

INSECTS OF MACQUARIE ISLAND. DIPTERA: CHIRONOMIDAE

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There are as yet only very few Chironomidae known from the sub-Antarctic islands, a situation which probably gives little justice to the true representation of this extremely hardy group. This paper is the first contribution to the chironomid fauna of Macquarie Island.

I wish to express great indebtedness to Mr. Keith Watson of the Australian National Antarctic Research Expeditions, who brought together the material in 1961 and through whose kindness I had the opportunity of studying the interesting Macquarie midges. I am also grateful to Dr. P. Freeman, British Museum (Natural History), London, for enabling me to borrow a paratype of the peculiar brachypterous species *Halirytus amphibius* Eaton. The drawings accompanying this paper were made by me.

1. *Halirytus macquariensis* Brundin, n. sp.

This member of the marine *Telmatogeton*-group is very closely related to *Halirytus amphibius* Eaton from Kerguelen I. (type of the genus).

Female. Length of body 4.5–5.0 mm (abdomen swollen), wing 0.7–1.4 mm. General color blackish with a greenish tinge, most of body pruinose, cerci strongly shining; antennae, legs (including extensive parts of the coxae), scutellar area, mesonotal pleura, and parts of the tip of abdomen pale brownish; wings and halteres smoky gray.

Head of about normal size; eyes smaller than normally in *Telmatogeton* and with fewer ocelli, widely separated. Antennae 5-segmented, short, of about length of head, segment 1 slightly longer than broad, its diameter about 2× that of flagellar segments, with several black short setae; segment 2 is 2× as long as broad, strongly constricted in middle, without setae; 3 and 4 subspherical, without setae; segment 5 nearly 2× as long as broad, with 1 or 2 short setae. Palpi consisting of only 1 small subspherical segment, in some specimens with 1 seta. Paraglossae small, with several short setae distally. Clypeus mostly with 2 pairs of setae, vertex with 3–5 setae.

Entire thoracic region strongly modified in connection with reduction of flight muscles and enlargement of ovaries, which extend from abdomen into mesothorax where they fill up most of cavity. The most marked peculiarity is perhaps the loss of practically the whole zone between the wing base and the bases of the coxae, meaning that the pleurotrochantins of the mid coxae end quite near to wing base and area of halteres and metathoracic spiracles in close contact with hind coxae; thus mesothoracic epimeron and meron and metathoracic episternum strongly reduced and dorsoventrally compressed. Frontad of

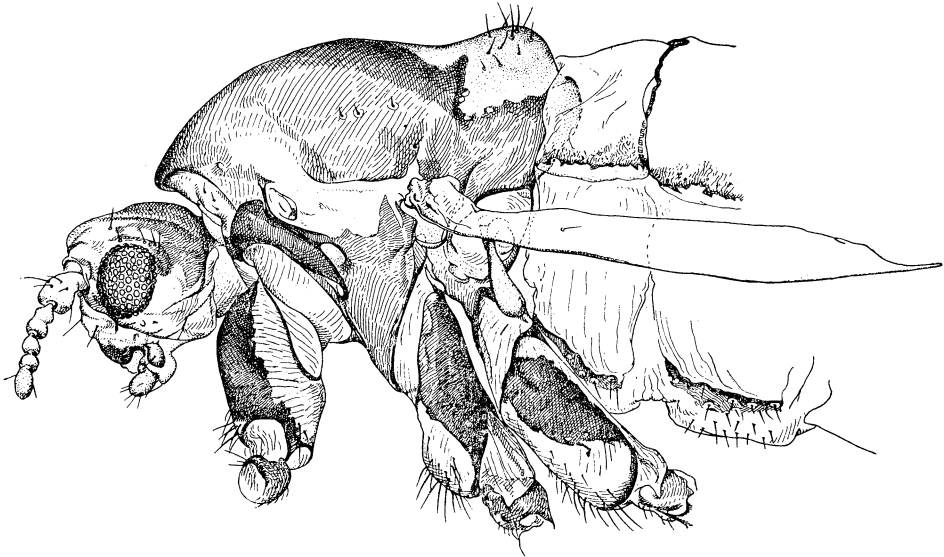


Fig. 1. *Halirytus macquariensis*, ♀. Aerial Cove, Macquarie Island.

