

Four New Species of Digenean Trematodes from Wrasses of Southern Japan and Neighboring Waters

Masaaki Machida

Department of Zoology, National Science Museum,
3–23–1 Hyakunincho, Shinjuku-ku, Tokyo, 169–0073 Japan

Abstract Four new species of digenean trematodes are described from wrasses (Family Labridae) of southern Japan and the neighboring waters. They are: *Lepocreadium bodiani* sp. nov. (Lepocreadiidae) from *Bodianus bilunulatus* from southern Japan, *Postlepidapedon philippinense* sp. nov. (Lepocreadiidae) from *Choerodon anchorago* from the Philippines, *Diplobulbus cheilini* sp. nov. (Opcoelidae) from *Cheilinus trilobatus* from the Philippines, and *Neolebouria palauensis* sp. nov. (Opcoelidae) from unidentified wrasse from Palau, the western Caroline Islands.

Key words: Digenea, Lepocreadiidae, Opcoelidae, new species, wrasse, Labridae, Japan, Philippines, Palau.

This paper deals with four new species of digenean trematodes collected from wrasses of southern Japan and the neighboring waters. Digeneans were fixed in AFA under slight pressure, stained with Heidenhain's hematoxylin and mounted in Canada balsam. The specimens are deposited in the National Science Museum, Tokyo (NSMT). Measurements are given in millimeters unless otherwise stated.

I am grateful to the staff of the Setouchi Fishermen's Cooperative Association, Kagoshima Prefecture, Japan for giving me facilities during the field work. I also wish to thank Mr. J. Araki of the Meguro Parasitological Museum, Tokyo (MPM) for kindly lending specimens.

Family Lepocreadiidae Odhner, 1905

Genus *Lepocreadium* Stossich, 1904

Lepocreadium bodiani sp. nov.

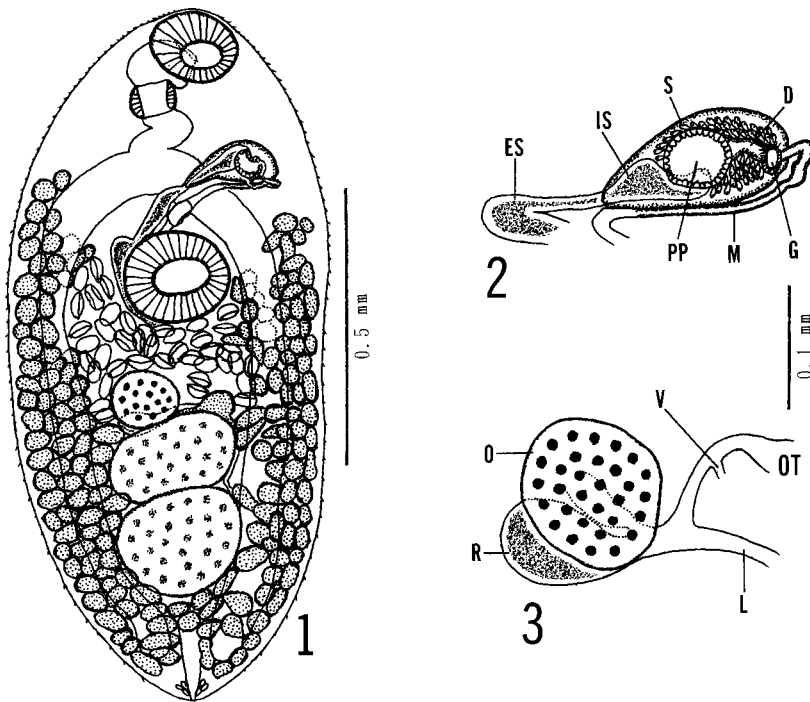
(Figs. 1–3)

Material. From intestine of *Bodianus bilunulatus* (Lacepède) (Family Labridae), Koniya, Kagoshima Prefecture, Japan, 20–XI–1985 (NSMT-PI 3215, holotype & 7 paratypes).

