AUSTRALIAN *DIXIDÆ*. [Dipt.]

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INTRODUCTION.

Previously nothing was known of the representatives of this family in Australia except a record of Skuse [1] saying that he knew three species belonging to the genus *Dixa* in New South Wales; they remained, however, undescribed, and I have been unable to find the specimens in his collection, preserved *pro parte* in the Australian Museum in Sydney and *pro parte* in the Macleay Museum in Sydney University.

During a short stay in New South Wales and Victoria and one summer spent in Tasmania, I found five species of *Dixa*, and recently Mr. A. J. Nicholson discovered another in New South Wales, which he kindly gave me for study, for which loan I am much obliged to him.

These Australian species indubitably belong to the genus *Dixa*, as they differ very little from the forms of the rest of the world; like them, they are differentiated from each other by mere details of colouration, relative length of antennæ, peculiarities of venation such as the position of *r-m* and relative length of fork of R_{2+3}, and chiefly by the structure of the hypopygium.

Their larvæ of which three types have been secured, differ also very little from the European forms. Like them, some have the peculiar crown of hair on the dorsum of the abdominal segments 2-7, and some present this dorsum completely smooth; they are provided also with the pair of pseudopods on the two first abdominal segments, the armature of hooks on the 6-8 segment; the mouth-parts and spiracular armature present only minute differential characters in their structures.

(1). Austral. Ass. Adv. Sci., Melbourne, Vol. II., 1890, p. 530.

ADULTS.

Table For Male and Females.

1. Antennæ long, nearly as long as the body, or at least, as the abdomen; basal joints of flagellum elongated and scarcely distinct from each other; *r-m* placed well before fRs. 3.

   Antennæ rather short, about as long as thorax; the basal joints of the flagellum somewhat fusiform, well distinct from each other; *r-m* placed at or after fRs. 2.

2. Mesonotum nearly all orange; front legs rather dark; stem of R_{2+3} much longer than R_2; smaller species. *D. FLAVICOLLIS*, n.sp.

   Mesonotum with three well-marked dark bands; all legs yellow with dark tip at femora and tibiæ; stem of R_{2+3} somewhat shorter than R_2; larger species. *D. GENICULATA*, n.sp.

3. No other marking on the wing but a spot on *r-m* which extends along the stem of Rs up to R_1; mesonotum orange with two dark bands connected in front. *D. TASMANIENSIS*, n.sp.

   Wing spot never extending up to R1; or else wing nebulous and colouration of mesonotum nearly all black. 4.

4. Besides the roundish spot around *r-m* the wings are infuscated on some other parts, chiefly on the apical region; nearly completely dark species. *D. HUMERALIS*, n.sp.

   Wing presenting only one spot near *r-m* or scarcely any trace of one. 5.

5. The spot of the wing distinctly marked, rather large, extending on the whole length of the stem of Rs. *D. UNIMACULATA*, n.sp.

   The spot of the wing very faint, restricted only alongside *r-m* *D. NICHOLSONI*, n.sp.

DIXA FLAVICOLLIS, n.sp.

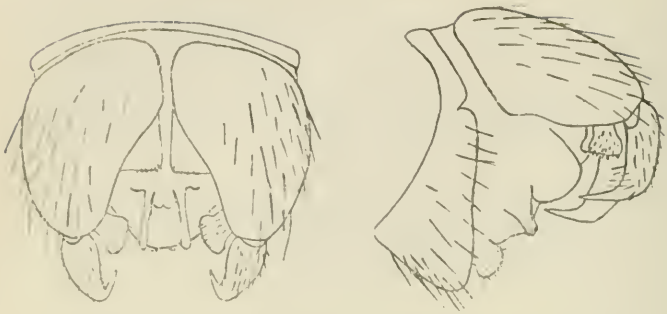

Fig. 1. Hypopygium of *D. flavicollis* from above and from the side.

Male: Face and snout dark yellowish; palpi black; antennæ with scape brown, flagellum black; vertex black, shining. Thorax rather dull orange, with exception of the prothorax blackish; on the middle of the mesonotum, anteriorly, there is the beginning of a dark band, another dark band on the pleuræ between the front and the hind coxæ; a brownish space below the wing's base; coxæ yellow, also the base of femora, which are gradually darker towards their extremity, the hind ones lighter; tibiæ and tarsi brown; apical swelling of hind tibiæ very conspicuous, claws large; halteres with orange stem and light brown knob. Abdomen brownish black, little shining; hypopygium large, completely black; wing nearly hyaline with a small infuscated spot on *r-m*.

