

1939

THE
THOMPSON YATES AND JOHNSTON
LABORATORIES REPORT

EDITED BY

RUBERT BOYCE AND CHARLES S. SHERRINGTON

WITH

H. E. ANNETT, BENJAMIN MOORE, RONALD ROSS

AND E. W. HOPE

ASSISTED BY

W. B. WARRINGTON, E. E. GLYNN

J. W. W. STEPHENS, J. L. TODD, J. WOLFERSTAN THOMAS, ANTON BREINL

H. E. ROAF, R. NEWSTEAD, AND E. S. EDIE

WITH ILLUSTRATIONS AND PLATES

VOL. VII. (New Series)

PART I

FEBRUARY, 1906

PUBLISHED FOR

THE UNIVERSITY PRESS OF LIVERPOOL

BY

WILLIAMS & NORGATE

14 HENRIETTA STREET, COVENT GARDEN, LONDON

1906



At the University Press of Liverpool
No. 67. February, 1906. 500

ON A NEW PATHOGENIC LOUSE WHICH
ACTS AS THE INTERMEDIARY HOST OF A
NEW HAEMOGREGARINE IN THE BLOOD
OF THE INDIAN FIELD RAT

ON A NEW PATHOGENIC LOUSE WHICH
ACTS AS THE INTERMEDIARY HOST OF A
NEW HAEMOGREGARINE IN THE BLOOD
OF THE INDIAN FIELD RAT

(*JERBELLUS INDICUS*)

BY
S. R. CHRISTOPHERS, M.B., (VICT.)
I.M.S., The King Institute, Guindy, Madras

AND
R. NEWSTEAD, A.L.S., F.E.S., etc.
(With one plate)



HAEMATOPINUS STEPHENSI, n.sp.

Male (fig. 1).—Body rather slender. Head as broad as long, quadrangular, posterior angles with a large flat chitinous expansion from which arises a stout hair extending backwards and reaching slightly beyond the insertion of the third pair of legs. Mentum with six short, curved spines, arranged in a cirlet; beyond the mentum is a bilateral series of three larger spines, arranged somewhat in the form of a circle. Mesothorax with two long, stiff hairs, widely separated. Antennae (fig. 2) stout, of five segments; first segment much the largest, broader than long, the length equalling half the width of the head; second segment simple; third segment the shortest, anteriorly produced into a long, blunt, curved spine; fourth segment simple, not quite as long as the second; apical segment shorter than the fourth, apex truncate, bearing three or four minute spines; margins of all the joints more or less highly chitinised. Leg i. shorter than the rest; leg ii. (fig. 3) similar to leg i., but the tarsus is a little more dilated; claw long and slender; leg iii. much the stoutest; terminal clasping-claw (fig. 4) large, apex blunt; inner sub-terminal claw much smaller, and when closed lies completely hidden within a groove in the tarsal joint, a small stout spine arises from its base. Abdomen of nine segments, each segment furnished with a transverse series of long, stiff hairs, some of those at the margins being much the longest. Genital armature (see fig. 1) with a central, slightly curved, blunt, spine-shaped, or horn-shaped organ, on either side of which is a small setiferous lobe.

Female.—Head (fig. 5) much narrower than that of the male, somewhat rectangular, length greater than the width. Antenna (fig. 6) of five segments; basal segment much the widest, its length equalling about one-fourth the width of the head; second segment the longest; apical segment truncate and furnished with several minute hairs; formula 2, 1, 4 (35); margins

of all the segments highly chitinised. Legs resembling those of the male ; but the tarsi of Leg i. and ii. (fig. 7) are attenuated anteriorly. Anal segment (fig. 8) with two broad, thin plates, each bearing three minute hairs.

Average length of both sexes, 1.4mm. ; width, 5mm.

The larva closely resemble the adults ; but the abdomen is much smaller and the hairs projecting from it are proportionately very long ; the segments carry a fringe of only four hairs instead of many as in the adults.

Ovum, with a comparatively large clasping organ or pedicel ; anterior pole with an irregular emarginate cap, which splits off at the period of hatching. The eggs are attached to the hair of the host at about one-third of the distance from the base, and measure approximately, .5 by .2mm.

INTERNAL ANATOMY.

Alimentary Canal.—This organ consists of the following portions :—

Fore-gut.

Mouth.

Chitinous pharyngeal pump.

Oesophagus.

Mid-gut.

1st portion or descending part of mid-gut.

2nd portion or ascending part of mid-gut.

Pyloric ampulla with the origin of malpighian tubules.

Hind-gut.

Intestine.

Rectum.

The *mouth* is very small. The opening is situated beneath the prow-like anterior portion of the head.

The *pharyngeal pump* is long and narrow. It passes through the head and into the thorax. It ends in the front part of the thorax in a number of chitinous bars.

