

***Selfcoelum limnodromi* n. gen., n. sp. (Digenea: Cyclocoelidae: Cyclocoelinae) from the long-billed dowitcher, *Limnodromus scolopaceus* (Charadriiformes: Scolopacidae) from Oklahoma, U.S.A.**

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Abstract

Eleven specimens of a new genus of cyclocoelid, *Selfcoelum limnodromi* n. gen., n. sp. (Digenea: Cyclocoelidae: Cyclocoelinae) from the air sacs of a long-billed dowitcher, *Limnodromus scolopaceus*, collected from the Cheyenne bottoms in Oklahoma and deposited at the Howard W. Manter Laboratory, University of Nebraska by Dr. Teague Self, former professor, Department of Zoology, University of Oklahoma, Norman, Oklahoma were examined. The new genus has an intertesticular ovary placing it in Cyclocoelinae. It is most similar to species of *Morishitium* and *Neohyptiasmus* in having a postpharyngeal genital pore and vitelline fields that are not confluent posteriorly. However, unlike species of either of these 2 genera, the ovary of *S. limnodromi* n. gen., n. sp. forms a triangle with the testes as is found in species of *Cyclocoelum* where the genital pore is prepharyngeal rather than postpharyngeal. *Selfcoelum* n. gen. further differs from *Morishitium* by having uterine loops that surpass the ceca and vitelline fields laterally approaching the body wall instead of being intercecal, and from *Neohyptiasmus* by having testes that are rounded and entire instead of being lobed. A revised key to the Cyclocoelinae is provided to include the 2 additional genera that have been recently described from North America, *Neoallopys* and *Selfcoelum*.

Key words: Cyclocoelidae; Cyclocoelinae; Digenea; Dowitcher; Galveston; *Limnodromus scolopaceus*; *Neoallopys*; Scolopacidae; Texas; Trematoda; U.S.A.

Introduction

The long-billed dowitcher, *Limnodromus scolopaceus* (Say, 1823) (Scolopacidae), is a relatively uncommon scolopacid wading bird found in mud flats, tidal pools and inland flooded regions of North America ranging from Alaska and northwestern Canada, and northeastern Siberia to as far south as Guatemala (Rappole & Blacklock 1994). Until 1950 *L. scolopaceus* and the short-billed dowitcher, *Limnodromus griseus* (Gmelin, 1789) were considered to be the same species (American Ornithologist's Union 1983). Although there has not previously been an endohelminth parasite reported from *L. scolopaceus*, Rankin (1939) described *Maritrema ovatum* Rankin, 1939 from the intestine of *L. griseus* in North America.

Three subfamilies are currently recognized in Cyclocoelidae Stossich, 1902 based largely on the position of the ovary relative to the testes: Cyclocoelinae Stossich, 1902 where the ovary is intertesticular; Haematotrephinae Dollfus, 1948 where the ovary is pretesticular and Ophthalmophaginae Harrah, 1922 where the ovary is posttesticular (Kanev et al. 2002). Kanev et al. (2002) recognized 7 genera of Cyclocoelinae Stossich, 1902: *Allopyge* Johnston, 1913 (type species *Allopyge antigones* Johnston, 1913 described from the small intestine [likely body cavity or respiratory system] of the Sarus crane, *Grus antigone* [Linnaeus, 1758], reported as *Antigone australasiana* Linnaeus, 1758 from Queensland by Johnston 1913); *Cyclocoelum* Brandes, 1892 (type species *Cyclocoelum mutabile* [Zeder, 1800], described as *Monostoma mutabile* Zeder, 1800 from the abdominal cavities of the common moorhen, *Gallinula chloropus* Linnaeus, 1758, and the Eurasian coot, *Fulica atra* Linnaeus, 1758, from Germany by Zeder 1800); *Hyptiasmus* Kossack, 1911 (type species *Hyptiasmus arcuatus* [Brandes, 1892], described as *Cyclocoelum arcuatum* Brandes, 1892 from the infraorbital sinus of the domestic goose, *Anser domesticus* Linnaeus, 1758, and the goldeneye duck, *Bucephala clangula* Linnaeus, 1758, in Germany by Brandes 1892); *Morishitium* Witenberg, 1928 (type species *Morishitium vagum* [Morishita, 1924], described as *Cyclocoelum vagum* Morishita, 1924 from the naso-lacrimal ducts of gallinaceous birds from Japan by Morishita 1924); *Neohyptiasmus* Kanev, Radev & Fried, 2002 (type species *Neohyptiasmus feizullaevi* [Feizullaev, 1980], considered to be *Prohyptiasmus robustus* by Feizullaev 1980, renamed *Neohyptiasmus feizullaevi* [Feizullaev, 1980] by Kanev et al. 2002 with the erection of the genus *Neohyptiasmus*); *Prohyptiasmus* Witenberg, 1923 (type species *Prohyptiasmus robustus* [Stossich, 1902], described as *Cyclocoelum robustum* Stossich, 1902 from the collection of Dr. C. Parona, Museum of Torino, Italy from the tufted duck, *Aythya fuliga* [Linnaeus 1758], reported as *Fuligula cristata* [Linnaeus, 1758] by Stossich 1902) and *Skrjabincoelum* Kurashvili, 1953 (type species *Skrjabincoelum petrowi* Kurashvili, 1953, described from the body cavity of the Jack snipe, *Lymnocyptes minimus* [Brünnich, 1764], from Russia by Kurashvili 1953). Dronen & Blend (2005) added an eighth genus (*Neoallopyge* Dronen & Blend, 2005) in this subfamily with the description of *Neoallopyge americanensis* Dronen & Blend, 2005 from the air sacs of the black-necked

