (Chaenopsidae) from California, *D. anisotremi* (NAHHAS et CABLE, 1964) in *Anisotremus virginicus* (LINNAEUS) (Sparidae) from Jamaica, *D. tropicum* (DURIO et MANTER, 1963) in *Lethrinus* spp. (Lethrinidae) from New Caledonia and Queensland, and *D. israelense* FISCHTHAL, 1980 in *Diplodus sargus* (LINNAEUS), *D. vulgaris* (ST.HILAIRE) (Sparidae) and *Saurida undosquamis* (RICHARDSON) (Synodontidae) from the Israeli coast of the Mediterranean. The description and measurements of the Kuwaiti specimens fit into one or more of these species.

*

*Acknowledgements* — The authors wish to thank Professor JIAN HUA REN of the Chemistry Department for the translation of the Chinese articles and Professor PAUL RICHMOND, chairperson of the Department of Biological Sciences of the University of the Pacific for his help in the use of the Nikon Eclipse E800 microscope.

## REFERENCES

ABDUL-SALAM, J. & SREELATHA, B. N. S. (1992) The surface topography and ultrastructure of the tegument of the ectoparasite digenean Transversotrema licinum. *Zool. Anzeiger* **228**: 248–261.

AL-YAMANI, F. Y. & NAHHAS, F. M. (1981) Digenetic trematodes of marine fishes from the Kuwaiti coast of the Arabian Gulf. Kuwaiti Institute for Scientific Research Serial. *Kuwait Bull. Marine Sci.* **3**: 1–22.

AMATO, J. F. R. (1982) Digenetic trematodes of percoid fishes of Florianópolis, Southern Brasil – Fellodistomidae, Monascidae, Diplangidae, Zoogonidae, and Waretrematidae with description of two new species. *Revista Brasiliana Biologia* **42**: 681–699.

BILQEES, F. M. (1972) Marine fish trematodes of W. Pakistan XII. A new genus Paradiplobulbus, including two species, P. isorchis and P. heterorchis. *Proc. Helminthol. Soc. Washington* **39**: 249–252.

BILQEES, F. M. (1973) Marine fish trematodes of W. Pakistan XIII. Three new species (Allocreadiidae and Hemiuridae), including a new genus Karachitrema gen. n.. *Acta Parasitologica Polonica* **21**: 327–334.

BRAY, R. A. (1983) On the fellodistomid genus Proctoeces Odhner, 1911 (Digenea), with brief comments on two other fellodistomid genera. *J. Nat. Hist.* **17**: 321–339.

BRAY, R. A. (2002) Family Fellodistomidae Nicoll, 1909. Pp. 261–293. *In* GIBSON, D. I., JONES, A. & BRAY, R. A. (eds): *Keys to the Trematoda. Vol. 1.* CABI Publishing and The Natural History Museum, London,

BRAY, R. A. & GIBSON, D. I. (1980) The Fellodistomidae (Digenea) of fishes from the north-east Atlantic. *Bull. British Museum (Natural History) Zoology* **37**: 199–293.

BRAY, R. A. & GIBSON, D. I. (1986) The Zoogonidae (Digenea) of fishes from the north-east Atlantic. *Bull. British Museum (Natural History) Zoology* series **51**: 127–206.

BUSH, A. O., LAFFERTY, K. D., LOTZ, J. M. & SHOSTAK, A. W. (1997) Parasitology meets ecology on its own terms. Margolis *et al*. revisited. *J. Parasitology* **83**: 37–62.

CRIBB, T. H., BRAY, R. A. &. BARKER, S. C. (1992) A review of the family Transversotrematidae (Trematoda: Digenea) with the description of a new genus, Crusziella. *Invertebrate Taxonomy* **6**: 909–935.

CRIBB, T. H. (2002) Superfamily Bivesiculoidea Yamaguti, 1934. Pp. 25–29. *In* GIBSON, D. I., JONES, A. & BRAY, R. A. (eds): *Keys to the Trematoda. Vol. 1*, CABI Publishing and The Natural History Museum, London

CROWCROFT, P. W. (1950) Note on Lintonium vibex (Linton, 1899) (Digenea – Trematoda). *Parasitology* **40**: 316–321.

DAWES, B. (1947) *The Trematoda of British Fishes*. Ray Society, London 364 pp.

DAWES, B. (1956) *The Trematoda with special reference to British and other European forms*. Cambridge Univ. Press, 644 pp.

