

XIII REPORT ON A COLLECTION OF
FREE-LIVING NEMATODES FROM THE
CHILKA LAKE ON THE EAST
COAST OF INDIA

By F. H. STEWART, D.Sc.

[The collection on which this paper is based was made in connection with a zoological survey of the Chilka Lake now being undertaken by zoologists attached to the Indian Museum. The lake is a large lagoon connected with the sea by a narrow mouth and containing water that varies greatly in salinity at different places and at different seasons. Full particulars on this and other points will be given in a later paper—N. ANNANDALE.]

**Distribution of the genera to which the species described
in the following report belong.**

(1) GEOGRAPHICAL. The four genera *Oncholaimus*, *Dorylaimus*, *Monhystera*, and *Leptosomatum* are cosmopolitan. Species of *Oncholaimus*, *Monhystera*, and *Leptosomatum* have been recorded from localities ranging from Scandinavia to the Antarctic, while *Dorylaimus* also occurs in the five continents and the Pacific islands.

(2) HABITAT. *Oncholaimus* is almost exclusively a marine genus. The exceptions to this rule recorded up to the present are—*O. rivalis*, Leydig, a doubtful *Oncholaimus* (Lit. 1); *O. thalassophygas*, de Man, which occurs in fresh water and the soil in Holland (Lit. 7); *O. indicus* v. Linstow, in the brackish water of the Ganges delta.

Dorylaimus has been recorded only from fresh water and the soil.

Monhystera is chiefly a freshwater genus. Bastian (Lit. 1) describes two species (*M. disjuncta* and *ambigua*) from the sea, with a doubt, however, as to whether they should truly be classed in the genus. G. Schneider (Lit. 11) describes two species (*M. trabeculosa* and *bipunctata*) from the Baltic. Several species such as *M. microphthalmia*, *macrura*, and *agilis*, deMan, inhabit brackish water.

Leptosomatum is entirely marine.

***Oncholaimus chilkenis*, sp. nov.**

(Pl. xxx, figs. 1—4; Pl. xxxi, figs. 15, 17, 18.)

Two tubes; (1) *Indian Museum* No. ZEV 6237/7. Among filamentous algae at edge of lake: Chilka Lake, Gantasila, Ganjam district, Madras. 19-4-14. Two adult female specimens, mounted

in glycerine-jelly-formalin. (2) *Indian Museum No. ZEV 6195/7*: from *Spongilla* sp., Pigeon Island, Chilka Lake, Orissa. 25-1-14. Two immature specimens, mounted in glycerine-jelly-formalin.

The measurements will be found in Table I

The head is marked off from the body by a slight but abrupt increase in breadth at the level of the posterior end of the buccal capsule. The maximum breadth is situated at the middle of the body and decreases very slightly and gradually to the anterior end; in the posterior third there is also a slight but gradual decrease to the anus; tail conical from the anus to the commencement of the caudal appendage. Vulva very slightly prominent, close to the middle of the body.

The head bears six lips, mobile as in *O. indicus*. In the four specimens under consideration at present the lips are closed in over the mouth. The lips are situated—two laterally, two sub-dorsally and two subventrally. Each lip bears a minute papilla on the outer surface. Bristles do not occur on the head. Lateral organs, oval in shape, lying transversely, distant 0.019 mm. from the anterior extremity, length 0.005 mm., breadth 0.0085 mm., anterior border of the oval slightly flattened. Buccal capsule cylindrical with a large right subventral tooth, and two smaller teeth, one dorsal, one left lateral as in *O. indicus*, v. Linst.

No rings on the cuticle. Hairs occur irregularly in the oesophageal region, one marked row in each lateral line in this region. No bristles at the vulva or anus.

