

## THE LARVAE OF THE AUSTRALIAN GOMPHIDAE (ANISOPTERA)

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*Received November 26, 1997 / Reviewed and Accepted January 30, 1998*

The descriptive information available on the larvae of the Australian Gomphidae is summarized. On the evidence of larval characters it is suggested that *Odontogomphus longipositor* Watson should provisionally be placed in the subgenus *Zephyrogomphus* of the genus *Austrogomphus*. The larvae of *Ictinogomphus dobsoni*, *Hemigomphus comitatus*, *H. coloolo*, *H. theischingeri*, *Antipodogomphus hodgkini*, *Austrogomphus arbustorum*, *A. metaleuca*, *A. amphiclitus*, *A. bifurcatus* and *A. longipositor* are described, most of them also figured, for the first time; the larvae of the remaining spp. are redescribed and illustrated in similar detail.

### INTRODUCTION

WATSON (1991) was the last to review the Australian Gomphidae. His revision was based primarily on the adults, and a descriptive paper on the larvae was announced for later. In several of his brief generic diagnoses of the larvae, WATSON (1991) referred to unpublished data of Theischinger and Watson.

For what was most probably going to be our joined paper, Tony (Watson) started up on his own but his unexpected and untimely death prevented progress beyond the basics. I have, therefore, taken the opportunity to present the announced paper, being well aware that Tony may have had additional information which is, however, no longer available, or may not have agreed to some of my opinions.

### MATERIAL AND METHODS

The material examined is lodged in the Australian National Insect Collection in Canberra (ANIC) or in the Theischinger collection (GT). Dried (mounted) specimens and specimens preserved in 80% alcohol have been used.

The descriptions are given from last instar larvae (L) or from final instar exuviae (E). The way of

larval identification is specified under each taxon. Identification by breeding out does not only include material bred out by myself but also by other reliable and competent workers.

As colouration of individuals may be variable in life due to specific conditions in the habitat and as colouration of preserved specimens may reflect the ways or methods of collection and preservation, colours are not given in the descriptions; they may range from pale greyish yellow to dark greyish brown. Pubescence which is rather strong in all taxa does not appear useful for diagnoses and is therefore omitted in illustrations and usually not mentioned or specified in descriptions. Smoothness or dentition of premental ligula and labial palp may to some degree be effected by conditions of habitat and food and possibly others.

All descriptions are made up in similar style in order to facilitate comparison of taxa. Only the most reliable characters are used in the key provided at the end of the paper. In spite of that the key may be of limited use for identifying other than last instar larvae.

## CHECKLIST OF AUSTRALIAN GOMPHIDAE AND THEIR LARVAE\*

- Ictinogomphus australis* (Selys)\*
- I. dobsoni* (Watson)\*
- I. paulini* Watson
- Hemigomphus atratus* Watson
- H. comitatus* (Tillyard)\*
- H. cooloola* Watson\*
- H. gouldii* (Selys)\*
- H. heteroclytus* Selys\*
- H. magela* Watson\*
- H. theischingeri* Watson\*
- Odontogomphus donnellyi* Watson\*
- Armagomphus armiger* (Tillyard)\*
- Antipodogomphus acolythus* (Martin)\*
- A. dentosus* Watson\*
- A. edentulus* Watson
- A. hodgkini* Watson\*
- A. neophytus* Fraser\*
- A. proselythus* (Martin)
- Austrogomphus (Austroepigomphus) melaleucae* Tillyard\*
- A. (A.) praeeruptus* (Selys)
- Austrogomphus (Austrogomphus) angelorum* Tillyard
- A. (A.) arbustorum* Tillyard\*
- A. (A.) australis* Dale in Selys\*
- A. (A.) collaris* Hagen in Selys\*
- A. (A.) cornutus* Watson\*
- A. (A.) doddi* Tillyard
- A. (A.) guerini* (Rambur)\*
- A. (A.) mjobergi* Sjöstedt\*
- A. (A.) ochraceus* (Selys)\*
- A. (A.) pusillus* Sjöstedt
- Austrogomphus (Pleiogomphus) amphi-litus* (Selys)\*
- A. (P.) bifurcatus* Tillyard\*
- A. (P.) divaricatus* Watson

\* Species of which larval material is or was available are marked with an asterisk.

*A. (P.) prasinus* Tillyard  
*Austrogomphus (Xerogomphus) gordonii* Watson\*  
*A. (X.) turneri* Martin\*  
*Austrogomphus (Zephyrogomphus) lateralis* (Selys)\*  
 ?*A. (?Z.) longipositor* (Watson)\*

## DESCRIPTIONS OF LARVAE

The descriptions are arranged in an order slightly different from the largely alphabetical checklist above and more closely reflecting similarities and supposed relationships. Generic characters of polytypic genus-group taxa of which the larvae of several species are known, are presented under these genus-group taxa and are not repeated under the single species. Diagnostic characters of monotypic genus-group taxa are given under their respective species. Diagnostic characters of polytypic genus-group taxa of which only the larva of a single species is known, are listed under that species.

## I c t i n o g o m p h i n a e Fraser

### ICTINOGOMPHUS COWLEY

*Ictinogomphus* COWLEY, 1934: 274

**Type species:** *Ictinus ferox* Rambur, 1842

WATSON (1991) recorded three species of *Ictinogomphus*. Only the larva of *I. paulini* is still unknown.

**HEAD.** — Antennae slim, 4th segment greatly reduced, often retracted into long 3rd segment; segment 3 reaching almost to tip of labrum. Labium reaching back to level of inner, ventral ridge on procoxa; prementum approximately as wide as long; ligula evenly curved, regularly toothed, fringed with setae, long on lateral margin; palps curved, dentate on inner margin, movable hook bluntly pointed.

**THORAX.** — Wing sheaths reaching end of segment 5 or on to segment 6.

**ABDOMEN.** — Hardly longer than wide; widest at segment 6. Large lateral spines on segments 7-9, smaller lateral spines on segments 3-6, decreasing in size from rear to front. Large middorsal hooks on segments 1-9; dorsal hook on segment 1 varying in size from low tubercle to small upright spike; bases of dorsal hooks on segments 2-5 occupying ca half length of tergum, or less, the hooks upright (2-3) or backward-sloping spikes (4-5); hooks on segments 6-9 terminating strong middorsal ridge on each segment, highest on 7. Epiproct 20-25% longer than paraprocts and cerci.

### ICTINOGOMPHUS AUSTRALIS (SELYS)

Figures 1-4

*Ictinus australis* SELYS, 1873: 41

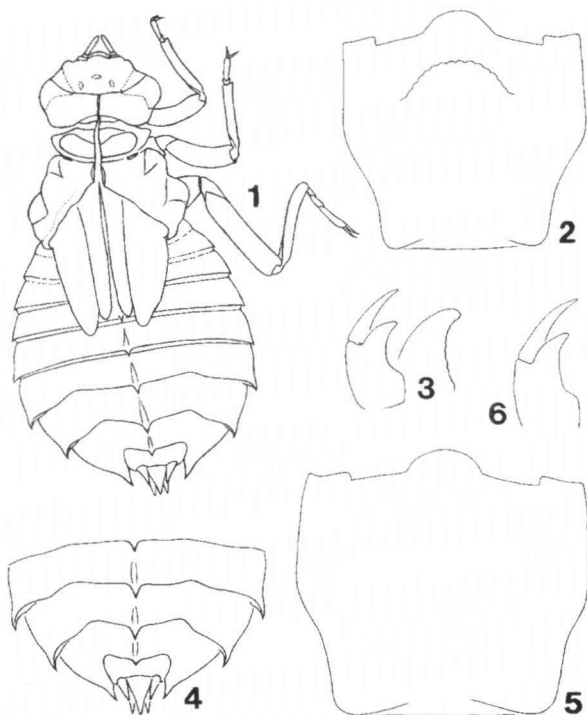
Identification by breeding out.

**Material.** — Queensland: EE from Edungalba, Ipswich, Lake Barrine (Atherton Tableland). Northern Territory: EE from Darwin.

Previous descriptive information. — TILLYARD (1917) gave a line drawing of the whole insect. HAWKING (1993) keying the dragonfly larvae of the Alligator Rivers region, presented illustrations of morphological details and a photograph of the entire insect (antepenultimate stage).

**Measurements** (in mm). — Total length 23.0-25.2; length of metafemur 5.1-6.4; greatest width of abdomen 10.7-12.3.

**HEAD.** — Prementum usually only slightly wider than long.



Figs 1-4. *Ictinogomphus australis* (Selys), E: (1) dorsal aspect; — (2) prementum (and detail), ventral aspect; — (3) labial palp (and detail), ventral aspect; — 4, abdominal segments 7-10, dorsal aspect. Figs 5, 6. *Ictinogomphus dobsoni* (Watson), E: (5) prementum, ventral aspect; — (6) labial palp, ventral aspect.

#### *ICTINOGOMPHUS DOBSONI* (WATSON)

Figures 5-6

*Indictinogomphus australis dobsoni* WATSON, 1969: 88

Identification by breeding out.

**Material.** — Western Australia: EE from Millstream Station (Fortescue R. at Roeburne rd and Deep Reach), Nannutarra Roadhouse (Ashburton R.), "2 Bend" Picnic Area (Murchison R.).

Previous descriptive information. — None.

**Measurements** (in mm). — Total length 26.1-28.0; length of metafemur 6.3-6.6; greatest width of abdomen 12.1-14.0.

**HEAD.** — Prementum usually markedly wider than long.

*ICTINOGOMPHUS PAULINI* WATSON*Ictinogomphus paulini* WATSON, 1991: 298

The larva of *I. paulini*, a species known only from the northern part of Cape York Peninsula, is still unknown.

## G o m p h i n a e Rambur

*Hemigomphus* group*HEMIGOMPHUS* SELYS*Hemigomphus* SELYS, 1854: 47

**Type species:** *Hemigomphus heteroclytus* Selys, 1854

We have safely identified larval material of six of the seven known (WATSON, 1991) species of *Hemigomphus*; only the larva of *H. atratus* is still unknown. The larva of *H. cooloola* can be separated from the other species on morphological characters, the larva of *H. magela* by geographical exclusion. The known distributions may be of some help for sorting out or exclusion of the larvae of the remaining four species. *H. gouldii* is known only from south of latitude 27°30' S; *H. heteroclytus* is basically southern and known only from a few localities north of the Paluma-Eungella gap (WATSON & THEISCHINGER, 1984); *H. theischingeri* is known only from rainforest north of the Paluma-Eungella gap, whereas *H. comitatus* is also known from drier situations of the same region and from the Eungella area.

