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A KEY TO BRITISH HENLEAS.

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When my brief paper on British Henleas appeared in the Zoologist' (1911, p. 464), it was impossible to foresee that in another year the number would be raised from eight to a score and a half, and that a key would be necessary in order to enable the student readily to distinguish one species from another. Aided by a Government grant, however, it has been possible for me to make many new discoveries in different parts of the country, and in this way greatly to extend our knowledge of this group of Enchytræids. Having during the past year given a somewhat full account of this genus in the 'Journal of the Royal Microscopical Society,' and in other journals enumerated in the Bibliography, it is not necessary to go over the same ground in detail. Since, however, several new species have been found since the principal of these articles was written, and some of these species have not yet been described, the key would be of little value without a few preliminary remarks.

The genus *Henlea* pertains to the Enchytræids, a family of Annelids belonging to the order Oligochæta. One of its chief characters is the forward position in which the dorsal vessel arises, usually from or near a bulbous swelling of the intestine, and the frequent presence of œsophageal glands in that locality. It now appears that the dorsal vessel often arises in or near the girdle, and it may be desirable eventually to separate the two groups into different genera. At present, however, it suffices to use this difference for purposes of classification within the genus.

Thus we have for our guidance the presence or absence of salivary glands, œsophageal glands, spermiducal glands, atrial glands, and the like; the shape of the brain, the point of origin of the dorsal vessel, the structure of the nephridia, the cœlomic corpuscles, the setæ, and other characteristics. After careful study of many hundreds of specimens from various parts of the country, it has gradually been borne in upon me that, while the setæ in the genus *Fridericia* are so constant that they can be absolutely depended upon as a species-character, the setæ in the Henleas are still in a fluctuating condition. In one and the same species they vary widely in number, and this applies to specimens collected at the same time in the same locality, as well as to those taken at intervals from different sites. Age and development have to be taken into account, and it is of the utmost importance that final diagnoses be based upon adults whenever possible.

In my former article (1)* eight species of *Henlea* were recorded as British, while a ninth was tentatively admitted in an Addendum. My next catalogue (2) contained no fewer than nineteen species, with the statement that "since this paper was written in May, 1912, one new species has been found by me in Ireland, making the twentieth British species." The description of the twentieth species duly appeared in the 'Irish Naturalist' (3) for January, 1913, the creature being named *Henlea glandulosa*, Friend. In the meantime further collections had been made in Derbyshire, Nottinghamshire, and elsewhere, with the result that other species apparently new to science were brought to light. Some of these, which were first found in Nottinghamshire, have been reported on in the 'Transactions of the Notts Nat. Hist. Soc.' (4). One has been named *H. mariona* on account of its resemblance to certain species of *Marionina*, which was formerly written *Mariona*. Others are very small, as the names *pusilla*, *parva*, *minuta*, and the like are intended to imply. In two or three species we find four pairs of septal glands, and in one case there are three setæ in each bundle throughout, for which reason it is named *H. trisetosa*.

In order that the key may be as complete as possible, it is necessary to add a brief description of those species which have

* The numbers in brackets refer to the Bibliography.

been discovered since my latest reports were published. A very careful revision of the whole of my material during the month of February showed that no fewer than twenty-nine species may now be regarded as British. *Henlea variata*, Friend, is proved to be the same in all essentials as *H. rhætica*, Bret., whose description must be extended to admit our native specimens. As no fewer than two out of every three of our indigenous species are destitute of œsophageal glands, it is proposed to divide the material into two groups, and retain the name *Henlea* for the one, adopting that of *Henleanella* for the other.

Subjoined are the descriptions of new species :—

1. Henlea alba, sp. nov.

Length when alive 12–15 mm. Segments 50. Transparent, white. Three pairs of septal glands in the normal positions. Setæ 3–4 in the lateral, and 4–5 in the ventral bundles. Spermathecæ with ampulla or bulb midway between the two ends of the duct. No glands at the 4–5 opening. The normal salivary glands wanting, but a pair of nephridia-like bodies (or apparently three) between the second and third pair of septals. If these are œsophageal glands they are abnormal in position and appearance. Similar glands are found in *H. inusitata*, and Bretscher has drawn attention to a like anomaly in *H. gubleri*.

