1990

Binder 142, Notocotylidae D-Z [Trematoda Taxon Notebooks]

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Hippocrepis Travassos, 1922

Generic diagnosis. — Notocotylidae: Notocotylinae: Body elongate, somewhat attenuated anteriorly. Ventral glands papilliform, arranged irregulary in more than 5 longitudinal rows. Oral sucker subterminal, with a prominent papilla on each side. Ceca united posteriorly into a common cecum which passes between two testes. Testes symmetrical or diagonal, at posterior extremity. Vesicula seminalis winding, partly outside, and partly inside cirrus pouch. Cirrus pouch very much elongated, containing winding seminal vesicle, pars prostatica and long eversible cirrus. Genital pore median, postbifurcal. Ovary pretesticular, median, with shell gland complex in front. Vitellaria follicular, in pretesticular lateral fields. Uterine coils transverse, not extending laterally beyond ceca; metraterm well differentiated. Intestinal parasites of mammals.

Genotype: *H. hippocrepis* (Dies., 1850) Travassos, 1922 (Pl. 94, Fig. 1131), in *Hydrochoerus capybara;* Brazil.

Other species: *H. fuelleborni* Travassos et Vogelsang, 1930, in *Myopotamus coypus;* Uruguay.

HIPPOCREPIS

Hofmonostomum Harwood, 1939

Generic diagnosis. — Notocotylidae, Notocotylinae: Body small, elongate, with poorly developed median ridge on ventral surface; outer ventral glands absent. Cuticle beset with minute spiniform scales on ventral side of anterior part. Oral sucker subterminal, esophagus narrow, ceca terminating medial to testes. Testes lobed, elongate, symmetrical, at posterior extremity. Cirrus pouch long. Genital pore median, postbifurcal. Ovary lobate, median, intertesticular. Vitellaria extending in lateral fields from uterine zone to testicular zone. Uterus intercecal, metraterm alongside cirrus pouch; eggs with long filament at each pole. Excretory pore dorsal, postovarian. Parasitic in intestinal tract of birds.

Genotype: *H. himantopodis* Harwood, 1939 (Pl. 70, Fig. 844), in *Himantopus mexicanus;* Puerto Rico.

HOFMONOSTOMUM

Lankatrematinae ~~n. subfam.~~ YAMAGUTI, 1958

Subfamily diagnosis. — Opisthotrematidae: Body ovoid, convace ventrally, without spines (?). Oral sucker small, esophagus rather short. Ceca terminating short of posterior extremity. Testes lobed, symmetrical, postcecal, at posterior extremity. Cirrus pouch very small. Genital pore ventroterminal. Ovary large, branched, extending transversely in front of testes between vitellaria. Laurer's canal absent. Vitelline follicles comparatively large, extending along lateral margins of body anterior to testes. Uterus occupying most of body anterior to ovary, forming a large terminal reservoir in front of ovary; metraterm thick-walled; eggs with a very long filament at each pole. Excretory vesicle V-shaped

Lankatrema Crusz et Fernand, 1954 [1])

Generic diagnosis. — Opisthotrematidae, Lankatrematinae: Body ovoid, flattened, concave ventrally and convex dorsally, without spines. Oral sucker small, practically terminal. Esophagus slender, ceca simple "reaching about to ovarial region". Testes lobed, located symmetrically along posterolateral margins of body. Cirrus pouch very small, containing pars prostatica and minute coiled cirrus. Genital pore median, ventroterminal. Ovary large, branched, transversely elongated in broad pretesticular median area and reaching as far laterally as vitellaria. Laurer's canal absent. Vitelline follicles comparatively large, extending along lateral margins of body anterior to testes. Uterus occupying most of anterior two-thirds of body, forming a large elongate egg reservoir in front of ovary; metraterm thick-walled; eggs very small, with very long filament at each pole. Excretory pore at extreme posterior end, vesicle bifurcated near its pore, arms running forward medial to vitellaria. Parasitic in stomach of Sirenia.

Genotype: *L. mannarense* Crusz et Fernand, 1954, (Pl. 103, Fig. 1243) in *Dugong dugong;* Ceylon.

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[1]) This genus was assigned to Nudacotylinae by the original authors.

LANKATREMA

Neocotyle Travassos, 1922

Generic diagnosis. — Nudacotylidae: Body small, strongly flattened, tapered anteriorly and broadly rounded posteriorly. Cuticle apparently smooth. Oral sucker terminal, esophagus of moderate length, ceca terminating in front of testes. Testes lobed, one on each side at posterior end of body. Vesicula seminalis externa and interna present. Cirrus pouch and metraterm well developed, lying almost transversely in front of left testis. Genital pore sublateral, immediately pretesticular. Ovary irregularly lobed, submedian, in front of right testis. Shell gland complex medial to ovary. Uterus coiled transversely between shell gland complex and oral sucker, extending laterally beyond ceca to near body margin; eggs with polar filaments. Vitellaria massed together outside of ceca in middle third of body. Intestinal parasites of mammals.

Genotype: *N. neocotyle* Travassos, 1922 (Pl. 85, Fig. 1029), in *Hydrochoerus capybara;* Brazil.

NEOCOTYLE

Notocotyloides Dollfus, 1966

La diagnose de *Notocotyloides* n. gen., type *petasatum* Dealongchamps 1824 est : « ***Parapronocephalinae*** ayant les caractères de *Parapronocephalum*, sauf que les testicules sont extracaecaux et que les glandes cutanées sont absentes ».

Parapronocephalidae Dollfus, 1966

Discussion. Position systématique

L'anatomie de l'adulte diffère à peine de celle des *Notocotylidae* du groupe *Notocotylus-Catatropis*. Les organes ont la même disposition, les mêmes rapports. Remarquons, toutefois, qu'il n'y a pas une très longue poche du cirre et que la forme de la tête est complètement différente.

La même forme de la tête existe dans le genre *Parapronocephalum* Belopolskaïa, dont seulement une espèce est connue : *P. symmetricum* Belopolskaïa 1952 (p. 141-143, fig. 6), qui a été trouvée dans les caeca intestinaux de *Calidris* [= *Arquatella*] *maritima* (Brünnich 1764) de la côte Mourmane par M. M. Belopolskaïa et d'*Arenaria interpres* (L.) de la mer Blanche par D. V. Naumov.

Disposant d'un abondant matériel, en très bon état, Belopolskaïa a donné une description détaillée de cette espèce. Elle l'a admise dans les *Pronocephalinae* A. Looss 1899, la raprochant plus particulièrement du genre *Adenogaster* A. Looss 1901, créé pour une seule espèce : *A. serialis* A. Looss 1901 (connue seulement à l'état adulte), de la première moitié du gros intestin d'un *Thalassochelys corticata* (Rondelet) à Alexandrie (Egypte).

Chez ce Trématode, la face ventrale présente — ce qui est exceptionnel chez les *Pronocephalinae* — des séries longitudinales de glandes cutanées (comme il y en a chez *Notocotylus*) d'où le nom spécifique donné par Looss.

Bien que la forme de la tête soit quelque peu voisine chez *Adenogaster* et *Parapronocephalum* et qu'il y ait des séries longitudinales de glandes cutanées dans les deux genres, il y a de grandes différences anatomiques qui les séparent : chez *Adenogaster*, les caeca digestifs sont pourvus de sacculations le long de leur bord interne, les testicules sont presque complètement extracaecaux, le vitelloducte transverse est en arrière de l'ovaire, qui est un peu déplacé vers la droite, le pore génital est déplacé vers la gauche, etc... C'est pourquoi Belopolskaïa, ne pouvant pas placer son espèce dans un genre de *Pronocephalinae*, a proposé un nouveau genre, qu'elle a placé dans cette sous-famille.

L'attribution aux *Notocotylinae* n'aurait pas été acceptable, non pas seulement parce que les testicules de *Parapronocephalum* sont intracaecaux, alors qu'ils sont extracaecaux chez les *Notocotylinae*, mais parce que la cercaire est d'un type complètement différent. Chez les *Notocotylidae*, la cercaire a une queue natatoire aussi longue ou plus longue que le corps et une paire d'yeux latéraux pigmentés ou, pour quelques espèces, un œil médian en plus de la paire latérale. Ces yeux persistent chez la métacercaire.

Belopolskaïa, sans avoir vu la cercaire de *Parapronocephalum*, savait que celle-ci ne ressemblait pas aux cercaires de *Notocotylinae*. En effet, Belopolskaïa, à défaut de cercaire, avait trouvé et identifié la métacercaire dans le foie de *Littorina rudis* Maton, de la côte Mourmane, et avait observé de très jeunes immatures, différant à peine de la métacercaire, dans le gosier de *Calidris* [= *Arquatella*] *maritima* (Brünnich 1764). Les métacercaires de la Littorine mesuraient 1,232 × 0,296 mm et les immatures de *Calidris* 1,408 × 0,312 mm (voir Belopolskaïa 1952, p. 142, 175-176, tableau 22 des dimensions des métacercaires de la Littorine et des immatures du gosier de *Calidris*, fig. 11 *a* chez *Calidris*, fig. *b* chez la Littorine).

Peu après, tous les stades larvaires furent trouvés par G. K. Chubrik (1954, p. 565-567, fig. 1*a-b* rédies, 1*v* cercaire avec son appendice caudal, 1*g* cercaire ayant perdu son appendice caudal, fig. 1*d* métacercaire dans son kyste) chez des *Littorina saxatilis* Olivi (= *rudis* Maton) de la côte Mourmane et de la mer Blanche, dans le foie et la gonade. Chubrik remarqua qu'en été on trouvait les rédies et cercaires chez les Littorines, mais qu'en automne on ne trouvait plus que les métacercaires.

Si l'on compare les stades larvaires décrits et figurés par Chubrik avec ceux de *Monostoma petasatum* Desl., on constate qu'ils sont, à très peu près, semblables.

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Malgré cette presque identité des formes larvaires et la même forme particulière de la tête, je ne crois pas que l'espèce de Deslongchamps soit congénérique de celle de Belopolskaïa. Nous avons vu que, chez celle-ci, les testicules sont intracaecaux et que trois séries longitudinales de glandes cutanées sont présentes à la face ventrale ; ce sont des caractères s'opposant à ceux de *petasatum*. Je propose donc, pour *petasatum*, un nouveau genre : *Notocotyloides*, et je le place dans une nouvelle famille : ***Parapronocephalidae***, sous-famille ***Parapronocephalinae*** K. I. Skrjabin (1955, p. 210) (6), dans le sous-ordre *Notocotylata* K. I. Skrjabin & R. Ed. Schulz 1933 (7), qui contient déjà cinq familles.

L'emplacement de cette nouvelle famille est schématisé ci-après :

— **Parasites de Pécilothermes** : Reptiles, rarement Poissons (chez les Poissons, seulement *Barisomum* Linton 1910, *Himasomum* Linton 1910).

Stade *Cercaria* inconnu.

Adulte avec expansions céphaliques (peu d'exceptions) ..... *Pronocephalidae*.

— **Parasites d'Homéothermes** : Oiseaux, rarement Mammifères.

Stade *Cercaria* avec longue queue et yeux pigmentés.

Adulte sans expansions céphaliques ..... *Notocotylinae*.

Stade *Cercaria* avec queue rudimentaire, pas d'yeux.

Adulte avec expansions céphaliques ..... *Parapronocephalinae*.

(6) K. I. Skrjabin (1955, p. 201-210) a longuement discuté des affinités naturelles et de la position systématique de *Parapronocephalum*, il a conclu que l'existence d'un collier céphalique dans ce genre n'était pas un caractère assez important pour justifier une sous-famille *Parapronocephalinae*, séparée des *Notocotylinae*.

(7) Ce sous-ordre est l'équivalent de la superfamille *Notocotylidae* F. Poche 1926 (nom changé en *Notocotylidea* par E. W. Price, 1932, p. 54, note 4) = *Pronocephaloidea* J. M. Ruiz 1946. Actuellement, on n'admet plus dans les *Pronocephalinae* de parasites d'homéothermes et l'on conserve la fam. *Rhabdiopoeidae* F. Poche 1926 pour les parasites de Siréniens ; cette famille comprend les genres *Rhabdiopoeus* S. I. Johnston 1913 et *Taprobanella* H. Cruz et V. S. V. Fernand 1954 ; ce dernier genre avait été considérée par ses auteurs comme appartenant aux *Pronocephaliinae* et ils en avaient donné une nouvelle définition permettant d'y inclure une espèce parasite d'homéotherme.

FROM DOLLFUS, 1966

Notocotyloides petasatum (Deslongchamps, 1824) Dollfus, 1966

Description

Corps plat, allongé, plus de trois fois à trois fois et demie plus long que large (mesurant 4,5 × 0,75 mm d'après Deslongchamps, 4 × 1 mm d'après Villot).

Bords latéraux non parallèles mais un peu festonnés et s'élargissant lentement en direction postérieure. Extrémité antérieure pourvue, de chaque côté, d'une sorte d'aileron, dont le bord s'étend transversalement dans toute la largeur de la tête, à la face ventrale, « ce qui donne à la tête du ver, dit Villot, lorsqu'on la regarde de face, une vague ressemblance avec un chapeau », d'où le nom spécifique donné par Deslongchamps. L'extrémité postérieure est arrondie et un peu plus large que l'antérieure.

La cuticule n'est pas spinulée. Je n'ai pas vu de glandes cutanées comme il y en a chez *Notocotylus*.

La ventouse orale est grande (diamètre : 0,32 mm d'après Villot) et profonde, elle occupe toute la hauteur de la tête, de l'apex au rebord du chapeau. L'œsophage qui lui fait suite est moins long que le diamètre de la ventouse ; il n'y a pas de pharynx. Les caeca intestinaux restent distants des bords latéraux du corps ; ils sont à peu près rectilignes, sauf tout à fait postérieurement, où ils se rapprochent quelque peu ; ils se terminent sans atteindre l'extrémité postérieure du corps.

Il y a deux testicules situés dans le dernier cinquième de la longueur du corps ; ils sont plus longs que larges et à bords irrégulièrement sublobés ; ils sont en dehors des caeca intestinaux et dépassent l'extrémité postérieure de ceux-ci.

La poche du cirre, mal visible chez mes individus, paraît courte ; elle aboutit au pore génital, situé au milieu de la largeur du corps, à la fin du premier sixième ou septième de la longueur de celui-ci. Je n'ai pas pu voir clairement une vésicule séminale interne dans la partie proximale de la poche du cirre.

L'ovaire est situé entre les deux testicules, au même niveau ; il en est séparé par les caeca intestinaux ; il est plus petit que les testicules et son contour est irrégulier.

Les vitellogènes sont situés de part et d'autre des caeca intestinaux et formés de follicules de forme irrégulière, ils s'étendent sur environ un quart à environ un sixième de la longueur du corps, immédiatement en avant des testicules. Le vitelloducte transverse passe contre le bord antérieur de l'ovaire. Le réservoir vitellin et la glande de Mehlis sont médians.

L'utérus a un trajet ascendant en spirale, décrivant des sinuosités très serrées, transversales, occupant la largeur de l'espace intercaecal, sauf distalement, où elles s'étendent sur une moindre largeur, avant de joindre la poche du cirre jusqu'au pore génital, en arrière de la bifurcation intestinale.

Les œufs remplissent l'utérus, ils sont extrêmement nombreux, operculés, très petits, mesurant de 20 à 22 µ de long sur 12 à 13 µ de large. La coque est très mince (environ 1 µ). Je ne suis pas certain de l'absence de filaments polaires, mais je n'en ai pas vu.

En ce qui concerne l'appareil excréteur, je ne l'ai observé qu'en partie ; il y a, en arrière de l'ovaire, une vessie terminale allongée longitudinalement, pourvue ou non d'une ou deux paires de très courts diverticules latéraux ; deux gros canaux y aboutissent symétriquement ; ils passent d'abord entre les caeca et les testicules, puis en dehors des vitellogènes ; ils se maintiennent dans l'espace entre les bords latéraux du corps et les caeca, jusqu'au niveau de l'œsophage. Le pore excréteur est ventral, un peu en avant de l'extrémité du corps.

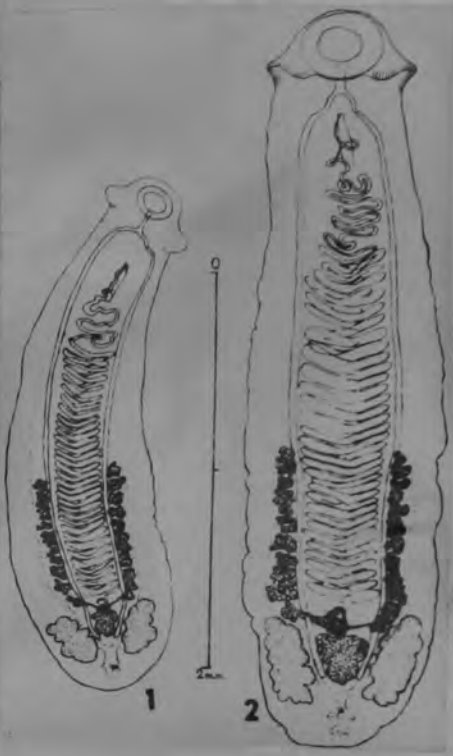

FIG. 1 et 2. — *Notocotyloides petasatum* (E. Deslongchamps 1824), adultes, récoltés à Roscoff (Finistère) chez *Strepsilas interpres* (L., 1758) par Alfred Villot (sept. 1874)

FROM DOLLFUS, 1966

Notocotylidae

Notocotyloides petasatum (Deslongchamps, 1824) Dollfus, 1966

Annales de Parasitologie (Paris), t. 41, 1966, n° 4, pp. 289 à 299

Sur *Monostoma petasatum* Deslongchamps 1824 et son cycle évolutif à deux hôtes

Par **Robert-Ph. DOLLFUS**

Eudes Deslongchamps (1824, p. 551, n° 2) a sommairement décrit, sans figure, un Monostome qu'il avait trouvé adulte dans les caeca d'*Haematopus ostralegus* L. (*Charadriidae*), à Caen (Calvados). Il le nomma *Monostoma petasatum* (*).

F. Dujardin (1845, p. 350-351) a reproduit la description originale de Deslongchamps mais l'a mal interprétée et a supposé que l'orifice antérieur, mentionné par Deslongchamps, était une ventouse ventrale et « qu'un orifice buccal se trouvait à l'extrémité du bord antérieur » ; il en a déduit qu'il s'agissait probablement d'un Holostome voisin de l'*Holostomum denticulatum* (Rudolphi 1819).

Quelques exemplaires d'un Monostome, que nous admettons être celui de Deslongchamps, ont été trouvés à Roscoff (Finistère) par Alfred Villot (1878, p. 18-20, pl. V, fig. 1), dans l'intestin d'un *Strepsilas interpres* (L.) (1). La figure donnée par Villot a été reproduite par Max Braun (1893, pl. XXVI, fig. 1). C'est la description et la figure données par Villot qui ont permis l'identification de l'espèce par les helminthologistes qui l'ont retrouvée et signalée : W. Nicoll (1907, p. 248) dans les caeca de *Totanus calidris* (L.), à Saint-Andrews (Ecosse), et Marie V. Lebour (1909, p. 3) dans les caeca de *Strepsilas interpres* (L.), à Beadnell (Northumberland) (2). Ni Nicoll, ni Lebour n'ont proposé une nouvelle attribution générique ; ils ont seulement employé l'appellation *Monostomum petasatum* Deslongchamps et, dans sa « Reference list of the Trematode parasites of British Birds », W. Nicoll (1923, p. 171, 190) a gardé le même nom, le plaçant parmi les « unclassified Monostomes ». Les ouvrages généraux sur les Trématodes, tels que ceux de Ben Dawes (1946) et de S. Yamaguti (1958), ne mentionnent même pas l'existence de ce parasite.

(1) Dans une note préliminaire, Villot (1875, p. 477) avait seulement relaté qu'il avait trouvé un « *Monostomum* à tête ailée et large ventouse » dans l'intestin d'un *Strepsilas interpres* (L.).

(2) Il est vraisemblable que d'autres helminthologistes ont retrouvé ce parasite, mais ne l'ont pas signalé ou identifié. Par exemple, le *Monostomum* sp. trouvé par Einar Lönnberg (1890) chez *Haematopus ostralegus* L. à Bergen Glaesvaer (côte ouest de Norvège) était, peut-être, l'espèce de Deslongchamps ; peut-être aussi le *Monostomum ignotum* W. Nicoll (1906, p. 514), du même hôte, à Saint-Andrews (Ecosse).

* Dans une autre publication, E. Deslongchamps (1827, p. 101-102) a relaté avoir trouvé un *Monostoma* à tête subtrigone dans les cæca d'*Haematopus ostralegus* L. ; il en a donné une description qui n'est pas meilleure que celle de 1824 et il a choisi un autre nom spécifique, disant « Nous lui avons donné l'épithète spécifique *Trigonocephalum*. » Ce nom est heureusement resté ignoré des helminthologistes.

A vrai dire, la description et la figure données par Villot n'étaient pas suffisamment détaillées pour permettre soit l'attribution à un genre déjà existant, soit la création d'un nouveau genre. Les réviseurs de l'ancien genre « *Monostoma* » (Fr. Sav. Monticelli 1892, G. Brandes 1892) ont mentionné l'espèce de Deslongchamps sans se prononcer à son sujet ; toutefois, quelques suppositions sur la position systématique ont été hasardées dubitativement. A. Looss (1902, p. 610) a fait remarquer que la forme de la tête, sans plus, rappelait celle des Pronocéphalidés ; mais le rattachement à cette famille n'était pas possible, malgré la forme de la tête rappelant celle d'espèces de la famille *Pronocephalidae* A. Looss 1902 (par exemple des genres *Pleurogonius* A. Looss 1901 et *Adenogaster* A. Looss 1901), parce que, dans cette famille, entre autres caractères différentiels, l'ovaire est toujours en avant des testicules et un peu latéral, le vitelloducte transverse est en arrière de l'ovaire, le pore génital est plus ou moins latéral.

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Willy Kossack (1911, p. 553) a rapproché l'espèce de Deslongchamps des *Notocotylidae* Max Lühe (1909, p. 31), mais les différences, ainsi que nous le verrons plus loin, sont, malgré des analogies évidentes, trop importantes pour permettre l'attribution à l'unique sous-famille *Notocotylinae* W. Kossack (1911, p. 22 ; 1911, p. 554-555) de cette famille.

Une meilleure connaissance anatomique de ce Monostome me paraissant indispensable pour préciser ses affinités, j'ai estimé nécessaire de revoir le matériel anciennement récolté par Alfred Villot à Roscoff, en septembre 1874.

Une partie de ce matériel existant encore au Laboratoire de Zoologie de l'Université de Grenoble, j'en ai demandé communication au Professeur André Dorier et celui-ci a eu l'amabilité de me confier — ce dont je le remercie vivement — les préparations, heureusement conservées, de la collection Villot. Ce matériel comprend quatre spécimens : deux d'entre eux ont été montés en milieu liquide et sont devenus inutilisables, les deux autres ont été montés dans du baume du Canada ; toute coloration a disparu et ils sont devenus si transparents que quelques détails de leur organisation ne sont plus perceptibles ; néanmoins, ils permettent de donner une description et des figures meilleures que celles publiées par Villot.

FROM DOLLFUS, 1966

NOTOCOTYLOIDES

NUDACOTYLIDAE Barker, 1916

Family diagnosis. — Monostomes related to Notocotylidae. Body oval, elliptical or tapered anteriorly and broadly rounded posteriorly, more or less concave ventrally. Ventral glands, ridges or papillae absent. Oral sucker small, pharynx absent, esophagus short or moderately long, ceca terminating anterior or medial to testes. Testes symmetrical or subsymmetrical, at posterior extremity. Vesicula seminalis externa and interna present. Cirrus pouch strongly developed, pretesticular, containing part of seminal vesicle, prostatic complex and protrusible cirrus. Genital pore submedian or sublateral, immediately pretesticular. Ovary lobed, more or less submedian, pretesticular or between and posterior to testes. Shell gland complex medial or anterior to ovary. Receptaculum seminis and Laurer's canal absent. Uterus in close transverse coils between cirrus pouch and oral sucker, almost reaching lateral margins of body; metraterm well differentiated; eggs filamented. Vitellaria extracecal, anterior to ovary and testes. Excretory vesicle giving off radiating canals.

Key to genera of Nudacotylidae

Ovary between and anterior to testes; ceca terminating in front of testes ..... *Neocotyle*

Ovary between and posterior to testes; ceca terminating in testicular zone ..... *Nudacotyle*

Nudacotyle Barker, 1916

Generic diagnosis. — Nudacotylidae: Body small, oval to elliptical, strongly flattened, convex dorsally and concave ventrally. Ventral glands, ridges or papillae absent. Cuticle unarmed. Oral sucker slightly subterminal, esophagus short or of moderate length, ceca terminating anterior or medial to testes. Testes oval or somewhat elongate, lobed or not, situated somewhat asymmetrically at posterior end of body. Cirrus pouch strongly developed, lying transversely or obliquely across median portion of body in front of testes, containing enlarged distal portion of seminal vesicle, prostatic complex and protrusible cirrus. Genital pore submedian, immediately in front of right testis. Ovary lobed, between and posterior to testes, more or less to left of median line. Shell gland intertesticular, pre-ovarian. Receptaculum seminis and Laurer's canal absent. Uterus coiled transversely between cirrus pouch and esophagus, extending laterally beyond ceca; eggs small, with polar filament at each pole. Vitellaria consisting of compact convoluted tubular masses or closely massed follicles, situated in pretesticular lateral fields in middle third of body or a little more posteriorly. Excretory vesicle stellate in outline, opening in center of posterior indentation, giving off 4 to 8(?) radiating canals. Intestinal parasites of mammals.

Genotype: *N. novicia* Barker, 1916 (Pl. 88, Fig. 1064), in muskrat; Minnesota.

"Cercaria marilli" develops in *Pomatiopsis rapidaria*, adults obtained in wild and laboratory-raised animals by feeding encysted *"Cercaria marilli"* — Ameel (1944), Kuntz (1951).

Key to species — Skrajbin (1953).

Other species:

N. tertia Travassos, 1939, in *Hydrochoerus capybara;* Brazil.

N. valdevaginata Travassos, 1922, in *Hydrochoerus capybara;* Brazil.

***Nudacotyle* sp.** (Fig. 36)

Only two rats harbored 68 and 2 examples, respectively.

Host : *Proechimys longicaudatus* (Rengger)† –2 exx.
Habitat : Small intestine.
Locality : Tingo Maria (Castillo Grande), Dpto. Huánuco.
Date : August 27, 1976.

This species is closely allied to *H. novicia* Barker, 1916, from North America, but differs from it by posteriorly situated genital pore and larger cirrus pouch. Whatever this species would be, this is the first discovery of the nudacotylid trematode from Peru.

From Miyazaki, Kifune, Habe and Uyema, 1978

Nudacotylidae

Fig. 36. *Nudacotyle* sp. from *Proechimys longicaudatus*.
Scale : 1 mm.

NUDACOTYLE

Ogmocotylinae Skrjabin et Schulz, 1933

Subfamily diagnosis. — Notocotylidae: Lateral margins of body turned over ventrally in form of a canoe. Ventral glands or ridges absent. Cirrus pouch very strongly developed. Genital pore submedian, far back of intestinal bifurcation. Parasites of mammals.

Ogmocotyle Skrjabin et Schulz, 1933 (March)
Syn. *Cymbiforma* Yamaguti, 1933 (August)

Generic diagnosis. — Notocotylidae, Ogmocotylinae: Body elongate, with lateral margins turned over ventrally to assume a conoe-like appearance. Cuticle unarmed. Ventral glands or ridges absent. Oral sucker terminal, esophagus narrow; ceca long, terminating short of posterior extremity. Testes elongate, more or less lobed, situated one on each side at posterior end of body. Cirrus pouch large, curved in form of a C, enclosing seminal vesicle, prostatic complex and long eversible ductus ejaculatorius. Genital pore submedian, far back of intestinal bifurcation. Ovary lobed or not, median, at level of posterior end of testes or immediately behind it. Shell gland complex pre-ovarian. Receptaculum seminis absent. Vitellaria partly anterior, partly dorsal, to testes, convergent posteriorly. Uterus closely coiled transversely between shell gland and metraterm, overreaching ceca laterally. Metraterm well developed; eggs with filament at each pole. Excretory vesicle short; lateral branches long, united anteriorly, with numerous anastomoses. Intestinal parasites of mammals.

Genotype: *O. pygargi* Skrjabin et Schulz, 1933 (Pl. 91, Fig. 1099; Pl. 97, Fig. 1177), in *Capreolus pygargus bedfordi;* Russia.

