Additional File 2. Morphological character list corresponding to characters in Additional File 1. Figure numbers refer to illustrations in Smith 2001.

Head

Preantennal

1. **Adult hyaline margin:** (0) absent or greatly reduced, forming a thin margin running anteriorly around the marginal carina (Fig. 2B); (1) confined to a medial indent in the marginal carina, not evident laterally; (2) confined medially between or around the premarginal carina and usually continuous with the dorsal preantennal suture (Fig. 2H); (3) expanded and enlarged, enclosing the premarginal carina and filling the premarginal region anteriorly (Fig. 2D).

2. **Adult marginal carina:** (0) forms a complete thickened band running anteriorly around the preantennal region of the head (Fig. 2B); (1) forms a band which is interrupted laterally (partially or completely), medially (dorsally and/or ventrally) or both (Fig. 2I).

3. **Adult marginal carina (if interrupted):** (0) ventrally interrupted medially, so that the marginal carina is restricted to both sides of the preantennal region ventrally but complete dorsally (Fig. 2C); (1) dorsally interrupted medially, so that the marginal carina is restricted to both sides of the preantennal region dorsally but complete ventrally* (Fig. 2G); (2) completely interrupted medially, so that the marginal carina is restricted to both sides of the preantennal region (Fig. 2E); (3) interrupted laterally (either partially or completely) but not interrupted medially* (Fig. 2I); (4) interrupted laterally (either partially or completely) and completely interrupted medially (Fig. 2A).

4. **Adult premarginal carina:** (0) seamlessly continuous with the postmarginal carina (Fig. 2B); (1) greatly reduced or absent* (Fig. 2F); (2) present and partially attached (not seamlessly continuous) to the postmarginal carina (Fig. 2H); (3) present and completely separate from the postmarginal carina (Fig. 2D).

5. **N III marginal carina:** (0) forms a complete thickened band running anteriorly around the preantennal region of the head; (1) forms a band which is interrupted laterally (partially or completely), medially (dorsally and/or ventrally) or both.

6. **N III marginal carina (if interrupted):** (0) ventrally interrupted medially, so that the marginal carina is restricted to both sides of the preantennal region ventrally but complete dorsally; (1) dorsally interrupted medially, so that the marginal carina is restricted to both sides of the preantennal region dorsally but complete ventrally; (2) completely interrupted medially, so that the marginal carina is restricted to both sides of the preantennal region; (3) interrupted laterally (either partially or completely) but not interrupted medially*; (4) interrupted laterally (either partially or completely) and completely interrupted medially.

7. **N III premarginal carina:** (0) seamlessly continuous with the postmarginal carina; (1) greatly reduced or absent*; (2) present both dorsally and ventrally, although not seamlessly continuous with the postmarginal carina; (3) present and completely separate from the postmarginal carina.

8. **N II marginal carina:** (0) forms a complete thickened band running anteriorly around the preantennal region of the head; (1) forms a band which is interrupted laterally (partially or completely), medially (dorsally and/or ventrally) or both.

9. **N II marginal carina (if interrupted):** (0) ventrally interrupted medially, so that the marginal carina is restricted to both sides of the preantennal region ventrally but complete dorsally; (1) dorsally interrupted medially, so
that the marginal carina is restricted to both sides of the preantennal region dorsally but complete ventrally; (2) completely interrupted medially, so that the marginal carina is restricted to both sides of the preantennal region; (3) interrupted laterally (either partially or completely) but not interrupted medially; (4) interrupted laterally (either partially or completely) and completely interrupted medially.

10. **N II premarginal carina:** (0) seamlessly continuous with the postmarginal carina; (1) greatly reduced or absent; (2) present both dorsally and ventrally, although not seamlessly continuous with the postmarginal carina; (3) present and completely separate from the postmarginal carina.

11. **N I marginal carina:** (0) forms a complete thickened band running anteriorly around the preantennal region of the head; (1) forms a band which is interrupted laterally (partially or completely), medially (dorsally and/or ventrally) or both.

12. **N I marginal carina (if interrupted):** (0) ventrally interrupted medially, so that the marginal carina is restricted to both sides of the preantennal region ventrally but complete dorsally; (1) dorsally interrupted medially, so that the marginal carina is restricted to both sides of the preantennal region dorsally but complete ventrally; (2) completely interrupted medially, so that the marginal carina is restricted to both sides of the preantennal region; (3) interrupted laterally (either partially or completely) but not interrupted medially; (4) interrupted laterally (either partially or completely) and completely interrupted medially.

