THE OCCURRENCE OF A MARINE LEECH, *ABRANCHUS BLENNII* N.SP., RESEMBLING *A. SEXOCULATUS* (MALM), IN NORTH WALES

By E. W. Knight Jones

Dept. of Zoology, University College of North Wales, Bangor

(Text-figs. 1–2)

Occurrence

In April 1939 two small leeches were found on two shannies, *Blennius pholis*, which had been collected from rock pools near Rhosneigyr on the west coast of Anglesey. Earlier in the year another leech was reported to have been found at the same place, free on the underside of a stone, and subsequently lost. In May a *B. pholis* was found which bore two leeches, one on each side. All the parasites were attached just behind the base of the pectoral fin.

Further search during the summer failed to reveal any more specimens although, in all, about a hundred shannies were examined. There is no doubt that all the leeches examined belong to the same species, which closely resembles that described by Malm (1863) as *Platybdella sexoculata* and put into the genus *Abranchus* by Johansson (1896). *A. sexoculatus* has only been recorded from the west coast of Sweden, where it is rare. Malm and Johansson were indefatigable collectors who captured large numbers of other species, yet up to 1896 only three of this one had been found, all on different hosts—*Gadus morrhua*, *Cyclopterus lumpus* and *Zoarces viviparus*. In 1929 Johansson says that this small rare leech occurs by preference on *Z. viviparus*, so it seems likely that further specimens have been found on this fish.

A comparison of the Anglesey leech with this species must be incomplete owing to the fact that no description of the internal anatomy of *Abranchus sexoculatus* has ever been published. The external resemblance is great but certain differences, which will be discussed later on, make me hesitate to identify them as the same. In this difficulty I propose to put forward the name *A. blennii* for the leech described below. If it is not a distinct species I hope that the account may yet be of interest as being the first adequate description of the structure of this form.

Generic Characters

The genus *Abranchus* was created by Johansson (1896, 1898) to include four species, *A. brunneus*, *A. scorpii*, *A. microstomus*, and *A. sexoculatus*. Later (1929) he separated the two former from the others and put them into

the genus *Ottonia*. We still owe our knowledge of these forms to his work and to that of Selensky (1915).

There are many characters common to both *Ottonia* and *Abranchus*. Of these the coelomic system, which is of great systematic value in the Ichthyobdellidae (Selensky, 1931), must be mentioned first, for it completely marks off these two genera from other forms. It is represented by tubular ventral, lateral and dorsal lacunae. The ventral lacuna, which contains the ventral blood vessel and the nerve cord, has no segmental communication with the others. The dorsal, which contains the dorsal blood vessel, communicates with the lateral lacunae in each segment of the testicular region by a transverse tubular connexion. There are no testicular lacunae and no pulsating vesicles or corresponding structures.

Other features which distinguish them from some or all other Ichthyobdellidae are six eyes, hypodermis with large dermal cells crowding out the fibrous connective tissue, ducts of prae-clitellar glands opening along a narrow line on each side, feeble musculature of the body wall, sphincters between the caeca of the stomach, blind guts, i.e. the long posterior pair of stomach caeca, separate or almost separate from one another, nephridial network confined to the dorsal and lateral parts of the body, testes tending to be irregular in form and arrangement, simple bursa.

With all these points in common, it is not surprising to find that the dividing line between these two genera is not very sharp. Johansson only describes the anatomy of two species at all fully, i.e. *Ottonia brunnea* and *Abranchus microstomus* (1896). He mentions many differences between them, but taking all these into consideration and comparing the internal as well as the external characters it is impossible to say that *A. blennii* is more closely related to one than to the other. In some respects it resembles *O. brunnea*, in others *A. microstomus*, in others it differs from both. Hence it is only possible to regard the division into two genera as one of convenience, based on the following considerable external differences unsupported by many other anatomical features.

Ottonia. Body rounded and almost uniformly thick along its whole length. Anterior sucker large. Skin opaque.

Abranchus. Prae-clitellar region smaller than and distinct from the flattened abdomen. Anterior sucker very small. Skin transparent.

