

Linzer biol. Beitr.	27/1	297-310	16.8.1995
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The *Eusynthemis guttata* (SELYS) group of species from Australia (Odonata: Synthemistidae)

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Abstract: What was hitherto known as *Eusynthemis guttata* (SELYS) is found to be a group of sibling species. The complex includes *E. guttata* (SELYS), *E. aurolineata* (TILLYARD) (formerly *E. guttata aurolineata*) and a previously undescribed species. These three species together with *Eusynthemis barbarae* (MOULDS) transferred from *Choristhemis* TILLYARD in this paper, and a previously undescribed species very close to *E. barbarae*, are considered to represent the *Eusynthemis guttata* (SELYS) group of species. The two new species are described as *Eusynthemis tillyardi* sp. n. and *E. tenera* sp. n., diagnostic characters and distributional data are given for all species of the group, and the zoogeography of the group is discussed. *Metathemis guttata melanosoma* TILLYARD is considered to be a junior synonym of *E. aurolineata* (TILLYARD).

Key words: *Eusynthemis guttata* group; Australia.

Introduction

SELYS (1871) described *Synthemis guttata* from "Nouvelle-Hollande" (= Australia). Under the same name, MARTIN (1901, 1907) reported the species from Victoria. Even though FÖRSTER (1903) established *Eusynthemis* (as a subgenus of *Synthemis* SELYS) based on *Synthemis brevistyla* SELYS, TILLYARD (1910) created the new genus *Metathemis* for *Synthemis brevistyla* SELYS, *S. guttata* SELYS, *S. nigra* TILLYARD and *S. virgula* SELYS. Under *Metathemis guttata*, TILLYARD (1910) supplemented SELYS' (1871) description and listed material from southern Queensland, New South Wales and Victoria. TILLYARD (1910) also studied the life history of what he considered to be this species from the Blue Mountains and proposed the name var. *pallida* for specimens from the Illawarra District in New South Wales. TILLYARD (1913a) described *Metathemis guttata aurolineata* from Dorrigo and Ebor in north-eastern New South Wales. TILLYARD (1913b) established *Metathemis guttata melanosoma* from Mount Tamborine in Queensland and, under *Metathemis guttata* (SELYS), he enumerated *M. guttata guttata*, *M. guttata* var. *pallida*, *M. guttata aurolineata* and *M. guttata melanosoma*. LIEFTINCK (1949) pointed out that *Metathemis* TILLYARD is a younger synonym of *Eusynthemis* FÖRSTER. FRASER (1960), HOUSTON WATSON (1988),

WATSON, THEISCHINGER & ABBEY (1991) and WATSON & HOUSTON (1994) followed TILLYARD (1913b) and LIEFTINCK (1949) without mentioning var. *pallida*. WATSON (1974) recorded the distribution of *Eusynthemis guttata* (SELYS) including but not recording separately the data for *E. guttata aurolineata* (TILLYARD) and *E. guttata melanosoma* (TILLYARD). WATSON, THEISCHINGER & ABBEY (1991) also pointed out and illustrated the great variability of *E. guttata aurolineata* (TILLYARD). From the evidence now available it appears that what was hitherto considered as *Eusynthemis guttata* (SELYS) is a south-eastern Australian group of sibling species. The recent discovery in the ANIC of an undescribed synthemistid requiring a comparison with *Choristhemis barbarae* MOULDS, finally revealed that these two species belong in *Eusynthemis* and represent what can be considered a north-eastern Australian component of the *E. guttata* group. All species considered to belong in the *Eusynthemis guttata* group have black intermediary plates in both wings of both sexes, almost identical secondary genitalia and female genitalia with valves small, medially adjoining with each other and directed ventrally, a combination of characters not shared by any other Australian species of *Eusynthemis*. They are treated in more detail below.

In the descriptions of the new species, the terminology follows CHAO (1953) and WATSON & O'FARRELL (1991).

The material referred to is held in the Australian Museum, Sydney (AM), in the Australian National Insect Collection, Canberra (ANIC), in the British Museum of Natural History, London (BMNH), in the Institut Royal des Sciences Naturelles de Belgique, Brussels (IRNB), in the Museum of Victoria, Melbourne (MV) and in the collection of the author (GT).

Other non-selfexplanatory abbreviations used in this paper:

appr.	approximately
Aust. Mus.	Australian Museum
ca	circa
Ck	Creek
c. u.	collector(s) unknown
ft	feet
km	kilometer
m	meter
mi.	miles
Mt(s)	Mount(ains)
No.	number
N. P.	National Park
nr	near
R.	River
S. F.	State Forest
s. l.	same locality

***Eusynthemis guttata* (SELYS) (Figs 1, 2)**

Synthemis guttata SELYS, 1871: 563.

Synthemis guttata SELYS; MARTIN, 1901: 227; MARTIN, 1907: 86.

Metathemis guttata (SELYS); TILLYARD, 1910: 36 (part).

Metathemis guttata guttata (SELYS); TILLYARD, 1913a: 575 (part); TILLYARD, 1913b: 231 (part).

Eusynthemis guttata guttata (SELYS); FRASER, 1960: 44 (part); WATSON, 1974: 146 (part); WATSON & THEISCHINGER, 1984: 153 (part); HOUSTON & WATSON, 1988: 107 (part); WATSON, THEISCHINGER & ABBEY, 1991: 235 (part); WATSON & HOUSTON, 1994: 28 (part).

