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Notocotylus fosteri sp. nov. (Trematoda, Notocotylidae) from the rice rat, *Oryzomys palustris* in Florida

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Abstract

Notocotylus fosteri sp. nov. (Trematoda, Notocotylidae) is described from the caecum of the rice rat, *Oryzomys palustris*, from a salt marsh on Waccasassa Bay, Florida, U.S.A. The new species differs from previously described *Notocotylus* species principally in the extreme prebifurcal position of the genital pore, which overlies the posterior margin of the oral sucker, but also by the number of ventral papillae (10–13/row), and the length of the metraterm relative to the cirrus sac (89%). This is only the second species of this genus found in North American mammals.

Key words

Trematoda, Digenea, Notocotylidae, *Notocotylus fosteri*, rice rat, *Oryzomys palustris*, Florida, U.S.A.

Introduction

The cosmopolitan trematode genus *Notocotylus* Diesing, 1839 (Notocotylidae) consists of about 48 species found primarily in birds with aquatic affinities, and to a lesser extent, in mammals, mostly rodents of the family Microtidae. In North America, the only valid species of *Notocotylus* in rodents appears to be *N. urbanensis* (Cort, 1914), which was described as *N. filamentis* Barker, 1915 from the muskrat, *Ondatra zibethicus* (Linnaeus, 1766), in Nebraska (Barker 1915). Filimonova (1985) synonymized the two species. The specimens from a Maryland muskrat, which were identified by Harrah (1922) as *N. urbanensis*, were redetermined by Dubois (1951) as *Quinqueserialis quinqueserialis* (Barker et Laughlin, 1915).

In 2003, a new species of *Notocotylus* was found in rice rats, *Oryzomys palustris* (Harlan, 1837), collected from a salt marsh near Cedar Key, Florida and this species is described herein.

Materials and methods

Rice rats were caught on September 29 and 30, 2003 in baited Sherman live traps in a salt marsh on Waccasassa Bay about 2 miles east of Cedar Key, Levy County, Florida. Trematodes were heat-killed in saline under light cover slip pressure, fixed in AFA (alcohol-formalin-acetic acid), stained in Ehrlich's haematoxylin and mounted in Canada balsam. Ventral glands were counted in unstained specimens and eggs were dissected from one specimen to measure the filaments.

Specimens used for scanning electron microscopy (SEM) were heat-killed without cover slip pressure, fixed in ethanol, dehydrated in a graded series of ethanol and acetone, and dried using hexamethyldisilazane (HMDS) (Ted Pella, Inc., Redding, California) as the transition fluid. They were then mounted on stubs, coated with gold and examined using a Hitachi 4700 scanning electron microscope (Hitachi USA, Mountain View, California) at an accelerating voltage of 15 kV.

Measurements are in micrometers and are listed as the holotype, followed by the range of the paratypes and the mean ± the standard error of 10 paratypes in parentheses. Type specimens were deposited in the United States National Parasite Collection, Beltsville, Maryland, 20705, U.S.A.

Results

***Notocotylus fosteri* sp. nov.** (Figs 1–3)

Description

Notocotylinae Kossack, 1911. Based on holotype and 10 paratypes with characters of genus. Body 3,075 (2,705–3,125, 2,915 ± 46.1) long and 1,030 (955–1,095, 1,030 ± 15.2) in