Description

Habits. *A. blennii* does not appear to swim but can move energetically by looping. If put into a dish it attaches itself by the posterior sucker and if undisturbed assumes a resting position, with the body very flattened and usually curled into a zigzag shape. A slight movement of the water or a shadow falling across it causes it to stretch itself to more than twice its resting length and to execute random searching movements, swinging its attenuated rigid body in all directions as though attached to the posterior sucker by a universal

joint. If a fish is presented to it and it is able to secure a hold by its anterior sucker it lets go the dish and immediately takes a firm hold upon its host by the large posterior sucker. Fresh specimens readily attach themselves to shannies in this way, and one was induced on two occasions to attach itself to *Centronotus gunnellus*. It would not attack a small *Cottus* similarly presented to it. When the *Centronotus* was put into a tank with other fish the leech on each occasion transferred itself to a shanny within a few days. It appeared to prefer the shelter provided by the shanny's large pectoral fin. Later, however, in a tank that contained only shannies it disappeared from off its host and must have been eaten by one of the fish.

External characters. The external appearance was carefully examined in only three of the specimens.

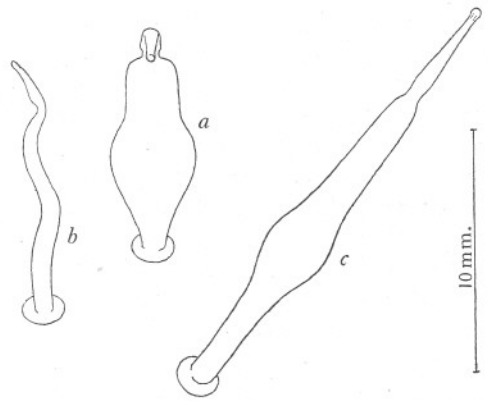

Fig. 1. *Abranchus blennii* n.sp.: *a*, resting with head thrown back, dorsal view; *b*, resting, side view to show flattening; *c*, moderately extended, dorsal view.

The length when fixed or resting is about 12 mm. A well-marked clitellar constriction divides the small front portion of the body, or "neck", from the large flattened abdomen. The body is broadest just behind the middle. The anterior sucker is minute. In the resting condition it is very little broader than the anterior end of the neck, but the animal is able to dilate it to twice this breadth (Fig. 2*b*). The posterior sucker is about 1·7 mm. across, that is, never as broad as the body at its broadest part, even when the leech is stretched out. When the body is shortened and flattened in the resting position it may be twice as broad as the posterior sucker (Fig. 1*a*). There are six eyes, two pairs on the head and one pair on the second annulus of the neck (Fig. 2*a*). The skin is smooth and transparent, and the annuli are obscure. The latter are plainer after fixation but still difficult to count. The genital openings are very difficult to make out. The caeca of the stomach show through the body wall, being usually dark red with blood. Numerous yellow or cream-coloured granules, the dermal pigment cells, lie in the skin. They are 40–150 μ across, round or oval in shape. The dorsal surface and the sides of the body are marked

with dark brown pigment, arranged in a series of transverse stripes interrupted in the middle line. In the posterior part of the abdomen the whole of the dorsal surface is pigmented and the posterior sucker often bears a radial stripe in the dorsal mid-line. The clitellum is particularly pale and opaque. In one specimen a few small black spots occurred near the edge of the posterior sucker.

Internal anatomy. This was studied by a single series of transverse sections, cut at 10μ and stained with Ehrlich's haematoxylin and eosin.

Body wall (Fig. 2*c*). The epidermis, which secretes a smooth strong cuticle, consists of cells with their inner ends rounded and of the usual ichthyobdellid type. It is unlike that of *A. microstomus*, which consists of flattened cells. Large epidermal gland cells are common.

The dermal pigment cells, which are conspicuous in the living animal as yellow flecks, occupy the hypodermis. They are rounded or flattened and 40–150μ across, with large nuclei. Because of the large size of these cells the fibrous connective tissue in this layer is correspondingly reduced.

The musculature, although weak, is stronger than that of *A. microstomus*. Its thickness varies somewhat, but it usually consists of a single layer of circular muscle fibres, one or two layers of oblique fibres, and one or two layers of longitudinal fibres. The oblique fibres are particularly small and weak. Dorso-ventral fibres occur in the post-clitellar parts of the body and must be responsible for the flattening of this region. They are also numerous in the clitellum, especially around the genital openings.

