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ACANTHOCEPHALUS CRINIAE N. SP. (ACANTHOCEPHALA: ECHINORHYNCHIDEA) FROM THE CRICKET FROG, CRINIA TASMANIENSIS (GUNTHER)

By

JENNIFER SNOW

Department of Zoology, University of Tasmania
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With 5 text figures

ABSTRACT

The morphology of the adult and the egg of *Acanthocephalus crinae* n. sp. from *Crinia tasmaniensis* (Gunther), *C. signifera* Girard and *C. laevis* (Gunther) is described.

Information on the frequency and degree of infection of *C. tasmaniensis*, collected from Mt Wellington, Tasmania, is given.

INTRODUCTION

In 1968, Inglis, commenting on parasites recovered from 197 frogs from Western Australia, states (p. 164), 'in a very few cases an acanthocephalan was recovered from the intestine'. This appears to be the only report of adult Acanthocephala from Australian Amphibia. In contrast, there are a number of records of cystacanths from Australian frogs (Johnston and Deland, 1929; Johnston and Edmonds, 1948).

An examination of Tasmanian frogs has yielded a new species of *Acanthocephalus* Koelreuther, a genus hitherto known to occur only in Amphibia of the Northern Hemisphere.

MATERIALS AND METHODS

Two hundred and three specimens of *Crinia tasmaniensis* (Gunther) were collected from Mt Wellington during the period January 1969 to September 1969, anaesthetized, and dissected. The gut of each specimen was removed to a Petri dish where it was placed on a piece of filter paper moistened with frog Ringer solution. It was then slit open along its entire length and examined under a binocular microscope. Acanthocephala present were transferred to a crystal dish containing frog Ringer solution, and allowed to relax. The length and breadth of the metasoma of each worm was then measured. Eggs were removed from a number of gravid female worms and examined under phase contrast. The testes of several male worms were dissected out and treated with 0.004% colchicine for three hours and then immersed in hypertonic saline for half an hour. They were then fixed, squashed and stained in aceto-orcein. The remaining worms were fixed with Van Cleave's fixative (Chubb, 1962). Thirty specimens of each sex were cleared and mounted whole in Faure's Gum Choral (Gatenby and Beams, 1951). Other specimens were stained with alum carmine, cleared in clove oil and mounted in Canada Balsam. About 10 worms were embedded in Paraplast wax and sectioned at 6-12 μ . The sections were stained with Mayer's haematoxylin.

In addition, whole mounts of a number of Acanthocephala found in *C. tasmaniensis*, *C. laevis* (Gunther) and *C. signifera* Girard, collected in Tasmania by Dr J. L. Hickman (Department of Zoology, University of Tasmania) prior to the present study, were examined. Dr Hickman also kindly made available his data on the infection of *C. tasmaniensis* with *A. crinae*.

DESCRIPTION

The following description is based on a study of approximately 60 *A. crinae* n. sp. removed from the intestine of *C. tasmaniensis* collected on Mt Wellington, Tasmania. *Adult* (figures 1-3): Body small, male 1.4 \times 0.3-3.6 \times 0.8 mm., female 2.1 \times 0.5-6.0 \times 0.9 mm. Trunk aspinose, slightly flattened dorsoventrally. Body wall with numerous small hyperdermic nuclei. Lacunae system with main vessels lateral and reticular anastomoses. Neck short (0.06-0.10 mm. in length), without bulbous swelling, never cylindrical or spirally twisted. Proboscis ovoid (0.19 \times 0.13-0.38 \times 0.18 mm), slightly swollen, terminal, invaginable; 11-16 longi-

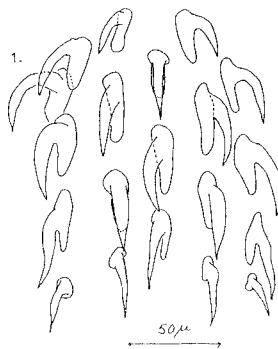


Fig. 1.—Ventral view of proboscis of female showing spines and roots of hooks.

