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TWO NEW SPECIES OF *ASCOMETRA* KHOLODKOVSKII, 1912 (CESTODA: PARUTERINIDAE) FROM THE KORI BUSTARD, *CHORIOTIS KORI* (BURCHELL), IN KENYA

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ABSTRACT: *Ascometra chorioidis* n. sp. and *Ascometra scheuermani* n. sp. are described from a Kori Bustard, *Choriotis kori* (Burchell) (Gruiformes: Otidae), captured in Kenya. The 2 species are distinguished from *Ascometra guttae* (Baylis, 1914) and *Ascometra numida* (Fuhrmann, 1909) (formerly placed in the genus *Octopetalum* Baylis, 1914) by the much larger number of testes in each segment. *Ascometra chorioidis* differs from *Ascometra vestita* Kholodkovskii, 1912, in the smaller proportional size of the cirrus sac, which extends medially across less than half the space between the margin of the segment and the parateral longitudinal excretory canal. From *A. vestita* and *A. chorioidis*, *A. scheuermani* is distinguished by its much longer cirrus sac. The findings support the earlier conclusion of Baer (1955) that *Octopetalum* Baylis, 1914 is a synonym of *Ascometra* Kholodkovskii, 1912.

The genus *Ascometra* Kholodkovskii, 1912, was established for a cestode from the Houbara Bustard, *Chlamydotis undulata* (Jaqu.) (Gruiformes: Otidae), in southern Kazakhstan. In his revision of the subfamily Idiogeninae Fuhrmann, 1907, Baer (1955) placed the genus *Octopetalum* Baylis, 1914, established for a cestode from a guinea fowl in Africa, in synonymy with *Ascometra*. More recently, Matevosian and Movsesian (1970) presented evidence that these genera are distinct. According to their interpretation, the genus *Ascometra* would include not more than 2 species, *Ascometra vestita* Kholodkovskii, 1912 (type of the genus), and *Ascometra baeri* Matevosian and Movsesian, 1970, *provis*. The latter, from *C. undulata* in Africa, had been identified by Baer (1955) as *A. vestita*. Two species, both from guinea fowl (Galliformes: Phasianidae), were retained in *Octopetalum* by Matevosian and Movsesian (1970).

The recent acquisition of cestodes from a Kori Bustard has permitted further assessment of the status of the 2 genera. The cestodes, kindly made available by Dr. Debra A. Scheuerman, Woodland Park Zoo, Seattle, had been expelled by the bustard on 23 August 1984. The bird had been received at the zoo in December 1983, soon after its capture in northern Kenya.

The purpose of the present paper is to describe 2 new species of the genus *Ascometra* and to consider the question of the validity of the genus *Octopetalum*.

MATERIALS AND METHODS

The cestodes, still alive when expelled, were relaxed in tapwater and fixed in a 10% solution of formalin. After removal of selected segments for sectioning, the specimens were stained in acetic carmine and processed by standard methods. To facilitate study of internal organs, the tegument and underlying muscle layers were removed from one side of the fully developed strobilae. Sections were prepared by the paraffin-embedding method, cut at 15 μ m, and stained in hematoxylin-eosin. Additional thick sections were cut by hand.

DESCRIPTIONS

Eleven cestodes were expelled by the bustard on a single occasion. Two immature specimens were not identifiable. The first species described below was represented by 1 complete cestode, 1 that lacked only the scolex and early immature segments, and the posterior half of a third. Dimensions of eggs were determined from permanent preparations and from gravid segments in 70% ethanol. In the following descriptions, all measurements are given in micrometers unless otherwise stated.

Ascometra chorioidis n. sp.

(Figs. 1–3)

Description

Complete strobila (holotype) 461 mm long, with 349 segments; maximum width, attained in late gravid segments, 3.2 to 4.8 mm. Strobilar margins serrate. All but terminal segments wider than long. Length/width ratio of mature segments 1:2.5 to 1:2.1; of early gravid segments without eggs in paruterine organ, 1:2.5 to 1:1.3; of gravid segments, with eggs in paruterine organ, 1:1.5 to 1:0.7. Scolex 638 in length by 594 in width, more or less globular and distinctly set off from neck. Suckers 175 to 242 in greater diameter, each provided

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FIGURES 1-3. *Ascometra chorioidis* n. sp. 1. Scolex. 2. Mature segment, ventral view. 3. Terminal gravid segment, dorsal view.