Tail simply conical from the anus to the commencement of the caudal appendage, differing therefore from *O. fuscus*, Bast. and *O. indicus*, v. Linst. (*vide* Pls. xxxi, xxxii, figs. 18, 19, 20). The caudal appendage is uniform in diameter and curves ventrally. A very slight annular constriction at the junction of tail and caudal appendage. A single caudal gland tube in front of the caudal appendage.

Oesophagus simple club-shaped, coarsely muscular. Intestine with many black globules.

Nerve ring not observed. Many cells enclosing the oesophagus. No ocelli.

Female gonads of the usual double type, a shell gland interposes between ovarian caecum and uterus as in *O. vulgaris*, Bast.

Contrasting	(1) <i>O. fuscus</i> , Bast.	(2) <i>O. indicus</i> , v.L.	(3) <i>O. chilensis</i> .
Total length ...	7 mm. ...	2.2 mm. ...	2.2 mm.
Head and body	Separated by a very faint increase of breadth at end of mouth capsule.	Not separated. Fig. 16. ...	Separated by marked increase of breadth. Fig. 17.
Shape of tail ...	Fig. 20. ...	Fig. 19. ...	Fig. 18.
Colour ...	Brown. ...	Grey. ...	Brown.

$$\text{Cobb's Formula, } \varphi, \frac{1.37 - \times - 2.59 - 2.74 - 1.63.}{1.37 - \times - 11.9 - 45.9 - 95.}$$

Dorylaimus, sp.¹

(Pl. xxx, figs. 5—7.)

(1) One tube unnumbered: from *Suberites aquae-dulcioris*, Anandale, Gantasila, February 1914, and (2) *Indian Museum No. ZEV 6194/7*: from *Spongilla* sp., Pigeon Island, Chilka Lake. 25-1-14.

Measurements—Table I.

Head rounded. Body cylindrical (Pl. xxx, fig. 5). Tail short, obtusely rounded. Head region narrower than the rest of the body including the tail.

Head (Pl. xxx, fig. 7), no lips or papillae or bristles; no lateral organs, but a pair of tubular organs in the dorsal and ventral lines distant 0.008 mm. from the head; opening of tubule slightly prominent; tubule runs inward and backward. Buccal capsule not present; quill 0.024 mm. long.

No rings or marks on the cuticle.

Tail short and blunt; in the male one short bristle in front of the anus, and the oblique muscular striation usual in the genus.

Oesophagus divided into anterior and posterior portions of subequal length by a diaphragm. At the junction of the two sections, the anterior section measures 0.022 mm. in diameter, the posterior section 0.026 mm., the radial muscular striation of the second section is more distinct and coarse than that of the first section. The posterior part of the second section is glandular in structure, and measures 0.03 mm. in diameter.

Nerve ring at junction of the two sections of the oesophagus.

Ventral duct or gland not observed.

Male gonads consist of two opposed testes and the vas deferens. Spicules two, very broadly sabre-shaped. No preanal papillae.

Female gonads of usual type. Uterine egg elongated sub-cylindrical.

Most closely allied to *Dorylaimus intermedius*, de Man: head without lips; tail blunt, very short.

Monhystera uria, sp. nov.

(Pls. xxx and xxxi, figs. 8—10.)

Indian Museum No. ZEV 6196/7.

From the gelatinous spawn of a Eunicid worm, Rambha, Chilka Lake, Ganjam, edge of the lake. 24-1-14. Six specimens examined, mounted in glycerine-jelly-formalin. Three males, two females, one immature.

Head rounded. Anterior extremity slightly tapered. Greatest diameter near the middle of the body; body attenuated

Owing to the absence of zoological consulting libraries in the smaller stations of India the present writer is unable to assure himself that this species has not already been described. It has consequently not been named, but the writer hopes to be in a position to supply the omission at an early date.

gradually in the posterior quarter to form a filiform tail. (Pl. xxx, figs. 8 and 9.)

