APPENDIX

Description of Chironomus maddeni sp. nov

Jon Martin¹ and Peter S. Cranston²

¹Genetics Department, University of Melbourne, Parkville, 3052, Australia
²CSIRO Division of Entomology, GPO Box 1700, ACT 2601, Australia

Introduction

In the preceding study (Madden et al., 1995), the investigated species of Chironomus evidently is undescribed. This judgement is based upon comparison with the cytology of all known species of Australian Chironomus by the senior author of this appendix contribution. Here we provide details of the cytology and morphology of all stages and provide a formal description of Chironomus maddeni as a species new to science.

Chironomus maddeni n.sp.

Type-locality: South Australia, Glen Osmond, pool in grounds of Waite Institute, University of Adelaide.

Description. Conforms in all stages with the generic diagnoses of Cranston et al. (1989; adult male), Pinder and Reiss (1986; pupa) and Pinder and Reiss, (1983; larva). All measurements in μm unless stated (as mm).

Adult Male (n=2) (Fig. 4a,b)

Body length 5.3-5.6 mm, wing length 2.4-2.5 mm, colour yellow to pale brown with mid-brown scutal vitta, scutellum, and pre-episternum. Abdomen pale, with brown, broadly diamond-shaped transverse area in basal half of tergites I-IV. Legs pale, unbanded.


Thorax with quite prominent scutal tubercle. Thoracic setation: acrostichals about 8, biserial, dorsocentrals 10-12 anteriorly uniserial, posteriorly biserial, 5 prealars, 12-14 scutellars. Wing with Varanum Ratio 1.03. Vein setation: R with 31, R₂+₃ 27-29, R₄+₅ 31-34; squama with 14-16.

Leg lengths and proportions as follows:

<table>
<thead>
<tr>
<th></th>
<th>Fe</th>
<th>Ti</th>
<th>Ta₁</th>
<th>Ta₂</th>
<th>Ta₃</th>
<th>Ta₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>1045-1080</td>
<td>865-900</td>
<td>1510-1620</td>
<td>765-790</td>
<td>570-580</td>
<td>500-505</td>
</tr>
<tr>
<td>PII</td>
<td>1115-1225</td>
<td>1010-1045</td>
<td>610-615</td>
<td>325-360</td>
<td>250-320</td>
<td>175-180</td>
</tr>
<tr>
<td>PIII</td>
<td>1260-1295</td>
<td>1225-1295</td>
<td>900-935</td>
<td>505-540</td>
<td>360-395</td>
<td>215-220</td>
</tr>
<tr>
<td></td>
<td>Ta₅</td>
<td>LR</td>
<td>BV</td>
<td>SV</td>
<td>BR</td>
<td></td>
</tr>
<tr>
<td>PI</td>
<td>215-250</td>
<td>1.75-1.80</td>
<td>1.69-1.70</td>
<td>1.22-1.26</td>
<td>2.0-2.5</td>
<td></td>
</tr>
<tr>
<td>PII</td>
<td>105-110</td>
<td>0.58-0.60</td>
<td>2.92-3.20</td>
<td>3.47-3.70</td>
<td>3.0-4.0</td>
<td></td>
</tr>
<tr>
<td>PIII</td>
<td>140-145</td>
<td>0.72-0.73</td>
<td>2.72-2.76</td>
<td>2.75-2.76</td>
<td>3.0-4.0</td>
<td></td>
</tr>
</tbody>
</table>

---

95
Sensilla chaetica: PII with 5-6 on subapex of T1₁, PIII with 7-8 on subapex of T1₁.

Hypopygium: see Figure 4a, b.

**Adult female (n=2)**

Body length 5.3-5.4mm, wing length 2.8-2.9mm, colour as male; abdomen less well marked than in male. Head without frontal tubercles, with 22+ temporal setae in a continuous multiserial row from inner verticals, 26 clypeals. Antenna (Fig. 4c) with apical flagellomere 400-420 long, basal 5 flagellomeres 156-158 long, Antennal Ratio 0.35-0.37. Palp segment 2-5 lengths: 52-60, 140-155, 190-210, 315-335.

Leg lengths and proportions as follows:

<table>
<thead>
<tr>
<th></th>
<th>Fe</th>
<th>Ti</th>
<th>Ta₁</th>
<th>Ta₂</th>
<th>Ta₃</th>
<th>Ta₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>1190-1260</td>
<td>972-1010</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PII</td>
<td>1290-1295</td>
<td>1190-1260</td>
<td>650-685</td>
<td>325-360</td>
<td>250-255</td>
<td>180</td>
</tr>
<tr>
<td>PIII</td>
<td>1405-1440</td>
<td>1440-1475</td>
<td>1010-1045</td>
<td>540-576</td>
<td>430-435</td>
<td>250</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Ta₅</th>
<th>LR</th>
<th>BV</th>
<th>SV</th>
<th>BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>145</td>
<td>1.74-1.83</td>
<td>3.38-3.48</td>
<td>3.63-3.94</td>
<td>4.0-5.5</td>
</tr>
<tr>
<td>PII</td>
<td>145</td>
<td>1.40-1.46</td>
<td>2.79-2.84</td>
<td>2.75-2.85</td>
<td>3.5-4.0</td>
</tr>
</tbody>
</table>

Sensilla chaetica: PII with 50-60 uniserial, absent only on basal 10% of Ti₁, PIII with 60-70 uniserial, absent only on basal 10% of Ti₁.

Genitalia: typical for *Chironomus s.str.*

*Pupa* (n=10) (Fig. 5d-g).