Primary types. - Syntypes (♂, ♀): Nouvelle-Hollande (= Australia) (IRNB).

Diagnostic characters: Labium largely brownish black; front of synthorax and most of anteorar sinus uniformly brownish black to black; synthorax with long, pale, anterior pleural stripe usually engulfing metathoracic spiracle and markedly wider than the short, almost straight, pale posterior pleural stripe; dorsal lobe of metanepisternum largely yellow.

Material examined: New South Wales: 1♀, Bendora, A.C.T., 7.1.1968, M.S. Upton (ANIC); 1♀, Blundell's, A.C.T., 18.12.1931, Nicholson (ANIC); 2♂♂, 1♀, nr Brindabella Ra., A.C.T., 17.12.1994, G. Theischinger and L. Müller (GT); 1♂, 1♀, Diggers Ck, Mt Kosciusko, 12.1.1929, A. Musgrave (AM); 1♂, Jindabyne, Jan. 1906, c. u. (AM); 1♂, Lee's Spring, A.C.T., 4000 ft, 5.2.1969, Common and May (ANIC); 1♂, Mt Gingera, A.C.T., 5500 ft, 14.2.1968, M.S. Upton, 2♂♂, 2♀♀, s. l., 5.2.1969, Common and May (ANIC); 1♀, Mt Kosciusko, 1400-1700 m, 14.12.1994, G. Theischinger and L. Müller (GT); 2♂♂, Mt Kosciusko, 5000 ft, 18.1.1954, R. Dobson (ANIC); 2♂♂, Mt Kosciusko, nr Island Bend, 9.1.1982, G. Theischinger (GT); 3♂♂, 2♀♀, Sawpit Ck, 6.2.1973, L. Müller (GT); 1♂, Sawpit Ck, 3800 ft, 9.1.1929, A. Musgrave (AM); 2♂♂, 1♀, Sawpit Ck, Kosciusko N. P., 21.1.1987, G.J. and A. Holloway (AM); 1♂, 10 km N Thredbo, Kosciusko N. P., 22.1.1987, G.J. and A. Holloway (AM); 2♂♂, 1♀, No. 1 Ck, appr. 5 mi. ENE Thredbo, Kosciusko St. P., appr. 4000ft, 1.3.1969, J.A.L. Watson (ANIC); 1♀, Uriarra Forest, A.C.T., 24.12.1967, J.A.L. Watson (ANIC); 1♂, Wilsons Valley, Snowy Mts, 16.2.1963, D.K. McAlpine (AM). Victoria: 2♂♂, 4♀♀, Alexandra, Dec. 1906, c. u. (AM, ANIC); 1♂, Belgrave, 18.2.1949, A. B. (MV); 2♂♂, Cement Ck, 24.2.1987, G. Theischinger (GT); 1♂, Cement Ck, 2250 ft, 31.1.1953, A. B. (MV); 1♀, Cobungra, 30.1.1946, R.D. R. (MV); 1♂, Fire Pool, Bogong, 27.2.1983, J. Hawking (ANIC); 1♀, Gunyah, 9.1.1949, E. Horsfield (ANIC); 1♂, waterfalls nr Halls Gap, 20.2.1984, G. Theischinger (GT); 1♀, Irymple, Jan. 1959, H. Thomas (MV); 1♀, Kallista, 17.1.1947, A. B. (MV); 2♂♂, Millgrove, 27.3.1954, A. B. (MV); 2♂♂, between Mt Bogong and Tawonga, 31.12.1976, G. Theischinger and L. Müller (GT); 1♂, 1♀, Mt Buller, 3000 ft, 29.1.1956, F.E. Wilson (ANIC); 1♂, Mt Macedon, Jan. 1975, A. O'Farrell (ANIC); 1♂, Noojee, 22.1.1987, J.A.L. Watson (ANIC); 2♂♂, Owens Ck, 31.12.1976, G. Theischinger and L. Müller (GT); 1♂, Tea Tree Flat, Delegate R., 16.1.1991, G. Theischinger (GT); 1♂, Triple Falls, nr Beech Forest, Otways, 17.2.1984, G. Theischinger (GT).

***Eusynthemis tillyardi* spec. nov. (Figs 3, 4)**

Metathemis guttata (SELYS), var. *pallida* TILLYARD, 1910: 363.

Metathemis guttata guttata (SELYS); TILLYARD 1913a: 575 (part).

Metathemis guttata (SELYS), var. *pallida* TILLYARD; TILLYARD, 1913b: 232.

Eusynthemis guttata guttata (SELYS); FRASER, 1960: 44 (part); WATSON, 1974: 146 (part); WATSON & THEISCHINGER, 1984: 153 (part); HOUSTON & WATSON, 1988: 107 (part); WATSON, THEISCHINGER & ABBEY, 1991: 235 (part); WATSON & HOUSTON 1994: 28 (part).

Metathemis guttata (SELYS), var. *pallida* TILLYARD; TILLYARD, 1913b: 232.