The head bears a low collar of delicate mobile membrane around the mouth. No papillae or bristles. Lateral organs distinct, circular, 0.0038 mm. in diameter; distance of the organs from the head equal to the breadth of the cephalic cone (0.0053 mm.). Oral cavity oval, enclosed between the collar and the anterior end of the oesophagus.

The cuticle bears no rings, marks, or hairs, with the exception of one flagellum on the extremity of the tail.

Lateral lines not distinguishable from muscle fields in preparations of the entire animal.

The tail decreases gradually in diameter from the level of the anus; conical in shape. No bristles, glands, or papillae, with the exception of the single terminal flagellum.

Oesophagus simply club-shaped. No bulbs, division, or definite colouration; no appendix. Intestine as in the genus; no sign of cellular division; charged with black granules superficially. Rectum short.

Nerve ring not observed. No ocelli.

No ventral gland.

Testis commences 0.017 mm. behind the end of the oesophagus and lies on the right side of the intestine. A prostate-like mass present at the junction of the testis and vas deferens. Vas deferens opens immediately in front of the anus through a small almond-shaped body. Two spicules in the wall of the rectum, long, thin, simply curved. Ovary in anterior extremity 0.102 mm. distant from head; ovary and uterus single. Uterus short, sausage-shaped, 0.064 mm. in length, contains spermatozoa only.

The immature specimen (Pl. xxxi, fig. 10) measures 0.357 mm. in length, possesses a distinct tubular buccal cavity with fine chitinous walls and a pointed anterior extremity, which is perforated for the mouth. Oesophagus clothed with a cellular coat. An oval hyaline mass situated posterior to the oesophagus represents the gonads. The intestine is composed of loose fibrillar tissue with some black granules.

The species is most closely allied to *Monhystera dispar*, Bast., in that it bears no ocelli, possesses a gut with black granules; a smooth unringed cuticle; lateral organs not spiral; distance of lateral organ from head equal to breadth of head; distance of vulva to anus greater than anus to tail. It differs from *M. dispar* in the following points:—Total length in *M. dispar* 0.72—1.1 mm.;

in *M. uria* 0.54 mm.; $\frac{\text{oesophagus}}{\text{total length}}$:—in *M. dispar* $\frac{1}{4.5-5.5}$ in *M. uria*

$\frac{1}{5.8}$; $\frac{\text{tail}}{\text{total length}}$:—in *M. dispar* $\frac{1}{6-7}$ in *M. uria* $\frac{1}{5.25}$ Six oral hairs

in *M. dispar*, none in *M. uria*. Short filiform caudal appendage in *M. uria*, none in *M. dispar*. Males more frequent in *M. uria*, unknown in *M. dispar*.

$$\text{Cobb's Formula— } \begin{array}{l} \sigma \quad \frac{1.03 - \times - 2.32 - 2.83 - 2.32}{.51 - \times - 13.9 - 50 - 85.8} \\ \quad \quad \frac{\times - \times - 3.1 - 3.8 - 2.5}{\times - \times - 17 - 58 - 83} \\ \text{♀} \end{array}$$

***Leptosomatium indicum*, sp nov.**

(Pl. xxxi, figs. 11—14.)

Indian Museum, No. ZEV 6142/7.

Manikpatna, outer channel of Chilka Lake, on the 16th of September 1903, from algae an an oyster shell. A single male specimen, mounted in glycerine jelly-formalin.

Head rounded. Diameter of the body increases in the first 0.34 mm. of the length to 0.0703 mm., thereafter increases very gradually to 0.088 mm. at a distance of 0.185 mm. from the tail. The tail is curved ventrally

Lips none. Papillae none. The mouth is surrounded by a membranous ring. A cap of yellow cuticular substance lies under the cuticle of the head, the base of the cap reaching to a distance of 0.022 mm. from the anterior extremity. The cap when seen in optical section presents the appearance of distinct skeletal pieces. A circle of very scant (4) short and stout hairs surrounds the head. Lateral organs are present—spherical capsules opening by an oval pore to the exterior; breadth of the capsule 0.0074 mm. (The lateral organs are described by Bastian as the apertures of the excretory glands.) Buccal cavity not present.