Description. Based on 8 specimens. Body

small, ovoid, 0.82–1.26 long by 0.47–0.58 wide near postacetabular level. Tegument with fine spines, sparse posteriorly. Oral sucker subterminal, $0.10\text{--}0.13 \times 0.13\text{--}0.17$; prepharynx 0.02–0.08 long; pharynx subglobular $0.06\text{--}0.08 \times 0.07\text{--}0.11$; esophagus 0.04–0.13 long, bifurcating midway between pharynx and acetabulum, sometimes nearer acetabulum than pharynx; caeca more or less voluminous, terminating near end of body. Acetabulum spherical or slightly wider than long, $0.13\text{--}0.20 \times 0.18\text{--}0.21$. Sucker ratio 1:1.2–1.4. Forebody 33–40% of body length.

Testes globular or subglobular, tandem or occasionally a little diagonal, contiguous, intercaecal; anterior testis $0.13\text{--}0.28 \times 0.20\text{--}0.25$ and posterior testis $0.19\text{--}0.27 \times 0.15\text{--}0.25$. Posttesticular space 21–32% of body length. Cirrus sac small, situated almost transversely, $0.15\text{--}0.19 \times 0.06\text{--}0.09$, preacetabular, from level of esophagus to a little posterior to intestinal bifurcation, left to midline with its proximal end lying dorsal or slightly sinistral to intestinal bifurcation or posterior to it. Internal seminal vesicle oval to elongate-oval, $0.04\text{--}0.11 \times 0.03\text{--}0.06$. Pars prostatica globular, $0.05\text{--}0.06 \times 0.04\text{--}0.06$. Ejaculatory duct short and narrow. Pars prostatica and



Figs. 1–3. *Lepocreadium bodiani* sp. nov. — 1. Entire worm, ventral view (holotype, NSMT-PI 3215). 2. Terminal genitalia, ventral view. 3. Ovarian complex, ventral view.

ejaculatory duct surrounded by glandular cells. Genital atrium small. Genital pore sinistral, extraecal, at bifurcal level. External seminal vesicle tubular, slightly convoluted, usually extending around right rim of acetabulum to a level midway between acetabulum and ovary or to near ovary.

Ovary spherical, $0.07\text{--}0.13 \times 0.11\text{--}0.14$, dextral, in contact with anterior testis. Oviduct connecting with seminal receptacle, giving off Laurer's canal and receiving common vitelline duct. Seminal receptacle $0.10\text{--}0.14 \times 0.04\text{--}0.07$, between ovary and anterior testis, sometimes overlapping them dorsally. Laurer's canal passing around left rim of anterior testis and opening dorsal to left caecum at level of boundary between two testes. Mehlis' glands sinistral to ovary. Vitelline follicles relatively large, from bifurcal or anteroacetabular level to posterior extremity, confluent in posttesticular region. Uterus pretesticular. Metraterm narrow, sinuous distally, along posterior side of cirrus sac, 0.22 and 0.25 long in two specimens. Eggs $56\text{--}61 \times 33\text{--}38 \mu\text{m}$. Excre-

tory vesicle tubular, anterior extent not determined; pore terminal.

Remarks. The present new species is characterized by the cirrus sac situated almost transversely with its position anterior to the acetabulum, and the genital pore located sinistral and extraecal at the bifurcal level. In the other species in *Lepocreadium*, the cirrus sac lies longitudinally with its posterior extent from near the postacetabular level to well posterior the acetabulum, and the genital pore is situated intercaecal, anterolateral to the acetabulum.