Girdle as usual extending over segment 12 to the setæ of 13. Cœlomic corpuscles of the brown, horny type so characteristic of several species of *Henlea*. Chloragogen cells large. The preclitellian nephridia found only in three segments, 8–9, 9–10, 10–11; but they often vary in number and position in different species. The dorsal vessel arises in the girdle, or in segment 13–14, where the intestine enlarges. No other species of *Henlea* has hitherto been found with the vessel in so backward a position, though it is frequent in *Enchytræus* and *Fridericia*. The œsophagus goes gradually into the intestine behind the last pair of septal glands, where the bulb usually occurs.

Collected at Netherhall, Bretby, Derbyshire, November 22nd, 1912, near an old tree-stump.

2. Henlea inusitata, sp. nov.

Length 6–10 mm. Segments 30–35; white and transparent. Setæ 3-6 behind, 5–8 in front in the lateral bundles, sometimes

from 6 to 9 in the ventral; shortest in the middle, as in *Fridericia*. Three pairs of septal glands normally disposed, the hindmost pair being different from the others. Between the second and third pair nephridia-like glands occur. They differ from those of *H. alba* described above, but apparently belong to the same class, though at present it is impossible to decide whether they are œsophageal or salivary glands. Their unusual character explains the specific name. Bulb in segment 8, and dorsal vessel in the intersegment 8–9. Girdle covering segment 12 to setæ of 13 with gland-cells recalling those of *Fridericia bulbosa*, Rosa. Brain slightly longer than broad, somewhat wider behind than in front; slightly concave when stretched; but straight or convex behind when at rest. Cœlomic corpuscles granulated, not horny or brown. Sperm funnel very small; no conspicuous atrial glands, penis or male pores. Spermathecæ consisting of a simple duct without distinct ampulla, bulb, or glands. Large blunt anteseptal, the whole nephridium resembling a leg of mutton.

Collected at Rolleston Junction, Notts, March 26th, 1912, in a heap of earth. Also found at Cauldwell, near Burton-on-Trent, June 11th, 1912.

3. Henlea minima, sp. nov.

Length 5–6 mm. Segments 25. Setæ 4–5 posteriorly, as many as six in front, growing smaller towards the centre of the bundle, as in *Fridericia*. But the Henleas vary in this matter a great deal. Three pairs of septals in normal position, small in front, medium, and large behind. No œsophageal glands; no salivaries; no nephridia-like glands between the septals. Brain similar to that of *H. inusitata*. Spermathecæ in the form of a tube, widest near the opening and narrowing towards the intestine. No ampulla, bulb or glands. Girdle extending as usual from segment 12 to setæ of 13. Cœlomic corpuscles large and clear, not horny; somewhat oval in shape. Intestine widens in segment 8, dorsal vessel arises in 10–11. Small anteseptal and large postseptal with duct as long as the latter, from whose mid-region it arises. Very fine sperm-duct opening into an atrial-gland in segment 12.

Collected with *H. alba* at Netherhall, between Bretby and Hartshorne, where I have taken *Rhyacodrilus* and other rare

annelids, autumn, 1911; but hitherto regarded as a minor variety of one of the larger species.

4. Henlea multispinosa, sp. nov.

Formerly looked upon as a mere variety of *H. dicksoni*, which it somewhat closely resembles at first sight. A fairly stout worm, about 12 mm. in length, transparent, of 40 to 45 segments. Setæ from 4–6 behind, to 8 in the middle, and as many as 10–12 in front. Salivary glands present, resembling those of *F. bulbosa*, Rosa; slender and slightly forked at the tip. No œsophageal or nephridia-like glands. Spermathecæ composed of a duct which varies somewhat in size but has no distinct bulb or ampulla. Small glands sometimes occur at the 4–5 opening. Brain of the typical shape and size, slightly incised behind. Very prominent girdle when fully adult, with large pores. Nephridia with medium-sized anteseptal and large post, from about the middle of which a long duct emerges. Found nephridia as far forward as 4–5. Œsophagus enters bulbous intestine in segment 7, the dorsal vessel arising in the middle of the eighth. The normal septal glands (three pairs) present. Cœlomic corpuscles oval and granular, not brown or horny.

Found under moss by the canal at Nottingham, December 16th, 1912, and reported as a multispinose variety of *H. dicksoni*.