Antennæ short, somewhat less than the head and thorax together, with very distinct joints in the flagellum, the basal ones being rather short and fusiform. The palpi with a short first joint, the second and third subequal, about four times as long as wide, last joint about twice the length of the third.

Venation: Origin of Rs well after the tip of Sc; *r-m* before fRs; first part of the stem of Rs three times larger than the second part; stem of R_{2+3} distinctly larger than R_{2+3}.

Hypopygium small, the lamellæ showing between the base of the side pieces presenting rounded angle; apical internal process of the side pieces axe-shaped, rather short and hairy on their whole surface; claspers shorter than the side pieces, subcylindrical at base, and then suddenly curved downwards and tapering into an acicular extremity; ædœagus little developed, without any conspicuous hook or process.

Length of wing: 3 mm.

Female: Similar to male in colour, but the median band of the mesonotum more marked, and with two lateral very faintly marked dark bands; otherwise agreeing completely with the type as to colouration and wing venation.

Type and allotype, which were the only specimens captured, come from Sassafras, Victoria, 19th October, 1922. They are in the collection of the Cawthron Institute.

DIXA GENICULATA, n.sp.

Fig. 2. Hypopygium of *D. geniculata* from above and from the side.

Similar to the preceding species but larger, and with darker marks on body but with lighter legs.

Male: Face and snout orange-yellow as well as the scape of antennæ; the flagellum black; palpi also black, vertex brown shining; mesonotum orange with three disconnected brown bands, the median one much abbreviated behind, the lateral ones in front; scutellum orange; post scutellum infuscated; halteres with orange stem and black knob. Prothorax brown, somewhat dark marks on the pleuræ from the front coxæ to the base of the abdomen and on the lower part of the mesosternum. Abdomen blackish brown, rather dull; coxæ, femora, and tibiæ yellow, the femora with black tip, the tibiæ with slightly darker base and black tip, tarsi brown, the metatarsi somewhat lighter towards their base on the anterior legs, the hind metatarsi distinctly lighter with dark base and extremity. Wing hyaline or scarcely greyish, with Sc and R1 as well as the costal field yellowish, one dark subcircular spot round *r-m* extending downwards on *m-cu*.

Antennæ short, about the length of the thorax, the basal flagellum joints very distinct from each other; palpi as in preceding species.

Venation: Origin of Rs after tip of Sc; first part of stem of Rs double the length of the second part, therefore *r-m* well before fRs; stem of R_{2+3} somewhat shorter than R_{2+}. Hypopygium built on the same plan as in *D. flavicollis*, but the parts differ as follows:—The lamellæ, visible from above between the base of the side pieces, are produced in a small blunt digitation; the internal distal processes of the side pieces are rather long, about half the length of the claspers, and much widened at their extremity, which carries a row of small setæ; the claspers are about as long as the side pieces and nearly straight, their tip, which is suddenly pointed, is somewhat turned down; no conspicuous process or hooks on the ædœagus or the tergum of the hypopygium; as a whole, all the parts are relatively more developed and robust than in *flavicollis*.

Length of wing: 3 2-3 mm.

Female: Similar to the male, the legs very slightly darker, especially the front ones.

Type and allotype from Burnie (Tasmania), 26th, 27th October, 1922. In the collection of the Cawthron Institute. Four paratypes, one male and three females from the same locality, and one female from St. Patrick's River, 21st October, 1922.

This last-mentioned specimen from St. Patrick's River has the dark marking of the mesonotum much obliterated; it corresponds very well in every other point. One female from Sassafras, captured at the same spot as *D. flavicollis*, agrees very well with the characters of *geniculata*, with the size, the wing venation and marking, and the yellow scape, but differs from it in the completely orange mesonotum and halteres as well as by the darker legs. I was, therefore, at first disposed to consider the Tasmanian form as a variety of the Victorian one, but closer examination showed that the points of difference are well marked and justified considering them as different species.

This difference in characters may be summed up as follows:—

Size larger in *geniculata*.

Scape distinctly orange and not brown.

Mesonotal dark bands well marked, and in mesonotum nearly completely orange.

