ACANTHOCEPHALA FROM NORTHERN INDIA.*

II. A NEW SPECIES OF *Centrorhynchus* (*C. maryasis*, sp. nov.) FROM A HIMALAYAN BIRD, *Urocissa melonacephala occipitalis* (Blyth).

By M. N. DATTA, *M.Sc., M.R.A.S., Zoological Survey of India, Calcutta.*

(PLATE VII.)

During a survey of the Kumaon Hills in May and June 1930, under the supervision of Dr. H. S. Pruthi, Assistant Superintendent, three specimens (2 females and 1 male) of *Urocissa melanocephala occipitalis* (Blyth) were shot on the bank of a stream which flows about 1½ miles east of Bhowali. I examined the intestines of these birds and found that they were heavily infected with Acanthocephalan parasites. The total number of parasites collected was 29. The worms were carefully detached from the intestinal walls and left overnight in normal salt solution. After about 16 hours in salt solution the worms became sluggish and were properly expanded. A few drops of 0·5 per cent. solution of Cocaine hydrochloride were then added to narcotise the worms and after a couple of hours some were flattened between two slides and fixed in Bouin's fluid. All the specimens, after washing, were preserved in 70 per cent. alcohol for further study in the laboratory. Full anatomical details could be studied in the flattened worms mounted in Canada Balsam after staining them in a solution of equal parts of Delafield's Haematoxylin and Haemalum. The worms are of a distinct olive colour.

The males are comparatively more slender and smaller than the females. The gravid females in which the lumen of the body is congested with liberated ova are a bit darker in colour. The adult males vary from 5·5—15·0 mm. in length and 1·3—2·0 mm. in breadth and the females from 4·0—18·0 mm. in length and 1·0—3·0 mm. in breadth.

The body is long and cylindrical, having a rounded proboscis at the anterior end and its maximum breadth is near the middle of the body after which it tapers towards the posterior extremity which is bluntly rounded.

The Proboscis (Fig. 3) is globular and is followed by a short neck. The proboscis and the neck are armed with 24—28 rows of 14—16 hooks in each row, radially and symmetrically arranged. The hooks on the proboscis and specially near the middle are very strong and curved, they all have rectangular bases which are embedded in the wall of the proboscis thus giving the worm a strong organ of fixation. The hooks on the neck are slender while the last 2 or 3 rows are minute and thorny.

Measurements of hooks.

	Ant. row.	Middle row.	Last row.
Length	0·047 mm.	0·056 mm.	0·037 mm.
Breadth	0·019 mm.	0·019 mm.	0·009 mm.

* The present paper forms the second instalment of a series of papers which I propose to publish under the above title. The first of this series referred to in the list of references was published in the *Ann. Trop. Med. Parasitol* in 1929.

The Proboscis-sheath (Fig. 3) which has a double-layered muscular wall, originates from the middle of the proboscis, near the constriction formed at the junction of the proboscis and the neck. Strong bands of muscles are attached to the posterior end and also in the cavity of the sheath. These muscular bands known as the retractor and protractor muscles form the motor-system for the protrusion and retraction of the proboscis.

The Central Nervous system (Fig. 3) consists of a single nerve ganglion situated on the middle of the wall of the proboscis sheath. Branches from this ganglion are distributed in the anterior part of the body.

The Lemnisci are two elongated and narrow muscular folds which arise from the anterior end of the body just behind the constriction at the base of the neck. They are longer than the proboscis sheath and are composed of subjacent hypodermis and some muscle fibres. Their size as compared with that of the proboscis sheath varies in various species of Acanthocephala and is of some value in the systematic studies of these worms.

The body-wall is composed of an outer thick layer of cuticle followed by a thick layer of subjacent hypodermis in which are found scattered here and there nuclei and the canals and canaliculi of the lacunar system (Verma & Datta, 1929). Below the hypodermis there is a layer of longitudinal muscle fibres. In the body-wall small patches of minute branched nuclei are found scattered in the hypodermis.