**HEAD.** — Ligula of prementum fringed with setae, armed with two rounded tubercles and usually protuberant. Labial palp straight or slightly curved, apically rounded or bluntly pointed and bearing well defined teeth along inner margin. Third antennal segment broad, its width about 3/5 its length.

**THORAX.** — Pro- and mesotibia armed with small, distal, outer claw. Wing sheaths reaching to about end of abdominal segment 4.

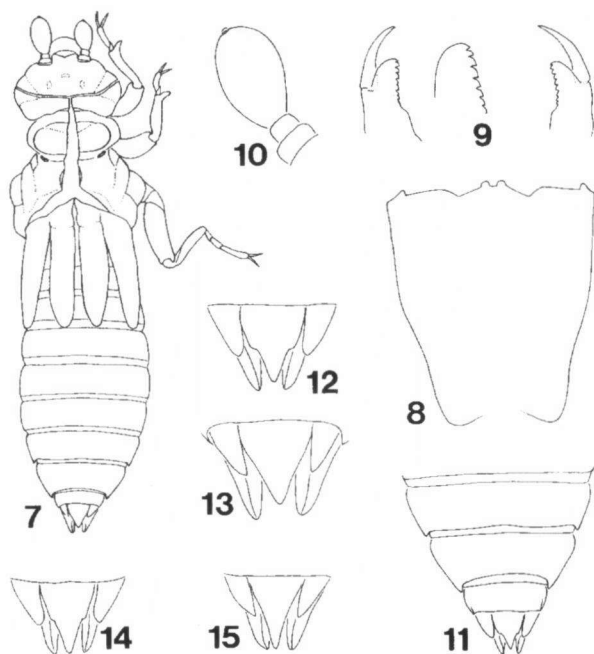
**ABDOMEN.** — Fusiform, broadest at segments 5 and 6. Small lateral spines on segments 8 and 9. Middorsal armature restricted to - at the most - low rounded humps.

*HEMIGOMPHUS HETEROCLYTUS* SELYS

Figures 7-13

*Hemigomphus heteroclytus* SELYS, 1854: 49

Identification by breeding out.



Figs 7-13. *Hemigomphus heteroclytus* Selys, E: (7) dorsal aspect; - (8) prementum, ventral aspect; - (9) labial palps (and detail), ventral aspect; - (10) antenna; - (11) abdominal segments 8-10, dorsal aspect; - (12, 13) anal pyramid, dorsal aspect: (12) male; - (13) female. Figs 14, 15. *Hemigomphus gouldii* (Selys), E, anal pyramid, dorsal aspect: (14) male; - (15) female.

sally. Labial palp rather straight, apically rounded, with 10 teeth along inner margin.

**ABDOMEN.** - Segments 7-9 with low, widely rounded, middorsal humps. Anal pyramid plump.

#### *HEMIGOMPHUS GOULDII* (SELYS)

Figures 14-15

*Austrogomphus gouldii* SELYS, 1854: 45

**Identification by breeding out.**

**Material.** - New South Wales: EE from Cataract R. (at Wilton-Appin Rd), Port Hacking, Wilson R. Res. nr Bellangry, and from Woronora R. (nr Heathcote).

**Previous descriptive information.** - HAWKING (1986) keying the dragonfly larvae of the River Murray system, commented on the impossible separation of *H.*

**Material.** - New South Wales: EE from nr Bendemeer (Manilla Rd) and Tea Tree Ck (Armidale).

**Previous descriptive information.** - TILLYARD (1917) presented a line drawing of the labial palp. HAWKING (1986) keying the dragonfly larvae of the River Murray system, commented on the impossible separation of *H. heteroclytus* and *H. gouldii* on morphological characters.

**Measurements** (in mm). - Total length 20.0 - 22.1; length of metafemur 3.1-3.3; greatest width of abdomen 5.4-5.6.

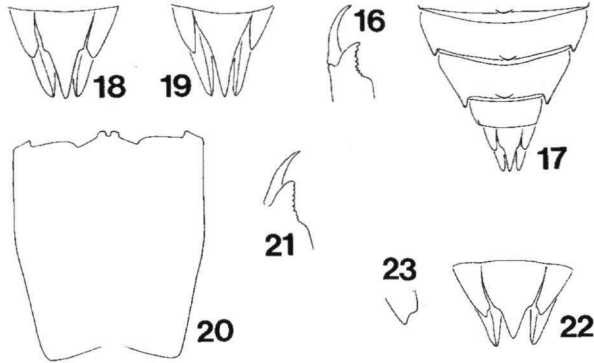
**HEAD.** - Prementum markedly wider distally than basally.

*gouldii* and *H. heteroclytus* on morphological characters.

**Measurements** (in mm). — Total length 19.1–21.4; length of metafemur 2.9–3.1; greatest width of abdomen 5.1–5.4.

**HEAD.** — Prementum markedly wider distally than basally. Labial palp rather straight, apically rounded, with 9–10 teeth along inner margin.

**ABDOMEN.** — Segments 7–9 with low, widely rounded, mid-dorsal humps. Anal pyramid moderately plump.



Figs 16–19. *Hemigomphus cooloola* Watson, E: (16) labial palp, ventral aspect; — (17) abdominal segments 8–10, dorsal aspect; — (18, 19) anal pyramid, dorsal aspect: (18) male; — (19) female. Figs 20–23. *Hemigomphus magela* Watson, E: (20) prementum, ventral aspect; — (21) labial palp, ventral aspect; — (22) anal pyramid, male, dorsal aspect; — (23) apex of cercus, male, dorsal aspect.

#### *HEMIGOMPHUS ATRATUS* WATSON

*Hemigomphus atratus* WATSON, 1991: 313

The larva of *H. atratus*, a species recorded only from Mt Haig near Tineroo Dam in north-eastern Queensland, is still unknown.

#### *HEMIGOMPHUS COMITATUS* (TILLYARD)

*Austrogomphus comitatus* TILLYARD, 1909: 245

**Identification by breeding out.**

**Material.** — Queensland: EE from S Johnson R. (Innisfail) and Finch Hatton Gorge.

**Previous descriptive information.** — None.

**Measurements** (in mm). — Total length 19.0–20.1; length of metafemur 2.9–3.0; greatest width of abdomen 5.2–5.4.

**HEAD.** — Prementum markedly wider distally than basally. Labial palp rather straight, apically rounded, with 9 teeth along inner margin.

**ABDOMEN.** — Segments 7–9 with low, widely rounded, middorsal humps. Anal pyramid moderately plump.

*HEMIGOMPHUS THEISCHINGERI* WATSON

*Hemigomphus theischingeri* WATSON, 1991: 324

Identification by individual association.

**M a t e r i a l.** — Queensland: E from Cape Tribulation.

Previous descriptive information. — None.

**M e a s u r e m e n t s** (in mm). — Total length 19.4; length of metafemur 2.9; greatest width of abdomen 5.0.

**HEAD.** — Prementum markedly wider distally than basally. Labial palp rather straight, apically rounded, with 9 teeth along inner margin.

**ABDOMEN.** — Segments 7-9 with low, widely rounded, middorsal humps. Anal pyramid moderately plump.

*HEMIGOMPHUS COOLOOLA* WATSON

Figures 16-19

*Hemigomphus cooloola* WATSON, 1991: 318

Identification by regional exclusion.

**M a t e r i a l.** — Queensland: EE from Searys Ck nr Rainbow Beach, and from Fraser Island (Lake Benaroon and Lake Birrabeen).

Previous descriptive information. — None.

**M e a s u r e m e n t s** (in mm). — Total length 19.4-20.6; length of metafemur 2.9-3.1; greatest width of abdomen 5.0-5.4.

**HEAD.** — Prementum markedly wider distally than basally. Labial palp curved, apically bluntly pointed, with 8 teeth along inner margin.

**ABDOMEN.** — Segments 7-9 with distinct, narrowly rounded, middorsal humps. Anal pyramid rather slim.

*HEMIGOMPHUS MAGELA* WATSON

Figures 20-23

*Hemigomphus magela* WATSON, 1991: 321

Identification by breeding out.

**M a t e r i a l.** — Northern Territory: EE from Baroalba Gorge (19 km E by N of Mt Cahill) and Baroalba Springs (19 km NE by N of Mt Cahill).

Previous descriptive information. — HAWKING (1993) keying the dragonfly larvae of the Alligator Rivers region, gave some morphological details and a photograph of the entire insect.



**Measurements** (in mm). — Total length 17.0-19.2; length of metafemur 2.8-3.0; greatest width of abdomen 4.9-5.2.

**HEAD.** — Prementum not much wider distally than basally; ligula well protruding with rounded teeth close together. Labial palp slightly curved, apically narrowly rounded, with 9 teeth along inner margin.

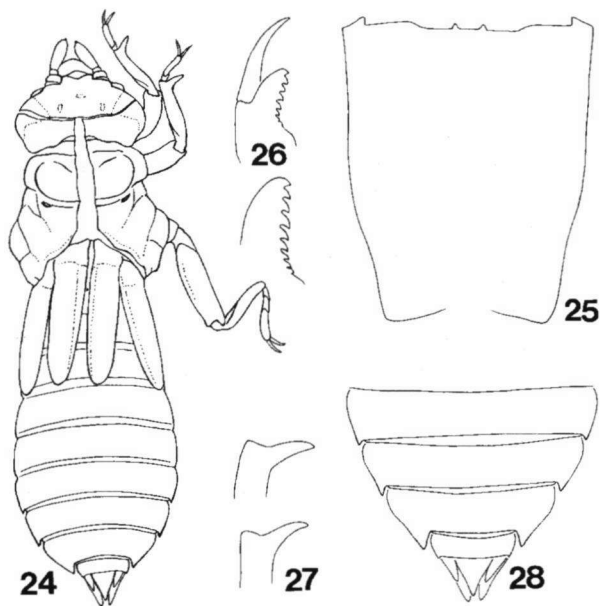
**ABDOMEN.** — Segments 7-9 with low, widely rounded, middorsal humps. Anal pyramid moderately plump. Cerci of male slightly bilobed.

### ODONTOGOMPHUS WATSON

*Odontogomphus* WATSON, 1991: 334

**Type species:** *Odontogomphus donnellyi* Watson, 1991

According to WATSON (1991) *Odontogomphus* includes the two species *O. donnellyi* and *O. longipositor*, both known only from north-eastern Queensland. Characters of adult *O. longipositor* suggested to L. Carle (pers. comm.) that this species is "perhaps the most questionably placed Australian dragonfly". On the evidence of larvae found at the type locality of *O. longipositor* and one other locality in tropical north-eastern Queensland and identified by exclusion as this species, *O. longipositor* is provisionally transferred to *Austrogomphus*, subgenus *Zephyrogomphus*, and *Odontogomphus* is considered monotypic. Characters given below, under *Odontogomphus donnellyi*.