Other species:

O. ailuri Price, 1954, in *Ailurus fulgens;* Zoo, Wash., D. C. *Ogmogaster* of Price is undoubtedly lapsus for *Ogmocotyle.*

O. indica (Bhalerao, 1942) Ruiz, 1946, in intestine and bile duct of various ruminants; India.

O. sikae (Yamaguti, 1933) Ruiz, 1946, (syn. *Cymbiforma s.* Y.) in *Sika nippon nippon;* Japan.

The Notocotylid monostome *Ogmocotyle pygargi*, was described by Skrjabin and Schultz (1933) from the small intestine of Siberian *Capreolus pygargus bedfordi*. The same year, Yamaguti (1933) reported another similar mammalian notocotylid from the small intestine of *Sika nippon* Kyoto, which he named as *Cymbiforma sikae* and referred it to a new subfamily Cymbiforminae. Bhalerao (1942) collected a large number of notocotylids from the small intestine of Indian hill-sheep and goats at Mukteswar and, following Yamaguti's account, named it *Cymbiforma indica*. Ruiz (1946) pointed out the similarity of the two genera and made *Cymbiforma* Yamaguti (1933) synonym of *Ogmocotyle* Skrjabin and Schultz, 1933. Accordingly, the Indian species was designated as *Ogmocotyle indica* (Bhalerao, 1942) Ruiz (1946) and assigned to a new subfamily Ogmocotylinae.

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A note on *Ogmocotyle ailuri* (Price, 1954) (Trematoda: Notocotylidae).

EMMETT W. PRICE
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In 1954 the writer described in abstract a species of notocotyloid trematode, which belonged to the genus *Ogmocotyle* Skrjabin and Shul'ts, 1933, from the lesser panda, *Ailurus fulgens*. Through a lapsus, apparently because of the similarity of the generic names *Ogmocotyle* and *Ogmagaster* (both notocotyloid), the name *Ogmagaster ailuri* was proposed for the parasite.

The host, *Ailurus fulgens*, was a young adult which died in the National Zoological Park, Washington, D. C. on May 21, 1957, and was listed in the records of the U. S. National Museum as Accession No. 252091. The specimen had been obtained from a New York dealer in wild animals but beyond this no information was available as to its original source.

In view of the fact that the lesser panda was a relatively rare animal in zoological gardens and because the Museum authorities wished to utilize the carcass for anatomical studies, a complete necropsy was not possible. However, on May 27, 1927 (erroneously given in the abstract as April 27) the writer was permitted to flush out the intestinal tract, by means of a tube inserted into the duodenum, and a single specimen of the trematode referred to above was recovered in the washings.

The purpose of this note is to present a more complete description of the species than was possible in the abstract.

Ogmocotyle ailuri (Price, 1954) Fig. 1.

SYNONYM. *Ogmogaster ailuri* Price, 1954

DESCRIPTION. Body scoop- or boat-shaped, 1.3 mm long by 0.73 mm wide. Cuticle smooth and without spines. Oral sucker subterminal, 0.112 mm in diameter; esophagus slender, 0.13 mm long; intestinal branches slender but could not be followed beyond level of anterior transverse uterine loop. Genital aperture to left of median line, about 0.64 mm from anterior end of body. Cirrus pouch somewhat crescent-shaped, about 0.6 mm long by 0.15 mm wide, the distal portion almost completely filled by the seminal vesicle and the transverse portion almost entirely occupied by the pars prostatica; cirrus unarmed. Testes 0.29 mm long by 0.096 mm wide, situated as in other notocotyloids. Ovary deeply lobed, about 0.1 mm long by 0.24 mm wide, situated between posterior ends of testes. Mehlis' gland about one-third as large as orary and antero-dorsal to it. Vitellaria consisting of relatively large follicles, forming band across body dorsal and largely anterior to testes. Uterus consisting of more or less regular transverse loops extending laterally to near margin of body, almost filling zone between anterior margins of testes and cirrus pouch. Metraterm prominent, transverse, about 0.24 mm long by 0.08 mm wide. Eggs 0.018 mm long by 0.011 mm wide, many with long filament at anterior and posterior poles and others with a long filament at antopercular pole and 2 shorter filaments at opercular pole.

HOST. Lesser panda, *Ailurus fulgens*.

LOCATION. Intestine.

LOCALITY. National Zoological Park, Washington, D. C.

HOLOTYPE. U. S. National Museum Helminthological Collection No. 27777.

DISCUSSION. The genus *Ogmocotyle* was proposed by Skrjabin [illegible]

(1933) for *O. pygargi* which had been collected from the small intestine of *Capreola pygargus bedfordi* in Siberia. In the same year Yamaguti (1933) proposed the genus *Cymbaforma* for a notocotyloid trematode, *C. sikae*, which had been obtained from the upper portion of the small intestine of *Sika nippon* in Japan. Ruiz (1946) regarded the two species as congeneric and pointed out that *Ogmocotyle* Skrjabin and Shul'ts had priority of a few months over *Cymbaforma* Yamaguti. Skrjabin (1953) regarded Yamaguti's species as a synonym of *O. pygargi*, an action that appears correct since there are insufficient differences to warrant regarding the two species as distinct.

Bhalerao (1942) described as *Cymbaforma indica* a species from the small

intestine and bile ducts of sheep, goats and cattle in India. This species was subsequentlyplaced in the genus *Ogmocotyle* by Ruiz (loc. cit.). Concerning the frequency of occurence of this parasite, Balerao (1948) stated that "*Cymbiforma indica* ——— is very common in goats and sheep and rare in cattle at Mukteswar."

Ogmocotyle ailuri resembles *O. indica* in many respects and may eventually be shown to be identical in spite of the wide difference in hosts. The principal character which seems to differentiate the two forms is the cirrus pouch, this structure being situated more transversely in *O. ailuri* than in *O. indica*.

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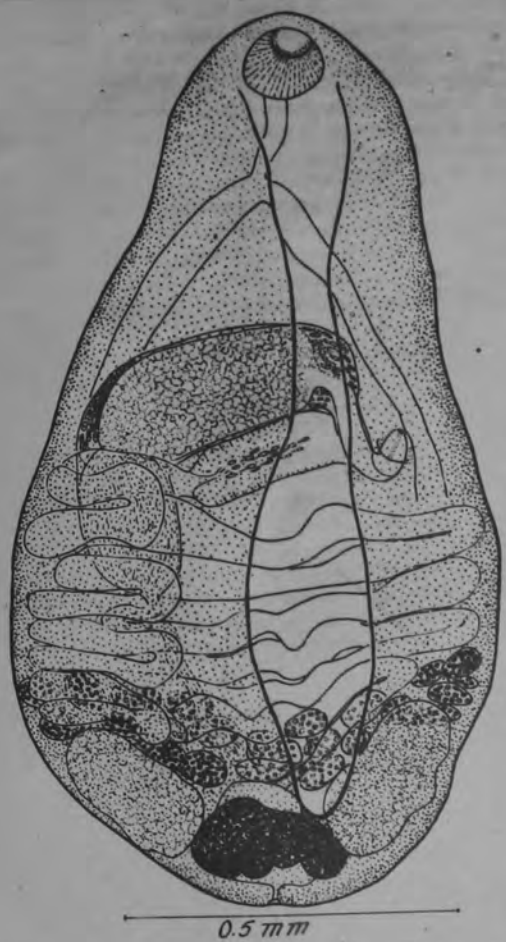
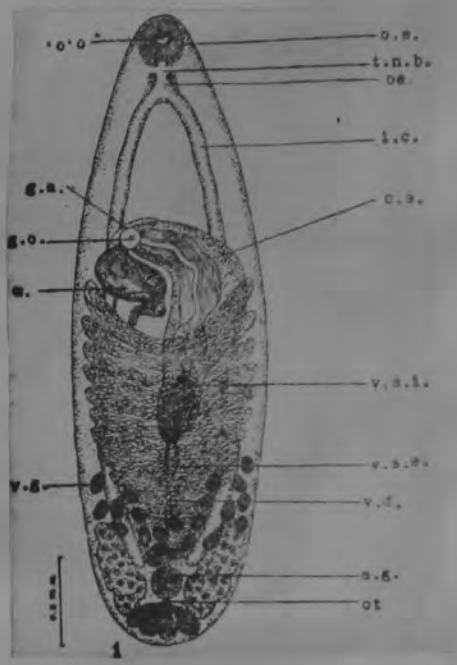


Fig. 1. *Ogmocotyle ailuri*. Complete worm, ventral view. Original.

OGMOCOTYLE INDICA (BHALERAO, 1942)

RUIZ, 1946

Ogmocotyle indica are small monostomes found in the intestine of sheep, goats and rarely cattle in certain hilly regions. They undergo disintegration on the death of the host, and owing to their minute size, are likely to be missed on casual examination. The worms are boat shaped and in fresh specimens most of the organs can be made out under a dissecting lens. They consist of clear, translucent anterior contractile portion, and packed opaque and greyish-white posterior portion which contains the reproductive organs. On fixation, the entire body of the worm becomes opaque. The dorsal surface of the body in living condition shows varying degree of convexity with slight ventrally inflexed lateral margins and rarely posterior margin also. Frequently the cirrus is seen protruded in the ventral concavity. Most of the worms in natural as well as flattened conditions appear elongated more or less oval or pear shaped. The anterior extremity is narrower ending bluntly. The body is broadest near the middle with the posterior extremity broad and rounded. The body measures 0.90-2.19×0.32-0.99.



1

In cross sections the body shows three portions : (1) the outer cuticle, (2) the inner subcutis and (3) innermost parenchyma. The cuticle, is chitinous, smooth and unarmed throughout. The subcutis consists of three muscle layers. The outermost is the circular muscle layer. Between the circular muscle fibres are scattered the ectodermal cells each with a prominent nucleus. The next longitudinal muscle layer is thicker than the circular one and is more developed on the dorsal and lateral margins. The third diagonal muscle layer is under the longitudinal muscle layer and forms a characteristic network, particularly on the ventral concave side of anterior half of the body. The parenchyma consists of thin walled, loosely packed areolar connective tissues with nucleated parenchymatous cells. In the ventral body wall also cuticle is smooth, but while the circular muscle layer is thicker and well developed the longitudinal muscle layer is thinner and comparatively poorly developed. Ventral glands or ridges, a character on which the subfamily is differentiated, are completely absent.


2

The oral opening is situated terminally and measures 0.03-0.061. It is surrounded by oral sucker which is circular with strong radiating muscles and measures 0.096-0.160 in diameter. From the sucker arises a short, uniformly thick oesophagus, which is tubular with thin muscular wall and measures 0.085-0.176×0.019-0.038. Surrounding the oesophagus along its whole length are seen unicellular glands with darkly stained granules upto the extent of 0.023-0.030 around. Pharynx is completely absent. The intestinal caecae are slender having thin muscular wall. The straight distance from the intestinal fork to the tips of the caeca measures 0.737-1.440 and their width is 0.023-0.061. The caeca first diverge and then run parallel to the lateral margins of the body, ending in the middle of the intertesticular area, converging slightly. The left caecal arm at the level of the genital atrium is frequently seen to push out towards the periphery. In one specimen the caeca were united beyond the intestinal fork at the level of the anterior end of the cirrus-sac and again divided forming another fork at the level of the bending of cirrus-sac, and further ran almost a normal course.

- OVER -

The transverse nerve-band is prominently visible and measures 0.023-0.086×0.017. Lying dorsally to the oesophagus it is situated at a distance of 0.17-0.257 from the anterior end. The nerve band at the two ends enlarges to form two subglobular ganglia giving out nerves.

The tubular excretory bladder extends from the middle of the vitellaria to a little in front of the posterior end of the body and measures 0.096-0.155 in length. Anteriorly, it bifurcates into two projecting tubular arms each measuring 0.003-0.007 in length. From these arms arise the lateral excretory ducts, one on each side, which run upto the level of anterior border of the cirrus-sac, where they further divide and anastomose. The area between the oral sucker and the anterior border of the cirrus-sac contains network of excretory tubules as a result of the anastomosing branches of these two excretory ducts. The excretory pore opens dorsally at a distance of 0.003-0.007 from the posterior end. The whole excretory system has been illustrated by Bhalerao.

The testes are situated opposite each other at the posterior end, along the lateral margins and external to the terminal portion of the intestinal caeca and separated by the ovaries. They are irregularly lobed and measure 0.134-0.538×0.069-0.240. The shallow lobulations may divide the organ into two to ten ill-defined lobes. The testes take comparatively lighter stain and consist of loosely packed, nucleated, unicellular cells. The two vasa efferentia arise separately from the medial surface of the testes and pass centrally towards each other. Anteriorly they unite to form the vas deferens in the posterior fourth of the body, which passes anteriorly in zig-zag manner and is more prominent at the beginning of the vesicula seminalis externa into which it opens. The convoluted vesicula seminalis externa enters the cirrus-sac at its posterior end and is continued as prominent vesicula seminalis interna. The cirrus-sac is the most prominent organ of the body and can be seen easily by the naked eye. It is placed almost centrally occupying nearly middle third of the body, with its bulged out and bent middle portion more on the left side of the mid-line, when viewed dorsally. The cirrus-sac is divided into two portions : the anterior, tubular neck-like portion containing cirrus and terminal portion of the ejaculatory duct, and the posterior, bulbous portion which tapers posteriorly, containing the posterior part of the ejaculatory duct, pars prostatica complex and vessicula seminalis interna The vesicula seminalis interna is cup-shaped, thickly muscular and measures 0.123-0.257×0.046-0.107. The pars prostatica is club-shaped and measures 0.115-0.325×0.096-0.161. Surrounding the pars prostatica are numerous unicellular gland cells, which may sometimes cover a little portion of the vesicula seminalis interna. From the pars prostatica arises anteriorly the convoluted ejaculatory duct which is of nearly 0.003-0.007 thickness and opens anteriorly into the genital atrium. The genital opening is at a distance of 0.274-0.754 from the anterior extremity (due to high contractability of the anterior portion), and opens ventrally on the left side of the mid line adjacent to the left caecal wall, slightly anterior to mid body. The cirrus is normally protruded and its length in this position is 0.120-0.305×0.030-0.120 the papillae on it being 0.015-0.034 high.

The follicular ovary lies centrally at the extreme posterior end and generally consists of four oval or pear-shaped lobes, separated from each other posteriorly and united anteriorly. Each lobe measures from 0.046-0.107×0.030-0.088 and the entire ovary measures 0.115-0.25× 0.069-0.154. The ovarian lobes are generally entire, but middle two

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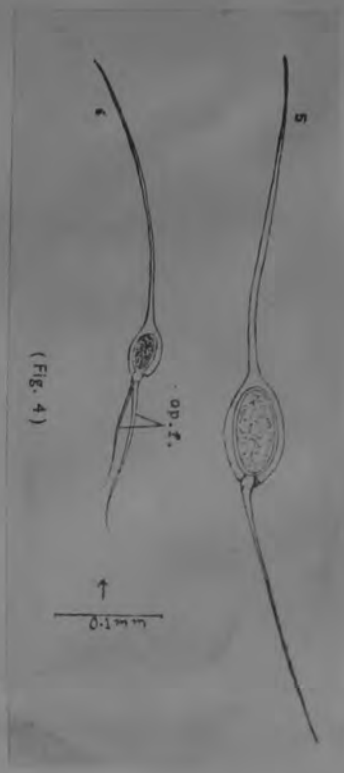
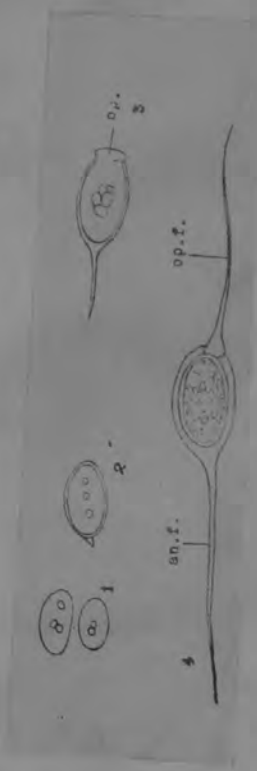
are frequently further divided posteriorly into two to sometimes three lobes, and look like kidney, inverted U- or fork -shaped. Occasionally the ovary may have fewer lobes. The ovarian lobes are deeply staining and consist of compact cells with prominent nuclei. A short oviduct, arises from the anterior end to form subglobular öotype, which lies at a distance of 0.088-0.130 from the posterior end of the body. Either surrounding or a little ahead of the öotype is a big, prominent circular shell gland, which measures 0.088-0.173. A receptaculum seminis is absent. The vitellaria is composed of 17-28 oval follicular glands each measuring 0.030-0.080 in length and arranged transversely in a curve both in extra-caecal and intracaecal areas. The vitelline glands are scattered in an area measuring 0.115-0.445, marked roughly by the posterior end of the cirrus-sac anteriorly and upto the shell gland or tip of the caeca posteriorly. Uterus, which is full of eggs arises anterior to the shell gland with one or two ascending coils, and continued anteriorly giving five to nine transverse coils across the body, running dorsal to the posterior portion of the cirrus-sac. The uterine coils extend beyond the intestinal caeca anteriorly and converge posteriorly, with the result that the posterior few coils are well within the intestinal caeca. Anteriorly the uterine coils extend upto the middle or posterior third of the cirrus-sac, the total area covering longitudinally from shell gland anteriorly measures 0.240-0.650. The uterus finally widens to form the metraterm, which lies on the left side of the cirrus-sac and measures 0.171-0.343×0.050-0.086. The metraterm is very muscular, lined internally by thick linear cuticular striations. The genital atrium measures 0.057-0.096, into which metraterm opens to the left side of the opening of the cirrus-sac.



(Fig. 4)

The egg consists of the body and two long polar filaments. The body is generally asymmetrically oval, nearly twice as long as broad, measuring 0.018-0.039×0.012-0.013. The wall of the body is comparatively thick and at one end forms the longer and stouter ant-opercular filament measuring 0.034-0.069. The filament at the opposite opercular pole is thinner and shorter, and is continuation of the plug, measuring 0.017-0.051. Both these filaments are broader proximally and finely tapering distally. Inside the eggs, passed in the faeces of the host, the embryo is not fully formed as described by Bhalerao, but is only in developmental stage. Rarely eggs may have two filaments at opercular end.



BIOLOGY

Incidence : A survey for the incidence of infection with *O. indica* was carried out in the plains and hills. In hill animals, the incidence of infection, on faecal examination, was found to be 28.9% (51 out of 176) among sheep and goats, and only 1.2% (1 out of 83) among cattle (Sharma Deorani, 1960). In the hilly areas too it is rarely found below a height of 4,000-4,500 feet. At heights of 5,000-6000 feet the intensity of infection is medium. In endemic areas, which were generally 6,000-8,000 feet or above, the percentage of infection varied from 44% at Baragaon, 45.4% at Budher, 53.1% at Gwaldam to 53.8% at Deoban.

Ratio of number of worms present to number of eggs voided in the faeces of the host. The pathogenicity of this trematode infection depends on the number of worms present in a host. In order to assess approxi-

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mate ratio of number of worms present in animals to the number of eggs voided in their faeces, quantitative faecal examinations for eggs of all the eight animals were carried out and their average worked out. These figures were compared with the number of worms collected from them on their death. Roughly the ratio of number of eggs voided to the number of worms present worked out to be 1:3 (The ratio appears to be very low).

Longivity of the worms : The worms collected on post mortem examination 3-5 hours of the death of the host were comparatively motionless, and in a few disintegration had already started. The worms collected on post-mortem examination 10-15 hours after the death of the host, were mostly dead and quite a good percentage of them had disintegrated. Katiyar (1956) found that the parasites were present in the intestine of the host upto 48 hours of their death.

The worms when kept in petri-dishes lived for 9-17 hours in water and 10-22 hours in normal saline during winter at room temperature. During summer at room temperature they lived 4-9 hours in water and 8-14 hours in normal saline. At incubation temperature of nearly 30°C they died in 5-12 hours in water and 10-15 hours in normal saline.

Intra-uterine development of the eggs : The eggs in the initial part of the uterus are rounded or oval and are devoid of filaments. In the ascending coils of the uterus the eggs developed posterior spine-like projections. Later, at the anterior or opercular end the lid-like operculum appears. In the first or second transverse coils a spine-like projection also starts from the operculum. With the development of the egg, these two polar filaments develop further and become many times longer. In the distal part of uterus the egg becomes more asymmetrically oval with one side of the body more convex than the other, and the two filaments become unequal and dissimilar. The two filaments which were originally opposite to each other, now do not fall in a straight line. The segmentation of the embryo at this stage is well advanced. Such mature eggs are seen in the distal part of uterus. During the passage of eggs through the female gonoduct the opercular narrower and shorter filament is always forward.

Examination of snails and slugs for natural infection : The terrestrial snails which were identified as *Euanstenia cassida* by the Zoological Survey of India, and slugs of *Limax* sp. were collected from the endemic areas of the infection. In all 318 *E. cassida* and 52 *Limax* sp. were kept under observation and were also examined after their death. But none was found positive for the developmental stages of the worm. Also 379 aquatic snails of the genera *Vivipara, Lymnaea* and *Gyraulus* from same area were similarly examined but they too were negative for the infection.

Attempts were made to infect the snails in the laboratory. In all, clean 61 *E. cassida* and 4 each of clean *Indoplanorbis, Lymnaea* and *Gyraulus* snails were fed on eggs either from faeces or from teased worms, and kept under observation for more than two months. On their death, the snails were teased and examined. No developmental stage of the parasite was found in any of them.

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DG-MCCOTYLE

Ogmogaster Jägerskiöld, 1891

Generic diagnosis. — Notocotylidae, Notocotylinae: Body oval, flattened; margins fluted or pleated; ventral surface provided with numerous longitudinal rugae or ridges. Oral sucker terminal, esophagus short, ceca slender and extending to posterior extremity. Testes lobed, placed symmetrically in posterior fourth of body. Cirrus pouch long, median. Genital pore median, posterior to oral sucker. Ovary lobed, median, intertesticular, at level of posterior part of testes, with shell gland complex in front. Laurer's canal present. Vitellaria consisting of isolated follicles, pretesticular. Uterus strongly convoluted, extending anteriorly beyond base of cirrus pouch and laterally beyond intestinal ceca. Excretory pore dorsal, close to posterior extremity. Intestinal parasites of marine mammals.

Genotype: *O. plicata* (Creplin, 1829) Jägerskiöld, 1891 (Pl. 94, Fig. 1134), in *Balaenoptera* spp.; Atlantic.

Other species:

O. antarctica Johnston, 1931, pro *plicatus* of Leiper et Atkinson nec Creplin, in *Leptonychotes weddelli* and *Lobodon carcinophaga*; Australia.

Genus OGMOGASTER Jägerskiöld, 1891

Generic diagnosis.—Ogmogasterinae: Body oval, flattened, and leaflike, margins fluted; ventral surface provided with longitudinal ribs or rugae. Oral sucker terminal; esophagus short; intestinal ceca slender and extending to posterior end of body. Genital aperture median, a short distance caudad of oral sucker; cirrus and vagina open into a short genital sinus. Cirrus pouch long, situated in median line and extending posteriorly to near equator of body; testes deeply lobed, situated in the same transverse plane in the posterior fourth of body. Ovary lobed, median in position and situated at the level of the posterior margin of testes; Mehlis's gland median, preovarial; Laurer's canal present; vitellaria lateral, consisting of isolated follicles and extending from anterior margin of testes to level of the base of the cirrus pouch; uterus greatly convoluted, the coils extending laterally beyond intestinal ceca. Parasites of cetaceans and pinnipeds.

Type species.—*Ogmogaster plicatus* (Creplin, 1829) Jägerskiöld, 1891.

OGMOGASTER PLICATUS (Creplin, 1829) Jägerskiöld, 1891

PLATE 12, FIGURE 52

Synonym.—*Monostomum plicatum* Creplin, 1829, pp. 878–880.

Description.—*Ogmogaster:* Body oval, 6 mm to 14 mm long by an average width of 4 mm, flat and leaflike; the margins of the body have a fluted or pleated appearance, and the ventral surface is provided with 15 to 17 longitudinal rugae. Oral sucker terminal, 500μ in diameter, according to Leiper and Atkinson (1915); esophagus short; intestinal ceca sinuous and terminating near the posterior end of the body. Excretory pore dorsal, about 700μ from the posterior end of body, according to Jägerskiöld; excretory vesicle Y shaped, situated ventral to ovary and testes. The limbs of the vesicle extend anteriorly and unite at the level of the intestinal bifurcation at which point two branches are given off, one on each side, which extend posteriorly in the lateral fields, then turn and pass anteriorly to the level of the oral sucker, where they again turn and pass backward and terminate near the posterior end of the body. Long branches are given off here and there along the course of the excretory ducts. Genital aperture median, situated a short distance caudad of the oral sucker; the male and female genital pores are situated side by side at the base of a short genital sinus. Cirrus pouch cylindrical, 3 mm long by 300μ wide, containing a seminal vesicle, 1.4 mm long by 200μ wide, and a long convoluted ejaculatory duct. The ejaculatory duct is lined with a membrane, which is closely beset with small papillalike projections; it may be protruded as a slender cirrus the length of which may equal the length of the body, according to Creplin (1829). Testes deeply lobed, 1 mm long by 1.1 mm wide, situated in the same transverse plane in the posterior fourth of the body; vasa efferentia short, uniting to form a relatively wide vas deferens which extends anteriorly in the median line to the base of the cirrus pouch; it then passes to the right of the cirrus pouch where it makes several loops, four to five according to Jägerskiöld, and then passes backward and enters the base of the cirrus pouch. Ovary deeply lobed, 500μ long by 1 mm wide, situated between the testes; Mehlis's gland preovarial; Laurer's canal present. Vitellaria lateral, composed of 12 to 16 isolated follicles on each side, lying ventral to ceca, and extending from the anterior margin of the testes to about the level of the base of the cirrus pouch. Uterus slender and greatly convoluted, extending laterally beyond the ceca and from the testes anteriorly to about one-fourth of the body length from the anterior end. Vagina muscular and lined with spines which are about 35μ long. Eggs elongate oval in shape, 25μ long, and provided with a long filament at each pole.

52.

Hosts.—Cetacea (*Balaenoptera borealis, B. musculus* = *B. physalus, B. acutorostrata* = *Balaena rostrata*); Pinnipedia [1] (*Leptonychotes weddellii, Lobodon carcinophaga*).

Location.—Intestine.

Distribution.—Europe (Norway); Antarctic waters (vicinity of Cape Evans).

Remarks.—The above description is taken largely from an exhaustive description of this species given by Jägerskiöld (1891).

[1] Johnston (1931) regards the form from pinnipeds as a species distinct from *Ogmogaster plicatus*. The new species, for which he proposes the name *O. antarcticus*, differs from *O. plicatus* in "its smaller size, different body proportions, presence of only 13 rugae, more restricted vitelline zone, and relatively smaller cirrus sac."

Ogmogaster antarcticus Johnston, 1931

Ogmogaster antarcticus Johnston, 1931

The taxonomic relationships and the historical aspects of the three species assigned to *Ogmogaster*, namely, *O. plicatus* (Creplin, 1829), *O. antarcticus* Johnston, 1931 and *O. pentalineatus* Rausch and Fay, 1966 have been reviewed in detail by Rausch and Fay (1966).

The basic measurements of specimens in the present collection are similar to those quoted by Rausch and Fay (1966) for material collected from *L. weddelli* at McMurdo Sound, Antarctica (Tab. 3). The only difference in the morphology is in the position of the uterine loops relative to the base of the cirrus sac. Rausch and Fay (1966) reported that the uterus does not often overlap the cirrus sac and that when it does it passes ventral to the sac. In the present collection 25 of 32 worms examined had a loop which crossed the end of the cirrus sac and in 14 of these the loop was dorsal. The worms examined in the present study are well within the limits of variation described for *O. antarcticus* by Rausch and Fay (1966) except in this feature which should be excluded from the differential characters quoted for *O. plicatus* and *O. antarcticus*.

O. antarcticus was recovered from all seven seals. Details of the intensity of these infections are given elsewhere (Beverley-Burton 1971). Nearly all the specimens were recovered from the caecum, which is very small in the Weddell seal. Relatively few were found in the colon. Previous reports have cited the preferred location as the small intestine but Rausch and Fay (1966) state that their specimens were also from the large intestine and caecum.