Primary type. - **Holotype** ♂: New South Wales, Berowra Heights, 18.12.1976, G. Theischinger (ANIC). **Paratypes:** New South Wales: 1♂, 1♀, Berowra Creek, 11.12.1976, G. Theischinger (GT); 1♂, 1♀, same data as holotype (GT); 1♂, 1♀, Blackheath, Blue Mountains, 20.11.1949, 1♂, s. l., 30.11.1949, R. Dobson (ANIC); 1♀, Blue Mountains, Feb. 1908, c. u. (AM); 1♂, 1♀, Bowen Creek, Blue Mountains, 17.1.1977, G. Theischinger and L. Müller (GT); 1♂, Carrington Falls, Robertson, 27.11.1948, R. Dobson (ANIC); 1♂, Cowan, Dec. 1976, G. Theischinger (GT); 1♂, Govetts Leap, near Blackheath, Blue Mountains, Jan. 1993, G. Theischinger (GT); 1♀, Joe Craft Creek, Berowra, 22.2.1995, L. Müller (GT); 2♂♂, Kanangra Boyd, 11.2.1988, G. Theischinger (GT); 1♂, Kanangra Walls, Jan. 1980, G. Theischinger (GT); 1♂, Lawson, Blue Mountains, 27.11.1949, R. Dobson (ANIC); 1♂, Lily Vale, Apr. 1907, c. u. (AM), 1♂, s. l., March 1908, c. u. (ANIC); 3♂♂, just E of Lithgow, 5.12.1979, G. Theischinger and L. Müller (GT); 1♂, near Lithgow, 11.2.1988, G. Theischinger (GT); 1♂, Mount Canoblas, 5.12.1979, G. Theischinger and L. Müller (GT); 1♂, Mount Dromedary, near Narooma, 2100 ft, 4.2.1969, M.S. Upton and J. Cardale (ANIC); 1♂, North Sydney, 27.1.1912, R.J. Tillyard (AM); 1♂, Quart Pot Creek, 15 km W Batemans Bay, 27.4.1986, G. Theischinger (GT); 1♂, 2♀♀, Royal National Park, 8.3.1973, L. Müller (GT); 1♂, 1♀, St Ives, 12.12.1990, G. Theischinger and L. Müller (GT); 1♂, 1♀, Upper Kangaroo Valley, 18.4.1949, R. Dobson (ANIC); 1♀, Wentworth Falls, Blue Mountains, 18.11.1953, R. Dobson (ANIC); 1♀, Woodford, 14.11.1926, Mackerras (ANIC). Victoria: 1♂, between Mount Bogong and Tawonga, 31.12.1976, G. Theischinger and L. Müller (GT); 1♂, Ovens Creek, 31.12.1976, G. Theischinger and L. Müller (GT).

Diagnostic characters: Labium pale yellow; front of synthorax and most of antealar sinus uniformly brownish black to black; synthorax with long, pale, anterior pleural stripe not engulfing metathoracic spiracle and hardly wider than the long, curved, pale, posterior pleural stripe; dorsal lobe of metanepisternum largely yellow.

Name: TILLYARD (1910) named as "var. *pallida*" specimens from the Illawara District of New South Wales, which he thought belonged to *E. guttata* (SELYS), and expressedly allocated infrasubspecific status to the variety. However, as Tillyard's specimens of "var. *pallida*" and other material from New South Wales and Victoria belong to a previously undescribed species, this species is dedicated to the great man who established the framework of the Australian dragonfly fauna.

Male

Dimensions: Hindwing 29.4-34.2 mm (N= 5); abdomen 33.6-38.0 mm (N= 5).

Head: Labium pale yellow; mandibles brownish black; labrum black; anteclypeus pale yellow; postclypeus black with one greyish yellow patch on each side; frons black with two large yellow patches, taking more than upper two thirds of anterior portion and anterior half of posterior portion and separated widely along midline; vertex and antennae black; occiput largely brownish black above, yellow behind; postgenae black with large yellow lateral mark; compound eyes green in life, brown in preserved specimens.

Cervix and prothorax: Dorsal cervical sclerites yellow; dorsal portion of eucervicale largely blackish brown with bits of yellow, ventral portion largely greyish brown; postcervicale dark brown; episternum and epimeron blackish brown; pronotum largely blackish brown to black, except for anterior rim of anterior lobe and most of posterior lobe which are yellow; outer face of coxa yellow, remainder brown; trochanter yellow; basal portion of femur yellow, remainder black; tibia, tarsus and claws black; tibial keel greyish brown, ca 55% of tibial length.

Synthorax: Spiracular dorsum, mesostigmatic lamina and collar black; dorsal carina yellow; antearlar ridge black; antearlar sinus largely black; front of synthorax and mesokatepisternum reddish- to brownish black; mesopostcoxa greyish yellow; mesepimeron and metepisternum brownish black with long and rather narrow yellow stripe in front of, but not engulfing metathoracic spiracle; dorsal lobe of metanepisternum largely yellow; metepimeron black with strongly curved yellow stripe posteriorly from near subalar ridge to metapleural suture; metapostepimeron yellow; metapostcoxa and metapoststernum greyish brown; terga blackish brown except for postscutella which are yellow; coxae blackish brown in front, otherwise yellow; trochanters, femora, tibiae, tarsi and claws black; tibial keels blackish brown, on mesotibia ca 60%, on metatibia ca 65% of tibial length.