Figs 24-28. *Odontogomphus donnellyi* Watson, E: (24) dorsal aspect; — (25) prementum, ventral aspect; — (26) labial palp (and detail), ventral aspect; — (27) apex of pro- and mesotibia; — (28) abdominal segments 7-10, dorsal aspect.

*ODONTOGOMPHUS DONNELLYI* WATSON

Figures 24-28

*Odontogomphus donnellyi* WATSON, 1991: 335

Identification by breeding out.

**Material.** — Queensland: EE from Tchooratippa Ck (Palmerston N. P.).

Previous descriptive information. — WATSON (1991), on generic level, gave a brief diagnostic description.

**Measurements** (in mm). — Total length 22.3; length of metafemur 3.6; greatest width of abdomen 6.2.

**HEAD.** — Prementum about 1.2 times as long as wide; ligula with margin almost straight, armed with two widely separated small subtriangular denticles, fringed with setae. Labial palp subtriangular, slightly curved, with apex rounded, bearing 8 large subtriangular teeth. Third antennal segment not greatly broadened, its width slightly less than half its length.

**THORAX.** — Pro- and mesotibia armed with strong, outwardly-directed distal claw. Wing sheaths reaching to about end of segment 4.

**ABDOMEN.** — Elongate, oval, lowly rounded above, broadest at segments 6 and 7. Lateral spines on segments 7-9. No middorsal armature.

*ARMAGOMPHUS* CARLE*Armagomphus* CARLE, 1986: 287 (subgenus of *Hemigomphus*)*Armagomphus* Carle. — WATSON, 1991: 331**Type species:** *Austrogomphus armiger* Tillyard, 1913

*Armagomphus* is a monotypic genus known only from south-western Australia. Characters given below, under *Armagomphus armiger*.

*ARMAGOMPHUS ARMIGER* (TILLYARD)

Figures 29-33

*Austrogomphus armiger* TILLYARD, 1913: 577

Identification by breeding out.

**Material.** — Western Australia: EE from Churchman Brook, 1 mi E Cookerhup and Waroona.

Previous descriptive information. — WATSON (1962) keying the dragonfly larvae of south-western Australia, gave illustrations of the entire insect and of morphological details.

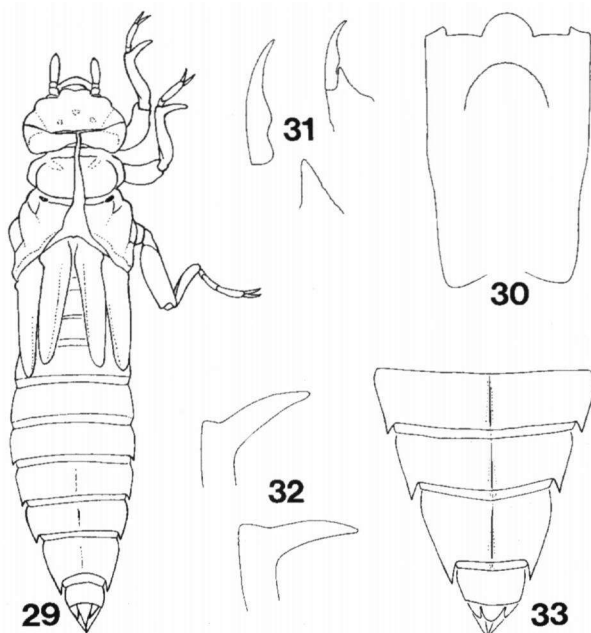
**Measurements** (in mm). — Total length 21.5-24.2; length of metafemur 2.8-3.0; greatest

width of abdomen 4.7-5.4.

HEAD. — Prementum more than 1.5 times as long as wide; ligula semicircular, margin with small crenulations, fringed with setae. Labial palp very small, subtriangular, inner margin with few - if any - wide shallow crenulations; movable hook blade-like, widened for about second quarter of length. Third antennal segment elongate, its width about  $\frac{2}{5}$  its length.

THORAX. — Pro- and mesotibia armed with strong, elongate, outwardly-directed distal claw. Wing sheaths reaching to about end of abdominal segment 4.

ABDOMEN. — Long, fusiform, deeply subtriangular in section, broadest at segments 5 and 6. Lateral spines on segments 6-9. No middorsal processes, but terga 8-10 ridged in midline.



Figs 29-33. *Armagomphus armiger* (Tillyard), E: (29) dorsal aspect; - (30) prementum (and detail), ventral aspect; - (31) labial palp (and details), ventral aspect; - (32) apex of pro- and mesotibia; - (33) abdominal segments 7-10, dorsal aspect.

### *Austrogomphus* group

#### *ANTIPODOGOMPHUS* FRASER

*Antipodogomphus* FRASER, 1951: 254

**Type species:** *Austrogomphus proselythus* Martin, 1901

WATSON (1991) recorded six species of *Antipodogomphus*. Of these the larvae of *A. edentulus* and of *A. proselythus* (see note under these species) are still unknown, and material of *A. neophytus* (see notes under this species) was not available for this study.

HEAD. — Prementum about as long as wide to distinctly longer than wide; ligula not at all to strongly protuberant, its margin finely crenulate to slightly toothed, fringed

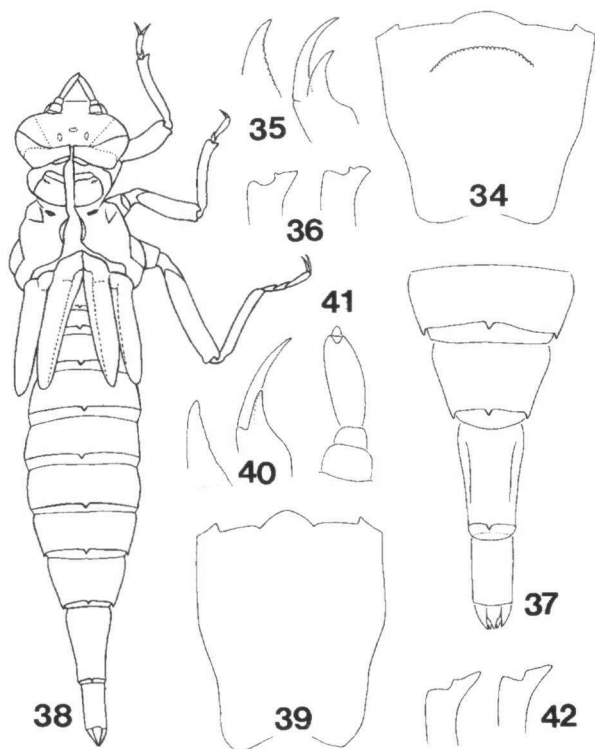
with setae. Labial palp straight or curved, pointed with inner margin finely crenulate to distinctly toothed. Third antennal segment long, not greatly broadened.

THORAX. — Pro- and mesotibia with distal outer claw rather large. Wing sheaths reaching not much beyond end of segment 3.

ABDOMEN. — Elongate, broadest at segment 4, with segments 7-10 progressively extended to form long respiratory siphon. Small lateral spines on segments 7 and 8 (possibly on 9: see under *A. neophytus*). Middorsal armature on segments 2-, or 3-8 or 9.

*ANTIPODOGOMPHUS ACOLYTHUS* (MARTIN)

Figures 34-37



Figs 34-37. *Antipodogomphus acolythus* (Martin), E: (34) prementum (and detail), ventral aspect; — (35) labial palp (and detail), ventral aspect; — (36) apex of pro- and mesotibia; — (37) abdominal segments 7-10, dorsal aspect. Fig. 38. *Antipodogomphus hodgkini* Watson, E, dorsal aspect. Figs 39-42. *Antipodogomphus dentosus* Watson, E: (39) prementum, ventral aspect; — (40) labial palp (and detail), ventral aspect; — (41) antenna; — (42) apex of pro- and mesotibia.

*Austrogomphus acolythus* MARTIN, 1901: 233

*Austrogomphus manifestus* TILL-YARD, 1909: 248

Identification by breeding out.

MATERIAL. — Queensland: EE from Emu Ck S. F., Elaman Ck & Little Yabba Ck (Kenilworth) and Porcupine Gorge (nr Hughenden). New South Wales: EE from Pallal.

Previous descriptive information. — HAWKING (1986) keying the dragonfly larvae of the River Murray system, presented an illustration of the posterior portion of the abdomen.

Measurements (in mm). — Total length 27.1-31.0; length of metafemur 4.0-4.2; greatest width of abdomen 5.1-6.0.

HEAD. — Labium about as wide as long;

ligula slightly protuberant, margin almost smooth. Labial palp and movable hook distinctly curved; inner margin of labial palp without any dentition (almost smooth).

**ABDOMEN.** — Very small lateral spines on segments 7 and 8. Very small spine-like middorsal processes on segments 2-8 or 9. Segment 9 shorter than 2.8 mm. Length : width of segment 10 1.7-2.0.

*ANTIPODOGOMPHUS HODGKINI* WATSON

Figure 38

*Antipodogomphus neophytus hodgkini* WATSON, 1969: 94

Identification by breeding out.

**Material.** — Western Australia: EE from Millstream Spring and from Millstream Station (Millstream Spring, The Island (Fortescue R.), Fortescue R. (at Roebourne Rd) and Deep Reach.

Previous descriptive information. — None.

**Measurements** (in mm). — Total length 28.0-37.0; length of metafemur 4.4-5.6; greatest width of abdomen 4.7-6.5.

**HEAD.** — Margin of ligula and inner margin of labial palp finely crenulate. Labial palp distinctly curved, inner margin usually distinctly toothed; movable hook strongly curved.

**ABDOMEN.** — Small but well detectable lateral spines on segments 7 and 8. Small, spine-like middorsal processes on segments 2-8 or 9. Segment 9 longer than 3.2 mm. Length : width of segment 10 ca. 2.2.

*ANTIPODOGOMPHUS NEOPHYTUS* FRASER

*Antipodogomphus neophytus* FRASER, 1958: 71

Identification by breeding out.

**Material.** — Northern Territory: E and LL from several localities listed by HAWKING (1993) may have been lost.

Previous descriptive information. — HAWKING (1993) keying the dragonfly larvae of the Alligator Rivers region provided a line drawing of the posterior portion of the abdomen. HAWKING & SMITH (1997) present a colour photograph. According to HAWKING (1993) the larva of *A. neophytus* can be separated from the larva of *A. dentosus* by the presence of lateral spines on segment 9 and by segment 9 being 3.3 mm long or longer. HAWKING's (1993) illustration of the posterior portion of the abdomen, however, does not show lateral spines on segment 9, nor does the colour photograph of HAWKING & SMITH (1997). None of the other known *Antipodogomphus* larvae have lateral spines on segment 9.

