

A new species of *Allacta* Saussure & Zehntner 1895 (Blattodea: Ectobiidae: Pseudophyllodromiinae) from India

*S. Prabakaran¹, M. Senraj² and Cristian C. Lucanas³

¹ Freshwater Biology Regional Centre, Zoological Survey of India, Hyderabad - 500 048, India.

² Southern Regional Centre, Zoological Survey of India, Chennai - 600 028, India.

³ Museum of Natural History, University of Philippines Los Banos, Laguna, Philippines.

(Email: prabakaranzsi@yahoo.co.in)

Abstract

A new species of *Allacta* Saussure & Zehntner, 1895, *A. kalakadensis* sp. n. is described and assigned to *-hamifera* species group. It differs from other known members of the *-hamifera* species group by the sexual wing dimorphism, pronotal and facial markings, and the structure of the male genitalia.

Keywords: *Allacta kalakadensis*; Cockroach; Diversity; Western Ghats; Wing dimorphism.

Received: 28 December 2018; Revised: 8 April 2019; Online: 9 April 2019.

Introduction

The Western Ghats of India is considered as a biodiversity hotspot, a region with high species richness with high percent endemism, but with alarming degrees of threat (Myers, 1988; Bossuyt *et al.*, 2004). Despite such high species richness, only 26 of 170 known Indian cockroach species are reported from Western Ghats, mainly from Karnataka (19 species; Prabakaran, 2010) and Tamil Nadu (7 species; Beccaloni, 2014). Recent collection trips to the Western Ghats have resulted in an array of cockroach specimens, including an undescribed species of *Allacta* Saussure & Zehntner, 1895.

The genus *Allacta* is differentiated from other Pseudophyllodromiinae mainly by the presence of pulvilli being only on the fourth tarsomere of all legs (Roth, 1993). Currently, it contains 42 species distributed in Tropical Asia and Australasia (Beccaloni, 2014). Despite the high diversity of the Western Ghats and the high number of *Allacta* species, Prabakaran and Senraj (2018), only recorded three species in India: *Allacta crassivenosa* Bolivar, 1897 [placed as *incertae sedis* by Roth, 1993], *Allacta diluta* (Saussure, 1863) and *Allacta figurata* (Walker, 1871). Here, a new species *Allacta kalakadensis* sp. n., is described from Tamil Nadu.

Materials and Methods

The material for the present study are based on recent collections from Kalakkad-

Mundanthurai survey of the Southern Regional Centre, Zoological Survey of India and specimens collected during night survey at Valaiyathu odai, Thirukurugudi Range, Tamil Nadu. Specimens collected from light trap and the bark of *Tamarindus indicus* were preserved in 90% ethyl alcohol. Genital segments were dissected and mounted on the permanent slide as described in Lucañas and Lit (2016).

Terminologies used for male genitalia follow Klass (1997), Li *et al.* (2018) for wing venations and Roth (2003) for other characters. The measurements and photographs were taken by Leica EZ4E Stereozoom Microscope. Illustrations were made using Inkscape 0.92.3. The specimens used in this study are deposited in the collections of the Southern Regional Centre, Zoological Survey of India, Chennai.

Taxonomy

Superfamily Blaberoidea

Family "Ectobiidae"

Subfamily Pseudophyllodromiinae

Genus *Allacta* Saussure and Zehntner, 1895

Allacta Saussure & Zehntner, 1895: 45 (Type species: *Abrodiaeta modesta* Brunner von Wattenwyl, 1893 by selection); Roth, 1991: 996; 1993: 361; 1995: 51; 1996: 235.

Abrodiaeta Brunner von Wattenwyl, 1893: 13 (Type species: *Abrodiaeta modesta* Brunner von Wattenwyl by selection)

Pseudochorisoblatta Bruijning, 1948: 90 (Type species: *Phyllodromia interrupta* Hanitsch, by selection.); Princis, 1965: 151.

Arublatta Bruijning, 1947: 224 (Type species: *Blatta punctata* Walker, 1869 = *Arublatta basivittata* Bruijning, by monotypy.); Roth, 1991: 996.

Composilpha Princis, 1950: 178 (Type species: *Chorisoblatta karnyi* Hanitsch, 1923 by monotypy.); Roth, 1996: 235.

Euhanitschia Princis, 1950: 180 (Type species: *Phyllodromia diagrammatica* Hanitsch by monotypy.); Roth, 1996: 235.

