Revision of the genus Megacrania Kaup (Cheleutoptera: Phasmatidae)

Author: Hsiung, Chia-Chi

Source: Journal of Orthoptera Research, 16(2) : 207-221

Published By: Orthopterists' Society

URL: https://doi.org/10.1665/1082-6467(2007)16[207:ROTGMK]2.0.CO;2

Revision of the genus *Megacrania* Kaup (Cheleutoptera: Phasmatidae)

Accepted October 5, 2007

Chia-Chi Hsiung

Lyman Entomological and Research Laboratory, Department of Natural Resource Sciences, McGill University, Macdonald Campus, 2111 Lakeshore Road, Ste Anne de Bellevue, Quebec, Canada H9X 3V9. Email: georgehsiung@hotmail.com

Abstract

The genus *Megacrania* Kaup is revised. Types or paratypes of all species were examined. Two new species, *Megacrania obscurus* and *Megacrania spina*, are described and illustrated. A key is given to the species.

Key words

stick insects, taxonomy, Phasmatidae, Megacrania, asian pacific, species

Introduction

The genus *Megacrania* Kaup is now known to include 12 species. These are mostly distributed along the western Pacific Ocean from the northeast of Australia to New Guinea, the Solomon Islands, Indonesia, the Philippines, and extending to Micronesia and the southern coast of Taiwan (Fig. 5). For the present work more than 400 specimens were examined from various museums around the world and two species are described as new. The author has also recently described four of the *Megacrania* species (Hsiung 2002, 2003).

Many species are misidentified by collectors and authors as *Megacrania alpheus* Westwood (Willemse 1955, Yeh & Chu 1981, Wang & Chu 1982, Chow & Lin 1986). The single species in Taiwan should be *Megacrania tsudai* Shiraki — not *M. alpheus* (Hsiung 1991). Since Shiraki did not designate a holotype when he described *M. tsudai*, Hsiung (1991) designated a lectotype from Shiraki's collections deposited in the National University of Taiwan and re-described the species. The late Dr. D.K. McE. Kevan examined the collections of *Megacrania* on my behalf in the British Museum (Natural History) in 1990. Kevan selected a lectotype of *M. alpheus* (Hsiung 1991). Yamasaki (1991) discovered that a *Megacrania* species occurred in Japan and described it as a subspecies of *M. alpheus*, *Megacrania alpheus adan*. It is unlikely that Yamasaki compared his specimen with the lectotype of *M. alpheus*: *M. alpheus* is a unique species and I have not found a single specimen with similar character to its lectotype. I have examined Yamasaki's photographs of *Megacrania* and consider it similar to *Megacrania tsudai* Shiraki.

Megacrania batesii Kirby is a dominant species from northeast Australia to New Guinea, the Bismarck Archipelago, and the Solomon Islands. Rentz (pers. comm.), using a chemical analysis, compared the Australian form with the Taiwanese form and found no difference between them. Hsiung & Yang (2000) however, found that the two forms were sufficiently different morphologically to be considered as separate species.

Willemse (1955) described *M. wegneri* from Indonesia and thought this new species very close to *M. alpheus*. But they are very different morphologically. Indonesia was the only locality given for this species in Willemse's paper. Following a series of taxonomic studies, Hsiung (2001) concluded that *wegneri* also occurred in New Guinea (both sexes collected) as well as on the Pelew Is and the Caroline Is (only females collected). Hsiung (2001) also described two new species from Indonesia, *Megacrania brocki* and *Megacrania rentzi*.

Hsiung (2003) described two new species from the Admiralty Is, *Megacrania vickeri* and *Megacrania artus*. Although the *Megacrania* species here is quite like the lectotype of *Megacrania alpheus*, there are many distinct morphological differences (Hsiung 2003) which distinguish it from *M. alpheus* and from other species of the genus.

Carl (1915) described the subspecies *Megacrania batesi speiseri* from female specimens collected on Malo, New Hebrides. I could not locate any of the types or specimens from Malo. A female collected in Efate, New Hebrides was examined and found to be significantly different from the description of Carl's subspecies. It is described here as the new species *Megacrania obscurus*.