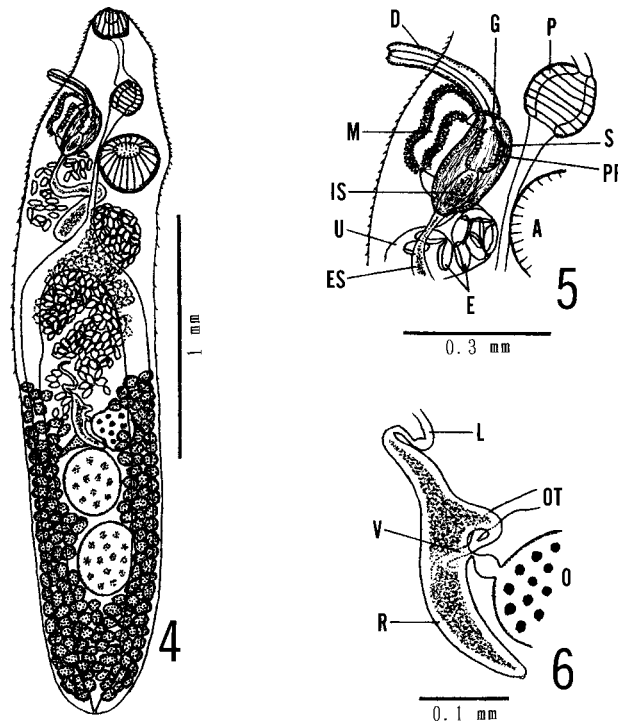
Genus *Postlepidapedon* Zdzitowiecki, 1993

***Postlepidapedon philippinense* sp. nov.**

(Figs. 4–6)

Material. From intestine of *Choerodon anchorago* (Bloch) (Family Labridae), Palawan, Philippines, 9–XI–1988 (NSMT-PI 3542, holotype & 4 paratypes).

Description. Based on 5 specimens. Body



Figs. 4–6. *Postlepidapedon philippinense* sp. nov. — 4. Entire worm, dorsal view (holotype, NSMT-P1 3542). 5. Terminal genitalia, dorsal view. 6. Ovarian complex, dorsal view.

elongate, tapering anteriorly and rounded posteriorly, 2.35–2.84 long by 0.44–0.60 wide. Tegument spinose, sparse posteriorly. Oral sucker subterminal, 0.11–0.13 $\times$ 0.14–0.17; prepharynx 0.05–0.30 long; pharynx pear-shaped, 0.12–0.17 $\times$ 0.11–0.15; esophagus slender, longer than prepharynx, 0.48–0.60 long, bifurcating well posterior to acetabulum; caeca terminating near posterior extremity. Acetabulum 0.20–0.27 $\times$ 0.23–0.29. Sucker ratio 1:1.6–2.0. Forebody 17–31% of body length.

Testes globular or subglobular, tandem, in contact or slightly separated, intercaecal, in posterior half of hindbody; anterior testis 0.20–0.29 $\times$ 0.23–0.29 and posterior testis 0.22–0.33 $\times$ 0.23–0.27. Posttesticular space 14–21% of body length. Cirrus sac elongate-oval, muscular, 0.15–0.30 $\times$ 0.08–0.15, extending posteriorly to midacetabular level. Internal seminal vesicle oval to tubular, thin-walled, 0.04–0.11 $\times$ 0.02–0.06. Pars prostatica saccular, 0.05–0.11 $\times$ 0.05–0.11. Ejacu-

latory duct everted, 0.15–0.37 long. Genital atrium small. Genital pore sinistral to posterior end of pharynx. External seminal vesicle tubular, bent once or twice, usually extending near intestinal bifurcation, not extending beyond it.

Ovary globular or occasionally with irregular surface, 0.15–0.20 $\times$ 0.15–0.20, slightly dextral, usually contiguous with anterior testis. Oviduct arising from anterior or antero-lateral portion of ovary, globular-shaped at the beginning, connecting with seminal receptacle by short duct, running to left, receiving common vitelline duct and entering ootype. Seminal receptacle elongate and saccular, tapering antero-posteriorly, 0.17–0.38 $\times$ 0.05–0.10, sinistral or dorsal to ovary. Laurer's canal originating from anterior tip of seminal receptacle, running forward, and opening mid-dorsally much nearer ovary than intestinal bifurcation. Mehlis' glands antero-sinistral to ovary. Vitelline follicles relatively large, from slightly anterior to ovary to posterior extremity, confluent

in posttesticular region. Uterus preovarian, crossing right caecum near intestinal bifurcation and posterior end of esophagus, and entering metraterm. Metraterm well-differentiated, covered with glandular cells, 0.16–0.32 long, usually exterior to cirrus sac. Eggs 61–70×35–46 μm . Excretory pore terminal. Excretory vesicle not made out.

