

## NEW DIDYMOZOID TREMATODES FROM *ONIGOCIA*-STEM PLATYCEPHALID FISHES

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### Summary :

Two new species of didymozoid trematodes are described from two species of *Onigocia-stem* platycephalid (flathead) fishes from Moreton Bay, Australia. *Indodidymozoon metridion* n. sp. is described from the operculum of *Suggrundus jugosus*. *Indodidymozoon ditremion* n. sp. is described from the buccal cavity, branchial arches and pharynx of *Inegocia japonica*. The two species can be distinguished from other species in the genus *Indodidymozoon*, except *Indodidymozoon branchiale*, by their two anterior uterine loops, which are located posterior to the fore-body-hindbody junction. The new species can be differentiated from *I. branchiale* by the length of their testes. *Indodidymozoon metridion* differs from *I. ditremion* in body size, position of ventral sucker and relative testis length. The structure of the Laurer's canal and Juel's organ of species in the genus *Indodidymozoon* is discussed.

**KEY WORDS :** Didymozoidae. *Indodidymozoon metridion*. *Indodidymozoon ditremion*. Platycephalidae. taxonomy.

**Résumé :** NOUVEAUX TRÉMATODES DIDYMOZOÏDES DE POISSONS PLATY-  
CÉPHALIDES DU GROUPE *ONIGOCIA*.

Deux nouvelles espèces de trématodes didymozoides sont décrites chez deux espèces de poissons platycéphalides du groupe *Onigocia* de Moreton Bay, Australie. *Indodidymozoon metridion* n. sp. est décrit de l'opercule de *Suggrundus jugosus*. *Indodidymozoon ditremion* n. sp. est décrit de la cavité buccale, des branchies et du pharynx de *Inegocia japonica*. Les deux espèces peuvent être distinguées des autres espèces du genre *Indodidymozoon*, sauf *Indodidymozoon branchiale*, par leurs deux boucles utérines antérieures qui sont situées en arrière de la jonction du corps antérieur et du corps postérieur. Les nouvelles espèces peuvent être distinguées de *I. branchiale* par la longueur de leurs testicules. La position relative de la ventouse ventrale et la longueur relative des testicules distinguent *I. metridion* de *I. ditremion*. Une discussion est donnée sur la structure du canal de Laurer et de l'organe de Juel des espèces du genre *Indodidymozoon*.

**MOTS CLES :** Didymozoidae. *Indodidymozoon metridion*. *Indodidymozoon ditremion*. Platycephalidae; taxonomie.

### INTRODUCTION

Platycephalid (flathead) fishes are benthic predators found throughout estuarine and coastal marine habitats of the Indo-Pacific region. The family consists of 14 genera and 58 species and is divided into two major stems : the *Onigocia*-stem containing the subfamilies Cymbacephalinae, Inegociiinae and Onigociiinae, and the *Platycephalus*-stem containing the subfamilies Platycephalinae and Elatinae (see Keenan, 1991). Species in the *Platycephalus*-stem are generally prominent in temperate coastal ecosystems and are largely endemic to Australian waters. Members of the larger *Onigocia*-stem are smaller, found in a wider variety of habitats, and are distributed predominantly throughout tropical and subtropical regions.

Didymozoids are an enigmatic family of trematodes found principally in predatory marine fish. Six species of platycephalid fish have been recorded as hosts of 14 species of didymozoid; individual platycephalid species have been recorded to host up to six species.

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The fourteen didymozoid species have been assigned to three genera, one in *Atalostrophion* MacCallum, 1915 (subfamily Nematobothriinae Ishii, 1935) (Ku and Shen, 1965), three in *Helicodidymozoon* Anderson and Cribb, 1994 and ten in *Indodidymozoon* Madhavi, 1982 (subfamily Didymozoinae Monticelli, 1888) (Anderson and Cribb, 1994).

