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CATHETOCEPHALUS AUSTRALIS N. SP. (CESTOIDEA: CATHETOCEPHALIDAE) FROM AUSTRALIA, WITH A PROPOSAL FOR CATHETOCEPHALIDEA N. ORD.

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ABSTRACT: *Cathetocephalus australis* n. sp. differs from *Cathetocephalus thatcheri* Dailey et Overstreet, 1973, in its smaller scolex (1.12–2.9 mm wide vs. 4.0–10.0 mm) and fewer testes (125–205 vs. 300–500). Cathetocephalidea n. ord. is proposed for Cathetocephalidae Dailey et Overstreet, 1973, which is removed from the Tetraphyllidea. The new order is characterized by the scolex that lacks bothridia, suckers, and hooks and is perpendicular to the long axis of the strobila, with many papillae and gland cells.

Between 1985 and 1988, 1,200 elasmobranchs representing 100 species from Australian waters were examined for tapeworms. Among those found were 2 species of *Cathetocephalus* Dailey et Overstreet, 1973, 1 of which is described herein as new. Specimens of the other, although different, are in too poor a condition to be described. The worms were fixed in 10% formalin and stained with celestine blue. Sections and whole mounts were made by conventional techniques. All measurements are in micrometers unless otherwise indicated.

DESCRIPTION

Cathetocephalus australis n. sp.

(Figs. 1-3)

General (based on 18 intact specimens and several sections; most specimens were too juvenile to yield useful measurements): Scolex (Fig. 1) lacking bothridia, suckers, or armature; a transverse organ perpendicular to the long axis of the strobila, attached to it dorsally and ventrally or laterally. Total width (tip to tip) 1.12–2.90 mm (n = 5); greatest thickness 210–440 at center of scolex (n = 5). Anterior surface of scolex with 2 bands of minute papillae separated by narrow, smooth, median band. Neck 500–960 long (n = 5). Strobila 50–95 mm long (n = 2) by 1.68–2.96 mm maximum width (n = 2) at posterior end when bearing gravid proglottids. No multistrobilate specimen was found. Proglottids protandrous, slightly craspedote, gradually increasing in size toward posterior end. Mature proglottids (Fig. 2) 0.92–1.68 mm long, 0.77–1.60 mm wide (n = 5). Gravid proglottids 1.68–2.96 long, 1.36–1.76 mm wide (n = 2). Osmoregulatory canals difficult to see except in neck. Ventral canals 32–40 wide, with posterior transverse anastomosis in each proglottid; dorsal canals about 5 wide. Genital pores irregularly alternating, about equatorial. Genital atrium (n = 5) about 80 long by 60 deep.

Male genitalia: 125–205 testes ($\bar{x}$ = 160) (n = 4), each 45–105 wide (n = 14). Testes in 2 shallow layers filling poral and aporal, posterior and anterior parenchyma, reaching from ovary to very near anterior margin of proglottid. Cirrus pouch ovoid, transverse, with anterior median notch, 300–630 long, 160–320 greatest width (n = 8). Cirrus about 1.0 mm long, armed with small spines. Base of cirrus surrounded by gland cells. Vas deferens anteromedial to cirrus pouch, a large saclike loop surrounded by gland cells ("external seminal vesicle" of Butler [1987]).

Female genitalia: Ovary bilobed, not x-shaped in cross section, 200–440 long, 400–840 wide (n = 5). Vagina anterior to cirrus pouch, with distal sphincter and gland cells, traversing to medial line, then looping posteriad to seminal receptacle between lobes of ovary. Seminal receptacle 70–104 long, 66–70 wide (n = 2). Vitellaria (Fig. 3) follicular, forming sleeve around medulla; follicles 16–48 wide (n = 10). Uterus first forms as simple median tube, becoming swollen with few shallow, lateral pockets when gravid; extending along middle three-fourths of segment. Eggs collapsed in our mounted specimens, apparently in clusters of 4–8.

Taxonomic summary

Type host: Bronze whaler, *Carcharhinus brachyurus* (Gunther, 1870).

Other hosts: Blacktip shark, *Carcharhinus limbatus* (Valenciennes, 1839); spot-tail shark, *Carcharhinus sorrah* (Valenciennes, 1839) syn. *Carcharhinus spallanzani* (Peron and Le Sueur *in* Le Sueur, 1822); great hammerhead, *Sphyrna mokarran* (Ruppell, 1837).