Wings: Membrane hyaline; veins black except for variably distinctive yellow median ray of costae; axillary, humeral and intermediary plates brownish black; antenodals 12-18/10-13; postnodals 8-11/10-13; Ax1, Ax3 and Ax5 in forewing and, beginning from Ax1, every second antenodal in hindwing distinctly thickened; other antenodals of first and second series mostly coinciding; pterostigmata 2,4-2,9 mm long, black, usually overlying 3-4 crossveins; sectors of arculus with long stalk; triangles free or crossed, subtriangle of forewing free; hypertriangles crossed by 1-3 veins; discoidal field of forewing with 1 or 2 cells adjacent to triangle, then 1 cell wide for a few cells, broadening to 10-15 cells at wing margin; discoidal field of hindwing starting with one row for a few cells, then broadening strongly to 9-13 cells at wing margin; 4-6 bridge crossveins; 2-3 crossveins in basal spaces; 4-6 cubito-anal crossveins; R4+5 and M almost parallel; anal loop of 7-12 cells, 3-5 cells wide, 2-3 cells deep; anal triangle 2-celled; anal angle rather obtuse; membranules pale greyish- to pale yellowish white.

Abdomen: Segments 1 and 2 subcylindrical, somewhat enlarged, segments 3-5 slightly compressed, from segment 6 to end of 8 widening progressively and slightly depressed, narrowing again towards apex. Tergites 1-9 black, marked with yellow as follows: 1, small medial postero-dorsal spot, one antero-ventral mark each side; 2, two small almond-shaped medio-dorsal spots on supplementary transverse carina, auricles, a broad patch each side along ventral margin; 3, one semicircular antero-lateral mark each side connected with narrow line along ventral margin, two medio-dorsal marks along transverse carina and connected along midline; 4 and 5, much as 3, but antero-lateral mark smaller and much more broadly connected with line along ventral margin;

6 and 7, much as 5, but antero-ventral patch completely ventral and tapering into narrow line along ventral margin, and, medio-dorsal spots completely separated by black midline; 8, two large medio-dorsal marks along transverse carina, one broad antero-ventral patch each side covering 2/3 length of segment; 9, one semicircular latero-ventral patch each side covering 1/2-2/3 length of segment, occasionally two very small, widely separated, antero-dorsal spots; segment 10 black; sternite 1 greyish-brown; secondary genitalia largely black, with bits of yellow; sternites 3-9 and bipartite sternite 11 black.

Anal appendages: Superior appendages black, slightly and evenly curved, convergent, a small lateral tooth at about 1/3 length; inferior appendage black, nearly as long as superiors, truncate, slightly arched, two small dorsal teeth each side of the broad apex.

Female

Dimensions: Hindwing 32.5-36.0 mm (N=5); abdomen 33.0-39.0 mm (N=5).

Head: Much as in male; frons with the two large yellow patches usually somewhat more widely separated and thus smaller.

Cervix, prothorax and synthorax: Much as in male.

Wings: Much as in male; membrane slightly infuscated before first strengthened antenodal in costal and subcostal space; yellow ray of costae very inconspicuous or absent; antenodals 15-18/11-13; postnodals 9-13/10-15; pterostigmata 2.5-3.3 mm long; subtriangle of forewing free or crossed; discoidal field of forewing usually 2 cells wide for 7-10 cells, broadening to 11-13 cells at wing margin; discoidal field of hindwing usually 2 cells wide for about 5 cells, widening to 11-15 cells at wing margin; anal loop 9-14 cells, 4-5 cells wide, usually 3 cells deep; no anal angle.

Abdomen: Much as in male; shape more uniformly subcylindrical; tergite 2 without auricles, yellow almond-shaped medio-dorsal spots more widely separated and larger; tergite 3 with yellow medio-dorsal marks not connected along midline; tergites 4-7 more similar to tergite 3; tergite 9 without yellow antero-dorsal spots; anal appendages short and straight; supra-anal plate black; sternites largely black.

Genitalia: Black; valves poorly developed; valves medially adjoining with each other and pointing ventrally.

Larva

The larvae from Leura, Blue Mountains, described under *Metathemis guttata* by TILLYARD (1910) can only belong to *E. tillyardi* sp. n. A diagnosis of the larva is not possible at the present.

***Eusynthemis aurolineata* (TILLYARD), stat. nov. (Figs 5-8)**

Metathemis guttata aurolineata TILLYARD, 1913a: 575.

Metathemis guttata melanosoma TILLYARD, 1913b: 231.

Eusynthemis guttata aurolineata (TILLYARD); FRASER, 1960: 44; KIMMINS, 1968: 295; WATSON, 1974: 146; WATSON & THEISCHINGER, 1984: 153; HOUSTON & WATSON, 1988: 107; WATSON, THEISCHINGER & ABBEY, 1991: 234; WATSON & HOUSTON, 1994: 28.

Eusynthemis guttata melanosoma (TILLYARD); FRASER, 1960: 44; KIMMINS, 1968: 298; WATSON, 1974: 146; HOUSTON & WATSON, 1988: 107; WATSON, THEISCHINGER & ABBEY, 1991: 235; WATSON & HOUSTON, 1994: 28.

Primary Types: Lectotype ♂ of *Metathemis guttata aurolineata* TILLYARD: New South Wales, Dorrigo, 4.12.1911, R.J. Tillyard (BMNH). Lectotype ♂ of *Metathemis guttata melanosoma* TILLYARD: Queensland, Tambourine, 24.12.1912, R.J. Tillyard (BMNH).

Diagnostic characters: Labium yellow; front of synthorax black or black with yellow stripe of variable length and width each side, antearlar sinus from entirely black to largely yellow; synthorax with long, pale, anterior pleural stripe engulfing metathoracic spiracle and markedly wider than pale posterior pleural stripe; dorsal lobe of metanepisternum largely yellow.