Remarks. Four species of *Postlepidapedon* have been described: *P. opisthobifurcatum* (Zdzitowiecki, 1990) (type species), *P. secundum* (Durio & Manter, 1968), *P. spissum* Bray, Cribb & Barker, 1997 and *P. uberis* Bray, Cribb & Barker, 1997. The present new species resembles the latter three species in the anterior extent of the vitellaria not reaching the posterior margin of the acetabulum, but differs from them in the intestinal bifurcation well posterior to the acetabulum, the internal seminal vesicle being tubular or oval with thin wall, the ejaculatory duct being long and everted, the external seminal vesicle not extending beyond the intestinal bifurcation, and the metraterm covered with glandular cells.

Family Opecoelidae Ozaki, 1925

Genus *Diplobulbus* Yamaguti, 1934

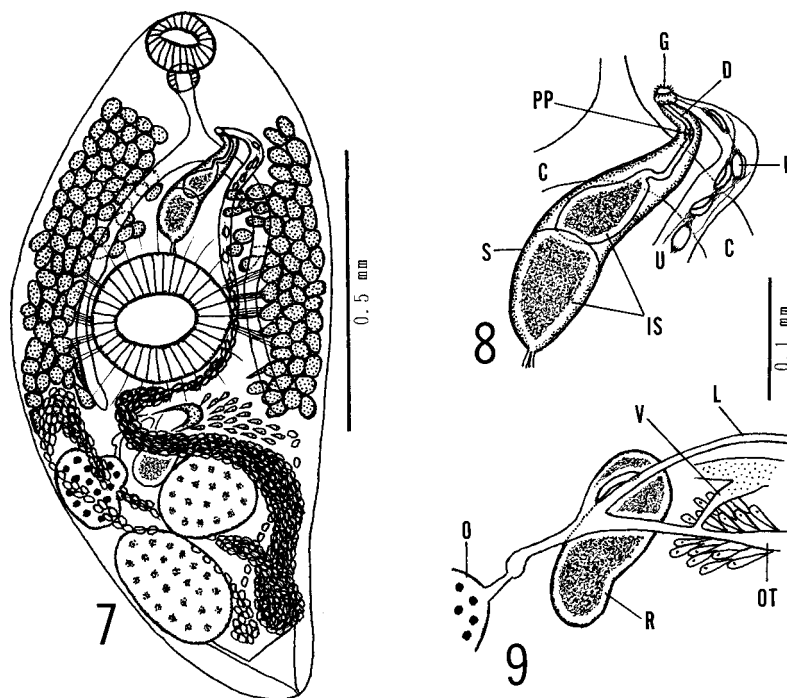
***Diplobulbus cheilini* sp. nov.**

(Figs. 7–9)

Material. From intestine of *Cheilinus trilobatus* Lacepède (Family Labridae), Palawan, Philippines, 16–XI–1988 (NSMT-PI 3587, holotype & 9 paratypes).

Description. Based on 10 specimens. Body fusiform, rounded anteriorly and tapering posteriorly, 0.86–1.67 long by 0.55–0.76 wide near acetabular level. Tegument smooth. Oral sucker subterminal, 0.10–0.14×0.12–0.17; prepharynx short, up to 0.04 long; pharynx globular, 0.04–0.08×0.06–0.09; esophagus 0.02–0.14 long, bifurcating midway between pharynx and acetabulum or closer to pharynx; caeca terminating slightly beyond acetabulum. Acetabulum subglobular, 0.22–0.29×0.25–0.31, with radiating muscles. Sucker ratio 1:1.8–2.2. Forebody 40–47% of body length.

