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STEPHEN A. FORBES, Chief

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Art. III. A NEW NORTH AMERICAN  
OLIGOCHAETE OF THE GENUS  
HAPLOTAXIS

BY  
FRANK SMITH

Art. IV. A REPRESENTATIVE OF THE  
GENUS TRICHODRILUS FROM  
ILLINOIS

BY  
JAMES E. KINDRED



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## ERRATA

Page 97, line 17, for first *larval* read *pupal*.

Page 112, in legend, for *jonessi* read *jonesii*.

Page 114, in legend, for *or* read *of*.

Page 125, line 4, for *Bonosa* read *Bonaso*.

Page 131, in legend, for *hirundinaceus* read *hirudinaceus*.

Page 133, last line, for *cocoon* read *cocoon*.

Plate XII, explanation page, next to last line, for *acrivora* read *aerivora*.

Plate XIII, explanation page, next to last line, for *White-grubs* read *White-grub*.

Page 293, Figure 5a was reversed in printing, and the two items of the legend should change places.

Page 515, second table, for *Pelocoris femorata* read *Pelocoris femoratus*.

#### INTRODUCTION

The only papers describing North American Haplotaxidae are two by Forbes ('90 and '90a) in which he describes *Haplotaxis emissarius* from Illinois under the name *Phrocoryctes emissarius*. The present paper extends the original description by giving the positions of the gonads and spermathecae, hitherto unreported. It also includes the description of a new species, *Haplotaxis forbesi*, from the Illinois River.

Forbes found no trace of reproductive organs in his specimens. The following quotation ('90a : 108) indicates what he regarded as the important characters in which *H. emissarius* differed from *H. menkeanus*, the closely allied European congener: "It differs especially by the fact that the dorsal rows of setae are obsolete except on a variable number of the anterior segments and that the lateral vascular arches extend from the dorsal to the ventral vessel, instead of connecting only with the latter." Later, Michaelsen ('99) gave reasons for believing that faulty observations by earlier European investigators were responsible for these reported differences, and that the European species actually corresponded with the description of Forbes in the absence of dorsal setae from most of the somites, and in the relation of the commissural blood-vessels. At this time Michaelsen considered that the various known forms of Haplotaxis of the northern hemisphere all belonged to one variable species, *H. gordioides* (Hartmann). In a later paper ('05) he described another species, *H. ascaridoides*, from Lake Baikal, in Siberia, which differs chiefly in the number of spermathecae present in sexually mature specimens, there being four pairs in the latter species and but three pairs in *H. gordioides*. Since the immature specimens of the two species are extremely similar, and since only immature specimens of the North American *H. emissarius* were known, Michaelsen concluded ('05 : 67) that the assumption that the latter species is identical with *H. gordioides* is not justifiable without a comparison of the reproductive organs.

#### REPRODUCTIVE ORGANS IN HAPLOTAXIS EMISSARIUS (Forbes)

Through the kindness of Professor Forbes I have had the privilege of examining the series of sections on which his description was partly based. I find vestiges of four pairs of gonads in 10-13. Two specimens in my own collection, from the same region (Champaign, Illinois) and from the same kinds of situations (tile drains) as were the type

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\* Contributions from the Zoological Laboratory of the University of Illinois, No. 118.

specimens of *H. emissarius*, apparently belong to that species. These specimens have better developed gonads, and they are clearly in 10-13\* (Pl. II, Fig. 4). One of the specimens has also three pairs of organs that are almost certainly degenerating spermathecae. They are in the anterior parts of 7-9 (Pl. II, Fig. 4), and open in 6/7-8/9 at the level of the lateral line of either side. Since the number and positions of the gonads and of the spermathecae in *H. emissarius* are the same as in *H. gordioides*, the actual status of the former must remain undetermined until still more can be learned about the reproductive system. We have no information concerning the sperm ducts, oviducts, sperm sacs, or ovisacs. These may easily furnish distinctive specific characters.

#### A NEW SPECIES FROM THE ILLINOIS RIVER

In 1894 and 1895, while in service for the Illinois State Laboratory of Natural History at the Biological Station on the Illinois River, the writer found many specimens of a Haplotaxis species in the wet banks of the river near Havana, Illinois, and preserved a considerable number, assuming that they were *H. emissarius* and that their reproductive organs might be sufficiently developed for description. Several series of sections were made, but a preliminary study showed that the specimens were not sexually mature, and as an anomalous relation of the gonads was apparent it seemed advisable to wait for better developed specimens. During the interval of over twenty years the desired specimens have not been obtained, and a recent study of the material at hand has led to the unexpected discovery that the Illinois River worms belong to a species distinct from *H. emissarius*.