### MATERIALS AND METHODS

Flatheads were caught in Moreton Bay by otter trawl. Mr J. Johnson of the Queensland Museum identified the flathead species. Voucher specimens of the two host species have been lodged in the Queensland Museum Ichthyological Collection (*Suggrundus jugosus* - coll. n° QM I 29556, *Inegocia japonica* - coll. n° QM I 29555). Trematodes were removed live from host tissue, washed in saline and fixed in near boiling 10% formalin. Specimens were stained with Mayer's haematoxylin, dehydrated in a graded series of alcohols, cleared in methyl salicylate and mounted in Canada balsam. One specimen of *I. ditremion* was unmounted after measuring, sectioned (7 µm) and stained with haematoxylin and eosin. Measurements are in

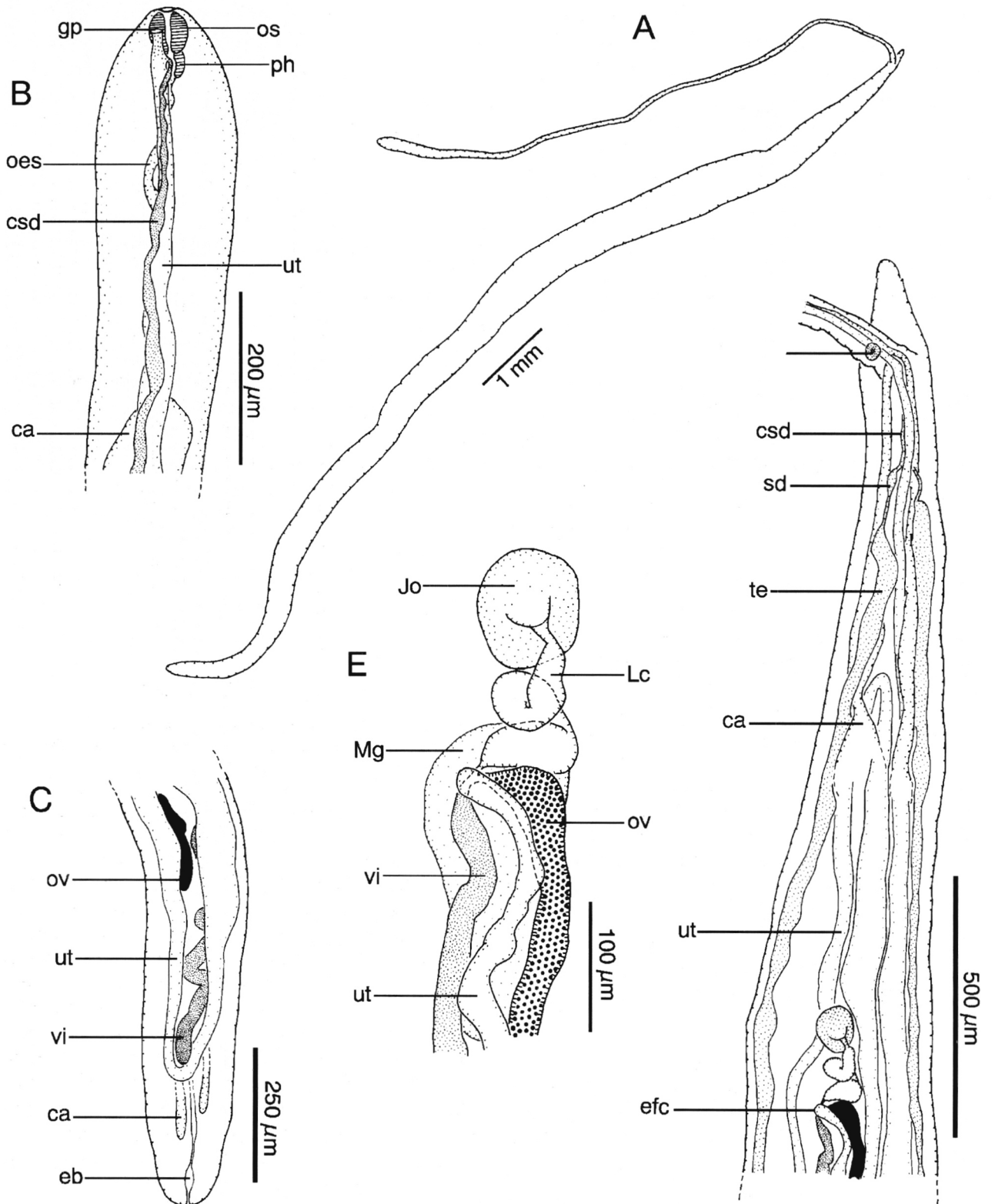


Fig. 1. - *Indodidymozoon metridion* n. sp.

A. Body structure. B. Anterior extremity of forebody. C. Posterior extremity of hindbody. D. Anterior extremity of hindbody. E. Egg-forming complex.

micrometres unless otherwise indicated and are given as ranges followed by means in parentheses. Figures were drawn with the aid of a camera lucida.