stilt, *Himantopus mexicanus* (Müller, 1776) (Recurvirostridae) from Texas, U.S.A. Species of *Morishitium* and *Neohyptiasmus* are similar in having a postpharyngeal genital pore and vitelline fields that are not confluent posteriorly. These 2 genera differ in that species of *Morishitium* have rounded testes and the uterus is intercecal, while in species of *Neohyptiasmus* the testes are lobed and the uterine coils overreach the ceca laterally often reaching the lateral margins of the body.

The purpose of this study was to expand our knowledge of the parasites from the long-billed dowitcher and the cyclocoelids of North America.

Materials and methods

During a collaborative study of the endohelminths of wading birds between the Harold W. Manter Laboratory, University of Nebraska, Lincoln, Nebraska and the Laboratory of Parasitology, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas we examined 11 specimens of a cyclocoelid collected by Dr. J. Teague Self, former professor, Department of Zoology, University of Oklahoma, Norman, Oklahoma from the air sacs of a long-billed dowitcher, *L. scolopaceus*, that was collected from the Cheyenne bottoms in Oklahoma (35° 42' N latitude, 94° 42' longitude) (HWML 41212.1–11) on May 8, 1963. Specimens were removed from vials where they had been stored in 70% ethanol, stained in Semichon's carmine and mounted in Canada balsam. Measurements are in micrometers ("m) and are given with the mean followed by the range in parentheses unless otherwise stated. The following specimens from HWML, the United States National Parasite collection (USNPC), the Natural History Museum (NHM), London, England, and the Laboratory of Parasitology collection at the Texas Cooperative Wildlife Collection, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas (ND) were examined: *Allopyge undulatus* (USNPC 037166.00), *Allopyge* sp. (NHM 1979.3.1.9–10), *Cyclocoelum bivesiculatum* (NHM 1952.12.17.58–67, 1980.6.3.96–98, 1981.2.11.97, 1983.10.10.2,), *C. microstomum* (NHM 1952.12.5.161), *C. mutabile* (USNPC 024905.00; NHM 1964.8.25.14–15, 1984.7.7.3, 1984.10.9.18–19, 1988.2.29.4, 1991.7.11.41), *C. obscurum* (USNPC 075304.00, 084755.00; NHM 1965.7.27.9–11, 1979.4.10.132–133, 1980.6.3.136–138, 1982.5.21.146, 1992.6.25.9–11; ND 77a–117a), *C. (=Hyptiasmus) oculus* (NHM 1952.12.5.162–163), *Cyclocoelum phasidi* (NHM 1946.12.20.20–23), *Cyclocoelum (=Morishitium) polonicum* (NHM 1983.9.30.3–37), *C. problematicum* (NHM 1922.10.25.98–99), *C. pseudocotyleus* (NHM 1973.12.11.61–65), *C. vanelli* (NHM 1920.8.26.1–2), *Cyclocoelum* sp. (NHM 1956.9.16.400–401, 1956.11.16.125, 1977.3.28.118–124; HWML 11775, 41212, 41216, 42309; ND 71–226–1–6), *Haematotrephus (=Cyclocoelum) kossacki* (NHM 1975.2.24.117–119), *H. (=Cyclocoelum) lanceolatum* (USNPC 078879.00; NHM 1991.7.11.50), *H. (=Cyclocoelum) tringae* (NHM 1990.1.10.1–7), *H. (=Cyclocoelum) vanelli* (NHM 1970.8.26.1–2), *Haematotrephus* sp. (NHM 1953.10.8.3–5, 1975.2.24.117–

