

*This contribution is dedicated  
to the memory of Prof. Dan Gerling  
a scientist, a colleague and a friend*

**Description of *Aleiodes (Hemigyroneuron) dangerlingi* n. sp.  
(Hymenoptera: Braconidae: Rogadinae) from New South Wales,  
Australia, and first description of female of *A. (H.) glandularis*  
Butcher & Quicke from South Africa**

DONALD L. J. QUICKE & BUNTIKA A. BUTCHER

*Integrative Ecology Laboratory, Department of Biology, Faculty of Science,  
Chulalongkorn University, Phayathai Road, Pathumwan, BKK 10330, Thailand.  
Center of Excellence in Entomology: Bee Biology, Diversity of Insects and Mites,  
Chulalongkorn University, Phayathai Road, Pathumwan, BKK 10330, Thailand.  
E-mail: d.quicke@email.com, buntika.a@chula.ac.th*

**ABSTRACT**

A new species *Aleiodes (Hemigyroneuron) dangerlingi* n. sp. (Hymenoptera: Braconidae: Rogadinae) from Australia (New South Wales) is described, illustrated and distinguished from other members of the subgenus. It is the second species of the subgenus known from Australia to date, and on the basis of its morphology is most closely related to *Aleiodes (H.) ellingsenae* Butcher & Quicke from Tasmania. The previously unknown female of *A. (H.) glandularis* Butcher & Quicke from South Africa is also briefly described and illustrated.

**KEYWORDS:** Braconidae, Rogadinae, *Aleiodes*, *ellingsenae*, *glandularis*, parasitoid wasp, Australia, New South Wales, new species, species richness.

**INTRODUCTION**

The Rogadinae (Hymenoptera: Braconidae) are a huge and cosmopolitan subfamily of parasitoid wasps, numerically dominated by the also cosmopolitan genus *Aleiodes* Wesmael (Quicke 2015). *Hemigyroneuron* Baker was originally described as a separate genus based on a single species from the Philippines, which possesses highly derived fore wing venation with the subbasal cell greatly expanded distally (Baker 1917). Van Achterberg (1991), Chen & He (1997) and Quicke & Shaw (2005) all retained *Hemigyroneuron* as a separate genus, and van Achterberg (1991) also described a similar genus, *Pholichora* van Achterberg, 1991, from Africa. Based on the DNA sequence data Zaldivar-Riverón *et al.* (2009) showed that both *Hemigyroneuron* and *Pholichora* are derived within *Aleiodes*, though they were recovered separately in the best trees, and accordingly synonymised them under *Aleiodes* as separate subgenera. Butcher & Quicke (2011) revised the species of this group, and formally synonymised *Aleiodes (Pholichora)* with *Aleiodes (Hemigyroneuron)* based on their morphology. Unpublished molecular data support a hypothesis that these wasps form a rather basally-derived clade within a larger

grade that was previously often treated as the subgenus *Chelonorhogas* Enderlein, 1912.

To date, including the present study, *Aleiodes* (*H.*) is known from 29 species, from the Old World (Afrotropical, Oriental and Australasian), mostly from the tropics and subtropics, though species are also known from Southern China (Yunnan) (Chen & He 1997) just outside the subtropics, and Tasmania (Butcher & Quicke 2016) well into the South Temperate Zone; the subgenus has not been discovered as yet in the Americas. Here we describe a new species, also from the South Temperate Zone—Hat Head, New South Wales, Australia—which is the first record of the subgenus from mainland Australia. We also describe and illustrate the female of *A. (H.) glandularis* Butcher & Quicke, from South Africa for the first time.

*Aleiodes* (*H.*) may be recognised from other *Aleiodes* members, some with convergent wing venation, using the key by Butcher *et al.* (2012).

#### MATERIALS AND METHODS

Terminology follows van Achterberg (1988) except for wing venation nomenclature, which follows Sharkey & Wharton (1997); Quicke (2015: fig. 2.2) also compared wing venation naming systems.

Specimens were illustrated using an Olympus SXZ16 microscope with automated multiple image capture at preset focal levels using an Olympus DP72 camera, and image combination using the Cell<sup>^</sup>D image processing system.

