

Selfcoelum lamothei n. sp. (Digenea: Cyclocoelidae: Cyclocoelinae) from the air sacs of the long-billed curlew, *Numenius americanus* (Scolopacidae), from the Galveston, Texas area, USA

Selfcoelum lamothei, n. sp. (Digenea: Cyclocoelidae: Cyclocoelinae) de los sacos aéreos del playero de pico largo, *Numenius americanus* (Scolopacidae), del área del condado de Galveston, Texas, EUA

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Abstract. Fourteen specimens of a new species of cyclocoelid, *Selfcoelum lamothei* n. sp. (Digenea: Cyclocoelidae: Cyclocoelinae), from the air sacs of a long-billed curlew, *Numenius americanus* Bechstein (Scolopacidae), collected from the Galveston area, Galveston County, Texas, USA, were examined. The new species has an intertesticular ovary that forms a triangle with the testes, placing it in Cyclocoelinae Stossich, 1902. The new species is most similar to *Selfcoelum capellum* (Khan, 1935) n. comb., but differs from this species by lacking an oral sucker and by having a somewhat larger ovary, larger testes, a smaller posttesticular space, a larger cirrus sac, larger eggs, and the vitelline follicles of *S. lamothei* n. sp. are more bulky making the vitelline fields more laterally extensive, and more anteriorly distributed (reaching anteriorly to the level of the pharynx compared to the level of the cecal bifurcation) than those of *S. capellum*. The new species can be distinguished from the 2 species currently assigned to *Selfcoelum* Dronen, Gardner and Jiménez, 2006, *S. brasilianum* (Stossich, 1902) and *S. linnodromi* Dronen, Gardner and Jiménez, 2006, by having an intercecal uterus rather than having uterine loops that overreach the ceca laterally. The genus *Selfcoelum* should be emended to include those species where the uterus is either intercecal or where the uterine loops overreach the ceca laterally and those species with or without an oral sucker.

Key words: curlew, Numenius americanus, Selfcoelum capellum n. comb., Selfcoelum lamothei n. sp., Cyclocoelidae, Galveston, Texas.

Resumen. Se examinaron 14 ejemplares de una nueva especie de ciclocélido, *Selfcoelum lamothei* n. sp. (Digenea: Cyclocoelidae: Cyclocoelinae) que es parásito de los sacos aéreos del playero de pico largo, *Numenius americanus* Bechstein (Scolopacidae), recolectados en el condado de Galveston, Texas, EUA. La especie nueva se caracteriza por presentar el ovario en posición intertesticular, formando un triángulo con relación a los testículos. Este rasgo sitúa a la nueva especie entre los Cyclocoelinae Stossich, 1902. *Selfcoelum lamothei* n. sp. es parecida a *Selfcoelum capellum* (Khan, 1935) n. comb., pero difiere de ésta por carecer de ventosa oral, por tener el ovario ligeramente más grande, un número mayor de testículos, menor espacio postesticular, una bolsa del cirro más grande, huevos de mayor tamaño, y vitelógenas más voluminosas arregladas en campos más extensos y distribuidas en la región anterior (alcanzando el nivel de la faringe en *S. lamothei* n. sp. y sólo hasta la bifurcación cecal en *S. capellum*). Asimismo, la especie nueva se distingue de las 2 especies asignadas a *Selfcoelum* Dronen, Gardner and Jiménez, 2006, por tener el útero en posición intercecal y no lateralmente extendido más allá de los ciegos intestinales. El género *Selfcoelum* se debe enmendar para incluir las especies donde el útero está en posición intercecal, aquellas donde se extiende lateralmente más allá de los ciegos intestinales, y aquellas con ventosa oral ausente o presente.

Palabras clave: playero de pico largo, *Numenius americanus*, *Selfcoelum capellum* n. comb., *Selfcoelum lamothei* n. sp., Cyclocoelidae, Galveston, Texas.