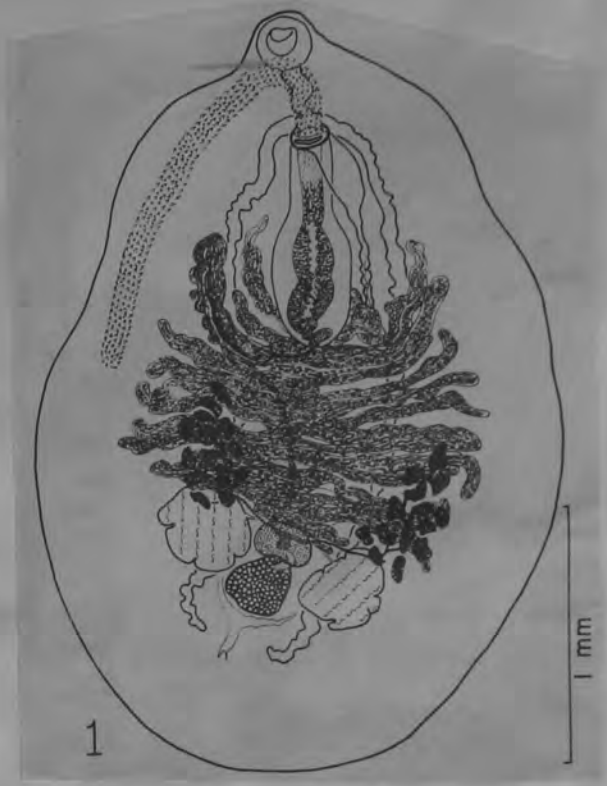
Table 3

Measurements of *Ogmogaster antarcticus* from the Weddell Seal

		Rausch & Fay (1966)	Present Material
Body:	length	4–5.5	4.42–6.01
	width	2–3	2.04–2.98
Number of longitudinal ridges	(mode)	13–15	13–15
Oral sucker:	length	0.42–0.56	0.39–0.51
	diameter	0.53–0.66	0.45–0.57
Cirrus sac:	length	1.25–1.64	1.74–2.20
	width	0.21–0.37	0.19–0.32
Testes:	length	0.84–0.96	0.59–0.82
	width	0.62–0.72	0.59–0.93
Ovary:	length	0.20–0.41	0.17–0.41
	width	0.56–0.91	0.44–0.66
Eggs:	length	18–15 µm	16–25 µm
	width	10–12 µm	9–12 µm
Polar filaments		150 µm	145–155 µm

Ogmogaster trilineatus ~~sp. n.~~ RAUSCH & RICE, 1970
(Figs. 1–4)

DESCRIPTION: Body oval, slightly arched dorsad, 2.9–3.9 long by 1.26–2.40 in maximum width, near middle (av. 3.25 by 1.74). Margins of body thin, sometimes slightly crenulated. Tegument aspinose, with faint, longitudinal striations. Three parallel, longitudinal ridges on ventral surface, 0.107–0.300 apart, about 0.178 in maximum width, up to 0.300 high, attenuated anteriorly and posteriorly. Mesial ridge extending from genital pore posteriad to level of ends of ceca; shorter lateral ridges extending posteriad about to level of posterior margins of testes. Ridges provided throughout with numerous glandular cells arranged in parallel, transverse rows. Oral sucker terminal to subterminal, 0.200–0.321 in transverse diameter by 0.207–0.307 long (av. 0.262 by 0.270). Esophagus about 0.180 long. Ceca slightly sinuous, without lateral diverticula, extending posteriad dorsally, passing medial to vitelline follicles and across medial margins of testes, and terminating slightly beyond posterior margins of testes. Rounded to slightly lobed testes equal to subequal in size, situated bilaterally in posterior ⅓ of body; left testis 0.257–0.621 long by 0.200–0.407 wide (av. 0.415 by 0.288); right, 0.314–0.585 long by 0.207–0.407 wide (av. 0.393 by 0.287). Vasa efferentia running mediad, joining just anterior to Mehlis' gland. Vas deferens dorsal to uterus, 0.024–0.040 in diameter, extending anteriad near midline, and enlarging dextral to end of cirrus sac, forming external seminal vesicle. Latter somewhat undulating, 0.024–0.130 in diameter, extending anteriad dextrally to level of middle of cirrus sac, then turning abruptly posteriad to proximal end of cirrus sac, entering latter after narrowing. Elongate-piriform cirrus sac on midline, extending through approximately ⅓ of length of body, 0.750–1.606 long by 0.285–0.382 in maximum diameter (av. 1.125 by 0.329); thick-walled pars prostatica, occupying about ½ length of cirrus sac (when cirrus extruded), 0.214–0.535 long by 0.135–0.285 in diameter. Cirrus sac opening into genital atrium on midline immediately posterior to cecal bifurcation. Everted cirrus about ½ as long as body, 0.107–0.135 in diameter (av. 0.119), and covered by thick spines 0.016–0.027 long. Rounded ovary, 0.221–0.357 long by 0.193–0.293 wide (av. 0.260 by 0.237), situated intercecally between and slightly posterior to testes. Mehlis' gland subspherical, 0.107–0.285 long by 0.178–0.335 wide (av. 0.171 by 0.232), on midline adjacent to anterior surface of ovary. Laurer's canal present. Vitellaria ventral, in two lateral groups; left group with 15 or 16 follicles; right, with 14–18. Vitellaria slightly overlapping anterior margins of testes, and extending anteriad about to middle of body. Vitelline ducts arising at level of anterior margins of testes and running mediad to Mehlis' gland. Uterus ventral, extending anteriad from level of Mehlis' gland, there enlarging to form uterine seminal receptacle, and forming numerous transverse loops overlapping ceca bilaterally. Anterior loops directed anteriad, extending about to middle of cirrus sac; uterus terminating in thick-walled metraterm running anteriad to left of cirrus sac and opening in genital atrium just posterior to opening of cirrus sac. Eggs 0.030–0.034 long by 0.010–0.014 wide (av. 0.032 by 0.012), possessing at each end single polar filament 0.147–0.275 long (av. 0.205); length of egg with filaments 0.360–0.560 (av. 0.436).

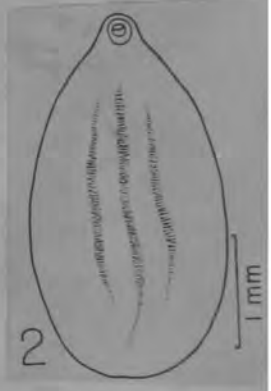


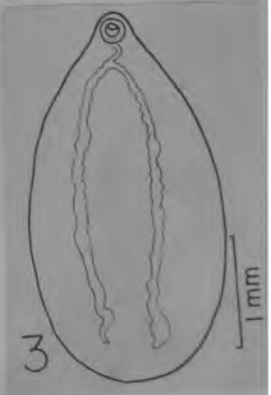
HOST: Fin whale, *Balaenoptera physalus* Linnaeus.

HABITAT: Rectum.

TYPE LOCALITY: North Pacific Ocean, off San Francisco, California, lat. 37°33′ N, long. 124°06′ W.

SPECIMENS: Holotype, USNM Helm. Coll. No. 70785; paratype, No. 70786.





Differential characters

Three species of *Ogmogaster* Jägerskiöld, 1891, were recognized by Rausch and Fay (1966), viz., *O. plicatus* (Creplin, 1829), *O. antarcticus* Johnston, 1931, and *O. pentalineatus* Rausch and Fay, 1966. *O. delamurei* Treshchev, 1966, which is clearly identical with *O. pentalineatus*, was described from gray whales, *Eschrichtius robustus* (Lilljeborg) [syn. *E. gibbosus* (Erxleben)], from the Chukchi Sea. Treshchev's paper appeared in a volume which was sent to press on 17 March 1966, while the description of *O. pentalineatus* was published in February, 1966. Consequently, on grounds of priority, the latter name is applicable to this species. The recently described *O. grandis* Skriabin, 1969, very similar morphologically to *O. plicatus*, was collected from fin whales from antarctic waters. Skriabin (1969) found it also in the sei whale, *Balaenoptera borealis* Lesson, and in the blue whale, *B. musculus* Linnaeus.

The species of *Ogmogaster*, excluding *O. grandis*, can be readily differentiated by the numbers of ventral ridges: *O. plicatus*, 18–28; *O. antarcticus*, 11–17; *O. pentalineatus*, 5 (an incomplete sixth was observed in one specimen); *O. trilineatus* sp. n., 3 (Rausch and Fay, 1966; Treshchev, 1966). According to Skriabin (1969), *O. plicatus* has 15 to 17 ventral ridges, and *O. grandis* has 19–25. In *O. trilineatus*, the internal organs are arranged more compactly, leaving the margins of the body free; in the other species, the uterus and other structures extend nearly to the lateral and posterior margins of the body. *O. trilineatus* is further distinguished by the following characters.

O. trilineatus differs from *O. plicatus* (and from *O. grandis*) in having a much smaller body, a relatively short cirrus sac (extending through at least half the length of the body in *O. plicatus*), smooth or weakly-lobed testes (*O. plicatus*: deeply lobed), and the uterus arranged in transverse loops (*O. plicatus*: reticulate).

Compared with *O. antarcticus*, *O. trilineatus* has a smaller body, testes and ovary of different form (both deeply lobed in *O. antarcticus*), and different uterine arrangement (*O. antarcticus*: reticulate). *O. antarcticus* is thicker, much more muscular, and often exhibits well defined, regular crenulations along the lateral and posterior margins of the body.

The new species is similar in size to *O. pentalineatus*. The latter's range in length of the body was given as 1.3–3.5 by Rausch and Fay (1966), and as 3.0–4.5 by Treshchev (1966). However, specimens subsequently obtained by one of us (DWR) from the type host measured as much as 5.6 long. *O. trilineatus* has a thinner, less muscular body, but the ventral ridges are both wider and higher than those of *O. pentalineatus*. *O. trilineatus* differs in having a cirrus sac of different shape and of relatively greater diameter, a shorter and thicker cirrus with larger spines, testes and ovary of different form (both lobed in *O. pentalineatus*), more compactly arranged vitelline follicles, and larger eggs with much longer polar filaments. The well defined lateral sacculations on the ceca of our specimens of *O. pentalineatus* were not observed in the specimens studied by Treshchev.

Discussion

Published records suggest that trematodes of the genus *Ogmogaster* usually occur in the small intestine of the host. For the examination of the fin whales considered here, the intestine was slit open at three or more randomly selected points and the surface of the mucosa scrutinized. No specimens of *Ogmogaster* were found. While working with gray whales in the winter of 1966–67, it was found that *Ogmogaster* spp. commonly occurred in the rectum. Thereafter, beginning with the 1967 whaling season, that portion of the rectum exposed after the blubber was flensed from the carcass was routinely examined.

Trematodes of the genus *Ogmogaster* were found in the rectum of 16 (30%) of 54 fin whales examined during 1967, 1968, and 1969. Three species were represented among specimens collected from 14 of these whales (Table 1). Such trematodes were found in the rectum of 53 (38%) of 139 gray whales: 7—*O. pentalineatus* only; 22—*O. antarcticus* only; 24—both species present (Rice and Wolman, 1970). None of these trematodes has been found in sei whales, *Balaenoptera borealis*, nor in sperm whales, *Physeter catodon* Linnaeus, taken off central California.

Table 1. Occurrence of *Ogmogaster* spp. in 1 fin whales.

Field No.	Date collected	*O. plicatus*	*O. antarcticus*	*O. trilineatus*
1967-173	2 Aug	×		
1967-192	2 Sep	×		
1968-151	7 Jul	×		
1968-156	31 Jul	×		
1968-159	1 Aug	×	×	
1968-169	14 Aug	×		
1969-169	31 Aug			×
1969-170	31 Aug	×		
1969-173	9 Sep	×	×	
1969-176	15 Sep		×	×
1969-181	28 Sep	×		
1969-183	5 Oct	×		
1969-184	7 Oct		×	
1969-185	8 Oct	×	×	

OGOMOGASTER

OPISTHOTREMATIDAE Poche, 1926

Family diagnosis. — Body spoon-shaped, spinose ventrally. Pharynx absent; esophagus slender; ceca without diverticles. Acetabulum absent. Testes symmetrical, in posterior half of body. Cirrus pouch present. Genital pore median, at posterior extremity. Ovary median or submedian, intercecal, pretesticular. Receptaculum seminis and Laurer's canal present, latter may be absent occasionally. Uterus confined to intercecal field or overreaching ceca laterally; eggs with long polar filaments. Vitellaria follicular, pretesticular. Excretory vesicle short, with partly anastomosing lateral branches. Parsites of Sirenia.

Type genus: *Opisthotrema* Fischer, 1883.

Key to subfamilies of Opisthotrematidae

Vitellaria marginal; uterus inter- and extracecal; testes post-cecal; excretory vesicle V-shaped ..... Lankatrematinae

Vitellaria entirely or mostly intercecal; uterus intercecal; testes inter- or extracecal; excretory vesicle tubular Opisthotrematinae

Notocotylidae

Family OPISTHOTREMATIDAE Poche, 1926

Family diagnosis.—Body spoon shaped; ventral surface spiny. Esophagus moderately long, slender; intestinal ceca without diverticula. Excretory pore dorsal; excretory vesicle short and with lateral branches. Genital openings median and situated almost at extreme posterior end of body. Cirrus pouch long and slender, median, containing a strongly convoluted seminal vesicle and a protrusible cirrus; testes intercecal or extracecal, situated in the same transverse plane in the posterior part of body. Ovary either dextral or sinistral in position, pretesticular; Mehlis's gland postovarial; seminal receptacle present; Laurer's canal present or absent; vitellaria weakly developed, intercecal, pretesticular; uterus long and slender, occupying the greater portion of the central part of body, usually confined to the intercecal field. Eggs with long polar filaments. Parasites of respiratory passages of Sirenia.

Type genus.—*Opisthotrema* Fischer, 1883.

KEY TO THE GENERA OF OPISTHOTREMATIDAE

1. Testes extracecal ..... Opisthotrema (p. 49).
   Testes intercecal ..... Pulmonicola (p. 55).

Opisthotrematinae Harwood, 1939

Subfamily diagnosis. — Opisthotrematidae: Body oval to pyriform, concave and spinose ventrally, with body edges more or less turned ventrad. Oral sucker small, esophagus moderately long, ceca reaching to near posterior extremity. Testes lobed or not, just lateral or medial to ceca in posterior half of body. Cirrus pouch long, enclosing slender convoluted seminal vesicle. Genital pore terminal. Ovary lobed, median or submedian, pretesticular. Vitelline follicles entirely or mostly intercecal, at level of ovary. Uterus confined to intercecal field; eggs filamented. Excretory vesicle tubular.

Key to genera of Opisthotrematinae

Testes intercecal, ovary median ..... *Pulmonicola*

Testes extracecal, ovary submedian ..... *Opisthotrema*

Opisthotrema Fischer, 1883

Syn. *Cochleotrema* Travassos et Vogelsang, 1931

Generic diagnosis. — Opisthotrematidae, Opisthotrematinae: Body oval to pyriform, flattened, convex dorsally and concave ventrally. Cuticle of ventral surface spiny. Oral sucker subterminal, followed by slender moderately long esophagus; ceca more or less sinuous, reaching to near posterior extremity. Testes indented, just outside ceca in same transverse plane in posterior part of body. Cirrus pouch long, median, containing slender convoluted seminal vesicle and long protrusible cirrus. Genital pore terminal. Ovary lobed, to right or left of median line in front of testes. Laurer's canal present. Vitellaria consisting of more or less symmetrical groups of rounded follicles or irregular acini, extending in intercecal area at level of ovary and testes. Uterus long, slender, convoluted, occupying greater part of central portion of body; metraterm with relatively strong muscular wall; eggs oval, filamented at each pole. Excretory pore dorsoterminal; excretory vesicle tubular, with lateral branches. Parasitic in respiratory tract or Eustachian tubes of Sirenia.

Genotype: *O. dujonis* (Leuckart, 1874) (Pl. 94, Fig. 1128), syn. *O. cochleare* Fischer, 1883, in Eustachian tubes and esophagus of *Halicore dugong;* Australia.

Other species:

O. cochleotrema (Travassos et Vogelsang, 1931) Price, 1932 (syn. *Amphistomum fabaceum* Dies of Leidy, 1891; *Opisthotrema cochleare* Fischer of Stiles et Hassall, 1894; *Cochleotrema cochleotrema* Trav. et Vogels., 1931), in nasal passages and stomach of *Trichechus manatus* and *T. latirostris;* North America and Tropical America.

TRAVASSOS AND VOGELSANG, 1931

Cochleotrema ~~n. g.~~ *Opistotrematidae*. Corpo discoide provido de um rebordo para adaptação ao hospedador; face dorsal convexa e ventral concava; ventosa oral sub-ventral, cecos longos e formando amplas alças; póro genital mediano, posterior, ventral; bolsa do cirro longa, delgada, com cirro, prostata e vesicula seminal enovelada; testiculos profundamente lobados, post-equatoriais, extra-cecais; ovario lateral, post-equatorial, post-uterino, pre-testicular, lobado; utero intra e extra-cecal, vajina longa e musculosa, dorsalmente a bolsa do cirro; vitelinos dorsais, medianos e laterais, post-, intra-e pre-testiculares, com poucos foliculos volumosos; canal de Laurer presente, partindo da espermateca, ovos operculados e providos de longos filamentos polares.

ESPECIE TIPO: *C. cochleotrema* n. sp.

HABITAT: Em *Trichecidae*

Notocotylidae
Opisthotrematinae

Genus OPISTHOTREMA Fischer, 1883

Synonym.—*Cochleotrema* Travassos and Vogelsang, 1931.

Generic diagnosis.—Opisthotrematidae: Body oval to piriform in shape, flattened dorsoventrally, dorsum strongly arched and venter strongly concave; margin of body may or may not be provided with a muscular rim. Cuticle of ventral surface spiny. Oral sucker ventral, situated a short distance from the anterior margin of body; pharynx absent; esophagus slender and of medium length; intestinal ceca more or less sinuous and extending into the posterior fourth of body. Excretory pore dorsal and somewhat removed from the posterior margin; excretory vesicle tubular and provided with lateral branches. Genital pores at posterior end of body; cirrus pouch long and slender, containing a slender, convoluted seminal vesicle and a long, slender, protrusible cirrus; testes lobed, situated extracecally, in the same transverse plane in the posterior part of body. Ovary lobed, to the right or left of the median line anterior to and separated from the testis on the corresponding side by the intestinal cecum, which passes between them; Mehlis's gland well developed; seminal receptacle present; Laurer's canal present or absent; vitellaria intercecal and consist of a grapelike mass of follicles on each side of median line, or of a mass of irregular follicles in the median field. Uterus long, slender, and convoluted, occupying the greater part of the central portion of the body; vagina long, slender, slightly sinuous, and provided with relatively strong muscular walls. Eggs oval and provided with a slender filament at each pole. Parasites of the respiratory tract and eustachian tubes of Sirenia.

Type species.—*Opisthotrema cochleare* Fischer, 1883 (=*Monostomum dujonis* Leuckart, 1874).

Remarks.—The foregoing diagnosis is based on the characters common for the two species which are described later. The writer recognizes the genus *Pulmonicola*, which was proposed by Poche (1926), as distinct from the genus *Opisthotrema* on the ground that the intercecal position of the testes in *Pulmonicola pulmonalis* is too great a difference to be regarded as being a character of only specific value.

KEY TO THE SPECIES OF THE GENUS OPISTHOTREMA

1. Body piriform in outline; distinct muscular rim absent; intestinal ceca relatively wide, their blind ends diverging-- **dujonis** (p. 50).
   Body oval in outline; distinct muscular rim present; intestinal ceca slender, their blind ends converging---------- **cochleotrema** (p. 52).

Notocotylidae
Opisthotrematinae

Price, 1932

OPISTHOTREMA DUJONIS (Leuckart, 1874), new combination

PLATE 11, FIGURE 46

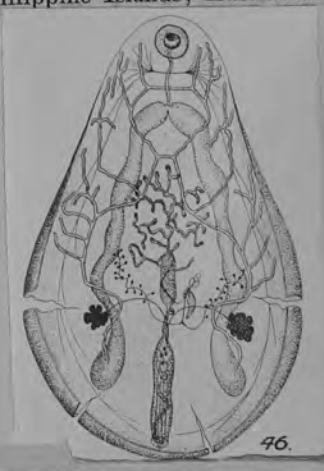
Synonyms.—Monostomum dujonis Leuckart, 1874, p. 419; *Opisthotrema cochleare* Fischer, 1883, pp. 1–42.

Description.—Opisthotrema: Body piriform in outline, 9 to 11 mm long by 5 mm wide; the dorsal surface is strongly convex and the ventral surface concave, which gives the body the appearance of the bowl of a spoon. Cuticle spiny on ventral surface, according to Fischer, and also on anterior part of dorsal surface, according to Johnston (1913). Oral sucker ventral, 600μ long by 850μ wide, situated about 460μ from the anterior end of body; esophagus slender, about 1 mm long by 80μ wide; intestinal ceca relatively wide, slightly sinuous and extending to near the posterior end of the body, their blind ends somewhat distended and diverging. The excretory system consists of two canals, one on each side, united by a commissure a short distance caudad of the intestinal bifurcation and again by a similar commissure about midway between the intestinal bifurcation and the posterior margin of the oral sucker. Each of the canals is provided with lateral branches, which extend to the margin of the body. Excretory vesicle (?); excretory pore (?). According to Fischer, the canals terminate near the ends of the ceca and probably open separately. The cirrus pouch is cylindrical, 2 mm long by 245μ wide, situated in the median line in the posterior part of the body, containing a greatly convoluted seminal vesicle and a slender protrusible cirrus; genital pore ventral, near posterior margin. Testes lobed, 250μ to 540μ in diameter, situated in the same transverse plane and extracecal in position. Ovary small, lobate, situated to the left of the median line and a short distance cephalad of the level of the testes; Mehlis's gland small, caudad of ovary; Laurer's canal present, the proximal part of the canal being expanded to form a seminal receptacle measuring 170μ long by 57μ wide. Vitellaria weakly developed, consisting of a few follicles situated along the vitelline duct at each side of the intercecal field. Uterus slender and occupying the intercecal space in the equatorial third of the body; during its course the uterus describes a number of loops which form a treelike pattern. The distal portion of the uterus is expanded to form an egg reservoir and continues as a slender vagina, which opens beside the male genital aperture. Eggs oval in outline, 29μ long by 9μ wide, provided with a long, slender filament at each pole.

Host.—Halicore dugong.

Location.—Eustachian tubes and esophagus.

Distribution.—Philippine Islands; Australia.



46.

Remarks.—This species was named *Monostomum dujonis* by Leuckart (1874) in a review of Zeller's (1874) paper "Uber *Leucochloridium paradoxum* Carus and die weitere Entwickelung seiner Distomenbrut." In this review, Leuckart, in commenting on the genital system of *L. paradoxum*, stated: "Und seine Generationsorgane in allen ihren Theilen vollstandig und deutlich erkennen lässt. Die Ausmündung derselben liegt, wie sonst nur bei wenigen Distomeen—Ref. kennt auch ein Monostomum, das sich ganz ähnlich verhält, *M. dujonis*, das Semper in den Eustachischen Röhren des Dujung der Philippinen sammelte und dem Ref. freundlichst zur Untersuchung uberlassen hat—an Hinterende des Körpers, dicht neben der des excretorischen Apparates." Fischer's (1883) description of *Opisthotrema cochleare* is based unquestionably upon a study of the specimens which Leuckart referred to, since he stated in the introduction of his paper: "Besagte Form wurde von Herrn Prof. Semper in Würtzburg auf seiner Expedition nach den Philippinen gesammelt. Sie entstammt der Paukenhöhle von Halicore Dugong."

The name given to this worm by Leuckart can not be regarded as a *nomen nudum* because an important morphological character, the position of the genital pore, is pointed out and in addition are given the host and habitat of the species. It is, therefore, the opinion of the writer, that the correct name for this species is *Opisthotrema dujonis* (Leuckart), since the rules of zoological nomenclature state: "Art. 25.—The valid name of a genus or species can be only that name under which it was first designated on the condition: a) That this name was published and accompanied by an indication, or a definition, or a description;" etc. The description given by Leuckart is more in the form of a comparison than an actual description, but it appears sufficient to fix the specific name, since the rules do not state how much description should be given.

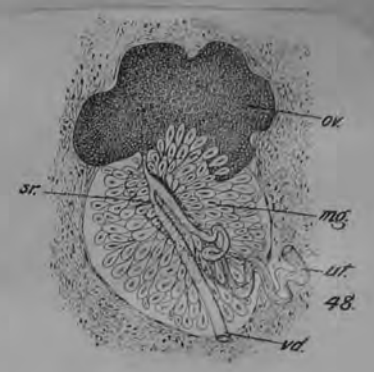
Notocotylidae
Opisthotrematinae

OPISTHOTREMA COCHLEOTREMA (Travassos and Vogelsang, 1931 [3]) new combination

PLATE 11, FIGURE 47–49

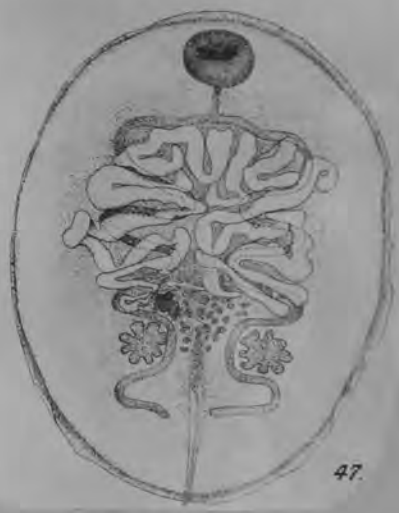
Synonyms.—*Amphistomum fabaceum* Diesing of Leidy, 1891, pp. 413–414, in part; *Opisthotrema cochleare* Fischer of Stiles and Hassall, 1894, p. 253; *Cochleotrema cochleotrema* Travassos and Vogelsang, 1931, pp. 143–146.

Description.—*Opisthotrema:* The body is oval in outline, 8.5 mm long by 6.5 mm wide, strongly concave ventrally and convex dorsally; the margin of the body is surrounded by a more or less delicate muscular rim, which is about 250μ wide. The strongly convexo-concave condition of the body suggests that the entire worm attaches itself to the mucous membrane in the manner of a vacuum cup, the muscular rim serving as a sort of seal. The cuticle of the ventral surface is covered with scalelike spines, 7μ long by 4μ wide, arranged in irregular alternating rows. The excretory pore is situated dorsally, about 930μ from the posterior end of the body, the aperture being surrounded by a muscular sphincter. The excretory vesicle is tubular, about 1 mm long, and is provided with two principal branches on each side; the first branch occurs at the level of the blind ends of the ceca and the other at the anterior end of the vesicle; two smaller branches are given off on each side a short distance caudad of the anterior branches. The remainder of the excretory system could not be worked out in detail, but judged from sections the course of the principal branches is probably similar to that described by Fischer for *O. cochleare*. The oral sucker is transversely oval, 1 mm long by 1.3 mm wide, strongly muscular, and situated ventrally about 465μ from the anterior margin of the body; it is deeply imbedded in the parenchyma and projects only slightly beyond the ventral surface. The esophagus is slender and about 465μ long; the intestinal ceca are slender and serpentine, 155μ wide, the blind ends converging toward the median line. Cirrus pouch slender, about 3 mm long by 155μ wide at the level of the testes; the walls are moderately thick and muscular, both circular and longitudinal fibers being present. The seminal vesicle is slender and greatly convoluted, and occupies the basal third of the cirrus pouch. A definite pars prostatica appears to be absent although some prostate cells are present along the distal, less convoluted portion of the seminal vesicle. The cirrus is slender, about 2 mm long, unarmed and protrusible. The genital aperture is ventral and situated at the posterior end of the body at the junction of the muscular rim with the body proper. The testes are deeply lobed, about 850μ by 620μ, extracecal and opposite each other in the posterior third of the body. The ovary is irregular in outline but not deeply lobed, about 435μ in diameter, situated to the right of the median line, intercecal and pretesticular. Mehlis's gland is composed of large piriform cells and is situated median and slightly dorsal to the ovary. The seminal receptacle is muscular, more or less oblong, about 697μ long by 155μ wide, and situated dorsal to Mehlis's gland. There is no Laurer's canal. The vitellaria consist of relatively few, large, irregularly shaped follicles situated in the intercecal space between the equator of the body and the testes; the follicles are not divided into two separate groups as in *O. dujonis*, but form a single, more or less grapelike mass. The



48.


49.


47.

[3] This species was described by the writer as new in the present paper, but while the manuscript was awaiting publication a description appeared by Travassos and Vogelsang (1931) of a species from *Trichechus manatus* which appears to be the same form. The description given herein is from the writer's specimens. Some slight differences exist between this and the description given by Travassos and Vogelsang, but these differences appear to be those of interpretation. Travassos and Vogelsang note that in their specimens the ventral surface is covered with small papillae similar to those occurring on the ventral surface of *Gastrodiscus*, and that Laurer's canal is present. In the specimens at the writer's disposal the ventral surface is covered with small triangular, scalelike spines (pl. 11, fig. 49) and no Laurer's canal is present. The absence of Laurer's canal is shown in pl. 11, fig. 48, which is a reconstruction from serial sections.

The writer does not agree with Travassos and Vogelsang as to the necessity of creating a new genus for this species, since the differences between this species and the type of the genus are too slight to warrant such action.

uterus is greatly convoluted, forming a wreathlike mass of loops which occupies the greater part of the central portion of the body; the loops extend slightly beyond the ceca laterally, but do not extend anteriorly beyond the intestinal bifurcation. The terminal portion of the uterus is continued as a muscular walled, slightly sinuous vagina or metraterm, which runs dorsal to the cirrus pouch and opens beside the male genital aperture. The eggs are oval in shape, 18μ long by 11μ wide, light straw colored, and provided with a long, slender filament at each pole.