No rings or markings of the cuticle. No hairs except around the mouth.

Tail rounded obtuse. Anus slightly prominent. A papilla situated in the midline 0.071 mm. before the anus. No caudal bristles. Oblique muscles in front of the anus as in *Dorylaimus*. Three tubular caudal glands opening at the posterior extremity. The duct of the caudal glands, while traversing the substance of the cuticle, is dilated to form a peculiar biscuit-shaped ampulla.

Alimentary System.—The oesophagus is of uniform breadth throughout the greater portion of its length. It measures 0.022 mm. until within 0.29 mm. from the posterior extremity of the organ. At this level it commences to expand slightly and reaches a maximum of 0.033 mm.

The oesophagus is not divided into sections nor dilated to form bulbs: colour of a dull yellow; not markedly muscular. A nipple-like appendage of the oesophagus projects into the commencement of the lumen of the intestine.

Intestine of the usual form; it does not exhibit tessellation on the outer surface, which is rough and irregular in appearance. Rectum not observed.

Nervous System.—Nerve ring 0.02 mm. in breadth, distant 0.289 mm. from the head. Cellular collar commences 0.05 mm.

from the head and clothes the remainder of the oesophagus: is exceptionally developed. Ocelli two in number, diameter of the ocellus 0.009 mm; distance of ocelli from the head 0.56 mm. They lie on the outer surface of the oesophagus immediately dorsal to the lateral lines; colour, black with a tinge of red. Two lines of fine red-black granules extend backward for a short distance from the ocelli.

Lateral organs as described above.

The Excretory System.—Excretory glands not distinguishable, but may exist in the mass of collar cells. No opening of the ventral gland distinguished unless a slight mark in the ventral line opposite the nerve ring represents the pore.

Male Reproductive Organs.—The fundus of the anterior testis lies 1.7 mm. distant from the head. Testes double; remainder of tract single. Spicules two, of the form indicated in fig. 13 of Pl. xxxi, hollow. A single accessory piece.

$$\text{Cobb's Formula—} \sigma \frac{0-1.32-1.32-1.55-1.7}{0-5.78-15.78-50.0-98.4}$$

Monhystera megalaima, sp. nov.

(Pl. xxxii, figs. 21—27.)

Indian Museum No. ZEV 6237-7. Among filamentous algae at edge of lake, Chilka Lake, Gantasila. 19-4-14. One male, one female, mounted in glycerine-jelly-formalin.

Measurements, see Table I.

Female.—A delicate organism. Body tapering only very slightly to the head, the posterior extremity tapers gradually from a short distance in front of the vulva; tail pointed but not filiform, with a permanent ventral curvature.

Head marked off from the body by a slight annular constriction; anterior surface flatly rounded (Pl. xxxii, figs. 22, 23); a circle of stout bristles, six in number, surrounds the head; length of bristles 0.0136 mm.; internal to this ring is a second ring of very short spines. No lips or papillae. Lateral organs large, circular, 0.0088 mm. in diameter; their anterior margin 0.0187 mm. from the head, a distance approximately equal to the breadth of the head. Mouth capsule oval, transverse, walls delicate; no teeth or cuticular thickenings.

Cuticle marked with very fine transverse rings from head to tail; the rings extend throughout the thickness of the cuticle. Hairs scanty, scattered irregularly, of remarkable length (0.02 mm., i.e. more than half the breadth of the body) and tenuity, sometimes spirally curled. No papillae.

Lateral lines and muscle fields not distinguishable.

Tail, see Pl. xxxii, fig. 24; a circle of short bristles close to the tip, no bristles at the anus or vulva. No glands or papillae.