Introduction

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The long-billed curlew, Numenius americanus

marine areas (American Ornithologist's Union, 1983). Although it is not commonly found along the east coast of the USA, this species ranges from Alaska and southwestern Canada through the western USA and the Gulf of Mexico, to as far south as Costa Rica (American Ornithologist's Union, 1983). The parasite fauna of the long-billed curlew is somewhat diverse. At present 2 acanthocephalans, 1 acarinid, 7 cestode, 12 digenean, 5 mallophagan and as many as 8 nematode species have been reported from this host (Table 1). The only cyclocoelid previously reported from the long-billed curlew was *Cyclocoelum obscurum* (Leidy, 1887) (Dubois, 1959; Dronen and Badley, 1979; Lamothe-Argumedo and Orozco-Flores, 2000).

Selfcoelum Dronen, Gardner, and Jiménez, 2006 was established by Dronen et al. (2006) with the description of Selfcoelum limnodromi Dronen, Gardner, and Jiménez, 2006 from the air sacs of the long-billed dowitcher, Limnodromus scolopaceus (Say) (Charadriiformes: Scolopacidae), from Oklahoma, USA. There are currently 2 species assigned to Selfcoelum, Selfcoelum brasilianum (Stossich, 1902) Dronen, Gardner and Jiménez, 2006, originally described as Cyclocoelum brazilianum Stossich, 1902, from the abdominal cavity of the lesser yellowlegs, Tringa flavipes (Gmelin) (reported as Scolopax flaviceps Gmelin) from Brazil (Stossich, 1902), and the type species, Selfcoelum limnodromi.

Materials and methods

Ten long-billed curlews, N. americanus, collected from Galveston, Galveston County, Texas, USA between August, 1977 and October, 1978, and 2 long-billed curlews collected from Lake Bryan, Brazos County, Texas, USA in September, 1996 were examined for helminths (U.S. Fish and Wildlife Service permits nos. PRT 760668 and SPR 1191436; Texas Parks and Wildlife Department permit no. TX SPH 0491253). Cyclocoelids collected were studied alive, relaxed in saline, heat-fixed under slight cover slip pressure in alcohol-formalin-acetic acid (AFA), stained in Semichon's carmine or Harris' hematoxylin and counter stained with eosin, and mounted in Canada balsam or Kleermount. Drawings were done with the aid of a drawing tube. Measurements are from mounted specimens and are given in micrometers (µm) with the mean followed by the range in parentheses unless otherwise stated. Comparative measurements were taken from the original species descriptions unless otherwise stated. Representative specimens were deposited in the Harold W. Manter Laboratory of Parasitology (HWML), University of Nebraska, Lincoln, Nebraska, USA. The following specimens from HWML were examined: *Selfcoelum limnodromi* (HWML 41212, 48162, 48163). Identification of digeneans to subfamily and genus was based on the key of Dronen (2007) and ecological terms used follow Bush *et al.* (1997).

Description

Selfcoelum lamothei n. sp. (Figs. 1-3)

Description based on 10 specimens. Body large, tapered anteriorly, 17.3 (16.3-18.1) mm long by 3.6 (3.0-4.0) mm wide at widest point. Oral sucker and acetabulum absent. Mouth slightly subterminal; prepharynx 305 (220-350) long; pharynx well developed, 285 (270-300) long by 275 (260-300) wide; esophagus longer than prepharynx, 465 (390-550) long. Ratio of length of prepharynx to length of esophagus 1:1.5. Ceca generally simple, some specimens with irregular inner margins forming large bulges, uniting near posterior extremity to form cyclocoel. Testes smooth, spherical to subspherical, occasionally lobed, dextral to midline, arranged diagonally in intercecal region of posterior 1/7 of body. Anterior testis 0.815 mm (0.650-1.060) long by 1.035 mm (0.830-1.250) wide. Posterior testis 0.885 mm (0.785-1.000) long by 0.970 mm (0.870-1.250) wide. Intertesticular space 1.115 mm (0.650-1.700). Posttesticular space 0.915 mm (0.750-1.075). Cirrus sac 630 (550-700) long by 220 (190-270) wide. Seminal vesicle occupying posterior region of cirrus sac; proximal end of ejaculatory duct looping once before passing through small cluster of prostate cells to terminate at genital pore, which is postpharyngeal, at level of posterior 1/4 of pharynx, near midline of body. Ovary smooth, oval, 525 (480-600) long by 535 (470-590) wide, intertesticular and sinistral to midline of body, forming triangle with testes. Ratio of width of ovary to mean width of testes 1:1.9. Uterine seminal receptacle well developed, 560 (490–585) long by 220 (195-265) wide. Mehlis' gland immediately posterior to and overlapping posterior margin of ovary. Laurer's canal absent. Vitelline follicles bulky, more laterally extensive than usually seen in most cyclocoelids, distributed along ceca from level of pharynx to posterior extremity, not confluent posteriorly. Vitelline follicles approximately 145 (75-260) wide near anterior end; 480 (340-560) wide near lateral margins of midbody. Vitelline reservoir immediately posterior to Mehlis' complex. Uterus extensive, intercecal, extending from posterior level of pharynx to intertesticular area. Uterine seminal receptacle posterior to Mehlis' complex and immediately