The male genitalia (Fig. 5) lying in the posterior two-third of the body consist of a pair of ovoid testes, two vasa-efferentia, a vas-deferens, a seminal vesicle, three long cylindrical prostatic glands, a penis and a funnel-shaped bursa. The two testes are oval and nearly equal in size. They lie closely apposed one behind the other, an efferent duct leads from each of these and running backwards for a short distance joins the duct from the other side to form the vas-deferens; the latter ends in a strong muscular conical organ—the Penis. Near the commencement of the vas-deferens lies the club-shaped seminal vesicle. In mature specimens the vas-deferens is seen packed with sperms. The three prostatic glands are long and cylindrical structures situated a little behind the posterior testes. The ducts leading from these glands run alongside the vas-deferens and then join to open into a common opening near the base of the penis. The penis projects into a bell-shaped bursa, which has a frilled muscular wall. When the worm is pressed or during the time of copulation, the bursa projects outward as a bell at the posterior end. The genitalia are covered by a thin membrane of connective tissue. A ligament—the genital ligament—keeps the genitalia in place being attached at one end to the membranous covering and at the other end to the posterior end of the proboscis-sheath.

The female genitalia (Fig. 6) consist of the Ovary, the Uterine bell, the Uterus, the Vagina and the Vulva. The ovary is a rounded structure attached near the posterior end of the proboscis-sheath by means of the genital ligament and is seen only in very young specimens. In mature worms the ovary bursts, liberating the oval egg-balls which float in the lumen of the body. The egg-balls consist of ova in various

stages of development. The uterine bell is a funnel-shaped structure with a number of regularly arranged guard cells. The movements of these cells serve the function of sorting out the mature and the immature ova (Verma & Datta, 1929). Only the mature ova pass into the uterus for fertilization. The ova, after fertilization, collect at the posterior end of the uterus and from there make their exit through the narrow vagina. The uterus is a long tube and its wall is very flexible. The vaginal wall is composed of very strong muscle fibres and the two ends of the vaginal canal are guarded by a couple of strong sphincter muscles. These sphincters control the exit of the fertilized ova, which can only come out in single row through the narrow canal of the vagina. At the posterior end of the vagina there are two small sac-like structures which open by means of small thin tubes into the vulva. The secretion from these glands probably serves the function of lubricating the vulva.

Only one pair of these worms were found copulating when the specimens were collected. The bursa of the male was found to have been thrust into the vulva of the female. This pair was kept in salt solution, and after some time by contraction the bursa was ejected and the two worms separated.

In this collection I found one very young male specimen (Fig. 8) in which the proboscis, the spines, the proboscis-sheath, a pair of testes and the bursa only were developed.

In assigning these worms to the genus *Centrorhynchus* I have relied on the size and shape of the body of the male and the female, the absence of spines on the body, the lemnisci being longer than the proboscis-sheath, the presence of a distinct neck on the proboscis, the presence of the central nervous system on the middle of the proboscis-sheath and the presence of three prostatic glands.

TABLE I.

Chart showing the points of difference between *Centrorhynchus maryasis*, sp. nov. and other related species.

Name of species.	Size of the body.	Dimensions of the Proboscis.	Hooks on the Proboscis.	
			No. of rows.	No. in each row.
C. asturinus (Johnston and Deland, (1929).	Male 18·0 mm. long and 0·6 mm. broad. Female 28·0 mm. long and 0·8 mm. broad.	0·85 mm. long and 0·25 mm. broad.	40	30
C. pinguis (Van Cleave, 1918).	Male 8·5 mm. long and 1·55 mm. broad. Female 15 mm. long and 2·5—1·2 mm. broad.	0·77 mm. long	32	16

TABLE I—*contd.*

Chart showing the points of difference between *Centrorhynchus maryasis*, sp. nov. and other related species—*contd.*