13. **N I premarginal carina:** (0) seamlessly continuous with the postmarginal carina; (1) greatly reduced or absent; (2) present both dorsally and ventrally, although not seamlessly continuous with the postmarginal carina; (3) present and completely separate from the postmarginal carina.

14. **Adult male anterior portion of the ante-clypeus:** (0) unsculptured, smooth (Fig. 2J); (1) covered by numerous horizontal striations (Fig. 2K); (2) covered by numerous crescentric markings (Fig. 2L).

15. **Adult dorsal anterior plate:** (0) absent (Fig. 2B); (1) present, always delineated anteriorly and laterally but not necessarily posteriorly (Fig. 2M-O).

16. **Adult dorsal anterior plate (if present):** (0) undivided (Fig. 2M); (1) partially divided medially* (Fig. 2N); (2) completely separated medially* (Fig. 2O).

17. **Adult posterior margin of the dorsal anterior plate (if dorsal anterior plate is present):** (0) not delimited, merges into dorsal sclerotization of the head capsule (Fig. 2M); (1) clearly delimited, separated from surrounding cuticle by the dorsal preantennal suture (Fig. 2N-Q).

18. **Adult male posterior prolongation of the dorsal anterior plate (if both the dorsal anterior plate is present and its posterior margin is delimited):** (0) absent, with the posterior margin rounded or slightly pointed but not significantly developed posteriorly (Fig. 2P); (1) strongly developed forming a distinct posterior prolongation (Fig. 2Q).

19. **N III dorsal anterior plate:** (0) absent; (1) present but poorly developed, having the appearance of an isolated (either partially or completely) portion of the marginal carina; (2) present and well developed (extended posteriorly), always delineated anteriorly and laterally but not necessarily posteriorly.

20. **N II dorsal anterior plate:** (0) absent; (1) present but poorly developed, having the appearance of an isolated (either partially or completely) portion of the marginal carina; (2) present and well developed (extended posteriorly), always delineated anteriorly and laterally but not necessarily posteriorly.

21. **N I dorsal anterior plate:** (0) absent; (1) present but poorly developed, having the appearance of an isolated (either partially or completely) portion of the marginal carina; (2) present and well developed (extended
(0) absent. Posterior margin rounded but not developed posteriorly; (1) posterior margin strongly pointed but not significantly developed posteriorly*; (2) strongly developed forming a distinct posterior prolongation*.

23. Adult male ventral anterior plate: (0) absent; (1) present and well developed, forming a distinct plate which is extended posteriorly (Fig. 3J).

24. N III ventral anterior plate: (0) absent; (1) present and well developed, forming a distinct plate which is extended posteriorly.

25. N II ventral anterior plate: (0) absent; (1) present and well developed, forming a distinct plate which is extended posteriorly.

26. N I ventral anterior plate: (0) absent; (1) present and well developed, forming a distinct plate which is extended posteriorly.

27. Adult dorsal preantennal suture: (0) absent, or forms a discrete suture isolated from the marginal carina (Fig. 2R); (1) present, arising from the ends of the premarginal carina and divides the dorsal preantennal carina medially* (Fig. 2S); (2) developed and enlarged behind the posterior margin of the dorsal anterior plate or marginal carina, but not evident laterally and not arising from the post marginal carina (Fig. 2T); (3) usually arises from the ends of the postmarginal carina and surrounds the dorsal anterior plate at least laterally. Anteriorly it is continuous with the hyaline margin (Fig. 2U).

28. Adult dorsal carina: (0) absent or forms a continuous or medially broken anterior band, dorsally supporting the pre- and postmarginal carina (Fig. 2B); (1) expanded premarginally filling the anterior region of the head. Either not evident postmarginally or forms a thin carina above but laterally continuous with the postmarginal carina (Fig. 2V); (2) predominantly developed postmarginally, either absent or weakly developed premarginally (Fig. 2Z).

29. Adult dorsal carina form (if predominantly restricted to the postmarginal region of the head): (0) restricted to the lateral margins of the head in the region of the post marginal carina, not expanded across the head*; (1) continuous across the head (Fig. 2W); (2) broken medially and variably project inward posteriorly forming two parallel bars, although the posterior projection may be weakly sclerotised (Fig. 2X); (3) developed medially but not forming a continuous band across the head, present although less well developed premarginally* (Fig. 2Y); (4) developed each side from the post marginal carina, often weakly sclerotised and not forming a definitive carina. May be continuous with the posterior margin of the dorsal anterior plate (Fig. 2Z).