Figures 1-3. *Selfcoelum lamothei* n. sp. from the long-billed curlew, *Numenius americanus*. 1, ventral view of paratype. 2, composite drawing of anterior end of adult, ventral view. 3, composite drawing of female reproductive system, ventral view. Abbreviations: C, cecum. M, Mehlis' glands of oötype. O, ovary. P, pharynx. R, uterine seminal receptacle. S, seminal vesicle. T, testis. U, uterus. V, vitelline duct.

dorsal to vitelline reservoir. Eggs indistinctly operculate, measuring at distal end of uterus 145 (135–160) long by 65 (60–75) wide; miracidia oculate. Excretory vesicle Y-shaped; anterior extent of arms not observed. Excretory pore subterminal on dorsal surface of body.

Taxonomic summary

Type host: the long-billed curlew, *Numenius americanus* Bechstein, 1812 (Scolopacidae).

Site of infection: air sacs of lungs.

Type locality: vicinity of Galveston, Galveston County, Texas, USA (29°18' N latitude, 94°48' W longitude).

Prevalence: 33% (4 of 12 birds).

Intensity: 2-5 per infected bird.

Mean intensity: 2.5.

Type specimens: holotype HWML 48562; paratypes (2 specimens) 48563.

Etymology: the species is named in honor of Dr. Rafael Lamothe-Argumedo in recognition of his many contributions to our knowledge of the helminths of vertebrates from the wild.

Remarks

The new species is assigned to Cyclocoelinae Stossich, 1902 because it has an intertesticular ovary (ranging from the level of the posterior end of the anterior testis to the anterior end of the posterior testis) that forms a triangle with the testes (Dronen, 2007). The testes in the new species are tandem to slightly diagonal and usually smooth; the vitelline fields are not united posteriorly; and the uterus is intercecal further supporting placement of this new species within Cyclocoelinae. Within Cyclocoelinae, Dronen (2007) recognized 2 genera: Cyclocoelum Brandes, 1892 containing those species with a prepharyngeal genital pore (ranging from anterior end of pharynx to midlevel of prepharynx), and Selfcoelum, containing those species with a postpharyngeal genital pore (ranging from midlevel of pharynx to near level of cecal bifurcation). The new species possesses a postpharyngeal genital pore that is at the level of the posterior 1/4 of the pharynx supporting placement of this new taxon in Selfcoelum.

While this new species is most similar to species of *Selfcoelum* by having a postpharyngeal genital pore, it differs from nominal species in the genus in having an intercecal and intertesticular uterus extending from the posterior level of the pharynx to the area between the testes, rather than having uterine loops that overreach the ceca laterally. Therefore, the generic diagnosis of *Selfcoelum* should be emended to include those species where the uterus is either intercecal or where the uterine loops overreach the ceca laterally. There are currently 2 species