The *oesophagus* passes backwards and upwards, surrounded by the large ganglionic masses. It is a delicate wrinkled tube, much folded upon itself. It enters the large and massive mid-gut with no appreciable proventricular fold.

The *mid-gut* is sharply bent upon itself, so that it forms a U-shaped organ. The first portion is the largest and its walls are thickest. It is lined by large granular cells with large nuclei. In the distended organ the cells are flattened. In the empty viscus they are cubical. Externally there are longitudinal and circular fibres arranged to form an open network. During life rythmical contractions are constantly taking place. The contents are blood, either unaltered in appearance, or partially digested. The mid-gut, especially the more massive first portion, occupies, when distended, most of the abdominal space not taken up by the ovaries.

The *pyloric ampulla* is a dilated portion of the mid-gut supplied with numerous circular muscles. Four malpighian tubules open into it. These

enter, two on either side, close together. Immediately beyond the malpighian tubules, a distinct dividing line between the mid-gut and the intestinal epithelium is seen.

The intestine is straight and thin-walled, but there is no differentiation into large and small intestine. The intestine passes from the muscular pyloric mass, close beneath the abdominal terga, to the rectum. The cells lining the cavity are small; there is a layer of circular muscle fibres, and outside this a number of longitudinal fibres. The nuclei of the latter form conspicuous objects in the fresh tissues. The rectum consists of a distended globular portion, containing rectal papillae, and a straight narrow portion leading directly to the anus at the apex of the 9th segment.

Salivary Glands.—These are small oval structures, consisting of a single acinus, which rests upon the anterior portion of the mid-gut in the first abdominal segment. A duct, which is of delicate structure, leads forwards towards the pharyngeal pump. Each acinus consists of several large cells with a central clear space, which is very refractile.

Malpighian tubules.—These resemble the tubules of insects generally and consist of cells with large oval nuclei. The cells are much drawn out, and nuclei are situated at considerable intervals along the tube.

Generative organs.—The female organs consist of an ovary on each side, opening into a short common oviduct. Each ovary is composed of 5 or 6 follicular tubes. Each follicular tube is attached to the body wall by a delicate apical strand of tissue, and opens into the oviduct of its own side. Each follicular tube contains two or more egg follicles in different stages of development. In the adult louse two fully matured follicles, one lying on each side, largely fill up the abdomen. All, except the youngest follicles, consist of a single layer of cubical or columnar cells surrounding an ovum and nurse cells. In the mature follicles the nurse cells, which lie towards the apex of the follicle, have become absorbed.

Spermatheca.—This is a large, thin-walled, chitinous sac, opening by a short tube near the anus. It may be empty or contain masses of spermatozoa.

Male organs.—The testes are curious double peg-top shaped organs. Each opens by a narrow tube into a wide seminal vesicle, in which masses of spermatozoa are seen. The duct of the testis opens at a distance from the end of the seminal vesicle, so that this possesses a caecal extremity. The seminal vesicles lie across the abdomen and open together into a short, straight tube surrounded with large muscle fibres. This tube in turn passes into the penis.

The fat body.—This is well developed. In the head and thorax it forms pads lying between the muscles and the organs. A very conspicuous pad lies beneath the pharynx, and other masses are situated close to the salivary glands. In the abdomen, the fat body consists of a number of conical masses attached by their apices to the body wall, near the origin of the lateral hairs. The bases of the conical masses lie against the mid-gut and other viscera and give support to these. The cells which compose the fat

body contain, as well as oil globules, masses of opaque granules, apparently of a calcareous nature.

In addition to the fat body, certain very curious cells are seen free in the body cavity. On dissecting the abdomen, these are liberated and lie about on the slide, quite unconnected with the other tissues. They are oval or spindle-shaped, measuring 140μ in length. At one or both poles they have a delicate spike-like process. They contain two nuclei, and possess a fairly resistant cuticle, which is left as a shrunken structure when the cell contents have been extruded. In spite of the parasitic like aspect of these cells, they appear to be normal tissue cells of the louse. Somewhat similar cells, though in less numbers, were found in dissection of a species of louse infesting calves. Certain groups of small, partially free, cells are also seen in the body cavity, especially near the terminal segments. The nature of these and the large cells noted above is not clear.

Muscular system.—Powerful muscles are concerned with the pumping organ and the large antennae. These occupy much of the space in the head, which is not taken up by the large ganglia. The thorax is mainly muscular. The abdomen has certain small dorso-ventral muscle bundles, which, seen in optical section in the fresh louse, are conspicuous refractile bodies. A band of muscle passes along each side of the body, and is attached to each segment near the origin of the long hairs. In the male powerful muscles are seen in connection with the penis.