this area posterior anepisternum reduced to 2 small lobes just before wing base, and the normally prominent sternopleuron is so strongly compressed that distance (in lateral view) between wing base and ventral contour of sternopleuron is less than length of the mid coxa (in *Telmatogeton* this distance is about $2\times$ coxal length). Anepisternal suture lacking, but prothoracic episternum highly developed.

Pronotal lobes better developed than in *Telmatogeton* but widely separated dorsally, parallel-sided in lateral view, each with 1–3 short setae on basal 1/2. Mesonotum markedly arched, somewhat protruding between pronotal lobes and moderately overhanging head; a few short dorsocentral and prae-alar setae present in some specimens. Supra-alar setae never present.

Scutellum quite fused with mesonotum and strongly reduced, in lateral view forming a slight knob, thus softly merging into the mesonotum; about 15–25 scutellar setae of very different size present. Postnotum strongly reduced and very weakly marked.

Wings always strongly reduced but never missing, variable in size and form; in most cases, however, wing tip broadly rounded; basal sclerites fairly well preserved; in some specimens a few (1–4) setae on stem vein; other veins hardly indicated, but some specimens with an isolated seta on upper wing surface marking position of a lost vein. Halteres very small, length 0.22–0.25 mm.

Legs long; relative lengths of segments from tibia distad, 68 : 39.5 : 16.3 : 10 : 8.2 : 13.2 on fore legs, 80 : 34.5 : 13.9 : 8 : 7.1 : 13.5 on mid legs, and 86 : 48.2 : 22.1 : 9.5 : 7.5 : 13 on hind legs. Coxae large; trochanters simple; tibial spurs absent. The short 4th tarsal segment not typically cordiform, hardly more deeply excavated distally than segments 1–3. Last tarsal segment deeply trilobed, median lobe extending to apex of claws, lateral lobes $2/3$ as long; empodium large, along under side with numerous arborescent ramifications.

Tarsal claws pointed and simple; each claw with an adjacent membranous lanceolate lamella but without basal setae occurring in some *Telmatogeton* species. All of femora, tibiae and tarsi setigerous; setae short and stout.

Abdomen rather sparsely covered with short setae arising from pale-colored ocellate spots especially on lateral parts of sternites; tergites 1 and 2 mostly quite devoid of setae. End of abdomen (fig. 2a) markedly tapering, triangular in outline and laterally compressed. Tergite 8 strongly reduced. Tergite 9 and sternite 8 large and strongly chitinized, the latter in ventral view (fig. 2b) distally constricted and deeply emarginated, thus forming 2 triangular ventral lobes at base of cerci. These are comparatively long and slender and rapidly tapering distally, thus smoothly completing general triangular form of abdominal end; cerci densely covered by microtrichiae and short fine bristles. The cerci protect the mesally situated slender valves of ovipositor, each being attached to base of a cercus and to tergite 10, which in its turn is prolonged distally in median part, forming dorsal wall of ovipositor.