5. Henlea quadrupla, sp. nov.

Separated from *H. tenella*, with which I formerly associated it. *H. tenella* has never been satisfactorily worked out; but the species which I regard as approaching it most nearly is now found to be quite distinct from this, which is readily distinguished by the septal glands being quadrupled.

Length 6–10 mm. Segments up to 50 in number. Setæ 2–4 behind, 3–4 or 5 in front. One pair œsophageal glands in segment 8, large salivary glands filling up much of the cœlom in front of the first pair of septal glands. Nephridia with posterior ending in a narrowed duct. This form of nephridium is at present only recorded for one other species in this group; but in *Henleanella* at least four species (*H. marina*, *H. curiosa*, *H. parva*, and *H. rosai*) present it. Spermathecæ with short duct, large ampulla and glands. Brain of normal type. Dorsal

vessel arising at the base of the pair of œsophageal-glands, *i. e.* in 8–9.

The Addendum to my article in the 'Zoologist' (1911, p. 468) refers to this species under the title *H. tenella*.

Found at Acresford, near Ashby-de-la-Zouch, November 28th, 1911, and the same week at Overseal, the adjoining parish. Also Netherhall, November 22nd, 1912, and Bretby, February, 1913.

6. Henlea trisetosa, sp. nov.

A small worm, measuring about 5–6 mm., with 35–40 segments. Setæ sigmoid, 3 in each set throughout. Like the last it has 4 pairs of septal glands, but there are no œsophageals, so that it falls into the *Henleanella* group. The dorsal vessel arises in 9–10. The most advanced pair of nephridia found was in 8–9; small ante- and large post-septal, with duct as long as the latter arising from the neighbourhood of the septum. Brain about as long as broad, of normal type. No salivary glands. Cœlomic corpuscles not of the horny type.

We may now proceed to notice some of the methods by which the ever-increasing number of species may be distinguished.

The Setæ.—In the genus *Fridericia* one is able in many instances to come to a definite conclusion, merely by the study of the setæ in front of the girdle. Where 4, 6, or 8 setæ occur in each bundle, the innermost are the shortest. It often happens that this diversity occurs also among the Henleas; but the rule is not a constant one, and the setæ of *Fridericia* differ in shape from those of *Henlea*. Generally speaking, we may say *Henlea* setæ are needle-shaped, *Fridericia* setæ are crochet-hooked, *Enchytræus* setæ are sigmoid. The species which have shorter inner setæ are *H. dicksoni*, *H. nasuta*, *H. ventriculosa*, *H. variata*, *H. mariona*, and *H. fridericioides*, with possibly some others.

The Brain.—As with the setæ, so with the brain; *Fridericia* and *Henlea* each has its type. In *Fridericia* it is very rarely concave behind, whereas in *Henlea* it is almost always so. When the brain of *Henlea* appears otherwise than concave behind it is nearly always due to tension or position. It must always be viewed from above, and is usually somewhat longer than broad.

Œsophageal Glands may be present or absent. When pre-

sent they usually occur at the point where the œsophagus merges into the intestine. They may also vary in number; and few characters are more helpful to the systematist than these glands. They are not found in *H. tenella*, *H. marina*, *H. curiosa*, *H. lampas*, and some others, and we name this group *Henleanella*.

Salivary Glands are present in *H. curiosa*, *H. rosai*, *H. dicksoni*, and *H. tenella*, among others. They vary a good deal in size, shape, and position. In *H. inusitata* and *H. alba* we find glands of a special nature.

Spermathecæ are present in all adults. In *H. puteana* there are two pairs. This, however, is unique, not only in the genus, but in the family. In all the other species one pair is found opening in the intersegment 4–5. There are no diverticula, as in *Fridericia*, but glands are frequently found near the external aperture, as in *H. marina* and *H. fridericioides*. *H. attenuata* has never yet been found adult, though the species is far from rare.

The Dorsal Vessel usually takes its origin in front of the girdle, and may frequently be seen as a white sac or a kind of pump, throbbing and pulsing vigorously. It is not unusually found near the œsophageal glands, about segments 7–9; but some of the more recently discovered species show the presence of the vessel in or behind the girdle, as in *Enchytræus* and *Marionina*. These may eventually form a new genus. In *Fridericia* its position is usually between segments 15–20, or even further back. The blood is always colourless.