Willemse (1962) described *Megacrania bakeri* from three females and a nymph collected on Espiritu Santo Island, New Hebrides. This is in the same general region as Carl's (1915) subspecies. Willemse (1926) gave a brief morphological description and measurements, based mainly on antennae, thorax, femur and subgenital plate. Unfortunately he did not give information about their wings, which are important features in this group. This species has been rarely mentioned since its publication.

I have examined the Phasmida Species File Online >http: //phasmida.orthoptera.org< and discovered that the photographs of *Megacrania bakeri* Willemse shown there are quite similar to the species I have described as *Megacrania obscurus*. Otte and Brock (2005) placed *M. bakeri*, along with *Megacrania batesi speiseri*, as synonyms of *M. alpheus alpheus*. Since the two species' localities are very close, they might well be the same species. I am quite confident, however, that they do not belong to any grouping associated with *M. alpheus*.

Günther (1931) listed both Willemse's *M. bakeri* and Carl's subspecies *M. batesii speiseri* for Fiji (Fidji) Island. However I can find no reference which indicates those species being found on Fiji Island. Günther (1931) might have thought Fiji Island was near the New Hebrides and so anticipated both species occurring there. Shiraki (1932) made a key to the species of (then known) *Megacrania* which numbered five, *M. bakeri* Willemse being one of them.

Prior to this paper, *M. batesii* was the only species recognized

in the region of New Guinea. There are now five recognized species from this region (which includes the Bismarck Archipelago), more than in any other region. *Megacrania spina* is described here as new.

Among the morphological characters that have been examined and compared between species, it was found that the most important characters are the length of the wings, the shape of the anal segment, the shape and number of granules and the spinosity of the lateral margin of the mesonotum (Figs 1, 2).

In the genus *Megacrania* most species are represented in collections by females: for only a few species have males also been collected.

Repositories

Types.— All existing types have been studied. Their location is indicated under each species.

Specimens.— I have studied specimens from the institutions listed below.

ANSP	Academy of Natural Sciences, Philadelphia.
BMH	Bishop Museum, Honolulu.
CAS	California Academy of Science, San Francisco, California.
CSIRO	CSIRO Division of Entomology, Canberra, Australia.
LEM	Lyman Entomological Museum, McGill University, Canada.
MNHU	Museum für Naturkunde der Humboldt-Universität zu Berlin, Berlin.
BNHM	British Natural History Museum, London.
NMNHL	National Museum of Natural History, the Netherlands.
NUTC	National University of Chung Hsing, Taichung, Taiwan.
NUTT	National University of Taiwan, Taipei, Taiwan.
SMN	Staatliches Museum für Naturkunde in Stuttgart, Germany.
SMT	Staatliches Museum Tierkunde, Dresden, Germany.
ZMUH	Zoologisches Museum, Universität Hamburg, Hamburg, Germany.

Genus *Megacrania*

Megacrania Kaup, 1871. Berliner Entomologische Zeit. 15: 38. Kirby 1904. A Synonymic Catalogue of Orthopera. I: 385. Vickery 1983. CSIRO Australian Division of Entomology, Technical Paper 20: 8. Hsiung 1991. Oriental Insects 25: 172 (Key to species). Otte & Brock 2005. Phasmida Species File. Catalog of Stick and Leaf Insects of the World. 1997. Brock & Hasenpusch. 2007. Zootaxa. 1570: 74 (checklist and bibiliography).

Type species.— *Platycrania phelaus* Westwood [Fiji, Solomon Islands].

Identification of the genus.— Body robust in females, slim and short in males; winged in both sexes; wings nearly as long as abdomen in males, not or scarcely more than half length of abdomen in females. Head moderate-sized, convex, slightly porrect. Antennae generally > twenty articles. Mesonotum about 2.5 to 3 × length of pronotum, its surface with granules or smooth (only in two species). Tegmina elongate-ovate, small, about equal in length to mesonotum. Abdomen slender in males, broad in females, the operculum extending to, or rather beyond, extremity of abdomen. Posterior margin of anal segment nearly rounded. Cerci broad lamellate, apices round. Anterior femora slightly longer than mesonotum; all femora with ridge bearing a few spines visible in ventral view. Tibiae of all legs without spines.

