

XXXVI LAND PLANARIANS

By RICHARD H. WHITEHOUSE, M.Sc., *Professor of Biology, Agra College, late of Queen's University of Belfast.*

(Plates xxix, xxx.)

INTRODUCTION.

The collection of land planarians to be described will probably rank as one of the most interesting of Mr. Kemp's many collections from the Abor Country. I particularly wish to express my indebtedness to Mr. Kemp for the privilege of working at these planarians; the task has been made much easier by his excellent series of sketches and notes on colour made from the living animals. These notes have been incorporated in the descriptions, the reliability of which has thereby been greatly increased.

The present accounts are the result of external examination only, but it is hoped that at least some of the species will be subjected to full anatomical investigation as soon as possible.

I wish to express my gratitude to the Belfast Natural History and Philosophical Society for assistance which enabled me to examine the land planarians in the British Museum collection; my best thanks are also tendered to Mr. H. A. Baylis for providing me with opportunities and accommodation for the examination of the Museum material.

Bipalium dihangense, n. sp.

(Plate xxix, figs. 1—3.)

Nine specimens of this species are included in the collections. It appears to be the commonest *Bipalium* in the Abor and surrounding country, it having been procured along the whole of the valley of the Dihang River. The animals were found attached to a variety of objects including stones, logs and leaf-stems of plantain, and in districts varying from 600 ft. to 2000 ft. in altitude.

In shape the animals conform to the typical *Bipalium* outline with broadly spread semicircular recurrent head-lobes, which in some cases curve so far inwards as to meet the sides of the neck (see fig. 3). The trunk, rather stoutly built, tapers gradually to a pointed extremity. The smallest specimen measured 53 mm. in length and 4 mm. in breadth, while the largest was 92 mm. and 7 mm. in length and breadth respectively; they present a

comparatively stout build measuring from 3 mm. to 4 mm. in thickness, a measurement which includes the raised ambulacral surface of the ventral side.

It is not easy to assign any definite position in the body for the mouth and genital aperture, but there is very little error in stating that, in the larger animals, the mouth is about half-way along the ventral surface; in the smaller specimens, the mouth is considerably further back, approximately two-thirds from the anterior end. The genital aperture is not very far removed from the mouth and its position is best described as being 7 mm. to 10 mm. behind it. As a rule both apertures were clearly visible, though in two cases the most careful examination failed to reveal more than one aperture.

The ground colour of the dorsal surface in the living animal is described by Mr. Kemp as a 'dull reddish brown'; the preserved animal presents more of a yellowish brown, frequently, however, with a reddish tint at the sides of the body. Occasionally a distinct bluish shade is to be observed; closer scrutiny shows that it is the deeper tissues that are a very dark greenish blue, and this colour can be seen through the brown; where the outer tissue has been removed by injury, the clear greenish blue is well shown. Thus in one or two cases a variety of colour is shown by an indiscriminate distribution of light blue, dark blue, green and various shades of brown.

Along the mid-dorsal line runs a thin dark line from the head to the caudal extremity, which usually widens very slightly above the regions of the mouth and genital aperture. In some specimens there is just a suspicion of a lateral darker band at the edge, much broader than the median line, and only to be seen in certain parts; this, not being constant, must be regarded as a variation. A little distance inwards from the posterior edge of the lobes of the head is a dark line not usually so prominent as the median line (see fig. 1).

The ventral colouration in the living animal is described by Mr. Kemp as brownish pink with a pale ambulacral surface, the head being somewhat dusky. In the preserved animal, the general surface is a light creamy brown or light biscuit colour; at the edges, the reddish (in some cases greenish) tint of the dorsal surface encroaches in the form of a seam. The head is always a little darker than the rest of the ventral surface. From the neck to the extreme posterior, in the mid-ventral line, is the whitish ambulacral surface, forming a prominently raised ridge, rather less than one-third the width of the body; in the region of the pharynx and genital organs it is somewhat wider; anteriorly, it is flat, and the shading gives, as in *B. giganteum*, a remarkable arrow-head appearance (see fig. 6).

Eyes surround the entire fringe of the head and lobes, and are continued round to the sides of the neck where they form a black patch; they are extremely numerous, and at the sides of the neck are much more closely approximated than on the head.