119, 1982.5.20.42–56, 1982.5.21.109–111, 1982.5.21.117, 1986.7.14.11; HWML 43005b, 41280; ND 77–426–7), *Ophthalmogagus bucephali* (HWML 21796.1–2), *Ophthalmophagus* sp. (HWML 1501), *Morishitium* sp. (HWML 43005a, 43009, 42237; ND 77a–117–118), *Neoallopysge americanensis* (USNPC 094819.00, 094820.00), *Neohaematotrophus* sp. (HWML 11775, 30407, 43007) and an unidentified cyclocoelid (NHM 1946.12.20.24–25).

Results

Family Cyclocoelidae Stossich, 1902

Subfamily Cyclocoelinae Stossich, 1902

Selfcoelum n. gen.

Type-species: *Selfcoelum limnodromi* n. gen., n. sp.

Diagnosis: Cyclocoelidae, Cyclocoelinae. Body large, flat, tapered anteriorly. Oral sucker and acetabulum absent. Mouth subterminal, prepharynx short, pharynx well developed, esophagus longer than prepharynx. Ceca long, united near posterior extremity forming cyclocoel. Testes rounded, entire, slightly diagonal, situated dextral to midline in posterior 1/5 of body. Ovary spherical, intertesticular to nearly opposite posterior testis forming triangle with testes. Genital pore postpharyngeal opening immediately to posterior margin of pharynx. Vitelline follicles small, delicate, distributed ventrally along ceca from level of cecal bifurcation to posterior extremity, vitelline fields not confluent posteriorly. Uterus with relatively few eggs, uterine loops extensively overreaching ceca laterally, often reaching lateral margins of body but not invading posttesticular space. Parasites of body cavity of Scolopacidae from western hemisphere.

Selfcoelum limnodromi n. sp. (Figs. 1–3)

Type host: *Limnodromus scolopaeus* (Say, 1823), Charadriiformes, Scolopacidae, long-billed dowitcher.

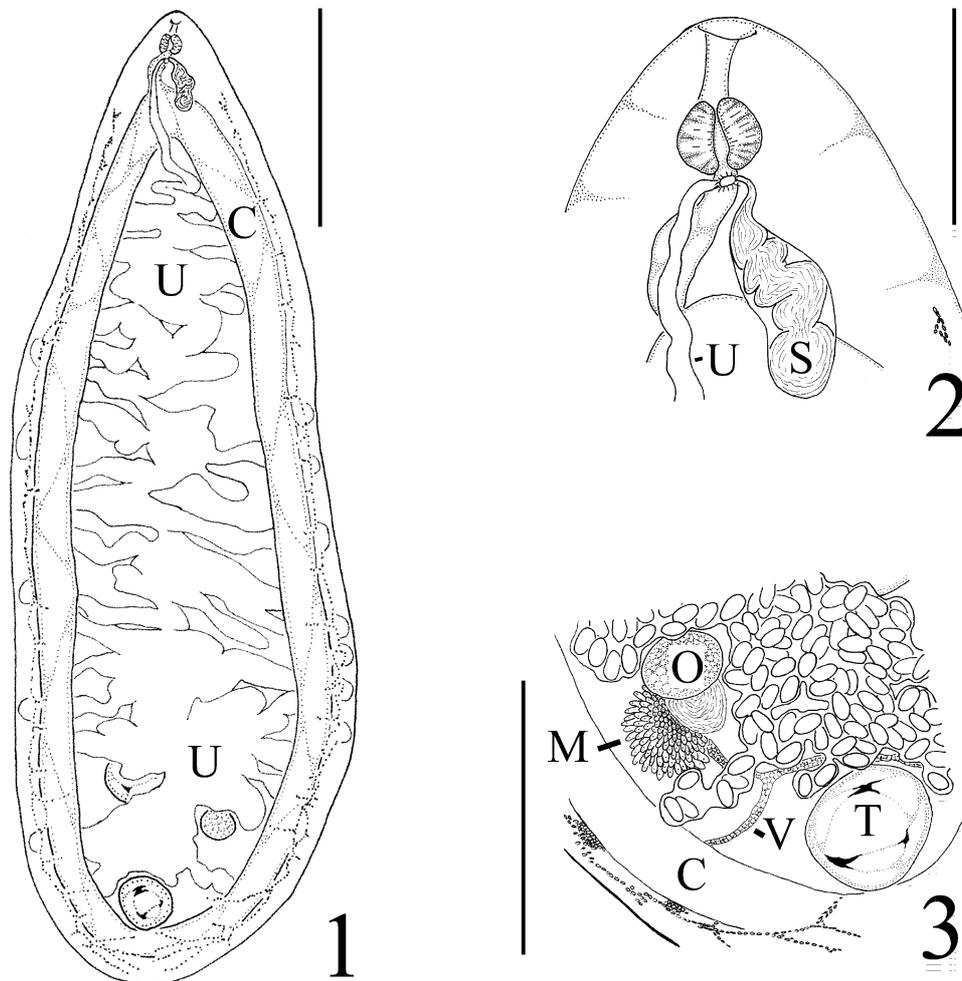
Type-locality: The Cheyenne bottoms, Oklahoma, 35° 42' N latitude, 94° 42' W longitude.