Testes diagonal, sometimes separating from



Figs. 7–9. *Diplobulbus cheilini* sp. nov. — 7. Entire worm, ventral view (holotype, NSMT-PI 3587). 8. Terminal genitalia, ventral view. 9. Ovarian complex, ventral view.

each other by uterine loops; anterior testis sinistral, usually wider than long, $0.12\text{--}0.24 \times 0.16\text{--}0.32$; posterior testis dextral, longer than wide, $0.20\text{--}0.32 \times 0.12\text{--}0.23$. Posttesticular space 6–12% of body length. Cirrus sac elongated, club-shaped, $0.26\text{--}0.39 \times 0.06\text{--}0.10$, bent and tapering distally, extending posteriorly from slightly anterior to anterodextral to acetabulum. Internal seminal vesicle bipartite, tubular distally, occupying 79–88% of cirrus sac. In expanded specimens, poorly-developed pars prostatica $13\text{--}15\ \mu\text{m}$ long is observed. Ejaculatory duct short, $0.02\text{--}0.05$ long. Genital atrium small. Genital pore sinistral at esophageal level.

Ovary subglobular or subtriangular, $0.10\text{--}0.20 \times 0.10\text{--}0.15$, dextral, between right caecal termination and posterior testis, occasionally touching anterior edge of posterior testis. Oviduct arising from anterosinistral edge of ovary, connecting with duct from seminal receptacle, dividing Laurer's canal, receiving common vitelline duct, and then entering ootype. Seminal receptacle saccular, $0.10\text{--}0.20 \times 0.10\text{--}0.15$, sinistral to ovary. Mehlis' glands well-developed, median, between acetabulum and anterior testis. Laurer's canal curved, opening dorsally and midway between acetabulum and anterior testis. Vitelline follicles extending from near pharyngeal level to caecal termination, mostly extracaecal and overlapping caeca. In holotype, uterus descending near posterior extremity, ascending anterior to ovary, descending once again near posterior extremity, ascending with a curve between acetabulum and anterior testis, and passing along left rim of acetabulum. Eggs $24\text{--}26 \times 14\text{--}16\ \mu\text{m}$, with fine filament $42\text{--}52\ \mu\text{m}$ long at each pole; the base of filament looks like the tuft of writing brush. Excretory vesicle inverted triangular, extending to near posterior border of rear testis or middle of posttesticular region; excretory pore terminal.

Remarks. Four species of *Diplobulbus* have been described: *D. caloteni* Yamaguti, 1934 (type species), *D. callyodontis* Yamaguti, 1942, *D. scari* Yamaguti, 1952 and *D. minutus* Pritchard, 1966. The present new species differs from them

by the cirrus sac possessing a bipartite instead of a unipartite seminal vesicle.

Genus *Neolebouria* Gibson, 1976

Neolebouria palauensis sp. nov.

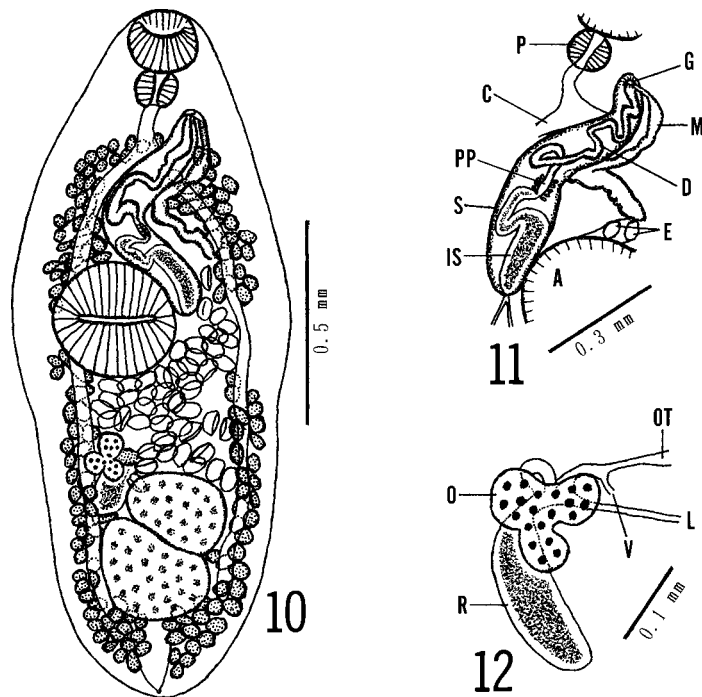
(Figs. 10–12)