Pupa. General appearance as in *Telmatogeton*. Cephalothorax strongly chitinized, amber colored. Anterior margin of cephalic lobe broadly rounded, mesally very faintly emarginated, somewhat mesad of each antennal sheath with 1 seta; 2 ventral setae on each of areas covering eyes, 1 in a central position and 1 at caudal margin. Most of mesonotal area strongly corrugated, laterally with sharply marked margins, forming protecting shields above the 2 anterior pairs of leg sheaths. Thoracic setae: on each side 1 seta at anterior

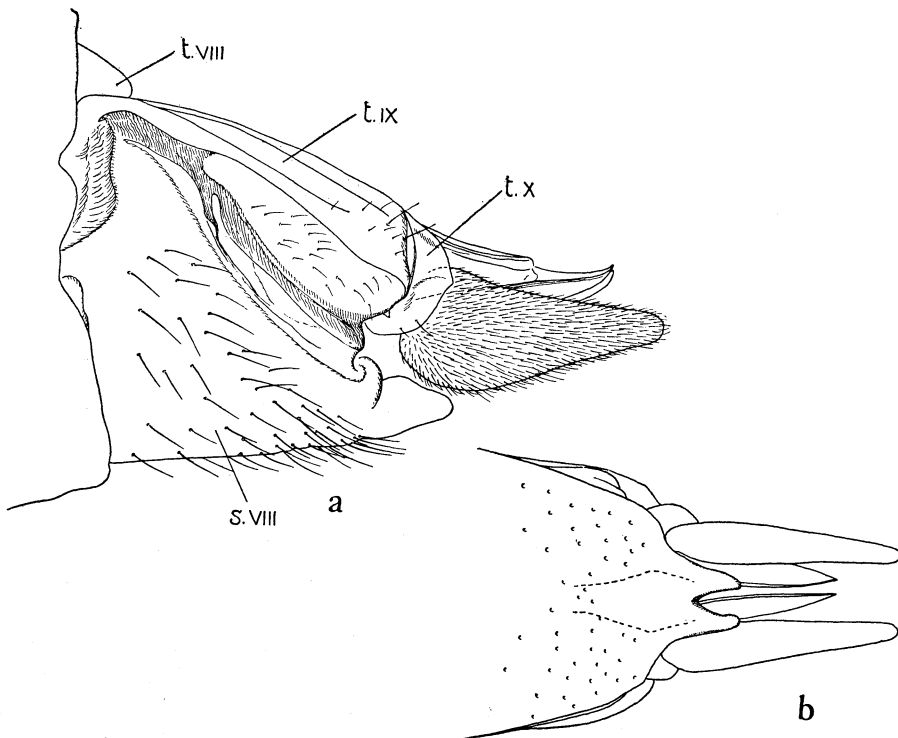


Fig. 2. *Halirythus macquariensis*, abdominal end of ♀. a, lateral view; b, ventral view.

margin, 2 close together between median line and base of thoracic horn, 1 further caudad in praescutellar area, and 1 just cephalad of wing sheath base; further, but perhaps not in all specimens, 1 small seta at base of sheaths of halteres.

Thoracic horns (fig. 3a) heavily chitinized, wedge-shaped, point bending forward, downward and a little inward (horns closely pressed against anterior part of cephalothorax). Spiracle opening dorsally a little distad and laterad from central point of horn and not far from lateral margin. Wall of horn chamber strongly sclerotized just before opening and appearing blackish. Opening marked by a simple dark ring; radially arranged lobes not present. Dorsal surface of horn covered by a faintly marked scale-like sculpture.