Diagnosis: Roth (1993; 1995) described the genus as follows: tegmina and wings fully developed or reduced in females as in (*Allacta persoonsi* Roth, 1995 and *Allacta nalepae* Roth, 1995). Hind wing with radial vein straight, apical triangle small or absent. Front femur Type B₂ or B₃. Pulvilli present only on the fourth tarsomere of all legs. Tarsal claws simple, symmetrical. Arolia present. Male genitalia with four major phallomeres; hook-like phallomere (L3) on the right side placing it under Pseudophyllodromiinae. In females, ootheca not rotated prior to deposition.

The bifurcate L2, setal brushes on L2d, presence of median accessory phallomere, as well as the shape of the subgenital plate suggests its close relation to *Sundablatta* Hebard, 1929 and *Pseudophyllodromia* Brunner von Wattenwyl, 1865 (Roth, 1996), as well as, *Tagaloblatta* Lucañas, 2016. It differs from the said genera by the combination of the following characters: by the presence of pulvilli only on the fourth tarsomere of all legs (present on all tarsomeres in *Pseudophyllodromia*, while absent in *Tagaloblatta*), and fore femur type B (type C in *Sundablatta*).

Vrsansky *et al.* (2011) insisted on the close relationship between *Allacta* and *Supella* Shelford, 1911, based only on external morphology (especially on the coloration of *Supella* (*Nemosupella*) and some *hamifera* – species group). Despite that, the internal male genitalia of *Supella* (as illustrated in McKittrick, 1964 and Roth, 1999): with simple and relatively elongate L2, distinctly separated L2d and L2vm, long elongate L3, and lacking median accessory phallomere, and the presence of a setose gland on the abdominal tergite 7, suggests a distant relationship between *Supella* and *Allacta*.

Distribution: Australasia (Papua New Guinea and Queensland); Tropical Asia (Beccaloni, 2014).

Species *incertae sedis* *crassivenosa* (Bolivar, 1897)

Described by Bolivar (1897) as *Ceratinoptera* (*Allacta*) *crassivenosa* based on a specimen from Kodaikanal, Tamil Nadu, India. Roth (1993) questioned the placement of this species in *Allacta* on the basis that Bolivar (1897) suggested that it is closely related to *A. brachyptera* Saussure & Zehntner and *A. abbreviata* Saussure & Zehntner, which are now placed in *Anallacta* Shelford (Blattellinae). Meanwhile, Wang *et al.* (2014) listed 41 species in this genus, including *crassivenosa*.

Upon examination of the photographs of the syntype in the Muséum National D'Histoire Naturelle, Paris website, the following characters were observed: Fore femur type C2, pulvilli present on all tarsomeres, and subgenital plate symmetrical or weakly asymmetrical. These characters clearly suggest that the species is not *Allacta* and is closer to either *Balta* Tepper or *Supellina* Bohn (Pseudophyllodromiinae). Closer inspection of the type specimen, particularly the structure of the tarsal claws and male genitalia, is needed to confirm this placement of this species.

-*hamifera* species group

Diagnosis: Roth (1993) described the –*hamifera* species group as follows: Pronotum dark with white or colourless lateral borders and or with pale central macula. Male interstyler margin V-shaped or incise with a lobe formed in the tip it appears keel like ridges found on the subgenital plate.

Remarks: Except for *A. crassivenosa*, Roth (1993) placed all of the known Indian *Allacta* sp. in the –*hamifera* species group.

***Allacta kalakadensis* Prabakaran & Senraj sp. n.**

(Figures 1 A- J)

[urn:lsid:zoobank.org:act:0CE7F1B1-C79E-4CB1-84A5-2EE10A0524DF](https://zoobank.org/act:0CE7F1B1-C79E-4CB1-84A5-2EE10A0524DF)

Material examined: HOLOTYPE: 1 male, INDIA, Tamil Nadu, Thirukurungudi Range, Valaiyathu odai. (08.41078°N; 77.55662°E) 142.2m, 24/09/2018. Coll. R. Venkitesan & Party, collected in Light trap. (Reg. No. IB-542). PARATYPES, 3 males, 1 female, same location

data as Holotype. Zoological Survey of India, Southern Regional Centre, Chennai, Tamil Nadu, India (Reg. Nos. IB-543,544,545,546).