Location: Spiral valve intestine.

Type locality: Goolwa, South Australia.

Other localities: Moreton Bay, Queensland; Port Lincoln, South Australia; Fremantle, Geraldton, Western Australia.

Etymology: Named for the southern distribution of the species.

Type specimens: Australian Helminthological Collection, South Australian Museum, holotype no. V4123, paratypes nos. 17535, 17536; other specimens: 18231 (sections on 14 slides), 18230 (3 slides), 17074, 18232 (7 slides), 17187 (2 slides), 17938 (3 slides).

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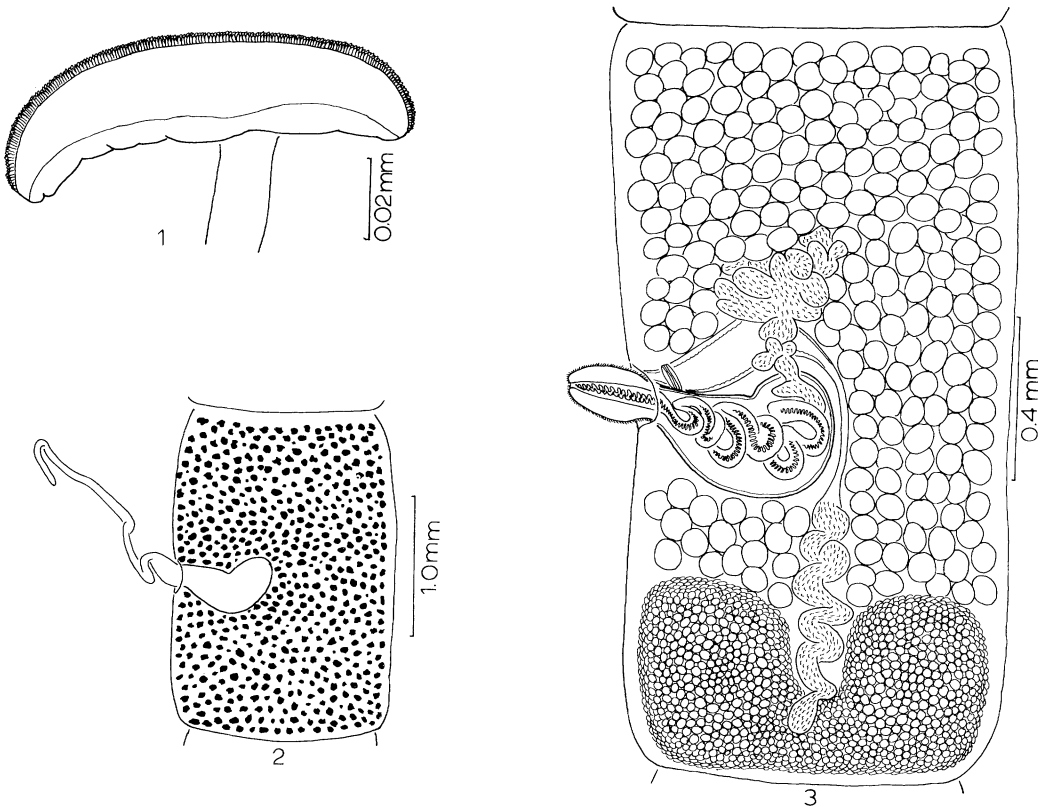

FIGURES 1–3. *Cathetocephalus australis* n. sp. **1.** Scolex. **2.** Mature proglottid. **3.** Gravid proglottid, showing distribution of vitelline follicles. The cirrus is about one-half extended.

Remarks

Dailey and Overstreet (1973) described *Cathetocephalus thatcheri,* The type and only species in the genus, and erected the family Cathetocephalidae for it. They did not record the number of testes. Watson and Thorson (1976) rediscovered the species in Lake Nicaragua and recorded the number of testes as 300–400. Both records are from the bull shark, *Carcharhinus leucas* (Valenciennes, 1839). We examined the holotype specimen of *C. thatcheri* and counted 400–500 testes; they are poorly stained and it was difficult to determine the number precisely. Butler (1987) described, but did not name, a second species of *Cathetocephalus* with about 125 testes from Australia, from a spot-tail shark, *C. spallanzani,* now considered by Campagno (1984) to be a synonym of *C. sorrah* (Valenciennes, 1839). We have examined her single specimen (QM GL 4635) and find it to agree with *C. australis.* The reader is referred to her excellent SEMs of the scolex of this species.