Knob of halteres distinctly black and relatively short.

All femora and tibiæ yellow with dark tip.
Anterior veins yellow.
Spot of the wing extending alongside *m-cu*.
Greater robustness of hypopygium, with some of the parts presenting a different shape.
Stem of R_{2+3} about equal to R_2 and not very much longer, as in *flavicollis*.

D. TASMANIENSIS, n.sp.

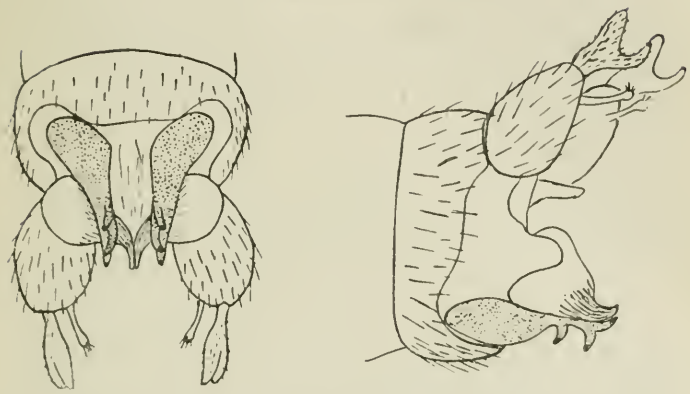

Fig. 3. Hypopygium of *D. tasmaniensis* from below and from the side.

Male: Head shining black, proboscis yellow, palpi and antennæ black, but the scape a little lighter on the side. Mesonotum yellowish-orange with three brown-black bands, confluent anteriorly, the median one divided by a very thin line, and shortened behind so as to leave a large yellow space in front of the scutellum, which is also yellowish, except on the sides; post-scutellum black; pleuræ blackish, lighter below the base of the wings. Front coxæ brown at base, yellowish at tip as well as the others, and the base of femora, which are more or less testaceous on their whole length, their tip being distinctly black; the middle femora are somewhat darker; tibiæ and tarsi brownish, the hind tibiæ a little lighter, chiefly at base. Base of stem of halteres yellowish, then dark, and the knob again yellowish. Abdomen black, moderately shining; hypopygium also black, the claspers lighter; wing greyish with a moderately marked brown spot extending from the base of Rs towards fRs and *r-m*, also a slight shadow near the extremity of Cu.

The antennæ are as long as the abdomen at least, and very thin towards the end; the joints are elongated, cylin-

drical, indistinguishable from each other, especially towards the end; relative length of palpal joints as in preceding species.

Venation: *r-m* placed after fRs; stem of R_{2+3} only a little shorter than R_2.

Hypopygium: Side pieces moderately long with an internal pre-apical thin process about as long as the claspers and swollen at tip, which carries three or four small bristles, two of which are stouter; claspers broad, triangular, ending in two branches separated by a semi-circular notch, the inferior branch curved upwards and with its tip black, strongly chitinous; the two lateral inferior pieces of the ædœagus dark and with three hooky spines, two pointing downwards and the terminal one upwards.

Wing length: 3 1-3 mm.

Female: Colouring exactly the same as in male; stem of Rs relatively shorter, wing marking more intensive, especially the shadow around the extremity of Cu.

Type and allotype from Mt. Wellington, Tasmania, 25th November, 1922. In the collection of the Cawthron Institute. A dozen paratypes from the same locality and from Hartz Mt., 9th December, 1922; Burnie, 31st January, 1923; Eagle-Hawk Neck, 15th November, 1922; Mt. Field, National-park, 18th December, 1922; Mt. Farrell, 9th February, 1923. All these localities in Tasmania.

D. NICHOLSONI, n.sp.

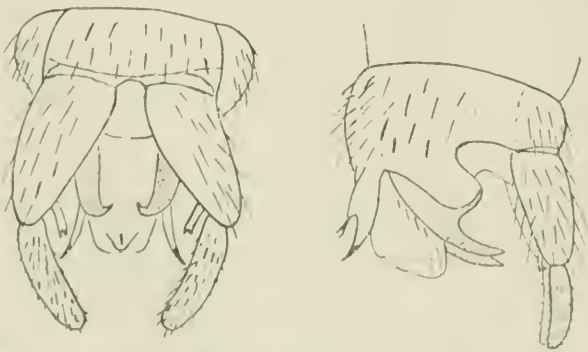

Fig. 4. Hypopygium of *D. nicholsoni* from above and from the side.