#### HAPLOTAXIS FORBESI, sp. nov.

Length, 100-150 mm. Diameter, 0.6-0.7 mm. Somites, 260-284. Prostomium approximately twice as long as wide. Setae, two to four per somite; dorsal setae much the smaller and limited to a few anterior somites. Gizzard in part of 4-5. Nephridia large in 12-14 and posterior to 17. Spermaries: one pair, in 10. Ovaries paired; in 15 and 16.

Cotypes, in the collection of the Illinois State Laboratory of Natural History (Accessions Cat. Nos. 27136 and 27137), and in the collection of the writer. Named for Professor S. A. Forbes, who first made known the presence of Haplotaxidae in North America.

But few of the specimens were preserved entire. Only the anterior 30 or 40 somites were saved in the case of most specimens, since short pieces were much more easily prepared for sectioning. Transverse, sagittal, and frontal sections of eight anterior ends, and cleared specimens of nine other anterior ends were used in the study of the more important characters.

#### EXTERNAL CHARACTERS

The measurements given above—length, 100-150 mm., and diameter, 0.6-0.7 mm.—are based on alcoholic material. The number of somites

\* Arabic numerals are used to designate the somites.

in apparently complete specimens is somewhat less than 300. The prostomium is without terminal pore and in some specimens transverse grooves are evident. Its length anterior to the mouth is nearly twice its width and equals the distance from the mouth to the middle or end of the fourth somite. The first five somites are shorter and broader than those next following and give the impression of a slight degree of cephalization, which is also manifest in the internal structure (Pl. II, Fig. 7). A distinct groove which seems, on the dorsal and lateral walls, to define clearly the anterior border of the first somite makes that somite appear slightly longer than the second, and apparently locates the mouth-opening on the mid-ventral surface of the somite rather than at its anterior margin. This leaves but a short interval between the mouth and the intersegmental groove  $1/2$ . If a similar state of things exists in other species it may account for the apparent extreme shortness of the first somite which has often been mentioned. I find a similar condition in *H. emissarius*.

The ventral setae (Pl. II, Fig. 6) are of the ordinary haplotaxid type, with nearly straight inner shaft, slightly developed nodule at about one-third of the length of the seta from the distal end, and distal part strongly curved. Ordinary measurements are  $0.30-0.32 \times 0.022$  mm. The dorsal setae are very much smaller ( $0.125 \times 0.007$  mm.), begin quite uniformly on the fifth somite, and are present on only the next following 12-20 somites. This character is presumably not of much systematic importance but is fairly uniform in a considerable number of specimens. The setal distances are approximately indicated by the following formula in which *l* represents the lateral line:  $aa : al : ld : dd = 4 : 4 : 3 : 8$ . No clitellum nor genital papillae have been found.

#### INTERNAL CHARACTERS

The buccal region (Benham, '04 : 301) is thin-walled and connected to the body wall by numerous muscular strands, and extends through the first three somites. The gizzard has its chief development in the posterior part of the fourth, and the anterior part of the fifth, somite, where the muscular wall is strongly thickened. The vascular system much resembles that already described for other species. The dorsal vessel forks just posterior to the brain. The branches extend anteriorly and then posteriorly and, after a somewhat tortuous course, unite in the posterior part of the third somite and form the anterior part of the ventral vessel. One pair of slender commissural vessels in each of the setigerous somites connects the dorsal and ventral vessels. The connections posterior to somite 4 are in the posterior part of the somites, close to the septa. The connections of the vessels of each of somites 2-4 are in the anterior part of the following somite.

The distribution of the nephridia differs from that usually found in the genus, the peculiarities of arrangement being correlated with those of the reproductive organs, to be described later. Ordinary nephridia like those described in other species of the genus are found in 12-14 and

in 18 and the following somites (Pl. II, Fig. 3). One specimen has a large nephridium on one side of 9, and a few have fairly large nephridia in 15 and 16. They are regularly much smaller or absent in 10, 11, and 17, and in some specimens in 15 and 16.

The brain differs somewhat in shape from that of *H. emissarius* and certain other species. The length of the median antero-posterior axis is about equal to the greatest lateral diameter (Pl. II, Fig. 1), and the greatest dorso-ventral axis is about three-fourths as great. The posterior surface is but slightly concave, and the anterior surface is conical with the apex somewhat rounded. In median frontal sections of the brain, the anterior margins include an angle of about  $90^\circ$ . The peculiar cushions of cells which support the ventral nerve cord are, as far as observed, found associated with all the ganglia except the first one. Those related to the second and third ganglia, in somites 3 and 4, are small and without the lateral wing-like extensions, and the others are larger and have such extensions more or less developed. No examination has been made of their distribution in the posterior part of the worms.