DING, X. J. (1993) Marine fish trematodes. III. On a new species of Monascus. *Annual Bull. Soc. Parasitol.* **12**: 201.

DOLLFUS, R-PH. (1947) Sur Monascus filiformis (Rudolphi, 1819) A. Looss, 1907. Trématode de l'intestin de Cepola rubescens (L.) en Méditerranée. *Annals Parasitol.* **22**: 319–323.

ESCHMEYER, W. N. (1998) *Catalog of fishes*. California Academy of Sciences, San Francisco Volumes 1–3. 2,905 pp.

FISCHTHAL, J. H. & KUNTZ, R. E. (1963) Trematode parasites of fishes from Egypt. Part IV. A redescription of Monascus typicus (Odhner, 1911) (Fellodistomidae) *Proc. Helminthol. Soc. Washington* **30**: 177–182.

FISCHTHAL, J. H. & THOMAS, J. D. (1968) Digenetic trematodes of some freshwater and marine fishes from Ghana. *Proc. Helminthol. Soc. Washington* **35**: 126–140.

FROESE, R. & PAULY, D. (eds) (2003) *FishBase. World wide web electronic publication*. http//:www.fishbase.org, version 10 June 2003.

HAFEEZULLAH, M. (1984) On the status of some digenetic trematodes of marine fishes of India. *Bull. Zool. Survey India* **6**: 209–218.

KISHORE, B., SHYAMASUNDARI, K. & RAO, K. H. (1989) The nervous system of Lintonium pulchrum (Johnston, 1913) from the marine fish Lagocephalus lunaris (Bloch & Schneider). *Rivista di Parassitologia* **5**: 123–128.

KOIE, M. (1979) On the morphology and life history of Monascus (=Haplocladus) filiformis (Rudolphi, 1819) Looss, 1907 and Steringophorus furciger (Olsson, 1868) Odhner, 1905 (Trematoda: Fellodistomidae). *Ophelia* **18**: 113–132.

KURONUMA, K. & ABE, Y. (1986) *Fishes of the Arabian Gulf*. Kuwait Institute for Scientific Research, 356 pages.

LAMOTHE-ARGUMEDO, R. (1969) Trematodos de peces III. Cuatro especies nuevas de trematodos parásitos de peces del Pacifico Mexicano. *Annls Inst. Biol. Univ. Nac. Autónoma México* **40**: 21–42.

LAYMAN, E. M. (1930) Parasitic worms from the fishes of Peter-the-Great Bay. *Izvestya Tikhookeanskoi Nauchno-Promyslovi Ostantsii* **3**: 1–120.

LOOSS, A. (1907) Zur Kenntnis der Distomenfamilie Hemiuridae. *Zool. Anzeiger* **31**: 585–620.

MACHIDA, M. (1971) Fellodistomatid trematodes from marine fishes near Tsushima Islands in the Sea of Japan. *Bull. Nat. Sci. Mus., Japan* **14**: 187–193.

MACHIDA, M & KURAMOCHI, T. (1999) Digenean trematodes from tetraodontiform fishes from Japanese and adjacent waters. *Bull. Nat. Sci. Mus., Japan. Series A. Zool.* **25**:1–25.

MACHIDA, M & KURAMOCHI, T. (2000) Digenean trematodes from halfbeaks and needle-fishes of Japan and adjacent waters. *Bull. Nat. Sci. Mus., Japan, Series A. Zool.* **26**:203–218.

MACHIDA, M & UCHIDA, A. (1990) Trematodes from unicorn fishes of Japanese and adjacent waters. *Mem. Nat. Sci. Mus.* **23**: 69–81

MADHAVI, R. (1975) Digenetic trematodes from marine fishes of Waltair coast, Bay of Bengal. Family Fellodistomatidae. *Rivista di Parassitologia* **36**: 267–278.

MANTER, H. W. (1961) Studies on digenetic trematodes of fishes of Fiji. I. Families Haplosplanchnidae, Bivesiculidae, and Hemiuridae. *Proc. Helminthol. Soc. Washington* **28**: 67–74.

MANTER, H. W. (1970) A new species of Transversotrema (Trematoda: Digenea) from marine fishes of Australia. *J. Parasitol.* **56**: 486–489.

MANTER, H. W. & PRITCHARD, M. H. (1962) Studies on digenetic trematodes of Hawaiian fishes: Families Fellodistomatidae, Opistholebetidae and Gyliauchinidae. *Transactions of the American Microscopic Soc.* **81**: 113–123.