tudinal rows of hooks, 4-5 hooks per row. Hooks increase in size from apex towards the middle and then decrease gradually towards the base; the spines 16-61 μ in length, the roots 9-48 μ . Receptacle cylindrical, 0.35 \times 0.12-0.39 \times 0.15 mm., double walled and inserted at the base of the proboscis. Ganglion at base of the proboscis receptacle. Two lemnisci, 0.4-0.5 mm. in length, more or less claviform, slightly longer than

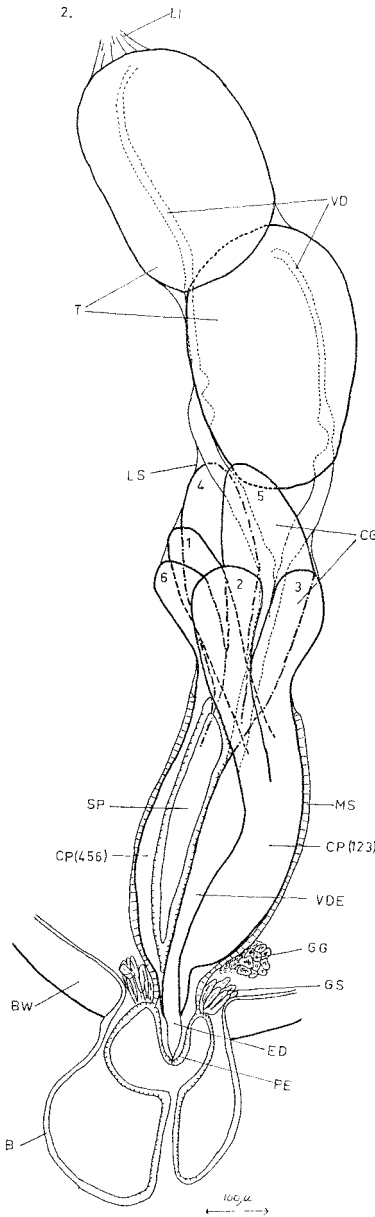


Fig. 2.—Male reproductive system.

B, bursa; BW, body wall; CG, cement gland; CP, cement passage; ED, ejaculatory duct; GG, genital ganglion; GS, genital sphincter muscle; LI, ligaments; LS, ligament sac; MS, muscular sheath; PE, penis; SP, Saccitigen's pouch; T, testes; VD, vas deferens; VDE, vasa deferentia.

the receptacle. Protonephridial organ absent. Testes oval, $0.20 \times 0.14 - 0.42 \times 0.34$ mm., tandem, in mid-region of the body. Six cement glands, almost pyriform, close together in a rosette or two rows of three. Efferent duct of female 0.8 - 0.9 mm. in length. Genital pore in

both male and female subterminal. Diploid chromosome number of 8.

Egg (figures 4, 5): Fusiform, flattened dorsoventrally, $67 \times 23 - 86 \times 25 \mu$ in size. Four membranes around acanthor, the fertilization membrane with slight polar prolongations. Acanthors prior to hatching approximately $43 \times 11 \mu$, after hatching approximately $47 \times 15 \mu$. Integument, excluding apex, covered by spines arranged in approximate spiral rows. Group of 6-9 hooks ($2.5 - 5.3 \mu$ long) plus large, bifid, bulbous based hook ($5.3 - 6.9 \mu$ long) always present at apex.

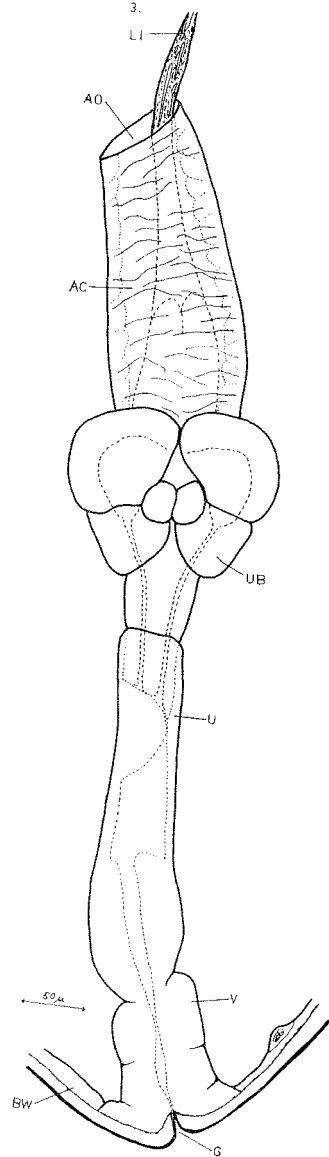


Fig. 3.—Female reproductive system.