In the description of *Metathemis guttata melanosoma*, TILLYARD (1913b) says that occasionally it approaches *M. g. aurolineata* in that some specimens possess a trace of the golden dorsal thoracic lines. Recently collected specimens from Goomburra State Forest, Queensland, show a great deal of variation in this and several other respects. There are individuals with and without yellow rays on the front of synthorax, individuals with largely black and with largely yellow antearlar sinus and with longer, more curved, and shorter, more straight, pale posterior pleural stripe of the synthorax. For these reasons and since I also collected *E. guttata melanosoma* in the Barrington Tops area, it is my opinion that *E. g. aurolineata* and *E. g. melanosoma* should not be considered as different subspecies, even though there are apparently also clear-cut populations. Populations of individuals with rather narrow separation of the two yellow patches on the frons and with rather large yellow patches on the front of the synthorax have been included under *E. g. aurolineata* by WATSON, THEISCHINGER & ABBEY (1991). As width of separation of the frontal patches and size of the synthoracic patches varies between individuals of this material and in cases approaches typical *E. aurolineata*, this view is maintained, at least for the present.

It appears that populations of *E. aurolineata* without and with narrow yellow rays on the front of synthorax occur in rainforests and wet sclerophyll forests, whereas populations with large yellow patches on the front of synthorax are mainly known from more open areas at high altitudes.

Material examined: Queensland: 1 ♀, Bon Accord Falls, Montville, 22.9.1955, R. Dobson (ANIC); 1 ♀, Bunya Mts, 14.2.1957, J. Kerr (MV); 1 ♂, 1 ♀, Elaman Ck and Little Yabba Ck, nr Kenilworth, 9.11.1976, G. Theischinger and L. Müller (GT); 6 ♂♂, Goomburra S. F., 20.1.1986, G. Theischinger and L. Müller (GT); 1 ♂, Kenilworth-Jimna, 15.1.1986, G. Theischinger & L. Müller (GT); 1 ♀, Killarney Falls, Dec. 1982, G. Theischinger and L. Müller (GT); 3 ♂♂, Little Yabba Ck, nr Kenilworth, 5.12.1976, G. Theischinger and L. Müller (GT); 1 ♂, Mt Tambo(u)rine, 21.12.1925, A. Musgrave and G.P. Whitley (AM), 1 ♀, s. l., 30.3.1950, A. B. (MV), 3 ♂♂, 1 ♀, s. l., 29.12.1954, R. Dobson (ANIC), 1 ♂, s. l., 26.11.1955, J. Kerr (MV), 1 ♂, s. l., 2.1.1956, C. King (MV); 1 ♂ (paratype of *M. g. melanosoma* TILL.), Tambourine, 8.12.1911, 1 ♂ (paratype of *M. g. melanosoma* TILL.), s. l., 11.12.1911, 1 ♂ (paratype of *M. g. melanosoma* TILL.), s. l., 21.12.1911, R.J. Tillyard (ANIC), 1 ♂ (paratype of *M. g. melanosoma* TILL.), s. l., 22.12.1912, 2 ♀♀ (paratypes of *M. g. melanosoma* TILL.), s. l., 24.12.1912, 1 ♂ (paratype of *M. g. melanosoma* TILL.), s. l., 27.12.1912, R.J. Tillyard (AM, ANIC), 1 ♂, s. l., 11.3.1953, 1 ♂, 1 ♀, s. l., 2.12.1953, D. Curtis (ANIC); 3 ♂♂, Upper Tullebudgera, 31.1.1965, A. O'Farrell (ANIC). New South Wales: 2 ♂♂, Barrington Tops, 8.1.1954, D. Sands (ANIC), 2 ♂♂, s. l., 7-8.12.1981, G. Theischinger and L. Müller (GT); 1 ♂, 1 ♀, Barrington Tops, 1500 m, 25.2.1990, G. Theischinger and L. Müller (GT); 1 ♂, Barrington Tops, Big Hole, 27.11.1979, G. Theischinger (GT); 1 ♂, Barrington Tops area, halfway up from Allyn R. Camping Ground, 10.1.1977, G. Theischinger (GT); 1 ♂, Bullock Ck, Grafton Rd, 6.2.1962, C.W. Frazier (ANIC); 1 ♂, Cathedral Rock N. P., Nov. 1990, G. Theischinger (GT); 1 ♀ (paratype of *M. g. aurolineata* TILL.), Dorrigo, 4.12.1911, 4 ♂♂, 1 ♀, (paratypes of *M. g. aurolineata* TILL.), s. l., 8.12.1911, R.J. Tillyard (AM, ANIC), 2 ♂♂ (paratypes of *M. g. aurolineata* TILL.), s. l., 11.12.1911, R.J. Tillyard (AM, ANIC), 1 ♀ (paratype of *M. g. aurolineata* TILL.), s. l., 15.12.1911, R.J. Tillyard (AM); 1 ♀, (paratype of *M. g. aurolineata* TILL.), Ebor, 21.12.1911, R.J. Tillyard (AM), 1 ♂ (paratype of *M. g. aurolineata* TILL.), s. l., 29.12.1911, R.J. Tillyard (ANIC), 1 ♂ (paratype of *M. g. aurolineata* TILL.), s. l., 30.12.1911, R.J. Tillyard (AM), 1 ♂ (paratype of *M. g. aurolineata* TILL.), s. l., 12.1.1912, R.J. Tillyard (ANIC); 1 ♂, Fenwicks Ck, Douglas R. S. F., 1050 m, 6.12.1986, G. Theischinger (GT); 2 ♂♂, Gara R., Armidale, 30.11.1962, C.W. Frazier (ANIC); 2 ♂♂, 1 ♀, Gloucester Tops, 1300 m, 2-3.12.1988, G. Theischinger and L. Müller (GT); 1 ♂, Manning R., 4100 ft, 16.1.1948, Aust. Mus. party (AM); 20 ♂♂, 4 ♀♀, Mt Kaputar, 3-4.1.1986, G. Theischinger (GT); 3 ♂♂, Mt Kaputar N. P., 12.10.1978, G. Daniels (AM); 3 ♂♂, 5 ♀♀, Mt Kaputar, Dawsons Swamp, 4800 ft, 23-28.1.1965, N.E.U. Exp. (ANIC); 2 ♂♂, New England N. P., nr entrance, 13.2.1963, C.W. Frazier (ANIC); 2 ♂♂, Norfolk Falls, Jan. 1993, G. Theischinger and L. Müller (GT); 3 ♂♂, Rocky Ck, 22 mi. E of Glen Innes, 22.12.1966, A. O'Farrell (ANIC); 2 ♂♂, Tenterfield, 27.12.1955, R. Dobson (ANIC); 2 ♂♂, 1 ♀, Tubrabucca, Barrington Tops, 27.12.1946, A.N. Burns (ANIC, MV), 1 ♀, s. l., 22.1.1948, R.J.M. P. and A. B. (MV); 1 ♂, "Tuglo", 48 km N Singleton, 3.12.1977, C.N. Smithers (AM); 1 ♂, Upper Manning R., 4200 ft, 9.1.1948, A. Musgrave and Aust. Mus. party (AM); 2 ♀♀, Upper Manning R., 4200 ft, 16.1.1948, A. Musgrave and Aust. Mus. party (AM); 1 ♂, 2 ♂♂, between Washpool Ck and Boonoo Boonoo R., NNO of Tenterfield, 7.11.1976, G. Theischinger and L. Müller (GT); 1 ♂, Wattle Flat, Styx R., 22.1.1964, A. O'Farrell (ANIC).