with symmetrical, cone-shaped protrusions bilaterally. Neck about 460 long. Genital anlagen first visible in 48th segment. Ventral longitudinal excretory canals 79 to 256 in diameter, with transverse connections across posterior margin of segment 253 to 473 in diameter. Dorsal canals, typically undulating, 15 to 44 in diameter in immature segments; in mature segments, dorsal canals 5 to 30 in diameter, sometimes interrupted, appearing as discrete segments with closed ends. Dorsal canals often not discernible. Genital pores mostly unilateral and sinistral, opening into genital atrium slightly posterior to middle of segmental margin. Female genital organs often doubled, with state of development variable. Bilateral genital pores and genital ducts present in about 23% of segments; replicated male genital ducts sometimes present. Genital ducts passing dorsally across longitudinal excretory canals. Cirrus sac relatively small, 205 to 294 in length ($\bar{x}$ 50: 246) by 71 to 85 in diameter ($\bar{x}$ 50: 77); extending medially less than half of distance between segmental margin and poral ventral longitudinal excretory canal. Internal seminal vesicle consisting of coiled tube 7 to 15 in diameter, within proximal end of cirrus sac. External seminal vesicle consisting of numerous coils, extending from proximal end of cirrus sac to margin of poral ovarian lobe; continuing posteriad as vas deferens and receiving vasa efferentia at level of vitelline gland. Testes subspherical, 43 to 110 in greater diameter ($\bar{x}$ 60: 74), arranged in 2 layers, and occupying anterior two-thirds of segment between ventral excretory canals; greater number of testes aporal. Number of testes per segment 180 to 209 ($\bar{x}$ 20 segments: 193).

FIGURES 4-6. *Ascometra scheuermanni* n. sp. 4. Scolex. 5. Mature segment, dorsal view. 6. Terminal gravid segment, ventral view.

Vagina opening in genital atrium posterior to orifice of male duct, passing medially as somewhat curved tube to lateral margin of poral ovarian lobe; there enlarging to form seminal receptacle ventral to ovary. Seminal receptacle more or less ellipsoidal, 164 to 218 in length ($\bar{x}$ 30: 187) by 66 to 110 in diameter ($\bar{x}$ 30: 87), situated just anterior to vitelline gland and partially surrounded by ovarian lobes. Lobed ovary 187 to 330 in length ($\bar{x}$ 25: 264) by 319 to 440 in width ($\bar{x}$ 25: 379), occupying most of segment between midline and poral ventral excretory canal. Lobed vitelline gland usually reniform, with anterior concavity; 121 to 242 in length ($\bar{x}$ 26: 170) by 242 to 495 in width ($\bar{x}$ 26: 325), situated just poral to midline posterior to ovary. Paruterine organ first visible as transverse, more or less rectangular structure at anterior margin of segment, between ventral excretory canals; organ gradually enlarging, displacing testes posteriad. Paruterine organ initially about 5 times wider than long, with relative length increasing posteriad; in early post-mature segments, 341 to 506 in length by 1.0 to 1.5 mm in width. Width of paruterine organ more or less constant, with length increasing up to about 792 before entry of eggs. Paruterine organ containing eggs only in last 2 to 15 segments. In terminal segments, paruterine organ 682 to 1.24 mm in length by 1.2 to 1.6 mm in width. Uterus first visible as ventral, anastomosing reticulum, gradually enlarging and filling entire segment between ventral excretory canals posterior to paruterine organ. Eggs spherical, with outer membrane 97 to 131 in diameter ($\bar{x}$ 25: 113). Embryophore 59 to 83 in diameter ($\bar{x}$ 28: 76).

Oncosphere somewhat elongate, 52 to 78 in greater diameter ($\bar{x}$ 26: 66). Embryonic hooks relatively long. Middle pair of hooks 25 to 38 in length ($\bar{x}$ 44: 32); lateral pairs, 23 to 29 ($\bar{x}$ 82: 26).

Specimens deposited: *Holotype*, USNM Helm. Coll., No. 78722; *Paratype*, No. 78723.

Host: *Choriotis kori* (Burchell), Kori Bustard (Gruiformes: Otididae).

Locality: Kenya: Laikipia Plateau, near the northern border of Kenya between Nanyuki and Rumeruti. At the Woodland Park Zoo, the cestodes were collected by Dr. Debra A. Scheuerman.

Habitat: Presumably the small intestine of the host.

Etymology of specific name: From the generic name of the host, genitive case.

The second species, described below, was represented by 2 complete specimens, 2 fully developed strobilae that were nearly complete, and 2 immature specimens. For measurement, eggs were obtained from gravid segments in 10% formalin.