Redtenbacher (1908) was the first systematist to present a key to the genus *Megacrania*; this included *Megacrania batesii* Kirby, *M. alpheus* (Westwood), *M. phelaus* (Westwood) and *M. nigrosulfurea* Redtenbacher n. sp. A new key to *Megacrania*, adding two more species, *M. tsudai* Shiraki and *M. bakeri* Willemse was published by Shiraki (1932). Hsiung (1991) presented a key which included *M. alpheus* (Westwood), *M. tsudai* Shiraki, *M. batesii* Kirby, *M. wegneri* Willemse, *M. phelaus* (Westwood) and *M. nigrosulfurea* Redtenbacher.

Key to Species of *Megacrania*

1. Mesonotum granulose. 2
—Mesonotum smooth 11

2. Mesonotum sparsely granulose; cerci short, not reaching apex of operculum. Philippines ("Ceylon" probably erroneous) . . . . . *alpheus* (Westwood)
—Mesonotum densely granulose; cerci long, surpassing apex of operculum 3

3. Lateral margins of pronotum and mesonotum slightly spinose 4
—Lateral margins of pronotum and mesonotum conspicuously spiny 9

4. Subgenital plate not surpassing extremities of cerci 5
—Subgenital plate surpassing extremities of cerci 8

5. Subgenital plate just reaching extremities of cerci. Admiralty Islands . . . . . *vickeri* Hsiung
—Subgenital plate not reaching extremities of cerci 6

6. Granules of mesonotum robust and sharp; hind wing reaching a little beyond hind margin of 3rd abdominal tergum. Taiwan . . . . . *tsudai* Shiraki
—Granules of mesonotum slightly elongate and not quite sharp; hind wing reaching a little beyond hind margin of 2nd abdominal tergum 7

7. Mesonotum with >60 granules, the lateral margin slightly spiny; tegmina ovate, shorter than mesonotum; posterior margin of anal segment nearly rounded. Solomon Is, Australia, NewGuinea . . . . . *batesii* Kirby
—Mesonotum with 60 granules, lateral margin not spiny; tegmina elongate-ovate, slightly longer than mesonotum; posterior margin of anal segment nearly square. Borneo . . . . . *rentzi* Hsiung

8. Hind wing nearly reaching posterior margin of 3rd abdominal tergum; mesonotum with 70 distinct granules; posterior margin of anal segment slightly cleft medially. Admiralty Is . . . . . *artis* Hsiung
—Hind wing surpassing posterior margin of 3rd abdominal tergum; mesonotum with 86 small and elongate granules; posterior margin rounded, smooth and not cleft medially. New Hebrides . . . . . *obscurus* Hsiung