AC, anterior chamber of uterine bell; AO, anterior opening of bell; BW, body wall; G, gonopore; LI, ligament; U, uterus; UB, uterine bell; V, vagina.

Type material: Holotype male, K228, allotype female, K228, and *paratypes*, K229, K230 (in glycerol/alcohol) deposited in the Tasmanian Museum, Hobart.

Location in the host: duodenum and ileum.

Type host: *Crinia tasmaniensis* (Gunther).

Type locality: Mt Wellington (3,800 ft), Hobart, Tasmania

Other hosts: *C. laevis* (Gunther). *C. signifera* Girard.

INFESTATION OF *C. TASMANIENSIS* WITH *A. CRINIAE* N. SP.

In the present investigation, 164 of the 203 *C. tasmaniensis* collected from Mt Wellington over the period January 1969 to September 1969 were found infected with *A. crinae* and from them a total of 484 (216 male, 268 female) worms were obtained. The degree of infection ranged from 1 to 9. The rather high incidence of infection agrees with that of frogs from the same locality collected by Dr J. L. Hickman over the years 1951-1967 (viz: 437:541, 1886, 855 male:1031 female, 1-39 worms per host).

DISCUSSION

The chromosome numbers of only a few Acanthocephala have been determined (see Makino, 1951). Two species of *Acanthocephalus*, *A. anguillae* (Müller) (syn. *Echinorhynchus proteus* Porta) and *A. ranae* (Schrank), have a diploid number of 8 (Makino, 1951 and John, 1957). From a study of meiotic metaphase plates and developing spermatozoa, the diploid number in *A. crinae* also appears to be 8. Four bivalents were found in most of the metaphase I plates, while 8 small chromosomes were observed in most of the metaphase II plates examined. Four rod like chromosomes were present in the developing sperm. No mitotic metaphase plate was found, so it was not possible to confirm that the ploidy number is 8.

Yamaguti (1963) lists 32 species as belonging to the genus *Acanthocephalus*. Since then a further two species

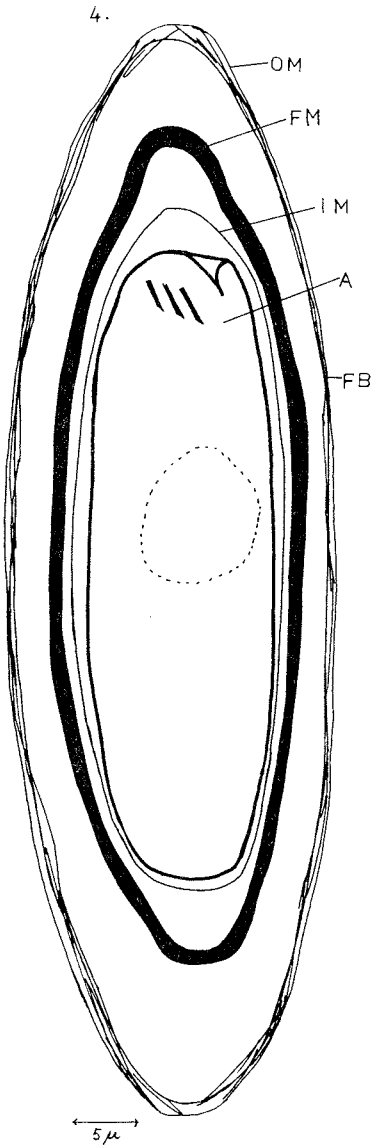


Figure 4. Mature egg.

A, acanthor (embryo); FB, fibrillar membrane; FM, fertilization membrane; IM, inner membrane; OM, outer membrane.