Abbreviations used in figures: ca, caecum; csd, common sperm duct; eb, excretory bladder; efc, egg-forming complex; gp, genital pore; Jo, Juel's organ; Lc, Laurer's canal; Mg, Mehlis' gland; oes, oesophagus; os, oral sucker; ov, ovary; ph, pharynx; sd, sperm duct; te, testis; ut, uterus; vi, vitellarium; vs, ventral sucker.

## DESCRIPTION

Family Didymozoidae Monticelli, 1888  
Subfamily Didymozoinae Monticelli, 1888

### *INDODIDYMOZON METRIDION* N. SP. (Figs 1,2)

In pairs; each worm is completely hermaphroditic and morphologically indistinguishable from its partner. (Measurements are of holotype and six paratypes unless otherwise indicated.)

Body consists of long, thin forebody, 5.0-8.0 (6.2) mm long and 58-81 (69) wide at posterior extremity, and longer, wider hindbody, 7.9-13.8 (10.1) mm long and 297-548 (436) wide at mid-point (Fig. 1, A). Forebody attached ventrally 130-190 (164) from anterior extremity of hindbody. Oral sucker elliptical, 47-52 (51) long and 37-45 (41) wide (Fig. 1, B). Prepharynx absent. Pharynx 28-36 (31) long and 29-39 (33) wide. Oesophagus 243-381 (316) long. Caeca extend length of hindbody, terminate 96-362 (189) ( $n = 6$ ) from posterior extremity (Fig. 1, C). Ventral sucker 16-534 (140) from posterior extremity of forebody, 31-34 (33) in diameter and 26-31 (28) ( $n = 3$ ) deep.

Testes paired, marginal, start 0.9-4.4 (2.8) mm from posterior extremity of hindbody and terminate near forebody-hindbody junction, 112-512 (293) from anterior extremity of hindbody (Fig. 1, D). Sperm ducts short, usually unite at forebody-hindbody junction but may unite up to 166 posterior to junction. Common sperm duct extends length of forebody to common genital pore. Genital pore at level of anterior half of oral sucker.

Egg-forming complex in hindbody 0.7-1.6 (1.1) mm from anterior extremity of hindbody. Mehlis' gland prominent, surrounds ootype and proximal portion of uterus (Fig. 1, E). Laurer's canal 81-332 (185) ( $n = 6$ ) long, extends anteriorly in coils, usually contains vitelline remnants, often contains large number of sperm proximally, constricts before opening into prominent Juel's organ. Juel's organ consists of small

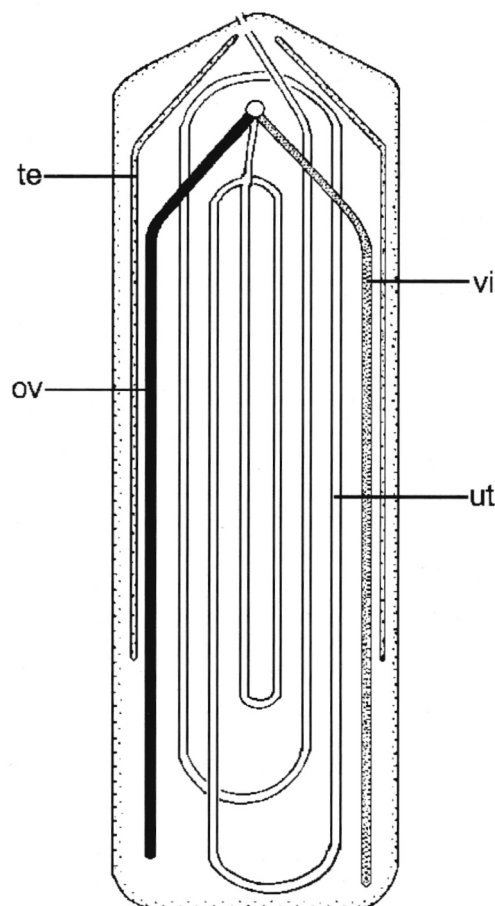


Fig. 2. - *Indodidymozoon metridion*  
Diagrammatic representation of reproductive organs in the hindbody. Note: only lengths are proportional.