***Ascometra scheuermani* n. sp.**
(Figs. 4–7)

Description

Strobila up to 516 mm long, with 567 segments. Maximum width 2.82 to 3.79 mm, usually attained in gravid segments. Strobila widening rather abruptly behind scolex. Strobilar margins serrate. All but terminal gravid segments wider than long. Mature segments with length/width ratio of 1:2.9 to 1:1.6; gravid segments, 1:2 to 1:1; terminal gravid segments, after entry of eggs into paruterine organ, 1:1.4 to 1:0.85. Scolex globular, distinctly set off from neck, about 700 in length by 737 in width. Suckers 264 to 297 in greater diameter; each provided with symmetrical, conical processes bilaterally. Neck about 640 long. Ventral longitudinal excretory canals 77 to 256 in diameter; transverse connection across posterior margin of segment 110 to 484 in diameter. Dorsal canals undulating in immature segments, 10 to 40 in diameter; canals narrowing posteriorly, usually disappearing in mature segments. When discernible in mature segments, dorsal canals very thin, 2.5 to 10 in diameter. Genital pores usually unilateral and sinistral, opening in genital atrium just posterior to middle of segmental margin. Reduplication of female genital organs rare, occurring in only about 0.8% of segments. Genital Anlagen visible in 56th segment. Genital ducts passing dorsally across longitudinal excretory canals. Cirrus sac slender and elongate, extending mediad to poral margin of ventral excretory canal; 420 to 609 in length ($\bar{x}$ 50: 513) by 51 to 87 in diameter ($\bar{x}$ 50: 65). Internal seminal vesicle consisting of slightly coiled tube, 7 to 15 in diameter, in proximal end of cirrus sac. External seminal vesicle consisting of much-coiled tube, extending mediad from proximal end of cirrus sac to anterolateral margin of poral ovarian lobe; then turning posteriorly, extending to level of vitelline gland and there receiving vasa efferentia. Sub-spherical testes 49 to 113 in greater diameter ($\bar{x}$ 60: 81), arranged in 2 layers and contiguous across middle field between ventral longitudinal excretory canals. Testes ranging from 180 to 221 per segment ($\bar{x}$ 20 segments: 200), surrounding female genital organs, and extending anteriorly to posterior margin of early-stage paruterine organ. Vagina opening into genital atrium

FIGURE 7. Egg of *Ascometra scheuermani* n. sp.

posterior to orifice of male duct; consisting of thin duct passing mediad to poral margin of ovary; there enlarging to form ovoid seminal receptacle. Seminal receptacle 128 to 189 in length ($\bar{x}$ 50: 157) by 33 to 87 in diameter ($\bar{x}$ 50: 59), situated ventrally near poral anterior margin of ovarian lobe. Ovary lobed, 102 to 269 in length ($\bar{x}$ 50: 206) by 233 to 410 in width ($\bar{x}$ 50: 324), situated ventrally in poral half of segment just anterior to vitelline gland. Vitelline gland lobed, usually reniform with anterior concavity; 90 to 156 in length ($\bar{x}$ 50: 133) by 146 to 238 in width ($\bar{x}$ 50: 201). Vitelline gland situated at posterior margin of ovary. Paruterine organ first visible as transversely elongate structure near anterior margin of early post-mature segments; 187 to 220 in length by 1.01 to 1.04 mm in width in early post-mature segments; 580 to 880 in length by 803 to 1.33 mm in width in early gravid segments. In terminal segments, 1.04 to 1.25 mm in length by 979 to 1.2 mm in width. Eggs first entering paruterine organ in 559th segment, with those in last 9 segments containing eggs. Cirrus sac and vagina persisting in gravid segments. Uterus first appearing as ventral, anastomosing reticulum, filling entire gravid segment between ventral excretory canals. Eggs with outer membrane 111 to 147 in diameter ($\bar{x}$ 22: 125); embryophore 66 to 88 in diameter ($\bar{x}$ 25: 79); oncosphere somewhat elongate, 59 to 78 in greater diameter ($\bar{x}$ 25: 69). Embryonic hooks relatively large; middle pair, 24 to 33 in length ($\bar{x}$ 42: 29); lateral pairs, 22 to 30 ($\bar{x}$ 93: 25).

Specimens deposited: *Holotype*, USNM Helm. Coll. No. 78724; *Paratype*, No. 78725.

Host: *Choriotis kori* (Burchell), Kori Bustard (Gruiformes: Otididae).

Locality: Kenya: Laikipia Plateau, near the northern border of Kenya between Nanyuki and Rumeruti. At the Woodland Park Zoo, the cestodes were collected by Dr. Debra A. Scheuerman.