Skin glands. Most of the space between the internal organs is occupied by the unicellular gland cells, the cell-bodies of which lie within the muscle layer though their ducts open on to the surface of the skin.

There appear to be two types of clitellar gland cell resembling those described by Badham (1916) in *Austrobdella*. One has a coarsely granular secretion the globules of which when first formed are scattered throughout the cytoplasm of the cell. The other type, to which the largest cells belong, has a denser cytoplasm and an homogeneous secretion which is confined to the lumen of the cell body and duct. The secretions stain brightly with eosin and both types remain distinctive right up to the openings of the ducts. All the clitellar gland cells belong to one of these two types and there are no intermediate forms. Both occur mixed together throughout most of the length of the body. Near the clitellum the cells are numerous and measure 30–60μ across. Further away they are less numerous and larger. The largest cells which occur behind the testicular region measure up to 200μ. All the ducts open on to the clitellum so that those of the posterior cells have to traverse a considerable distance. For the greater part of this they are arranged in eight adradial bundles, two dorsal, two ventral and two lateral on each side (Fig. 2*d*, *e*). The ducts of the cells anterior to the clitellum have no such regular arrangement. The clitellum itself is packed with the ducts which open to the exterior over the whole surface.

The prae-clitellar gland cells, which are numerous in the three segments anterior to the clitellum, are all fairly large (about 80 μ across) and are distinguished by their faintly basophil staining. Their secretion, if any was present, was quite unstained and their ducts were best seen after the light

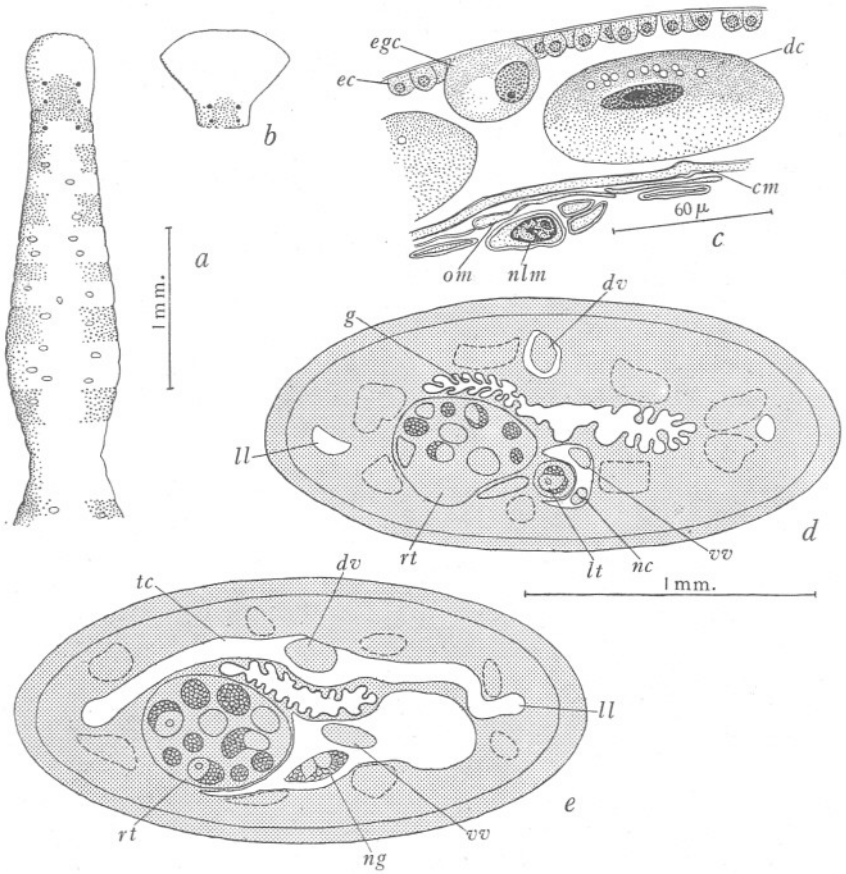

Fig. 2. *Abranchus blennii* n.sp. *a*, anterior end, dorsal view. *b*, head with sucker dilated. *c*, transverse section body wall; *cm*, circular muscle fibre; *dc*, dermal pigment cell; *ec*, epidermal cell; *egc*, epidermal gland cell; *nlm*, nucleus of longitudinal muscle fibre; *om*, oblique muscle fibre. *d*, transverse section body between 2nd and 3rd post-clitellar ganglia, shaded except for coelom and gut cavity, bundles of clitellar gland ducts bounded by interrupted lines; *dv*, dorsal vessel in dorsal lacuna; *g*, gut; *ll*, lateral lacuna; *lt*, left testis shifted over to right side; *nc*, nerve cord; *rt*, right testis; *vv*, ventral vessel in ventral lacuna. *e*, transverse section through 3rd post-clitellar segment, as *d*, in addition *ng*, ganglion; *tc*, transverse communication.