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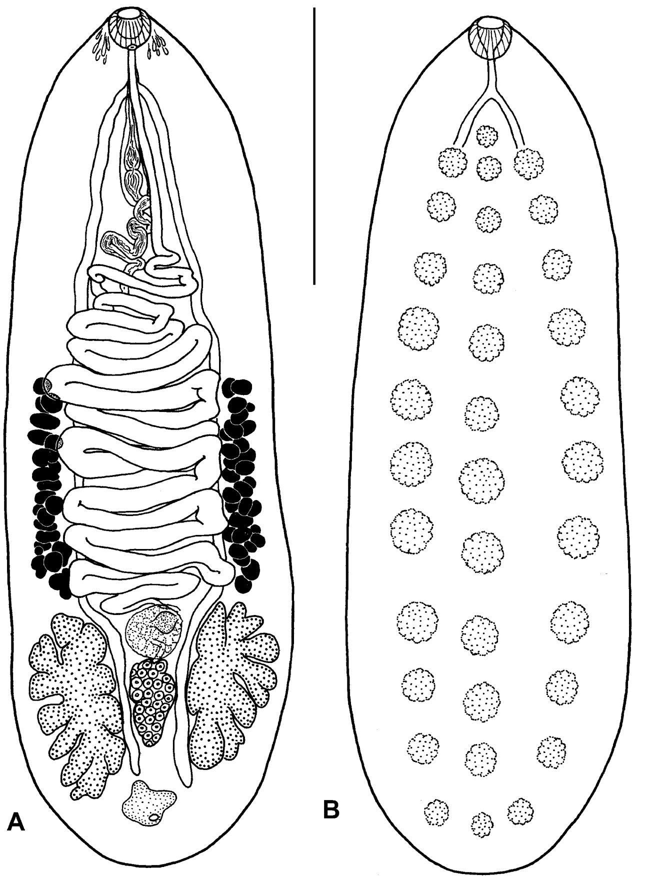

Fig. 1. *Notocotylus fosteri* sp. nov., holotype: **A** – ventral view, **B** – distribution of papillae. Scale bar = 1 mm

maximum width at about level of ovary. Tegument unspined. Total number of ventral papillae 32–37; lateral and medial rows all contain 10–13 papillae (usually 11–12), most common arrangement being 12:12:12. Cercarial eye-spot pigment scattered in forebody. Oral sucker 133 (129–167, 150 ± 3.4) long, 154 (154–179, 165 ± 2.6) wide. Oesophagus 133 (129–188, 165 ± 8.4) long, bifurcating into 2 caeca, which curve between ovary and testes, and terminate 250 (195–270, 230 ± 10.6) or 6–9% of body length from posterior end of body, usually anterior to posterior end of testes, but sometimes extending slightly past testes. Testes opposite, deeply lobed, 690 (540–775, 630 ± 27.3) long, 335 (270–365, 310 ± 10.9) wide. Vas deferens passing anteriorly to form convoluted external vesicle. Cirrus sac median, straight, 565 (565–770, 675 ± 20.2) long, broad posteriorly and sharply narrowed anteriorly, containing saccular internal seminal vesicle and pars prostatica. Cirrus not everted in available specimens. Common genital pore ventro-medial, considerably in front of the intestinal bifurcation, overlying posterior margin of oral sucker ventral to the beginning of the oesophagus. Ovary median, between testes, usually entire, occasionally bilobed posteriorly, 320 (265–395, 315 ± 14.0) long, 170 (125–170, 140 ± 4.4) wide. Vitelline reservoir immediately anterior to ovary. Vitellarium formed of 2 lateral groups of 15–18 bilobed to multilobed follicles extending from 26–20 (28)% of body length from posterior end to 44–51 (48)% of body length from anterior end. Uterus extending anteriorly from ovary in 15–18 major, laterally directed coils, with 5–7 coils anterior to vitelline follicles; some uterine coils slightly exceeding caeca but are contained by vitelline follicles, terminating considerably posteriorly to cirrus sac, slightly overlapping external seminal vesicle. Metraterm muscular, lateral to cirrus sac for about half its length, then overlying it ventrally and opening via common genital pore, 545 (500–770, 605 ± 22.7) long, 82–97 (89)% of cirrus sac length. Eggs operculate with long, single filament at each pole, egg capsule 16–21 (18) × 10–13 (11) wide (n = 20), each filament 140–170 (165) long. Excretory pore opening dorsally at about level of posterior end of testes; excretory vesicle saccular.

Type host: Rice rat, *Oryzomys palustris* (Harlan, 1937) (Rodentia, Cricetidae).

Site: Caecum.

Type locality: Waccasassa Bay, Levy County, Florida, U.S.A. (29°10´29½N, 83°1´55½W).

Type specimens: Holotype 96484 and paratypes 96485, USNPC, Beltsville, Maryland, U.S.A.

Collection dates: 29–30 September, 2003.

Prevalence and intensity of infection: 3 of 4 hosts infected with 2–20 flukes.