*ANTIPODOGOMPHUS DENTOSUS* WATSON

Figures 39-42

*Antipodogomphus dentosus* Watson, 1991: 347

Identification by breeding out.

Material. — Northern Territory: E, Kakadu N.P., pool in Nourlangie Ck.

Previous descriptive information. — HAWKING (1993) keying the dragonfly larvae of the Alligator Rivers region distinguished the larva of *A. dentosus* from *A. neophytus*. According to HAWKING (1993) the larva of *A. dentosus* can be separated from the larva of *A. neophytus* by the absence of lateral spines on segment 9 and by segment 9 being 2.7 mm long or shorter.

Measurements (in mm). — Total length 27.0; length of metafemur 3.7; greatest width of abdomen 5.6.

HEAD. — Ligula of prementum strongly protuberant, margin finely crenulate. Labial palp almost straight, subtriangular, inner margin slightly uneven, movable hook almost straight.

ABDOMEN. — Slim but well detectable lateral spines on segments 7 and 8. Small, spine-like middorsal processes on segments 3-9. Segment 9 about 2.7 mm long. Length : width of segment 10 ca 2.0.

*ANTIPODOGOMPHUS EDENTULUS* WATSON*Antipodogomphus edentulus* WATSON, 1991: 350

The larva of *A. edentulus*, a species recorded only from Cape York Peninsula, is still unknown. However, an about half-grown larva from Cape York, Wenlock R., at Moreton, which is very similar to *A. dentosus* (see description above) is possibly *A. edentulus* or *A. proselythus*.

*ANTIPODOGOMPHUS PROSELYTHUS* (MARTIN)*Austrogomphus proselythus* MARTIN, 1901: 233*Austrogomphus arenarius* TILLYARD, 1906: 549*Antipodogomphus proselytus* FRASER, 1951: 254

FRASER (1959) described the larva of what he thought was *A. proselythus* from a single exuviae from Edungalba in Queensland without associated adult. This exuviae is now in ANIC (which houses the Dobson collection) and is labelled as "type" and as "transforming" which, however, apparently is not how it was collected. In the ANIC, there are also one other specimen from Edungalba labelled as

“transforming” without associated adult and two specimens from Edungalba (not labelled as “transforming”), all identified as *A. proselythus* by Watson. There are, however, several adults and exuviae with associated adults of *A. acolythus* from Edungalba, whereas there are no adults of *A. proselythus* from this locality. As also Watson (1991) did not mention *A. proselythus* from Edungalba under “Material Examined and Distribution” and as all available exuviae supposedly belonging to the larger species *A. proselythus* are smaller than the available exuviae of the smaller species *A. acolythus*, it is my opinion that Fraser (1959), under *A. proselythus*, probably described the exuviae of *A. acolythus* and that the larva of *A. proselythus* is still unknown. However, an about half-grown larva from Cape York, Wenlock R., at Moreton, which is very similar to that of *A. dentosus* (see description above) is possibly *A. proselythus* or *A. edentulus*.

#### AUSTROGOMPHUS SELYS

*Austrogomphus* SELYS, 1854: 44

*Austroepigomphus* FRASER, 1951: 254

**Type species:** *Gomphus guerini* Rambur, 1842

WATSON (1991) subdivided *Austrogomphus* into five subgenera. They are *Austrogomphus* s. str., *Austroepigomphus*, *Pleiogomphus*, *Xerogomphus* and *Zephyrogomphus*. Larvae of members of all subgenera are known.

**HEAD.** — Ligula of prementum slightly protuberant, fringed with setae. Third antennal segment only slightly broadened.

**THORAX.** — Pro- and mesotibia armed with distal outer claw of variable length and strength.

**ABDOMEN.** — Flattened, with segments 7-10 usually short, never greatly elongate. Lateral spines on variable combinations of segments. Middorsal armature mostly present, rarely absent.

#### SUBGENUS AUSTROGOMPHUS SELYS

**Type species:** *Gomphus guerini* Rambur, 1842

We have safely identified larval material of seven of the ten known species of *Austrogomphus* s. str. (WATSON, 1991). Only the larvae of *A. angelorum*, *A. doddi* and *A. pusillus* are unknown.

**HEAD.** — Margin of ligula lacking well defined teeth. Postocular lobe rounded or angulated.

**THORAX.** — Wing sheaths reaching to about the end of segment 4.

**ABDOMEN.** — Segment 9 short, its ventral basal width : midventral length ca 2.5-2.6.

*AUSTROGOMPHUS (AUSTROGOMPHUS) ANGELORUM* TILLYARD*Austrogomphus angeli* TILLYARD, 1913: 233*Austrogomphus angelorum* PETERSON, 1993: 21

The larva of *A. angelorum*, a species known only from the Murray River system in New South Wales and South Australia, is still unknown.

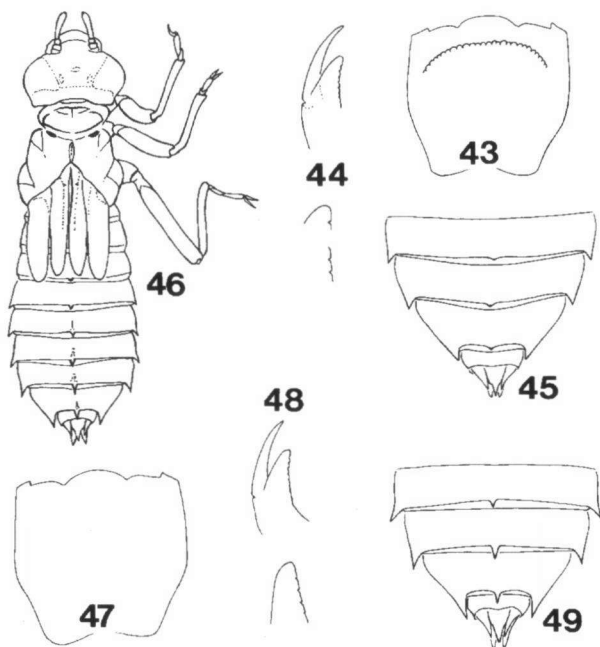
*AUSTROGOMPHUS (AUSTROGOMPHUS) ARBUSTORUM* TILLYARD

Figures 43-45

*Austrogomphus arbustorum* TILLYARD, 1906: 597

Identification by breeding out.

Material. — Queensland: EE from Edungalba.



Figs 43-45. *Austrogomphus (Austrogomphus) arbustorum* Tillyard, E: (43) prementum (and detail), ventral aspect; — (44) labial palp (and details), ventral aspect; — (45) abdominal segments 7-10, dorsal aspect. Figs 46-49. *Austrogomphus (Austrogomphus) mjobergi* Sjöstedt, L: (46) dorsal aspect; — (47) prementum, ventral aspect; — (48) labial palp (and detail), ventral aspect; — (49) abdominal segments 7-10, dorsal aspect.

Previous descriptive information. — None.

Measurements (in mm). — Total length 13.5-15.2; length of metafemur 3.2-3.4; greatest width of abdomen 4.8-5.0.

HEAD. — Prementum slightly longer than wide; margin of ligula minutely denticulate. Labial palp with inner margin undulate and with apex rounded.

THORAX. — Distal outer claw of pro- and mesotibia small.

ABDOMEN. — Widest at segment 4. Small lateral spines on segments 6-9; lateral spine on segment 9 not reaching end of segment 10. Very short, bluntly pointed mid-dorsal cones on seg-



ments 5-9. Paraprocts slightly longer than epiproct; cerci about 5/6 length of epiproct.

*AUSTROGOMPHUS (AUSTROGOMPHUS) MJOBERGI* SJÖSTEDT

Figures 46-49

*Austrogomphus mjobergi* SJOSTEDT, 1917: 11

Identification by breeding out.

**M a t e r i a l.** — Western Australia: EE from Millstream, Millstream Spring, Millstream Station (Palm Pool, The Island - Fortescue R., and Fortescue R. at Roebourne Rd). Northern Territory: small LL from South Alligator R. (nr Coronation Hill).

Previous descriptive information. — HAWKING (1993) keying the dragonfly larvae of the Alligator Rivers region, provided a line drawing of the antennae and a photograph of the entire insect.

**M e a s u r e m e n t s** (in mm). — Total length 13.5-15.5; length of metafemur 3.3-3.5; greatest width of abdomen 4.8-5.1.

**HEAD.** — Prementum not much longer than wide; margin of ligula finely denticulate. Labial palp with inner margin finely denticulate and with apex very blunt.

**THORAX.** — Distal outer claw of pro- and mesotibia small.

**ABDOMEN.** — Widest at segment 7. Lateral spines on segments 4-9, those on 4 and 5 very small; lateral spine on segment 9 reaching well beyond end of segment 10. Prominent but slim middorsal spines on segments 4-9, those on 8 and 9 clearly the longest. Paraprocts markedly longer than epiproct; cerci about 5/6 length of epiproct.

*AUSTROGOMPHUS (AUSTROGOMPHUS) AUSTRALIS* DALE in SELYS

Figures 50-52

*Austrogomphus australis* DALE in SELYS, 1854: 46

Identification by individual association.

**M a t e r i a l.** — Queensland: E from Paroo R. (Eulo). South Australia: E from Murray R. (Berri).

Previous decriptive information. — HAWKING (1986) keying the dragonfly larvae of the River Murray system, presented an illustration of the posterior portion of the abdomen.

**M e a s u r e m e n t s** (in mm). — Total length 19.5-20.5; length of metafemur 4.3-4.5; greatest width of abdomen 5.4-5.6.

**HEAD.** — Prementum slightly longer than wide; margin of ligula finely crenulate. Labial palp rather stout and pointed, with inner margin finely crenulate.

**THORAX.** — Distal outer claw of pro- and mesotibia of moderate size.

**ABDOMEN.** — Widest at segment 6. Lateral spines on segments 4- or 5-9; lateral

spine on segment 9 constricted before tip, reaching beyond end of segment 10. Only very small and insignificant, spiny dorsal humps on segments 3-8. Epiproct slightly shorter than paraprocts; cerci hardly more than 1/2 length of paraprocts.