Diagnosis: The combination of the following characters separate the new species from all other known *Allacta -hamifera* species group: sexually dimorphic: males macropterous; females brachypterous, tegmina reaching up to the fourth abdominal segment. Vertex exposed. Pronotum subparabolic, with large pale central macula surrounded by brown borders, margin hyaline. Tegmina with a pair of brown macula. Profemur Type B₃. Pulvilli present only on the fourth tarsomere of all legs. Tarsal claws simple, symmetrical. Supraanal plate transverse and narrow; paraprocts simple and symmetrical. Subgenital plate weakly asymmetrical; with weak postero-median invagination; styles simple, similar. Hook-like phallomere (L3) on the right side; median phallomere (L2) bifurcate, with setal brushes; accessory median phallomere present.

On the basis of coloration and interstyler invagination, *A. kalakadensis* sp. n. is placed on the *-hamifera* species group. This species closely resembles to *A. interrupta* (Hanitsch, 1925) and *A. svensonorum* Roth, 1995 from Borneo, *A. figurata* (Walker, 1871) and *A. diluta* from India, which all can be separated by difference in the head markings (*A. interrupta* with occiput pale, vertex with dark brown maculae which divides into two narrowing longitudinal stripes that joins medially at the level of the antennal socket; *A. svensonorum*: head yellowish, with occiput and vertex dark brown with weak dark areas near gena and compound eyes; *A. figurata*: head yellowish brown, with occiput pale, vertex dark brown, with two longitudinal brown stripes separated by a narrow pale stripe reaching below the level of the antennal socket, weak dark areas near gena; *A. diluta*: face brownish, vertex brown; *A. kalakadensis*: face yellowish, occiput dark brown, vertex dark brown forming two longitudinal brown stripes ending just above the antennal socket and three dark spots between the antennal sockets, clypeus with dark marginal macula) and tegminal markings (*A. interrupta*, each with a pair of brownish maculae; *A. svensonorum*, hyaline reddish brown without distinct markings; *A. figurata*, each with a pair of reddish brown macula, the basal darker than the distad; *A. diluta*, each with a pair of brown elongated maculae fused in borders; *A. kalakadensis*, each with two distinctly separated large macula).

It further differs from the Bornean species by the structure of the male genitalia. Unfortunately, the male of *A. diluta* and the male genitalia of *A. figurata* have not been described, which Princis treated as synonyms. It differs from the female *A. diluta* in term of wing size (macropterous in *A. diluta* female, but brachypterous in *A. kalakadensis* sp. n.), meanwhile it differs from *A. figurata* in terms of the pronotal (*A. kalakadensis* with larger pale central macula and thinner brown border than *A. figurata*) and facial markings (with two longitudinal brown stripes separated by a narrow pale stripe reaching below the level of the antennal socket in *A. figurata*, while vertex dark brown forming two longitudinal brown stripes ending just above the antennal socket and three dark spots between the antennal sockets, clypeus with dark marginal macula in *A. kalakadensis*).

Description: *Size* (mm): Male: overall length: 11.0 - 11.6; tegmen: 8.4 - 9.1; pronotum: length x width: 2.1 - 2.3 x 2.7 - 3.1. Female: overall length: 9.2; tegmen: 3.7; pronotum: length x width: 2.2 x 3.0.

Male (Fig. 1A): The interocular distance less than interantennal distance. Ocellar spots located above in the antennal socket. Head (Fig.1C) with brown dark patches from vertex to just above the antennal socket, with a medial, longitudinal light stripe completely connecting the dark patches up; the longitudinal light stripe with three separate dark dots; inner postero-lateral corners of eyes, anterior margin and postero-lateral corner of clypeus dark brown. 5th maxillary palpi enlarged, slightly shorter than 4th palpi.

Pronotum subparabolic in shape, with large pale central macula with dark brown border that reaches from anterior region to posterior region; pronotal margin hyaline. Front femur (Fig.1E) Type B₃: 5-6 proximal stout spines succeeded by a row of pilliform spinules of uniform length and terminating in 3 large spines increasing in size distally. Pulvilli present only on the 4th tarsomere of legs. All, except 4th tarsomere, with two equal rows of spines laterally. Tarsal claws simple and symmetrical; arolia present. Tegmina and hindwings fully developed, extending beyond the end of the abdomen; in the resting position hind wing goes beyond the tegmen. Tegmina (Fig. 1F) yellowish brown and hyaline, with pair of small dark macula and the anal field also covered by dark marking; mediocubital (M) longitudinal; claval branches (CuA) few, reaching the apical margin and remaining oblique.