Material. From intestine of unidentified wrasse (Family Labridae), Palau, western Caroline Is., 27–VI–1980 (NSMT-Pl 2366, holotype & 9 paratypes); 6–VII–1980 (NSMT-Pl 2424, 2 paratypes).

Description. Based on 12 slightly macerated specimens. Body nearly spindle-shaped with rounded both ends, $1.51\text{--}1.93$ long by $0.62\text{--}0.73$ wide near acetabular level. Tegument smooth. Oral sucker subterminal, $0.13\text{--}0.17 \times 0.14\text{--}0.18$; prepharynx $12\text{--}33\ \mu\text{m}$ long; pharynx globular, $0.07\text{--}0.10 \times 0.10\text{--}0.13$; esophagus $0.04\text{--}0.13$ long, bifurcating nearer pharynx than acetabulum; caeca ending at level of posterior border of rear testis to midlevel of posttesticular region. Acetabulum spherical, $0.25\text{--}0.33 \times 0.28\text{--}0.36$. Sucker ratio 1:1.8–2.1. Forebody 40–48% of body length.

Testes subglobular, tandem or slightly diagonal, continuous, intercaecal; anterior testis $0.13\text{--}0.20 \times 0.18\text{--}0.29$ and posterior testis $0.17\text{--}0.28 \times 0.21\text{--}0.29$. Posttesticular space 12–18% of body length. Cirrus sac elongate club-shaped, arcuate, $0.61\text{--}0.84 \times 0.10\text{--}0.15$, terminating posteriorly at anterior 1/3 to near posterior border of acetabulum; containing S-shaped seminal vesicle $0.38\text{--}0.50$ long, tapering distally; short pars prostatica $43\text{--}64\ \mu\text{m}$ long, surrounded by a small number of prostatic cells; and convoluted eversible ejaculatory duct $0.43\text{--}0.71$ long, occupied 55–68% of cirrus sac. Genital pore sinistral, at mid- to postpharyngeal level.

Ovary distinctly trilobed, $0.10\text{--}0.16 \times 0.10\text{--}0.17$ as a whole, anterodextral to anterior testis. Seminal receptacle elongate saccular, $0.17\text{--}0.24 \times 0.06\text{--}0.11$, posterodorsal to ovary. Laurer's canal opening dorsally a little anterior to fore testis. Mehlis' glands sinistral to ovary. Uterus pretesticular; metraterm conspicuous, $0.49\text{--}0.69$



Figs. 10–12. *Neolebouria palauensis* sp. nov. — 10. Entire worm, ventral view (holotype, NSMT-PI 2366). 11. Terminal genitalia, ventral view. 12. Ovarian complex, ventral view. A, acetabulum; C, caecum; D, ejaculatory duct; E, egg; ES, external seminal vesicle; G, genital pore; IS, internal seminal vesicle; L, Laurer's canal; M, metraterm; O, ovary; OT, ootype; P, pharynx; PP, pars prostatica; R, seminal receptacle; S, cirrus sac; U, uterus; V, common vitelline duct.

long, bent, parallel to and slightly shorter than cirrus sac. Eggs $66\text{--}73 \times 40\text{--}48\ \mu\text{m}$. Vitelline follicles from pharyngeal level to posterior end of body; confluent posterior to testes and slightly confluent at bifurcal level. Excretory vesicle I-shaped, terminating in zone of anterior testis; pore terminal.