chamber surrounded by glandular mass, often contains vitelline remnants and sperm. Sperm not observed in proximal extremity of uterus. Ovary single, filamentous, 10-29 (23) wide, starts on left or right, extends sinuously through hindbody from 304-1056 (586) from posterior extremity to egg-forming complex. Oviduct short. Vitellarium single, filamentous, 19-47 (35) wide, extends along side opposite to ovary, starts 134-592 (259) from posterior extremity of hindbody. Ovary and vitellarium may cross each other and reverse sides, may initially extend posteriorly before turning towards egg-forming complex. Uterus forms five loops in hindbody [two anterior (one anterior to, one posterior to egg-forming complex) and three posterior] (Fig. 2) before extending length of forebody, fuses with common sperm duct near common genital pore to form short hermaphroditic duct; both anterior loops posterior to forebody-hindbody junction. Eggs 15.5-18.0 (17.0) long and 7.5-9.5 (8.5) wide, have several long filaments.

Excretory duct extends medially through hindbody, usually forms small ovoid bladder near posterior extremity. Excretory pore terminal.

Host : *Suggrundus jugosus* (McCulloch, 1914) (Platycephalidae).

Site in host : Under skin on interior surface of operculum.

Locality : Moreton Bay, Queensland, 153°15'S, 27°15'E.

Specimens : Queensland Museum, Brisbane : holotype GL 14973.

3 paratypes GL 14974-14976; The Natural History Museum (London): 3 paratypes 1995.2.1.1-3.

Etymology : From the Greek *metridios* meaning fruitful or filled with seed.

Comparison :

*Indodidymozoon metridion* n. sp. can be distinguished from all other species in the genus by the arrangement of the anterior uterine loops in its hindbody. Most species (*I. brevicolle* (Yamaguti, 1938); *I. koti* (Yamaguti, 1938); *I. lesteri* Anderson and Cribb, 1994; *I. madhaviae* Anderson and Cribb, 1994; *I. moretonensis* Anderson and Cribb, 1994; *I. pearsoni* Anderson and Cribb, 1994; *I. platycephali* (Ku and Shen, 1965) and *I. suttiei*, Anderson and Cribb, 1994) have uterine loops that extend anterior to the forebody-hindbody junction. *Indodidymozoon musculi* (Mordvinova and Nikolaeva, 1991) has no loop anterior to the forebody-hindbody junction and one loop posterior to the junction. *Indodidymozoon metridion* and *I. branchiale* have no uterine loops anterior to the forebody-hindbody junction but have two loops posterior to the junction. However, both of the anterior uterine loops of *I. branchiale* are anterior to the egg-forming complex whereas *I. metridion* has one loop anterior to and one loop posterior to the egg-forming complex. *Indodidymozoon metridion* can also be distinguished from *I. branchiale* by its pointed rather than rounded anterior end of the hindbody. Further, the testes of *I. branchiale* are restricted to the anterior third of the hindbody whereas those of *I. metridion* extend over half the length of the hindbody.

#### *INDODIDYMOZOON DITREMION* N. SP. (Figs 3,4)

In pairs; each worm is completely hermaphroditic and morphologically indistinguishable from its partner. (Measurements are of holotype and nine paratypes unless otherwise indicated.)

Body consists of long, thin forebody, 1.2-3.4 (2.3) mm long and 40-70 (58) wide at posterior extremity, and longer, wider hindbody, 2.7-7.7 (5.1) mm long and 329-529 (450) wide at mid-point (Fig. 3, A). Forebody attached ventrally 18-162 (104) from anterior extremity of hindbody. Oral sucker elliptical, 36-55 (44) long and 34-45 (38) wide (Fig. 3, B). Prepharynx absent. Pharynx 23-32 (27) long and 29-

37 (34) wide. Oesophagus 154-243 (199) long. Caeca extend length of hindbody, terminate 61-250 (113) from posterior extremity (Fig. 3, C). Ventral sucker near posterior extremity of forebody, 21-34 (28) in diameter and 23-31 (28) (n = 3) deep.

Testes paired, marginal, start 320-1546 (685) (n = 6) from posterior extremity of hindbody (Fig. 3, C) and terminate near forebody-hindbody junction, 128-534 (256) from anterior extremity of hindbody (Fig. 3, D). Sperm ducts short, unite at forebody-hindbody junction. Common sperm duct extends length of forebody to common genital pore. Genital pore at level of anterior half of oral sucker.