***Bipalium giganteum*, n. sp.**

(Plate xxix, figs. 4—6.)

Eleven specimens of this species were obtained from three different localities, viz., the Rotung district, Kobo, and Dibrugarh in Assam; it thus appears that it has a fairly wide distribution. In many particulars, it bears a close resemblance to *B. dihangense*, and was occasionally found side by side with that species.

The animals are large, the smallest measuring 103 mm. in length and 7 mm. in breadth, while the largest attained the length of 217 mm. and a breadth of 15 mm.; these measurements are those of spirit-preserved animals, and thus the living creatures must be capable of extending to a considerably greater length.

The colour of the dorsal surface resembles that of *B. dihangense* and is an even dull brown; in the majority of cases, however, the brown is considerably altered by the presence of an underlying dark bluish colour; in fact the appearance is strongly suspicious of a dark slaty blue colouration covered by a secreted brown mucus.

Ventrally, the colour is markedly different from *B. dihangense*; it is an unmistakable blue grey, and lighter in shade than the blue of the underlying tissues of the dorsal surface. The under surface of the head is generally a little paler than the trunk. The ambulacral surface is much paler than the rest of the ventral surface, and forms a very prominent ridge to the extreme posterior; the anterior end of the ambulacral surface, which is flat, by reason of the shades of colour, presents very markedly the form of an arrow head (see fig. 6); true, the same thing is shown in other species, but is not nearly so pronounced as in this one.

In the majority of cases, the mouth is situated near the middle of the body, but its position is variable and it may lie nearly two-thirds from the anterior end. In many specimens, the pharynx was protruded through the mouth as a creamy frill, and in some instances had also been forced through the body wall on the dorsal surface; this suggests that the pharynx is of enormous size. The genital aperture is usually about one-third the distance between the mouth and the posterior end of the body, though this distance may be increased to one-half.

Note on *Bipalium smithi* (v. Graff).

With regard to *Bipalium giganteum*, it appeared from v. Graff's description of *Bipalium smithi*, reported from Darjiling, that the two might be identical; but a careful examination of the type specimen in the British Museum disposed of this likelihood. It may not be out of place to add a brief account of this species which refers to the complete specimen in the British

Museum of Natural History, South Kensington. Its measurements are: length 54 mm., breadth 8 mm., breadth of the head 7 mm., breadth of the neck 4 mm., breadth of ambulacral surface 3 mm. The colour dorsally is a velvety bluish black with just a touch of dull brown; the brown is more emphasized anteriorly until on the head the colour is a dirty yellowish brown with touches of rust colour. Ventrally, from the edge, the dorsal colouration passes gradually into a rusty brown, which is then sharply defined from the ambulacral surface; the flat ambulacral surface is made up of two colours (1) a narrow median deep cream, bordered on each side by (2) a light green band. The dorsal surface is much flatter than the ventral, but I would scarcely say that the edges were sharp. The ambulacral surface is not raised above the general surface, and its extreme anterior end has a pale arrow-head form of light biscuit-brown colour. The under surface of the head is a dark rusty brown. The position of the mouth and genital aperture were not to be made out with certainty.

***Bipalium delicatum*, n. sp.**

(Plate xxix, figs. 7 and 8.)

Two specimens from Rotung, at an altitude of 1300 ft., have been included under this name, the form and colour pattern of which are similar; the general colour, however, is markedly different, one being light brown and the other a very dark brown. Both specimens were found under stones.

The light coloured specimen attains a length of 55 mm., a breadth of 5 mm. and a thickness of 3 mm. The head, which appears a little damaged, is semicircular in form and is not a great deal wider than the trunk. The mouth is placed 30 mm. from the anterior end, and the genital aperture 19 mm. behind the mouth. The ground colouration of the dorsal surface is light brown with a median band of a much paler colour extending nearly the whole length of the animal, and not well defined at the edges; this median stripe expands somewhat on the head and loses itself gradually in the general colour of the head (see fig. 7). The ventral surface is pale and about the same shade as the dorsal median band.