Male: Head with appendages dark brown; mesonotum with three confluent broad dark bands which leave only very little dull ferruginous colour on the sides and before the

scutellum, this and post-scutellum obscurely ferruginous. Pleuræ with exception of sternopleuræ testaceous-orange, as well as all the coxæ; legs brownish, the femora slightly lighter. Base of stem of halteres testaceous, the rest and the knob brown. Abdomen black, more or less shining, with dark scarce pubescence; hypopygium ferruginous; wings grey with a very indistinct smoky marking on fRs and *r-m*.

Antennæ filiform as in preceding species; palpi also similar.

Venation: Origin of Rs in front of the end of Sc, *r-m* placed after fRs; stem of Rs equal to stem of R_{2+3}.

Hypopygium: Side pieces with an internal pre-apical process of moderate length and bifid at the end; claspers cylindrical without any spines, hooks, or bristles, their ends blunt; ædœagus complicated, presenting two downward pointing processes (2) ending in a sharp black spine and presenting a small tuft of hair at base of this spine, the internal parts of the ædœagus in form of two strong hooks pointing upwards.

Wing length: 3 mm.

Female: The colouring seems to agree well with that of male as far as it is possible to judge from alcohol specimens; there is agreement in all morphological details.

Type and allotype from Mill, Allyn River, N.S.W., 18th December, 1922. In the collection of the University, Sydney.

Nineteen paratypes in spirit collected in the same locality at the same date, by Mr. A. J. Nicholson, who found these flies clustered on stones.

D. HUMERALIS, n.sp.

Fig. 5. Hypopygium of *D. humeralis* from below and from the side.

Male: Very similar to *D. nicholsoni*, but its general colouration very much darker. The thorax, which is rather

(2). The hypopygium of *Dixa* as in most *Culicoidea* is inverted, the tergum being situated ventrally.

shining, is only yellow-orange at the shoulder and at inferior part of the mesosternum; halteres uniformly dark yellowish; all coxæ yellowish, the femora also, but with dark tip; anterior tibiæ brownish, the hind one yellowish, with dark, moderately swollen extremity; tarsi brown; wing nebulous, with a rather strongly marked roundish spot near the base of Rs, and extending on fRs and *r-m*, a slight infuscation on the whole wing tip from the level of fR_{2+3}, but extending more towards the base of R_{4+5}, a slight infuscation also at base of the anal area, then under the first half of Cu and on both sides of the extremity of Cu.

Antennæ and palpi as in preceding species.

Venation: Origin of Rs after the tip of Sc; stem of Rs shorter than the stem of R_{2+3}; *r-m* placed at fRs; stem of R_{2+3} a little shorter than R_2.

Hypopygium: Small, the side pieces *without* any internal process, the claspers bifid, the upper branch blunt, the inferior one thinner, curved upwards, and with a black hard tip; the ædœagus with two downward directed long, thin, yellow hooks, with a dark tip, and carrying some short hair in tuft on the middle of their inferior side.

Wing length: 2½ mm.

Female unknown.

The type, a unique specimen, was collected on Mt. Wilson (Blue Mts., N.S.W.), 20th November, 1921, and is in the collection of the Cawthron Institute.

D. UNIPUNCTATA, n.sp.

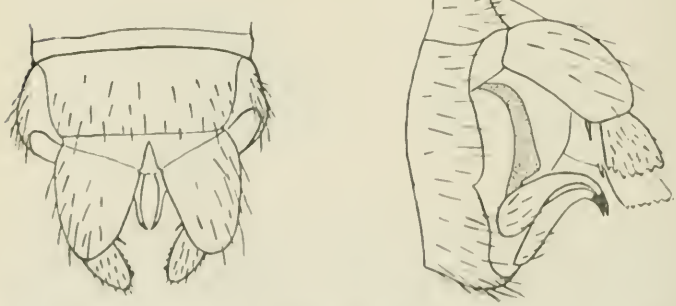

Fig. 6. Hypopygium of *D. unipunctata* from above and from the side.