30. Adult ventral carina: (0) entire, usually well marked semicircular band around the oral cavity (Fig. 3B); (1) interrupted medially forming a broken arch. Usually extends close to but never fuses with the marginal carina and lacks a flattened distal extension (Fig. 3C); (2) interrupted medially, each side possess a flattened anterior extension which approaches but does not fuse with the marginal carina (Fig. 3D); (3) interrupted medially, each side possess a flattened anterior extension which fuses with a marginal carina that is always interrupted, either completely or only ventrally (Fig. 3A, E); (4) joined to the ends of the premarginal carina but appear as bands only anteriorly (Fig. 3F); (5) poorly developed, apparently fused with the postmarginal carina* (Fig. 3G).

31. N III ventral carina: (0) entire, usually well marked semicircular band around the oral cavity; (1) interrupted
32. **N II ventral carina**: (0) entire, usually well marked semicircular band around the oral cavity; (1) interrupted medially forming a broken arch. Usually extends close to but never fuses with the marginal carina; (2) interrupted medially, each side possess a flattened anterior extension which approaches but does not fuse with the marginal carina; (3) interrupted medially, each side possess a flattened anterior extension which fuses with a marginal carina that is always interrupted, either completely or only ventrally; (4) joined to the ends of the premarginal carina but appear as bands only anteriorly.

33. **N I ventral carina**: (0) entire, usually well marked semicircular band around the oral cavity; (1) interrupted medially forming a broken arch. Usually extends close to but never fuses with the marginal carina; (2) interrupted medially, each side possess a flattened anterior extension which approaches but does not fuse with the marginal carina; (3) interrupted medially, each side possess a flattened anterior extension which fuses with a marginal carina that is always interrupted, either completely or only ventrally; (4) joined to the ends of the premarginal carina but appear as bands only anteriorly.

34. **Adult pulvinus**: (0) single lobe attached to the ventral carina (Fig. 3H); (1) divided into two lateral lobes (Fig. 3I).

35. **Adult male conus**: (0) undeveloped, marked only by a slight bump before the anterior margin of the antennal socket; (1) developed, forming a significant blunt or pointed process extending laterally from the margin of the head. May be hyaline, sclerotised or both.

36. **Adult female conus**: (0) undeveloped, marked only by a slight bump before the anterior margin of the antennal socket (Fig. 4A); (1) developed, forming a significant blunt or pointed process extending laterally from the margin of the head. May be hyaline, sclerotised or both (Fig. 4J-L).

37. **Adult female conus morphology (if coni are developed)**: (0) shorter or as long as the scape (Fig. 4K, L); (1) longer than the scape (Fig. 4J).

38. **Adult trabecula**: (0) absent; (1) present* (Fig. 4B, L).

39. **Adult transverse carina**: (0) absent; (1) present, either complete or broken medially (Fig. 2A’).

40. **Adult marginal pulvinal band**: (0) absent; (1) present as a distinct band separate from the torma (Fig. 3H, L [not shaded]); (2) fused at either end to the ventral carina (Fig. 3K).

41. **Adult torma**: (0) absent; (1) present and distinctly separate from the marginal pulvinal band (Fig. 3H, L [not shaded]).

42. **Adult pulvinus size**: (0) small, unmodified; (1) greatly expanded filling the ventral preantennal region (Fig. 3L).

43. **N III marginal pulvinal band**: (0) absent; (1) present as a distinct band separate from the torma; (2) fused at either end to the ventral carina.

44. **N III torma**: (0) absent; (1) present and distinctly separate from the marginal pulvinal band.

**Antennal**
Male antennal segments: (0) not significantly heteromorphic; (1) significantly heteromorphic (Fig. 4E, G-I [Not shaded]).

Male scape shape based on elliptic Fourier analysis: (0) partition 0, short and rounded; (1) partition 1, elongated with lateral process; (2) partition 2, elongated without lateral process.

Process on anterior lateral margin of the male scape (if antennal segments are significantly heteromorphic): (0) absent (Fig. 4F, G, I); (1) present (Fig. 4E, H).

5-6 microsetae in a row across the length of the male scape: (0) absent (Fig. 4E, F, H, I); (1) present (Fig. 4G).

Male and female pedicel and flagellum / flagellomeres: (0) not covered in numerous fine microsetae (Fig. 4E, G-I); (1) covered in numerous fine microseta (Fig. 4F).

Male flagellomeres: (0) unfused (Fig. 4E, H, I); (1) fused (Fig. 4F, G).

First flagellomere shape (if antennal segments are significantly heteromorphic and unfused): (0) unmodified; (1) derived, not forming a simple flagellomere (Fig. 4E, H, I).

Subterminal attachment of flagellomeres II and III (if antennal segments are significantly heteromorphic and unfused): (0) absent (Fig. 4F-I); (1) present (Fig. 4E).