Hosts.—*Trichechus manatus* and *T. latirostris* (=*Manatus latirostris*.)

Location.—Nasal passages and stomach.

Distribution.—North America (United States—Philadelphia, Pa.), and Tropical America.

Specimens.—U.S.N.M. Helm. Coll. No. 1732.

Remarks.—In a note presented at a meeting of the Philadelphia Academy of Natural Sciences, Leidy (1891) reported the occurrence of *Amphistomum fabaceum* Diesing in a sea cow, *Manatus latirostris*, which died in the zoological garden. These specimens had been collected from the large intestine and submitted by Dr. H. C. Chapman. In the same note he said: "Numerous specimens, many of larger size, up to 11 mm long by 9 mm broad, were obtained from the nasal passages of another sea cow, and were presented to the Academy by Jacob Geismar."

Stiles and Hassall (1894) examined the trematodes of the Leidy collection and redetermined the specimens reported from the nasal passages as *Opisthotrema cochleare* Fischer. A part of the material, two specimens, was retained in the United States National Museum collection, and it is upon these that the foregoing description of *Opisthotrema cochleotrema* is based.

These specimens are sexually mature, but somewhat smaller than those reported by Leidy. One of them was stained and mounted whole; the other was stained and sectioned. The description given above is a composite one, the details being obtained from the sectioned specimen.

Opisthotrema cochleotrema differs in a number of respects from *O. dujonis* (Leuckart) (=*O. cochleare* Fischer), so that there appears to be no doubt that they are distinct species. *O. cochleotrema* is provided with a muscular rim similar to that described for *Pulmonicola pulmonalis* (von Linstow); the intestinal ceca are slender and uniform in diameter, serpentine, and their blind ends converge; Laurer's canal is absent; and the terminal part of the uterus is not expanded to form an egg reservoir. In *O. dujonis* the body is not provided with a muscular rim; the intestinal ceca are not of uniform width, only slightly sinuous, and their blind ends diverge; Laurer's canal is present; and the distal part of the uterus is expanded to form an egg reservoir. Other differences may be easily seen by comparing the descriptions and figures of the two species.

Fischer's (1883) figure of *Opisthotrema cochleare* (=*O. dujonis*) leaves the impression that the principal branches of the excretory system open separately and in this connection he states "indem wahrscheinlich nicht eine, sondern zwei Mündungsstellen vorhanden dürften, die der ventralen Seite angehören und jederseits unterhalb der Darmschenkel liegen." Poche (1926) doubts the presence of two excretory pores in this species, but Fuhrmann (1929) believes that two openings should be present and has indicated in the figure of *O. cochleare* ("nach Fischer") just where these openings should be located. The study of serial sections of *O. cochleotrema* has shown that the position of the excretory pore in this species is essentially the same as that in members of the family Notocotylidae[4] and Pronocephalidae. In view of this fact it appears reasonable to assume that the position of the excretory pore in *O. dujonis* will be

[4] In Poche's (1926) classification of the trematodes, the monostomes belonging to the families Notocotylidae, Pronocephalidae, Opisthotrematidae, and Rhabdiopoeidae are placed in the super-superfamily Notocotylida. Since groups of the rank of super-superfamily have not been recognized by helminthologists and are unnecessary at present, the writer proposes at this time the new superfamily Notocotyloidea, to replace the super-superfamily Notocotylida Poche.

Notocotylidae

Cochleotrema cochleotrema ~~n. sp.~~ TRAVASSOS AND VOGELSANG, 1931

Figs. 1 - 2.

Corpo discoide, escavado ventralmente e concavo na face dorsal; mede de comprimento cerca de 8 a 10 mm. por uma largura de 6 a 8.5 mm. e tem uma espessura de cerca de 4 mm. (não considerando a escavação ventral) tomada entre o plano do rebordo ventral e o plano tanjente da superficie dorsal. A côr dos exemplares fixados é branco leitosa. Separando a superficie ventral da superficie dorsal existe um anel muscular de cerca de 0.25 mm. de largura que serve para adaptar o parasito a superficie do hospedador fixando-o como se fosse todo ele uma ventosa; este anel forma um pequeno lobo na parte posterior. A face ventral é cheia de pequenas papilas muriformes de algum modo comparavel ao que se observa em *Gastrodiscus*, porém muito pequenas e só visiveis praticamente em córtes histolojicos. A superficie dorsal é lisa. A musculatura do corpo é muito desenvolvida existindo fortes feixes musculares situados obliquamente em todas as direções. A ventosa oral é situada na face ventral, ficando por dentro do anel de adaptação, sendo evidente que o parasito tem que retirar sua alimentação da mucosa do hospedador, mede cerca de 1.25 a 1.50 mm. de diametro. Em seguida a ventosa vem um esofago desprovido de farinje, com cerca de 1.25 mm. de comprimento. Os cecos são relativamente estreitos e sinuosos formando 3 grandes alças externas e 3 internas, as extremidades são dirijidas para a linha mediana (ao contrario de *O. cochleariforme*). O poro genital fica situado na linha mediana junto ao rebordo posterior do corpo. Em seguida ao atrio genital, que é muito reduzido, fica

Fig. 1. *Cochleotrema cochleotrema* (Trav.)

~OVER~

a longa e delgada bolsa do cirro que atinje a zona testicular e mede cerca de 3.5 mm. de comprimento por 0.25 mm. de largura maxima. A bolsa contém um cirro protratil inerme, prostata e longa e sinuosa vesicula seminal. Os testiculos são profundamente lobados com cerca de 1 a 1.5 mm. de diametro sendo o transversal o maior. Estão situados na mesma zona e em campos afastados, extra-cecais e ficam no terço posterior do corpo. A vajina é longa e delgada tendo mais ou menos o comprimento da bolsa do cirro e corre paralela e dorsalmente a esta. O utero apresenta um ramo acendente e outro decendente formando numerosas alças transversais que ultrapassam as areas cecais sobre tudo ao nivel das alças internas do intestino. Existe uma volumosa glandula de Mehlis mediana e canal de Laurer que é dilatado na porção inicial formando a espermateca (tal como representou Fischer para o *O. cochleare*). O ovario é pre-testicular, intracecal, lateral, lobado, mede cerca de 0.42 a 0.50 mm. de diametro medio. Os vitelinos são constituidos por volumosos acnes situados desde logo abaixo da zona testicular até um pouco acima da zona ovariana, intra-cecais, dorsais e parcialmente medianos. Os ovos medem cerca de 0.021 mm. de comprimento por 0.013 mm. de largura maxima, são operculados e apresentam longos flagelos polares, o flagelo do operculo é mais espesso que o oposto, mede na base cerca de 0.002 a 0.003 mm. de diametro. Os flagelos medem cerca de 0.32 a 0.37 mm. de comprimento e podem ser desdobrados por anomalia frequente, quer o mais delgado quer o operculare, são mais desenvolvidos nos ovos maduros de modo a darem aspetos muito diversos aos cortes histologicos do utero do parasita que nos segmentos mais proximais os ovos são mais nitidos e se coram mais fortemente, nos segmentos distais o conteúdo uterino tem aspeto filamentoso e córa-se mais fracamente. O aparelho excretor não pode ser estudado.

HABITAT: Estomago de *Trichecus manatus* L.

PROV.: Os exemplares que estudamos foram colecionados no Jardim Zoologico de Hagenbeck de Hamburgo.

DISTR. GEOGR.: America Tropical.

OPISTHOTRENA

Paramonostomum Lühe, 1909

Syn. *Neoparamonostomum* Lal, 1936

Generic diagnosis. — Notocotylidae, Notocotylinae: Body flattened, oval to elliptical, or more elongate, without ventral glands or ridges. Ceca passing medial to testes, terminating at or near posterior extremity. Testes indented or lobed, symmetrical, outside of terminal portion of ceca. Cirrus pouch well developed. Genital pore median, immediately postbifurcal or bifurcal. Ovary median, intertesticular, with shell gland complex in front. Receptaculum seminis absent. Vitellaria acinous, extending in pretesticular lateral fields. Uterus transversely coiled, not extending laterally beyond ceca; egg with polar filaments. Parasitic in small intestine or ceca of birds and mammals.

Genotype: *P. alveatum* (Mehlis in Creplin, 1846) Lühe, 1909 (Pl. 61, Fig. 739), syn. *Monostomum alveiforme* Cohn, 1904, in intestinal tract of *Anas platyrhynchos, Clangula hyemalis, Somateria mollissima, Oidemia nigra, O. fusca, Nyroca marila, Mareca penelope, Anser anser, Cygnus cygnus, C. olor, Branta bernicla;* Europe.

Key to species — Skrjabin (1953).

Other species from birds:

P. brantae Bullock, 1952, in *Branta canadensis;* N. Hampshire.

P. bucephalae Yamaguti, 1935, syn. *Neoparamonostomum b.* (Y.) Lal, 1936, in *Bucephala clangula, Tadorna tadorna, Spatula clypeata, Nyroca marila mariloides;* Japan.

P. casarcum Lal, 1936, in *Casarca rutila;* India.

P. elongatum Yamaguti, 1934, syn. *Neoparamonostomum e.* (Y.) Lal, 1936, in *Olor bewickii jankowskii* and *O. cygnus;* Korea.

P. ionorne Travassos, 1921, syn. *Neoparamonostomum i.* (T.) Lal, 1936, in *Ionornis martinica, Parra jacana, Limnopardalis rythirhynchus, Chionis alba;* Brazil and Patagonia. Lal (1936) suggested for this and several other species a new genus *Neoparamonostomum* which was rejected by Harwood (1939) as a synonym of *Paramonostomum.*

P. macrostomum Ku, 1938, in *Fulica atra atra;* China.

P. microstomum Moghe, 1932, syn. *Neoparamonostomum m.* (M.) Lal, 1936, in *Philomachus pugnax;* India.

P. obtortum Caballero, 1942, in *Querquedula discors;* Mexico.

P. ovatum Hsü, 1935, in *Anas platyrhynchos, A boschas dom.;* China.

P. parvum Stunkard et Dunihue, 1931, syn. *Neoparamonostomum p.* (S. et D.) Lal, 1936, in intestine of *Chen caerulescens, Glaucionetta clangula americana;* U.S.A. & Canada.

P. querquedulae Lal, 1936, in *Querquedula circia;* India.

Representatives from mammals:

P. echinum Harrah, 1922 (Pl. 92, Fig. 1111), syn. *Neoparamonostomum e.* (H.) Lal, 1936, in *Fiber zibethicus;* U.S.A.

P. pseudalveatum Price, 1931, in *Fiber zibethicus* and *Branta canadensis;* U.S.A.

PARAMONOSTOMUM - discussion from Stunkard, 1967

The studies of Harwood raise questions of specificity in the genus *Paramonostomum*. The position of the genital pore relative to the bifurcation of the digestive tract, and the extent of the vitellaria are variable; indeed, Harwood observed (p. 336), that the location of the genital pore "may not be wholly reliable in specimens preserved in a contracted state, especially if the cephalic end is curved ventrad." Observation of living specimens discloses much variation in location of the genital pore as the anterior end of the body is extended and retracted. The description of *P. alveatum* by Kossack (1911) was based on material from a number of host species and the specimens varied from 0.78 to 0.90 mm. in length and 0.50 to 0.56 mm. in width. The genital pore was described as ventral to the intestinal bifurcation and the vitellaria occupied the middle third of the body. Concerning the vitellaria, Kossack stated (p. 564), "Doch ist ihre Erstreckung nicht ganz konstant, da sie häufig nach hinten bis zum Vorderrand der Hoden reichen." In the present study, the cercariae, metacercariae, and adults are referable to two different size groups. The adults of one group are less than 0.50 mm. in length and are identified as *P. parvum*; adults of the other group are 0.55 to 0.90 mm. in length and are identified as *P. alveatum*. If there were specimens of intermediate size, it would be feasible to include all in a single species, but since all were from the same intermediate host-species and developed in the same final host-species, the differences appear to be genetic. The specimens studied by Harwood agree with the larger of the present species and may belong to *P. alveatum*.

Examination of published descriptions in the light of the above considerations raises doubt concerning the validity of certain species. *Paramonostomum pseudalveatum* Price, 1931, from the muskrat, is very similar to *P. parvum* Stunkard and Dunihue, 1931, from an unidentified duck, whose life-cycle is reported in the present paper. The two species are virtually equal in size and shape; in both the cirrus sac is short and wide, with loops of the seminal vesicle and uterus extending beside the sac; the metraterm is short, not more than one-half the length of the cirrus sac; the vitellaria extend from the testes to the level of the cirrus sac, and the uterus has 8 to 11 transverse loops. *Paramonostomum pseudalveatum* has a larger oral sucker, larger gonads, larger cirrus sac and a somewhat more anterior location of the genital pore. If these features are the result of development in different hosts, the two species may be identical. Similarly, *Paramonostomum brantae* Bullock, 1952, agrees so completely with descriptions of *P. alveatum* that the two specific concepts merge and *P. brantae* falls in synonymy. Bullock (1952) noted the similarity and distinguished between the two species on the shape of the ovary in *P. alveatum*, which he recognized as an unreliable character, and the larger cirrus sac of *P. brantae*. The figure of *P. brantae* shows the cirrus sac expanded and filled with spermatozoa. *Paramonostomum macrostomum* Ku, 1938, was described on a single specimen from *Fulica atra* taken at Soochow, China. A somewhat larger single specimen from the same host, *F. atra*, taken at Lucknow, India, was described by Baugh (1958) as *Paramonostomum fulicai*. *Paramonostomum nettioni* Baugh, 1958, from the common teal, *Nettion crecca*, is similar morphologically and is intermediate in size between *P. macrostomum* and *P. fulicai*, but information is inadequate to determine the specific status of these species. Two species, *Paramonostomum casarcum* from *Casarca rutila* and *Paramonostomum querquedulum* from *Querquedula circia*, were described by Lal (1936) in India. Each species was described from a single specimen. The worms are approximately the same size and morphological agreement is so complete and precise that specific distinction is highly questionable. An item of reported difference is the location of the genital pore, which in *P. casarcum* is at the posterior border of the oral sucker, whereas in *P. querquedulum* it is slightly anterior to the intestinal bifurcation. But the location of the pore shifts with extension and retraction of the anterior end of the body and with the orientation of the oral sucker. If the sucker is turned so that the mouth is subterminal, the esophagus appears short and bent and the pore apparently is farther forward. Moreover, the two species described by Lal (1936) are very similar to and may be identical with worms from ducks taken at Soochow, China, and described by Hsü (1935) as *Paramonostomum ovatum*. The description of *Paramonostomum microstomum* by Moghe (1932) is incomplete, the uterus is represented in diagrammatic manner and the locations of the ovary and Mehlis' gland are reversed. The specimens were from *Philomachus pugnax*, taken at Nagpur, India, and are similar to those described by Lal (1936). The single specimen from *Querquedula discors* taken in Mexico and described by Caballero (1942) as *Paramonostomum abtortum*, closely resembles the worms described by Lal (1936). A distinct group, characterized by long cirrus sac and short vitelline zones, includes *Paramonostomum actidis* Cable, 1960, from charadriiform birds of Puerto Rico, and *Paramonostomum histrionici* Ching, 1962, from *Histrionicus pacificus* taken near Friday Harbor, Washington. Three other species are characterized by linear, spatulate bodies, very long cirrus sacs that extend to the middle of the body and short vitelline zones. They are *Paramonostomum elongatum* Yamaguti, 1934, from *Olor bewicki jankowskii* and *Olor cygnus* taken in Korea; *Paramonostomum bucephalae* Yamaguti, 1935, from *Bucephala clangula*, *Tadorna tadorna*, *Spatula clypeata* and *Nyroca marila mariloides*, taken in Japan; and *Paramonostomum mdoriehi* Dimagno, 1957, from the emperor goose, *Philacte canagica*, taken in Alaska. The description of new species from single specimens is not commended and final determination of specific identity in the genus *Paramonostomum* may depend on the discovery of life-cycles and the description of larval stages.

PARAMONOSTOMUM Luhe, 1909

Body compressed, egg shaped, greatest breadth a little caudad from middle of body, posterior end broadly rounded, anterior tapering and pointed; anterior half of ventral surface thick set with short heavy spines. Ventral glands absent. Cirrus pouch weakly muscular. Vagina usually one-half length of cirrus pouch.

Type species: P. alveatum (Mehlis, 1846)

Notocotylidae

~~Paramphistomidae~~

Lal (Proc. Indian Academy Sci., Sec. B 3 (1):25-34, 1936) retains PARAMONOSTOMUM as a valid genus of the subfamily Notocotylinae. He describes P. querquedulum from Querquedula circia and P. casarcum from Casarca rutila .

He divides Paramonostomum into two subgenera and gives keys to genera and species.

Notostomatidae

Paramonostomum alveatum (Mehlis in Creplin,1846)

TABELLE 12. *Paramonostomum alveatum* aus *Somateria lissima*. Maße von 5 Exemplaren in mm.

Körperlänge	0,916	1,063	0,755	0,697	0,
max. Körperbreite	0,631	0,661	0,617	0,558	0,
Mundsaugnapf					
Länge	0,079	0,076	0,079	0,079	0,
Breite	0,090	0,079	0,086	0,093	0,
Cirrusbeutel-					
Breite	0,107	0,079	0,079	0,097	0,

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FROM ODENING, 1963

from Stunkard 1967

Notocotylidae

Paramonostomum alveatum (Mehlis in Creplin, 1846)

Paramonostomum alveatum (Mehlis in Creplin, 1846)
(Figs. 4–6)

Previous accounts include the inadequate redescription of the original specimens by Monticelli (1892), the brief statement by Luhe (1909) when he erected the genus *Paramonostomum*, and the account by Kossack (1911).

Adult (Fig. 4)

The worms are ovate, rounded posteriorly, more pointed anteriorly. Typically, the edges of the body are turned ventrad and mediad, so the venter forms a cupuliform cavity, which suggested the specific name, *alveatum*. The opening is smaller than the outline of the body. Fixed and stained sexually mature specimens measure 0.50 to 0.85 mm. in length and 0.40 to 0.53 mm. in greatest width, which is in the posterior half of the body. Under pressure of a coverglass, the dimensions of living worms are much greater. The cuticula appears to be smooth, but examination of living specimens under high magnification discloses exceedingly minute, closely set spines, arranged in parallel rows, on the ventral surface. The musculature of the body wall is weak and movement is slight or sluggish. The pigment from the ocelli of the cercaria persists in the parenchyma of the anterior end of the body. The oral sucker is 0.06 to 0.065 mm. in diameter; the esophagus is short, about the length of the oral sucker; the caeca are dorsal in location and follow the lateral contours of the body; they turn mediad at the anterior ends of the testes, pass between the testes and ovary, and terminate blindly behind the level of the gonads. As noted by Rothschild (1941, p. 363, fig. 1), "it is well known that in mature notocotylid trematodes the excretory vesicle becomes greatly complicated." Essentially, large, ramifying dendritic branches arise from the lateral and medial sides of the ring formed by the fusion of the collecting ducts of the cercaria, and constitute a complex reticulum that permeates the parenchyma of the body. The bladder, situated posterior to the ring, opens to the surface by a dorsal pore near the caudal end of the body.

The testes are oval, lobed organs, situated in the extracaecal areas at the poste-

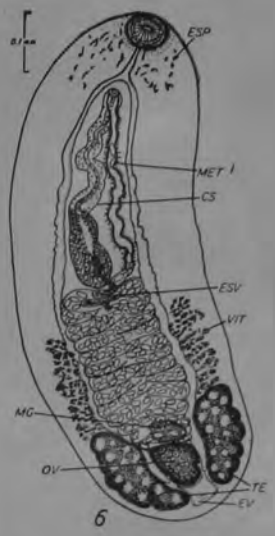
rior end of the body. They measure 0.12 to 0.18 by 0.10 to 0.14 mm. in diameter. Sperm-ducts arise at the anteromedian faces and unite in front of Mehlis' gland to form the vas deferens which passes anteriad, dorsal to the uterine coils. About one-third of the body-length from the anterior end, the duct enlarges to form a large, coiled, external seminal vesicle, the last loop of which extends forward on the right side of the cirrus sac. The cirrus sac is curved, short and broad, 0.16 to 0.24 mm. long and 0.10 to 0.13 mm. wide; the posterior portion contains the large internal seminal vesicle; the pars prostatica is short, and the cirrus is eversible (Fig. 4). The ovary is median, between the testes. It is a variably lobed organ, 0.08 to 0.15 mm. in diameter. The oviduct arises at the anterodorsal face of the ovary and receives a short, common vitelline duct as it enters Mehlis' gland, which is smaller and immediately anterior to the ovary. Mehlis' gland contains the ootype, in which the eggs are formed. The initial coils of the uterus are filled with spermatozoa. There are 10 to 12 transverse uterine loops that occupy the intercecal area posterior to the cirrus sac. They are ventral to the digestive caeca and in pressed specimens the vitellaria are almost contiguous with the uterine loops. The metraterm is ventral to the cirrus sac and about one-half its length. The vitellaria are extracaecal and extend from the testes to the level of the cirrus sac. The eggs are operculate, have long polar filaments, measure 0.019 to 0.021 by 0.011 to 0.012 mm., and are embryonated when passed.

FAMILY NOTOCOTYLIDAE LÜHE, 1909

Cable, Connor, & Balling, 1960

Paramonostomum actitidis n. sp. (FIGURE 6)

Specific diagnosis based on 4 ovigerous specimens with the characters of the genus. Body 0.76 to 0.96 long by 0.29 to 0.33 wide, cuticle finely spinose; cercarial eyespot remnants lateral to esophagus; glandular pits absent on ventral surface. Oral sucker length 0.052 to 0.061, width 0.059 to 0.075; pharynx absent; esophagus 0.072 to 0.084 long; intestinal bifurcation at end of first one seventh of body length; ceca appear to possess short lateral diverticula and terminate at posterior margin of ovary. Excretory pore dorsal, between ovary and posterior end of body. Testes elongate, lateral margins lobed; right testis slightly larger than left, 0.20 to 0.24 long and 0.07 to 0.09 wide; left testis 0.18 to 0.21 by 0.06 to 0.13; cirrus sac elongate, clubshaped, reaching mid-level of body, 0.28 to 0.43 long by 0.059 to 0.068 in maximum width; internal seminal vesicle in basal portion of cirrus sac, followed by convoluted external seminal vesicle; pars prostatica clubshaped and surrounded by numerous prostate cells; cirrus long, unarmed. Genital pore a short distance posterior to intestinal bifurcation. Ovary median, posterior to testes, somewhat oval, irregularly indented, 0.09 to 0.13 by



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0.08 to 0.10; Mehlis' gland complex immediately anterior to ovary and of usual notocotylid type; uterus extends from Mehlis' gland almost to equator of body, with 10 to 12 transverse coils; metraterm conspicuous, a little shorter than cirrus sac. Vitellaria of somewhat elongate, mostly extracecal follicles extending from anterior margin of testes to beginning of posterior one third of body length. Eggs 0.018 to 0.020 by 0.009 to 0.011 exclusive of polar filament 0.025 to 0.030 long at each end of shell.

Hosts: *Actitis macularia* (spotted sandpiper), *Charadrius hiaticula semipalmatus* (semipalmated plover), *Charadrius wilsonia wilsonia* (Wilson's plover).

Sites small intestine and ceca.

Locality: mud flat at Cabo Rojo, Puerto Rico.

Type specimen: Holotype No. 38208 (from *Actitis macularia*).

This species differs from *Paramonostomum alveatum*, *P. pseudalveatum*, *P. parvum*, *P. macrostomum* and *P. brantae* primarily in being elongate rather than oval; from *P. ionorne* in body size, extent of vitellaria, and size of the testes; and from *P. echinum*, *P. bucephalae*, *P. casarcum*, *P. querquedulum*, *P. ovatum*, *P. malerischi*, and *P. obtortum* in body size. *P. actitidis* resembles most closely *P. microstomum*, but in *P. actiditis* the eggs and body are smaller.

The larva of this species could well be *Cercaria caribbea I*, a species very similar to monostome cercariae which Rothschild (1941) reported to be larvae of the genus *Paramonostomum*. *Cercaria caribbea I* develops in an abundant snail on the mud flat where hosts of *P. actitidis* were collected. The larva encysts readily on the bottom of the dish, and metacercariae were found attached to the operculum of the snail host, indicating that the life cycle is completed when that host is ingested by birds.

Genus Paramonostomum Lühe, 1909

The genus *Paramonostomum* was erected by Lühe (1909) to contain *Monostomum alveatum* Mehlis in Creplin. Except for *P. echinum* Harrah (1922) no additional species were described in the genus until the simultaneous description of two American species in 1931: *P. parvum* Stunkard and Dunihue and *P. pseudalveatum* Price. Since 1931 several species have been described from the Orient and South America. The main characteristics of the genus, as indicated by Harwood (1939), appears to be the absence of ventral glands. However, in view of the fact that the glandular pattern of *Catatropis* is often difficult to determine, except in serial section, it seems possible that some of the species of *Paramonostomum* should actually be referred to *Catatropis*. There now appear to be a sufficient number of species without glands to justify this generic character even though Lühe's original concept of the genus was a little too indefinite on this point.

The material on which the present study is based consists of 700 worms taken from the intestine of the Canada goose. About 75 worms were studied in whole mounts. The absence of ventral glands was determined from serial sections of six specimens. For reasons indicated below it was decided to refer these forms to a new species for which the name *Paramonostomum brantae* is proposed.

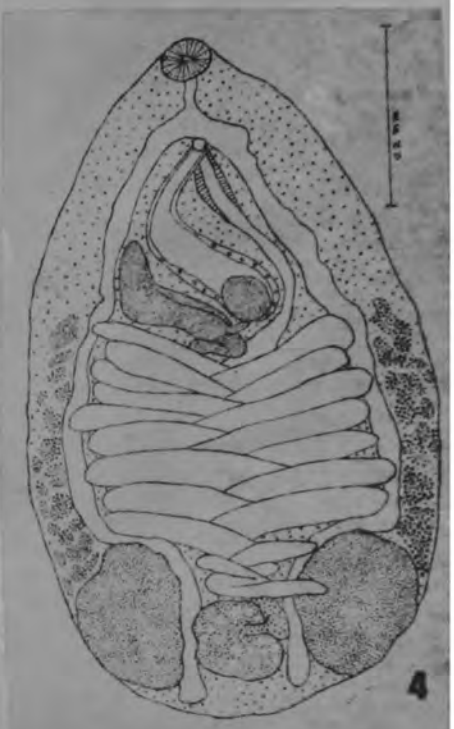
Paramonostomum brantae n. sp. Bullock, 1952
(fig. 4)

The body is much flattened dorsoventrally and the ventral surface is arched to form a shallow, inverted cup. The specimens under consideration varied from 0.5 to 0.9 mm. in length by 0.3 to 0.5 mm. in width. The anterior extremity is slightly pointed while the posterior end is rounded. Studies of both whole mounts and serial sections failed to produce any evidence of spination of the integument in any portion of the body. Likewise, no evidence for the presence of any type of ventral glands was found.

The oral sucker is slightly subterminal and varied from 0.036 to 0.056 mm. in diameter. A pharynx is lacking. The esophagus is short, broad, and slightly convoluted with a length of 0.04 to 0.05 mm. The ceca are long as in the other representatives of the family and course posteriorly near the sides of the body. In the posterior region they curve medially around the anterior border of the testes and pass between the testes and ovary, ending near the posterior extremity of the body.

The testes are broadly oval organs, measuring 0.10 to 0.16 mm. long by 0.06 to 0.12 mm. wide. They are slightly lobed on both the medial and lateral borders, although the extent of lobation varied from specimen to specimen. In some instances there was a considerable difference in the lobation of the two testes of the same specimen. The vasa efferentia from the testes unite just anterior to Mehlis' gland to form the vas deferens. This latter duct proceeds anteriorly in the middorsal line. The cirrus sac is slightly twisted into an S- or C-shaped curve and is extremely large. It measures 0.12 to 0.25 mm. long by 0.049 to 0.070 mm. wide at its broadest point. The prostatatic portion of the male reproductive tract is prominent and comprises the major portion of the structure in the cirrus sac. A small anterior segment of the seminal vesicle is contained in the posterior quarter of the cirrus sac while the greater portion of the seminal vesicle is free and highly convoluted. It usually bulges anteriorly along the cirrus sac before joining the vas deferens dorsal to the anterior uterine folds. The genital pore is located just posterior to the bifurcation of the gut.