had been cut down. Johansson says that in *A. microstomus* and *O. brunnea* the ducts of these cells open along a narrow line on each side, and are confined to the second prae-clitellar segment. In *A. blennii* a large proportion of the ducts open in clumps arranged along the lateral edge in the manner Johansson

describes, but the remainder open all over the dorsal surface of the body. Moreover, the openings occur on all segments of the prae-clitellar region.

Nervous system. The nerve cord lies for the whole of its length in the ventral lacuna. It is terminated anteriorly by the large suboesophageal ganglionic mass which gives off a nerve ring round the proboscis sheath, and posteriorly by the ganglionic mass associated with the posterior sucker. Between these there are in the majority of leeches twenty-one separate ganglia marking a corresponding number of segments which Johansson and other authorities group as follows:

Prae-clitellar region	3	segments
Clitellum	3	,,
Testicular region	6	,,
Region of the blind gut	6	,,
Anal region	3	,,

In *A. blennii* three of these ganglia have disappeared, probably by fusion with the anterior or posterior ganglionic masses, for there are only eighteen separate ganglia. In the series of sections the clitellum, as indicated by the openings of the clitellar glands, includes the 3rd, 4th, 5th and 6th ganglia, owing to the contraction which occurred on fixation having thrown the nerve cord into a loop in this region. The genital openings occur between the 5th and 6th ganglia so it seems probable that the 4th, 5th and 6th ganglia belong to the three segments of the clitellum. If this is so, ganglia 7–12 must correspond with the testicular region. The last pair of testes does in fact occur between ganglia 11 and 12 and the segmental communications between the dorsal and lateral lacunae occur opposite ganglia 8–12. On the other hand the blind guts open into the stomach in front of the 12th ganglion, whereas in most Ichthyobdellidae, including *A. microstomus* and *O. brunnea*, this occurs between the last segment of the testicular region and the first of the blind gut region.

Most of the evidence, however, is in favour of ganglia 4, 5 and 6 belonging to the clitellum. This leaves the full number of three separate prae-clitellar ganglia, indicating that it is a fusion of the three anal ganglia with the posterior ganglionic mass that is responsible for the reduction from the typical condition.

Gut. The pharynx is short and has a very narrow lumen. The proboscis, retracted within the proboscis sheath, has the typical ichthyobdellid structure with radial, circular and longitudinal muscles. It differs from that of *A. microstomus*, in which the radial muscles are reduced and the circular muscles particularly powerful. There are about sixty salivary gland cells scattered throughout the prae-clitellar region, from the suboesophageal ganglion to the clitellum itself. They are 50–150 μ across and closely resemble clitellar gland cells of the granular type. However, they can be readily distinguished from these by the fact that their secretion is more finely granular. The ducts run into the base of the proboscis and traverse its length, lying alongside the

longitudinal muscle fibres. A few open into the lumen on the way, but the vast majority open at the extreme tip. According to Johansson this is unusual and in *A. microstomus* all the ducts open at the base of the proboscis.

The oesophageal glands are sacs, which were large but practically empty in the specimen sectioned. They open posteriorly into the gut, in the front part of the clitellum, by a short duct with a minute lumen. The duct is provided with a small sphincter muscle for closing it and radial muscles for dilating it. So far as I am aware, no such muscles have been mentioned previously in relation to this type of gland.

The stomach gives off a pair of caeca in the front part of each segment of the testicular region. The caeca extend forward so as to lie inter-segmentally. The first pair is small. There are sphincter muscles round the stomach behind the 3rd, 4th and 5th pairs. The caeca of the 6th pair are relatively huge and not only send lobes forward like the others, but extend backwards alongside the intestine almost as far as the anus. There can be little doubt that they are homologous with the blind guts of *A. microstomus* and other forms, and it is remarkable that they are, as in *O. brunnea*, completely separate from one another throughout their whole length.