The non-parametric Chao 1 estimator of total species richness (Chao 2005) employs the following equation:

$$\text{Predicted number} = \text{Observed number} + (\text{Number of singletons})^2 / 2 * \text{Number of doubletons}$$

The holotype will be deposited in the Australian National Insect Collection, Canberra, Australia (ANIC) and the paratype will be deposited in the Canadian National Collection of Insects, Ottawa, Canada (CNCO). The holotype of *A. glandularis* is deposited in South African National Collection of Insects, Pretoria, South Africa (SANC), the additional female reported here is in the collection of the Centre for Biodiversity Genomics, Guelph, Canada (CBDG).

#### TAXONOMY

Genus *Aleiodes* Wesmael, 1838

Subgenus *Hemigyron* Baker, 1917

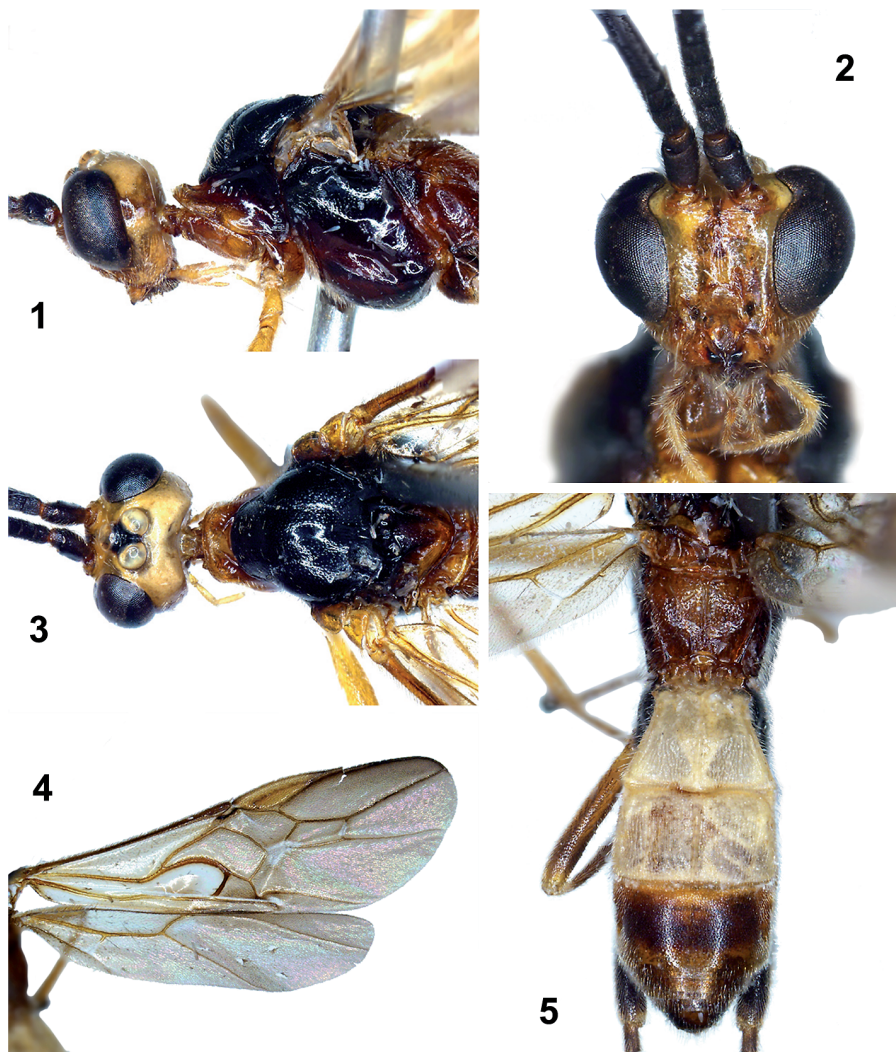
*Aleiodes dangerlingi* n. sp.

(Figs 1–5)

**LSID:** urn:lsid:zoobank.org:act:0C60FFED-BAFC-43FA-974C-19FB6C27C035.

**Etymology:** The species is named in tribute to the late Professor Dan Gerling of Tel Aviv University, who was an amazingly motivated entomologist particularly in the area of biological pest control.