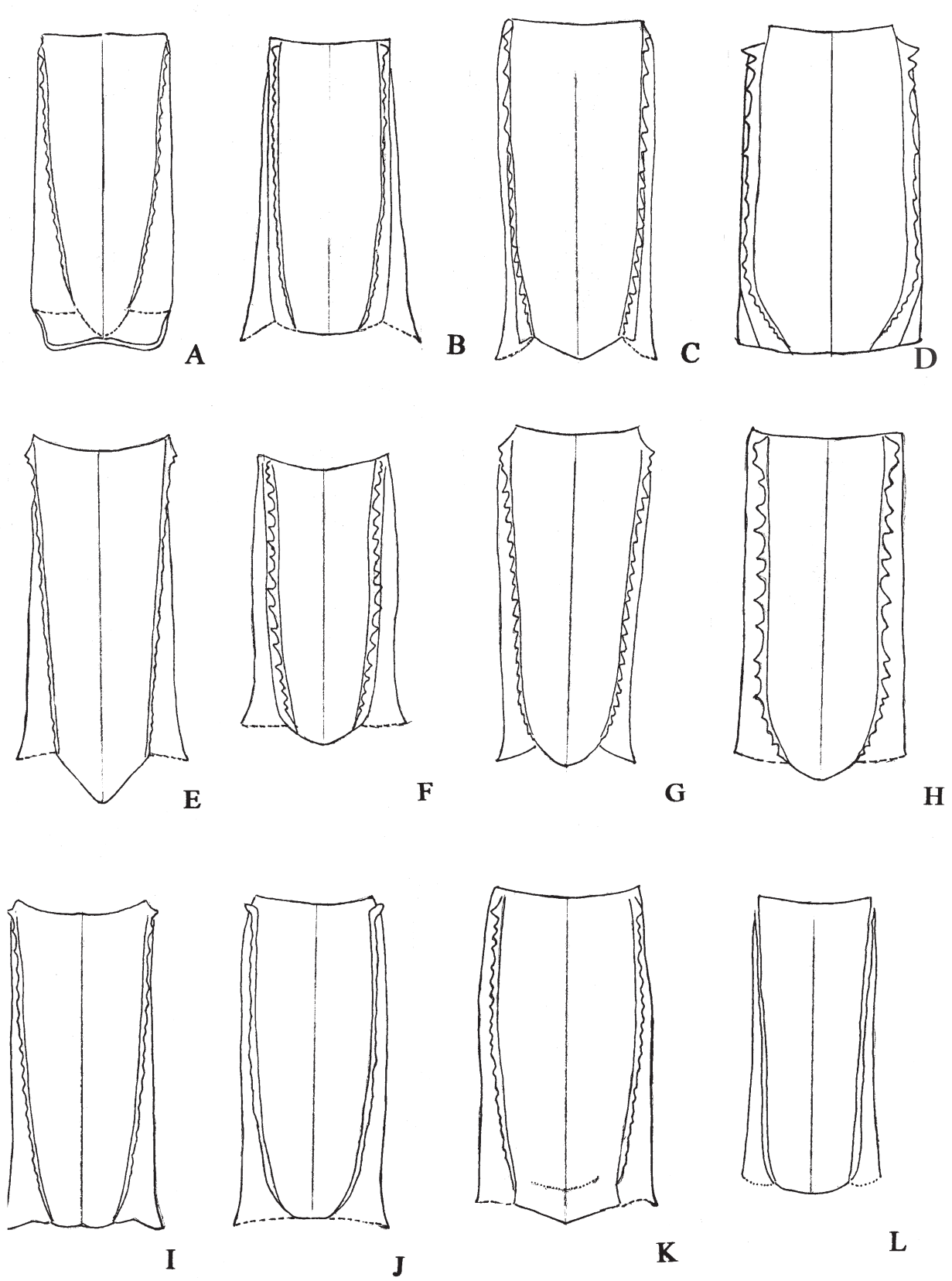

Fig. 1. Female, dorsal views comparing degree of spinosity on lateral margins of mesonota of: A. *Megacrania alpheus*, B. M. *vickeri*, C. *M. tsudai*, D. *M. batesi*, E. *M. rentzi*, F. *M. wegneri*, G. *M. brocki*, H. *M. spina*, I. *M. artus*, J. *M. obscurus*, K. *M. nigrosulfurea*, L. *M. phelaus*.