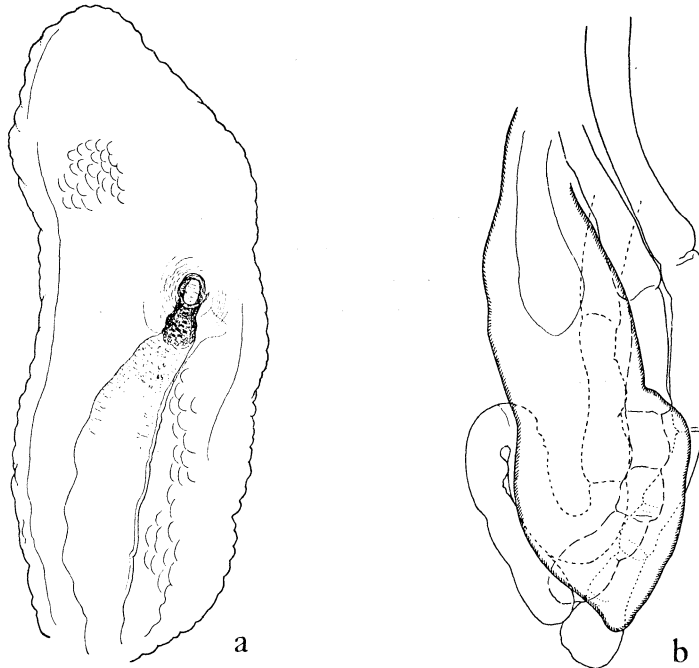


Fig. 3. *Halirytus macquariensis*, pupa. a, right thoracic horn, dorsal view; b, wing sheath and leg sheaths of the right side, with the contour of the imaginal wing within the base of the wing sheath, ventrolateral view.

Wing sheaths (fig. 3b) of normal length, ending just before anal margin of abdominal sternite 2, comparatively very narrow basally but strongly widening distad, median margin and in some specimens even lateral margin forming a marked angle at beginning of distal 1/2 of sheath. Thus the short and narrow wings of imago only occupy a limited part of the space in basal 1/2 of sheaths.

Leg sheaths (fig. 3b), as in other members of *Telmatogeton*-group, all meeting at tip of wing sheaths. Metatarsal ends of fore leg sheaths meet in median line above trochanters of hind legs, and from here directed straight caudad, only bending a little ventrad because of bodycontour (entirely visible in ventral aspect). Sheaths of mid legs lie close to fore leg sheaths, changing from a lateral to a lateroventral position within zone of tarsal seg-

ments 2-5; in this distal part covered by wing sheaths (always ending a little before tips of fore leg sheaths). Last 2 bends of wing sheath protected; hind leg sheaths placed far distad and situated within distal 1/2 of wing sheaths. Last bend situated under dorsolateral wing sheath margin and externally visible together with rest of sheath, which extends mediad along margin of wing sheath, thus meeting sheaths of fore and mid legs at right angles.

Abdomen with same peculiar oblique terminal disc as in other genera of *Telmatogeton*-group. Tergites and sternites of segments II-VII with very dense and fine shagreening; tergites II-VI and sternites III-VII with sclerotized U-shaped line along frontal and lateral margins; on sternite II it is incomplete, being present only along lateral margins; the line is somewhat incomplete even on sternite III in mesal part of frontal margin, where a very large spinous brown patch occupies about 1/2 of distance between lateral arms of the U. Further, small paired spinous patches present laterally near ends of arms of U-shaped lines of tergites and sternites III-VI, thus altogether 8 patches on each of actual segments. On tergites III-V shagreening markedly coarse in a narrow zone along frontal margin of U-shaped line.

It is a characteristic feature of chironomid pupae that they are provided with 5 + 5 setae on each of abdominal tergites II-VII; there are 5 setae on each side of median line, but their position is very different in different groups. According to Tokunaga (1935) there are only 3+3 setae in *Telmatogeton japonicus* Tok. I am able to state, however, that *T. williamsi* Wirth is provided with 5+5 setae, though some of them are extremely