Egg-forming complex in hindbody 322-968 (550) from anterior extremity of hindbody. Mehlis' gland prominent, surrounds ootype and proximal portion of uterus (Fig. 3, E). Laurer's canal 122-211 (158) (n = 4) long, extends anteriorly in coils, usually contains vitelline remnants, often contains large number of sperm proximally, constricts before opening into prominent Juel's organ. Juel's organ consists of small chamber surrounded by glandular mass, often contains vitelline remnants and sperm. Sperm not observed in proximal extremity of uterus. Ovary single, filamentous, 19-44 (33) wide, starts on left or right, extends sinuously through hindbody from 284-845 (528) from posterior extremity to egg-forming complex. Oviduct short. Vitellarium single, filamentous, 28-52 (38) wide, extends along side opposite to ovary, starts 110-400 (186) from posterior extremity of hindbody. Ovary and vitellarium may cross each other and reverse sides. Uterus forms five loops in hindbody [two anterior (usually one anterior to, one posterior to, exceptionally both posterior to egg-forming complex) and three posterior] (Fig. 4) before extending length of forebody, fuses with common sperm duct near common genital pore to form short hermaphroditic duct; both anterior loops posterior to forebody-hindbody junction. Eggs 14.5-19.5 (16.5) long and 7.5-9.0 (8.0) wide, have several long filaments.

Excretory duct extends medially through hindbody, usually forms small ovoid bladder near posterior extremity. Excretory pore terminal.

Host : *Inegocia japonica* (Tilesius, 1812) (Platycephalidae).

Site in host : Wall of pharynx and under skin in buccal cavity and branchial arches.

Locality : Moreton Bay, Queensland, 153°15'S, 27°15'E.

Specimens : Queensland Museum, Brisbane : holotype GL 14977,

5 paratypes GL 14978-14982 (14982 sectioned); The Natural History Museum (London): 4 paratypes 1995.2.1.4-7.