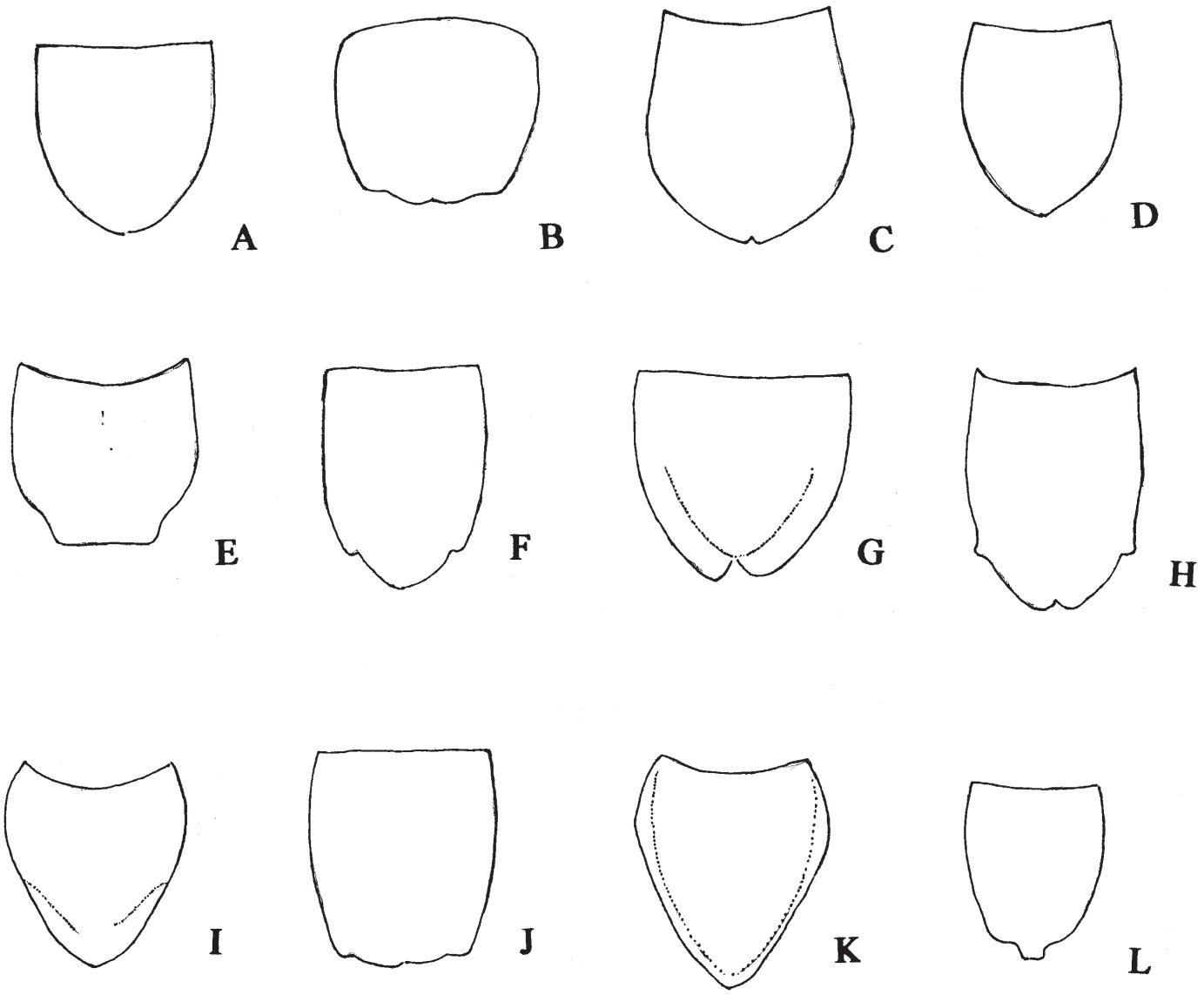

Fig. 2. Female, dorsal views comparing anal segment of: A. *Megacrania alpheus*, B. *M. vickeri*, C. *M. tsudai*, D. *M. batesi*, E. *M. rentzi*, F. *M. wegneri*, G. *M. brocki*, H. *M. spina*, I. *M. artus*, J. *M. obscurus*, K. *M. nigrosulfurea*, L. *M. phelaus*.

9. Lateral margin of mesonotum spiny, the first few anterior teeth not expanded basally; anal segment not cleft medially. Indonesia, New Guinea, Pelew Is . . . . . *wegneri* Willemse
—Lateral margin of mesonotum spiny, the first few anterior teeth closely expanded basally and closely connected; anal segment cleft medially 10

10. Mesonotal surface with 60 granules, the lateral margin spiny, the first three anterior teeth closely connected; hind wing only reaching center of 3rd abdominal tergum. Indonesia (Key Inseln, Obi Is, Boeroe) . . . . . *brocki* Hsiung
—Mesonotal surface with 95 granules, lateral margin very spiny, the first two anterior teeth closely connected; hind wing reaching 4th abdominal tergum. New Guinea . . . . . *spina* Hsiung

11. Body and hind wing long (130 mm, 36 mm); femora serrated ventrally, with distinct spines along the keels. Color: pale green. Fiji, Solomon Is, New Britain . . . . . *phelaus* (Westwood)
—Body and hind wing short (98 mm, 21mm); femora not serrated with only a few minute spines ventrally. Color: yellowish black. New Guinea (including New Britain) . . . . . *nigrosulfurea* Redtenbacher

1. *Megacrania alpheus* (Westwood, 1859)

Megacrania alpheus (Westwood). Kaup 1871. Berliner Entomologische Zeit. 15: 38. Kirby 1904. A Synonymic Catalogue of Orthoptera I: 385. Redtenbacher 1908. Die Insektenfamilie der Phasmiden 3: 370. Hsiung 1991. Oriental Insects 25: 172 (Lectotype designation). Otte & Brock 2005. Phasmida Species File. Catalog of Stick and Leaf insects of the World. 197.

Platycrania alpheus Westwood, 1859: p. 112. plate IV. fig 2.

Type.— Lectotype ♀, Ceylon (mislabelling, probably the Philippines; deposited BNHM).