Apical compression of flagellomeres II and III (if antennal segments are significantly heteromorphic and unfused): (0) absent (Fig. 4E-H); (1) present (Fig. 4I).

Postantennal

Gular plate: (0) absent; (1) present forming a distinct sclerotised region on the ventral surface of the head, although not necessarily clearly delimited.

Gular plate form (if present): (0) not delimited, only evident as a distinct sclerotised region on the ventral surface of the head (Fig. 3M); (1) clearly distinct anteriorly but laterally and posteriorly more or less continuous with the ventral sclerotization of the head (Fig. 3N); (2) clearly delimited anteriorly and laterally but not necessarily posteriorly (Fig. 3O).

Anterior margin of the gular plate (if present and delimited): (0) smoothly rounded (Fig. 3P); (1) pointed (Fig. 3A, N, O, Q).

Pointed anterior margin of the gular plate (if present, delimited and has a pointed anterior margin): (0) completely tapered to a distinct point; (1) pointed medially on an otherwise flat anterior margin (Fig. 3N, O); (2) pointed medially on an otherwise rounded anterior margin (Fig. 3A, Q).

Marginal temporal carina: (0) thin, forming a more or less evenly thick band around the temples (Fig. 2B'); (1) thickened and enlarged, forming a band of uneven thickness around the temporal margin (Fig. 2C').

Postocular nodus: (0) absent or weakly developed, identifiable as a slight expansion of the marginal temporal carina; (1) well developed and enlarged (Fig. 2B', C).

Female ocular setal condition: (0) thorn-like or normal microseta; (1) normal or macroseta (not thorn-like); (2) thorn-like macroseta*.

Female postocular setal condition: (0) thorn-like or normal microseta; (1) normal or macroseta (not thorn-like)*; (2) thorn-like macroseta.

Female postocular setal position: (0) on the lens of the eye; (1) not on the lens of the eye.

Female marginal temporal setal number: (0) three*; (1) four; (2) five; (3) six or more*.

Female dominant marginal temporal setae (for taxa with 5 MTS): (0) all subordinate microsetae; (1) MTS 1
and 3 dominant; (2) MTS 2 and 3 dominant; (3) MTS 1, 2 and 3 dominant; (4) MTS 1, 2, 3 and 5 dominant*; (5) MTS 3 dominant; (6) MTS 2 and 5 dominant*; (7) MTS 3 and 4 dominant*; (8) MTS 1 - 4 dominant; (9) MTS 1 - 5 dominant.

65. Female MTS patterns (where MTS 1 and 3 are dominant): (0) MTS 1 and 3 dominant microsetae, MTS 2, 4, and 5 microsetae; (1) MTS 1 and 3 dominant normal or macrosetae, MTS 2, 4, and 5 microsetae.

66. Female MTS patterns (where MTS 1, 2 and 3 are dominant): (0) MTS 1, 2, and 3 dominant normal or macroseta, MTS 4 and 5 microsetae; (1) MTS 1 thorn-like macroseta, MTS 2 and 3 dominant normal or macroseta, MTS 4 and 5 microsetae*; (2) MTS 1 developed microseta, MTS 2 thorn-like macroseta, MTS 3 dominant macroseta, MTS 4 and 5 thorn-like microseta*.

67. Female MTS patterns (where MTS 3 is dominant): (0) MTS 3 dominant microseta; MTS 1, 2, 4 and 5 subordinate microsetae; (1) MTS 3 dominant normal or macroseta; MTS 1, 2, 4 and 5 subordinate microsetae.

68. Female MTS patterns (where MTS 1 - 5 are dominant): (0) MTS 1 dominant microseta, MTS 3 normal or macrosetae; MTS 2, 4 and 5 thorn-like macrosetae; (1) MTS 3 normal or macrosetae, MTS 1, 2, 4, and 5 thorn-like macrosetae*; (2) MTS 1 - 4 normal or macroseta, MTS 5 thorn-like macroseta*.

Thoracic

69. Anterior prothoracic setal distribution: (0) absent or confined to the anterior margin of the prothorax without a disjunct distribution (Fig. 7A); (1) not confined to the extreme anterior margin, distribution disjunct (Fig. 7C). These setae are not to be confused with the two microsetae present on each cervical sclerite.

70. Rhombic sclerite shape: (0) small discrete oblong, rhombic or rounded sclerite, may be weakly developed or only delimited anteriorly (Fig. 7F); (1) medium to large sclerite, may not be strongly delimited (Fig. 7G).