Remarks. Yamaguti described four species of *Plagioporus* from wrasses from Japan; these are: *P. choerodontis* (Yamaguti, 1934) (= *Lebouria* c.), *P. ira* Yamaguti, 1940 and *P. (Caudotestis) azurionis* Yamaguti, 1951 from *Choerodon azurio*, and *P. (Caudotestis) thalassomatis* Yamaguti, 1942 from *Thalassoma purpurum*. Pritchard (1966) reduced *P. (C.) thalassomatis* to synonymy with *P. (C.) neopercis* Yamaguti, 1938. Yamaguti (1971) placed *azurionis* and *neopercis* in *Caudotestis*, a subgenus of *Plagioporus*. Bray (1979) redefined *Caudotestis*, in which the caeca terminate at or close to the anterior margin of the

fore testis, the genital pore lies ventro-median in the forebody, the vitellaria occur from the pharynx to the middle of the posterior testis, etc. Therefore, *azurionis* and *neopercis* do not belong to *Caudotestis*.

P. choerodontis is distinguished from the other three species by having a transversely elongated ovary, extracaecal uterus, and small-sized eggs. *P. neopercis* differs from the remaining two species, *ira* and *azurionis*, by possessing a subglobular ovary, vitellaria not extending posterior to the testes, and small-sized eggs. The present new species is more like *ira* and *azurionis* than *choerodontis* and *neopercis*.

Gibson (1976) erected *Neolebouria* to include species with an irregularly lobed ovary, and with vitellaria which are confluent dorsally within the forebody, and transferred *ira* to *Neolebouria*. Gibson and Bray (1982) erected *Macvicaria*, differing from *Neolebouria* by possessing a smooth

ovary in the former and a lobed ovary in the latter. Shimazu and Nagasawa (1985) examined *Plagioporus apogonichthydis* Yamaguti, 1938 and found the ovary in various shapes, rounded to trilobed. They considered *Macvicaria* congeneric with *Neolebouria*, because the shape of the ovary was not available for separating *Macvicaria* from *Neolebouria*. Such is also the case with *azurionis*. The ovary in *azurionis* is variable, subglobular or oval, smooth, indented or distinctly 2- or 3-lobed. I place *azurionis* as a member of *Neolebouria*.

Aken'Ova and Cribb (2001) defined the main diagnostic features of *Neolebouria* as follows: a distinctly to indistinctly trilobed ovary; vitellaria extending into the forebody and uniting or almost uniting dorsally; excretory vesicle extending to the level of the ovary or at least to the level of the anterior testis; and the genital pore antero-bifurcal and sub-median to sub-lateral.

Yamaguti (1940, 1951) did not give the lengths of internal seminal vesicle, ejaculatory duct and metraterm in *ira* and *azurionis*, except for the metraterm 0.10 long in *azurionis*. The holotype and one paratype of *ira* (MPM Coll. No. 22187) revealed the internal seminal vesicle to be 0.44–0.45 long, the ejaculatory duct 0.18 long, and the metraterm 0.25–0.30 long, whereas the holotype of *azurionis* (MPM Coll. No. 22191) showed the internal seminal vesicle 0.57 long and the ejaculatory duct less than 0.10 long. Compared with *ira* and *azurionis*, the present new species has much larger cirrus sac which extends well beyond the anterior border of the acetabulum, a distinctly trilobed ovary, and longer ejaculatory duct and metraterm.