Site: Air sacs.

Deposited specimens: HWML holotype 48162, HWML paratypes 48163, HWML vouchers specimens 41212.

Etymology: The genus is named after Dr. J. Teague Self in recognition of his many

contributions to our knowledge of the endohelminth parasites of the birds of North America. The species designation comes from the genus of the bird from which these specimens were collected, *Limnodromus* Wied, 1833.



FIGURES 1–3. *Selfcoelum limnodromi* n. gen., n. sp. from the long-billed dowitcher, *Limnodromus scolopaceus*. **1.** Ventral view of adult. **2.** Composite drawing of anterior end showing placement of the genital pore and terminal genitalia, ventral view. **3.** Composite drawing of female genitalia, dorsal view. Abbreviations: C, cecum; O, ovary; S, seminal vesicle; T, testis; U, uterus; V, vitelline follicles. Scale bars: **1**, 2,050 μm ; **2**, 550 μm ; **3**, 1,200 μm .

Description: Based on 11 specimens. With characteristics of the genus. Body large, markedly tapered anteriorly, 9.2 (8.5–9.6) mm long by 2.5 (2.3–3.1) mm wide at widest point. Oral sucker and acetabulum absent. Mouth slightly subterminal; prepharynx 185 (140–200) long; pharynx well developed, 195 (180–210) long by 195 (190–200) wide; esophagus longer than prepharynx, 410 (400–430) long. Ceca simple, long, uniting near

posterior extremity to form cyclocoel. Testes smooth, spherical to subspherical, arranged diagonally near posterior extremity in intercecal region. Anterior testis 435 (400–480) long by 485 (420–600) wide. Posterior testis 575 (530–580) long by 535 (500–600) wide. Posttesticular space 690 (550–820) or approximately 8% of body length. Cirrus sac 590 (500–700) long by 175 (170–190) wide. Genital pore situated on ventral surface of body immediately posterior to posterior margin of the pharynx, near midline of body, located at the level of the posterior fourth of pharynx in a few specimens. Ovary smooth, oval, situated intertesticularly to nearly opposite posterior testis in some specimens, forming a triangle with testes, 290 (250–340) long by 280 (230–370) wide. Seminal receptacle located immediately posterior and somewhat dextral to ovary, 255 (104–400) long by 230 (120–330) wide. Ootype immediately posterior to ovary, overlapping the left margin of seminal receptacle. Laurer's canal absent. Vitelline follicles small, delicate in appearance, distributed along ceca from level of cecal bifurcation to posterior extremity, vitelline fields not confluent posteriorly. Uterus containing few eggs (approximately 200–500), intercecal in anterior third of body becoming widely extracecal in posterior region where loops approach lateral margins of body. Eggs 140 (135–151) long (n=20) by 79 (75–85) wide; miracidia nonoculate. Excretory vesicle simple, anterior extent not observed. Excretory pore terminal.