***Eusynthemis barbarae* (MOULDS) comb. nov. (Figs 9, 10)**

Choristhemis sp. No 3; WATSON, 1977: 278.

Choristhemis barbarae MOULDS, 1985: 113.

Choristhemis barbarae MOULDS; HOUSTON & WATSON, 1988: 105; WATSON, THEISCHINGER & ABBEY, 1991: 232; WATSON & HOUSTON, 1994: 28.

Primary type: Holotype ♂: Queensland, Mt Lewis, SW of Mossman, 10.12.1974, M.S. and B.J. Moulds (AM).

Diagnostic characters: Labium yellow with a substantial part of lateral lobes black; front of synthorax and antealar sinus black; synthorax with long pale anterior pleural stripe engulfing metathoracic spiracle and markedly wider than the short straight pale posterior pleural stripe; dorsal lobe of metanepisternum largely black; female with anterior portion of frons broadly black along midline; male with superior anal appendages rather long and straight; terminal segments of female abdomen markedly expanded.

Characters shared with *Eusynthemis guttata* group and not corresponding with *Choristhemis*: anal loop of 9-11 cells, often 3 cells deep in female; membranule of normal size, not vestigial; penis with ventral processes well spread and with apical portion basally wide and ending in long thin tip; female genitalia with valves poorly developed, medially adjoining with each other and pointing ventrally; base of male superior anal appendages laterally expanded, inferior appendage with two hook-like teeth each side of apex.

Material examined: Queensland: holotype ♂ (as above); 2 ♂ (paratypes), same data as holotype (ANIC); 1 ♀ (paratype), same data as holotype (AM); 1 ♀, Mt Lewis, 30 km in, near end of road, W of Mossman, 28.12.1989, 1 ♂, s. l., 29.12.1989, M.S. and B.J. Moulds (AM).

***Eusynthemis tenera* spec. nov. (Figs 11, 12)**

Primary type: Holotype ♀: Queensland, Myee Creek, 2100 ft, Palmerston National Park, 2.12.1967, R. Dobson (ANIC).

Diagnostic characters (female): Labium including lateral lobes pale yellow; anterior frons of female not black along midline; front of synthorax and antealar sinus black; synthorax with long pale anterior pleural stripe engulfing metathoracic spiracle and markedly wider than the short straight pale posterior pleural stripe; dorsal lobe of metanepisternum largely black; anal loop of 8 cells, 2 cells deep; terminal segments of abdomen hardly expanded.

Name: From Latin tener, -a, -um, meaning delicate.

Female

Dimensions: Hindwing 32.0 mm; abdomen 32.0 mm.

Head: Labium including lateral lobes pale yellow; mandibles greyish- to blackish brown; labrum black; anteclypeus largely greenish yellow, greyish brown along lateral and dorsal margins; postclypeus largely pale bluish green, a small subtriangular patch each side along dorsal margin close to midline and mesal corner of latero-ventral lobes blackish brown, ventral and dorsal margins narrowly greyish brown; anterior frons largely pale green merging into pale greyish brown along midline and ventral margin, top of frons brownish black; vertex and antennae black; occiput largely blackish brown on top, yellow behind; postgenae black with large yellow lateral mark; compound eyes dark brown in preserved specimen, probably green in life.