The dark specimen measures 39 mm. long and 4 mm. broad; the mouth is situated 15 mm. and the genital aperture 35 mm. from the anterior end. Except for two apparently bleached patches, the whole of the ventral surface is of the same colour as the dorsal. The eyes are distributed indiscriminately round the head, and are continued for a very considerable distance along the sides of the body, approaching half the animal's length. At the sides of the neck they form a well-marked patch. The paler specimen appears to have been dead some time before being preserved, and consequently, except at the neck, the eyes have been removed along with the rather disintegrated outer tissues.

***Bipalium rotungense*, n. sp**

(Plate xxix, figs. 9 and 10.)

One individual only of this species was secured, together with the specimens of *Bipalium delicatum*. It measures 55 mm. in length, 7 mm. in breadth, and 3 mm., including the raised ambulacral surface, in thickness. The head is a little broader than the body, and is followed by a neck 4 mm. wide. The ambulacral surface is 1.5 mm. wide; the mouth is placed 32 mm. and the genital aperture 42 mm. from the anterior end. The animal is thrown into deep wrinkles over the whole of its surface, indicating that it is capable of extending considerably longer than its present length.

The colour of the dorsal surface, in spirit, is a bluish grey with touches of brown here and there. Medially is a pair of narrow dark lines separated only by a narrow pale central band. Anteriorly, both these lines and the middle band gradually merge into the general colour of the head. On the extreme edge of the dorsal surface is a rather indefinite darker line, contrasting sharply with the paler ventral surface, but indefinitely marked off on its inner dorsal side. The eyes appear to be confined to the anterior margin of the head, to which they form a dark seam (see fig. 10).

The ventral surface is paler than the dorsal and of a medium grey colour, except on the head, where the shade is darker. The median ambulacral surface is almost white; in the region of the mouth and the genital aperture it is a little broader than elsewhere.

***Bipalium sordidum*, n. sp.**

(Plate xxx, figs. 11—14.)

This planarian, of which one specimen only was found under a stone on the bank of the Yembung River, agrees in many features with v. Graff's *B. robiginosum*, but the head colouration differs in at least one important feature.

The specimen is 28 mm. long; the greatest breadth, a little beyond the middle of the trunk, is 4.5 mm.; at the neck it is only 2 mm. broad and the head measures 3 mm. across; in thickness the body attains 3 mm. The mouth and genital aperture are respectively 14 mm. and 21 mm. from the anterior end.

The dorsal surface is flat, and the colour in the living animal is described by Mr. Kemp as "very deep umber brown with profuse black mottling, leaving an irregular very pale median band" (see fig. 11). This very narrow pale band extends from the base of the head to the extreme posterior; its boundary is very irregular and its continuity is occasionally interrupted; above the mouth and genital aperture it widens very slightly. The mottling is much denser near the middle line than at the sides, and it is in this latter position that the reddish brown is shown most clearly; the base of the head is the darkest part of

the animal, and here it is practically black. In all these features of pattern this species agrees with *B. robiginosum* (v. Graff); one difference, however, is that in the latter species, there are two prominent patches of clear reddish brown on the head, one on each side, inclined towards the middle line; such patches are not found in *B. sordidum*. Further, *B. robiginosum* is described as having a greenish or yellowish tone in the brown, though the colour seems variable; and the median line is described as stopping short of the extreme posterior.

The eyes are numerous and extend all round the head to the sides of the neck, where they are somewhat more ventral than dorsal. The head itself is not so broad as the body, whereas in *B. robiginosum* it is a little wider; preservation may have effected some contraction, but Mr. Kemp remarks that the head is not broadly expanded.

Ventrally, on either side of the ambulacral surface, the colour, in the living animal, is pale umber with very minute black specks; in the preserved animal it is a dirty brown colour. The ambulacral surface is much paler and in the preserved creature is a dirty white except in the middle line, which has a shade of brown (see fig. 14); this median portion is the only part of the ambulacral surface that is raised; at the mouth and genital aperture, it broadens out a little (see fig. 14). The under surface of the head is darker than the rest of the ventral surface.

Mr. Kemp notes that this planarian is much more sluggish in its habits than other allied species.

Placocephalus superbus, n. sp.

(Plate xxx, figs. 15—20a.)

All the eleven specimens of this species were found in the Rotung district. In length they range from 52 mm. to 18 mm.; the difference in length is due to the state of contraction, the 52 mm. specimen measuring only 2 mm. in breadth, while a 24 mm. specimen measured 4 mm. across. The dorsal surface is flat and the ventral strongly convex; the ambulacral surface is not perceptibly raised above the general surface. The greater part of the trunk is of similar width, though the body tapers for some little distance from the posterior end to a rather pointed extremity.