Coelom and vascular system. The coelomic spaces are extremely thin walled.

The ventral lacuna runs the whole length of the body. It contains the nerve cord and the ventral blood vessel. The paired lateral lacunae can be distinguished from just behind the clitellum to about half-way along the region of the blind guts.

The dorsal blood vessel can be distinguished over most of the length of the body. The dorsal lacuna is confined to the testicular region, where it contains the dorsal blood vessel (Fig. 2*d*, *e*). In each segment, except the first, it is joined to the lateral lacunae on either side by a transverse communication (Fig. 2*e*). The species which Johansson describes have these communications in all six segments of the testicular region, but in *A. blennii* the ducts of the clitellar cells occupy so much space in the first post-clitellar segment that there is no room for the segmental communication. In fact at this point the dorsal lacuna itself is not yet distinguishable.

Excretory system. The nephridial tubules stained very lightly and were difficult to follow. They could be observed beside the lateral lacunae in many places, and occasionally beside the dorsal lacuna.

Reproductive system. The testes occur in all six segments of the testicular region. They vary greatly in size and are somewhat irregular in shape. In the specimen sectioned their arrangement was asymmetrical, for the left testes of some segments were displaced to the right side. The bursa has a simple structure and the sexual organs are otherwise unremarkable.

Comparison with Allied Species

The genus *Abranchus* when amended by Johansson (1929) contained only two species, i.e. *A. microstomus* and *A. sexoculatus*, and up to the present

time no further species have been described. Certain points in which *A. blennii* differs from *A. microstomus* have already been mentioned. In addition *A. microstomus* is wholly unpigmented and about twice as large as our leech.

A. blennii resembles *A. sexoculatus* in size, general body form and pigmentation, but it is necessary to point out some differences which suggest that they are distinct species.

Johansson says that *A. sexoculatus* has a circle of small spots round the edge of each sucker. None of the three leeches examined alive had any spots, other than eye-spots, on the anterior sucker, but I do not think much importance can be attached to this point as Malm does not mention such spots in his careful original description. The posterior sucker lacked spots altogether in two of our specimens. In the other it bore four spots near the edge, two placed laterally and two dorsally one on each margin of the mid-dorsal stripe. Malm says that the two most median spots of the circle are situated one on each margin of a mid-dorsal band, but this point of resemblance does not outweigh the fact that our specimens had no circle of spots on the posterior sucker. This character is the more important because not only *A. sexoculatus*, but also the other species of *Abranchus* and *Ottonia*, possess a complete circle (Johansson, 1898).

Another point of difference lies in the relative and absolute size of the posterior sucker. Malm gives this as being 2·5 mm. across. Johansson says that it is broader than the body at its broadest point, and describes the body as being 2–2·5 mm. across. Our specimens had suckers measuring only 1·6–1·8 mm. across and, as has already been mentioned, the body when fully broadened out is twice as broad as the sucker. The posterior sucker then is definitely smaller than that of the Swedish form. It is interesting to note that Johansson (1898) separated the two species *Ottonia brunnea* from Sweden and *O. scorpii* from Spitzbergen solely because the posterior sucker of the latter had a diameter twice that of the former. Selensky's study of the internal anatomy of *O. scorpii* later (1915) upheld the view that they were distinct species.

In the same way, though the external differences described above do not in themselves constitute a very good specific distinction, they indicate that *Abranchus sexoculatus* and *A. blennii* may prove to be separate species. Doubtless sections of the Swedish form would decide the question.

Summary

Several specimens of an ichthyobdellid leech were found on *Blennius pholis* collected on the coast of Anglesey.

The leech resembles *Abranchus sexoculatus* (Malm), a rare form only recorded previously from Sweden and not yet adequately described. Slight differences, however, indicate that it may be a distinct species and the name *Abranchus blennii* is provisionally put forward for it.

A short review of the genus *Abranchus* and a description of the appearance and structure of the leech follow.

My thanks are due to Prof. F. W. Rogers Brambell for his encouragement and advice; and to Mr W. H. Leigh-Sharpe for advice regarding the literature.

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