Septal Glands are present in all known species. The normal number is three pairs, situated in segments 4–6; but the number occasionally varies. In one species, which I formerly described as *H. tenella*, but now regard as a new species, we find four pairs of septal glands. The same applies to the new species described above as *H. trisetosa*. This number is exceeded in some other Enchytræids, but is not at present known to occur in any other species of the genus *Henlea*. One species in each group has only two pairs.

Cœlomic Corpuscles occur in all Enchytræids, and vary greatly. Some species of *Henlea* have corpuscles which look like horny discs. They are round or oval and brown, almost like encysted protozoa. Others conform to the regular type.

Though each species has its distinctive characteristics, some

are so similar in general appearance that they may readily be confused. Thus *H. dicksoni* may easily be mistaken for *H. rhætica*. *H. curiosa* and *H. lampas* have much in common. *H. attenuata* is easily distinguished from *H. heterotropa* by its attenuated form.

I have come to the conclusion that the conditions under which these tiny annelids exist greatly affect some of their characters. Under stimulating conditions not only do they attain a larger size, but the setæ frequently increase in number. Hence there are two or three species which have polychæt varieties, the number of setæ reaching 8–12 per set in each segment. Thus an individual with 50 segments would have no fewer than 2000 setæ, though not more than half an inch in length.

It is now possible to present our facts in a systematic form, and in preparing the following key I have followed the lines laid down in my former paper (2), which is here extended to include all the known British species.

Synopsis of the Genus.

i. Two pairs of spermathecæ present. One species only, *viz.* *Henlea puteana*.
ii. One pair of spermathecæ present. Varying much in character.
    1. Consisting of a simple duct.
    2. A duct with median bulb.
    3. A duct with ampulla attached to the intestine.
    4. Glands at the 4–5 opening.

We find further species with:—

i. No œsophageal glands present; these we name the *Henlea-nella* group.
ii. One pair of œsophageal glands—
    1. In segment 7.
    2. In segment 8.
iii. Two pairs of œsophageal glands. One species only, *viz.* *H. ventriculosa*. These may be regarded as the true *Henlea* group.

Finally we have another clue in the septal glands, as follows:—

i. Two pairs of septals in *H. mariona* and *H. fridericioides*.
ii. Three pairs in all others, except
iii. Four pairs in *Henlea trisetosa* and *H. quadrupla*.

The exceptions are always easy to find, but for the bulk a key is required.

Finally we note the species with nephridia-like glands, whose character is not yet determined.

Key to the Genera.

Two Groups are recognized, *viz.*:—

I. Species lacking œsophageal glands . Henleanella.
II. Species possessing œsophageal glands Henlea.

The following belong to Group I.

Henleanella: Œsophageal glands absent.

1. Two pairs of septal glands . . . . *H. mariona.*
2. Four pairs of septal glands . . . . *H. trisetosa.*
3. Three pairs of septal glands—
   i. Setæ not exceeding five per set—
      a. Dorsal vessel clitellian—
         † Salivary glands absent . . . *H. marina.*
         †† Salivary glands present . . . *H. curiosa.*
         ††† Abnormally placed glands . . *H. alba.*
      β. Dorsal vessel anteclitellian—
         † Sperm-funnel spindle-shaped . . *H. tenella.*
         †† Sperm-funnel pear-shaped . . *H. lampas.*
   ii. Setæ exceeding five per set—
      a. Two pairs of spermathecæ . . . *H. puteana.*
      β. One pair of spermathecæ—
         † Duct of nephridia from posterior—
            * Salivaries present . . . *H. rosai.*
            ** Salivaries absent . . . . *H. parva.*
         †† Duct of nephridia from anterior—
            * Salivaries present—
               (1) Slender or forked . . *H. multispinosa.*
               (2) Sac-like in 4–5 . . . *H. minuta.*
               (3) Unusual type of glands . *H. inusitata.*
               (4) Of normal form . . . *H. dicksoni.*
            ** Salivaries absent—
               (1) Dorsal vessel arises in 7–8 . *H. glandulosa.*
               (2) Dorsal vessel arises in 8–9 . *H. arenicola.*
               (3) Dorsal vessel arises in 9—
                  a. Length 2–3 mm. . *H. perpusilla.*
                  β. Length 7–8 mm. . *H. rhætica.*
               (4) Dorsal vessel arises in 10–11 *H. minima.*

The following belong to Group II.

Henlea: Œsophageal glands present.