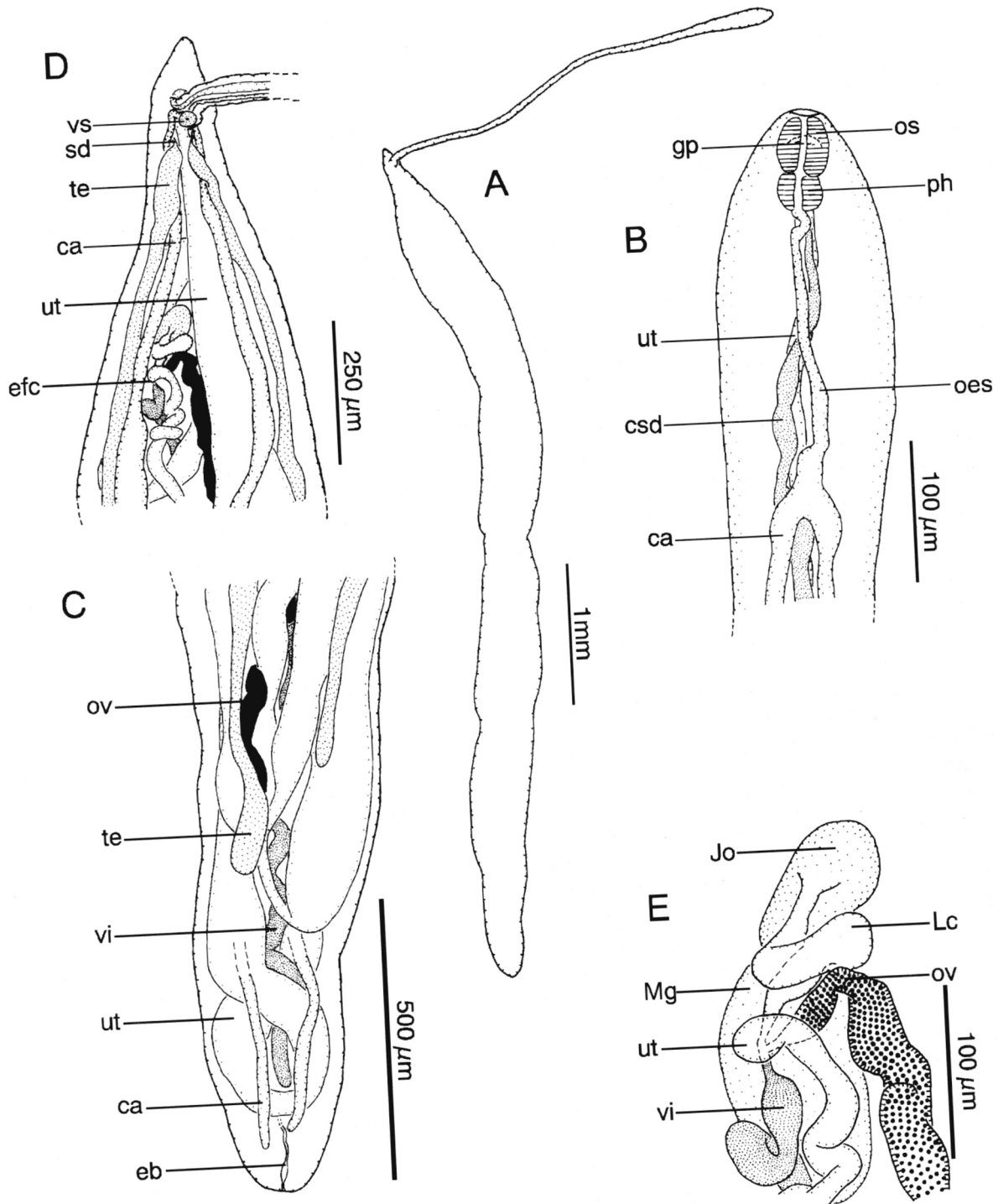


Fig. 3. - *Indodidymozoon ditremion* n. sp.  
 A. Body structure. B. Anterior extremity of forebody. C. Posterior extremity of hindbody. D. Anterior extremity of hindbody. E. Egg-forming complex.

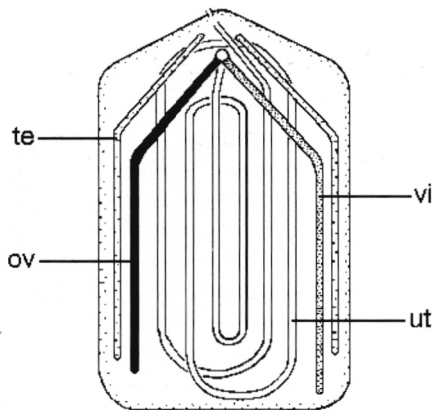


Fig. 4. - *Indodidymozoon ditremion*  
Diagrammatic representation of reproductive organs in the hindbody. Note: only lengths are proportional.

**Etymology :** The name *ditremion* is an anagram of *metridion*, an indication of the similarity of the two species described here.

**Comparison :**

*Indodidymozoon ditremion* n. sp. has a uterus that, like that of *I. metridion* n. sp., forms two anterior loops posterior to the forebody-hindbody junction. *Indodidymozoon ditremion* can be distinguished from the other species in the genus *Indodidymozoon* except *I. branchiale* and *I. metridion* by this feature. As for *I. metridion*, *I. ditremion* can be differentiated from *I. branchiale* by having at least one anterior uterine loop posterior to the egg-forming complex, having a pointed rather than rounded anterior hindbody end, and the length of its testes which extend through most of its hindbody rather than being restricted to the anterior third of the hindbody. *Indodidymozoon ditremion* is smaller than *I. metridion* and differs in the position of the ventral sucker, that of *I. metridion* being some distance from the forebody-hindbody junction rather than adjacent to the junction. Although there is some overlap in the proportional size of testes of the two species, there is a tendency for the testes of *I. metridion* to be relatively shorter than those of *I. ditremion*. In most cases, the testes of *I. metridion* extend through the hindbody for 2/3 to 3/4 of its length whereas those of *I. ditremion* extend for at least 4/5 the length of the hindbody.

## DISCUSSION

The egg-forming complex of species in the genus *Indodidymozoon* includes a Laurer's canal that, in most cases, is short and

connects to a Juel's organ, a glandular organ thought to recover nutrients from waste reproductive materials. This structure is similar to that described by Gibson and Bray (1979) for some species in the didymozoid genus *Nematobothrium*. There is no doubt that the structure at the end of the Laurer's canal is a Juel's organ and not a blind seminal receptacle; both vitelline material and sperm are usually present in the 'inner vesicle'. The Laurer's canal of the two species described here is unusually long in comparison with those of other species in the genus *Indodidymozoon*. In most individuals of *I. metridion* and *I. ditremion* it contains a large number of sperm. It appears that in these species the Laurer's canal has replaced the uterus as the storage vessel for the sperm. However, the Juel's organ apparently maintains its role of degrading and resorbing waste reproductive materials.

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