71. Mesothoracic spiracle position: (0) ventral sublateral without an enlarged atrium; (1) more or less pleural, not sublateral, without extension on a slight lateral protuberance or with an enlarged atrium (Fig. 8F); (2) more or less plural with an enlarged atrium and thickening of the atrial walls (Fig. 8G); (3) extended out on a slight lateral protuberance of the prothorax without an enlarged atrium (Fig. 8H).

72. Female lateral and/or posterior prothoracic setal arrangement: (0) 0+0*; (1) 1+1, may be lateral or sublateral (Fig. 7B); (2) 2+2 (Fig. 7C); (3) 4+4 or 5+5* (Fig. 7D); (4) numerous setae along the lateral and posterolateral margin becoming sub-posterior medially (Fig. 7E).

73. Female lateral and/or posterior prothoracic setal position (if a 1+1 arrangement is present): (0) single setal pair on the lateral or posterior margin, not sublateral; (1) single sublateral setal pair slightly anterior to the posterior margin of the prothorax (Fig. 7B).

74. Proepimeron proximal development: (0) more or less blunt ended (usually rounded) (Fig. 8K); (1) expanded (occasionally may be fused across the middle to form a single medial plate) (Fig. 8A-E).

75. Direction of proximal development of the proepimeron (if expanded): (0) more or less equally expanded anteriorly and posteriorly (Fig. 8B); (1) predominantly anteriorly (towards / into the prothorax) (Fig. 8C); (2) predominantly posteriorly (towards the abdomen) (Fig. 7A); (3) predominantly posteriorly (towards the abdomen) but partially fused anteriorly (Fig. 8D); (4) completely fused medially* (Fig. 8E).

76. Small medial sclerite between or beneath the proximal ends of the proepimeron: (0) absent; (1) present (Fig. 8A).

77. Meso-metasternal plate: (0) absent; (1) present (Fig. 8I, J).
Second sternal plate: (0) absent; (1) present (Fig. 8I, J).

Cuticular bridge between the meso-metasternal plate and the 2nd sternal plate (if both the meso-metasternal plate and 2nd sternal plate are present): (0) absent (Fig. 8I); (1) present (Fig. 8J).

Ventral pterothoracic setae in the region of the meso- to metasternal plate: (0) absent; (1) present (Fig. 8K).

Female ventral pterothoracic setal arrangement in the region of the meso- to metasternal plate (if present): (0) single setal pair (may be meso- or metasternal); (1) mesosternal setae absent, row of four or five metasternal setae present*; (2) pair of mesosternal and a pair of metasternal setae present; (3) single pair (rarely 3) mesosternal setae and at least 3 (usually 4 although sometimes 5, 6 or 8) metasternal setae.

Attachment of the 2nd and 3rd pairs of legs: (0) sternocoxal, approximately 95% of the coxal surface present beneath the thorax and abdomen (Fig. 8L); (1) sterno- pleurocoxal, approximately 30-70% of the coxal surface present beneath the thorax and abdomen (Fig. 8M); (2) pleurocoxal, approximately 5-15% of the coxal surface present beneath the thorax and abdomen (coxa attached at the corners of the pterothorax) (Fig. 8N).

Pteronotum: (0) undivided (Fig. 7A, N, Q, R); (1) divided medially (Fig. 7O, P, S).

Pterothoracic lateral margins: (0) more or less parallel (Fig. 7R); (1) divergent (Fig. 7O).

Pterothoracic lateral margins (if parallel): (0) without setae (Fig. 7R); (1) with setae on the lateral margins.

Pterothoracic posterior margin: (0) more or less flat (Fig. 7R); (1) curved or distinctly ‘v’ shaped (Fig. 7O-Q).

Female medial pair of microseta on the first third of the pterothorax: (0) absent (Fig. 7Q); (1) present (Fig. 7R).

Female medial pair of setae on the last third of the pterothorax: (0) absent (Fig. 7R); (1) present.

Female pterothoracic trichoid seta: (0) absent; (1) present, must be a typical trichoid seta emanating from a distinct ventral or lateral pit (Fig. 7H).

Female pterothoracic thorn-like seta, associated with, although not dependent upon the presence of a trichoid seta: (0) absent; (1) present (Fig. 7H).

Female setal pattern on the lateral and posterior margin of the pterothorax, excluding the trichoid setae or its setal equivalent and its associated thorn-like setae: (0) rarely three, four or more commonly at least five well spaced setae forming a complete or broken row along the margin both sides (Fig. 7O, Q, S); (1) mainly clustered, not forming a complete or broken row along the margin (Fig. 7N, R); (2) clustered single outer pair and three or four inner setae in a row both sides (Fig. 7P).