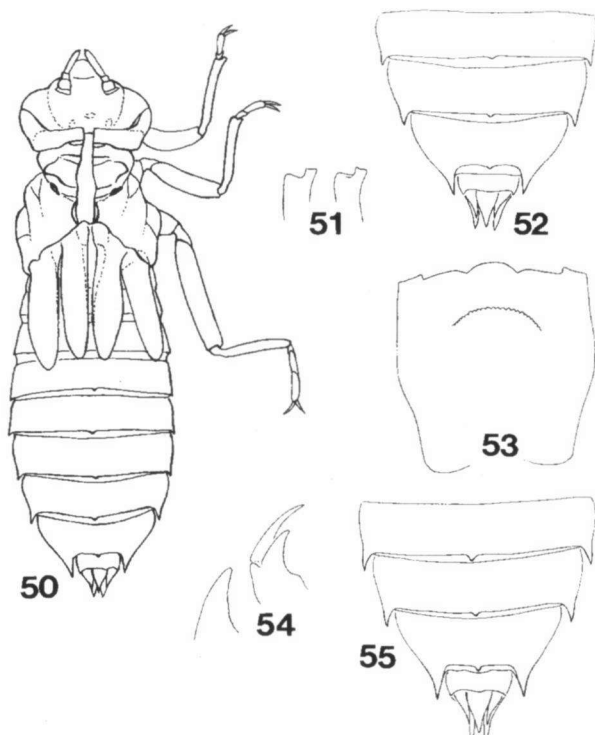
*AUSTROGOMPHUS (AUSTROGOMPHUS) COLLARIS* HAGEN in SELYS

Figures 53-55

*Austrogomphus collaris* HAGEN in SELYS, 1854: 45

Identification by breeding out.

**Material.** — Western Australia: EE from Gingin (0.5 mi S), Helena R. and Murray R. (10 mi W Williams).



Figs 50-52. *Austrogomphus (Austrogomphus) australis* Dale in Selys, E: (50) dorsal aspect; - (51) apex of pro- and mesotibia; - (52) abdominal segments 7-10, dorsal aspect. Figs 53-55. *Austrogomphus (Austrogomphus) collaris* Hagen in Selys, E: (53) prementum (and detail), ventral aspect; - (54) labial palp (and detail), ventral aspect; - (55) abdominal segments 7-10, dorsal aspect.

Previous descriptive information. — WATSON (1962) keying the dragonfly larvae of south-western Australia, figured the entire insect.

**Measurements** (in mm). — Total length 18.4-21.1; length of metafemur 4.0-4.4; greatest width of abdomen 5.6-6.4.

**HEAD.** — Prementum and labial palp as in *A. australis* (see above).

**THORAX.** — Distal outer claw of pro- and mesotibia rather small.

**ABDOMEN.** — Widest at segment 5. Lateral spines on segments 4- or 5-9; lateral spine on segment 9 constricted before tip, reaching to the end of segment 10. Small middorsal spines on segments 4-9, rarely on 4-8. Epiproct

slightly shorter than paraprocts; cerci about  $2/3$  length of paraprocts.

*AUSTROGOMPHUS (AUSTROGOMPHUS) CORNUTUS* WATSON

Figures 56-60

*Austrogomphus (Austrogomphus) cornutus* WATSON, 1991: 384

Identification by breeding out.

Material. — New South Wales: EE from Pallal and Wollondilly R. (at Goodman's Ford).

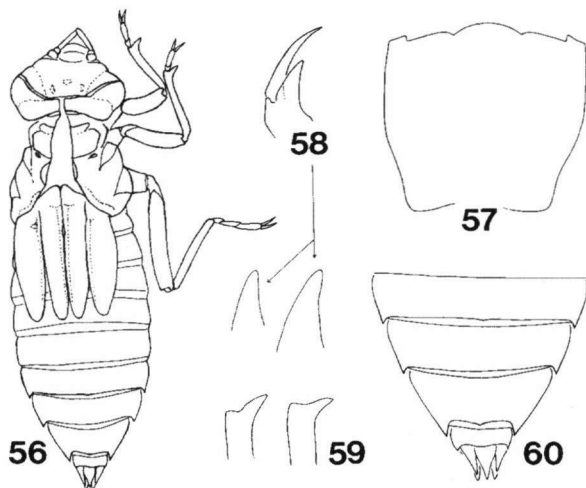
Previous descriptive information. — HAWKING (1986) keying the dragonfly larvae of the River Murray system, under *Austrogomphus* sp. "c", presented a line drawing of the posterior portion of the abdomen.

Measurements (in mm). — Total length 19.1-21.2; length of metafemur 3.7-4.0; greatest width of abdomen 4.8-5.7.

HEAD. — Prementum almost as wide as long; ligula slightly protuberant with margin uneven to slightly crenulate. Labial palp pointed, with inner margin slightly crenulate.

THORAX. — Distal outer claw of pro- and mesotibia rather large.

ABDOMEN. — Widest at segment 4. Small lateral spines on segments 7-9; lateral spine on segment 9 reaching to about  $1/2$  length of segment 10. No middorsal processes. Epiproct and paraprocts of about the same length, cerci about  $5/6$  of that length.



Figs 56-60. *Austrogomphus (Austrogomphus) cornutus* Watson, E: (56) dorsal aspect; — (57) prementum, ventral aspect; — (58) labial palp (and details), ventral aspect; — (59) apex of pro- and mesotibia; — (60) abdominal segments 7-10, dorsal aspect.

*AUSTROGOMPHUS (AUSTROGOMPHUS) DODDI* TILLYARD

*Austrogomphus doddi* TILLYARD, 1909: 249

The larva of *A. doddi*, a species known only from north-eastern Queensland, is

still unknown. It is probably similar to that of *A. cornutus*.

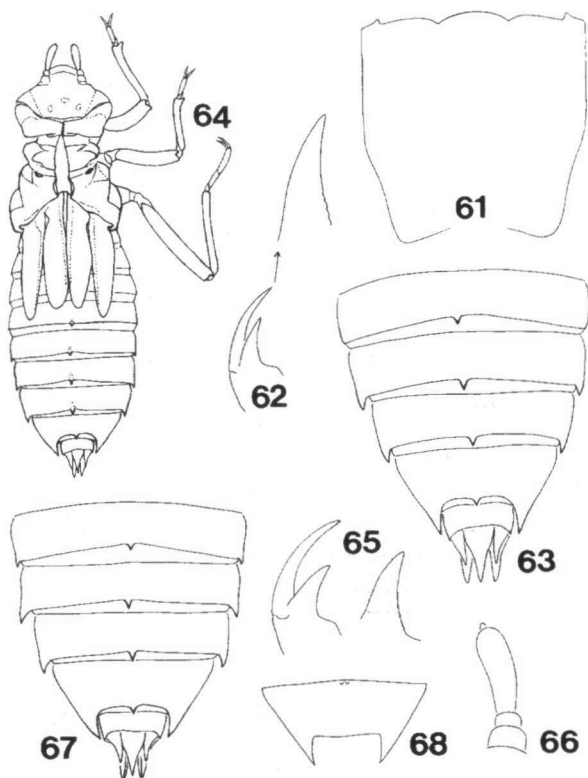
*AUSTROGOMPHUS (AUSTROGOMPHUS) GUERINI* (RAMBUR)

Figures 61-63

*Gomphus guerini* RAMBUR, 1842: 162

Identification by breeding out.

**Material.** — New South Wales: EE from Cobrabald R. (26 km S Walcha) and Medlow (Blue Mts). Victoria: EE from Gisborne. Tasmania: E from Launceston.



Figs 61-63. *Austrogomphus (Austrogomphus) guerini* (Rambur), E: (61) prementum, ventral aspect; — (62) labial palp (and detail), ventral aspect; — (63) abdominal segments 6-10, dorsal aspect. Figs 64-68. *Austrogomphus (Austrogomphus) ochraceus* (Selys), E: (64) dorsal aspect; — (65) labial palp (and detail), ventral aspect; — (66) antenna; — (67) abdominal segments 6-10, dorsal aspect; — (68) abdominal segment 9, ventral aspect.

**Previous descriptive information.** — An illustration of the entire larva was presented by O'FARRELL (1970), WATSON & O'FARRELL (1991) and WATSON et al. (1991). HAWKING (1986) keying the dragonfly larvae of the River Murray system, provided an illustration of the head (dorsal view).

**Measurements** (in mm). — Total length 20.0-23.2; length of metafemur 4.7-5.1; greatest width of abdomen 6.6-7.1.

**HEAD.** — Prementum almost as wide as long.

**THORAX.** — Distal outer claw of pro- and mesotibia small.

**ABDOMEN.** — Widest at segments 4 and 5. Lateral spines on segments 7-9; lateral spine on segment 9 reaching to or slightly beyond end of seg-

ment 10. Short stout middorsal spines on segments 3-9 or 4-9. Epiproct slightly shorter than paraprocts; cerci about 2/3 length of paraprocts.

*AUSTROGOMPHUS (AUSTROGOMPHUS) OCHRACEUS (SELYS)*

Figures 64-68

*Hemigomphus ochraceus* SELYS, 1869: 24

Identification by breeding out.

**Material.** — Queensland: EE from Mt Tamborine. New South Wales: EE and LL from Cataract R. (at Wilson-Appin Rd), Illawarra, Mogo Ck nr Popran Ck, Nepean R. (Malden Bridge), St Albans (McDonald R.) and from Woronora R. (nr Heathcote). Victoria: EE from Kiewa R.

**Previous descriptive information.** — HAWKING (1986) keying the dragonfly larvae of the River Murray system, provided an illustration of the head (dorsal view).

**Measurements** (in mm). — Total length 19.2-21.6; length of metafemur 4.9-5.4; greatest width of abdomen 6.3-7.0.

**HEAD.** — Prementum almost as wide as long.

**THORAX.** — Distal outer claw of pro- and mesotibia substantial.

**ABDOMEN.** — Widest at segments 4 and 5. Lateral spines on segments 3-, 4-, 5-, or 6-9; lateral spine on segment 9 reaching from close to, to well beyond end of segment 10. Generally small, slim middorsal spines on segments 4-9, sometimes absent on up to several segments (see comment below). Epiproct slightly shorter than paraprocts; cerci about 2/3 length of paraprocts.

**Comment.** — The larva of *A. ochraceus* appears to be extremely variable. Material known from parts of Queensland and from New South Wales shows strong middorsal and moderate lateral abdominal armature, material from the Cooloola area in Queensland shows weak middorsal and strong lateral abdominal armature, whereas both middorsal and lateral abdominal armature are rather poorly developed in individuals from Victoria.

*AUSTROGOMPHUS (AUSTROGOMPHUS) PUSILLUS SJÖSTEDT*

*Austrogomphus pusillus* SJÖSTEDT, 1917: 13

The larva of *A. pusillus*, a species known only from Noonkanbah Station in the Kimberley region of north-western Australia, is still unknown.