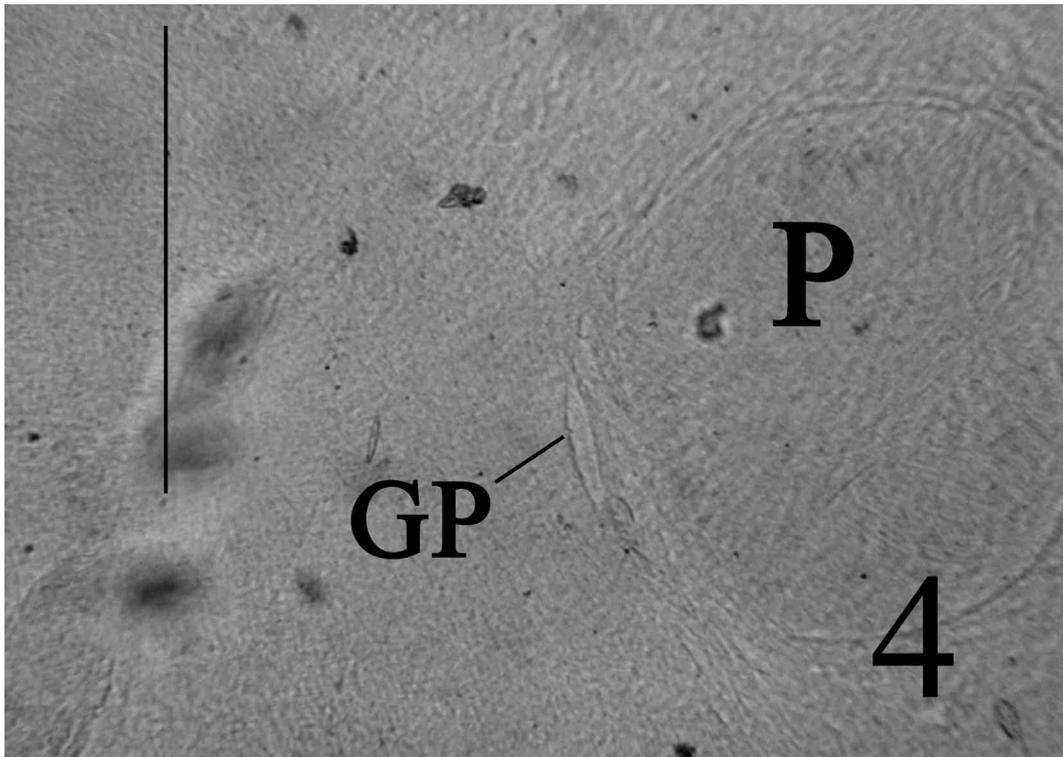


FIGURE 4. Photograph of pharyngeal area of *Selfcoelum limnodromi* n. gen., n. sp. showing the postpharyngeal placement of the genital pore. Abbreviations: GP, genital pore; P, Pharynx. Scale bar 190 μ m.

Key to the Cyclocoelinae (revision based on the key published by Kanev et al. 2002)

- 1a. Testes in transverse row *Skrjabinocoelum* Kurashvili, 1953
 1b. Testes diagonal or tandem 2
 2a. Testes oblique, forming a triangle with the ovary 3
 2b. Testes oblique to tandem forming a straight line with the ovary 4
 3a. Genital pore prepharyngeal, uterine coils intercecal *Cyclocoelum* Brandes, 1892
 3b. Genital pore postpharyngeal, uterine coils overlapping ceca and vitelline fields laterally
 *Selfcoelum* n. gen. Dronen, Gardner & Jiménez, 2005
 4a. Genital pore prepharyngeal 5
 4b. Genital pore postpharyngeal 6
 5a. Vitelline fields united posteriorly *Hyptiasmus* Kossack, 1911
 5b. Vitelline fields not united posteriorly *Prohyptiasmus* Witenberg, 1923
 6a. Vitelline fields united posteriorly 7
 6b. Vitelline fields not united posteriorly 8
 7a. Testes tandem with posterior testis relatively close to posterior end, intertesticular
 uterine loops present *Allopyge* Johnston, 1913.
 7b. Testes oblique with posterior testis some distance from posterior end, intertesticular
 uterine loops absent
 *Neoallopyge** Dronen & Blend, 2005
 8a. Testes entire, uterine coils intercecal *Morishitium* Witenberg, 1928
 8b. Testes lobed, uterine coils overlapping ceca and vitelline fields laterally
 *Neohyptiasmus* Kanev, Radev & Fried 2002

*Although this genus was described from the black-necked stilt, *Himantopus mexicanus* (Recurvirostridae) from the New World (North America) instead of being from cranes (Gruidae) from the Old World, *N. americanensis* is similar to species of *Allopyge*.