Etymology: The specific epithet is in honor of our friend and colleague Garry W. Foster.

Differential diagnosis

Cribb (1991) listed 41 valid species of the genus *Notocotylus*, and described a new species, *N. johnstoni* Cribb, 1991. To his list should be added *N. mcdonaldi*, *N. guptai*, *N. ajgaini*, and *N. vinodae*, all described by Gupta and Singh (1987); *N. neyrai* Gonzalez Castro, 1945; and *N. polylecithus* Qiongzhang, 1992. Of these 48 species, only *N. aegyptiacus* (Odhner, 1905), *N. gippyensis* (Beverley-Burton, 1958), *N. johnstoni, N. mamii* (Hsu, 1954), *N. naviformis* Tubangui, 1932, *N. skrjabini* Ablasov, 1953 [synonym: *N. breviserialis* (Stunkard, 1967)], *N. tadornae* Bisset, 1977 and *N. vinodae* have a prebifurcal genital pore. In only two of these species, *N. gippyensis* and *N. tadornae*, the genital pore is as far anterior as in *N. fosteri* sp. nov., overlying the posterior margin of the oral sucker. However, *N. gippyensis* and *N. tadornae* have only one row of ventral papillae, not three as in other species of *Notocotylus*.

In addition, *N. fosteri* has 10–13 papillae, usually 11–12, in all rows while *N. breviserialis* and *N. skrjabini* have only 4–5, *N. vinodae* has 15–16 and *N. aegyptiacus* has 12–14. In *N. naviformis*, the median row has 13 papillae and the lateral rows only 10, and in *N. johnstoni* the number of papillae in the median row (9–11) usually is one or two less than the number in the lateral rows (10–13). The metraterm in *N. aegyptiacus*

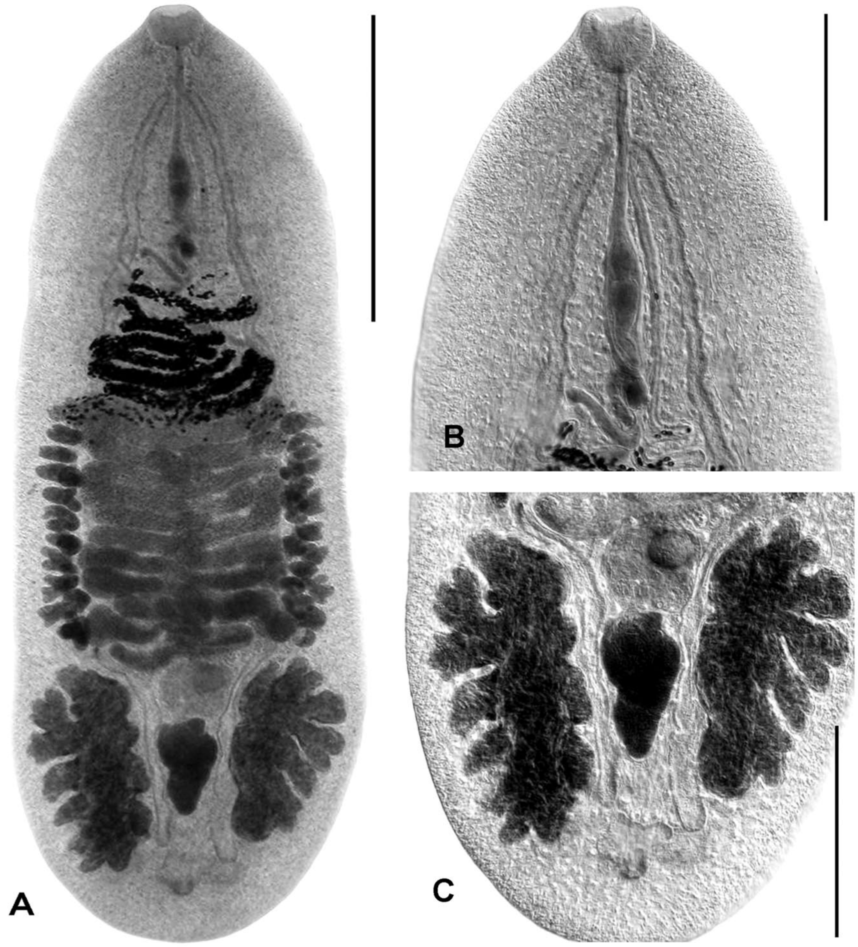

Fig. 2. *Notocotylus fosteri* sp. nov., holotype: **A** – ventral view, scale bar = 1 mm; **B** – anterior end; **C** – posterior end. Scale bars = 0.5 mm (B, C)