Male: Clypeus yellowish, palpi brown, antennæ with the scape brown, flagellum black; vertex shining black. Thorax orange-yellow, with the exception of the prothorax, which is dark; three dark disconnected bands on mesonotum; a very wide dark band across the pleuræ from the anterior coxæ to the base of the abdomen; all coxæ yellow, also the femora, especially at base, the hind ones completely, except for the tip, which is black, whereas the anterior ones become gradually darker towards the tips; anterior tibiæ brownish with dark tip, the hind one yellowish with black moderately swollen extremity; tarsi blackish; halteres completely orange-yellow. Abdomen brownish black, rather dull, hypopygium slightly brownish, wing greyish with an infuscated roundish spot on the last half of the stem of Rs on fRs and *r-m*, also a very indistinct shadow on the last part of Cu.

Antennæ elongated as in preceding species, and relative length of the palpal joint similar.

Venation: Origin of Rs not much after the tip of Sc, *r-m* placed a little after fRs; stem of Rs about equal to stem of R_{2+3}, the latter about half the length of Rs.

Hypopygium: Small, side pieces with a very small inconspicuous internal distal process, which looks like a small spine, but is composed of a cylindrical basal part on which are inserted two small bristles; claspers about half the length of the side pieces, axe-shaped, their outer edge serrated; ædœagus with two conspicuous orange hooks pointing downwards with black tip.

Length of wing: 3½ mm.

Female unknown.

Type from St. Patrick's River, Tasmania, 1st November, 1922. In the collection of the Cawthron Institute. One paratype from the same locality and date.

LARVÆ.

The three larvæ which have been secured up to now are not referred to the three particular species by way of rearing, but only by simultaneity of capture of the imagines in the same spot where the larvæ had been found. Therefore their identity remains somewhat dubious, although in each case only one species of the adult had been found at the same time with the larvæ hereafter described. None of the pupæ are known.

TABLE OF KNOWN LARVÆ.

1. Dorsum of abdominal segments 2-7 carrying a conspicuous crown of hairs; armature of spines present only on the abdominal sternite 5 and 6 *D. GENICULATA*, Tonn.

   The abdominal segments without crown of hairs; armature of spines present on the abdominal segments 5-7 2.

2. Base of the lateral plates of the spiracular armature connected by a chitinous plate; spiracles round; caudal appendage not much longer than the lateral plates. *D. TASMANIENSIS*, Tonn.

   The lateral plates not connected between them at base; spiracles elongated; caudal appendage distinctly longer than the lateral plates. *D. NICHOLSONI*, Tonn.

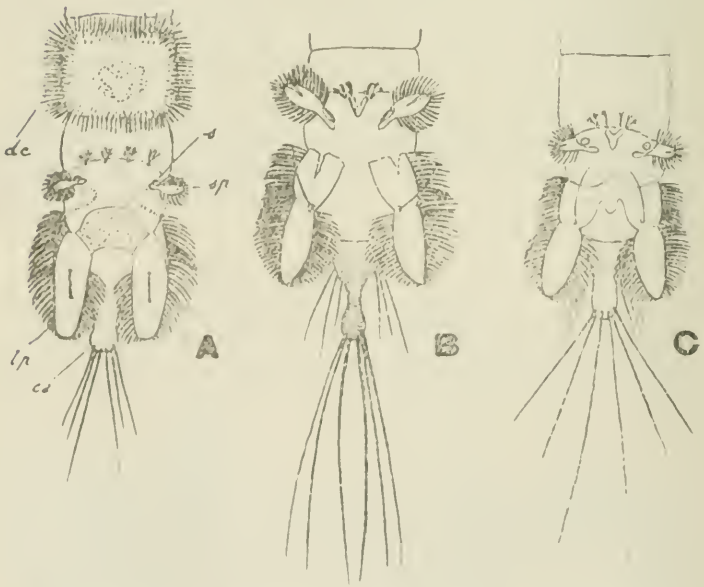

Fig. 5.—Extremity of the body of larvæ from above:—A: *D. geniculata*. B: *D. nicholsoni*. C: *D. tasmaniensis*. s: spiracle; sp: spiracular plate; lp: lateral plate; ca: caudal appendage; dc: dorsal crown of hairs.

DIXA NICHOLSONI, Tonn.

The full-grown larva is 8 mm. long, its colour grey with brown diffused markings on the dorsum.

Head black with ferruginous parts chiefly on the sides.