SUBGENUS *PLEIOGOMPHUS* WATSON

*Pleiogomphus* WATSON, 1991: 410 (subgenus of *Austrogomphus*)

**Type species:** *Hemigomphus amphilitus* Selys, 1873

WATSON (1991) recorded four species of *Austrogomphus* (*Pleiogomphus*). We have safely identified larvae of *A. amphilitus* and *A. bifurcatus* and we may have larvae of the remaining two species. The larvae of *A. amphilitus* and *A. bifurcatus* can be distinguished from each other, but all available material other than *A. amphilitus* from north-eastern Queensland appears rather uniform and at the present inseparable from *A. bifurcatus*.

**HEAD.** — Prementum about as wide as long; ligula slightly protuberant, with margin finely crenulate. Labial palp almost straight, pointed, with inner margin only somewhat uneven. Postocular lobe protuberant.

**THORAX.** — Distal outer claw of pro- and mesotibia very small or absent. Wing sheaths reaching well beyond end of segment 4.

**ABDOMEN.** — Widest at segments 4 and 5. Short lateral spines on segments 3-9, those on segments 3-6 very small; lateral spine on segment 9 very wide and very closely adjacent to lateral margin of segment 10. Small middorsal spines on segments 3- or 4-9. Paraprocts slightly longer than epiproct, cerci slightly more than 3/4 length of paraprocts.

*AUSTROGOMPHUS (PLEIOGOMPHUS) AMPHILITUS (SELYS)*

Figures 69-75

*Hemigomphus amphilitus* SELYS, 1873: 30

*Austrogomphus risi* MARTIN, 1901: 232

**Identification by breeding out.**

**Material.** — Queensland: EE from Elaman Ck & Little Yabba Ck (Kenilworth), from Emu Ck S. F. and from Fitzroy R. (at Edungalba). New South Wales: EE from Nepean R. (Maldon Bridge) and from Pallal.

**Previous descriptive information.** — None.

**Measurements** (in mm). — Total length 21.5-22.5; length of metafemur 5.1-5.4; greatest width of abdomen 6.1-6.6.

**THORAX.** — Distal outer claw of pro- and mesotibia very small.

**ABDOMEN.** — Middorsal spines on segments 3-9, that on 8 almost as large as lateral spines of 8.

*AUSTROGOMPHUS (PLEIOGOMPHUS) BIFURCATUS TILLYARD*

Figures 76-78

*Austrogomphus bifurcatus* TILLYARD, 1909: 244

**Identification by regional association.**

**Material.** — Queensland: E from Birthday Ck (Paluma Dam nr Mt Spec).

Previous descriptive information. — None.

Measurements (in mm). — Total length 21.5; length of metafemur 4.8; greatest width of abdomen 6.6.

THORAX. — Distal outer claw of protibia hardly, of mesotibia not at all detectable.

ABDOMEN. — Middorsal spines on segments 4-9, that on 8 markedly smaller than lateral spines of 8.

*AUSTROGOMPHUS (PLEIOGOMPHUS) DIVARICATUS* WATSON

*Austrogomphus (Pleiogomphus) divaricatus* WATSON, 1991: 418

Larval material of *A. divaricatus* is either still unavailable or at this stage inseparable from *A. bifurcatus*.

*AUSTROGOMPHUS*  
(*PLEIOGOMPHUS*)  
*PRASINUS* WATSON

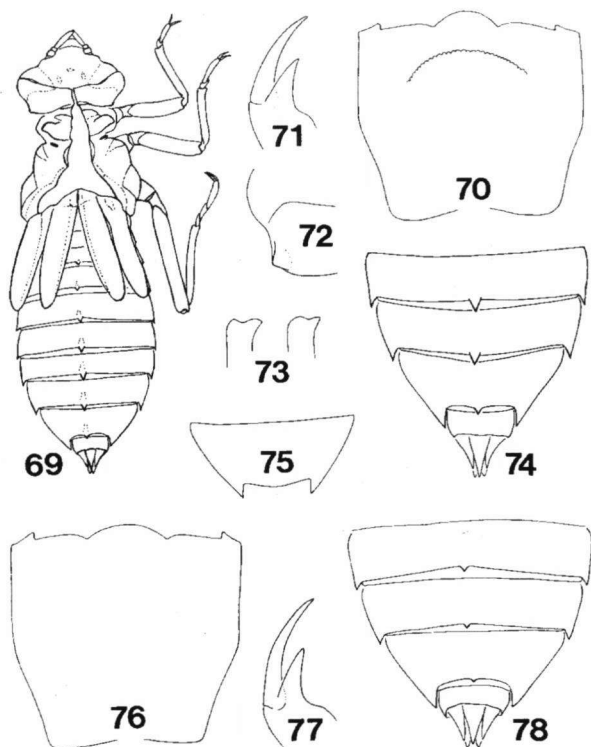
*Austrogomphus*  
*prasinus* TILL-  
YARD, 1906:  
552

Larval material of *A. prasinus* is either still unavailable or at this stage inseparable from *A. bifurcatus*.

SUBGENUS  
*ZEPHYROGOMPHUS*  
WATSON

*Zephyrogomphus*  
WATSON, 1991:  
432 (subgenus of  
*Austrogomphus*)

Type species: ?*Hemigomphus lateralis* Selys, 1873



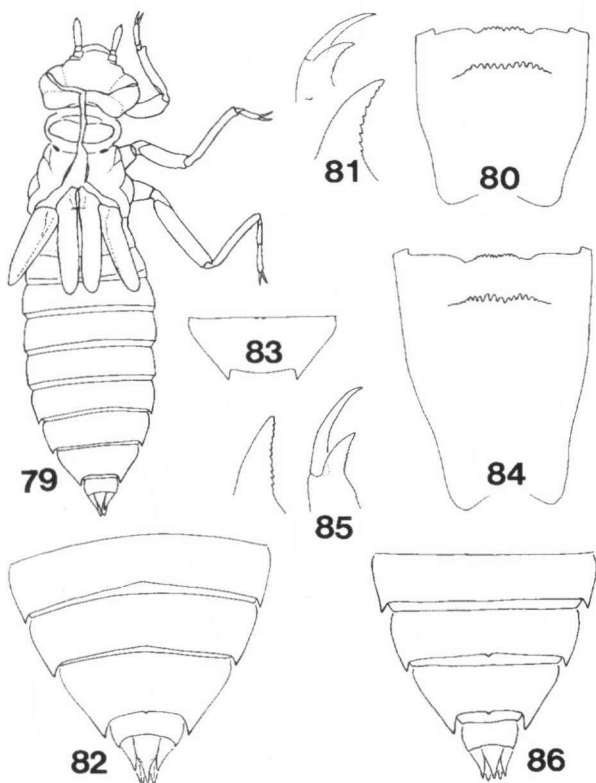
Figs 69-75. *Austrogomphus (Pleiogomphus) amphiclitus* (Selys), E: (69) dorsal aspect; — (70) prementum (and details), ventral aspect; — (71) labial palp, ventral aspect; — (72) postocular region, dorsal aspect; — (73) apex of pro- and mesotibia; — (74) abdominal segments 7-10, dorsal aspect; — (75) abdominal segment 9, ventral aspect. Figs 76-78. *Austrogomphus (Pleiogomphus) bifurcatus* Tillyard, E: (76) prementum, ventral aspect; — (77) labial palp, ventral aspect; — (78) abdominal segments 7-10, dorsal aspect.

WATSON (1991) established the subgenus *Zephyrogomphus* for *Austrogomphus lateralis* from south-western Australia. The subgenus was supposed to be monotypic. On the evidence of larvae clearly displaying the morphological characters of *Zephyrogomphus* but identified by supposition as those of *Odontogomphus longipositor*, this species is provisionally transferred here to *Austrogomphus* and placed in the subgenus *Zephyrogomphus*. A similar vicariance between a south-western Australian species, *Lathrocordulia metallica* Tillyard, and one from north-eastern Queensland, *L. garri-soni* Theischinger & Watson, was recorded by WATSON et al. (1991).

**HEAD.** — Prementum longer than wide; ligula slightly bilobed, its margin with well defined, sometimes irregularly shaped and spaced teeth. Labial palp slightly curved, pointed, with regular series of teeth along inner margin.

**THORAX.** — Distal outer claw of pro- and mesotibia small.

**ABDOMEN.** — Lateral spines on segments 7-9; lateral spine on segment 9 reaching to about 1/2 length of segment 10. Middorsal processes present or absent. Segment 9 short, its ventral basal width : midventral length ca. 2.5-2.6. Segment 10 about twice as wide as long.



Figs 79-83. *Austrogomphus* (*Zephyrogomphus*) *lateralis* (Selys), E: (79) dorsal aspect; — (80) prementum (and detail), ventral aspect; — (81) labial palp (and detail), ventral aspect; — (82) abdominal segments 7-10, dorsal aspect. Figs 84-86. ?*Austrogomphus* (?*Zephyrogomphus*) *longipositor* (Watson), E: (84) prementum (and detail), ventral aspect; — (85) labial palp (and detail), ventral aspect; — (86) abdominal segments 7-10, dorsal aspect.



*AUSTROGOMPHUS (ZEPHYROGOMPHUS) LATERALIS (SELYS)*

Figures 79-83

*?Hemigomphus lateralis* SELYS, 1873: 57*Austrogomphus occidentalis* TILLYARD, 1908: 729

Identification by breeding out.

Material. — Western Australia: EE from Bull Ck (at Riverton).

Previous descriptive information. — WATSON (1962) keying the dragonfly larvae of south-western Australia, illustrated the entire insect.

Measurements (in mm). — Total length 21.0-22.4; length of metafemur 3.9-4.2; greatest width of abdomen 5.8-6.3.

HEAD. — Prementum about 1.1 times as long as wide; ligula with about 4 or 5 larger teeth and some small crenulations each side of midline. Labial palp curved, pointed, with inner margin denticulate (about 12 teeth).

THORAX. — Distal outer claw of pro- and mesotibia small. Wing sheaths reaching to end of abdominal segment 3.

ABDOMEN. — Widest at segments 5 and 6. A minute middorsal spine may be present on segment 9. Epiproct slightly shorter than paraprocts; cerci about 3/4 length of paraprocts.

*?AUSTROGOMPHUS (?ZEPHYROGOMPHUS) LONGIPOSITOR (WATSON)*

Figures 84-86

*Odontogomphus longipositor* WATSON, 1991: 337

Identification by supposition.

Material. — Queensland: E from Paluma (Mt Spec); small larvae from 16 km on Davies Ck Rd (E of Mareeba).

Previous descriptive information. — None.

Measurements (in mm). — Total length 21.0; length of metafemur 4.0; greatest width of abdomen 6.0.