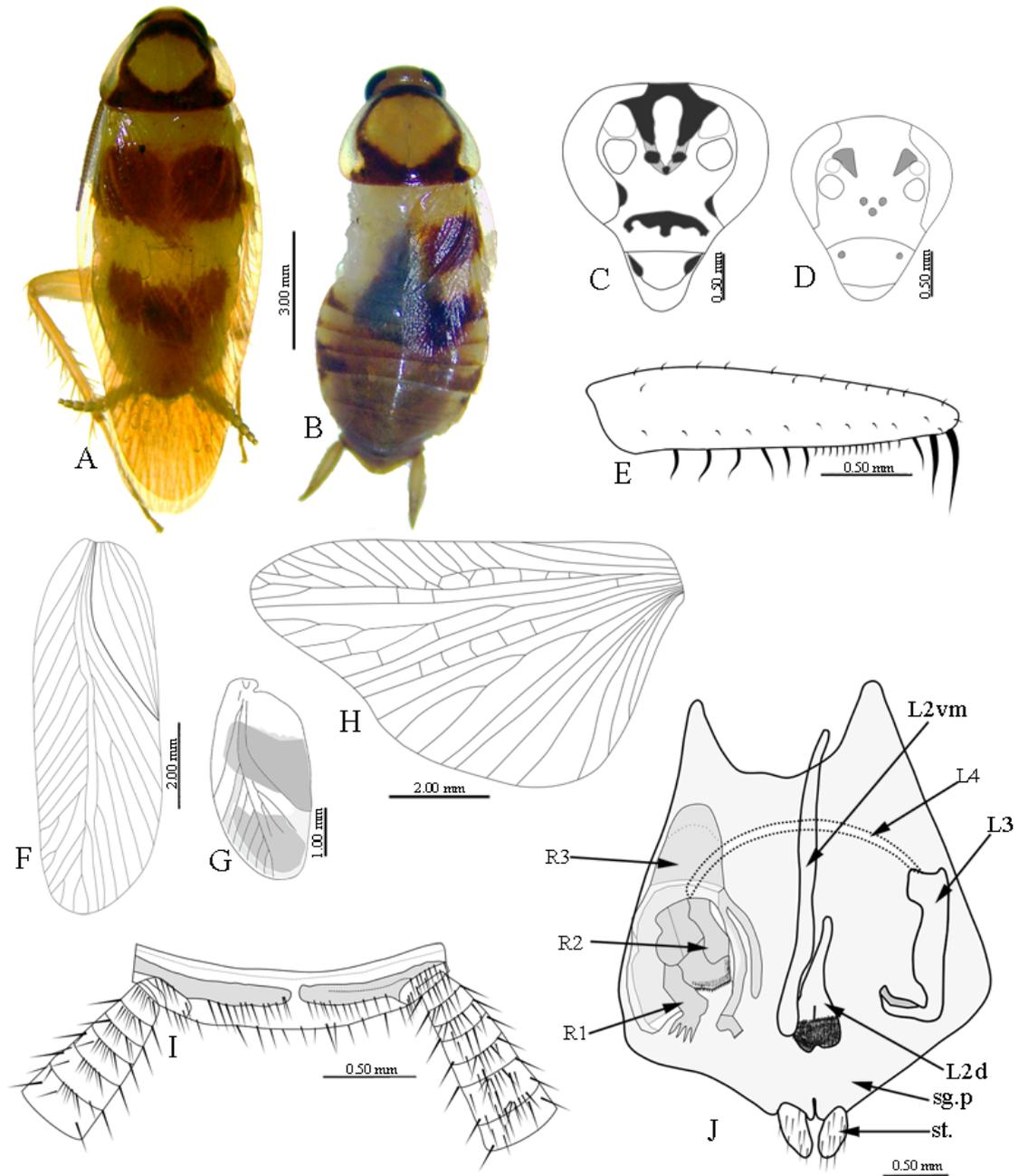


Figure 1. *Allacta kalakadensis* sp. n.: Habitus of male (A) and female (B). Head of male (C) and female (D); profemur (E); tegmina of male (F) and female (G); hindwing of male (H); supra-anal plate (I); subgenital plate and genitalia (J). Acronyms: sg.p. – subgenital plate; st. – style; R1, R2, R3 – Right phallomere sclerites; L2d, L2vm – median phallomere sclerites; L3 – hook-like phallomere; L4 – accessory median phallomere.