Female setal pattern on the posterior margin of the pterothorax, excluding the trichoid setae or its setal equivalent and its associated thorn-like seta (if present as a complete or broken row along the margin): (0) complete, setae in some cases may be well spaced (Fig. 7O, Q); (1) discontinuous, setae absent within the submedian and median region of the pterothorax (Fig. 7S).

Female setal patterns on the lateral and posterior margin of the pterothorax, excluding the trichoid setae or its setal equivalent and its associated thorn-like seta (if clustered along the margin): (0) loosely grouped on the posterolateral margin in various arrangements, not closely associated; (1) ‘2,2,2,2’ arrangement (rarely ‘2,2,1,2,2’) (Fig. 7N); (2) ‘3+3’ arrangement (Fig. 7I); (3) ‘2,3+3,2’, ‘3,2+2,3’ or ‘3,3+3,3’ (Fig. 7J); (4) ‘4+4’ arrangement (rarely ‘4,1+1,4’) (Fig. 7K); (5) ‘5+5’ arrangement* (Fig. 7L); (6) ‘7+7’ arrangement* (Fig. 7M).

Female setal patterns on the lateral and posterior margin of the pterothorax, excluding the trichoid setae or its setal equivalent and its associated thorn-like seta (if clustered and present as a 2,2+2,2 or 2,2,1+2,2 arrangement): (0) 2,2+2,2; (1) 2,2,1+2,2 (Fig. 7N).
Abdominal

95. **Adult male tergum I**: (0) absent or fused to tergum II; (1) present, identified by a small isolated and weakly sclerotised tergite (Fig. 10).

96. **Adult female submedian to median dorsal setae on abdominal segment II**: (0) absent; (1) single pair or row (Fig. 11B); (2) two pairs or rows, one behind the other (Fig. 11D); (3) three or more pairs or rows, each more or less behind each other (Fig. 11C).

97. **Adult female abdominal segment II**: (0) not deeply embedded within abdominal segment III; (1) deeply embedded within abdominal segment III (Fig. 11E).

98. **Adult female lateral and/or sublateral setae on abdominal segment II**: (0) absent; (1) present, may be lateral, dorsal and/or ventral.

99. **Adult female abdominal segment II**: (0) not deeply embedded within abdominal segment III; (1) deeply embedded within abdominal segment III (Fig. 11E).

100. **Abdominal spiracle number**: (0) six pairs; (1) less than six pairs.

101. **Atria of abdominal spiracles**: (0) small (Fig. 11O); (1) greatly enlarged (Fig. 11P).

102. **Abdominal male lateral flecks (sensu Moreby, 1978)**: (0) absent; (1) present (see Figs 7-10 in Moreby, 1978).

103. **Cell shaped cuticular sculpturing on the dorsal and/or ventral abdominal surface**: (0) absent in all stadia examined; (1) present, either dorsally and/or ventrally in any stadium (Fig. 11Q & 13 D).

104. **Adult female pleural and tergal abdominal plate sclerotisation. Segment IV to VII ONLY**: (0) absent (completely unsclerotised) or greatly reduced, limited to dorsal tergites; (1) restricted to pleurites that extend no more than sublaterally over the dorsal surface* (Fig. 12G); (2) restricted to separate pleurites and tergites; (3) restricted to tergopleurites that are unfused medially; (4) restricted to tergopleurites that are fused medially.

105. **Adult female pleural abdominal ribs. Segment IV to VII ONLY**: (0) absent or restricted to thin folds over the lateral side of the abdomen (Fig. 11K); (1) enlarged although not greatly expanded (Fig. 11L); (2) greatly expanded with an enlarged pleural knot (Fig. 11M); (3) greatly expanded with an anterior and posterior process (Fig. 11N).

106. **Adult female sternal abdominal plates. Segment IV to VII ONLY**: (0) absent; (1) present, may be medially fused forming a single sternite or broken forming paired sternites on each segment.

107. **Adult female sternal plate morphology (if present). Segment IV to VII ONLY**: (0) sclerotised and complete, fused medially across the abdomen; (1) unsclerotised and complete, fused medially across the abdomen; (2) separate, present both sides of the abdomen; (3) separate in the anterior segments but complete in the posterior segments.

108. **Adult male pleural and tergal abdominal plate sclerotisation. Segment IV to VII ONLY**: (0) absent (completely unsclerotised) or greatly reduced, limited to dorsal tergites (Fig. 12A); (1) restricted to separate pleurites and tergites (Fig. 12B); (2) restricted to tergopleurites that are unfused medially (Fig. 12C); (3) restricted to tergopleurites that are unfused medially in segments IV and possibly V but medially fused in the remaining
segments* (Fig. 12D); (4) restricted to tergopleurites that are fused medially (Fig. 12E); (5) restricted to tergopleurites that are unfused medially and accompanied by a separate isolated medial tergite on the posterior region of each segment (Fig. 11A); (6) restricted to tergopleurites that are fused medially and accompanied by a separate isolated medial tergite on the posterior margin of the fused tergopleurite* (Fig. 12F).