**Diagnosis:** As with the Australian *Aleiodes* (*H.*) *ellingsenae* Butcher & Quicke, 2016, the new species keys easily in Butcher and Quicke (2011) to couplet 27, which leads to two species, viz. *A. (H.) bakeri* Butcher & Quicke, 2011, from Java, and *A. (H.) nigricans* (Chen & He, 1997) from China. Both Australian species differ markedly from these in coloration and morphology. *Aleiodes* (*H.*) *nigricans* is largely brown-black with red-brown markings on the mesopleuron



**Figs 1–5:** *Aleiodes* (*Hemigyrroneuron*) *dangerlingi* n. sp., female holotype: (1) head and thorax, lateral view; (2) head, front view; (3) head and thorax, dorsal view; (4) wings; (5) metanotum, propodeum and metasoma, dorsal view.

and mesosternum, red-yellow markings on the 1<sup>st</sup> metasomal tergite, and red-yellow legs; *A. (H.) bakeri* differs from both of these also in the shape of the distal expansion of the subbasal cell, which narrows almost immediately after the junction of vein 1-M. *Aleiodes (H.) ellingsenae* and *A. (H.) dangerlingi* n. sp. are also the only known species of their subgenus with forewing vein 1-CU1 strongly curved and running anteriorly distal to junction 1-M.

*Aleiodes (H.) dangerlingi* n. sp. differs from *A. (H.) ellingsenae* as follows (*ellingsenae* character states in parentheses): malar space shorter,  $0.25\times$  height of eye (0.3), approximately half as long relative to height of eye compare with *A. (H.) ellingsenae* (Butcher & Quicke 2016: fig. 1A); head evenly rounded behind eyes (bisinuous; Butcher & Quicke 2016: fig. 1D); occipital carina completely lacking (present ventrally from approximately mid-height of eye); fore wing vein m-cu approximately  $2.0\times$  (RS+Mb) (veins m-cu and (RS+M)b almost equally long); mesosoma with red-brown markings (entirely black); wing membrane yellow-brown to brown with brown pterostigma and venation (wing membrane entirely very dark smoky black with black venation and no hint of yellow-brown); 1<sup>st</sup> and 2<sup>nd</sup> metasomal tergites entirely cream-white (anterior half of 1<sup>st</sup> tergite black, remainder of 1<sup>st</sup> and 2<sup>nd</sup> tergites bright white).

**Description** (holotype female): Antennae incomplete, with at least 60 flagellomeres; 1<sup>st</sup> to 3<sup>rd</sup> flagellomeres approximately equally long; 3<sup>rd</sup> flagellomere  $1.1\times$  longer than wide. Eyes large, sharply and deeply emarginated opposite antennal sockets; width of head : width of face : height of eye = 1.0 : 0.4 : 0.6. Face smooth and shiny with moderately dense setiferous punctures. Malar space  $0.25\times$  height of eye. Ocelli large; shortest distance between posterior ocelli : transverse diameter of posterior ocellus : shortest distance between posterior ocellus and eye = 1.0 : 2.7 : 1.0. Occiput smooth and shiny. Occipital carina completely absent dorsally and laterally, represented ventrally by very short spur from hypostomal carina remote from base of mandible. *Mesosoma*:  $1.65\times$  longer than high. Pronotum with large and deep antescutal depression; crenulate anteriorly, smooth laterally except postero-ventrally where there are a few short crenulae. Mesoscutum smooth and shiny; notauli weak and narrow, finely crenulate, present only on anterior half of mesoscutum; postero-medially weakly longitudinally striate. Scutellar sulcus large and reniform with single strong midlongitudinal carina and a short, weaker submedial pair. Mesopleuron and mesosternum largely shiny with punctures at base of setae anteriorly; precoxal sulcus short, comma-shaped, moderately impressed, with fine vertically-orientated carination anteriorly. Metanotum with almost complete midlongitudinal carina. Propodeum smooth and shiny except for setiferous punctures, with complete midlongitudinal carina and with several shorter carinae arising from the posterior margin submedially. *Fore wing*: Lengths of veins r-rs:3RSa:3RSb = 1.0:2.0:4.7. Vein 1-M strongly sloping, anteriorly forming an angle of  $10^\circ$  with C+SC+R,  $1.8\times$  longer than M+CU and  $2.75\times$  longer than (RS+M)b. Subbasal cell with strongly enlarged, ovoid apical part, without