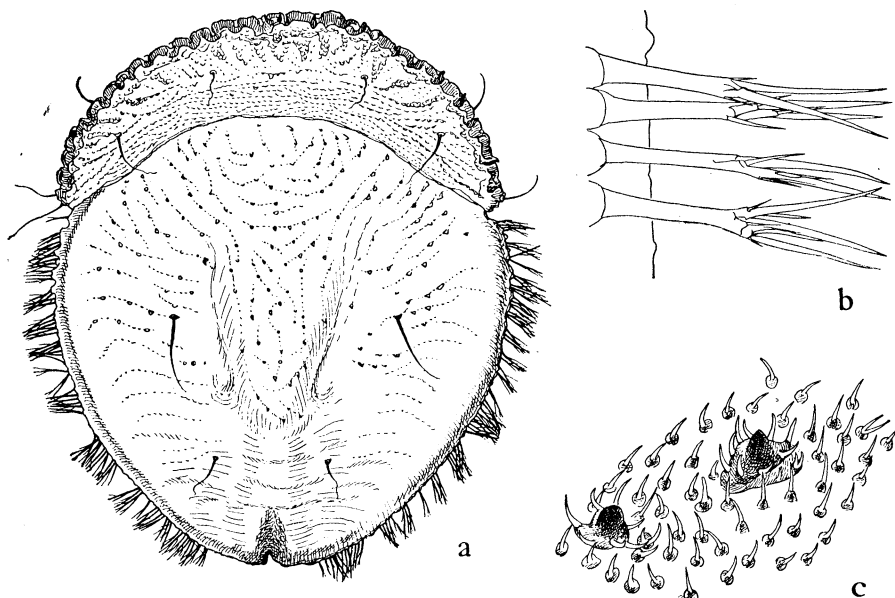


Fig. 4. *Halirytus macquariensis*, ♀ pupa. a, terminal abdominal disc, dorsal view; b, marginal hairs on the posterior portion of the terminal disc, ventral view; c, structures on the surface of the terminal disc.

small. Thus 5+5 tergal setae doubtless do represent the plesiomorphic (primitive) pattern even in the tribe Telmatogetonini. In *Halirytus macquariensis* there are, as a matter of fact, only 2+2 tergal setae left laterally, the others persisting as small rings in the cuticula. In some cases these rings are provided with a minute spine as the last remnant of a seta.

In *Telmatogeton*, at least in *japonicus* and *williamsi*, there are 3 pleural (lateral) setae on each side of the abdominal tergites II-VII, 1 anal and 2 frontal ones. *H. macquariensis* is provided with only 1 frontal and 1 anal seta laterally.

Terminal disc of abdomen with outline and structures as in fig. 4a. Dorsal portion of disc with about 25 sharp heavily-sclerotized denticles on rim. Larger posterior portion of disc with dense groups of peculiar hairs along thickened margin except at extreme posterior apex which is more or less markedly bilobed and bears ventrally a pair of small hooks. Marginal hairs (fig. 4b) ramified distally in a peculiar way, not according to a dichotomic system but with branches or secondary spines irregularly developed and arising from sutures of different type. Face of the posterior portion of disc very rough because of a dense covering of minute spines arising from small tubercles; mixed with these are larger knoblike prominences arranged in irregularly winding rows and provided with small spines pointing radially in different directions (fig. 4c).

Chaetotaxy of segments VIII and IX. The narrow unspecialized tergite VIII with 1 dorsal and 2-3 lateral setae on each side. Triangular sternite VIII, which is bilobed apically even in pupa, with 2 pairs of lateral setae. There is further, 1 seta between these and