109. **Adult male sternal abdominal plates. Segment IV to VII ONLY:** (0) absent; (1) present, may be medially fused forming a single sternite or broken forming paired sternites on each segment.

110. **Adult male sternal plate morphology (if present). Segment IV to VII ONLY:** (0) complete, fused medially across the abdomen (Fig. 13A); (1) unsclerotised and complete, fused medially across the abdomen (Fig. 13B); (2) separate, present both sides of the abdomen (Fig. 13C); (3) separate in the anterior segments but complete in the posterior segments (Fig. 13D).

111. **Adult female dorsal abdominal setal rows. Segment III to VI ONLY:** (0) absent; (1) present, may be discontinuous and with at least four or more setal pairs present per segment.

112. **Adult female dorsal abdominal setal row arrangement (if present). Segment III to VI ONLY:** (0) present laterally to intermediately, usually as microsetae or short small normal setae. May also be present more medially and possibly continuous across the abdomen; (1) continuous sublateral to intermediate microsetal or short normal setal rows; (2) continuous sublateral to intermediate normal or macrosetal rows; (3) discontinuous, single sublateral or intermediate normal or macroseta and a submedian normal or macrosetal row; (4) discontinuous, two or three sublateral or intermediate normal or macroseta and a submedian normal or macrosetal row; (5) continuous submedian normal setal row*.

113. **Adult female dorsal abdominal setal type (if present in rows, laterally to intermediately). Segment III to VI ONLY:** (0) short small microsetae; (1) normal setae*.

114. **Adult female dorsal abdominal setae (if not in rows). Segment III to VI ONLY:** (0) median normal or macrosetal pairs only; (1) median microsetal pairs only; (2) median and submedian or intermediate microsetal pairs; (3) intermediate setal pairs regardless of type on the posterior margin of each segment, no median setae; (4) median and intermediate setal pairs, may be normal or macrosetae; (5) submedian and median pairs only*; (6) median blade-like and intermediate normal setal pairs with submedian pairs on segments VII and VIII*; (7) sublateral pairs only*.

115. **Adult female ventral abdominal setal rows. Segment III to VI ONLY:** (0) absent; (1) present, not necessarily complete but with at least 4 setal pairs per segment.

116. **Adult female ventral abdominal setal type (if present in rows). Segment III to VI ONLY:** (0) microsetae, may be discontinuous sublateral or intermediately; (1) not microsetae, either normal setae or macrosetae. May be discontinuous sublateral or intermediately.

117. **Adult female trichoid seta on the posterolateral margin of abdominal segment VIII:** (0) absent, not identifiable from the other setae on the posterolateral margin of this segment (Fig. 11R); (1) present and identifiable although not emanating from a distinctive pit (Fig. 11S); (2) present with a distinct trichoid seta emanating from a distinct and well developed pit (Fig. 11T).

118. **Adult female dorsal abdominal plates of the terminal abdominal segments:** (0) fused, giving the appearance that the segment forms a single unit (Fig. 11U); (1) terminal division absent, no evidence of a terminal XI tergite although divisions are present between the lateral portions of the fused IX and X tergite (Fig. 11A’ & B’); (2) terminal division present separating the segment into its anterior (tergite IX and X) and posterior
Adult female fused IX and X tergites, not necessarily delimited from tergite XI: (0) divided into separate pleurites and a single medial tergite* (Fig. 11Y); (1) fused medially forming a single tergopleural plate (Fig. 11V); (2) divided into tergopleurites, no medial tergite.

Adult female XI tergite (if present and delimited from tergite IX and X): (0) medially fused forming a single terminal tergal plate (Fig. 11X); (1) medially divided into two terminal tergites (Fig. 11Z).

N III dorsal abdominal plates of abdominal segment II: (0) absent, unsclerotised; (1) pleurites only; (2) pleurites and isolated tergites; (3) tergopleurites.