is only 50% as long as the cirrus sac while it averages 89% as long in *N. fosteri*. There are 3–4 previtelline uterine loops in *N. mamii* and 5–7 in *N. fosteri*.

Of the eight species with a prebifurcal genital pore listed above, only *N. skrjabini* has been reported from North America and seven species have been recorded only from birds. Only *N. johnstoni* has been recorded from a mammal, the Australian water rat, *Hydromys chrysogaster* Geoffroy, 1804. Besides the position of the genital pore, other differences between the two include the uterine loops overlapping the cirrus sac in *N. johnstoni*, while they never overlap it in *N. fosteri*, and the vitelline follicles are compact and entire in *N. johnstoni* but bilobed to multilobed in *N. fosteri*.

Discussion

Given the rarity of *Notocotylus* infections in rodents, it is certainly an amazing coincidence that the morphologically closest species to *N. fosteri* appears to be *N. johnstoni*, described from the Australian water rat by Cribb (1991). Although in different families, the rice rat and water rat appear to be ecological equivalents, living in both fresh water and salt water marshes, and exhibiting a much more omnivorous diet than most rodents. It is difficult to imagine that the two trematodes could be closely related, taking into account their geographical distribution. This may simply be a case of convergence, since the rice rats infected with *N. fosteri* were collected from a salt water marsh, and the water rats infected with *N. johnstoni* were collected from a fresh water marsh (J.G. Pearson, pers. comm.).

The fact that *N. fosteri* was collected in a salt marsh is also significant in respect to its life history. Life cycles are known for comparatively few of the 48 other species of *Notocotylus*, but both fresh water snails and brackish water snails are intermediate hosts of various species (Beverly-Burton 1961, Stunkard 1966). It remains to be seen whether *N. fosteri* is a strictly mammalian species, or whether it also infects birds. In a study of rice rats in 1970–1972 from the same general area as the present study, Kinsella (1988) found no infections of *Notocotylus*, but instead found the rice rats commonly infect-