Oesophagus simple, club-shaped, no bulb or division; a transverse diaphragm in the muscular substance at a level immediately

in front of the lateral organs. Intestine with brown granules and without tessellation.

Neither nerve ring nor cellular collar visible.

No ventral gland.

Fundus of ovary 0.205 mm. from head. Gonad tube single as in the genus. Uterus contains large unsegmented ova.

Male.—General outline resembles the female but the tail is more blunt. (Pl. xxxii, fig. 25).

The specimen is coiled on itself, and owing to its delicate character could not be straightened. The head is therefore seen obliquely and foreshortened. Indications of a buccal cavity are however visible, together with the cephalic ring of setae as in the female (Pl. xxxii, fig. 26). Lateral organ faintly distinguishable.

Cuticle as in the female. No bristles observed on the body.

Tail narrows abruptly near the termination. No glands, papillae, or bristles.

The testis commences immediately behind the oesophagus and lies on the left side of the intestine. Vas deferens situated ventrally to the intestine. Spicules (Pl. xxxii, fig. 27) with knob-like proximal extremities, twisted shafts, and glans-like distal extremities, hollow.

This species resembles *M. dubia*, Bütschli, and *M. agilis* de Man, in possessing a transversely striated cuticle; contrasted with the former, however, it is of more slender form, and the lateral organs are not spiral; contrasted with the latter, the vulva is situated more posteriorly, and the distance from vulva to anus is equal to, not twice as great as, the distance from anus to tail.

$$\text{Cobb's Formula, — } \text{♀} \frac{\times - \times - 2.69 - 2.84 - 2}{0.69 - \times - 16.1 - 78.1 - 88.3}$$

LIST OF SOME IMPORTANT PAPERS DEALING WITH FREE-LIVING NEMATODES.

- (1) Bastian, Charlton Monograph of the Anguillulidae.—
Trans. Linn. Soc., vol. 25, 1866.
- (2) Bütschli, O. Beiträge zur Kenntniss der freilebenden
nematoden.—*Nov. Act. Kais. Leop.
Carol. Akad.*
- (3) Bütschli, O. Zur Kenntniss der freileb. Nemat.—
Senckenbg Natforsch. Ges. Abhand.
1873.
- (4) Daday, v. Freshwater nematodes of South
America.—*Zoologica*, 1905, p. 51.
- (5) Daday, v. Freshwater nematodes of German
Africa.—*Zoologica*, 1910, vol. 23.
- (6) Daday, v. Die freilebende Süsswasser-Nematoden
Ungarns.—*Zoologisch. Jahrb., Syst.*,
Bd. 10.
- (7) Man, de *Nematoden der Niederländisch. Fauna*,
Leiden, 1884.

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| (8) Man, de | <i>Mém. Soc. Zool. de France</i> , vol. 1. |
| (9) Man, de | <i>Mém. Soc. Zool. de France</i> , vol. 2. |
| (10) Man, de | <i>Zool. Jahrb.</i> , Suppl. 15, vol. 1, 1912. |
| (11) Schneider, G. | <i>Zool. Anz.</i> 29, p. 626. |

LETTERING OF PLATES.

Reference letters—*acc. p.*=accessory piece, *amp.*=ampulla, *an.*=anus, *b.c.*=buccal cavity, *ceph. cap.*=cephalic cap, *d. ej.*=ductus ejaculatorius, *d.h.*=dorsal hair, *d. t.*=dorsal tooth, *d. tu.*=dorsal tubule, *go.*=gonads, *h.*=hair, *in.*=incisura, *int.*=intestine, *lat. h.*=lateral hair, *l. l.*=lateral line, *l. lat. lip pap.*=papilla of lateral lip, *l. m.*=longitudinal muscle, *L. lat. o.*=left lateral organ, *l.o.* and *lat. o.*=lateral organ, *l. oc.*=left ocellus, *L. sp.*=left spicule, *n. r.*=nerve ring, *obl. m.*=oblique muscle, *oc.*=ocellus, *oe. pig. gran.*=oesophageal pigment-granules, *oes.*=oesophagus, *oes. l.*=oesophageal lumen, *ov.*=ovary, *pap.*=papilla, *Pap. R. lat. lip.*=papilla of right lateral lip, *q.*=quill, *rect.*=rectum, *R. lat. o.*=right lateral organ, *r.s.v.p.*=right sub-ventral papilla, *R.s.v.t.*=right sub-ventral tooth, *s.d.t.*=right subdorsal tooth, *sp.*=spicule, *t. g.*=tail gland, *ut.*=uterus, *v.*=vulva, *vag.*=vagina, *v.h.*=ventral hair, *v. t.*=ventral tooth, *v.tu.*=ventral tubule.