The head is much depressed dorso-ventrally, has no prominent lappets, and is only marked off from the trunk by a slight constriction. The eyes are not very numerous but extend along the free edge of the head and on the sides of the neck; in some cases they are continued for a short distance along the sides of the trunk.

The dorsal colouration of this beautiful planarian consists of the following elements: an inner pair of black lines, closely approximated, with a narrow median pale buff stripe between; on their outer edges, these thin black lines fade gradually into a pale

umber stripe, which in turn merges into a broader band of dark chestnut colour; outside this, and sharply defined at both edges, is a broad black stripe; beyond this, and at the extreme edge of the body, most specimens show a very narrow pale buff stripe, which, however, may be regarded as an encroachment of the ventral colouration. In general, the posterior end of the body is darker than the rest, the paler bands being much suppressed; the relative breadths of the colours between the broad and narrow black lines also vary frequently; occasionally, too, the inner pale umber is absent and its place taken by the dark chestnut colour which pales on reaching the outer black band.

In the region of the neck all the bands merge into a dusky area, but the head itself has a distinctive colouration, consisting of two semicircular bands, well defined from one another, a black border piece and an inner pale buff band (see fig. 17).

Ventrally, the ambulacral surface, scarcely raised above the general level, is very pale yellow—almost white—its width being about a quarter that of the body. On either side the colour may be described as a warm straw shade, slightly paler anteriorly. The mouth is situated at about the middle of the under surface, though occasionally it is a little beyond the middle. The genital aperture is three or four millimetres behind the mouth.

Appendix I

It has been thought advisable to include a separate description of one specimen (ZEV⁵²⁹²) on the ground of a striking difference in the form and colour pattern of the anterior extremity, as well as minor differences in colour. Future investigation of the internal anatomy of this specimen will finally decide its position, but in the meantime it is probably better to include it here.

The specimen is 52 mm. long with an almost uniform breadth of 24 mm.; its thickness measures only 1 mm. against the 3 mm. of the 24 mm. specimens; and the mouth and genital aperture are respectively 21 mm. and 36 mm. from the anterior end.

The patterns of the dorsal surface of the trunk are almost identical with the other specimens so far as the longitudinal black lines are concerned, except that the inner black stripes are proportionately a very little thicker. The real colour difference in the trunk is that between the inner and outer black lines is a pale lemon shade, chestnut-brown being entirely absent. Such comparatively insignificant a variation is not sufficient justification for separate treatment, but there is a striking difference in the form and colour of the anterior end. Here the specimen conforms to the Geoplanid type; no head-lobes are present and there is no sign of a neck; the eyes are placed laterally and are sparsely distributed (see figs. 18 and 19). In colour there is a complete absence of the broad black seam round the anterior end, and nothing but a general dusky tone indicates the clearly defined head of the other specimens (see fig. 18). It is possible that the

extremely attenuated form of the body has resulted in the obliteration of the head lobe, which is never very prominent: such a striking correspondence of general colour pattern suggests that the difference in form of the head may thus be accounted for. Should the animal prove to belong to the Geoplanidae, the almost identical trunk colouration could only be accounted for by regarding it as an excellent case of mimicry.

The ventral surface colouration agrees with the other specimens.

Appendix II.

Special attention should be drawn to one specimen (No. ZEV²³¹⁷, fig. 20a) which shows a distinct variety in dorsal head colouration. The dorsal colours are well defined, consisting of a pale buff median stripe, flanked on either side by a thin well-defined black line, which, on reaching the head, expands into two broad patches. On the outer side of each of these median black lines is a definite chestnut brown band, followed by the rather broad pale buff stripe before reaching the broad lateral black band; the body is edged by a repetition of the pale buff marking. As in the normal specimens, the head is fringed all round with a black seam.