HEAD. — Prementum about 1.4 times as long as wide; ligula with about 6 larger teeth and some minor crenulations each side of midline. Labial palp slightly curved, pointed, inner margin with 10-11 teeth.

THORAX. — Notal lobe of prothorax widely rounded. Distal outer claw of pro- and mesotibia hardly detectable. Wing sheaths reaching to about the end of abdominal segment 4.

ABDOMEN. — Widest at segment 5. Very small middorsal cones on segments 8 and 9. Epiproct and paraprocts subequal in length, cerci slightly shorter.

SUBGENUS *AUSTROEPIGOMPHUS* FRASER

*Austroepigomphus* FRASER, 1951: 254

**Type species:** *Onychogomphus praeruptus* Selys, 1857

WATSON (1991) recorded two species under *Austrogomphus* (*Austroepigomphus*) but he considered the status of *A. praeruptus* as uncertain. We know only the larva of *A. melaleuca*.

Characters given below, under *A. melaleuca*.

*AUSTROGOMPHUS (AUSTROEPIGOMPHUS) MELALEUCAE* TILLYARD

Figures 87-93

*Austrogomphus melaleuca* Tillyard, 1909: 241

Identification by regional association.

**Material.** — New South Wales: EE from Sydney.

Previous descriptive information. — None.

**Measurements** (in mm). — Total length 22.0-23.0; length of metafemur 4.4-4.8; greatest width of abdomen 6.0-6.3.

**HEAD.** — Prementum slightly longer than wide; ligula rather strongly protuberant, with margin finely and almost regularly denticulate (fewer than 30 denticles). Labial palp slightly curved, bluntly pointed, with inner margin crenulate to denticulate. Postocular lobe angulated or protuberant.

**THORAX.** — Distal outer claw of pro- and mesotibia hardly detectable. Wing sheaths reaching to about the end of segment 4.

**ABDOMEN.** — Widest at segments 5 and 6; with middorsal keel. Lateral spines on segments 5-9; lateral spine on segment 9 reaching to about 1/3 length of segment 10. Middorsal spines on segments 2-9, those on segments 2 and 3 very small. Segment 9 elongate, its ventral basal width : midventral length ca. 1.8-1.9. Segment 10 elongate, not much wider than long, basally not much wider than apically. Paraprocts slightly longer than epiproct; cerci about 3/4 length of paraprocts.

SUBGENUS *XEROGOMPHUS* WATSON

*Xerogomphus* WATSON, 1991: 424 (subgenus of *Austrogomphus*)

**Type species:** *Austrogomphus turneri* Martin, 1901

WATSON (1991) placed two species in *Austrogomphus* (*Xerogomphus*). They are: *A. gordonii*, known from the north-west of Western Australia and from inland

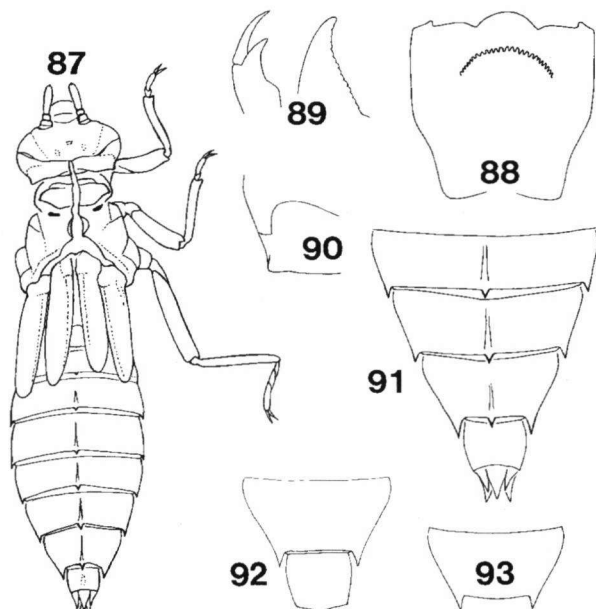
Australia in Northern Territory, and *A. turneri*, known from the Kimberleys, the "Top End" of Northern Territory, Cape York Peninsula and eastern Queensland. Their larvae are very similar but can be separated from each other by geographical exclusion (see above) and by morphological characters.

**HEAD.** — Prementum slightly longer than wide; margin of ligula with at least 40 fine denticles. Labial palp slightly curved, bluntly pointed, with inner margin almost smooth to finely crenulate.

Postocular lobe somewhat angulated.

**THORAX.** — Distal outer claw of pro- and mesotibia small. Wing sheaths reaching to about end of segment 4.

**ABDOMEN.** — Widest at segments 5 and 6; segments 6-9 middorsally keeled. Lateral spines on segments 6-9. Middorsal spines on segments 2-9, those on segments 2 and 3 very small. Segment 9 elongate, its ventral basal width : midventral length 1.7-1.8. Segment 10 basally markedly wider than apically. Paraprocts markedly longer than epiproct; cerci slightly longer than epiproct.



Figs 87-93. *Austrogomphus (Austroepigomphus) melaleucae* Tillyard, E: (87) dorsal aspect; — (88) prementum (and detail), ventral aspect; — (89) labial palp (and detail), ventral aspect; — (90) postocular region, dorsal aspect; — (91) abdominal segments 7-10, dorsal aspect; — (92) abdominal segments 9 and 10, ventral aspect; — (93) abdominal segment 9, ventral aspect.

#### *AUSTROGOMPHUS (XEROGOMPHUS) GORDONI* WATSON

Figures 94-100

*Austrogomphus gordonii* WATSON, 1962: 13

Identification by breeding out.

**Material.** — Western Australia: EE from Gascoyne Junction, Koomina Pool (Tambrey Station), Millstream Station (Fortescue R. at Roebourne Rd), Nanutarra Roadhouse (Ashburton R.), Rocky Pool (Gascoyne R.) and "2 Bend" Picnic Area (Murchison R.).

Previous descriptive information. — WATSON (1962) keying the dragonfly larvae of south-western Australia, figured the entire insect.

Measurements (in mm). — Total length 22.0-23.0; length of metafemur 4.2-4.5; greatest width of abdomen 6.1-6.4.

ABDOMEN. — Lateral spine on segment 9 reaching to at the most 1/5 length of segment 10. Segment 10 almost conical in outline, with lateral margin nearly straight.

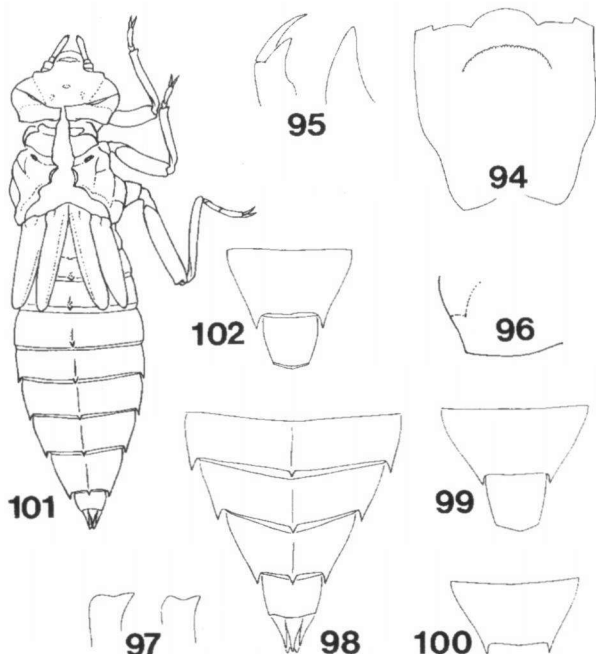
*AUSTROGOMPHUS (XEROGOMPHUS) TURNERI* MARTIN

Figures 101-102

*Austrogomphus turneri* MARTIN, 1901: 230

Identification by breeding out.

Material. — Northern Territory: EE from Amelia Spring, 54 km S by W Borroloola.



Figs 94-100. *Austrogomphus (Xerogomphus) gordonii* Watson, E: (94) prementum (and detail), ventral aspect; — (95) labial palp (and detail), ventral aspect; — (96) postocular region, dorsal aspect; — (97) apex of pro- and mesotibia; — (98) abdominal segments 7-10, dorsal aspect; — (99) abdominal segments 9 and 10, ventral aspect; — (100) abdominal segment 9, ventral aspect. Figs 101-102. *Austrogomphus (Xerogomphus) turneri* Martin, E: (101) dorsal aspect; — (102) abdominal segments 9 and 10, ventral aspect.

Previous descriptive information. — HAWKING (1993) keying the dragonfly larvae of the Alligator Rivers region, presented line drawings of morphological detail and a photograph of the entire insect.

Measurements (in mm). — Total length 19.0-20.0; length of metafemur 3.7-3.9; greatest width of abdomen 5.3-5.6.

ABDOMEN. — Lateral spine on segment 9 reaching to about 1/4 length of segment 10. Segment 10 barrel-shaped in outline, with lateral margins distinctly curved.

## DISCUSSION

In general the classification of the Aus-

tralian Gomphidae by WATSON (1991) based primarily on adults is supported on the evidence of the larval characters used in this paper. However, the known larvae of the *Austrogomphus* subgenus *Pleiogomphus* appear more similar to some typical *Austrogomphus* species (e.g. *A. (A.) ochraceus*) than some typical *Austrogomphus* species are to each other, and the larvae of the *Austrogomphus* subgenera