Antennæ with the usual short triangular spines, without hairs, carrying only one small external bristle inserted about one-third before the extremity. Mandibles and maxillæ of the usual type, these last conical and as long as the maxillary palpi. Mentum bluntly conical without any distinct indentation. Labrum with two rather well developed tufts of hairs.

Anterior edge of prothoracic sternite with a row of very long bristles reaching beyond the head; four of them are disposed in a tuft, and are, with the others, in the following order: 1.1.1.1.4.1.-1.4.1.1.1.1. The two pairs of pseudopods of the two first abdominal segments are equally developed. The armature of spines on the sternum of abdominal segments 5-6 are composed of two groups of two juxtaposed rows of spines, containing each 7 spines pointing backwards, the spines of the upper row being much stronger than those of the inferior row; on the 7th segment the groups are composed only of rows of 5 spines; the two groups of rows are separated by a small longitudinal chitinous band. The basal sternal plate of the caudal appendage has two groups of three rather long bristles reaching beyond the end of the caudal appendage, which is black, and carries six long bristles at its extremity.

The structure of the spiracular plates, as in figure 7B; the spiracles themselves elongated; between them there is a chitinous armature in shape of a V surmounted on each side with three tufts of small curved hairs. The lateral plates are not connected at their base by a chitinous structure; their comb, situated on the middle of their inferior side (the lateral side of the body), is formed by a regular row of moderately developed spines, the last of which is stronger than the others.

DIXA TASMANIENSIS, Tonn.

Length of full-grown larva 6 mm.; it is very similar to the larvæ of the preceding species; its colouration is the same, and its whole body is also covered with a microscopical but very dense pubescence. Head mostly ferruginous, blackish above and with a black posterior edge. Antennæ with the usual short spines, and besides the external small bristle,

which is nearly median, they carry on the ventral side a number of hairs. Labrum with well-developed dense tufts of hairs. Maxillæ conical as in preceding species, but without hair at its extremity; the palpi with rather larger spines on the internal side. Mentum without distinct indentation.

Anterior border of prothoracic sternum with moderately long black bristles pointing forward and not reaching beyond the head; they are disposed according to the following order, four of them making a tuft on each side: 1.1.1.4.1.-1.4.1.1.1. The two outer ones on each side are only half the size of the others. The armature of spines on the sternum of abdominal segments 5-7 are as in the preceding species as to number and disposition; the spines, however, are relatively longer, and between the two groups there is no chitinous longitudinal small plate.

The sternal basal plates of the caudal appendages with two groups of three moderately long bristles; the caudal appendage, which is testaceous and relatively small, carries six long black bristles about twice as long as the appendage itself.

Spiracular plates according to figure 7C; the spiracles themselves are roundish; the V-shaped structure between them is provided with two groups of three small tufts of curved hair as in preceding species. The bases of the lateral plates are connected with each other by a chitinous formation; their inferior comb is composed of a row of very small spinules which end in a relatively large trifid spine.

DIXA GENICULATA, Tonn.

Length of full-grown larva 6½ mm. Its colour is of a dirty yellowish, the dorsum darker on account of the long hairs of the abdomen; head testaceous with a black anterior and posterior edge above. Antennæ and palpi black; labrum with the usual dense, well-developed tufts of hair; mandibles as usual, maxillæ also, pointed, with only a few hairs at the tip. Antennæ without hairs or bristles, only with the short triangular spinules. Mentum without distinct indentation.

No conspicuous bristles on the anterior edge of the prothoracic sternum; the first pair of abdominal prolegs more developed than the second; armature of hooks present only on the 5th and 6th abdominal segments, and composed of two adjacent groups of spines in two juxtaposed rows, the inferior one being formed of six straight thin spines, the

superior one of five closer somewhat falcate spines, no chitinous small plates between the groups of spines. All round the dorsum of abdominal segments 2-7 there is a conspicuous crown of stiff hairs which are more developed on the sides than anteriorly or posteriorly. Basal sternal plate of caudal appendage without conspicuous bristle, the caudal appendage, which is short and testaceous, is provided with six black terminal bristles, only a little longer than the appendage itself; lateral plates connected at their base by a chitinous plate; their median bristle is coarse and branched at the tip.

The spiracular plates according to figure 7A; the spiracles themselves round, separated by a row of four little groups of branched hairs.