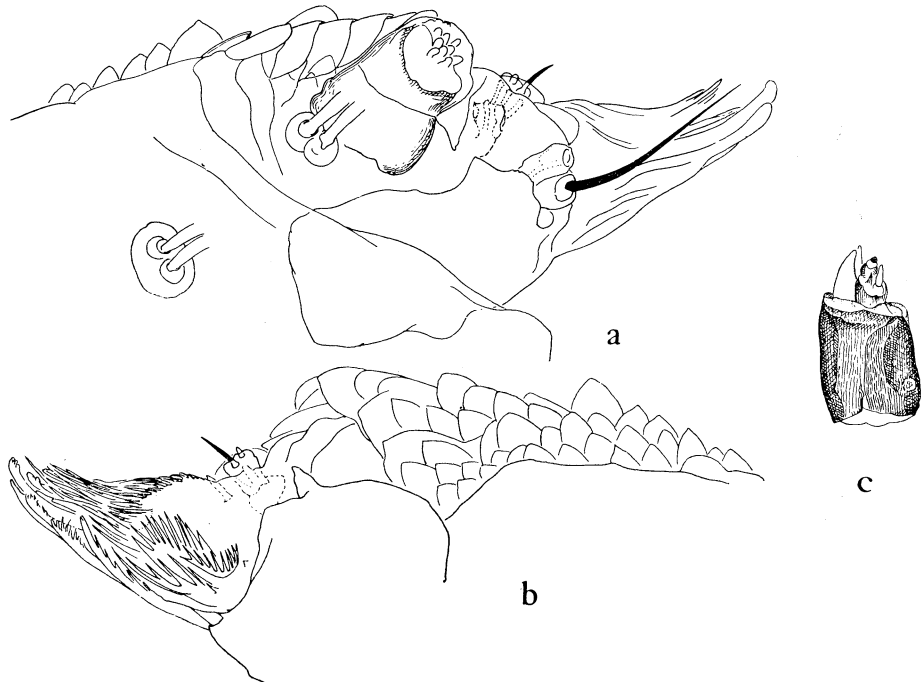


Fig. 5. *Halirytus macquariensis*, larva. a, right maxilla, ventral view; b, same, dorsal view; c, antenna, dorsal view.

tergal group of lateral setae, probably to be considered as a pleural one. Dorsal portion of disc apparently the specialized intersegmental membrane between tergites VIII and IX—with 2 pairs of submarginal setae. On the posterior disc portion (tergite IX) 2 pairs of setae arranged in trapezoid. Sternite IX, which encloses sternite VIII and the cercal lobes, on each side with 4–6 setae in a row along cercal lobes and 1 isolated seta further frontad near margin.

Larva. Length up to 10 mm. In general very much like larva of *Telmatogeton japonicus* as described and figured in detail by Tokunaga (1935) and of *Halirytus amphibius* described by Thienemann (1937). Setae of body all very short and slender and mostly difficult to see, but chaetotaxy seems to agree fairly well with that of *T. japonicus*. At least on prothoracic segment there are even more setae than described by Tokunaga, being 11 on each side in one specimen. According to Thienemann there are none on abdominal segments 1–7 in *H. amphibius*. Perhaps some have been overlooked? There are 16 simple hooks on each posterior pseudopod and, more basally, 3 dorsal-lateral setae against 2 in *amphibius* and *T. japonicus* according to Thienemann and Tokunaga. Antennae (fig. 5c) built as in the other 2 species. Median part of clypeolabrum with 6 strong setae curved ventrocaudad, against 8 in *amphibius*, and 2 pairs of “sensory pegs” a little dorsad, which are present in *T. japonicus* but were not observed in *amphibius* by Thienemann. Premandibles as in other 2 species. Heavily sclerotized mandibles constantly with only 5 teeth, against 7 in *amphibius* and *japonicus*. Maxillae even in details agreeing with those of *T. pacificus* Tok. as figured by Strenzke (1960, fig. 40). Thus lacinia (or inner lobe) carries several unilaterally feathered setae, as is the case also in *amphibius* but not in *T. japonicus*, where they are simple. Hypopharyngeal structures well developed and of same construction as in *T. japonicus*, but the peculiar ventral setae of hypopharynx are finely lobed only quite distally. Mentum with 11 teeth, median tooth broad and pointed; in *amphibius* are only 9 teeth.

Holotype, ♀, Nuggets Point, Macquarie I., 2. III. 1961, K. Watson. Paratypes, 128 ♀♀, Aerial Cove, Bauer Bay, Buckles Bay, Catch-me Point, Garden Cove, Green Gorge, Isthmus, Nuggets Point, all localities on Macquarie I., 14, 17. II, 2, 29. III, 19. IV, 8. V, 23, 27, 28. X, 2, 23. XI, 1. XII. 1961, K. Watson. Further numerous larvae, some pupal skins, and 1 pupa, Macquarie I., K. Watson.