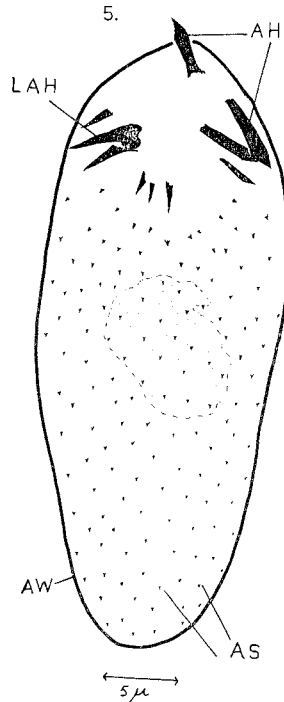


Fig. 5.—Acanthor or embryo.

AH, acanthor hooks; AS, acanthor spines; AW, acanthor wall; LAH, large acanthor hook.

TABLE I
CHARACTERISTICS OF SPECIES OF *PSEUDOACANTHOCEPHALUS* AND *ACANTHOCEPHALUS*
WITH A PROBOSCIS ARMATURE SIMILAR TO THAT OF *A. CRINIÆ* N. SP.

Species	Egg Size (μ)	Embryo size (μ)	Genital pore in female	Cement Glands	Testes (mm.)	Proboscis size in male (mm.)	Length of hook spines (μ)	Size of male (mm.)	Source of Information
<i>A. criniæ</i> n. sp.	67×23—86×25	43×11	subterminal	6 in a rosette	0.20×0.14—0.42×0.34	0.19×0.13—0.25×0.16	16—61	1.4×0.3—3.6×0.8	
<i>A. ranae</i>	*110×13(d) 110—128(b)	—	*terminal(a)	*3 pairs in a tandem(c)(d)	*0.96×0.62(c) *0.65—0.75× 0.45—0.56(a)	0.45—0.50×0.3(d)	*61—95(b)	*4.5—9.0(b) 5—12(d)	(a) Engbert (1962) (b) Grabda-Kazubska (1962) (c) Kaiser (1893) (d) Lühe (1911)
<i>A. falcatus</i>	*74—87×17—21	38—47	*terminal	3 pairs in two rows of three	0.24—0.78 ×0.21—0.62	*0.25—0.32×0.15 —0.24	48—86	2.12—5.21× 0.43—1.00	Grabda-Kazubska (1962)
<i>A. lucidus</i>	*94—100× 24—26(a) *93—114× 24—32(b)	45—60× 13—15(b)	—	—	0.37—0.95× 0.32—0.65(b)	*0.35×0.3(a) *0.35—0.40× 0.18—0.29(b)	*70—88(a) 70—120 70—135(b)	*4.00(a) 4.5—7.3× 0.8—1.3(b)	(a) Van Cleave (1925) (b) Yamaguti (1935)
<i>A. vanleaveii</i>	*54—72 ×12—18	—	—	*7 (based on one male only)	*slenderly elongate, complex measures 1.64×0.12	0.23×0.135	*30—105	*4.3×0.4	Hughes and Moore(1943)
(+) <i>A. tumescens</i>	—	—	—	—	0.41×0.27	*0.38×0.13	23—49	*5.8×0.4	Hartwich (1956)
<i>P. bufonis</i>	75—84× 23—27	—	—	—	*0.70—0.78× 0.47—0.53 close together midregion of trunk	*0.63×0.28—0.33	40—77	*4.2—8.1	Petrotschenko (1954)

FOOTNOTE: (+) Definitive host is a fish, those of other species are amphibians.

* Indicates where characteristic differs from same characteristic of *A. criniæ* n. sp.

A. jacksoni Bullock (1962) and *A. madagascariensis* Golvan (1965) have been described. The only other genus found as adults in Amphibia is *Pseudoacanthocephalus* Petrotschenko. This genus has been considered to be a synonym of *Acanthocephalus* (Golvan, 1960; Baer, 1961). Therefore in the present study *A. crinia* n. sp. is compared with the species of both these genera.

In the pattern of its proboscis armature *A. crinia* n. sp. resembles the six species, *A. ranae*, *A. falcatus* (Froelich), *A. lucidus* Van Cleave, *A. vancleavei* Hughes et Moore, *A. tumescens* Linstow and *Pseudoacanthocephalus bufonis* (Shipley). However, it differs from each of these in a number of other characters (see Table 1) and is considered to represent a new species.

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