Hind wing (Fig.1H) with costal and subcostal veins clubbed with cross veins; radial veins branched after middle part of the wing, with 3 complete branches; the median vein straight and unbranched; cubitus vein curved with 4 complete branches. Abdominal terga unspecialized.

Supraanal plate (Fig.1I) transverse, rectangular; paraprocts simple, similar. Cerci yellowish brown, darkens towards apex. Subgenital plate (Fig.1J) symmetrical with a pair of small bulbous and similar small styles directed towards the midline to the interstyler margin; interstyler

margin extended ventrad forming a keel-like ridge. Genital hook (L3) medium sized located in the right side with a preapical incision, the median phallomere (L2vm) with greatly modified apex, with a curved sclerite (L2d) and lie under the median phallomere in the apex. The left phallomere have several irregular setal brushes with sclerites in the centre, in the apical part end with 4 spikes (R1). The accessory median phallomere (L4) lies below the median phallomere, left phallomere, and genital hook.

Female (Fig.1B): Similar to male except: head with dark patches extending from vertex and ending in ocellar spot and frons with three mild yellowish black spot (Fig.1D); tegmina reduced (Fig.1G), reaching only up to 4th abdominal segment; hind wing very small; postero-lateral corners of 3rd, 4th and 5th abdominal segments with yellowish markings; cerci yellowish brown, darkening towards the apex.

Etymology: named after the type locality: Kalakad Mundanthurai Tiger Reserve Area, Tamil Nadu, India.

Known Distribution: INDIA: Tamil Nadu.

Remarks: Due to the distinct pattern difference between the male and female, it may be possible that they are two separate species, despite that, they are considered the same here on the premise that both were collected from the same tree. Additional samples would enable to check the color variations between sexes and additional molecular information might be needed to clarify this.

Acknowledgements

Thanks are due to the Dr. Kailash Chandra, Director, Zoological Survey of India, Kolkata and the Officer in Charges, Southern Regional Centre & Freshwater Biology Regional Centre, ZSI, Chennai and Hyderabad for providing the necessary facilities. Authors are also thankful to Dr R. Venkitesan Scientist-D Zoological Survey of India, Southern Regional Centre, Chennai for collecting and providing the specimens.

References

Beccaloni, G.W. 2014. Cockroach Species File Online. Version 5.0/5.0. World Wide Web electronic publication. <<http://Cockroach.SpeciesFile.org>> [accessed 27 November, 2018].

- Bolivar, I. 1897. Les Orthopteres de St – Joseph's College a Trichinopoly (Sud de l'Inde). *Annales de la Societe de entomologique de France* 66: 282-316.
- Bruijning, C.F.A. 1947. An account of the Blattidae (Orthoptera) from Celebes, the Moluccas and New Guinea. *Zoologische Mededelingen Leiden* 27: 205-252.
- Bruijning, C.F.A. 1948. Studies in Malayan Blattidae. *Zoologische Mededelingen Leiden* 29: 1-174.
- Brunner von Wattenwyl, C. 1865. *Nouveau Systeme des Blataires*. La Société I. R. De Zoologie et de Botanique, et Accompagne De 13 planches. Vienna. 426 pp.
- Brunner von Wattenwyl, C. 1893. Revision du Systeme des Orthopteres et description des espee rapportees par Leonardo Fea de Birmainie. *Annali del Museo civico di storia natural di Genova* 13(2): 5-230.
- Bossuyt, F., Meegaskumbura, M., Beenaerts, N., Gower, D.J., Pethiyagoda, R., Roelants, K., Mannaert, A., Wilkinson, M., Bahir, M.M., Manamendra-Arachchi, K., Ng, P.K.L., Schneider, J., Oommen, O.V. and Milinkovitch, M.C. 2004. Local Endemism within the Western Ghats - Sri Lanka Biodiversity Hotspot. *Science* 306: 479-481.
- Hebard, M. 1929. Studies in Malayan Blattidae (Orthoptera). *Proceedings of the Academy of Natural Science, Philadelphia* 81: 1-109.
- Klass, K-D. 1997. The external male genitalia and the phylogeny of Blattaria and Mantodea. *Bonner Zoologische Monographien* 42: 1-341.
- Li, X.R., Zheng Y.H., Wang C.C. and Wang Z.Q. 2018. Old method not old-fashioned: parallelism between wing venation and wing-pad tracheation of cockroaches and a revision of terminology. *Zoomorphology* 137: 519-533.
- Lucañas, C.C. 2016. *Tagaloblatta kasaysayan* n. gen. et sp. (Blattodea: Ectobiidae: Pseudophyllodromiinae), a new minute cockroach from Mt. Makiling, Los Baños, Laguna. *Philippine Journal of Systematic Biology* 10: 35-38.
- Lucañas, C.C. and Lit, I.L. Jr. 2016. Cockroaches (Insecta, Blattodea) from caves of Polillo Island (Philippines), with description of a new species. *Subterranean Biology* 19: 51-64.
- Mckittrick, F.A. 1964. *Evolutionary studies of cockroaches*. Ithaca, New York: Cornell University Agricultural Experiment Station