MARTORELLI, S. R. & CREMONTE, F. (1998) A proposed three-host life history of Monascus filiformis (Rudolphi, 1819) (Digenea: Fellodistomidae) in the southwest Atlantic Ocean. *Can. J. Zool.* **76**: 1198–1203.

NAHHAS, F. M. & POWELL, E. C. (1971) Digenetic trematodes of marine fishes from the Floridian Northern Gulf of Mexico. *Tulane Studies in Zoology and Botany* **17**: 1–9.

NAHHAS, F. M. & SEY, O. (1998) Chauhanotrema spiniacetabulum sp. n. (Digenea: Waretrematidae) from Hemiramphus marginatus (Forsskål) (Hemiramphidae) from the Kuwaiti coast of the Arabian Gulf. *J. Helminthol. Soc. Washington* **65**: 6–9.

NAHHAS, F. M. & SEY, O. (2002) Digenetic trematodes from marine fishes off the coast of Kuwait, Arabian Gulf: Superfamily Hemiuroidea. *Acta zool. hung.* **48**: 1–20.

NAHHAS, F. M., SEY, O. & NISHIMOTO, R. (1998) Digenetic trematodes of marine fishes from the Kuwaiti coast of the Arabian Gulf: Families Pleorchiidae, Fellodistomidae, and Cryptogonimidae, with a description of two new species, Neoparacryptogonimus sphericus and Paracryptogonimus ramadani. *J. Helminthol. Soc. Washington* **65**: 129–140.

NASIR, P. (1973) Monotypic status of Prosogonotrema Pérez Vigueras, 1940 (Trematoda: Digenea). *Rivista di Parassitologia* **34**: 271–276.

NASIR, P. & GOMEZ, Y. (1977) Digenetic trematodes from Venezuelan marine fishes. *Rivista di Parassitologia* **38**: 53–73.

ODHNER, T. (1911) Zum natürlichen System der Digenen Trematoden. III. Ein weiterer Fall von sekundärum Anus. *Zool. Anzeiger* **38**: 97–117.

OSHMARIN, P. G. & MAMAEV, YU. L. (1963) A new subfamily of the trematodes with closing mechanism of bursa from a fish caught in the South Chinese Sea. *Zool. Zh.* **42**: 665–669.

RANDALL, J. E. (1995) *Coastal fishes of Oman*. Univ. Hawaii Press, Honolulu, 439 pp.

SEY, O. (1995) Description of Bianium arabicum sp. n. (Trematoda, Lepocreadiidae) from the pufferfish, Lagocephalus lunaris (Bloch et Schneider, 1801) in Kuwait and a review of the genus Bianium Stunkard, 1930. *Parasitol. Hung.* **28**: 13–20.

SEY, O. & NAHHAS, F. M. (1997) Digenetic Trematodes of Marine Fishes from the Kuwaiti coast of the Arabian Gulf: Family Monorchiidae Odhner, 1911. *J. Helminthol. Soc. Washington* **64**: 1–8.

SEY, O., AL-GHAITH, L. & NAHHAS, F. M. (1998) Scanning electron microscopy study of a copulating monorchiid (Trematoda: Digenea). *J. Helminthol. Soc. Washington* **65**: 243–245.

SKRJABIN, K. I. & KOVAL, V. P. (1957) Family Fellodistomatidae Nicoll, 1913. *Trematodes of animals and man* **13**: 163–452.

STUNKARD, H. W. & NIGRELLI, R. F. (1930) On Distomum vibex Linton, with special reference to its systematic position. *The Biol. Bull.* **58**: 336–343.

VASANTHA KUMARI, N. (1975) A species of the genus Monascus Looss, 1907 (Trematoda: Digenea: Fellodistomidae) parasitic on flat fishes. Dr. B. S. Chauhan Commemoration Volume. pp. 247–250.

YAMAGUTI, S. (1934) Studies on the helminth fauna of Japan Part 2. Trematodes of fishes, I. *Japanese J. Zool.* **5**: 249–541.

YAMAGUTI, S. (1971) *Synopsis of digenetic trematodes of vertebrates*. Parts 1 & 2. Keigaku Publishing Company. Tokyo, Japan. 1074 pp.

Revised version received October 21, 2003, accepted October 22, 2003, published November 30, 2003