Cervix and prothorax: Dorsal cervical sclerites yellow; dorsal portion of eucervicale brown and yellow, ventral portion largely yellowish brown; postcervicale yellowish- to greyish brown; pronotum largely greyish- to blackish brown except for anterior lobe and extreme edge of posterior lobe which are yellow, and an orange streak each side on median lobe; anterior face of coxa yellow, remainder dark greyish brown; trochanter yellowish grey; basal portion of femur greyish yellow, remainder black; tibia, tarsus and claws black.

Synthorax: Spiracular dorsum, mesostigmatic lamina and collar black; dorsal carina yellow; antealar ridge and sinus black; front of synthorax and mesokatepisternum black; mesopostcoxa greyish yellow; mesepimeron and metepisternum black with long and rather wide yellow stripe in front of and engulfing metathoracic spiracle; dorsal lobe of metanepisternum largely black; metepimeron black with rather straight and narrow yellow stripe posteriorly from near subalar ridge to near metapleural suture; metapostepimeron yellow; metapostcoxa yellowish grey; metapoststernum dark brownish grey; terga greyish- to blackish brown except for yellow central portion of mesopostscutellum and for yellowish grey metapostscutellum; coxae yellowish grey to black; trochanters brownish black; femora, tibiae, tarsi and claws black.

Wings: Membrane hyaline, very slightly suffused with greyish- to greenish brown; veins black; axillary, humeral and intermediary plates black; antenodals 15/10-12; postnodals 10-11/13; Ax1, Ax3 and Ax5 in forewing and, beginning from Ax1, every second antenodal in hindwing distinctly thickened; other antenodals of first and second series mostly coinciding; pterostigma 2,1-2,2 mm long, black, overlying 3 crossveins; sectors of arculus with long stalk; triangle of both wings and subtriangle of forewing free; hypertriangle crossed by 2 veins in forewing, by 1-2 veins in hindwing; discoidal field of forewing with two rows of cells adjacent to triangle for two cells, then 1 cell wide for 4-5 cells, broadening to 11 cells at wing margin; discoidal cell of hindwing starting with 1 or 2 rows of cells for a few cells, then broadening strongly to approximately 11 cells at wing margin; 4-5 bridge crossveins; 3 crossveins in basal space of both wings; 6 cubito-anal crossveins in both wings; R4+5 and M almost parallel for much of their length but rather strongly divergent immediately before margin in forewing, roughly parallel in hindwing; anal loop of 8 cells, 4 cells wide, 2 cells deep; membranule pale greyish yellow in both wings, not vestigial.

Abdomen: Subcylindrical, with segments 1 and 2 and 8-10 very slightly expanded. Tergites 1-7 black, somewhat paler along ventral margin, marked with brownish yellow as follows: 2, two elongate medio-dorsal marks along supplementary transverse carina; 3-6, one antero-lateral mark each side and two medio-dorsal spots along transverse carina; 7, two medio-dorsal spots along transverse carina only indicated; tergites 8-10 black; sternite 1 greyish brown; sternites 2-11 black; supra-anal plate black; anal appendages black, very slender, subconical.

Genitalia: Black; valves poorly developed, medially adjoining with each other, pointing ventrally.

Male unknown.

Zoogeography

The taxonomic disjunctions in the *Eusynthemis guttata* group are probably the outcomes of pleistocene climatic fluctuations. It appears that the taxonomic units as recognized in this paper are or were at least at some stage isolated from each other by extensive regions lacking suitable freshwaters.

The present distribution of the species suggests an early splitting of an ancestral eastern Australian species into a northern and a southern component. *Eusynthemis barbarae* and *E. tenera*, each known only from a single locality in tropical Queensland, seem to be remnants of the probably formerly more widely spread northern species, whereas *Eusynthemis guttata*, *E. tillyardi* and *E. aurolineata* apparently derived from a species formerly widely spread in south-eastern Australia. *Eusynthemis aurolineata*, a species of the northern tablelands of New South Wales and some montane areas in south-eastern Queensland, is still completely separated by the Hunter River Valley from *E. tillyardi*, mainly a species of the Blue Mountains and associated ranges north and south-west of Sydney. *E. guttata* is a species of the southern highlands (mainly alpine). Along suitable corridors and rather recently, *E. tillyardi* possibly extended its range into the southern highlands, where it now coexists in places with *E. guttata*, and can be considered perialpine.