1. Two pairs of œsophageal glands . . . *H. ventriculosa.*
2. One pair of œsophageal glands in segment 7—
   Three pairs of septal glands—
   a. Dorsal vessel arises in 7–8—
      * Salivary glands present . . . *H. attenuata.*
      ** Salivary glands absent . . . *H. heterotropa.*
   β. Dorsal vessel arises in 8 . . . . *H. nasuta.*

3. One pair of œsophageal glands in segment 8—
   - *α*. Two pairs of septal glands . . . *H. fridericioides.*
   - *β*. Three pairs of septal glands—
     - * Dorsal vessel arises in 8 . . . *H. pusilla.*
     - ** Dorsal vessel arises in 8–9—
       - (1) Sperm-funnel about 2 × 1 . *H. fragilis.*
       - (2) Sperm-funnel about 4 × 1 . *H. hibernica.*
     - *** Dorsal vessel postclitellian . . *H. triloba.*
   - *γ*. Four pairs of septal glands . . . *H. quadrupla.*

As it is a great convenience to the student to have these facts presented in various ways, I append a numerical key as well:—

1	Œsophageal glands absent (*Henleanella*)	2
	Œsophageal glands present (*Henlea*)	15
2	Two pairs of septal glands	*H. mariona.*
	Three pairs of septal glands	3
	Four pairs of septal glands	*H. trisetosa.*
3	Setæ not exceeding five per set	4
	Setæ exceeding five per set	8
4	Dorsal vessel clitellian	5
	Dorsal vessel anteclitellian	7
5	Salivary glands absent	*H. marina.*
	Salivary glands present	6
6	Normal in type and position	*H. curiosa.*
	Abnormal in type and position	*H. alba.*
7	Sperm-funnel spindle-shaped	*H. tenella.*
	Sperm-funnel pear-shaped	*H. lampas.*
8	Two pairs of spermathecæ	*H. puteana.*
	One pair of spermathecæ	9
9	Duct of nephridia from posterior	10
	Duct of nephridia from anterior	11
10	Salivaries present	*H. rosai.*
	Salivaries absent	*H. parva.*
11	Salivaries present	12
	Salivaries absent	13
12	Slender or forked	*H. multispinosa.*
	Sac-like in segment 4–5	*H. minuta.*
	Unusual form of gland	*H. inusitata.*
	Normal type of salivary	*H. dicksoni.*
13	Dorsal vessel arises in 7–8	*H. glandulosa.*
	Dorsal vessel arises in 8–9	*H. arenicola.*
	Dorsal vessel arises in 9	14
	Dorsal vessel arises in 10–11	*H. minima.*
14	Length of the type 2–3 mm.	*H. perpusilla.*
	Length of the type 7–8 mm.	*H. rhætica.*

15	Two pairs of œsophageal glands	*H. ventriculosa.*
	One pair of œsophageal glands	16
16	Glands in segment 7	17
	Glands in segment 8	19
17	Dorsal vessel in 7–8	18
	Dorsal vessel in 8	*H. nasuta.*
18	Salivary glands present	*H. attenuata.*
	Salivary glands absent	*H. heterotropa.*
19	Two pairs septal glands	*H. fridericioides.*
	Three pairs septal glands	20
	Four pairs septal glands	*H. quadrupla.*
20	Dorsal vessel arises in 8	*H. pusilla.*
	Dorsal vessel arises in 8–9	21
	Dorsal vessel postclitellian	*H. triloba.*
21	Sperm-funnel about 2 × 1	*H. fragilis.*
	Sperm-funnel about 4 × 1	*H. hibernica.*

In conclusion, a few special features may be pointed out. *Henlea puteana* alone has two pairs of spermathecæ, and *H. ventriculosa* is the only known species with two pairs of œsophageal glands. *H. alba* and *H. inusitata* have abnormal glands, which may be œsophageal or salivary. In *H. fridericioides* and *H. mariona* there are only two pairs of septal glands, but one is a member of the Henlean group, the other belongs to *Henleanella*. In certain cases the dorsal vessel arises in or behind the girdle. At present *H. triloba* stands alone in this respect in the Henlean group. Some of the species have the duct of the nephridium arising near the septum, in others it is posterior, and in others it has a median origin. The spermathecæ present great variety, but they never have diverticula, as in *Fridericia*.

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