The ovary is a round, slightly lobed organ located between the testes. The posterior margin of the ovary may be slightly anterior, slightly posterior, or on the same level as the posterior end of the testes. The ovary varies in diameter from 0.06 to 0.10 mm. If it is not nearly spherical it is usually broader than long. It usually exhibits, in a given specimen, approximately the same



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degree of lobation as the testes. No specimens showed any semblance of a rosette-shaped gonad as described by Kossack (1911) for *P. alveatum*. The large Mehlis' gland is about half the size of the ovary and is located immediately anterior and slightly to the left of it. The vitellaria are composed of discreet, fairly large follicles and extend from the anterior border of the testes to about the middle of the body. They are entirely extracecal. In most specimens the vitelline follicles usually extend slightly more anteriorly on the right side than on the left. (This asymmetry was also noted in some specimens of *P. parvum* that were available to the author). Due to the large size of the cirrus sac the anterior follicles of the vitellaria are usually on a level with this structure even though reaching only slightly anterior to the middle of the body. The vitelline ducts pass medially from the posterior region of the vitellaria and join to form a vitelline reservoir at the anterior end of the Mehlis' gland. The uterus shows the characteristic, regular, closely packed folds of the family. In some specimens these folds are quite distinct whereas in others they are so closely packed as to make counting difficult. Counts of the number of folds of 75 specimens showed a variation of from 8 to 11 with the majority of specimens possessing 9 or 10 (av. 9.9). These folds extend from Mehlis' gland to the base of the cirrus sac which in this form is almost at the middle of the body. The eggs are 0.015 to 0.019 mm. by 0.009 to 0.012 mm. and are provided with long polar filaments.

Host: Canada goose, *Branta canadensis* collected at Durham, New Hampshire.

Specimens: U. S. N. M. Helm. Coll. No. 37352, type and paratypes; other paratypes in the collection of W. L. Bullock, Durham, N. H.

Paramonostomum brantae is a typical representative of the *alveatum* group of the genus as considered by Harwood (1939). It differs from *P. parvum* in having a proportionately larger cirrus sac as well as in the distribution of the vitellaria, and the smaller number of uterine folds. It differs from *P. pseudalveatum* in the size of the cirrus sac, the distribution of the vitellaria, in the larger number of uterine folds, and in the position of the genital pore. It most closely resembles *P. alveatum*, the type of the genus, but lacks the rosette-shaped lobation of the ovary as indicated by Kossack (1911) and possesses a larger cirrus sac than indicated by any of the figures of this long known but enigmatic form.

DISCUSSION

The separation of *P. brantae* from *P. alveatum* proved difficult due to the multiplicity of conflicting descriptions of the European form. Creplin (1846) simply gave the host record (*Anas bernicla*) of *M. alveatum* and attributed the species to Mehlis. Wedl (1858) described *M. serrarosum* (ex *Fulica atra*) which Kossack (1911) assigned, with some misgivings, to *M. alveatum*. Reference to Wedl's paper by the present author led to still further uncertainty regarding the identity of Wedl's form. The trematode figured and described by Wedl does not even appear to belong to the subfamily Notocotylinae. The ceca are outside of the testes; there is no esophagus; and the vitellaria extend from the genital pore to the extreme posterior end. It is, therefore, extremely doubtful that *M. serrarosum* Wedl 1858 should be considered as a synonym of *M. alveatum* Mehlis in Creplin 1846.

Recent workers have given more consistent descriptions of this European form. Monticelli (1892) studied and described the then dried up original Mehlis' material. Mühling (1898) based his description on "millions" of small yellowish worms from *Fulicula marila*. The latter author considered his specimens to be identical with the original Mehlis' material. Lühe (1909) redescribed the species and erected the genus *Paramonostomum* on the basis of the apparent absence of ventral glands. Kossack (1911) gave a rather complete description in his lengthy consideration of the monostomes. Harrah (1922) claimed to present the description of Lühe (1909) while Dawes (1946) appeared to rely on the descriptions of both Lühe

Paramonostomum casarcum n.sp. Lal, 1936

This trematode was obtained from the intestinal caeca of the Brahminy duck, *Casarca rutila* and appeared pink in fresh condition. It measures 3·8 mm. by ·95 mm. The body is quite flat with the anterior end narrower than the posterior.

The oral sucker, situated ventrally at the anterior end, measures ·14 mm. by ·1 mm. and is followed by œsophagus ·14 mm. long. The œsophagus divides into two intestinal caeca which run to the posterior end of the body.

The excretory pore lies midway between the ovary and the posterior end. It is a small slit-like aperture in the middle in between the last lobe of the testes.

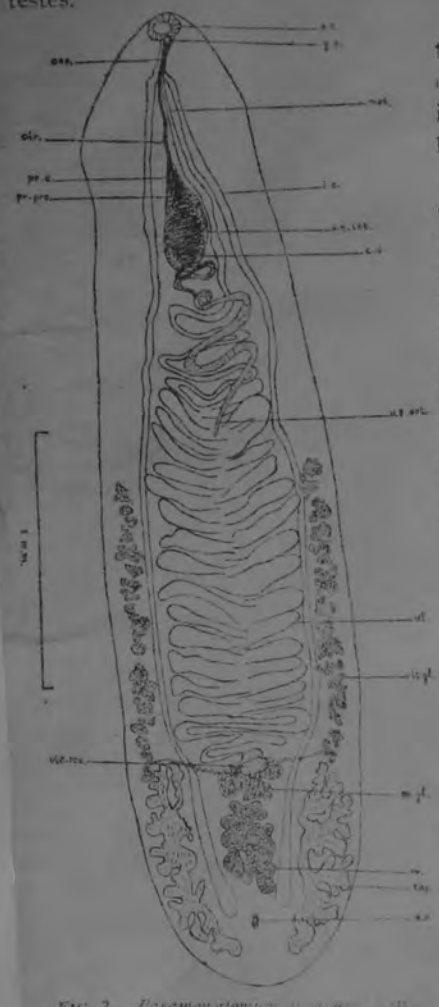


FIG. 3. *Paramonostomum casarcum* n.sp. showing the disposition of the internal organs.

The testes are deeply lobed on their external margins. They are of different sizes—the right testis, measuring ·8 mm. by ·15 mm., is slightly longer than the left which measures ·76 mm. by ·175 mm. The vasa deferentia arising from the testes join together anteriorly to form the vesicula seminalis. The vesicula seminalis interna occupies the base of the cirrus sac which is tubular, wide at the base, and measures ·91 mm. in length. The genital aperture opens at the posterior border of the oral sucker. The cirrus is long and muscular. The pars prostatica and the prostatic cells are present.

FIG. 4. *Paramonostomum casarcum*, n.sp., eggs with filaments.

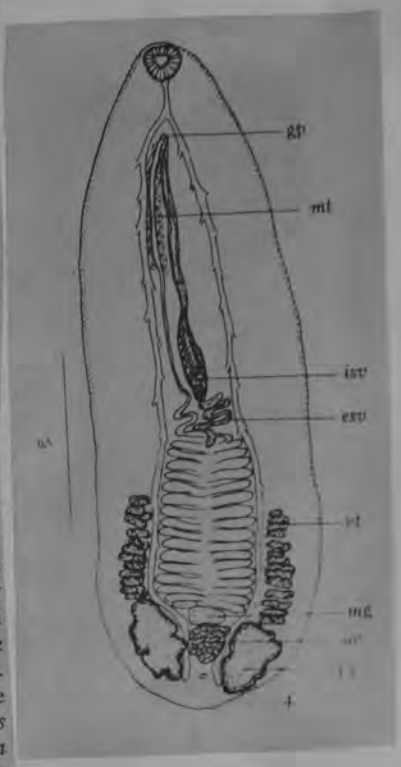
The ovary is deeply lobed and measures ·38 mm. by ·22 mm. The ootype is situated in front of it. The shell-glands consist of small gland-cells and occupy a large area in the region of the ootype. The vitellaria are in the form of separate follicles placed in the usual position and extend from the anterior tip of the testes forward beyond the middle of the body. Their horizontal ducts meet in the region of the ootype to form a vitelline reservoir that opens into the ootype. The uterus seems to arise from the right side of the anterior boundary of the ootype. It runs forward forming loops and finally forms the metraterm which runs parallel to the cirrus sac and opens along with the latter at the genital aperture. The eggs measure ·015 mm. by ·01 mm. without filament. Each egg is thin-shelled and provided with a filament at each pole.

To sum up, the characters of the species are :—

1. Monostomes without ventral glands.
2. Genital pore at the posterior border of the oral sucker.
3. Uterus with transverse loops in the intercæcal region in front of the ootype.
4. Vitelline glands extend beyond the middle of the body from the posterior end.

This species differs from *Paramonostomum dhealum* and *Paramonostomum pseudalveatum* in the deeply lobed condition of the testes, the extent of the vitellaria, and the greater number of the uterine loops; from the allied species *Paramonostomum querquedulum* it differs in the forward position of the genital pore, in the proportionate width of the animal, and the size of the eggs. It is, therefore, described as a new species.

3. *Paramonostomum histrionici* n. sp. Ching 1961
Host.—*Histrionicus histrionicus pacificus.* harlequin duck
Location.—Intestine.
Locality.—Friday Harbour, Washington.
Frequency.—Eighteen mature specimens, the majority in one of two birds examined.
Holotype.—U.S. National Museum No. 59547. See Fig. 4 of holotype.
Description (based on five specimens, average in parentheses).—Body elongate, edges curled ventrally in life, posterior end rounded, length, 1.357–1.938 (1.609); width, 0.433–0.609 (0.552). Body surface finely spined, lacks ventral glands. Muscle fibers well developed throughout body. Oral sucker, 0.108–0.120 (0.115) in transverse diameter. Pharynx lacking; esophagus, 0.063–0.085 (0.077) in length. Intestine bifurcates 9–13% from the anterior edge of the body. Intestinal ceca with short lateral branches, extend posteriorly between testes and ovary and end at the posterior edge of the ovary. Genital pore slightly posterior to intestinal bifurcation. Testes elongate, lobed to a moderate degree, symmetrically placed in the posterior part of the body, 0.165–0.228 (0.203) long and 0.114–0.182 (0.132) wide. External seminal vesicle contorted, joins the cirrus sac which contains the short, coiled, internal seminal vesicle, club-shaped prostatic vesicle, prostatic cells, ejaculatory duct, and unarmed cirrus. Cirrus sac elongate and club shaped, 0.427–0.644 (0.565) in length, reaching to mid-body. Ovary irregularly lobed and somewhat round, 0.085–0.114 (0.070) in diameter. It is located between the testes at their anterior level. Mehlis' gland complex about one-half the size of the ovary, proximal loops of the uterus form a seminal receptacle. Coils of uterus number 16–18; the metraterm is surrounded by numerous gland cells and is one-half the length of the cirrus sac, 0.228–0.343 (0.270). Vitellaria are transversely oval follicles that extend 0.313–0.427 (0.357) from the ovary. They lie in the posterior 30–40% of the body and are extracecal. Eggs, exclusive of polar filaments, measure 17–22 by 9–13 microns. Polar filaments in one egg measured over 100 μ. Excretory pore dorsal, midway between posterior edge of the body and ovary, in one specimen surrounded by about nine cuticular spines.
Comparisons.—Of the reported species of *Paramonostomum* with elongate bodies, *P. histrionici* resembles *P. malerischi* Dunagan, 1957; *P. actitidis* Cable, Connor, and Balling, 1960; *P. elongatum* Yamaguti, 1934; *P. echinum* Harrah, 1922; and *P. bucephalae* Yamaguti, 1935. *P. histrionici* differs from *P. malerischi*, a species reported from the emperor goose in Alaska, in the



tion of the genital pore and the shorter extent of the vitellaria. This species differs from *P. actitidis* and *P. elongatum* in body size and the length of the metraterm in relation to the length of the cirrus sac. Moreover, *P. actitidis* has numerous prostate cells in the basal portion of the cirrus sac and 10 to 12 uterine coils. *P. elongatum* is not spined and has smooth ceca. *P. histrionici* differs from *P. echinum* in the size of the oral sucker in relation to body size, location of the cirrus sac in the anterior half of the body, and the number of uterine folds (16–18 in contrast to about 22 in Harrah's figure of *P. echinum*). From *P. bucephalae*, *P. histrionici* differs in the lack of tubercles on the cirrus and pars prostatica, and in the shorter extent of vitellaria. *P. echinum*, *P. bucephalae*, and *P. histrionici* all have metraterm lengths one-half the length of the cirrus sac. Smith (2), in his study of *Quinqueserialis hassalli* (McIntosh and McIntosh, 1934) Harwood, 1939, showed that the metraterm length could be one-half or as long as the cirrus sac length. The number of uterine loops also varied from 10 to 15. In the author's opinion, the metraterm length relative to the cirrus sac length and the number of uterine loops may be used for differentiation until age, host, and morphological variations of this genus can be studied.

cf with
P. querquedulum Lal, 1936

Acknowledgments

The author expresses appreciation to Robert Dickerman for collections of birds, to Dr. Robert Fernald of Friday Harbour Laboratories for the use of facilities, and to Dr. J. R. Adams for research space and equipment.

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Family Notocotylidae

3. *Paramonostomum histrionici* n. sp. Chin g, 1961

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Location.—Intestine.

Locality.—Friday Harbour, Washington.

Frequency.—Eighteen mature specimens, the majority in one of two birds examined.

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Description (based on five specimens, average in parentheses).—Body elongate, edges curled ventrally in life, posterior end rounded, length, 1.357–1.938 (1.609); width, 0.433–0.609 (0.552). Body surface finely spined, lacks ventral glands. Muscle fibers well developed throughout body. Oral sucker, 0.108–0.120 (0.115) in transverse diameter. Pharynx lacking; esophagus, 0.063–0.085 (0.077) in length. Intestine bifurcates 9–13% from the anterior edge of the body. Intestinal ceca with short lateral branches, extend posteriorly between testes and ovary and end at the posterior edge of the ovary. Genital pore slightly posterior to intestinal bifurcation. Testes elongate, lobed to a moderate degree, symmetrically placed in the posterior part of the body, 0.165–0.228 (0.203) long and 0.114–0.182 (0.132) wide. External seminal vesicle contorted, joins the cirrus sac which contains the short, coiled, internal seminal vesicle, club-shaped prostatic vesicle, prostatic cells, ejaculatory duct, and unarmed cirrus. Cirrus sac elongate and club shaped, 0.427–0.644 (0.565) in length, reaching to mid-body. Ovary irregularly lobed and somewhat round, 0.085–0.114 (0.070) in diameter. It is located between the testes at their anterior level. Mehlis' gland complex about one-half the size of the ovary, proximal loops of the uterus form a seminal receptacle. Coils of uterus number 16–18; the metraterm is surrounded by numerous gland cells and is one-half the length of the cirrus sac, 0.228–0.343 (0.270). Vitellaria are transversely oval follicles that extend 0.313–0.427 (0.357) from the ovary. They lie in the posterior 30–40% of the body and are extracecal. Eggs, exclusive of polar filaments, measure 17–22 by 9–13 microns. Polar filaments in one egg measured over 100 μ. Excretory pore dorsal, midway between posterior edge of the body and ovary, in one specimen surrounded by about nine cuticular spines.

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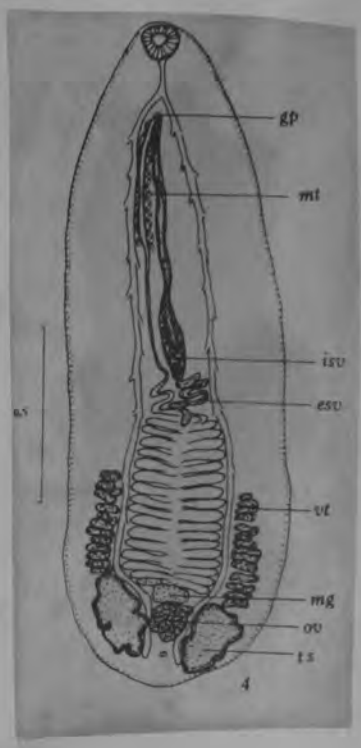


location of the genital pore and the shorter extent of the vitellaria. This species differs from *P. actilidis* and *P. elongatum* in body size and the length of the metraterm in relation to the length of the cirrus sac. Moreover, *P. actilidis* has numerous prostate cells in the basal portion of the cirrus sac and 10 to 12 uterine coils. *P. elongatum* is not spined and has smooth ceca. *P. histrionici* differs from *P. echinum* in the size of the oral sucker in relation to body size, location of the cirrus sac in the anterior half of the body, and the number of uterine folds (16–18 in contrast to about 22 in Harrah's figure of *P. echinum*). From *P. bucephalae*, *P. histrionici* differs in the lack of tubercles on the cirrus and pars prostatica, and in the shorter extent of vitellaria. *P. echinum*, *P. bucephalae*, and *P. histrionici* all have metraterm lengths one-half the length of the cirrus sac. Smith (2), in his study of *Quinqueserialis hassalli* (McIntosh and McIntosh, 1934) Harwood, 1939, showed that the metraterm length could be one-half or as long as the cirrus sac length. The number of uterine loops also varied from 10 to 15. In the author's opinion, the metraterm length relative to the cirrus sac length and the number of uterine loops may be used for differentiation until age, host, and morphological variations of this genus can be studied.

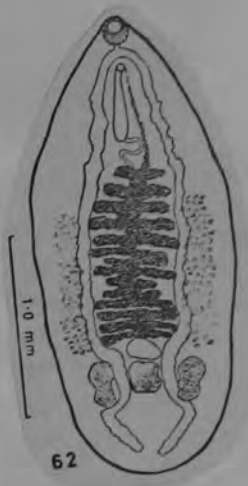
Paramonostomum kuntzi ~~n. sp.~~ BHUTTA AND KHAN, 1975

(Fig. 62)

One specimen of *Gallinula chloropus* was collected from Balloki Headworks area and 4 specimens of this species recovered from its intestine.

The body of the worm is dorsoventrally flattened. In some specimens the lateral margins of the body are turned ventrally so as to form a ventral longitudinal concavity. It is elongated and somewhat oval in outline with its anterior end narrow and the posterior end broadly rounded. Maximum breadth is attained at about the equator of the worm.

The body is devoid of any glands but the ventral surface is beset with numerous small spines. The oral sucker is subterminal and spherical. Pharynx and ventral sucker are absent. The oesophagus is short. The caeca are long having variable diameter throughout their length and posteriorly pass between the two testes to terminate near the posterior extremity.



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The gonads are in the last quarter of the worm. The testes are symmetrical, extracaecal and lie at a distance of 0.242 – 0.363 mm in front of the posterior end. The intertesticular distance measures 0.181 – 0.363 mm. The testes have a slightly indented margin. The cirrus sac is about one eighth of the body length and lies just behind the intestinal bifurcation. It encloses vesicula seminalis interna, prostatic complex and a long eversible ductus ejaculatorius. Vesicula seminalis externa is also present. The genital pore is median and just post-bifurcal in position. The ovary with slightly indented margin lies between the two testes and is median in position. The Mehlis' gland is immediately in front of the ovary. The vitellaria are follicular occupying the extra-caecal fields extending from the anterior level of the testes to a little in front of the middle of the body. The uterus is extensive, thrown into 13-14 densely packed transverse coils. It occupies most of the inter-caecal space between the posterior margin of the cirrus sac and the anterior level of the ovary. The muscular metraterm is about two thirds of the cirrus sac. The eggs are numerous, small, oval, light yellow, unembryonated and provided with filaments at both ends. The excretory vesicle is short and Y-shaped with two long arms which unite anteriorly.

MEASUREMENTS

(All measurements in millimetres)

Body length	1.727 – 2.575
Body breadth	0.696 – 1.121
Oral sucker	0.140 – 0.153 × 0.140 – 0.160
Oesophagus	0.039 – 0.052
Ovary	0.117 – 0.225 × 0.098 – 0.176
Mehlis' gland	0.098 – 0.114 × 0.145 – 0.186
Testes	0.205 – 0.294 × 0.087 – 0.225
Cirrus sac	0.313 – 0.343
Metraterm	0.196 – 0.215
Eggs	0.018 – 0.020 × 0.010 – 0.015

Host: *Gallinula chloropus*
Location: Intestine
Locality: Balloki Headworks area

over

Discussion

The species under study differs from *P. alveatum*, *P. pseudalveatum*, *P. querquedulum*, *P. malerischi* and *P. dollfusi* in having a post-bifurcal genital aperture. It differs from *P. microstomum* in the extent of vitellaria, in having its Mehlis' gland in front of the ovary and in having much smaller eggs. The present species differs from *P. parvum* in the shape of the body which is as long as broad in *P. parvum*, in the extent of the intestinal caeca and the size of the testes. *P. actiditis* can be differentiated from the present species in the size of the body, extent of the vitellaria. Length of the cirrus sac, extent of the vitellaria and the size of the body differentiate the present species from *P. histrionicae*. *P. elongatum* is a smaller species and it further differs from the present species in the length of the cirrus sac and extent of the vitellaria. *P. ovatus* differs from the present species in size and shape of the body and size of the oral sucker. *P. brante* and *P. ionornae* differs from it in the shape of the body, size of the ovary, testes, and cirrus sac. *P. chabaudi* differs from the present species in the extent of the vitellaria, in the shape and position of the testes, size of the cirrus sac, extent of the intestinal caeca and the uterine coils and in having small diverticula in the caeca. *P. echinum* differs from the present species in its body being many times as long as broad, in the extent of the uterus and vitellaria and in the length of the cirrus sac. *P. buciphale* can be differentiated from it by the presence of tubercles on the cirrus. In view of the above comparisons, the species under study is considered new to science and it is proposed to name it *Paramonostomum kuntzi* in honour of R. E. Kuntz.

Notocotylidae

Paramonostomum macrostomum sp. nov. Ku, 1938

A coot, *Fulica atra atra* Linn, from Soochow, China was dissected for examination of trematodes. Among the worms obtained one was found to be new. It is a caecal fluke belonging to the genus *Paramonostomum* Lühe and the name, *P. macrostomum* is proposed for this species. The type specimen has been deposited in the Department of Biology, National Southwest Associated University, Kunming, China.

DESCRIPTION: The body is small, flask-shaped in outline, and narrow anteriorly and rounded posteriorly. It measures 1.032 mm. long and 0.608 mm. maximum wide in front of the ovary. There are no ventral glands on the lateral surface. The cuticle is smooth. The body is curved ventrally after fixing. The subterminal oral sucker is large and cup-shaped. It measures 0.128 mm. by 0.08 mm. There is no pharynx. The oesophagus is short and is followed by the intestinal caeca which are situated between the vitelline lobules and the uterus at the anterior end of the posterior half of the caeca, and the testes and ovary at the posterior end. The ends of the intestinal caeca are rounded. They are at a distance of 0.072 mm. from the posterior end of the body.

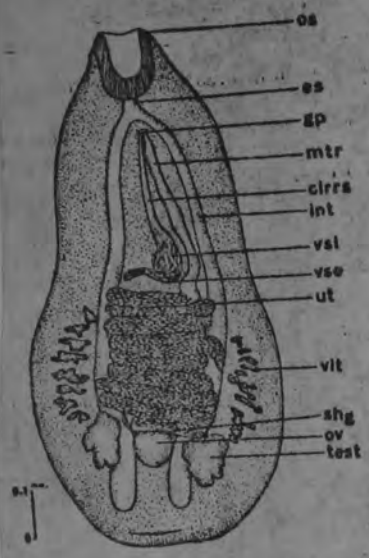


Fig. 2. Paramonostomum macrostomum sp. nov.

cirrs—cirrus sac; es—oesophagus; gp—genital pore; int—intestine; mtr—metraterm; os—oral sucker; ov—ovary; shg—shell gland; test—testis; ut—uterus; vse—vesicula seminalis externa; vsi—vesicula seminalis interna; vit—vitellaria.

The testes are deeply and irregularly lobed, measuring 0.120 mm. by 0.096 mm., and lying in the posterior part of the body. They are arranged symmetrically on the lateral sides near the terminal end of the intestinal caeca at the level of the ovary. The long cirrus sac lies in the mid-anterior part of the body and is rounded posteriorly. It measures 0.296 mm. in length. The posterior part of the cirrus sac increases in size, and encloses the vesicula seminalis interna. There is a transverse vesicula seminalis externa lying behind the cirrus sac in front of the first transverse uterine coil. The genital pore opens with the metraterm just behind the intestinal bifurcation.

The ovary is roughly oval in shape, lying between the testes. It measures 0.088 mm. by 0.080 mm. The shell gland lies on the left side in front of the ovary. The transverse uterine coils, about 10 in number, fill up the whole intercaecal field between the vesicula seminalis externa and the shell gland. A constricted metraterm lies on the left side of the cirrus sac. It opens with the cirrus sac through the genital pore. The small but numerous eggs, 0.018—0.020 mm. by 0.010—0.012 mm. fill up the uterine coils and are provided with two polar filaments. The vitellaria are irregular lobules, loosely arranged, beginning from the anterior end of the posterior third of the body to the front of the testes.

DISCUSSION: Only a single mature specimen was obtained from the caecum of the coot, *Fulica atra atra* Linn. The body is bent after fixation, and unfortunately broken by the pressure of the cover glass when it was mounted in balsam.

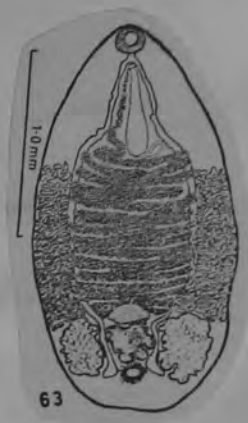
This worm resembles very closely to *Paramonostomum alveatum* Kossack 1911 so far as the shape and size of the body are concerned. The proportion of the body length to the body width is less than 2 : 1 in both species, while the shape of the present specimen is roughly oval, devoid either of the lobes or the sinuous margins. The present specimen differs from *P. alveatum* Kossack 1911 in several aspects as shown in the following table :

Paramonostomum orientalis ~~n. sp.~~ BHUTTA AND KHAN, 1975

(Fig. 63)

The following description is based upon a single worm collected from the intestine of one specimen of kraig collected from Balloki Headworks area.

The body of the fluke is dorsoventrally flattened, oval in outline with the posterior end broader than the anterior. The worm attains maximum breadth at its equator. The tegument of the body is thin and devoid of any glands but has small spines on its ventral surface. The oral sucker is subterminal and subspherical. Ventral sucker and pharynx are absent. The oesophagus is very short. The intestinal fork lies at a distance of 0.166 mm from the anterior extremity. The caeca are long, of variable diameter and have small irregular diverticula. Posteriorly the caeca bend inwards, and run along the mesial surface of the respective testis. Their distal extremities are distended.



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The gonads are in the last quarter of the worm. The testes are symmetrical, and markedly lobed with an interesticular distance of 0.245 mm The vesicula seminalis externa and vesicula seminals interna are present. The well-developed and elongated cirrus sac is about one fourth of the total body length and in addition to the vesicula seminalis interna it encloses the pars prostatica and a long eversible ductus ejaculatorius. The genital aperture is just post-bifurcal and median in position. The ovary is median and intertesticular and situated at a distance of 0.225 mm in front of the posterior extremity. It is smaller than the testes and is deeply lobed. The Mehlis' gland lies immediately in front of the ovary and is transversely elongated. The vitellaria are follicular, extracaecal, extending from the anterior level of the testes to some distance behind the cirrus sac. The uterus is extensive and thrown into 16-17 closely packed transverse coils which occupy most of the intercaecal space between the ovary and the posterior margin of the cirrus sac. At some places the uterine coils may over-reach the intestinal caeca but they never protrude into the extracaecal fields. The eggs are light yellow, numerous, small, unembryonated and provided with filaments at both ends. The excretory vesicle is short with two long arms which unite anteriorly.

Measurements

(All measurements in millimetres)

Body length	2.03
Body breadth	1.06
Oral sucker	0.137 × 0.166
Ovary	0.235 × 0.225
Testes	0.313 – 0.362 × 0.245 – 0.264
Mehlis' gland	0.147 – 0.225
Cirrus sac	0.490 × 0.117
Metraterm	0.303
Eggs	0.015 – 0.017 × 0.010 – 0.012

Host: Kraig

Location: Intestine

Locality: Balloki Headworks area

over

Discussion

In the presence of a post-bifurcal genital aperture the species under present study differs from *P. alveatum*, *P. pseudalveatum*, *P. querquedulum*, *P. malerischi* and *P. dollfusi* and resembles all the remaining species of the genus. It differs from *P. microstomum* in having its Mehlis' gland in front of the ovary and in having a cirrus sac longer than the metraterm. It can be differentiated from *P. parvum* in having a body longer than broad and in size of the testes. The present species differs from *P. actiditis* in body size and anterior extent of the vitellaria. It can be differentiated from *P. histrionicae* in body size, in the length of the cirrus sac and the metraterm. It differs from *P. elongatum* in being much smaller in size, shape of the body and length of the cirrus sac. It can be differentiated from *P. ovatus* in shape and body size, length of the cirrus sac and metraterm. It differs from *P. brantae* in shape of the body, size of the testes, ovary and the cirrus sac. It differs from *P. ionornae* in shape and size of the body, in diverticulated nature of the caeca and extent of the vitellaria. It can be separated from *P. echinum* in length of the cirrus sac, extent of the vitellaria, anterior extent of the uterus and in having relatively smaller eggs. It differs from *P. bucephalae* in the extent of the vitellaria and in possessing an unarmed cirrus. It can be differentiated from *P. chabaudi* in body shape, in having a relatively much smaller cirrus sac and much smaller eggs, larger ovary and in anterior extent of the vitellaria. It differs from *P. kuntzi* (described earlier in this work) in size of the cirrus sac and metraterm, in a relatively longer metraterm relative to the length of the cirrus sac, anterior extent of the vitellaria, extent of the caeca and relatively smaller eggs. In view of the all these comparisons and differences it is obvious that a new species is being dealt with for which the name *Paramonostomum orientalis* is proposed.