Habitat: Presumably the small intestine of the host.

Etymology of specific name: This cestode is named in honor of Dr. Debra A. Scheuerman, who kindly made available the material on which the present paper is based.

COMPARISONS

A brief taxonomic review is necessary to provide a basis for the generic allocation of the ces-

todes described herein. The 2 genera, *Ascometra* Kholodkovskii, 1912, and *Octopetalum* Baylis, 1914, were established for morphologically similar cestodes obtained respectively from a bustard in Eurasia and from guinea fowl in Africa. They were placed by Fuhrmann (1932) in the subfamily Paruterininae Fuhrmann, 1907, in the family Dilepididae, but other systematic arrangements were proposed subsequently. The status of the 2 genera was assessed by Baer (1955), in his revision of the subfamily Idiogeninae Fuhrmann, 1907, which he placed in the family Davaineidae.

Both *Ascometra vestita* Kholodkovskii, 1912 and *Octopetalum gutterae* Baylis, 1914, the type species of the 2 genera, were characterized in part by the lack of a rostellum, a unique character among genera assigned to the subfamily Idiogeninae. Both also have suckers with distinctive, muscular processes. Baer (1955) made a detailed study of paratypes of the cestode described as *Inermicapsifer otidis* Meggitt, 1927, which he considered to be synonymous with *Ascometra vestita*. Based on his findings with particular reference to the scolex and suckers, Baer placed *Octopetalum* in synonymy with *Ascometra*. Three species of *Ascometra* were recognized: *A. vestita*, *A. gutterae*, and *A. numida* (Fuhrmann, 1909). Baer (1955, p. 14) provided the following diagnosis of the genus *Ascometra*:

"Idogeninae à scolex inerme et à ventouses munies chacune de deux papilles musculaires symétriques. Pores sexuels alternant irrégulièrement; conduits sexuels passant à la face dorsale du vaisseaux excréteur et du nerf. Musculature du strobila bien développée. Vaisseaux excréteurs dorsaux absents ou existant seulement dans les segments jeunes du strobila. Glandes sexuelles femelles médianes; utérus ramifié, persistant, se vidant dans un organ parutérin dans les segments gravides. Testicules nombreux, entourant les glandes sexuelles femelles. Parasites d'Oiseaux."

In a preliminary report, Artiukh (1965) accepted Baer's conclusions concerning the genus *Ascometra*, placed by Artiukh in the family Idiogenidae Mola, 1929. The same systematic arrangement was followed by Artiukh (1966) in his monograph on the suborder Davaineata Skriabin, 1940. On the basis of Baer's (1955) conclusions as well, Matevosian (1969), in her monograph on the superfamily Paruterinoidea Matevosian, 1962, excluded the genus from the family Paruterinidae.

More recently, however, Matevosian and Movsesian (1970) undertook a reassessment of the genera *Ascometra* and *Octopetalum*, which they placed in the subfamily Rhabdometrininae Matevosian, 1965, in the family Paruterinidae. They concluded that the cestode studied in detail by Baer (1955) was not *A. vestita*, but that it represented a distinct species for which they conditionally proposed the name *Ascometera baeri* Matevosian and Movsesian, 1970 (according to Article 15, International Code of Zoological Nomenclature, a name proposed conditionally after 1960 is not available). Matevosian and Movsesian concluded that the genera *Ascometra* and *Octopetalum* are in fact distinct. With reference to the generic diagnosis of *Ascometra* (syn. *Octopetalum*) published by Baer (see above), the relevant differences in the generic diagnoses would be as follows (Matevosian and Movsesian, 1970, pp. 143–144):

Ascometra: Single papilla arising from floor of suckers. Genital openings unilateral. Genital ducts passing dorsally across ventral excretory canals. Dorsal excretory duct absent. Number of testes exceeding 100. Paruterine organ extended transversely.

Octopetalum: Two symmetrically placed papillae on each sucker. Genital pores irregularly alternating. Dorsal canal present. Genital ducts passing between longitudinal excretory canals. Number of testes less than 100. Paruterine organ extended longitudinally.

It is evident that the 2 cestodes described herein exhibit combinations of characteristics that preclude their allocation to either genus as diagnosed by Matevosian and Movsesian (1970). The cestodes from the Kori Bustard have the following characteristics in common: bilateral processes on the suckers; dorsal longitudinal excretory canals present (but sometimes not discernible in mature segments); genital pores predominantly unilateral; genital ducts passing dorsally across longitudinal excretory canals; and numbers of testes far in excess of 100. In 1 species, the paruterine organ is wider than long; in the other, longer than wide (terminal gravid segments).