The head markings remind one of *Bipalium diana* with its black edge to the head lobe, and the cephalic expansions of the median pair of black lines; this latter feature is also reminiscent of *Bipalium ceres*. But neither of these species has the same general colours or the lateral black bands in the trunk. The general colour of the animal closely resembles that of some varieties of *Bipalium proserpina*, but this latter species has no black edge to the head lobe. The animal under consideration might, of course, be regarded as a variety of *B. proserpina* in which the black edge to the head is a new feature, and the broad paired central black bands (see v. Graff's Monograph) have differentiated into a thin median pair of black, and an adjacent brown, band. For the present, however, I think it is advisable to include it as a variety of *Placocephalus superbus*.

Pelmatoplana aurantia, n. sp.

(Plate xxx, figs. 21—26.)

Only a single specimen of this species was found, and was taken from under stones at Rotung. It measures 50 mm. in length, 4 mm. across, at its widest part, the region of the genital pore, and 3 mm. in thickness. The mouth is situated 18 mm. and the genital aperture 29 mm. from the anterior end. The body is sub-cylindrical for the first third of its length, beyond which it gradually becomes more depressed, tapering slowly from the genital region to a pointed extremity.

A number of eyes are present and extend round the sides and front of the uptilted head; they are more numerous at the sides

than at the front where they practically form only a single row. The extreme anterior, in this specimen, is slightly insunken, a feature which is due to contraction (see figs. 22—24).

The living animal has, dorsally, a ground colour of orange yellow (brownish yellow in spirit), with a well-defined thin median black line, and a black line, a little distance removed from the edge, on either side, a little broader, and rather less defined, particularly on its inner border (see fig. 25). At the extreme posterior all three merge, forming an almost black extremity (see fig. 26). Between the black lines the tone is somewhat dusky compared with the outer edge which is bright orange yellow. This bright zone is carried to the ventral side with very little difference in shade except at the flat ambulacral surface itself which is much paler, and measures a millimetre or less in width. On the dorsal side of the head the longitudinal markings merge into a dark grey pigmentation (see fig. 22)

The genital aperture is very prominent, but the mouth is much less so.

In many features, this species resembles *P. sondaica* (Loman), but its colour, greater breadth and flat ambulacral surface differ from the latter species.

Cotyloplana pilleata, n. sp.

(Plate xxx, figs. 27—31.)

About thirty specimens of this planarian are included in the collection, all from the Yembung and Rotung districts. The largest specimen measures 105 mm. in length, even in a contracted condition, and the smallest is 50 mm. long; most specimens are a little more than 70 mm. long, 4 to 5 mm. broad and 3 mm. in thickness. Judging from the amount of wrinkling shown, it would appear that some of these planarians are capable of an extension to quite 130 mm., and probably much more.

The dorsal surface is rather flat, while the ventral surface may be strongly convex, though in one collection made in Upper Rotung the ventral surface in all the specimens is nearly as flat as the dorsal. The anterior end is raised at a considerable angle (see fig. 29) and bears, on its upper side, the two eyes, and on the ventral side, practically at the extreme anterior, a single sucker (see figs. 28 and 30). Mr. Kemp remarks that in the living animal the head appears slightly swollen, but this is scarcely noticeable in the preserved specimens.

While the colour-pattern remains constant, the shades of colour vary very considerably. There is a mid-dorsal dark black line running from the extreme anterior (in some few cases starting short of this) to the posterior extremity, widening quite perceptibly above the pharyngeal and genital regions. On either side of this line is a narrow strip of bright lemon yellow, which is not always well defined from a broad lateral brown band,

which completes the dorsal colouration. Occasionally the yellow is absent and the brown meets the black centre line; in other cases, a paler brown takes the place of the yellow. The brown band is liable to much variation in shade; it may be little more than a dusky yellow on the one hand, or a dirty brown on the other, between which are all intermediate shades of bright orange brown and chestnut brown. The upper surface of the head is a dusky grey, with rather lighter patches round the eyes; the general impression is that of a cap on the head. The median line merges gradually into this area.

The dorsal lateral colouration is carried round the sides of the body to the ventral surface, though often paler as far as the ambulacral surface, which is a pale yellow (whitish in spirit); the creeping surface is about a quarter the breadth of the body, but wider at the mouth and genital pore; and in some cases forms a raised ridge, while in others it is quite flat or even depressed. The mouth is placed at less than half way along the ventral surface from the anterior end, and the genital pore at positions varying from midway between the mouth and posterior extremity to two-thirds the same distance.