Holotype, most of the paratypes and larvae, the pupa and 2 pupal skins returned to Division of Entomology Museum, C. S. I. R. O., Canberra. Some paratypes, larvae and pupal skins retained in Swedish Museum of Natural History, Stockholm.

All imagos were on pins and because of that strongly shrunken. The imagos studied were boiled for a moment in strongly diluted NaOH.

Discussion. Two marine sub-Antarctic species have hitherto been included in the genus *Halirytus* erected by Eaton 1875 for the species *amphibius* Eaton from Kerguelen I., which was (and still is) only known in the female sex. *H. magellanicus* from the Straits of Magellan was described from males by Jacobs (1900) and placed by him in his new genus *Belgica* together with *antarctica* Jacobs from the Straits of Gerlache in West Antarctica. Rübtsamen, however, erected a new genus, *Jacobsiella*, for *magellanica* in 1906. Later on *Jacobsiella* was synonymized with *Halirytus* by Edwards (1926, 1928), who even believed it possible that *magellanicus* might prove to be the same as *amphibius*. In his excellent papers on “Clunioninae”, Wirth treated the genus *Halirytus* only briefly on the basis of available literature (1949).

Our knowledge of the metamorphosis of *Halirytus* is still quite limited. The short description of the larva of *amphibius* given by Enderlein (1909) was completed in important points by Thienemann in 1937, but the pupa is apparently unknown, and of *magellanicus* we know neither the pupa nor the larva.

With experience from the rich *Halirytus*-material collected by Mr. K. Watson on Macquarie I. and with a paratype of *amphibius* from Kerguelen at hand, I feel justified to discuss at first the questioned validity of *magellanicus* as a separate species. In his paper Rübssaamen (*l.c.*, plate IV, fig. 1) has given a fairly good illustration of the habitus of *magellanicus* (♂). We see that the scutellum is well set off and clearly delimited from the mesonotum and that the postnotal area is of about normal width; further the wing is provided with 6 setae forming a regular row. One gets the general impression that *magellanicus* is forming a comparatively plesiomorphic type. Since we, by comparison with *amphibius* and *macquariensis*, have to deal with 3 marked differences, of which the construction of scutellum and postnotum are at least theoretically conclusive, there is apparently no reason to doubt the state of *magellanicus* as a separate species.

We have now to discuss the position of the Macquarie-population described above. Is it specifically different from *amphibius* of Kerguelen? There is reason to ask the question, because I cannot see any noteworthy differences in the imago; and the pupa of *amphibius* is not available for comparison. On the other hand it seems impossible to believe that the *Halirytus*-larvae of Kerguelen and Macquarie belong to the same species: mentum with 11 teeth in *macquariensis* against 9 in *amphibius*, and, what seems most important, 5 teeth on the mandibles of *macquariensis* against 7 in *amphibius*.

There is some evidence suggesting that *macquariensis*, and apparently even *amphibius*, are parthenogenetic species. Thus the rich material of *macquariensis* contains only females; and these were collected on many occasions from February to December. We know that the males of the *Telmatogeton*-group normally show a strong activity within the intertidal zone during ebb, when they are seen rapidly scampering over the rocks seeking out the females for mating (Tokunaga, 1935, Wirth, 1947). Therefore, it seems hard to believe that Mr. Watson should have overlooked the males if they were really present or at all existed. So far, parthenogenesis has not been established in *Telmatogetonini*. In reality its presence would be little surprising because of the extreme conditions of the actual sub-Antarctic habitats.