Discussion

Although the position of the ovary approaches being opposite to the anterior testes in a few of our specimens of *S. limnodromi* n. gen., n. sp., generally it is intertesticular necessitating the assignment of this species to Cyclocoelinae. The variation seen in the position of the ovary appears to be related to the amount of curvature of the body at the time of fixation. In straighter specimens the ovary is distinctly intertesticular, while in some specimens that are bent slightly to the left, it is almost adjacent to the anterior testis. The new genus is most similar to *Morishitium* and *Neohyptiasmus* by having a postpharyngeal genital pore and vitelline fields that are not united posteriorly. However, the new genus is unlike either of these genera because the ovary forms a triangle with the testes rather than being situated in a straight line with the testes. The new genus differs

further from *Morishitium* by having the uterine loops overreaching the ceca laterally often reaching the body wall and from *Neohyptiasmus* by having testes that are rounded and entire rather than being lobed.

In the assignment of genera within Cyclocoelinae, Kanev et al. (2002) used the orientation of the testes to separate out *Skrjabinocoelum* where the testes are in a transverse row from the rest of the genera in the subfamily where the testes are either diagonal or tandem. These authors then distribute the remaining genera where the testes are either diagonal or tandem into 2 basic groups: those in which the genital pore is prepharyngeal (*Hyptiasmus*, *Cyclocoelum* and *Prohyptiasmus*) and those where the genital pore is postpharyngeal (*Allopyge*, *Morishitium* and *Neohyptiasmus*). *Neoalloyge* has a postpharyngeal genital pore, vitelline fields that are united posteriorly and an intertesticular ovary that is in a straight line with the slightly oblique testes, and members of this genus would be placed in the second basic group of Kanev et al. (2002). Previously, the only genus in Cyclocoelinae where the ovary forms a triangle with the testes, as is seen in *Selfcoelum* n. gen., was *Cyclocoelum*; however, species of *Cyclocoelum* are unlike *S. limnodromi* n. gen., n. sp. by having a prepharyngeal genital pore rather than a postpharyngeal genital pore, and uterine loops that are intercecal. The position of the genital pore in reference to the pharynx (prepharyngeal or postpharyngeal) is critical in distinguishing the new genus. The position of the genital pore is often difficult to see in cyclocoelids; however, most of our specimens show this feature quite clearly (see photograph in Figure 4). Following the key of Kanev et al. (2002), *Selfcoelum* n. gen. would be placed in their second basic group (those with a postpharyngeal genital pore) in the key where species do not have similar body morphologies to *S. limnodromi* (triangular configuration of ovary and testes rather than the ovary being in a straight line with the testes). This raises the question of which characteristic, the position of the genital pore in relation to the pharynx (prepharyngeal or postpharyngeal), as used by Kanev et al. (2002), or the location of the ovary in relation to the testes should be used to further divide the genera of Cyclocoelinae in which the testes are either diagonal or tandem. Certainly, the possibility of parallel evolution provides an explanation of the current situation reflected in the key of Kanev et al. (2002), but if the division into the 2 basic groups of Cyclocoelinae genera with diagonal or tandem testes was based on whether the ovary forms a triangle with the ovary or is in a straight line with the testes, instead of the position of the genital pore in reference to the pharynx, genera with similar basic body morphologies would be placed together in the key. It is also noteworthy that location of male and female gonads is a much easier characteristic to see than is the location of the genital pore in cyclocoelids. In the revised key proposed above, the position of the ovary in relation to the testes was used to divide genera of Cyclocoelinae where the testes are either diagonal or tandem into 2 basic groups. The key has been expanded to include *Neoalloyge* recently described from North America and *Selfcoelum* n. gen. described herein.

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