assigned to Selfcoelum, S. brasilianum and S. limnodromi. The new species can be distinguished from both of these species by having an intercecal uterus. A third species, Cyclocoelum capellum Khan, 1935, described from the air sacs of the common snipe, Capella gallinago (Linnaeus), from India (Khan, 1935), has an intertesticular ovary that forms a triangle with the testes (Cyclocoelinae). Dubois (1959) synonymized this species with C. obscurum, the only other cyclocoelid reported from N. americanus (see Table 1); however, we do not support this synonymy. Based on the data for both C. capellum and C. obscurum provided by Dubois (1959, p. 78-79), C. capellum differs from C. obscurum in the former species having a larger body (17.0-25 mm vs 6.0-13 mm long) and a smaller egg (120-130 by 64-68 vs 138-162 by 70-94). In addition, we noted that unlike species of Cyclocoelum where the genital pore is prepharyngeal, C. capellum has a postpharyngeal genital pore as is typical of species of Selfcoelum (Dronen, 2007). We have therefore reassigned C. capellum to Selfcoelum, as Selfcoelum capellum (Khan, 1935) n. comb. Unlike S. brasilianum, S. limnodromi, and S. lamothei n. sp., S. capellum possesses an oral sucker; therefore, the generic diagnosis of Selfcoelum should be emended to include either the presence or absence of an oral sucker.

Of the 3 nominal species now considered in Selfcoelum, the new species is most similar to S. capellum in body size (17.0–25 mm), the size of the uterine seminal receptacle (300-400 by 150-200), the width of the pharynx (275), and because S. capellum also has an intercecal uterus and a uterine seminal receptacle ("receptaculum seminis uterinum" of Yamaguti [1933]; "receptacle seminalis uterinum" of Harrah [1922]). It differs from S. capellum by having a somewhat larger ovary (370-500), larger testes (1.003 mm approximate mean width of testes; 1:1.9 ratio of width of ovary to mean width of testes compared to 790; 1:1.7), a smaller posttesticular space (1.200 mm), a larger cirrus sac (400 by 170), larger eggs (120-130 long by 64-68 wide), and the vitelline follicles of S. lamothei n. sp. are more bulky making the vitelline fields more laterally extensive, and they are more anteriorly distributed (reaching anteriorly to the level of the pharynx compared to the level of the cecal bifurcation) than those of S. capellum.

Discussion

Dronen (2007) recognized 6 subfamilies in Cyclocoelidae Stossich, 1902: Cyclocoelinae; Haematotrephinae Dollfus, 1948; Hyptiasminae Dollfus, 1948; Ophthalmophaginae Harrah, 1922; Skrjabinocoelinae Dronen, 2007; and Szidatitreminae

Parasite	Infection Site	Locality	References
Acanthocephala			
<i>Mediorhynchus papillosus</i> Van Cleave, 1916	Intestine	New Mexico	Butler and Pfaffenberger, 1981
Mediorhynchus robustus Van Cleave, 1916	Intestine	Alberta	Goater and Bush, 1988
Acarina			
Toritrombicula (Whartonacarus) dupliseta Loomis, 1966	Skin	Mexico	Loomis, 1966
Cestoda			
Anomotaenia sp. Choanotaenia numenii Owen, 1946	Intestine Intestine	Alberta Alberta, Nebraska	Goater and Bush, 1988 Owen, 1946; Yamaguti, 1959; Schmidt, 1986; Goater and Bush, 1988
Dictymetra nymphaea (Schrank, 1790)	Intestine	Alberta	Goater and Bush, 1988
Dictymetra paranumenii* Clark, 1952	Small intestine	Alberta, Nebraska	Clark, 1952; Yamaguti, 1959; Schmidt, 1986; Goater and Bush, 1988; Bona, 1994
Dictymetra radiaspinosa† Matevosian, 1954	Small intestine	Alberta, Nebraska, New Mexico	Clark, 1952; Matevosian, 1954; Yamaguti, 1959; Butler and Pfaffenberger, 1981‡; Goater and Bush, 1988; Bona, 1994
Dictymetra sp. Ophryocotyle insignis Lonnberg, 1890	Intestine Intestine	Alberta Alberta	Goater and Bush, 1988 Goater and Bush, 1988
DIGENEA			
Brachylaima fuscata (Rudolphi, 1819)	Intestine	Alberta	Goater and Bush, 1988
Cyclocoelum obscurum (Leidy, 1887)	Air sacs, body cavity	Texas	Dubois, 1959; Dronen and Badley, 1979; Lamothe-Argumedo and Orozco-Flores, 2000
Himasthla mcintoshi Stunkard, 1960	Intestine	Utah	Stunkard, 1960
Himasthla rhigedana Dietz, 1909	Intestine	Texas	Dronen and Badley, 1979
Lyperosomum oswaldoi (Travassos, 1920)	Bile ducts, liver	Texas	Dronen and Badley, 1979
Lyperosomum sinuosum Travassos, 1917	Pancreas	Texas	Dronen and Badley, 1979