Pale brown, with basal ring and tracheal bases, abdominal apophyses, posterolateral spur and bases of anal lobe setae all darker brown. Cephalic tubercles (Fig. 5d) mid-brown, 122-157 long subapically bearing 28-25 long frontal seta. Thorax with dense brown rugulosity to midpoint (Fig. 5e). Basal ring oval, 120-132 long, 58-98 wide, with elliptical fused double tracheal bases.

Abdomen (Fig. 5f) with very restricted shagreen, present only along apophyses on TV and TVI. Pedes spurii B quite strong on II. Pedes spurii A on IV, much weaker on V, absent on VI. Tergal spinule pattern as in Figure 5f. Hook row with 60-75 hooks, extending about 55-60% of the width of tergite II. Conjunctivae all bare. Paratergite IV with narrow spines, remainder bare. Setation ('O', D, V and L) typical for genus. Posterolateral spur (Fig. 5g) simple, narrow, tapering to fine point, sometimes with one or two small fine spines at base. Anal lobe with about 150 multiple ranked setae in fringe (not drawn).

*Fourth-instar larva* (n=10) (Fig. 5a-c).

Medium sized, length about 15-18mm (female), 13-14mm (male). Head capsule with mentum mid-brown, mandibular teeth brown, remainder of mandible yellow, gular region slightly darkened towards posterior margin, very slight darkening of frontoclypeus and dark brown to black occipital margin. Ventral tubules relatively short (c. 0.65-1.3mm), not coiled, anterior pair usually slightly shorter than the posterior pair; no lateral projections on eighth abdominal segment. Similar to larvae of *C. oppositus*-group.

Measurements. Head capsule length 580-660. Antenna (Fig. 5c) segments 100-112, 26-31, 8-9, 9-11, 6-8; Antennal Ratio 1.9-2.2; Ring organ 33-42 from base of 1st segment; style 39-44 bifid; Lauterborn organs and peg 5-6, about half length of third antennal segment. Mandible (Fig. 5b) 202-225, with yellow-brown outer tooth, dark apical and two inner teeth, mola yellow. Mentum (Fig. 5a) 160-170 wide, with typical triple-toothed median part and six pairs of lateral teeth of which the innermost pair are rather more closely appressed than are the remainder; ventromental plate 108-117 with 29-35 striae across median part.
Figure 5. *Chironomus maddeni* sp. nov. larva and pupa. (a)-(c) Larva: (a) mentum, (b) mandible, (c) antenna; (d)-(g) Pupa: (d) cephalic tubercles and frontal setae, (e) anterior thorax, (f) tergites (anal lobe fringe not figured), (g) posterolateral comb.
Larval cytology (Fig. 6a-f)
Four polytene chromosomes (Fig. 6) with the arm combination of the pseudothummi-group, i.e. BF, CD, AE, G. Large nucleolus developed near the centromere of arm F, with a smaller one developed medially in arm G. Only one inversion polymorphism, in arm A, noted in the material available for study.

Arm B (Fig. 6a): Sequence as B2 of C. oppositus (Martin 1969; Martin et al., 1978), i.e. large puff of 2D is near the distal end with the dark bands of 2E towards the telomere.

Arm F (Fig. 6b): Sequence as F1 of C. oppositus (Martin 1969; Martin et al., 1978), including the large nucleolus at 4C.

Arms D and C (Fig. 6c): Banding pattern does not appear to correspond to any previously described sequence.

Arm E (Fig. 6d): Sequence as E1 of C. oppositus (Martin 1969; Martin et al., 1978).

Arm A (Fig. 6e): Differs from the previously described sequences by an inversion of approximately the region 14D1-15C8 of sequence A4. This results in the ball of 15E having a similar position and orientation to that of A5. However it can be distinguished from that sequence because the distal region remains similar to A4. One specimen was heterozygous for an inversion of the region from about 15D4-15E.

Arm G (Fig. 6f): Differs from arm G of C. oppositus by the nucleolus being near the middle of the arm, with an obvious Balbiani ring between the nucleolus and the postulated centromere.

Material examined
Holotype male slide-mounted in Euparal, ex-South Australia, Glen Osmond, pool in grounds of Waite Institute, University of Adelaide (Madden), reared in culture in Melbourne University Genetic Department by Jon Martin, Australian National Insect Collection (ANIC).

Paratypes, 1 male, 2 females, 10 pupal exuviae, 10 larvae, all mounted in Euparal, same data as holotype.

Comments
Cytologically this species is similar to those of the broader C. oppositus-group (i.e. including the undescribed species C. alternans b and C. alternans c (Martin and Lee, 1984)). It can be distinguished from C. oppositus by the lack of a subterminal nucleolus in arm G, and from C. alternans b and C. alternans c by the orientation of group 15E of arm A, since both the latter species have sequence A4.

Although this species is distinguishable on the basis of cytology, it has not been possible to find unambiguous character states to differentiate from related species in the C. oppositus-group. However, characters that may prove of value in future differentiation include the following:

Adult: “normal” male genitalia, unpatterned wing and legs, short bristle ratio (BR) on the fore leg, longer on mid and hind legs; presence of acrostichal setae and absence of frontal tubercles.

Pupa: this stages provides less diagnostic information than in many other genera. The tergal spine pattern, presence of spines on paratergite IV, thoracic rugosity and pigment distribution may prove significant in species differentiation.Larva: the short, uncoiled ventral tubules with the anterior pair usually slightly shorter than the posterior pair and lack of lateral projections on eighth abdominal segment typify the oppositus-group. Within this group the number of striae in the basal part of the ventromentum (29-35), and the distribution of pigment on the head capsule may allow separation from other members of the group.