Paramonostomum palawanense ~~sp. n.~~ (Fig. 9) Fischthal, and Kuntz, 1972

Description (based on 51 adult worms from one host ; 10 measured) : Body pyriform, spined, without ventral glands or ridges, 322–355 long by 154–170 wide. Oral sucker usually subterminal ventral, sometimes nearly terminal, 29–32 by 26–32. Acetabulum absent. Pharynx absent; oesophagus 24–31 long ; caeca cell lined, extending to testes.

Testes two, smooth to slightly lobed, symmetrical, diagonally oriented, at posterior extremity ; right testis 50–66 by 28–50, left 57–68 by 30–50. External seminal vesicle tubular to saccular, winding considerably within and just anterior to uterine field. Cirrus sac elongate, more or less straight, thin walled. Internal seminal vesicle thin walled, filling most of cirrus sac. Pars prostatica short. Cirrus short, muscular, joining metraterm to form short, tubular, thick walled, muscular genital atrium. Genital pore median, just behind caecal bifurcation.

Ovary usually somewhat lobed but may be smooth, round to transversely or longitudinally elongate, 28–46 by 36–66. Seminal receptacle absent. Vitelline follicles in compact lateral fields, extending anteriorly from anterior part or margin of testes ; right field 66–82 by 32–41, left 65–94 by 29–48 ; transverse vitelline duct emerging from near posterior end of each field, uniting dorsal or just anterior to ovary to form small reservoir. Uterus filling most of body between ovary and posterior margin of cirrus sac. Metraterm thick walled, muscular, 21–30 long. Eggs numerous, thick shelled, operculate, without filament, most with very small anopercular knob submedianly placed, 30 measured 19–26 (21·1) by 13–18 (15·6).

Excretory bladder short, tubular to saccular, commencing ventral to ovary ; pore terminal to just subterminal.

Host : *Centropus sinensis bubutus* Horsfield, common coucal (Cuculiformes : Cuculidae).

Location : Small intestine.

Locality : Tarabanan Concepción.
Date : 17 May 1962.

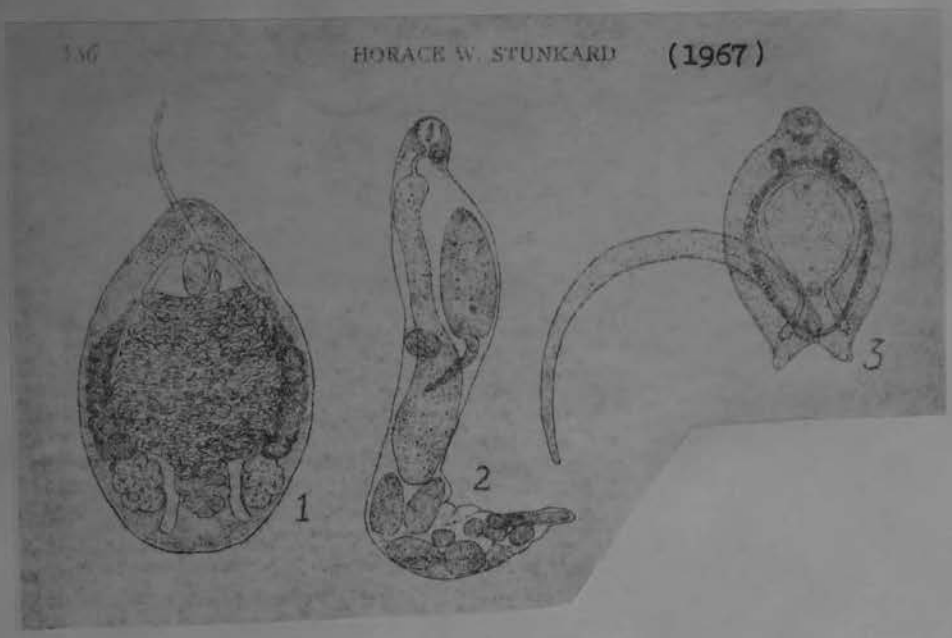
Specimens : No. 72212 (holotype) ; No. 72213 (paratypes).

Discussion : Study of whole mount specimens and sections did not reveal a pharynx, acetabulum, ventral glands or ridges, or egg filaments. The very small anopercular knob of the eggs is most readily seen in sections and to a lesser extent in eggs freed from the uterus or in intact whole mounts ; this knob probably is a vestige of the filament. While the egg filament is a common feature in the notocotylids, it is also quite variable as a single worm may have one or a variable number of filaments at either pole or none at all. The presence of an operculum on the egg was also noted for *Paramonostomum alveatum* (Mehlis in Creplin, 1846) Lühe, 1909, by Stunkard (1967), and occurs in species in the notocotylid genera *Notocotylus* Diesing, 1839, and *Catatropis* Odhner, 1905.

Our new species differs from all others in *Paramonostomum* Lühe, 1909, in completely lacking an egg filament. In body shape and in having a short cirrus sac it is most closely related to the non-elongate species of the genus, namely, *P. alveatum*, *P. brantae* Bullock, 1952, *P. macrostomum* Ku, 1938, *P. parvum* Stunkard and Dunihue, 1931, and *P. pseudalveatum* Price, 1931. These species differ further from ours in having the vitellarian fields extending anteriorly to midbody length or beyond. In body size our form is most like *P. parvum* and *P. pseudalveatum*.

Notocotylidae

Paramonostomum parvum Stunkard & Dunihue, 1931



Notocotylidae

Paramonostomum querquedulum n.sp. Lal, 1936

This trematode was obtained from the intestinal cæca of the Gargeney, *Querquedula circia*. It measures 3·398 mm. in length and has a maximum width of 1·11 mm. in the middle region of the body behind the cirrus sac.

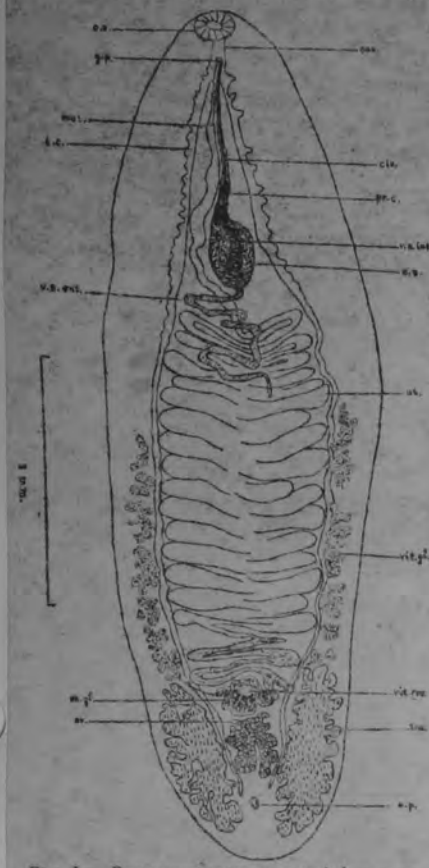


FIG. 1. *Paramonostomum querquedulum*, n.sp., showing the disposition of the internal organs.

The oral sucker is sub-ventral and measures ·17 mm. by ·12 mm. and is followed by an elongated œsophagus, ·165 mm. long. At its posterior end the œsophagus divides into two intestinal cæca which run upto the posterior end of the body. The intestinal cæca at their proximal end show slight irregular projections along their external border.

FIG. 2. *Paramonostomum querquedulum*, n. sp., eggs with filaments.

The excretory system is as usual, with an excretory pore at the posterior end of the body behind the ovary.

The testes are two in number, and extracæcal in position. Their outer margin is deeply lobed. The left testis is slightly larger than the right and measures ·74 mm. by ·235 mm. The right testis measures ·66 mm. by ·24 mm. The two vasa deferentia meet in the middle to form the vesicula seminalis consisting of a proximal portion (vesicula seminalis externa) and a distal portion enclosed within the cirrus sac (vesicula seminalis interna). The cirrus sac is pear-shaped with long neck and measures ·93 mm. in length. It contains a long but feeble cirrus and a few prostatic gland-cells near the base of its neck.

The ovary which is more or less bifid posteriorly measures ·265 mm. by ·22 mm. The ootype is situated in front of the ovary and receives ducts from the vitelline glands. The shell-gland cells are present and surround the ootype and the vitelline reservoir. The vitelline glands consist of separate follicles mostly extracæcal, and occupy about the middle region of the animal. The two horizontal vitelline ducts of the two sides unite in the region of the ootype to give rise to the vitelline reservoir. The uterus arises from the left side of the ootype and runs forward forming transverse loops ending in the metraterm at its distal end. The metraterm runs parallel to the cirrus sac and opens with it at the genital pore which is situated midway between the oral sucker and the intestinal bifurcation. The uterus is full of thin-shelled eggs that are provided with a filament at their either end. They measure ·02 mm. by ·009 mm. without filaments.

This species is characterised thus:—

1. Monostomes without ventral glands.
2. Genital pore situated midway between the oral sucker and the intestinal fork.
3. The ovary bifid posteriorly and the uterus with transverse loops in the intercæcal region.
4. Vitellaria extend slightly beyond the middle of the body from the posterior end.
5. The intestinal cæca show slight lateral projections on their outer margin.

This species differs from the type species *Paramonostomum alveatum* and from the species *Paramonostomum fenestratum* in the proportion of length and breadth of the body, in the general topography of the organs, and specially in the deeply-lobed condition of the testes, the extent of vitellaria, and greater number of uterine loops. Hence it is designated as a new species.

Paramonostomum querquedulum Lal, 1936

(Fig. 61)

The following account is based on a single specimen recovered from the intestine of one out of two specimens of *Anas crecca* collected from Lahore.

The body of the fluke is oblong with its anterior extremity narrow and somewhat pointed. The posterior extremity is broadly rounded. The lateral margins of the body are slightly curved ventrally. The tegument is beset with numerous minute spines but is devoid of any glands. The oral sucker is subterminal and slightly broader than long. Pharynx and ventral sucker are absent. The oesophagus is very short. The intestinal bifurcation lies at a distance of 0.606 mm from the anterior extremity. The caeca are long, sinuous and extend beyond the testes to terminate near the posterior end of the body. At the anterior margins of the testes the caeca bend inwards the pass along the mesial surface of the respective testis. The distal extremities of the caeca are slightly distended.

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The gonads lie in the last quarter of the body. The testes are symmetrically placed in the extra-caecal fields at a distance of 0.181 mm from the posterior extremity. They are longitudinally elongated and have indented margin. Vesicula seminalis interna and vesicula seminalis externa are present. The cirrus sac is very long, tubular and is distended towards the proximal end. Apart from the vesicula seminalis interna it encloses pars prostatica and a long protrusible ductus ejaculatorius. The cirrus sac extends from just behind the oral sucker to a little beyond the anterior one third of the body. The genital pore lies just behind the oral sucker and is median in position. The ovary lies between the two testes in the intercaecal space. It is deeply lobed, median in position and smaller than either testis. It is situated at a distance of 0.303 mm from the posterior end of the worm. The Mehlis' gland is immediately pre-ovarian and is transversely elongated. The vitellaria are follicular, arranged mainly in the extra-caecal fields, extending from the anterior margin of the testes to a little behind the equator. At some places they over-reach the caeca. The uterus is extensive, thrown into 18-19 tightly packed transverse coils. It occupies almost whole of the intercaecal space between the ovary and posterior level of the cirrus sac. At some places the uterine coils cover the caeca. The eggs are small, numerous, light yellow, oval unembryonated and are provided with filaments at both the ends. The excretory vesicle is short with its cornua united anteriorly.

MEASUREMENTS

(All measurements in millimetres)

Body length	2.97
Body breadth	0.87
Oral sucker	0.107×0.147
Oesophagus	0.076
Ovary	0.196×0.196
Testes	0.43×0.25
Mehlis' gland	0.127×0.176
Cirrus sac	0.94
Eggs	0.017×0.010–0.012

Host: *Anas crecca*
Location: Intestine
Locality: Lahore

DISCUSSION

The species under present study resembles *P. querquedulum* Lal, 1936 in all essential features and has been identified as such. However, this species is being recorded for the first time from this host and also for the first time from Pakistan.

From BHUTTA AND KHAN, 1975

PARAMONOSTOMUM SIGNIENSIS ~~n.sp.~~ JONES AND WILLIAMS, 1969

Family Notocotylidae Lühe, 1909 : subfamily Notocotylinae Kossack, 1911

Host : Sheathbill, *Chionis alba* (Gmelin) (Aves : Charadriiformes)

Locality : Signy Island (lat. 60° 43′ S., long. 45° 36′ W.) SOUTH ORKNEY ISLANDS, ANTARCTICA

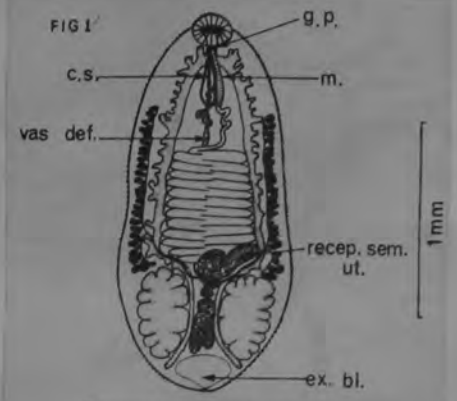
Incidence : 4 of 9 juvenile and 1 of 3 adult Sheathbills

Intensity : range, 1–8 ; mean 3·6

Habitat : rectum, 15 specimens ; bursa Fabricii, 3 specimens

A specimen is to be deposited in the British Museum (Natural History).

FIG 1



Paramonostomum signiensis n.sp.

Paramonostomum signiensis **n.sp. measures 1·8–3·2 mm. in length and attains a maximum breadth of 0·8–1·4 mm. in the posterior half of the body ; the length/breadth ratio is thus 2·1/1 to 2·5/1. The shape of the body is roughly oval in outline and the surface is covered with conical spines measuring 0·003–0·005 mm, in length (Fig. 1). A ventral sucker is absent and no ventral glands were seen.**

The terminal oral sucker measures 0·166–0·23 mm. in transverse diameter, the mouth being directed ventrally ; the ratio of the diameter of the sucker to the body length varies from 1/8·3 to 1/11. A pharynx is absent and the mouth leads directly into an oesophagus measuring 0·08–0·1 mm. in length which bifurcates posteriorly to form the intestinal caeca (Fig. 1). The latter extend posteriorly one on either side of the body passing laterally to the cirrus sac, uterus and ovarian complex, and medianly to the vitellaria and testes. Posteriorly the intestinal caeca diverge laterally on either side of the excretory bladder which opens to the exterior subterminally on the dorsal surface. The lateral margins of the intestinal caeca are conspicuously diverticulated and some small diverticula occur also on the medial side of the caeca.

The two testes are situated at the same level in the posterior third of the body and they are separated by the intestinal caeca and the ovarian complex (Fig. 1). The testes measure 0·33–0·43 mm. in length by 0·27–0·30 mm. in breadth and are markedly lobed, the degree of which appears to be fairly constant in the specimens examined being 6–7 lobes on the lateral and 3–5 lobes on the medial margins. From each testis arises a vas efferens which unites with its fellow at the level of the receptaculum seminis uterinum to form the vas deferens. Pursuing a slightly sinuous course the latter passes forward and attains a diameter of 0·026–0·032 mm. Some distance before entering the cirrus sac the course of the vas deferens becomes increasingly convoluted although the diameter of the duct does not increase. In this region the vas deferens functions as a vesicula seminalis externa ; eventually this enters the hind end of the cirrus sac to become the vesicula seminalis interna. The latter is much coiled and is continuous through the pars prostatica with the ductus ejaculatorius of the unarmed cirrus.

The club shaped cirrus sac is 0·32–0·48 mm. long with a maximum diameter of 0·08–0·13 mm., its hinder end lying about one quarter of the way along the body (Fig. 1). The ratio of the length of the cirrus sac to the body length varies from 1/5·3 to 1/6·5 and although it is fairly small it has muscular walls measuring 0·01–0·02 mm. in thickness. Anteriorly the cirrus sac opens into a shallow genital atrium which in turn opens to the exterior through the genital pore lying immediately posterior to the oral sucker.

– OVER –

The ovary is 0·22–0·27 mm. long by 0·11–0·15 mm. in breadth and slightly lobed in shape although in some specimens there is a pro- unced notch in the posterior margin (Fig. 1.) In front of the ovary s the complex of the ootype, Mehlis' gland and, ventrally, the vitell- e reservoir. The vitellaria extend forward in the two lateral fields om the level of the testes to the hinder end of the cirrus sac, that to the anterior quarter of the body. From each lateral field of telline follicles a transverse duct emerges running ventrally to the testinal caeca, eventually opening into the mid ventral vitelline servoir.

A prominent receptaculum seminis uterinum is present and there e from 12 to 15 conspicuous transverse loops in the forward course of e uterus (Fig. 1). The uterus then takes a more direct, though still uous, course forward until it reaches the hinder end of the cirrus c. At this point the uterus is seen to have a strong muscular wall d may be regarded as the metraterm. This runs forward in a aight line ventral to the cirrus sac to open into the genital atrium.

e level of the most anterior of the transverse loops of the uterus ries from one third to one half of the way along the body, but in ntracted and distorted specimens the transverse loops of the uterus re seen to lie much further forwards up to and around the cirrus sac also, did the vitellaria. In these specimens the metraterm has a uous course and we conclude that these are the effects of contraction d do not represent the usual condition. The eggs, exclusive of their ng polar filaments, measure 0·017–0·019 mm. by 0·010–0·012 mm.

Two species of notocotylid trematodes have previously been corded from the Sheathbill, namely *Notocotylus chionis* Baylis, 1928 Baylis (1928), Jones & Williams (1968)) and *Paramonostomum norne* Travassos, 1921 (Baylis (1928)). *Paramonostomum signiensis* sp. is distinguished from species of *Notocotylus* by the complete sence of ventral glands and from *P. ionorne* by the possession of testinal diverticula and body spines. Also the cirrus of *P. signiensis* sp. is unarmed whereas that of *P. ionorne* is spinose, and the genital ore of the latter opens ventral to the intestinal bifurcation while in *P. signiensis* n.sp. the opening lies immediately posterior to the oral cker. Furthermore, the transverse loops of the uterus in *P. signiensis* n.sp. do not reach the cirrus sac, except in greatly con- acted specimens, and the most anterior loop lies at the level of he first third of the body, whereas in *P. ionorne* the transverse loops xtend forward as far as the hind end of the cirrus sac which, in this pecies, is about one quarter of the way along the body. Finally, the ody of *P. signiensis* n.sp. is covered by small cuticular spines while he body of *P. ionorne* lacks spines.

It is interesting that these two species occupy different habitats in he Sheathbill host. Thus, *P. ionorne* lives in the caeca and *P. signiensis* n.sp. inhabits the rectum and, in juveniles, the bursa Fabricii. It is, perhaps, surprising that a monostome fluke lacking trong adhesive structures should live in the rectum where it is ubjected to periodic, powerful expulsive movements of the gut.

Hitherto twenty-two species of *Paramonostomum* Lühe, 1909 ave been described but only five species closely resemble *P. signiensis* n.sp. and these may be differentiated in the following manner :

1 Intestinal caeca with diverticula 2
Intestinal ceaca without diverticula 5

2 Genital pore situated immediately posterior to the oral sucker 3
Genital pore not situated immediately posterior to the oral sucker 4

3 With 18–20 transverse loops in the uterus ; vitellaria not extending anterior to the transverse loops of the uterus and not reaching the hind end of the cirrus sac .....*P. harwoodi* Nath & Pande, 1962.
With 12–15 transverse loops in the uterus ; vitellaria extending well in front of the transverse loops of the uterus and reaching the level of the hind end of the cirrus sac .....*P. signiensis* n.sp.

4 Genital pore situated mid-way between the oral sucker and the intestinal bifurcation ; body lacking cuticular spines ; posterior end of the cirrus sac lying one third of the way along the body ; vitellaria extending just into the anterior half of the body.....*P. querquedulum* Lal, 1936.
Genital pore situated posterior to the intestinal bifurcation ; body with cuticular spines ; posterior end of the cirrus sac reaching the middle of the body ; vitellaria confined to the posterior half of the body and mostly in the posterior third .....*P. histrionici* Ching, 1961

5 Genital pore situated immediately posterior to the oral sucker ; body with cuticular spines ; testes slightly lobed ; with 12–14 transverse loops in the uterus ; vitellaria confined to the posterior half of the body.....*P. nettioni* Baugh, 1958
Genital pore situated immediately posterior to the oral sucker ; body lacking cuticular spines ; testes greatly lobed ; with 17 transverse loops in theuterus ; vitellaria extending into the anterior half of the body.....*P. casarcum* Lal, 1936

PARAMONOSTOMUM

Pulmonicola Poche, 1926

Generic diagnosis. — Opisthotrematidae, Opisthotrematinae: Body provided with muscular rim except for space occupied by oral sucker. Cuticle smooth. Oral sucker subterminal; ceca straight, uniform in diameter. Testes entire, just medial to cecal ends. Cirrus pouch slender, spirally coiled distally, containing strongly convoluted seminal vesicle. Genital pore terminal. Ovary median, lobed, pretesticular. Receptaculum seminis and Laurer's canal present. Vitellaria consisting of a small number of follicles situated in intercecal field between testes and ovary. Uterus convoluted chiefly in pre-ovarian intercecal field; metraterm dorsal to cirrus pouch; eggs very small, with long filament at each pole. Excretory system probably similar to that of *Opisthotrema*.

Genotype: *P. pulmonalis* (von Linstow, 1904) Poche 1926 (Pl. 93, Fig. 1122), syn. *Opisthotrema pulmonale* Linstow, in lung of *Halicore australe*, *H. dugong*; Australia.

OPISTHOTREMATIDAE
Notocotylidae
Opisthotrematinae

Genus PULMONICOLA Poche, 1926

Generic diagnosis.—Opisthotrematidae: Entire margin of body, except space occupied by oral sucker, provided with a muscular rim. Cuticle without spines. Oral sucker ventral, near anterior margin of body; intestinal ceca straight, uniform in diameter. Excretory system (?), probably similar to that in *Opisthotrema*. Testes entire, intercecal, situated near ends of ceca. Ovary median. Other characters as in *Opisthotrema*.

Type species.—*Pulmonicola pulmonalis* (von Linstow, 1904) Poche, 1926.

PULMONICOLA PULMONALIS (von Linstow, 1904) Poche, 1926

PLATE 11, FIGURE 50

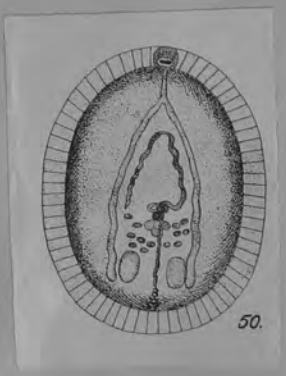
Synonyms.—*Opisthotrema pulmonale* von Linstow, 1904, pp. 678–680.

Description.—*Pulmonicola:* Body oval in outline, 5.13 mm long by 3.95 mm wide; margin of body, except for the portion occupied by the oral sucker, modified to form a muscular rim. Oral sucker situated on ventral surface, 330μ from the anterior margin; esophagus very slender, 180μ long by 28μ wide; intestinal ceca uniform in diameter and extending into the posterior fourth of body. Cirrus pouch slender, spirally coiled distally, and containing a greatly convoluted seminal vesicle. Testes oval, entire, 390μ long by 280μ wide, situated intercecally in the same transverse plane. Ovary small, median in position, situated a short distance caudad of the equator of body; Mehlis's gland smaller than ovary and situated immediately caudad of it; receptaculum seminis present; Laurer's canal present. Vitellaria in intercecal field and consisting of a few isolated follicles situated between the ovary and testes. Uterus slender, intercecal, occupying the equatorial third of body in immature specimens, but in mature specimens more convoluted and occupying the second and third fourths of the body; vagina dorsal to cirrus pouch; genital pore at posterior end of body. Eggs 16μ long by 9μ wide, yellow in color, and provided with a long filament at each pole.

Hosts.—*Halicore australe*, *H. dugong*.

Location.—Lung.

Distribution.—Australia (Torres Straits).



50.

PULMONICOLA

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STUDIES ON *QUINQUESERIALIS HASSALLI* AND TAXONOMIC CONSIDERATIONS OF THE SPECIES OF *QUINQUESERIALIS* (TREMATODA: NOTOCOTYLIDAE)[1]

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During the summers of 1948 and 1951, more than 895 mammals collected by field parties of the University of Kansas, Museum of Natural History, were examined for helminth parasites. Collections were made in Kansas, Oklahoma, New Mexico, Colorado, Wyoming and South Dakota. 176 specimens of *Quinqueserialis hassalli* (McIntosh and McIntosh, 1934) Harwood, 1939 were collected as follows: 66 specimens from one *Microtus montanus caryi* Bailey, montane meadow mouse in Wyoming; 16 specimens from one *Microtus montanus fusus* Hall, montane meadow mouse in Colorado; 72, 2 and 16 specimens from three *Microtus pennsylvanicus modestus* (Baird), Pennsylvanian meadow mice, two in New Mexico and one in Colorado; 1 specimen from one *Thomomys talpoides ssp.*, northern pocket gopher in Wyoming.

The trematodes were killed and preserved in 5 per cent formalin. Toto mounts were prepared according to Riser's (1950) modification of Proescher's Celestin Blue B Stain. While none of the specimens were individually killed under a cover glass, they were all killed, preserved, and prepared in the same way. The NOTOCOTYLIDAE are not very muscular trematodes and although the ventral surface tends to become concave there is no great body contraction.

Genus *Quinqueserialis* Skvortsov, 1934

Quinqueserialis hassalli (McIntosh and McIntosh, 1934) Harwood, 1939. *Synonyms: Monostoma sp.* Stiles and Hassall, 1894; *Notocotylus hassalli* McIntosh and McIntosh, 1934; *Barkeria hassalli* (McIntosh and McIntosh, 1934) Szidat, 1936; *Quinqueserialis wolgaensis* Skvortsov, 1934.

Q. hassalli (Fig. 1) is a monostome trematode with more or less concave ventral surface on which occur five longitudinal rows of papillae. The intestinal ceca curve inward to pass medial to the testes. The two testes are lateral, near the posterior end of the body. An elongate cirrus sac opens at the median genital pore near the level of intestinal bifurcation. The ovary is median, between the testes. The vitelline follicles are in two lateral rows or groups, anterior to the testes. The uterus is pre-ovarian with lateral coils. An elongate metraterm is present.

Q. hassalli is a common trematode parasite found in the ceca of the microtine rodent *Microtus*, having been recorded only twice from other hosts: once from the jumping mouse (*Zapus*) by Erickson (1938) and once from the woodchuck (*Marmota*) by Rausch and Tiner (1948). The latter was reported with the notation that the animal was trapped in a wet marshy area and that remains of snails and vegetation were found in the stomach and intestine of the animal. It was suggested that

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[1] Studies from the Department of Zoology, University of Nebraska, No. 264. The work was done under the direction of Dr. H. W. Manter.

[2] Formerly at the University of Nebraska.

this type food may have caused the infection. The reporting of the occurrence of *Q. hassalli* in the pocket gopher, *Thomomys talpoides ssp.*, constitutes a new host record.

Rausch and Tiner (1948) reported a 46 per cent incidence of this trematode in voles from the southern Wisconsin marsh. The trematodes averaged eight per infected host, with a maximum number of 37 in a single host. Kuns and Rausch (1950) reported a 14 per cent incidence of this trematode in "Willows and Wet Meadows" type habitat in the Jackson Hole Region of Wyoming, with a 4 per cent incidence for all types of habitats of that region. The prevalence indicated by my collections was much lower. Of 307 *Microtus* examined, a total of 5 was found infected or 1.6 per cent. Evidently local conditions of the habitat influences the distribution and incidence of infection. These conditions vary so greatly that figures of incidence are without much value. It may be noted, however, that the previously recorded maximum infection was 37 specimens. This is now extended to 72.

A study of the 176 specimens was made in order to determine morphological variations within the species.

Size and shape (Figs. 1 to 11): Specimens ranged from 1.6 to 3.96 mm. in length and from 0.88 to 2.04 mm. in maximum width. They were flat or with concave ventral surfaces. Some had longitudinal ridges on the dorsal surface (Fig. 11). Shape varied from elongate spatulate to pyriform.

It was possible to compare infections of varying intensities (72, 16, or 2 parasites) in the same species of host; and infections of equal intensity in different species of hosts. Infections of high intensity produced smaller specimens on the average. However, there were large specimens from heavy infections the same size as small specimens from light infections. No significant differences could be detected in specimens from the various hosts except that the single specimen from the pocket gopher (*Thomomys*) was largest in size and had minimal development of the ventral papillae.