N III dorsal abdominal plate sclerotisation. Segments III to VIII ONLY: (0) absent (completely unsclerotised) although a few pleurites may be weakly delimited (Fig. 14A); (1) restricted to pleurites in abdominal segments III and IV only, all other segments not bearing sclerotised plates (Fig. 14C); (2) restricted to pleurites in abdominal segments III to VII only, segment VIII not bearing sclerotised plates* (Fig. 14D); (4) restricted to pleurites in abdominal segments III to VIII only, no evidence of any separate tergites (Fig. 14F); (5) pleurites and tergites separate and sclerotised although tergites absent from one or more posterior segments (Fig. 14E); (6) pleurites and tergites separate and sclerotised (Fig. 14G); (7) tergopleurites that are only connected to each other along their posterior margins except in segment VIII which possesses separate tergites and pleurites (Fig. 14H); (8) tergopleurites unfused medially (Fig. 14I).

N III abdominal pleurite shape (if abdominal sclerotisation is restricted to pleurites in segments III to VIII): (0) thin similar sized elongated plates bordering the edges of each segment (Fig. 14F); (1) rounded plates on the lateral margin within each segment which get significantly smaller in each proceeding segment.

N III terminal abdominal segments: (0) undifferentiated by sclerotised abdominal plates (Fig. 14A-F); (1) differentiated either partially or completely by sclerotised abdominal plates (Fig. 14G-I).

This character refers to the differentiation of segments IX, X and XI only.

N III terminal abdominal segments (if undifferentiated by sclerotised abdominal plates): (0) completely undivided, no evidence to intersegmental division in the integument of the terminal segment (Fig. 14B-D); (1) divided, with evidence of an intersegmental division via folds in the integument of the terminal segments (Fig. 14A, E & F).

N III terminal abdominal segments (if differentiated by sclerotised abdominal plates): (0) delimited by an isolated pair of tergal and/or sternal plates only (Fig. 14H); (1) delimited by a single tergopleural plate (a pair of sternites may also be evident)*; (2) differentiated into two or three rows of plates (Fig. 14G & I).

N III terminal abdominal segments (if differentiated into two or three rows of sclerotised abdominal plates): (0) two rows present (Fig. 14G); (1) three rows present (Fig. 14I).

N III segment X (if terminal segments IX, X and XI are differentiated into three rows of sclerotised abdominal plates): (0) medially separated into two isolated tergites or tergopleurites; (1) medially fused forming a single tergite or tergopleurite across the segment (Fig. 14I).

N II abdominal plate sclerotisation. Segments III to VIII ONLY: (0) absent (completely unsclerotised) although a few pleurites may be weakly delimited; (1) restricted to pleurites in abdominal segment III, all other segments not bearing sclerotised plates*; (2) restricted to pleurites in segments III and IV only, all other segments not bearing sclerotised plates*; (3) restricted to pleurites in segments III - V, absent in segments VI -
VIII; (4) restricted to pleurites in segments III - VI, absent in segments VII and VIII*; (5) restricted to pleurites in segments III - VIII, no evidence of any separate tergites; (6) pleurites and tergites separate and sclerotised; (7) tergopleural plates that are only connected to each other along their posterior margins except in segment VIII which possesses separate tergites and pleurites; (8) tergopleurites unfused medially.

**Internal Genitalia**

130. *Testes:* (0) weakly bilobed; (1) strongly bilobed (Fig. 15A, C).

131. *Distal termination of the testes:* (0) blunt without a short process or flagellate extension* (Fig. 15B); (1) blunt with a short process which may or may not carry a short flagellate extension (Fig. 15A, C); (2) flagellate but not carried by a short process (Fig. 15D).

132. *Vesicula seminalis:* (0) forms a more or less single structure which appears internally divided medially (Fig. 15A); (1) separated distally but apparently fused proximally with the vas deferens entering the separated organ before it becomes fused (Fig. 15G); (2) forms two distinct separate structures*.

133. *Subdivisions within each vesicula:* (0) absent (Fig. 15E); (1) present, each vesicula must be clearly lobed internally (Fig. 15F).

134. *Lateral lobe on each vesicula:* (0) absent; (1) present (Fig. 15A, E, H, I, K).

135. *Lateral lobe size on each vesicula (if present):* (0) small (Fig. 15E, H, I); (1) large, lying along more than half the length of each vesicula. (Fig. 15A, K).

136. *Ductus ejaculatorius, joining each vesicula at the base:* (0) forms a short simple tube only slightly longer than the length of the basal apodeme (Fig. 15I); (1) greatly swollen, at least 1 ½ x length of the basal apodeme (Fig. 15J); (2) long and coiled (Fig. 15K).

137. *Unpaired diverticulum at the junction of the vesicula seminalis and ductus ejaculatorius:* (0) absent (Fig. 15A, H-K); (1) present* (Fig. 15L).

138. *Genital chamber calyx:* (0) unsclerotised, extremely hyaline or not visible; (1) sclerotised and striated, clearly visible in cleared slide mounted specimens (Fig. 16A, B).