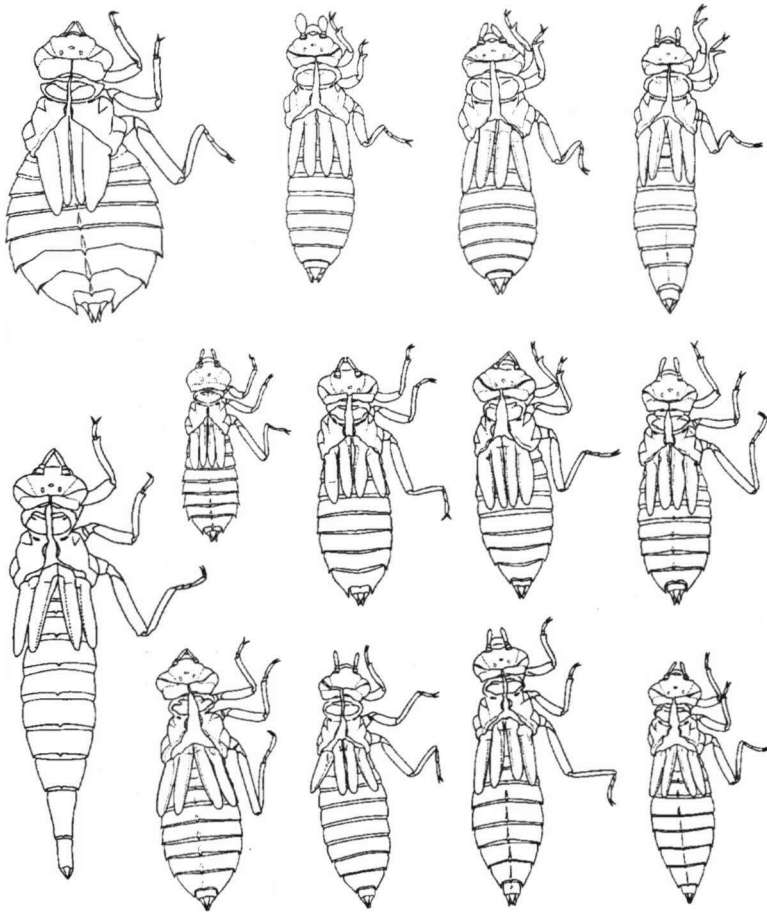


Fig. 103. Comparison of the known last instar larvae or exuviae representing the Australian gomphid taxa above species level: (first row) *Ictinogomphus australis*; – *Hemigomphus heteroclytus*; – *Odontogomphus donnellyi*; – *Armagomphus armiger*; – (second row) *Antipodogomphus hodgkini*; – *Austrogomphus (Austrogomphus) mjobergi* (*arbustorum* group, including *arbustorum* and *mjobergi*); – *A. (A.) australis* (*australis* group, including *australis* and *collaris*); – *A. (A.) cornutus* (*cornutus* group, including *cornutus* and *doddi*); – *A. (A.) ochraceus* (*guerini* group, including *guerini* and *ochraceus*); – (third row) *Austrogomphus (Pleiogomphus) amphiclitus*; – *Austrogomphus (Zephyrogomphus) lateralis*; – *Austrogomphus (Austroepigomphus) melaleuca*; – *Austrogomphus (Xerogomphus) turneri*.

*Austroepigomphus* and *Xerogomphus* appear markedly closer to each other than the adults. Characters of the supposed larva of *Odontogomphus longipositor* strongly suggest its preliminary inclusion in *Austrogomphus* (*Zephyrogomphus*) but only the discovery of the male of ?*A. (?Z.) longipositor* will make a confident decision on its systematic position possible.

KEY TO THE GENERA, SUBGENERA AND SPECIES OF KNOWN FINAL INSTAR GOMPHID LARVAE AND EXUVIAE OF AUSTRALIA

1. Abdomen broad, rounded, almost as wide as long (Fig.1) ..... genus *Ictinogomphus* 2
- Abdomen much longer than wide (e.g. Fig. 7) ..... 3
- 2(1). Known from the Pilbara region or further south in Western Australia ..... *I. dobsoni*
- Known from the Kimberley region in Western Australia, Northern Territory, Queensland or New South Wales ..... *I. australis*  
(the hitherto unknown larva of *I. paulini*, a species known only from the northern part of Cape York Peninsula would also key out here)
- 3(1). Ligula of prementum armed with two prominent denticles (e.g. Figs 8, 25) ..... 4
- Ligula not so armed (e.g. Figs 30, 34, 70, 80, 88, 94) ..... 7
- 4(3). Ligula usually protuberant, the two denticles rounded and close together (e.g. Fig. 8) ..... genus *Hemigomphus* 5
- Distal margin of ligula almost straight, the two denticles subtriangular and widely separated (Fig. 25) ..... *Odontogomphus donnellyi*
- 5(4). Known only from Northern Territory ..... *H. magela*
- Known from elsewhere in Australia ..... 6
- 6(5). Labial palp curved with apex bluntly pointed (Fig. 16); abdominal segments 7-9 with distinct, narrowly rounded, middorsal hump (Fig. 17) ..... *H. cooloola*
- Labial palp rather straight with apex rounded (e.g. Fig. 9); abdominal segments 7-9 with at most - low, usually widely rounded middorsal hump (Fig. 11) ..... *H. comitatus/gouldii/heteroclytus/theischingeri*  
[separation of this cluster at the present not possible even though moderately consistent differences in slenderness/stoutness of anal pyramid have been noted (Figs 12-15)]
- 7(3). Ligula of prementum strongly protuberant, semicircular (Fig. 30); fore- and middle tibia bearing strong, elongate distal outer claw (Fig. 32) ..... *Armagomphus armiger*
- Ligula of prementum less protuberant, not semicircular (e.g. Figs 34, 43); fore- and middle tibia armed with shorter distal outer claw, or unarmed (e. g. Figs 36, 59) .....  
..... (*Austrogomphus* group) 8
- 8(7). Abdominal segments 8-10 produced into long tube (Fig. 37) .. genus *Antipodogomphus* 9
- Abdominal segments 8-10 not so produced (e.g. Figs 45,74, 82, 91, 98) .....  
..... genus *Austrogomphus* 12
- 9(8). Segment 9 long (middorsal length 3.2 mm or more) ..... 10
- Segment 9 short (middorsal length not more than 2.8 mm) ..... 11
- 10(9). Lateral spines on abdominal segments 7-9 (but see comment under specific description) ..... *A. neophytus*
- Lateral spines on abdominal segments 7 and 8 only (Fig. 38) ..... *A. hodgkini*
- 11(9). Prementum almost as long as wide, ligula at the most slightly protruding (Fig. 34); labial palp sickle-shaped, end hook distinctly curved (Fig. 35) ..... *A. acolythus*
- Prementum much longer than wide, ligula strongly protruding (Fig. 39); labial palp subtriangular and almost straight, end hook only slightly curved (Fig. 40) ..... *A. dentosus*

- 12(8). Abdominal segment 9 elongate, its ventral basal width : midventral length ca 1.7-2.0 (Figs 93, 100); abdominal segment 10 almost as long as wide (Figs 92, 99, 102) ..... 13
- Abdominal segment 9 short, its ventral basal width : midventral length ca 2.8 (e.g. Figs 68, 75, 83); abdominal segment 10 much wider than long (e.g. Fig. 45) ..... 15
- 13(12). Fewer than 30 denticles along margin of premental ligula (Fig. 88); lateral spines on abdominal segments 5-9 (Fig. 87); abdominal segment 10 about as wide basally as apically (Fig. 92)..... *A. (Austroepigomphus) melaleuca*
- Well over 40 denticles along margin of premental ligula (Fig. 94); lateral spines on abdominal segments 6-9 (Fig. 101); abdominal segment 10 markedly wider basally than apically (Figs 99, 102) ..... subgenus *Xerogomphus* 14
- 14(13). Lateral spines of segment 9 reaching to at the most 1/5 length of segment 10; lateral margins of abdominal segment 10 almost straight (Fig. 99); known from the north-west of Western Australia and from inland Australia in Northern Territory ..... *A. (X.) gordonii*
- Lateral spines of segment 9 reaching to about 1/4 length of segment 10; lateral margins of abdominal segment 10 distinctly curved (Fig. 102); known from the Kimberley region in Western Australia, the "Top End" of Northern Territory, Cape York Peninsula and eastern Queensland ..... *A. (X.) turneri*
- 15(12). Postocular lobe angulated or protuberant (Fig. 72 ); lateral spines on abdominal segments 3-9, that on 9 very wide and very closely adjoining and parallel to outer margin of segment 10 (Figs 74, 78) ..... subgenus *Pleiogomphus*, 16
- Postocular lobe rounded or angulated; lateral spines on abdominal segments 3 (rarely)-, 4-, 5-, 6-, or 7-9, that on 9 narrower and less closely adjoining and not parallel to outer margin of segment 10 (e.g. Figs 63, 82) ..... 17
- 16(15). Middorsal spine on abdominal segment 8 about as large as lateral spines of segment 8 (Fig. 74) ..... *A. (P.) amphiclitus*
- Middorsal spine on abdominal segment 8 markedly smaller than lateral spines of segment 8 (Fig. 78)..... *A. (P.) bifurcatus*
- 17(15). Ligula of prementum slightly bilobed, its margin armed with series of well defined, sometimes irregularly shaped and spaced teeth (Fig. 80, 84) ..... subgenus *Zephyrogomphus* 18
- Ligula of prementum not bilobed, its margin only crenulate or weakly denticulate without well defined teeth (e.g. Figs 43, 53) ..... subgenus *Austrogomphus* 19
- 18(17). Prementum about 1.1 times as long as wide (Fig. 80); from Western Australia ..... *A.(Z.) lateralis*
- Prementum about 1.4 times as long as wide (Fig. 84); from north-eastern Queensland ..... *?A. (?Z.) longipositor*
- 19(17). Abdomen without middorsal armature (e. g. Fig. 56); distal claw of pro- and mesotibia almost as long as width of tibiae (Fig. 59) ..... *A. (A.) cornutus*
- Abdomen with middorsal armature (e.g. Fig. 46); distal claw of pro- and mesotibia markedly shorter than width of tibiae (e.g. Fig. 51)..... 20
- 20(19). Small species (not longer than 16 mm); apex of labial palp rounded (Figs 44, 48); known only from northern Australia (North of 24°S) ..... 21
- Larger species (longer than 18 mm); apex of labial palp rather pointed (e.g. Figs 54, 62); known only from more southern Australia (South of 23°S) ..... 22
- 21(20). Lateral spine of abdominal segment 9 reaching well beyond end of segment 10, middorsal spines on abdomen slim (Fig. 49) ..... *A. (A.) mjobergi*
- Lateral spine of abdominal segment 9 not reaching to end of segment 10, middorsal processes on abdomen stout (Fig. 45) ..... *A. (A.) arbustorum*
- 22(20). Middorsal abdominal processes absent or very short and rather stout; lateral margins of segment 9 slightly S-curved, thus lateral spines of abdominal segment 9 constricted before tip (Figs 52, 55) ..... 23
- Middorsal abdominal processes short but well developed or very small; lateral margins of

- segment 9 not S-curved, thus lateral spines of abdominal segment 9 not constricted before tip (Figs 63, 67) ..... 24
- 23(22). Known from Queensland, New South Wales, Victoria and South Australia ..... *A. (A.) australis*
- Known only from Western Australia ..... *A. (A.) collaris*
- 24(22). Lateral spines on abdominal segments 7-9 only (Fig. 63) ..... *A. (A.) guerini*
- Lateral spines on abdominal segments 3-, 4-, 5- or 6-9 (Fig. 67) ..... *A. (A.) ochraceus*

### ACKNOWLEDGEMENTS

I wish to acknowledge the opportunity to study some material prepared for this study by the late Dr J.A.L. WATSON. Mr J.H. HAWKING is thanked for making available some of the material bred out by him and his helpers. I also wish to thank ICI Botany Operations (Sydney) for technical support.

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