Ventral papillae (Fig. 13): The structures found on the ventral surface have been called "glands" by some authors and "papillae" by others. Because the papillae do not have pores or characteristic glandular structures and because of the lack of any evidence that these structures are secretive, even in their beginning development, the term "papillae" seems preferable to "glands." The total number of countable ventral papillae per specimen varied from 74 to 96: lateral row, 15 to 20; paramesial row, 16 to 21; mesial row, 13 to 18. The papillary areas may become extended and invaded by internal organs such as the uterus, vitellaria, testes and ovary. In small bodied specimens, internal pressures due to competition of available space by developing organs may force these organs to invade the papillae and cause their further distortion or protrusion. In most cases, the papillae are simple knob-like structures. In some specimens they appear to be "two-headed" or shaped like a dumbbell. Rarely, the distal portion of the papillae are concave to give the appearance of a sucker. Some specimens have such small trace of ventral papillae that only by the most careful scrutiny could a few be revealed. In such cases it was difficult or impossible to determine the number of rows of papillae, nor could the number of papillae be ascertained. In most specimens, the five rows of papillae could be observed, but in these cases the number of papillae might or might not be countable. When countable, as mentioned previously, the number of papillae per

row may vary as much as five, e.g., from 13 to 18 or from 16 to 21. When not countable, the reason was there were areas within rows that had not developed papillae or papillae had fused together. This fusion of papillae was observed to occur both longitudinally and laterally and was due, in part, to the distorting effects caused by the invasion of the papillae by internal organs.

Internal morphology: The intestinal ceca of some specimens were simple tubes while in others they possessed very short lateral bulges. The ceca extend posteriorly approximately dorsal to the paramesial row of papillae, pass between the ovary and testes and end blindly a short distance from the posterior end of the body.

The two testes are extracecal, one on each side and posterior to the uterine coils. They measured from 0.24 to 0.72 mm. long by 0.18 to 0.54 mm. wide. The edges of the testes may appear wart-like or be fimbriated. The cirrus sac varies from 0.66 to 1.44 mm. long by 0.12 to 0.24 mm. wide. It is located in the anterior half of the specimen, and may be 1/2 or 1/3 the body length. The cirrus is heavily spined. The internal seminal vesicle is large and conspicuous in the posterior part of the cirrus sac. The ventral genital pore is located approximately at the level of the intestinal bifurcation. In most specimens it is slightly posterior to this point but in some it appears level with or anterior to the point of bifurcation.

The ovary is located between the testes, is somewhat longer than wide, usually irregularly lobed but sometimes almost smooth. It varies in size from 0.18 to 0.48 mm. long by 0.15 to 0.36 mm. wide. The anterior edge of the ovary may be anterior, on a level with, or posterior to the anterior level of the testes and similarly the posterior edge of the ovary may be anterior, on a level with or posterior to the posterior level of the testes. Mehlis' gland is preovarian with the posterior edges overlapping the anterior edge of the ovary. Vitelline follicles are extra-cecal and extend from near the anterior edge of the testes (or slightly posterior), anteriorly to a point varying from about 2/3 the distance to the cirrus sac, or to the base of the cirrus sac, or even slightly beyond. The vitellaria on both sides do not always extend the same distances. The vitellaria in some specimens appear as distinct globular follicles. They are not constantly in one, two, or more rows but vary greatly in distribution, size and shape. Individual follicles may fuse to form a mass of considerable size. The variations of the vitellaria are worthy of note since some authors use the size, shape and extent of the vitellaria as specific taxonomic characters in the genus *Quinqueserialis*.

The uterus consists of from ten to fifteen transverse loops extending laterally past the intestinal ceca and situated between the cirrus sac and the anterior end of the testes. There may possibly be more than a maximum of fifteen loops in some of the specimens; the uterus being so tightly packed and coiled that individual loops could not be determined. In some specimens uterine coils were between the vitellarian follicles and extended almost to the body wall. The development of the uterus and its extension laterally past the intestinal ceca is a constant and prominent characteristic of *Q. hassalli*. An elongate, glandular metraterm is present which varies in length from 0.42 to 1.02 mm. The metraterm may be 1/2 or as long as the cirrus sac.

The eggs (Fig. 12) are ovoid and vary in size from 0.012 to 0.022 mm. long by 0.008 to 0.016 mm. wide. The two polar filaments found on all ova emerging from the uterus of mature specimens were also observed on ova within the anterior

loops of the uterus. In some specimens, young ova within the posterior uterine loops were observed without filaments or with short rudimentary filaments.

DISCUSSION

Four species of *Quinqueserialis* have previously been considered valid: *Q. quinqueserialis* (Barker and Laughlin, 1911) Harwood, 1939; *Q. hassalli* (McIntosh & McIntosh, 1934) Harwood, 1939; *Q. wolgaensis* Skvortsov, 1934; and *Q. floridensis* Rausch, 1952. *Q. quinqueserialis* is commonly found in large numbers in both muskrats (*Ondatra*) and voles (*Microtus*). *Q. hassalli* has been reported from only voles (*Microtus*) with the two exceptions previously noted. *Q. wolgaensis* was described from *Arvicola* (= *Microtus*) in Russia. *Q. floridensis* was described from the round-tailed muskrat (*Neofiber*) in Florida.

The differentiation of these species has previously been based on number of papillae in ventral rows; form and distribution of vitellaria; length of metraterm in relation to length of cirrus sac; and egg size. This study has shown that all of these characters show considerable variation.

Other workers on species of notocotylids have disagreed on the importance of ventral papillae as a differentiating character. Braun (1892) and Lal (1935, 1936) stressed the importance of the number of rows of papillae, the number of papillae per row and the protrusibility of the papillae. However, Looss (1899), Baylis (1928), Duthoit (1931), Noble (1933), and Harwood (1939) disagree as to the importance of such characters. My conclusions were that since irregularities are found in the number of ventral papillae, this character is unreliable and should be used with the greatest discretion only when a large number of specimens are available for study.

Harwood (1939) and Ruiz (1946) in their reviews of the genus *Quinqueserialis* use characters which by this study are not satisfactory in differentiating species. Harwood (1939) and Rausch (1952b) have suggested that *Q. quinqueserialis*, *Q. wolgaensis* and *Q. hassalli* might actually be a single species.

Q. quinqueserialis is similar to *Q. hassalli* in many respects. However, in *Q. quinqueserialis* the transverse uterine coils do not extend laterally past the intestinal ceca and in *Q. hassalli* the uterine coils do extend laterally past the intestinal ceca and may extend into the area of the vitellaria to the body wall. This character which has not been stressed previously by authors appears to be a clear and constant difference between these two species. It is suggested that this character be considered the basis on which to distinguish the two species instead of vitellaria which have been shown to be too variable.

Q. wolgaensis was differentiated by Skvortsov (1934) by the shape of the body, the number of papillae, and the size of the vagina. Skvortsov was apparently not aware of *Q. hassalli* when he described *Q. wolgaensis*. He stated that only one American species, *Notocotylus quinqueserialis*, had five rows of ventral papillae. Morphological characters of *Q. wolgaensis* are identical to ones found in my specimens of *Q. hassalli*. The uterine coils of *Q. wolgaensis* as figured by Skvortsov, extend laterally past the intestinal ceca. Thus, *Q. wolgaensis* is considered a synonym of *Q. hassalli*.

Q. floridensis was described by Rausch (1952a) from the round-tailed muskrat, *Neofiber alleni nigrescens* Howell. He considered the relatively extreme lateral

extent of the uterine coils beyond the intestinal ceca, the absence of polar filaments of the eggs, restricted longitudinal extent of the vitellaria, and small body size to be unique and sufficient to distinguish his species from other species of *Quinqueserialis*.

A similar extreme lateral extent of the uterus does occur in *Q. hassalli* but not *Q. quinqueserialis*.

Through the courtesy of Dr. Robert Rausch, I have had the opportunity to examine specimens of *Q. floridensis*. In these specimens, I was able to observe the polar filaments of the eggs. Some of the eggs and their polar filaments are identical in shape and size to those of *Q. hassalli*. The length of the body and the size of the sucker of *Q. floridensis* are approximately the same as the smaller specimens of *Q. hassalli*. The testes, cirrus sac, ovary, metraterm are (proportionally) approximately one-half of the sizes of those found in the smaller specimens of *Q. hassalli*. The chief distinguishing character of *Q. floridensis* appears to be the extent of the vitellaria which are located almost wholly posterior to the uterine loops. *Q. hassalli* has vitellaria located in a longitudinal row, posterior and also lateral to the uterine loops. The shortest extent of vitellaria in *Q. hassalli* is similar to, but not identical with that of *Q. floridensis*.

The status of *Q. floridensis* as a valid species, based only on small body size and extent of vitellaria, seems to the author to be somewhat uncertain. Rausch (1952b) stated that in *Q. quinqueserialis* the specimens from the muskrats are relatively smaller than ones from voles. Since *Q. hassalli* has not been described from any muskrat, it may be that *Q. floridensis* are such specimens and that the differences are a result of host effect. However, *Q. floridensis* must remain a distinct species until feeding experiments or life cycle studies can show otherwise.

Differentiation of the three species of *Quinqueserialis* can be made as follows:

KEY TO THE SPECIES OF *Quinqueserialis*

1. Transverse loops of uterus not extending laterally past intestinal ceca .... *Q. quinqueserialis*
   Transverse loops of uterus extending laterally past intestinal ceca 2
2. Vitellaria extend from testes anteriorly to a point 2/3 or more the distance to the cirrus sac. *Q. hassalli*
   Vitellaria almost wholly posterior to uterine loops ..... *Q. floridensis*

Another species of NOTOCOTYLINAE resembles *Q. hassalli* except for ventral papillae. *Notocotylus noyeri* Joyeux, 1922, from *Arvicola* (= *Microtus*) was described as possessing only three rows of papillae. The similarity of this species to *Q. hassalli* plus the uniqueness in its taxonomic position are such that the possibility of its specific identity to *Q. hassalli* should be considered.

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EXPLANATION OF PLATE

All figures are of *Quinqueserialis hassalli*. They were all (except 11 and 13) drawn with the aid of a camera lucida, minor details and corrections being supplied freehandedly. Figures 11 and 13 are diagrammatic. Abbreviations: *ce*, cecum; *cs*, cirrus sac; *dr*, dorsal ridge; *met*, metraterm, *ov*, ovary; *t*, testes; *ut*, uterus; *vp*, ventral papillae; *vt*, vitellarium.

FIG. 1. Specimen from the pocket gopher, *Thomomys*.

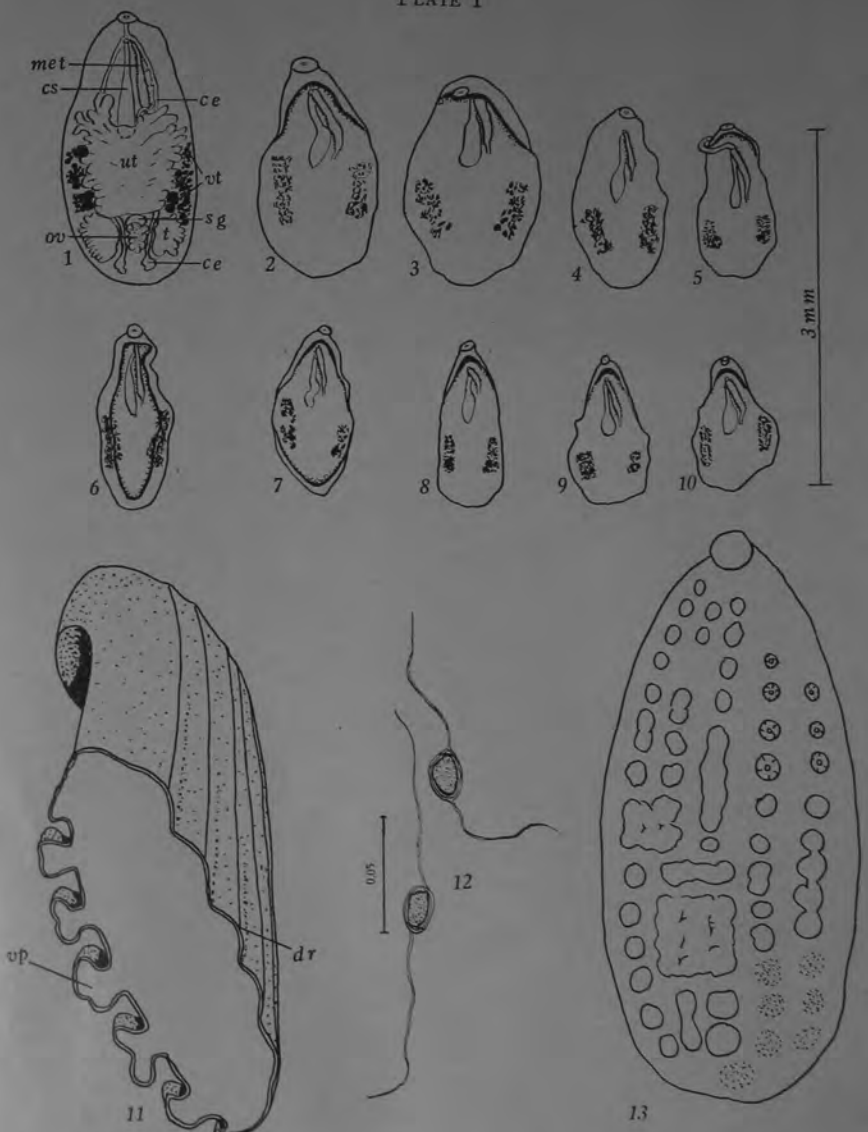
FIGS. 2 to 10. Specimens from species of meadow mice, *Microtus*, to show variation in size and vitellaria.

FIG. 11. A stereogram, showing the body form of the anterior half of a specimen with ventral papillae and dorsal ridges.

FIG. 12. Mature eggs with filaments.

FIG. 13. Diagram, showing all possible anomalous forms of ventral papillae: absence; rudimentary; sucker-like; double-headed; and fusion of two or more papillae.

PLATE I



Quinqueserialis Skwortzow, 1935

Syn. *Barkeria* Szidat, 1936

Generic diagnosis. — Notocotylidae, Notocotylinae:. Body elliptical or more elongate. Ventral glands in five longitudinal rows. Oral sucker practically terminal; ceca terminating near posterior extremity. Testes lateral to terminal portion of ceca. Vesicula seminalis externa tubular, winding in median field. Cirrus pouch elongated claviform. Genital pore median, close to intestinal bifurcation. Ovary intertesticular, with shell gland complex in front. Vitellaria follicular, in pretesticular lateral fields. Uterine coils transverse, may or may not extend laterally beyond ceca; metraterm well differentiated. Excretory system as in *Notocotylus*. Intestinal parasites of mammals.

Genotype: *Q. quinqueserialis* (Barker et Laughlin, 1911) (Pl. 98, Fig. 1187), syn. *Notocotylus urbanensis* of Harrah, 1922, partim, in *Ondatra zibethica, Microtus Pennsylvanicus pennsylvanicus, Zapus hudsonius;* U.S.A. and Canada.

Cercaria in *Gyraulus parvus* — Herber (1939, 40, 42).

Key to species + Skrjabin (1953).

Other species:

Q. floridensis Räusch, 1952, in *Neofiber alleni nigrescens;* Florida.

Q. hassalli (McIntosh et McIntosh, 1934), syn. *Notocotylus quinqueserialis* Harrah, 1922, nec Barker et Laughlin, 1911, in *Microtus p. pennsylvanicus, Zapus h. hudsonius;* U.S.A.

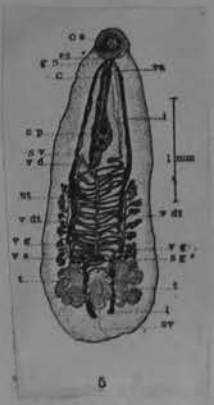
Q. wolgaensis Skwortzow, 1935, in *Arvicola terrestris;* Russia.

QUINQUESERIALIS

1911) SKVORTSOV, 1935

Notocotyle quinqueseriale (Barker and Laughlin, (Plate 1, Fig. 5).

Characters in general like those of genus. Ventral surface provided with five distinct longitudinal rows of wart-like papillae extending from anterior to posterior end, with 16 to 18 papillae in each row. Cuticula without spines. Length of body, 2.5 to 4.0 mm.; width 0.66 to 1.33 mm. Cirrus pouch elongated, extending from posterior margin of oral sucker to middle third of body. Vagina as long as cirrus pouch. Eggs light straw color, oval, with long polar filament at each end; 0.019 to 0.021 mm. long, 0.01 to 0.013 mm wide. Polar lid present. Most abundant parasite found; generally occurs in cecum.



СЕМЕЙСТВО *NOTOCOTYLIDAE* LÜHE, 1909

Paramonostomum cladocoelium sp. nov.

(рис. 1) Belopolskaya, 1968

Хозяин: бурокрылая ржанка — *Charadrius dominicus* Mull.
Локализация: слепые отростки кишечника.

Место и время обнаружения: устье р. Лены (Чай-Тумусе), 7.VIII, 9.VIII 1957 г.

Частота встречаемости: у 2 молодых куликов из 5 исследованных, 45 взрослых бурокрылых ржанок не были заражены этими трематодами.

Описание вида (типовой экземпляр). Тело вытянутое, боковые края почти параллельны, передний конец заострен, задний закруглен. Шипики покрывают тело примерно до середины. Длина тела 0,907 мм, ширина тела 0,280 мм на уровне желточников. Терминальная ротовая присоска округлая, диаметром 0,070 мм, длина пищевода 0,075 мм, ветви кишечника имеют дивертикулы, развитые с внутренней стороны.

Лопастные семенники 0,135 мм длины и 0,081 мм ширины, сумка цирруса 0,199 мм длины и 0,052 мм ширины, половое отверстие лежит за бифуркацией кишечника, наружный семенной пузырек имеется.

Яичник лопастной, 0,090 мм длины и 0,074 мм ширины, петли матки расположены перпендикулярно продольной оси тела и почти доходят до дна сумки цирруса, метратерм 0,157 мм длины, не все петли матки заполнены яйцами, размеры яиц 0,020 × ×0,013 мм, желточники начинаются позади середины тела, их протяженность 0,206 мм.

Размеры паратипов: длина тела 0,896—1,106 мм, ширина 0,268—0,302 мм, диаметр ротовой присоски 0,061—0,070 мм, длина пищевода 0,075—0,090 мм. Лопастные семенники 0,124—0,137 ×0,064—0,080 мм, сумка цирруса 0,186 — 0,216 × 0,031—0,036 мм, яичник 0,059—0,064 ×0,070 —0,086 мм, метратерм 0,148 — [illegible] мм, желточники [illegible] яйца 0,018—0,021 ×0,011 —0,013 мм.

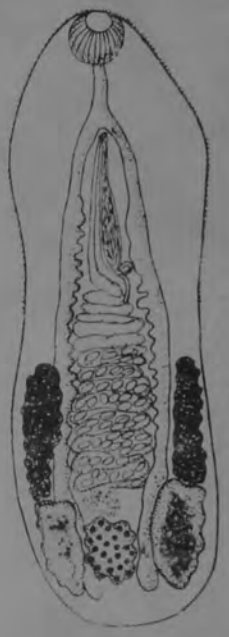


Рис. 1. *Paramonostomum cladocoelium* sp. nov. из бурокрылой ржанки, типовой экземпляр

Дифференциальный диагноз: вновь описываемый вид характеризуется наличием дивертикулов кишечника. Среди представителей рода *Paramonostomum* известны два вида, кишечник которых обладает дивертикулами: *P. actitidis* Cable, Connor et Balling, 1960 от кулика — *Charadrius hiaticula semipalmatus*, добытого в Пуэрто-Рико, и *P. histrionici* Ching, 1961 от *Histrionicus histrionicus pacificus*, добытого в штате Вашингтон, США. При меньших размерах тела *P. actitidis* имеет более длинную сумку цирруса и матку меньшей протяженности, чем *P. cladocoelium*, кроме того, у *P. actitidis* дивертикулы расположены с наружной стенки кишечника, а у *P. cladocoelium* с внутренней. Значительно более крупный *P. histrionici* имеет иные соотношения длины сумки цирруса, метратерма и протяженности матки. У *P. histrionici* метратерм составляет $^1/_2$ длины сумки цирруса, а у *P. cladocoelium* — более $^3/_4$ длины сумки цирруса. Голотип вида хранится в коллекции Гельминтологической лаборатории АН СССР.

Paramonostomum microovatum sp. nov.
(рис. 3) Belopolskaya, 1968

Хозяин: краснозобик — *Calidris testacea* Pall.

Локализация: слепые отростки кишечника.

Место и время обнаружения: [illegible], Калининградская обл, Куршская коса, 30.IX 1959.

Частота встречаемости: у одного молодого краснозобика из двух исследованных найдено 9 трематод.

Описание вида (типовой экземпляр): Длина тела 1,4[illegible] ширина 0,470 мм. Ротовая присоска деформирована, ее диаметр 0,[illegible] мм, пищевод 0,078 мм, ветви кишечника оканчиваются за семенниками. Семенники слабо лопастные, 0,108—0,11[illegible]×0,064—0,068 мм, наружный семенной пузырек слабоизвитой, сумка цирруса короткая — 0,237 мм, она содержит семенной пузырек, циррус 0,108 мм длины и 0,027 мм ширины. Циррус вооружен притупленными шипиками, половое отверстие лежит за бифуркацией кишечника. Яичник неправильной формы, перед ним располагается тельце Мелиса, размер яичника 0,048×0,054 мм, некоторые петли матки налегают на ветви кишечника, метратерм слабо мускулистый, почти такой же длины, как сумка цирруса (0,240 мм). Желточники начинаются несколько позади середины тела. Яйца мелкие, 0,015—0,016×0,009—0,010 мм, филаменты развиты слабо и очень тонкие, их длина 0,064 мм.

Размеры паратипов: длина тела 0,936—1,107 мм, ширина 0,313—0,347 мм, диаметр ротовой присоски 0,048—0,054 мм, пищевод 0,048—0,056 мм, длина сумки цирруса 0,216—0,324 мм, желточники начинаются на уровне середины тела или несколько позади ее.

Дифференциальный диагноз: к вновь описываемому виду *P. microovatum* наиболее близки *P. microstomum* Moghe, 1932 и *P. musculosum* (описание приведено в этой же статье), но *P. microovatum* отличается от первого вида наличием пищевода, расположением желточников, которые начинаются на уровне середины тела и размером яиц, они в три раза меньшей длины, чем у *P. microstomum*; от второго вида *P. microovatum* отличается толщиной цирруса и наличием бугорчатых шипиков, слабо развитой мускулатурой в стенке метратерма и размерами филаментов яиц, которые почти в три раза короче, чем у *P. musculosum*.

Тип вида хранится в Зоологическом институте АН СССР.

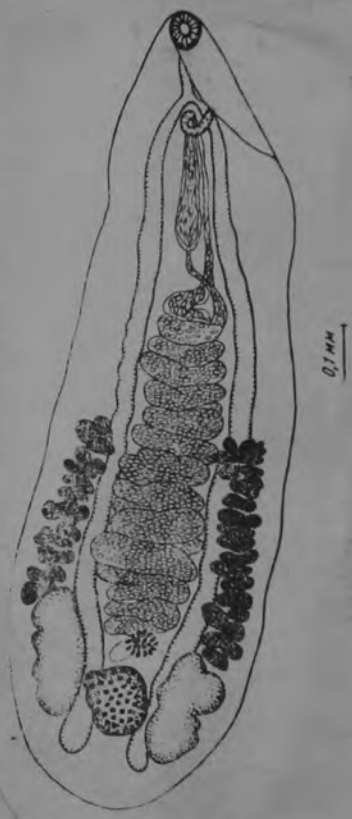


Рис. 3. *Paramonostomum cladocoelium* sp. nov. из краснозобика, типовой экземпляр

Paramonostomum musculosum sp. nov.

(рис. 2) Belopolskaya, 1968

Хозяин: краснозобик — *Calidris testacea* Pall.
Локализация: слепые отростки кишечника.

Рис. 2. *Paramonostomum [illegible]* sp. nov. из краснозобика, типовой экземпляр

Место и время обнаружения: устье р. Лены (Чай-Тумусе[illegible] VIII 1957 г.

Частота встречаемости: у одного молодого краснозобика из трех исследованных.

Описание вида (типовой экземпляр): длина тела 1,13 мм, ширина 0,29[illegible] мм, ротовая присоска терминальная, ее диаметр [illegible] мм, длина пищевода 0,108 мм, ветви кишечника оканчиваются за семенниками. Семенники округлые, слабо лопастные, наружный семенной мешок сильно извитой, сумка цирруса 0,216 мм длины, циррус длинный (0,140 мм), тонкий (0,016 мм толщины) без шипов.

Яичник крупный, края его слегка изрезаны, перед ним находится тельце Мелиса. Петли матки ограничены ветвями кишечника, метратерм сильно мускулистый, его длина 0,21[illegible] мм. Яйца 0,019—0,020 × 0,014 мм, с длинными, хорошо заметными филаментами (0,221 мм). Желточники начинаются примерно на уровне $^3/_5$ длины тела от его переднего конца.

Размеры паратипов: 1,34—1,52 мм длины и 0,358—0,393 мм ширины. Ротовая присоска 0,064—0,081 мм, пищевод 0,110—0,118 мм, длина сумки цирруса 0,324—0,343 мм, длина метратерма 0,324—0,340 мм. Яйца 0,018—0,021 × 0,013—0,014 мм.

Дифференциальный диагноз. От большинства видов *Paramonostomum* описываемый вид отличается сильно мускулистой стенкой метратерма и его длиной, которая равна длине сумки цирруса.

У *P. microstomum* Moghe, 1932 длина метратерма и сумки цирруса почти равны, но у этого вида нет пищевода и яйца в два с половиной раза крупнее, чем у *P. musculosum*.

Тип вида хранится в коллекции Гельминтологической лаборатории АН СССР.

QUINQUESERIALIS ZIBETHICAI ~~sp. nov.~~ S. P. GUPTA, 1962

Body elongate, 4.3 mm. long and 1.25 mm. wide, the anterior end attenuated and the posterior end rounded with thin lateral margins: Cuticle smooth and without spines. Ventral glands papilliform, arranged irregularly in five longitudinal rows. Oral sucker terminal, 0.16 mm in diameter. Pharynx absent. Oesophagus short, 0.15 mm. long. Intestinal caeca with slight rugae, the terminal portion of the caeca passing between the testes and ending immediately posterior to the testes.

Genital pore at 0.33 mm. from anterior end, median and close to the intestinal bifurcation.

Excretory pore median situated ventrally, 0.156 mm. from the posterior extremity.

Testes oval, lobed, symmetrical, lateral to the terminal portion of caeca and close to the posterior extremity. The left testis measures 0.47 × 0.27 mm. and the right testis, 0.49 × 0.32 mm. in size. Cirrus sac elongated, Claviform. measuring 0.98 × 0.18 mm. Vesicula seminalis externa tubular, coiled, lying medially free in the parenchyma at the base of cirrus sac. Vesicula seminalis interna coiled, 0.21 mm. long, occupying the basal region of cirrus sac. Pars prostatica, measuring 0.32 × 0.07 mm., surrounded by prostate glands. Ductus ejaculatorius, 0.45 mm. long. Cirrus not protruded.

Ovary oval, measuring 0.19 × 0.14 mm.-median, intertesticular situated at 0.35 mm. from the posterior extremity. Shell (Mehlis) gland in front of the ovary, 0.14 mm. in diameter. Vitelline glands follicular extracaecal and extending from the anterior margin of the testes upto a point 1.87 mm. from the posterior end of the body. ie. a little posterior to the middle of the body. Uterus with transverse loops, extending from the anterior end of ovary for a short distance beyond the lateral margin of intestinal caeca and vitellaria and then between the caeca as far as the cirrus sac. It then runs as a thin walled tube on the left side of the cirrus sac to open at the genital pore. Metraterm well differentiated, muscular, 0.41 mm. long. Eggs measure 0.02-0.024 × 0.008-0.012 mm. in size with a polar filament at each pole.

Material.	Only one specimen.
Host :	Muskrat (*Ondatra zibethica*)
Location :	duodenum.
Locality :	Ile Perrot, Quebec, Canada

Only 3 species of the genus *Quinqueserialis* have been recorded so far from mammals, *i.e.*, *Q. quinqueserialis* of the muskrat (*Ondatra*) and voles (*Microtus*), *Q. hassalli* (syn. *Q. wolgaensis* (Skvortsov, 1934) from voles in the U. S. A., Canada and Russia and *Q. floridensis* from a round tailed muskrat (*Neofiber*) in Florida. The present form was recovered from the duodenum of a muskrat, *Ondatra Zibethica* from Canada and is new to science.

Quinqueserialis zibethicai sp. nov. Ventral view.