sclerome, with distal part of M+CU and 1CUa forming 'S'-shaped curve, 1CUa strongly arched towards fore wing margin; glabrous distally and sparsely setose for its whole narrow basal part. Vein 1cu—a moderately curved, reclivous, not posteriorly expanded. *Hind wing*: Vein M+CU  $1.35\times$  1-M. Vein m—cu entirely absent. *Legs*: Long, hind leg  $1.1\times$  longer than fore wing. Lengths of fore femur : tibia : tarsus = 1.0 : 1.0 : 1.0. Lengths of hind femur : tibia : tarsus = 1.0 : 1.0 : 1.2. Hind femur  $5.8\times$  longer than maximally deep. Hind basitarsus  $0.38\times$  hind tibia;  $6.7\times$  longer than wide. Claws with 4 or 5 setiform pecten spines. *Metasoma*: 1<sup>st</sup> and 2<sup>nd</sup> metasomal tergites finely longitudinally striate, remainder smooth and shiny with dense, small, setiferous punctures. Tergite 1 with strong, posteriorly uniting, dorsal carinae that give rise to strong midlongitudinal carina; strongly widening posteriorly;  $1.17\times$  wider posteriorly than long. Tergite 2 with small midbasal triangular area and complete strong midlongitudinal carina;  $1.85\times$  wider posteriorly than medially long,  $0.9\times$  length of 3<sup>rd</sup> tergite medially. Ovipositor sheaths with squared end.

*Coloration*. Head (except black stemmaticum) and fore legs yellow. Mesosoma black with propleuron, anterior of pronotum, posterior of scutellum, metanotum and propodeum red-brown. Mid legs brown (coxa darker). Hind legs black. Metasomal tergites 1 and 2 entirely cream-white; remaining tergites brown. Wing membrane yellow brown basally becoming darker brown (with distinct yellowish tinge) on apical half; venation brown, pterostigma dark yellow-brown.

*Measurements*. Length, body 8.0 mm and fore wing 7.5 mm.

*Male*. Unknown.

**Holotype**: ♀ **Australia**: New South Wales, with labels: "09-NSWHH-1781 AUS: NSW; Hat Head Lt: -31.0626° Ln: 153.052°, 38.58m Paul Hebert 12/26/2009" and "Barcode of Life DNA voucher specimen. Smpl ID: 09-NSWHH-1781, BOLD Proc. ID: HYAS008-10", collected in Malaise trap in dry sclerophyll forest. DNA barcode Genbank accession HM914649 (ANIC).

**Paratype**: 1♀, same data as holotype except codes "09-NSWHH-1781" and Proc. ID HYAS011-10", DNA barcode Genbank accession HM914652, iBOLD BIN BOLD:AAL8274 (CNCO).