Name of species.	Size of the body.	Dimensions of the Proboscis.	Hooks on the Proboscis.	
			No. of rows.	No. in each row.
C. aluconis (Muller, 1780).	Male 6—25 mm. long and 0·5—0·6 mm. broad. Females 11—45 mm. long and 0·8—1·5 mm. broad.	1·0—1·5 mm. long and 0·3 mm. broad.	30	15
C. spinosus (Kaiser, 1893).	Male 30—45 mm. long and 0·9—1·1 mm. broad. Female 40—60 mm. long and 1·5 mm. broad.	0·65 mm. long	30—32	24
C. corvi Fukui 1929.	Male 13—14 mm. long and 0·9—1·0 mm. broad. Females 19·7—19·8 mm. long and 1·5 mm. broad.	0·43—0·51 mm. long and 0·44—0·48 mm. broad.	36—40	11—12
C. maryasis, sp. nov., 1932.	Male 5·5—15 mm. long and 1·3—2 mm. broad. Females 4—18 mm. long and 1·0—3 mm. broad.	0·79 mm. long and 0·48 mm. broad.	24—28	14—16

From the above table it is clear that the main points of difference between the new and the other closely related species consist in the size of the body of the male and the female, in the numbers of longitudinal rows of hooks and of hooks in each row on the proboscis.

In the new species, *Centrorhynchus maryasis*, the males are generally more slender and smaller than the females of about the same age. A distinct neck is present, the hooks in the middle of the proboscis are larger, stronger and more curved than those on the neck. The wall of the proboscis-sheath is double-layered and is attached near the middle of the proboscis. The central nervous system is situated near the middle of the wall of the proboscis-sheath. The three prostatic glands are long and cylindrical structures. There are no spines on the body-wall.

In conclusion I have to express my gratitude to Dr. Baini Prashad, Director, Zoological Survey of India, for his kind and unceasing help, as also for going through the manuscript.

Host.—*Urocissa melanocephala occipitalis* (Blyth).

Location.—Intestine.

Locality.—Kumaon Hills (near Bhowali).

Type-specimens, No. W $\frac{3000}{1}$, with all the preparations, are deposited in the reserve collection of the Zoological Survey of India, Indian Museum, Calcutta.

TABLE II.

Measurements of flattened specimens in millimeters.

Specimens.	1	2	3	4	5	6
Total length of individual	14·00	6·60	5·60	16·00	10·00	4·00
Maximum breadth	2·00	1·40	1·30	3·00	1·50	1·00
Proboscis with neck—						
Length	0·76	0·79	0·73	0·81	0·79	0·69
Breadth	0·47	0·48	0·41	0·49	0·47	0·39
Proboscis-sheath—						
Length	0·79	1·11	0·79	0·85	0·90	0·77
Breadth	0·30	0·32	0·28	0·39	0·31	0·27
Lemnisci—						
Length	1·30	1·82	0·93	1·40	1·16	0·90
Breadth	0·15	0·17	0·09	0·17	0·19	0·08
Testes—						
Anterior—						
Length	0·71	0·87	0·41	..	..	..
Breadth	0·39	0·59	0·28	..	..	..
Posterior—						
Length	0·69	0·87	0·41	..	..	..
Breadth	0·37	0·56	0·28	..	..	..
Prostatic glands—						
Length (mass)	3·44	2·33	1·45	..	..	..
Breadth (single)	0·07	0·06	0·04	..	..	..
Seminal vesicle—						
Length	1·49	1·12	1·02	..	..	..
Breadth	0·41	0·26	0·28	..	..	..
Bursa—						
Length	0·99	0·97	1·02	..	..	..
Breadth	0·79	0·52	0·28	..	..	..
Uterine bell—						
Length		..		0·35	0·34	0·26
Breadth	..		..	0·12	0·15	0·09
Uterus—						
Length		..		0·93	0·84	0·78
Breadth	..	..	..	0·09	0·11	0·07
Vagina—						
Length	..		..	0·28	0·19	0·20
Breadth	..			0·13	0·09	0·09

N.B.—Specimens Nos. 1—3 are males and Nos. 4—6 are females.
(1. adult) 2. medium sized, and 3. small male.
4. adult, 5. medium sized, and 6. small female.)

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