Acknowledgements

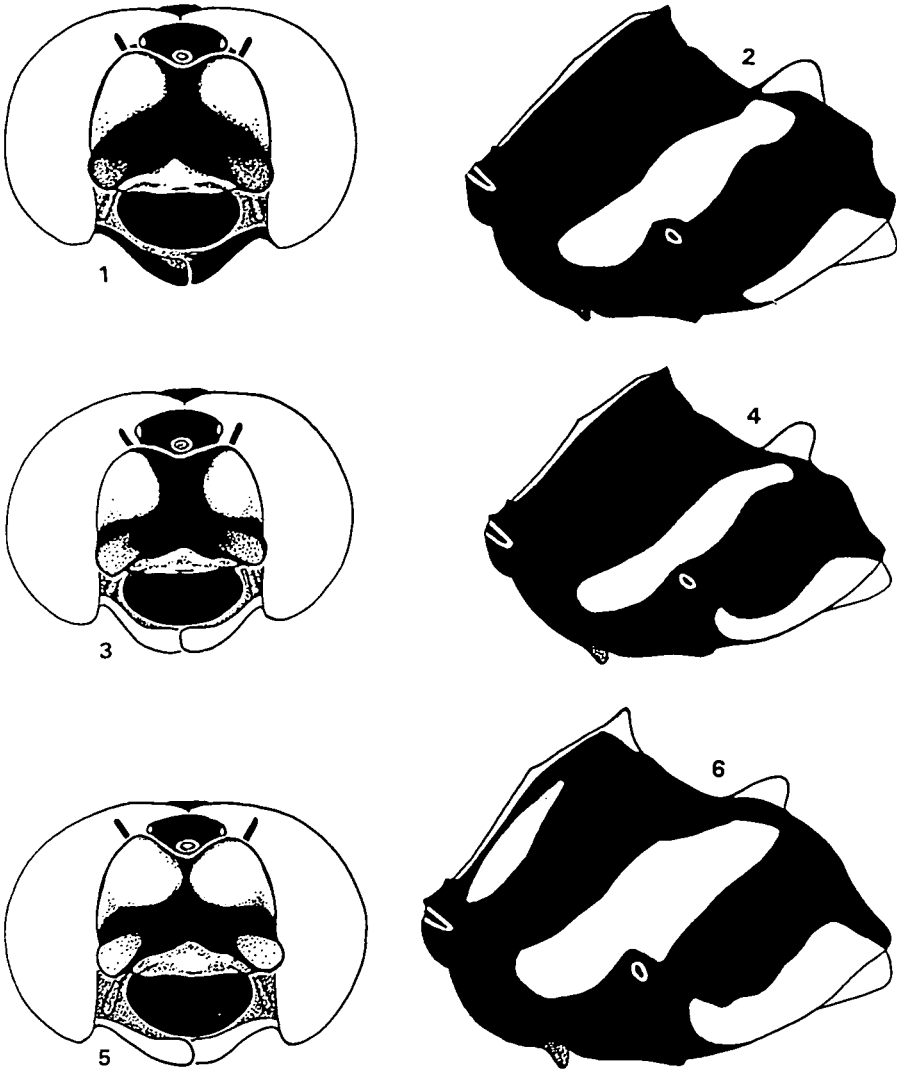
For giving me access to material in their care and for assistance in the field I wish to thank the following people: Mrs H.M. Abbey (Canberra), Mr B. Day, Mr M.S. Moulds and Mr L. Müller (Sydney).

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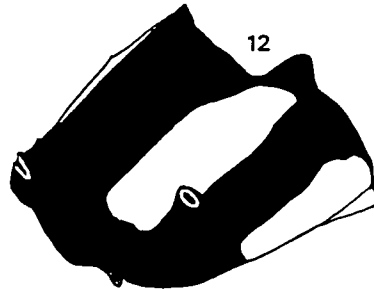
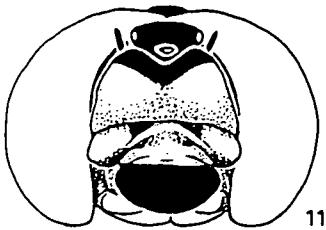
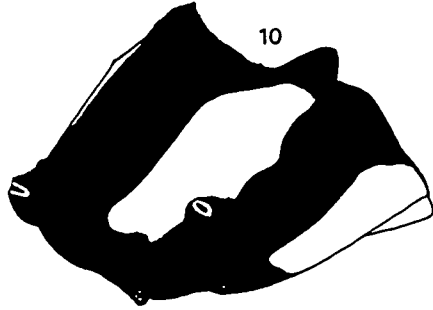
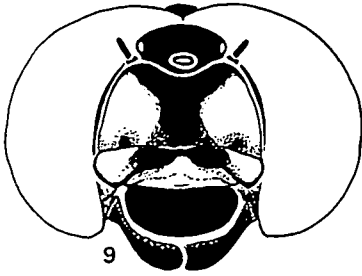
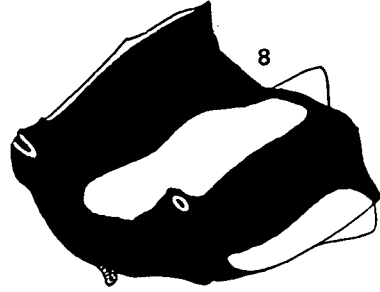
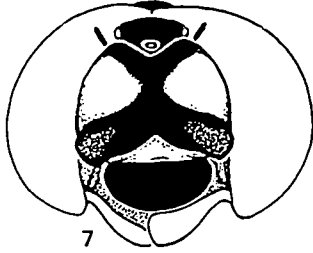
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Figs 1, 2: *Eusynthemis guttata* (SELYS), male. 1: head, frontal aspect; 2: synthorax, lateral aspect. Figs 3, 4: *Eusynthemis tillyardi* sp. n., male 3: head, frontal aspect; 4: synthorax, lateral aspect. Figs 5, 6: *Eusynthemis aurolineata* (TILLYARD), male, extremely pale form. 5: head, frontal aspect. 6: synthorax, lateral aspect.



Figs 7, 8: *Eusynthemis aurolineata* (TILLYARD), male, extremely dark form. 7: head, frontal aspect; 8: synthorax, lateral aspect. Figs 9, 10: *Eusynthemis barbarae* (MOULDS), female. 9: head, frontal aspect; 10: synthorax, lateral aspect. Figs 11, 12: *Eusynthemis tenera* sp. n., female. 11: head, frontal aspect; 12: synthorax, lateral aspect.