Table	1.	Continues

Parasite	Infection Site	Locality	References
Maritrema arenaria	Intestine	Texas	Dronen and Badley, 1979
Paratrema numenii	Bursa of Fabricit	ıs, Texas	Dronen and Badley, 1979
Parorchis acanthus	Intestine	Texas	Dronen and Badley, 1979
Pelmatostomum americanum	Intestine	Texas	Dronen and Badley, 1979
Probolocoryphe glandulosa (Coil 1955)	Intestine	Texas	Dronen and Badley, 1979
Zygocotyle lunata§ (Diesing, 1836)	Intestine	?	Dronen and Badley, 1979
Mallophaga			
Austromenopon crocatum (Nitzsch, 1866)	Feathers	New Mexico	Butler and Pfaffenberger, 1981
<i>Cummingsiella</i> (= <i>Philopterus</i> [<i>C</i> .]) <i>longirostricola</i> (Wilson, 1937)	Feathers	New Mexico, Texas	Wilson, 1937 Butler and Pfaffenberger, 1981
Lunaceps numenii numenii (Denny, 1844)	Feathers	New Mexico	Butler and Pfaffenberger, 1981
Philopterus (= Docophorus) testudinarius (Denny, 1840)	Feathers	Iowa	Osborn, 1896
Saemundssonia humeralis americana Carriker, 1956	Feathers	Texas	Carriker, 1956
Nematoda			
Acuaria sp.	Gizzard	Alberta	Wong and Kennedy, 1990; Wong and Anderson, 1991
Acuarioidea/Habronemtoidea sp.	Gizzard	Alberta	Wong and Anderson, 1991
Ancyracanthopsis winegardi	Under koilin	Alberta,	Wong and Anderson, 1990;
Wong and Anderson, 1990	lining of gizzard	Manitoba	Wong and Kennedy, 1990
Pectinospirura argentata Wehr, 1933	Proventriculus	Alberta	Wong and Kennedy, 1990
Physocephalus sexalatus	Serosa of large	Alberta,	Bartlett et al. 1987;
(Molin, 1860) third stage larvae	and small intestine	Manitoba	Wong and Kennedy, 1990
Schistorophus skrjabini	Gizzard	Alberta,	Wong and Kennedy, 1990;
(Wassilkowa, 1926)		Manitoba	Wong and Anderson, 1991
Sciadiocara cucullatus (Wehr, 1934)	Gizzard	Texas	Wong and Anderson, 1991
Sciadiocara umbellifera (Molin, 1860)	Gizzard	Alberta	Wong and Kennedy, 1990; Wong and Anderson, 1991

*Clark (1952) erected this species as *Dictymetra paranumenii* Clark, 1952. Bona (1994, p. 513, Fig 25.199[f]) recognized this species within the genus *Dictymetra* Clark, 1952. Yamaguti (1959, p. 259, 262) considered *D. paranumenii* to belong within the genus *Choanotaenia* Railliet, 1896, listing *Dictymetra* as a junior synonym of *Choanotaenia*. Schmidt (1986, p. 362, 404) also listed this species as belonging within *Choanotaenia*; however, he considered *Dictymetra* to be a junior synonym of *Anomataenia* Cohn, 1900.

†Clark (1952) originally erected this species as *Dictymetra numenii* Clark, 1952. Matevosian (1954) suppressed the genus *Dictymetra* Clark, 1952 as a junior synonym of *Choanotaenia* Railliet, 1896, but in so doing created a junior, secondary homonym

as the taxon *Choanotaenia numenii* was preoccupied (see Owen, 1946). Matevosian (1954) thus erected *Choanotaenia radiaspinosa* Matevosian, 1954 to replace *D. numenii* Clark, 1952 *nec* Owen, 1946 (see Bona [1994, p. 451]). While *C. radiospinosa* [sic] was considered valid by Yamaguti (1959, p. 262), Schmidt (1986) recognized only *C. numenii* of Owen (1946) and *D. paranumenii* (as *C. paranumenii*) of Clark (1952), not listing the species "*radiaspinosa*" within either *Dictymetra* (considered a junior synonym of *Anomataenia*) or *Choanotaenia*. Finally, Bona (1994, p. 512, 513, Fig 25.199[d]) recognized this species as remaining within *Dictymetra* which he considered a valid genus.