Based on these findings, we conclude in agreement with Baer (1955) that *Ascometra* and *Octopetalum* cannot be distinguished at the generic level. In addition to the 3 species of *Ascometra* recognized by Baer, the species described provisionally by Matevosian and Movsesian (1970) is very similar to *A. vestita*. If this cestode is indeed distinct from the latter, the applicable

name would appear to be *Ascometra otidis* (Meggitt, 1927) (syn. *Inermicapsifer otidis* Meggitt, 1927). Since the characters used in distinguishing the 2 new species from *A. vestita* serve as well to separate them from this taxon, *A. baeri* Matevosian and Movsesian, 1970 provis. is not considered further here.

Of the 3 species previously recognized in the genus *Ascometra* by Baer (1955), *A. gutterae* and *A. numida* have less than 100 testes, whereas *A. chorioidis* n. sp. and *A. scheuermani* n. sp. have about twice that number. The former are much smaller cestodes, not exceeding 100 mm in length of strobila [see Matevosian and Movsesian (1970) for table of measurements]. Further comparisons of the new species with *A. gutterae* and *A. numida* is unnecessary. Compared with *A. vestita*, the type species of *Ascometra*, both *A. chorioidis* and *A. scheuermani* have much longer, more robust strobilae (maximum strobila-length reported for *A. vestita*: 280 mm). The new species have bilateral processes on the suckers, whereas *A. vestita* was described as having a single papilla arising from the floor of the sucker. *Ascometra chorioidis* differs also from *A. vestita* in having a cirrus sac of similar length, but of much smaller proportional size. Moreover, the cirrus sac in *A. chorioidis* extends mediad across less than half the space between the segmental margin and ventral excretory canal, whereas that of *A. vestita* overlaps the canal [see Matevosian and Movsesian (1970) fig. 1, based on Kholodkovskii's type material]. *Ascometra chorioidis* also has about 50 more testes (ca. 150 in *A. vestita*) of more limited distribution (uniformly dispersed throughout the middle field of the segment in *A. vestita*). So far as can be judged from the figure of the early gravid segment provided by Matevosian and Movsesian (1970) (material from Kazakhstan), the paruterine organ of *A. vestita* does not occupy the entire field between the ventral canals, as it does in *A. chorioidis*. Compared with *A. vestita*, *A. scheuermani* has a longer cirrus sac (mean length of 513, as compared with 220 to 250 in *A. vestita*). The testes in *A. scheuermani* are more numerous, but have a limited distribution, not filling the area around the genital ducts porally. As in *A. chorioidis*, the paruterine organ in *A. scheuermani* occupies the full width of the segment between the ventral canals, and it is longer than wide in terminal gravid segments, whereas that of *A. vestita* is wider than long. The eggs of *A. chorioidis* and *A. scheuermani* are similar in size (Fig. 7), and are much

larger than those of *A. vestita* [see Matevosian and Movsesian (1970)].

DISCUSSION

Although the cestodes now included in the genus *Ascometra* fall into 2 morphological groups, primarily on the basis of numbers of testes, they exhibit combinations of characters that preclude separate generic allocations. *Ascometra vestita* and the 2 species described herein have large strobilae, around 200 testes, and they occur in bustards (Otididae). The remaining 2 species have small strobilae, less than 100 testes, and occur in guinea fowl. The members of the former group are known from both Eurasia and Africa, whereas the 2 in guinea fowl are African in distribution. On the basis of apparent host-specificity in birds representing 2 families in different orders (Gruiformes and Galliformes), cestodes of the 2 groups appear to represent distinct phyletic lines.

The Kori Bustard from which our material was obtained had been kept at the Woodland Park Zoo (Seattle, Washington) for approximately 8 months following its capture in Kenya. The presence of immature cestodes among those expelled by the bird suggests that the cycles of 1 or both species were being completed at the zoo, where the bustards had free range in a large (ca. 0.8 ha), savannah-type area. Gwynn and Hamilton (1935) reported the findings of cysticeroids lacking a rostellum and having bilateral protrusions on the suckers in a locust, *Nomadacris septemfasciata* Serv. (Acrididae), in Chad. As recognized by them, these were possibly the larval stage of a cestode of the genus *Octopetalum* (= *Ascometra*). Dr. D. A. Scheuerman (pers. comm.) reported that locusts were common in the enclosure in which the Kori Bustards were kept.

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