It has long been agreed that the clunionine midges (*Clunioninae*) comprise 2 well defined groups, the *Clunio*-group and the *Telmatogeton*-group. Basing his opinion on very careful revisional studies of most of the genera in all stages Wirth (1949), after some hesitation, decided to accept the subfamily *Clunioninae* of the authors as a monophyletic group. But he underlined the similarity between *Eretmoptera* of the *Clunio*-group and certain members of the genus *Smittia* of the tribe *Metriocnemini* among the *Orthoclaadiinae*. He was, indeed, very near to the truth. Then in 1960 it was shown in a conclusive way by the late Dr. Strenzke that the *Clunio*-group (with the genera *Belgica*, *Clunio*, *Eretmoptera*, *Tethymyia* and *Thalassosmittia*) belongs to the tribe *Metriocnemini*, where it is forming a sister group of my *Smittia*-group (Brundin 1956), enlarged with the genus *Parasmittia* Str. Further the results of Strenzke did confirm the opinion expressed by me in 1956 that the *Telmatogeton*-group is more plesiomorphic than the *Clunio*-group. Strenzke interpreted the *Telmatogeton*-group provisionally as a tribe and left open the very difficult question as to

its sister group. There is no hope at present of coming to a valid solution here, because we know too little about decisive synapomorphic structures among the plesiomorphic Chironomidae in general. But I will take this occasion to touch upon a complex of morphological features as yet never accounted for in connection with discussions of phylogenetic relationships in Chironomidae and, so far I know, in Culiciformia in general.

The position of the leg sheaths of the *Halirytus*-pupa described above, which is met with also in the other genera of Telmatogetonini, is, indeed, not a general characteristic of the chironomid pupae. In fact, we find that arrangement again only in the subfamily Podonominae and, among the Orthoclaadiinae, in the tribes Protanypini and Diamesini, in the peculiar genus *Lobodiamesa* Pagast of New Zealand, and, with certain modifications, in the tribe Heptagyini. It is a striking and important fact that all these groups are decidedly plesiomorphic. This type of leg sheath arrangement may be called the podonomine type.

In other chironomid groups we do find other types of leg sheath arrangement. Quite dominant, however, is the type which is represented more or less typically in all Tanypodinae and in most of the Orthoclaadiinae and Chironominae. In this type the leg sheaths do not meet at the tip of the wing sheaths, but are bent ventrad and frontad under these sheaths, each leg sheath ending separately. The last bend of the hind leg sheaths is always situated within the proximal half of the wing sheaths. This type of arrangement may be called the tanypodine type.

It is now an interesting fact that the pupae of the families Thaumaleidae, Ceratopogonidae, Simuliidae, and Dixidae do belong to the podonomine type, too, whilst the tanypodine type seems to be constricted to certain groups among Chironomidae and, possibly, Culicidae in general. There is good reason to believe that the podonomine type is the more plesiomorphic (primitive), the tanypodine type the more apomorphic (derivative) one.

It is evident that the persistence of such features as the spiracle of the thoracic horns in the pupa and the lack of a furrow on the imaginal postnotum does mean that the *Telmatogeton*-group belongs to the most plesiomorphic groups among the Orthoclaadiinae. In fact, through the combination of the features mentioned Telmatogetonini is more plesiomorphic than any other orthoclaadiin group, sharing the presence of a spiracle in the pupal thoracic horns only with the subfamilies Podonominae and Tanypodinae and the primary lack of postnotal furrow only with Podonominae, a podonomine-like new subfamily known to me from the Andes and East Australia, and with the peculiar genus *Harrisonina* Freem. of South Africa.

2. *Smittia* (Holmgr.) Brund., sp. Macquarie

There is a rich material of a true *Smittia* from Macquarie I. collected by Mr. Keith Watson and comprising 119 females, numerous larvae and some pupae. This terrestrial species is, I think, new to science, but as there are only females available (the species being probably parthenogenetic) and our knowledge of the genus *Smittia* in general and of its representation in the Southern Hemisphere in particular is very restricted, I prefer to postpone a description. A discussion of relationships would not be possible at present – and there is already far too much of isolated diagnoses in the literature on Diptera.

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