[‡] Butler and Pfaffenberger (1981) wrote in the abstract of their paper that the cestode *Choanotaenia numenii* Owen, 1946 was found from 2 *N. americanus* examined; however, within the body of their paper, they listed that the cestode *Dictymetra numenii* (= *D. radiaspinosa*) Clark, 1952 was recovered from the 2 long-billed curlews examined and further commented that "[t]he cestode had been previously reported from the same host [Clark, 1952]". As *C. numenii* of Owen (1946) is not conspecific with *D. numenii* of Clark (1952), we have elected to follow Goater and Bush (1988, p. 142) who recognized *D. numenii* Clark, 1952 as the cestode species reported by Butler and Pfaffenberger (1981).

\$Dronen and Badley (1979, p. 645) listed this digenean as having been reported earlier from *N. americanus*, but they indicated that the host species identification was uncertain.

Dronen, 2007. Within Haematotrephinae, S. lamothei n. sp. is most similar to species of Haematotrephus Stossich, 1902 (syns. Corpopyrum Witenberg, 1923; Haematoprimum Witenberg, 1923; Harrahium Witenberg, 1923) in having a postpharyngeal genital pore, nonconfluent vitelline fields posteriorly and diagonal testes forming a triangle with the ovary; however, the ovary of the new species is intertesticular while species of Haematotrephus have an ovary that is pretesticular to opposite the anterior testis. Within Hyptiasminae, the new species is most similar to species of Morishitium Witenberg, 1928 (syns. Pseudhyptiasmus Dollfus, 1948; Neocyclocoelum Feizullaev, 1980; Neohyptiasmus Kanev, Radev and Fried, 2005) in having a postpharyngeal genital pore, non-confluent vitelline fields posteriorly, and an intertesticular ovary; however, S. lamothei n. sp. has diagonal testes that form a triangle with the ovary whereas species of Morishitium have tandem testes that form nearly a straight line with the ovary. Of the species within Ophthalmophaginae, S. lamothei n. sp. is most like species of Spaniometra Kossack, 1911 (syns. Bothriogaster Fuhrmann, 1904; Contracoelum Witenberg, 1926; Bothrigaster Dollfus, 1948) in possessing a postpharyngeal genital pore and non-confluent vitelline fields posteriorly, but the new species has an intertesticular ovary forming a triangle with the testes and species of Spaniometra have a posttesticular ovary nearly in a straight line with the testes. Species of Skrjabinocoelum Kurashvili, 1953, the only genus within Skrjabinocoelinae Dronen, 2007, are similar to the new species in having a postpharyngeal genital pore and an intertesticular ovary; however, the testes are nearly side by side and form a straight line with the ovary in species of Skrjabinocoelum while the testes are diagonal and form a triangle with the ovary in the new species. Species of Szidatitrema Yamaguti, 1971, the only genus of Szidatitreminae Dronen, 2007, are similar to S. lamothei n. sp. in possessing a postpharyngeal genital pore, non-confluent vitelline fields posteriorly, and an

ovary forming a triangle with diagonal testes; however, the new species has an ovary that is intertesticular whereas species of *Szidatitrema* have an ovary that is posttesticular or opposite the posterior testis.

As mentioned above, *Cyclocoelum obscurum* (Leidy, 1887) Harrah, 1922, reported from the body cavity and air sacs of 2 long-billed curlews from Texas (Dronen and Badley, 1979; also see Dubois, 1959 and Lamothe-Argumedo and Orozco-Flores, 2000), represents the only other cyclocoelid documented from this host (Table 1). While *C. obscurum* and *S. lamothei* n. sp. are within Cyclocoelinae, species of *Selfcoelum* differ from species of *Cyclocoelum* in the former having a postpharyngeal genital pore and the latter having a prepharyngeal genital pore (Dronen, 2007).

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