Tracheal system.—Two large spiracles of oval shape are situated just behind the spiny area of the thorax. From these, and smaller abdominal stigmata, tracheae form loops with distributing branches for the tissues. The tracheae are not very large or numerous.

Nervous system.—The ganglionic masses of the head are of great size. The thoracic ganglion is also a large and conspicuous object, especially in sections.

The circulatory system.—There is a pulsating chamber beneath the 6th and 7th abdominal terga, from which a dorsal vessel, also pulsatile, passes forwards over the mid-gut. Muscle fibres of a peculiar nature pass outwards from the chamber to the body wall.

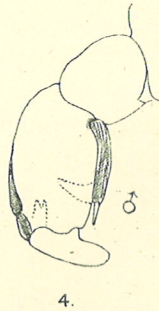
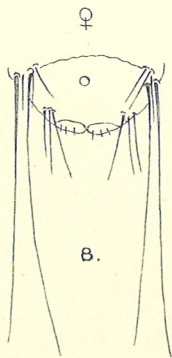
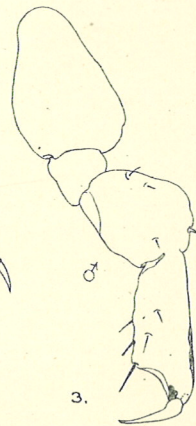
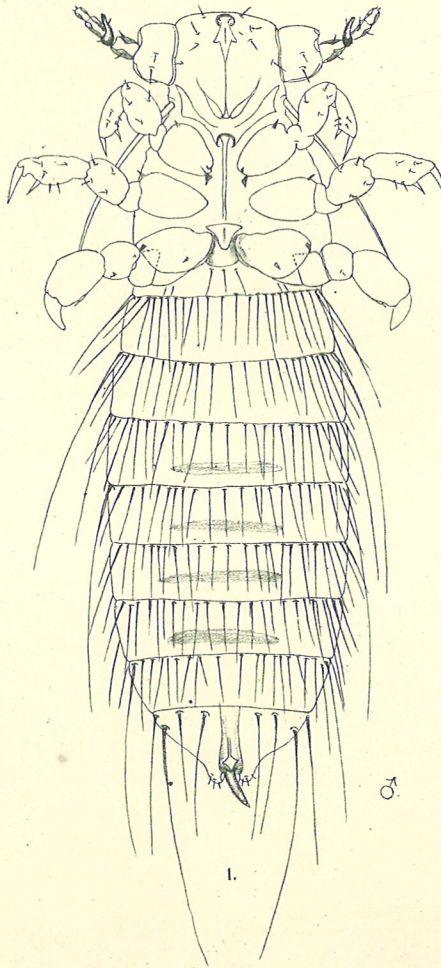
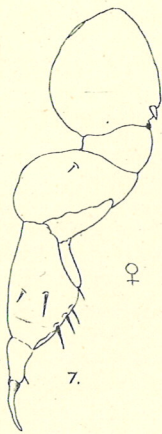
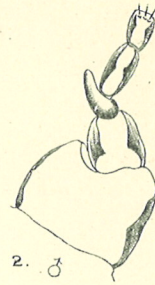
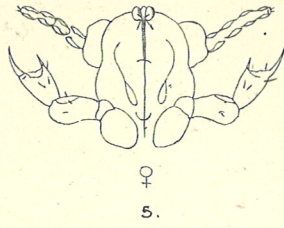
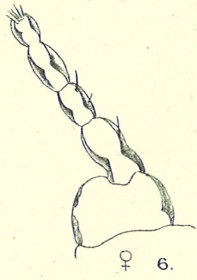
Habitat.—Parasitic on the Indian field rat (*Gerbillus indicus*), chiefly in the region of the head and shoulders; but to a less extent elsewhere. The lice are active in their habits, and evade capture, although the eyes are absent in both sexes. In this connection it may be interesting to add that their host is nocturnal in its habits and an extensive burrower.

This species is related to *Hæmatopinus acanthopus*, Burm.; found on the European field vole (*Arvicola* sp.) and *H. sciuropteri*, Osborne, of North America; but it is easily separable from these by the greater number of hairs on the abdominal segments, by the form and character of the hind tarsi, and the structure of the genital armature of the male.

EXPLANATION OF THE PLATE 1

- Fig. 1.—Male (ventral), $\times 75$.
 Fig. 2.—Antennae of the male, $\times 150$.
 Fig. 3.—Leg ii of the male, $\times 150$.
 Fig. 4.—Tarsus of leg iii of the male, $\times 150$.
 Fig. 5.—Head of the female (ventral), $\times 75$.
 Fig. 6.—Antennae of the female, $\times 150$.
 Fig. 7.—Leg i of the female, $\times 150$.
 Fig. 8.—Anal segment of the female, $\times 75$.

PLATE.



R. Newstead del.

HÆMATOPINUS STEPHENSI, n.sp.