References

- Aken'Ova, T. O. L. & T. H. Cribb, 2001. Two new species of *Neolebouria* Gibson, 1976 (Digenea: Opecoelidae) from temperate marine fishes of Australia. *Syst. Parasitol.*, **49**: 65–71.
- Bray, R. A., 1979. Digenea in marine fishes from the eastern seaboard of Canada. *J. Nat. Hist.*, **13**: 399–431.
- Bray, R. A., T. H. Cribb & S. C. Barker, 1997. *Postlepidapedon* Zdzitowiecki, 1993 and *Gibsoniwermis* n. g. (Digenea: Lepocreadiidae) from fishes of the southern Great Barrier Reef, Australia, and their relationship to *Intusatrium* Durio & Manter, 1968. *Syst. Parasitol.*, **36**: 143–155.
- Durio, W. O. & H. W. Manter, 1968. Some digenetic trematodes of marine fishes of New Caledonia. Part II. Opecoelidae and Lepocreadiidae. *J. Parasitol.*, **54**: 747–756.
- Gibson, D. I., 1976. Monogenea and Digenea from fishes. *Discovery Rep.*, **36**: 179–266, pl. XVIII.
- Gibson, D. I. & R. A. Bray, 1982. A study and reorganization of *Plagioporus* Stafford, 1904 (Digenea: Opecoelidae) and related genera, with special reference to forms from European Atlantic waters. *J. Nat. Hist.*, **16**: 529–559.
- Odhner, T., 1905. Die Trematoden des arktischen Gebietes. *Fauna Arct.*, **4**: 289–372.
- Ozaki, Y., 1925. Preliminary notes on a trematode with anus. *J. Parasitol.*, **12**: 51–53, pl. 7.
- Pritchard, M. H., 1966. Studies on digenetic trematodes of Hawaiian fishes: Family Opecoelidae Ozaki, 1925. *Zool. Jb. Syst. Bd.*, **93**: 173–202.
- Shimazu, T. & K. Nagasawa, 1985. Trematodes of marine fishes from Moroiso Bay, Misaki, Kanagawa Prefecture, Japan. *J. Nagano-ken Junior Coll.*, (40): 7–15.
- Stossich, M., 1904. Alcuni Distomi della collezione elmintologia del Museo di Napoli. *Ann. Mus. Zool. Napoli*, **1**: 1–14.
- Yamaguti, S., 1934. Studies on the helminth fauna of Japan. Part 2. Trematodes of fishes, I. *Jpn. J. Zool.*, **5**: 249–541.
- Yamaguti, S., 1938. Studies on the helminth fauna of Japan. Part 21. Trematodes of fishes, IV. 139 pp., 1 pl., Publ. by author.
- Yamaguti, S., 1940. Studies on the helminth fauna of Japan. Part 31. Trematodes of fishes, VII. *Jpn. J. Zool.*, **9**: 35–108, pls. I & II.
- Yamaguti, S., 1942. Studies on the helminth fauna of Japan. Part 39. Trematodes of fishes mainly from Naha. *Trans. Biogeogra. Soc. Japan*, **3**: 329–398, pl. XXIV.
- Yamaguti, S., 1951. Studies on the helminth fauna of Japan. Part 44. Trematodes of fishes, IX. *Arb. Med. Fak. Okayama*, **7**: 247–282, pls. I–V.
- Yamaguti, S., 1952. Parasitic worms mainly from Celebes. Part 1. New digenetic trematodes of fishes. *Acta Med. Okayama*, **8**: 146–197, pls. I–VI.
- Yamaguti, S., 1971. Synopsis of Digenetic Trematodes of Vertebrates. 1047 pp., 349 pls. Keigaku Publ., Tokyo.
- Zdzitowiecki, K., 1990. Little known and new Antarctic Digenea species of the genera *Neolepidapedon* and *Lepidapedon* (Lepocreadiidae). *Acta Parasitol. Pol.*, **35**: 19–30.
- Zdzitowiecki, K., 1993. A contribution to the morphology of the Antarctic fish lepecreadiid digeneans, with a description of a new genus. *Acta Parasitol.*, **38**: 109–112.