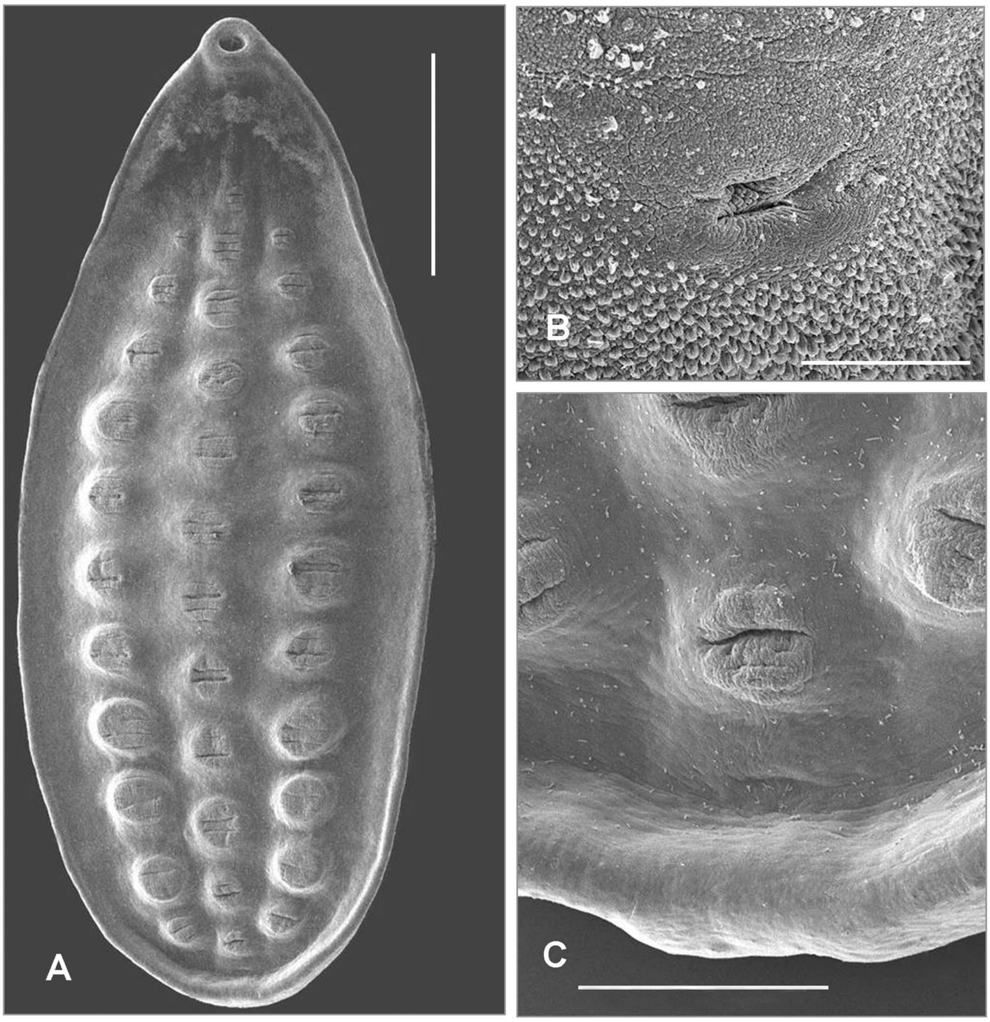

Fig. 3. SEM images of *Notocotylus fosteri* sp. nov.: **A** – ventral view showing the distribution of the papillae, scale bar = 0.5 mm; **B** – genital pore, scale bar = 20 µm; **C** – posterior end, scale bar = 100 µm

ed with another notocotylid, *Catatropis johnstoni* Martin, 1956. It is possible that the *N. fosteri* infections originated from a bird host, but it is also possible that variations in microhabitats within the marsh, especially with regard to snail distribution, could account for the discrepancy. Obviously, more study is warranted.

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References

Barker F.D. 1915. Parasites of the American muskrat (*Fiber zibethicus*). *Journal of Parasitology*, 1, 184–197.

Beverley-Burton M. 1961. Studies on the trematodes of British freshwater birds. *Proceedings of the Zoological Society of London*, 137, 13–39.

Cribb T.H. 1991. Notocotylidae (Digenea) from the Australian water rat *Hydromys chrysogaster* Geoffroy, 1904 (Muridae). *Systematic Parasitology*, 18, 227–237.

Dubois G. 1951. Étude des trématodes nord-americains de la collection E. L. Schiller et revision du genre *Notocotylus* Diesing, 1839. *Bulletin de la Société Neuchâteloise des Sciences Naturelles*, 74, 42–76.

Filimonova L.V. 1985. Trematode fauna of the USSR. Notocotylidae. Izd. Nauka, Moscow (In Russian).

Gupta P.C., Singh R.C. 1987. On four new species of the genus *Notocotylus* Diesing, 1839 (Digenea: Notocotylidae) from avian hosts of Uttar Pradesh. *Kampur University Research Journal Science*, 4 (1983), 27–35.

Harrah E.C. 1922. North American monostomes primarily from freshwater hosts. *Illinois Biological Monographs*, 7, 225–324.

Kinsella J.M. 1988. Comparison of helminths of rice rats, *Oryzomys palustris*, from freshwater and saltwater marshes in Florida.

Proceedings of the Helminthological Society of Washington, 55, 275–280.

Stunkard H.W. 1966. The morphology and life-history of *Notocotylus atlanticus* n. sp., a digenetic trematode of eider ducks, *Somateria mollissima*, and the designation *Notocotylus duboisi* nom. nov. for *Notocotylus imbricatus* (Looss, 1893) Szidat, 1935. *Biological Bulletin of the Marine Biological Laboratory, Woods Hole, Massachusetts*, 131, 501–515.

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