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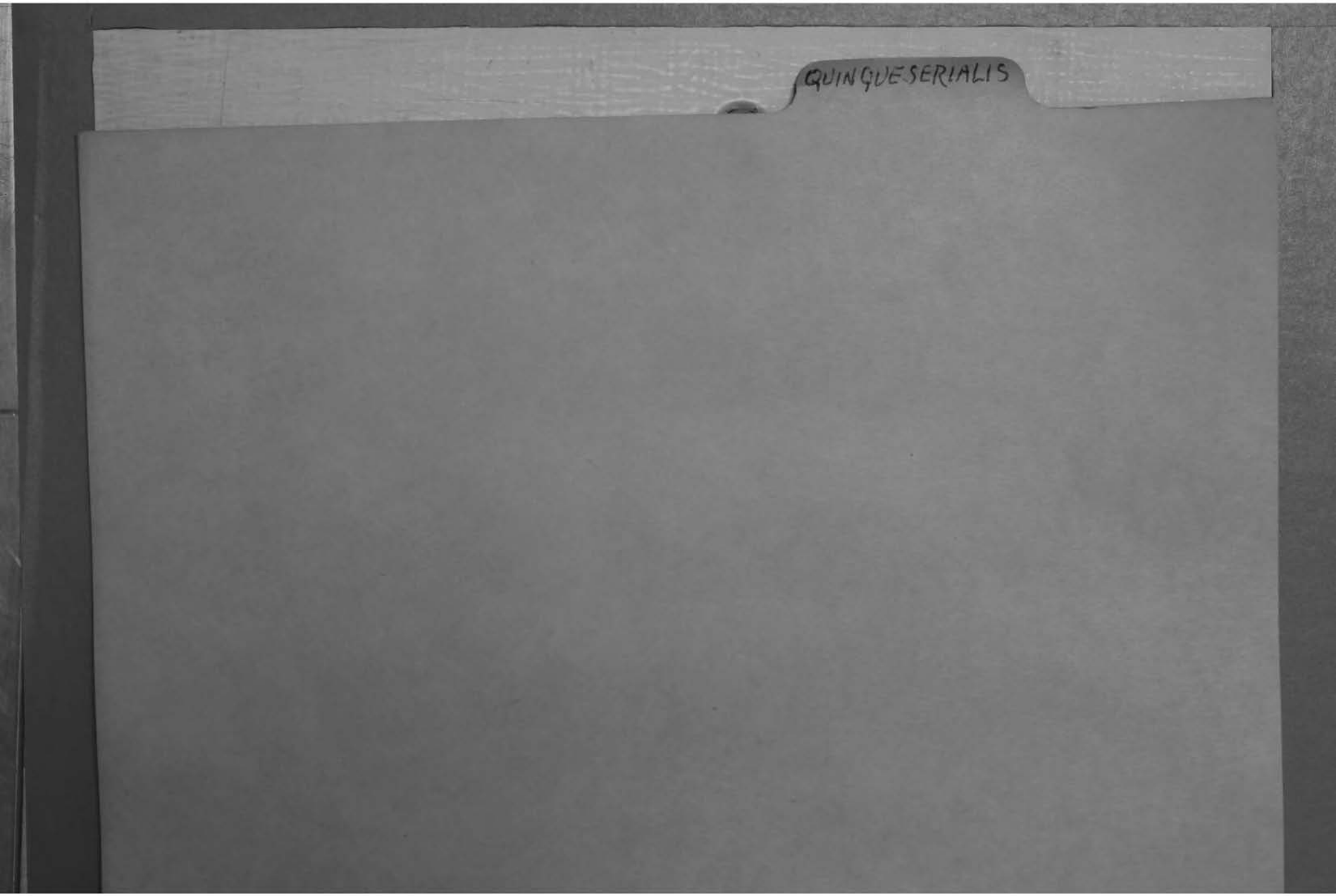
Discussion: Quinqueserialis zibethicai sp. nov. resembles *Q. quinqueserialis*, *Q. hassalli* and *Q. floridensis* in that it possesses five longitudinal rows of glands on ventral surface of body. It differs from *Q. hassalli* in the extent of vitelline glands to a point posterior to the middle region of the body. It differs from *Q. floridensis* in its larger size, in vitellaria arranged in a linear series, which are mostly extracaecal and in its extracaecal uterine coils extending for only a short distance and not reaching the cirrus sac.

Q. zibethicai resembles closely *Q. quinqueserialis* found in the same host muskrat in Canada but differs from it in extracaecal position of uterine coils and the extent of vitelline glands. *Q. zibethicai* resembles *N. filamentis* in the extension of vitelline glands, but differs from it in having 5 irregular longitudinal rows of ventral glands and in having extracaecal uterine coils. *Q. zibethicai* can also be distinguished from *P. echinum* and *P. pseudalveatum* by the presence of longitudinal rows of glands on the ventral surface of its body and in having extracaecal uterine coils.

Yamaguti (1958) considered *N. urbanensis* to be synonym of *Q. quinqueserialis* and *Q. wolgaensis* distinct from *Q. hassalli*. The author considers *N. urbanensis* as distinct from *Q. quinqueserialis* because it possesses three longitudinal rows of glands on ventral surface of the body. *N. urbanensis* resembles *N. filamentis* in the extent of vitelline glands, in having intercaecal uterine coils and 3 longitudinal rows of glands on the ventral surface of the body. Hence *N. urbanensis* is considered synonym of *N. filamentis* instead of *Q. quinqueserialis*. Further the author agrees with Smith (1954) in considering *Q. wolgaensis* synonym of *Q. hassalli*.

Key to the species of the genus QUINQUESERIALIS SKvorstov, 1934.

1. Vitelline glands extend upto a little posterior to the middle of the body..... *Q. zibethicai*. sp. nov.
   Vitelline glands extend either a little anterior or posterior to the cirrus sac.....2.
2. Transverse loops of uterus posterior to intestinal caeca not extending laterally..... *Q. quinqueserialis*.
   Transverse loops of uterus posterior to the intestinal caeca extending laterally.....3.
3. Vitellaria of large size and grouped in clusters upto the level of the base of the cirrus sac..... *Q. hassalli*.
4. Vitellaria arranged in two longitudinal groups of 12 to 15 follicles posterior to the uterine coils and anterior to the testes..... *Q. floridensis*.


QUINQUESERIALIS

Tristriata Belopolskaia, 1953

Generic diagnosis. — Notocotylidae, Notocotylinae: Body small, elliptical with three (one median and two submedian), parallel, longitudinal series of two to four rod-shaped ridges each on ventral surface, the anterior part of which is concave. Oral sucker subterminal, very large. Esophagus short, ceca straight, close to median line. Testes lobed, symmetrical just outside ceca at posterior extremity. Seminal vesicle narrow, tubular, winding. Cirrus pouch claviform, median; cirrus spinose, long, stout. Genital pore immediately behind intestinal bifurcation. Ovary median, intercecal, in testicular zone, with shell gland complex in front. Vitelline follicles grouped immediately in front of testes. Uterus coiled transversely between shell gland and seminal vesicle, overreaching ceca laterally; eggs small, filamented. Parasitic in birds.

Genotype: *T. anatis* Belopolskaia, 1953 (Pl. 73, Fig. 899) in *Clangula clangula;* Russia.

TRISTRIATA

Uniserialis n. g. Beverley-Burton, 1958

Diagnosis: Notocotylidae Lühe, 1909; body flattened, small, rather pointed at the anterior end but rounded posteriorly; cuticle aspinose. Ventral surface with a single median longitudinal row of sessile glands. Oral sucker terminal, pharynx absent; esophagus short leading to intestinal bifurcation, ceca simple ending blindly near posterior extremity. Ventral sucker absent. Common genital pore ventral, median, anterior to intestinal bifurcation, near oral sucker. Two lobed testes, posterior and extracecal in position; external vesicula seminalis well developed. Cirrus sac elongate with internal vesicula seminalis; cirrus unarmed. Ovary median, between the testes, immediately posterior to Mehlis' gland; receptaculum absent. Uterus with ascending limb only, forming intracecal transverse slings. Metraterm long, with thickened walls and opening at the genital pore. Vitellaria follicular, in 2 lateral extracecal bands, running forward from anterior border of testes. Excretory pore dorsal and posterior, receiving the 2 main excretory vessels. Eggs numerous small and operculate with long polar filaments. Adults in intestinal ceca and bursa Fabricius of birds. Genotype: *U. gippyensis* n. sp.

Uniserialis gippyensis n. sp. Beverley-Burton, 1958

Specific description: With characters of the genus. Body small, 1.37–2.54 long and 0.63–1.27 in maximum width at level of transverse uterine coils. Ventral surface with single median longitudinal row of 5 large sessile glands which are coral pink and conspicuous in unfixed material. Anterior gland situated in posterior part of anterior third of body overlying base of cirrus sac; second gland immediately behind first. Third or median gland lying just inside posterior half of body, widely separate from second and fourth glands. Latter situated in posterior third of body, immediately anterior to fifth or posterior gland which is ventral to ovary. Anterior and posterior glands of series noticeably smaller than other glands; median gland largest. In all specimens examined all glands are more or less protruded and have transverse slit-like openings. Oral sucker terminal, globular or sub-globular, measuring 0.12–0.17 × 0.12–0.18; mouth directed forwards. Short slender esophagus up to 0.13 in length, leads to bifurcation of gut. Intestinal ceca extend to within 0.14 of the posterior end of body. Ceca diverge in region of transverse uterine coils, converging to pass between testes; in post-testicular region ceca slightly distended and more widely separate. Testes longer than wide, extra-cecal and lying in posterior region of body. Right testis 0.19–0.51 × 0.17–0.28, and left 0.19–0.42 × 0.15–0.36. Both testes lobed on outer margins; inner margins with less pronounced lobation. External vesicula seminalis well developed and dorsal to uterus. Distal portion of external vesicula seminalis lying in longitudinal axis of body but anteriorly forming 2 or 3 large loops before passing into cirrus sac. Cirrus without spines or papillae and lying in an elongate, clearly demarcated cirrus sac which measures 0.44–0.80 × 0.07–0.14. Base of cirrus sac situated in second third of body. Cirrus sac also containing internal vesicula seminalis and pars prostatica. Ovary slightly lobed 0.11–0.24 × 0.10–0.24 lying in posterior region of body between testes. Mehlis' gland just anterior to ovary in position and measuring 0.06–0.12 × 0.08–0.15. No receptaculum seminis. Uterus with ascending limb and prominent transverse slings which are entirely intracecal. Total number of uterine slings varying between 8 and 13, number anterior to vitellaria between 3 and 5. Metraterm nearly as long as cirrus sac; when full of eggs extremely difficult to see, but when empty or containing only a few eggs thickened walls are visible. Metraterm and cirrus sac opening at common genital pore which is slit-like and situated, anterior to the intestinal bifurcation, near the oral sucker and only 0.09–0.19 from anterior margin of body. Vitellaria composed of distinct, irregular follicles measuring 0.02–0.03 × 0.03–0.06. Vitelline follicles arranged in longitudinal extracecal bands on either side of body, confined to posterior half of body and with posterior follicles overlying anterior border of testes. Vitelline ducts passing between testes and posterior uterine slings to meet in the midline, dorsal to Mehlis' gland. Excretory pore dorsal and posterior lying mid-way between posterior margin of body and ovary. Two excretory canals run from esophageal region, parallel anteriorly with ceca, to small excretory bladder lying ventral to excretory pore. Eggs thin-shelled, colorless and operculate, 18–20 × 11–13 microns and bearing polar filaments up to 0.113 long.

Host: Anas platyrhyncha platyrhyncha L.

Locations: Intestinal ceca and bursa Fabricii.

Locality: Nacton Decoy, near Ipswich, Suffolk, England.

Co-type: To be deposited in the collection of the British Museum (Natural History).

DISCUSSION

This new genus shows affinities with other genera of the Notocotylidae Lühe, 1909, especially those of the sub family Notocotylinae Kossak, 1911, which includes *Notocotylus* Diesing, 1839, *Catatropis* Odhner, 1905, *Paramonostomum* Lühe, 1909, *Quinqueserialis* Skvorzov, 1934, *Hofmonostomum* Harwood, 1939 and *Tristriata* Belopolskaia, 1953.

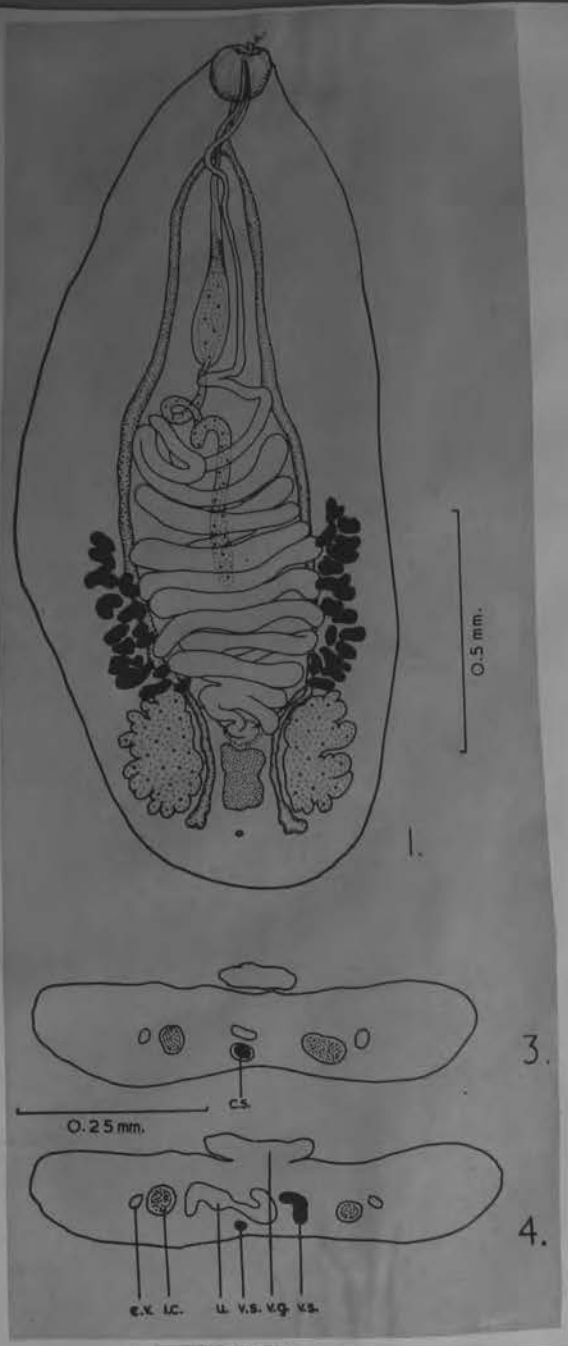
Diesing (1839) erected the genus *Notocotylus* for specimens of "typical" notocotylid internal anatomy and with 3 longitudinal rows of ventral glands. As Dubois (1951) pointed out there was still considerable confusion over the genus until Odhner (1905) erected the genus *Catatropis* for those notocotylids with a mid-ventral keel, on either side of which is a row of glands. Later workers, Noble (1933), Johnston (1928) and Skrjabin (1953), disregarded the presence of a ventral keel as a generic feature in *Catatropis* and attempted the separation of *Catatropis* and *Notocotylus* using differences in the evaginability of the ventral glands and in the ratio of the measurements of the cirrus sac and metraterm. The genus *Paramonostomum* was erected by Lühe (1909) for those species which have no ventral glands or ridges. As noted by Harwood (1939), it is probable that several species described as *Paramonostomum* are actually *Catatropis*. The genus *Quinqueserialis* Skvorzov, 1934 is based on the presence of 5 rows of ventral glands. *Hofmonostomum* Harwood, 1939 has weak glands in the median row which open onto a keel-like ridge; there are no lateral glands and the vitellaria extend posterior to the testes. The most recently described genus, *Tristriata* Belopolskaia, 1953 has 3 large ventral ridges.

Uniserialis gippyensis bears a superficial resemblance to *Notocotylus skrjabini* Ablassov, 1953, but differs from this species not only in the pattern but also in the number of the ventral glands, the position of the common genital pore, and the relative measurements of the cirrus-sac and metraterm.

While the validity of genera based on the differences of the ventral glands and/or ridges has been questioned by Baylis (1928), Dubois (1931) and Harwood (1939), there does not appear to be at present an alternative character which can be used for the separation of the genera mentioned above. Szidat & Szidat (1933) and Szidat (1935) showed that in the genus *Notocotylus* the *pattern* of the ventral

glands is more or less constant for any given species. Both Harwood (1939) a Skrjabin (1953) rely on the pattern of the glands and ridges in their keys for t identification of the genera of the sub-family Notocotylinae.

The present material is unlike any of the above genera as it has a single row clearly separate, sessile glands. Therefore a new genus *Uniserialis* is erected wi *U. gippyensis* as type species.



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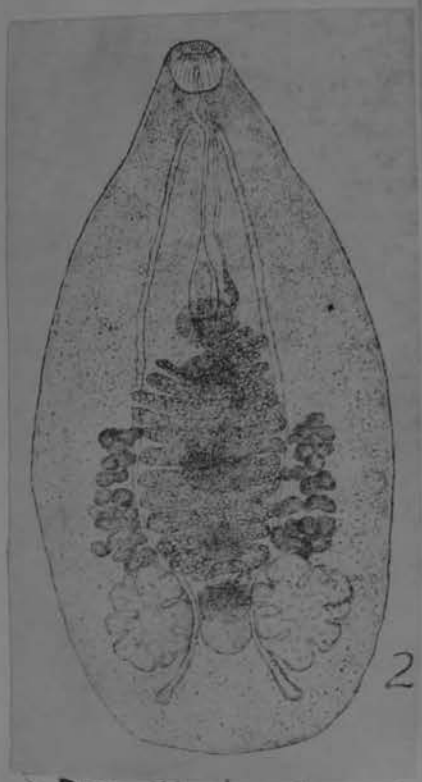
Notocotylidae

Uniserialis gippyensis Beverly-Burton, 1928



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From Stunkard, 1967

Uniserialis breviserialis Stunkard, 1967

Adult (Fig. 1)

The body is ovate, much flattened, more pointed anteriorly and rounded posteriorly. It is convex dorsally, concave ventrally, with the edges of the body turned ventrad and mediad. Fixed and stained specimens measure 1.19 to 2.54 mm. in length and 0.56 to 1.66 mm. in width. The cuticula is thin; fine spines were observed on the ventral surface of living worms but they do not show on fixed and stained specimens. The body wall is delicate, the musculature is weak; the longitudinal muscles are best developed. The ventral surface bears five median, protrusible glands that are conspicuous in living specimens. They are circular to oval in outline with transverse slit-like openings. The anterior and posterior glands measure 0.12 to 0.15 mm. in diameter; the three middle ones are somewhat larger and measure 0.16 to 0.20 mm. in diameter. The most anterior gland is situated about its diameter posterior to the base of the cirrus sac; the second gland is at the level of the anterior ends of the vitellaria; the third gland is near the middle of the vitelline zone; the fourth gland is at or slightly posterior to the level of the caudal ends of the vitellaria, and the most posterior gland is at the ovarian level. The lateral glands are smaller than the median ones; they measure 0.09 to 0.12 mm. in diameter, and are situated in the intervals between the median ones. The three anterior ones are in the fields of the digestive caeca and the most posterior glands are ventral to the antero-median lobes of the testes.

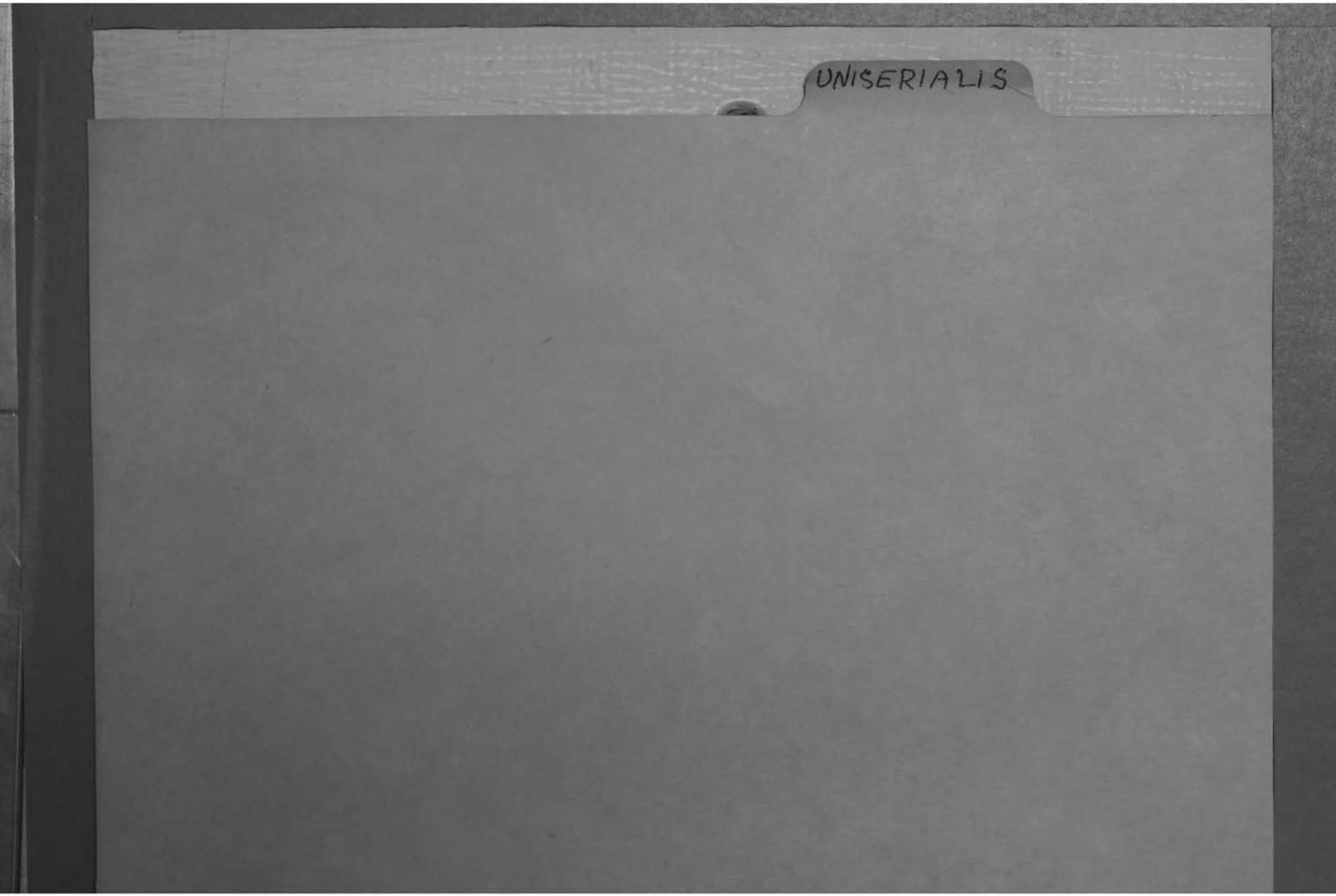
The excretory pore is dorsal, about midway between the ovary and the posterior end of the body. The bladder is small and the collecting ducts extend forward, forming a loop that crosses the body anterior to the cerebral ganglia. Dendritic branches from the longitudinal ducts form a complex network of excretory channels.

The oral sucker is terminal, 0.13 to 0.20 mm. in diameter; the mouth is slightly ventral; the esophagus is short, about the length of the sucker; the caeca extend posteriad, lateral to the uterine loops, turn mediad to pass between the testes and ovary, and end blindly posterior to the testes.

The testes are situated in the extracaecal areas near the posterior end of the body. They are deeply lobed, and vary in size from 0.12 by 0.10 mm. to 0.50 by 0.375 mm. Sperm ducts arise at the antero-median faces and unite a short distance anterior to Mehlis' gland to form the vas deferens which passes anteriad, dorsal to the uterus. At about the level of the anterior ends of the vitellaria, it expands to form a coiled external seminal vesicle which continues the forward course to the cirrus sac. A coiled internal seminal vesicle occupies the posterior third to one-half of the cirrus sac and is continued by the ejaculatory duct; both are enclosed in prostatic cells. The cirrus sac leads to the genital pore, located anterior to the cerebral ganglia and at or near the level of the posterior border of the oral sucker. The cirrus sac is dorsal to the metraterm and measures from 0.19 to 0.40 mm. in length and 0.055 to 0.15 mm. in greatest width. It is located in the anterior fourth of the body.


1

The ovary is lobed, usually longer in the antero-posterior axis and increases in size as the worm matures. In a young specimen it may be 0.16 by 0.072 mm. and in a large, fully mature worm it may be 0.28 by 0.20 mm. The oviduct arises at the antero-dorsal margin and receives a common vitelline duct as it enters Mehlis' gland, which is somewhat smaller and immediately anterior to the ovary. There is no seminal receptacle and the initial coils of the uterus are filled with spermatozoa. The uterus passes forward in intercaecal, transverse loops, 15 to 25 in number, to communicate with the metraterm. The metraterm is somewhat shorter than the cirrus sac, is ventral in position, has a weak muscular wall, and opens at the genital pore posterior to the opening of the cirrus sac. The vitellaria consist of 15–20 discrete, irregularly shaped follicles which occupy the extracaecal areas from the testes to the level of the external seminal vesicle. They extend through a distance of 0.22 to 0.62 mm. and in large part are situated in the middle third of the body. Collecting ducts course posteriad along their median faces and at the posterior end of the vitellaria pass mediad, ventral to the caeca, then turn dorsad, joining above Mehlis' gland to form a vitelline receptacle from which the short common duct leads to the oviduct. The eggs are operculate, 0.019 to 0.020 mm. long, 0.011 to 0.013 mm. wide, provided with long polar filaments, and embryonated when passed.


UNISERIALIS

The Notocotylidae, is a family of trematodes composed of five genera and found in the alimentary canal of aquatic birds and mammals, ~~are trematodes~~ They are characterized by the absence of a ventral sucker, (the acetabulum), the absence of a pharynx, ovary located between testes, testes usually lateral to ceca; simple, long, separately ending ceca, transverse, horizontal, looped uterus, eggs with a long filament at each end, and usually three longitudinal rows of unicellular glands on the ventral surface.

A whistling swan, Cygnus columbianus, examined this spring contained a number of notocotylid trematodes which were identified as Paramonostomum elongatum (Yamaguti) (one specimen) and Notocotylus lineaus (Rudolphi, 1819) Szidat, 1936, (about fifteen specimens). Both species are members of the sub-family Notocotylinae.

The genus Paramonostomum is distinguished from ~~the~~ related genera by the absence of ventral glands, peculiar and characteristic structures occurring in many Notocotylidae. The single specimen of Paramonostomum collected agreed exactly with a description of Paramonostomum elongatum, Yamaguti, 1934. Previously this species has been only known from a swan in Korea, Olar bewicki jaukowskii. This species differs from the others collected here by its greater size, relative longer metraterm in proportion to the cirrus pouch (2/3 length of cirrus sac), length of cirrus pouch in proportion to the length of the body (extending to near middle of body), the absence of evidence that ventral glands were present, genital pore caudal to bifurcation of intestinal ceca, and the length of the vitellaria occupying one fourth (1/4) the body length.

The identification of the other specimens is somewhat uncertain. There is reason to believe that the ventral glands are often difficult to observe, especially in specimens which are dead when collected. None could be seen on any of our trematodes, except for one specimen where only traces of glands could be seen. Since the glands are

always observable, it seems that this characteristic is merely one of doubtful value. in distinguishing species. Therefore, it is necessary to use other distinguishing characteristics in identifying these specimens. They seemed to agree most closely with Notocotylus linearis (Ruldolphi, 1819) Szidat, 1936, fitting the description by Szidat, except the ventral glands were not visible. This trematode is relatively smaller than P. elongatum, the metraterm measured one third the length of the cirrus pouch, cirrus sac extend to the beginning of middle third of body, genital pore posterior to bifurcation of the ceca, and the vitellaria occupied one third the body length. Hitherto, this species has been reported from the ceca of the plover, Vanellus cristatus in (Germany) Europe.

Notocotylus attenuatus is a common species from ducks, geese, and swans in Europe and is known from ducks and geese in this country. It differs from N. linearis in being larger and in that the vagina is about one half (½) the length of the cirrus sac rather than one third(1/3). N. dafilae Harwood, 1939, from ducks in this country is about the same size as our specimens, but in this species also the metraterm is one half (½) the length of the cirrus sac.

The last parasite to be reported as a new location record is Notocotylus regis, Harwood, 1939 from the rail in Nebraska, Rallus elegans. It has been formerly reported from Texas. The ovoid body shape easily distinguishes it from most other members of the genus Notocotylus. The metaterm is two thirds (2/3) as long as cirrus pouch, genital pore mid-cephalic to the intestinal bifurcation, cirrus sac one fourth (¼) length of body, and vitellaria occupy one fourth (¼) body length.

In summary two new host records are reported, namely N. linearis and P. elongatum from the whistling swan, and a new locality, record of N. regis from the rail of Nebraska;