Cathetocephalus australis is easily differentiated from *C. thatcheri* by its smaller scolex (1.12–2.9 mm wide vs. 4.0–10.0 mm), and fewer testes (125–205 vs. 300–500). Also the apical papillae occupy proportionally more surface area of *C. thatcheri.* The genus is reported for the second time in the Southern Hemisphere.

Also among our collection are several specimens of a third species of *Cathetocephalus* from a graceful shark, *Carcharhinus amblyrhynchoides* (Whitley, 1934) from Rosewood Island, Queensland, Australia. Unfortunately, the specimens are in too poor condition to describe. Slides and vials of this species are deposited in South Australian Museum, AHC 16250.

Cathetocephalidae Dailey et Overstreet, 1973, was placed in the order Tetraphyllidea despite the lack of bothridia on the scolex and presence of 2 bands of papillae on its scolex. We believe these characteristics clearly warrant the establishment of a new order for this family.

Cathetocephalidea n. ord.

Diagnosis: Strobila elongate, polyzoic, protandrous, occasionally multistrobilate. Scolex lacking suckers, bothridia, or armature, transversely elongated perpendicular to the axis of the strobila. Apex of scolex with 2 parallel bands of minute papillae separated by narrow, smooth, median band. Strobila attached to scolex anywhere along its bottom surface and at any angle, sometimes multistrobilate. Proglottids slightly craspedote, increasing in length toward posterior end; anapolytic. Genital pores marginal, irregularly alternating. Testes numerous. Ovary compact, bilobed in cross section, posterior. Vitelline follicles forming sleeve around medulla. Uterus with lateral diverticulae, be-

coming a swollen sac; uterine pore absent. Parasites of elasmobranchs (sharks).

Remarks

Although the strobila and proglottids are similar to those in Tetraphyllidea, Trypanorhyncha, and Lecanocephalidea, the scolex, as described above, is unlike any of these. Therefore we establish a new order to include Cathetocephalidae and the 2 species of *Cathetocephalus* so far described in it.

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BOOK REVIEW . . .

Medical Parasitology: A Self Instructional Text, 3rd ed., by Ruth Leventhal and Russell F. Cheadle. F. A. Davis Company, Philadelphia. 1989. 188 p. 126 color photographs in 16 plates. $29.95.

Medical Parasitology is presented as a self-instructional text, intended to provide health professionals with a fundamental understanding of diagnosis, prevention, and treatment of parasitic disease, and according to the authors, "is best used in conjunction with a course that includes both lecture and laboratory experiences." The book is divided into eight chapters having the following titles and sequence: Introduction, Nematoda, Cestoda, Digenea, Protozoa, Arthropoda, Laboratory Procedures, and Control and Treatment. Although concerned primarily with the medical aspects of parasitology, general consideration also is given to the classification and biology of representative taxa, with the ecology of infection receiving special attention in the chapter on control and treatment. Word diagrams of life cycles and labeled drawings of diagnostic stages also are provided. The design of the book is creative in that glossaries are placed at the beginnings of chapters where their content becomes an integral part of the subject matter. The self-instructional feature incorporates a series of chapter "learning objectives," designed to orient the student to the material presented, followed by a "post test," at the end of the chapter, whereby students can measure their performance, the acceptable standard for success being a score of 80%. The instructional method does not, as one might anticipate, lead the student through a prescribed series of observations or procedures, although, for reference purposes, the reader is directed to other parts of the text or to any of several bibliographic sources. One of the principal sections to which the reader is referred is the fine collection of 126 colored photographs that appear in "atlas" form at the front of the text. These photographs are accompanied by well annotated legends that emphasize not only the diagnostic features of the parasites, but also their pathology and symptomatology. The incorporation of the atlas, along with the presence of readable tables that effectively summarize the information in each chapter, including that on serodiagnostic applications, make this a desirable reference for either the clinical or the teaching laboratory. The book does contain some errors, two notable ones being the use of family endings, rather than ordinal, in the table of cestode orders and the mention of nematodes as having several muscle layers beneath the cuticle. Also, there may be some disagreement with the use of certain terms, e.g., "axostyle" for "axoneme" in *Giardia,* or the word "speciate" for "identify." Nevertheless, the book is well presented, and although it appears rather concise, it is ingeniously comprehensive and should serve admirably the purposes intended by the authors.

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