The reproductive organs are but incompletely developed in all of the specimens examined, but the gonads are large and unmistakable. Eight sectioned specimens and nine specimens cleared in cedar oil are perfectly uniform in having one pair of gonads in 10 and one pair in each of somites 15 and 16 (Pl. II, Fig. 3). The anterior pair are doubtless spermaries and the other two pairs are ovaries. There are vestiges of spermiducal funnels and of the adjacent parts of the sperm ducts, but no traces of the location of the spermiducal pores. Two sectioned specimens show sufficient vestiges of the oviducal apparatus to indicate that the oviducal pores were in the anterior parts of 16 and 17 and dorso-laterad of the lines connecting the ventral setae of either side of the worm. One of the two specimens has an additional ovary of small size on one side of 17 but has no corresponding oviduct. The wide separation of the ovaries from the spermaries and the extreme posterior position of the former are characters that are very aberrant, not only for the genus, but for the Oligochaeta as a whole. No traces of sperm sacs, ovisacs, or spermathecae have been detected.

#### GENERAL DISCUSSION

The marked differences in the relations of the gonads are sufficient to distinguish *H. forbesi* from *H. emissarius*, but it differs also in its smaller size; in the small number of somites in apparently complete worms; and in having fewer somites with dorsal setae. The shape of the brain also is quite different in the two species (Pl. II, Fig. 1 and 2), as shown by a comparison of the following three measurements: median antero-posterior axis, greatest lateral diameter, and greatest dorso-ventral axis. These ratios for *H. forbesi*, in the order mentioned, are 4 : 4 : 3; and those for *H. emissarius*, 5 : 8 : 4.

The scanty records of the occurrence of *H. forbesi* give almost no information concerning its distribution or the precise kinds of situations

in which it is to be found at different times of the year. The records are confined to 1894 and 1895, when careful periodical surveys were made of the plant and animal life of the Illinois River and its connected lakes at the Biological Station. Although there were numerous dredging operations at different places in the river channel, the only specimen taken in this way was obtained December 18, 1894, at Station E, directly opposite a place on the shore where all our other specimens of *H. forbesi* were taken. In May, 1894, numerous specimens were found on both sides of the river at Station E, in the water-soaked banks, just above the water level. In the interval between April 13 and 23, 1895, numerous specimens were found at the same station, but in the west bank of the river only. Their abundance is indicated by a memorandum stating that 29 specimens were taken from the mud obtained by an assistant by three successive scoops with the hands. At this time a careful search was made for specimens in other locations at various places down the river for nearly six miles, but none were found.

Apparently they are nearer to the surface in April or May than at other times of the year. Just where they are during the remainder of the year is entirely unknown. Since *H. emissarius* is subterranean in habit, being collected chiefly from wells and tile drains, it seems reasonable to suppose that the new form also may have a subterranean habitat during most of the year.

The time of sexual activity of *H. forbesi* is unknown. The specimens collected are all of about the same stage of development, with gonads quite large and often extending nearly to the posterior septum, but without any signs of cell-division activity. We have no records of partially grown, juvenile specimens.

It seems probable that both *H. emissarius* and *H. forbesi*, and perhaps other species of the genus, actually occur in many parts of North America, but have thus far escaped notice except in Illinois.

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## PLATE II

- Fig. 1. *Haplotaxis forbesi*, frontal section through prostomium and brain in plane of longest antero-posterior axis of latter.  $\times 105$ .
- Fig. 2. *Haplotaxis emissarius*, same as above.
- Fig. 3. *Haplotaxis forbesi*, diagram showing location of gonads, ducts, and nephridia (of left side). (Double lines indicate large normally developed nephridia, and single lines are in somites in which nephridia are imperfectly developed, or sometimes absent.)
- Fig. 4. *Haplotaxis emissarius*, diagram showing location of gonads, spermathecae, and nephridia (of left side). (Double and single lines for nephridia are used, as in Fig. 3.)
- Fig. 5. *Haplotaxis forbesi*, dorsal seta.  $\times 175$ .
- Fig. 6. The same, ventral seta.  $\times 175$ .
- Fig. 7. The same, longitudinal section through five anterior somites in a plane slightly oblique to the median sagittal plane and laterad of the same. The distal ends of ventral setae, the relation of the mouth to the first somite, and part of the musculature of the alimentary tract are shown.  $\times 70$ .

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PLATE II