**Distribution**: Australia.

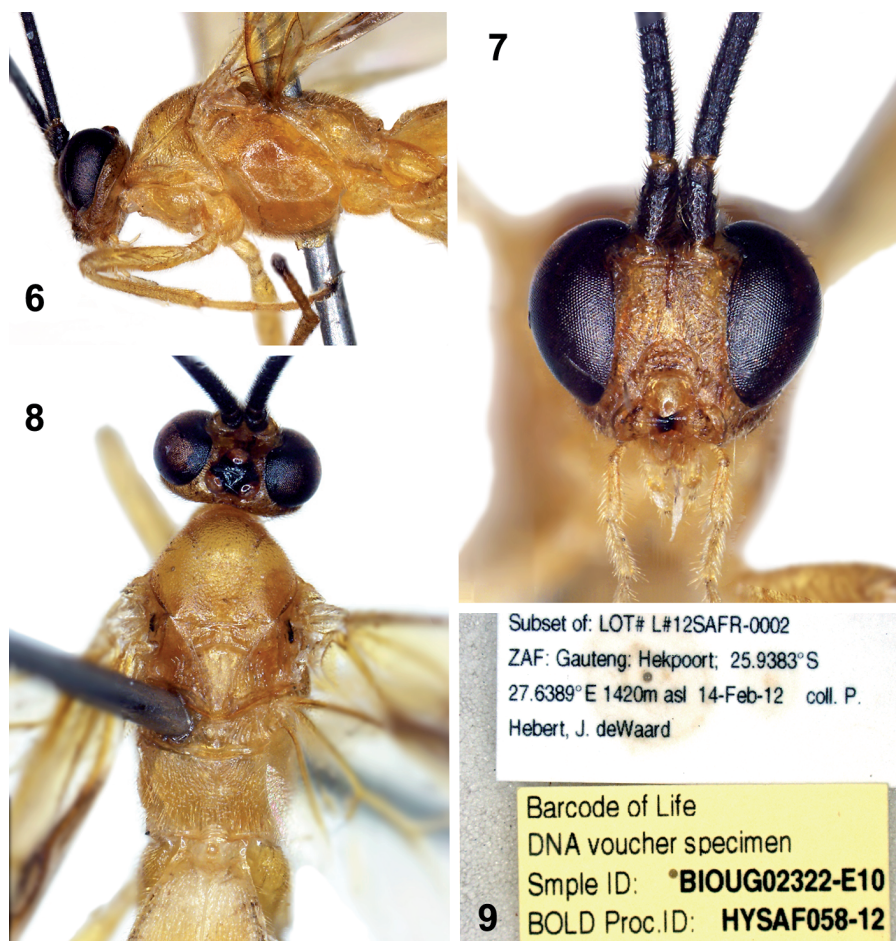
**Biology**: Unknown.

*Aleiodes glandularis* Butcher & Quicke, 2011

(Figs 6–11)

**Diagnosis**: Subbasal cell with large oval glabrous expansion distally formed of thickened veins, demarked basally by spurious vein arising from M+CU, with single large brown "D"-shaped sclerome with some ventral setae; vein 1CUa (=1-CU1) approximately  $1.25\times$  length of 1Cub (=2-CU1); vein 1-1A without a posteriorly directed spur; veins 1Cub, 1CUb and 2-1A dark to very dark brown contrasting with adjacent venation; head yellow except for stemmaticum.

**Description** (only sexual differences and features not present in male holotype): Antenna with 55 flagellomeres. Terminal flagellomere approximately twice as long as penultimate flagellomere, strongly acuminate. Width of head : width of face :