Table I.	<i>Oncholaimus chilensis.</i>			<i>Dorylaimus, sp.</i>			<i>Monhystera uria.</i>			<i>Monhystera macrolaima.</i>		<i>Leptosomatum indicum.</i>
	♀ 6237A	♂ 6195	♀ 6237B	♂ from <i>Su-berites.</i>	♂ 6194	♀ 6194	♂ 6196	♂ 6196	♀ 6196	♀ 6237	♂ 6237	♂ 6142
Total length ...	2.210	1.540	2.700	2.000	1.870	1.938	...	.660	.536	1.300	.765	5.000
Maximum breadth ...	.060	.057	.074	.041	.044	.052	...	.019	.024	.044	.025	.088
Head to maximum br. ...	.022	...	...	...	...	...	...	...	...	...	...	4.815
Mx. br. ...	I	I	I	I	...	I	...	I	I	I	I	I
Total l. ...	36.8	28.7	36.	50	...	37	...	37	23	29.5	30.6	56.8
Head br. ...	.022	...	.026	.015	...	.012	..	...	...	.0185	...	.033
Buccal capsule l. ...	.039	.032	.037	...	...	...	...	.003	...	.009	...	...
Br. of body at end bucc. cap. ...	.037	.027	.037	...	...	...	...	.007	...	...	...	...
Oesophag. l. ...	.323	.269	.323	.377	.425	.400	...	.092	.093	.210	.0935	.799
Oesophag. l. ...	...	I	...	I	I	I	...	I	I	I	I	I
Total l. ...	...	5.7	...	5.3	5	4.4	...	7.1	5.8	6.2	8.07	6.38
Br. of body at end oes. ...	.055	.056	.070	.037	...	.040	.015	.015	.017	.035	.020	.066
Ant. end oes. to nerve ring... ..	...	.104	...	.200	...	.200	...	...	...	...	...	.289
Nerve ring to post. end oes. ...	...	.155	...	.177	...	.200	...	...	...	...	...	.510
Ant. end oes. to n. r. ...	...	I	...	...	...	...	...	...	...	...	...	I
N. r. to post. end oes. ...	...	1.49	...	...	...	...	...	...	...	...	...	1.7
Br. of body at n. r. ...	...	...	...	...	...	.035	...	...	...	...	...	.066
Oes. ant. mx. br. ...	.022	.017	.026	.026	...	.019	...	...	...	...	...	...
Oes. ant. min. br. ...	...	...	...	.022	...	.014	...	...	...	...	...	...
Oes. post. mx. br. ...	.033	.029	.042	.030	...	.032	...	...	...	...	...	.033
Oes. post. min br. ...	...	...	...	...	...	...	...	...	...	...	...	...
Head to vulva ...	1.280	...	1.240	...	...	.850	...	...	.314	1.016	...	...
Vulva to tail ...	1.140	...	1.450	...	...	1.090	...	...	.222	.284	...	...
Head to vulva ...	I	...	I	...	...	I	...	...	I	I	...	...
Vulva to tail ...	0.89	...	1.17	...	...	1.28	...	...	0.7	0.28	...	...