- New York College of Agriculture. Memoir 389, 197 pp.
- Myers, N. 1988. Threatened biotas: "Hot spots" in tropical forests. *The Environmentalist* 8(3): 187-208.
- Prabakaran, S. 2010. Studies on the cockroach Fauna of Karnataka. *Records of the Zoological Survey of India* 110(2): 109-110.
- Prabakaran, S. and Senraj, M. 2018. A checklist of cockroaches (Insecta: Blattodea) from India. Version 1.0. Online publication available at www.zsi.gov.in.
- Princis, K. 1950. Entomological results from the Swedish expedition 1934 to Burma and British India. *Arkiv for zoologi (N.S.)* 1: 203-222.
- Princis, K. 1965. Kleine Beiträge zur Kenntnis der Blattarien und ihrer Verbreitung. VIII. (Orthoptera) EOS. *Revista Espanola de Entomologia* 41(1): 135-156.
- Roth, L.M. 1991. New Combinations, Synonymies, Redescriptions, and New Species of Cockroaches, mostly Indo-Australian Blattellidae. *Invertebrate Taxonomy* 5: 953-1021.
- Roth, L.M. 1993. The cockroach genus *Allacta* Saussure & Zehntner (Blattaria, Blattellidae: Pseudophyllodromiinae). *Entomologica Scandinavica* 23: 361-389.
- Roth, L.M. 1995. New species of *Allacta* Saussure & Zehntner from Papua New Guinea, Irian Jaya, and Sarawak (Blattaria, Blattellidae: Pseudophyllodromiinae). *Papua New Guinea Journal of Agriculture, Forestry and Fisheries* 38: 51-71.
- Roth, L.M. 1996. The cockroach genera *Sundablatta* Herbard, *Pseudophyllodromia* Brunner, and *Allacta* Saussure & Zehntner (Blattaria: Blattellidae, Pseudophyllodromiinae). *Tijdschrift Voor Entomologie* 139: 215-242.
- Roth, L.M. 1999. New cockroach species, redescriptions, and records, mostly from Australia, and a description of *Metanocticola chritmasesnsis* **gen. nov., sp. nov.** from Christmas Island (Blattaria). *Records of the Western Australian Museum* 19: 327-364.
- Roth, L.M. 2003. Systematics and phylogeny of cockroaches (Dictyoptera: Blattaria). *Oriental Insects* 37: 1-186.
- Saussure, H. 1863 *Melanges orthopterologiques, premiere fascicule. Blattides*. *Memoirs of the Society of Physics and Natural History of Geneve* 17: 129-170.
- Saussure, H. and Zehntner, L. 1895. Revision de la tribu des Perisphaeriens (insects Orthopteres de la famille des Blattides). *Revue Suisse Zoologi* 3: 1-59.
- Vrsansky, P., Cifuentes-Ruiz, P., Vidlicka, L., Ciamporm, F.Jr. and Vega, F. 2011. Afro-Asian cockroach from Chiapas amber and the lost Tertiary American entomofauna. *Geologica carpathica* 62(5): 463-475.
- Walker, F. 1871. Catalogue of the specimens of Dermaptera, Saltatoria, in the collection of the British Museum. V. Supplement to the catalogue of Blattariae. The Trustees of the British Museum: London. 43pp.
- Wang, Z.Q., Gui S.H., Che, Y.L. and Wang, J.J. 2014. The Species of *Allacta* (Blattodea: Ectobiidae: Pseudophyllodromiinae) Occurring in China, With A Description of a New Species. *Florida Entomologist* 97(2): 439-453.