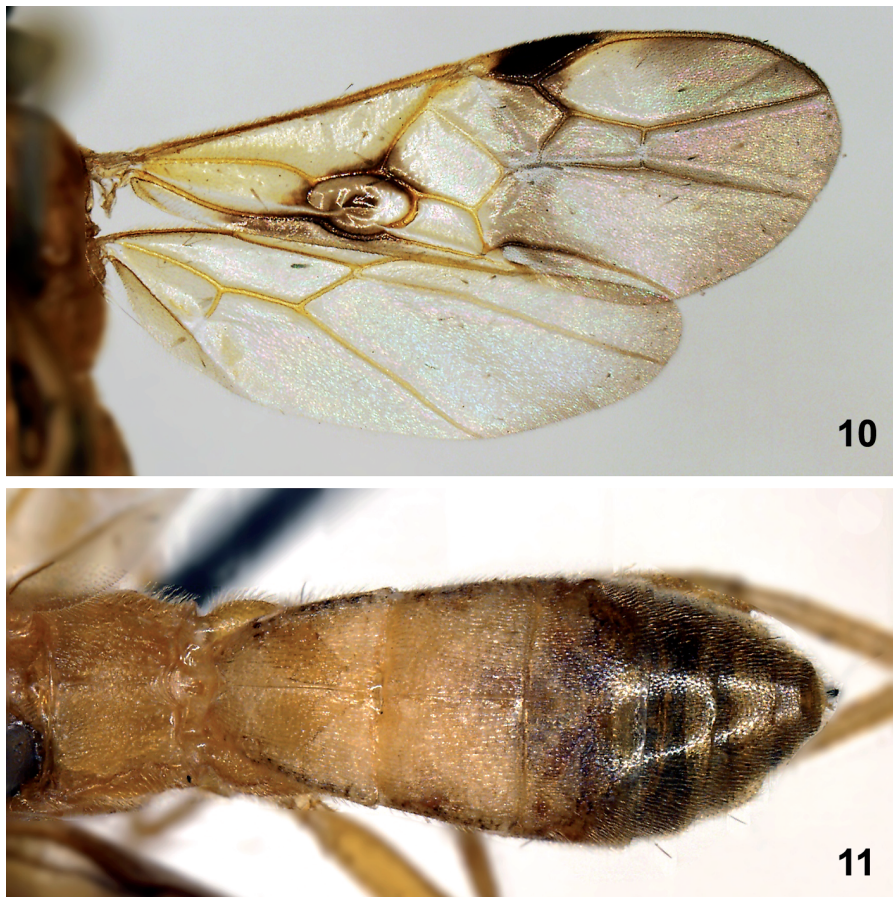


**Figs 6–9:** *Aleiodes (Hemigyron) glandularis*, female: (6) head and mesosoma, lateral view; (7) head, front view; (8) head and mesosoma, dorsal view; (9) data labels.

height of eye = 1.0 : 0.38 : 0.6. Malar space 0.13× height of eye. Inter-tentorial distance 2.25× shortest distance between anterior tentorial pit and eye. Ocelli very large; shortest distance between posterior ocelli : transverse diameter of posterior ocellus : shortest distance between posterior ocellus and eye = 1.0 : 13.0 : 2.0. Meta-soma narrower, 2<sup>nd</sup> tergite 1.9× wider than medially long; 1.1× longer medially than 3<sup>rd</sup> tergite. Ovipositor sheath sub-triangular, more or less square-ended, glabrous dorsally.

*Coloration.* Essentially the same as male holotype except dark patterning of wing membrane and venation markedly darker and more contrasting.

*Measurements.* Length, body 9.0 mm, fore wing 8.5 mm and antenna 7.8 mm.



**Figs 10, 11:** *Aleiodes (Hemigyroneuron) glandularis*, female: (10) wings; (11) metasoma, dorsal view.

**Material examined:** **South Africa:** Holotype ♂ “SOUTH AFRICA, Tvl [Transvaal], Soutpan, Pretoria District. 25.24S 28.05E. 20.xi.1985 J.S. Donaldson” (SANC); 1 ♀ with labels “subset of Lot# L# 12SAFR-0002, ZAF: Gauteng: Hekpoort: 25.9383° S 27.6389° E 1420m asl 14-Feb-12 col. P. Hebert, J. Dewaard” and “Barcode of Life, DNA voucher specimen, Smple ID: BIOUG02322-E10, BOLD Proc.ID: HYSAF058-12” (CBDG).

#### DISCUSSION

The South African species *Aleiodes glandularis* was originally described from a single male holotype, and named because of the conspicuous pores opening on the 4–6<sup>th</sup> metasomal tergites, which are release sites for male tergal glands. The pores and glands are unknown in females but are present in males of *Aleiodes (Hemigyroneuron)* and several other species of *Aleiodes* that appear to originate

close to the base of the genus (Butcher & Quicke 2011) including male *A. (Arca-leiodes)*. We first thought that a female specimen from South Africa, in the collection of the Centre for Biodiversity Genomics, Guelph, Canada, was a new species, but closer examination showed that, apart from primary sexual characters and considerably bolder coloration, it agreed almost perfectly with the male of *A. glandularis*, and here we provide illustrations and a brief description of this specimen, which we believe to represent the previously unknown female of that species.

Members of the subgenus *Hemigyron* appear seldom to be common. In Butcher & Quicke's (2011) revision of this group, which recognised 26 species, the non-parametric Chao 1 estimator (Chao 2005) was applied to the total number of species known, those known from only one specimen and those known from precisely two individuals, in order to estimate the probable total number of species in the subgenus. The calculation suggested that the world fauna might actually be as high as 107. Since then, three additional species have been added (each known from a single individual) (Butcher & Quicke 2015, 2016), though we have also discovered a second specimen of *A. (H.) glandularis* Quicke & Butcher in the collection of the Biodiversity Institute of Ontario. A new Chao 1 calculation based on current numbers suggests a world species total of 99.5. However, Chao 1 assumes all species are truly equally abundant whereas natural species abundance curves typically have a few relatively more common species and a tail of rarer ones, and under these circumstances Chao 1 will invariably underestimate the total.

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