Description.— Pronotum slightly shorter than broad; mesonotal surface with 40 to 45 large and distinct granules and with two nearly parallel rows of distinct, small spines near lateral margins. Tegmina ovate, shorter than mesonotum. Hind wing short, about 1.6× as long as tegmina, reaching middle of 2nd abdominal tergum. Abdomen 74 mm in length, about 4.6× as long as mesonotum. Posterior margin of anal segment nearly rounded, slightly concave in central area. Subgenital plate 21 mm long, about 1.3× length of mesonotum and surpassing extremities of cerci.

Distribution.— Ceylon (mislabelling, probably the Philippines).

Specimen examined.— **1** ♀ (lectotype) bearing the following labels: 1. *Platycrania alpheaus* Westw. 2. Ceylon (reversed side 50.1). 3. *alpheaus* Westw.

Measurements.— (mm) length of body 112; midline length of pronotum 7; midline length of mesonotum 17; length of tegmen 15; length of hind wing 23; length of femur: front 30, middle 17, hind 19; length of tibiae: front 26, middle 16, hind 17.

2. *Megacrania vickeri* Hsiung, 2003

Megacrania vickeri Hsiung, 2003. Journal of Orthoptera Research 12 (1): 31-35. Otte & Brock. 2005. Phasmida Species File. Catalog of Stick and Leaf Insects of the World. 198.

Type.— Holotype ♀ Los Negros, Admiralty Is.

Description.—♀: mesonotum much longer than broad, its surface with numerous distinct, nearly oval granules and two nearly parallel rows of weak spines near lateral margin. Tegmina elongate-ovate, slightly longer than mesonotum; hind wings about 1.9× as long as tegmina, reaching to middle of 4th abdominal segment. Abdomen elongate, about 2.6 × as long as mesonotum; posterior margin of anal segment nearly rounded and slightly cleft medially; subgenital plate slightly longer than mesonotum, just reaching to extremities of cerci. ♂♂: agree generally with the females, but smaller, differing as follows: about 60 very distinct granules on surface of mesonotum; hind wings reach to anterior margin of 5th abdominal segment.

Distribution.—Known only from the Admiralty Islands.

Measurements.— (lengths mm) ♀♀: body: 103.5 to 113.0; median of pronotum: 8.5; median of mesonotum 18.5 to 19.0; tegmen: 20.0 to 22.8; hind wing: 39.5 to 42.5; femora: anterior 30.0, middle 17.5, posterior 18.5 to 20.0; tibiae: anterior 27.0, middle 16.0, posterior 15.5 to 19.0.
♂♂: body: 82.0 to 83.0; median of pronotum: 6.1 to 6.5; median of mesonotum: 8.0 to12.1; tegmen: 38.0 to 45.8; hind wing: 38.0; femora: anterior 22.0 to 22.2, middle 13.0 to 14.2, posterior 16.0; tibiae: anterior 20.0 to 23.5, middle 12.5, hind 15.0 to 15.5.

Specimens examined.—**Holotype** ♀, bearing three labels: 1. Los Negros, Admiralty Is, XI – 45; 2. W. Wagner, D. Greether Collectors: 3. Bishop Museum Collection # 113.
Allotype ♂, bearing three labels: 1. Los Negros Admiralty Ils, XI – 45; 2. W. Wagner, D. Greether Collectors; 3. Bishop Museum Collection # 112. **Paratype: 1** ♀, labels1 and 2 same as allotype, 3. Bishop Museum Collection 114. **1**♂, labels 1 and 2 same as allotype 3. Bishop Museum Collection # 60.

3. *Megacrania tsudai* Shiraki, 1932

Megacrania tsudai Shiraki, 1932. Dobutsugaku Zasshi, Zool. Soc. Japan 45: 108 –111. Shiraki 1935. Memoirs of the Faculty of Science and Agriculture, Formosa 14(3): 70. Hsiung 1991. Oriental Insects 25:173 (lectotype designated). Otte & Brock. 2005. Phasmida Species File. Catalog of Stick and Leaf Insects of the world. 198.

Megacrania alpheus [*nec* (Westwood, 1859)]: Yasumatsu 1942. Takarazuka Ent. Bull.18: 11 (biology). Willemse 1955. 23: 45 [taxonomy – remarks on *M. alpheus* Westwood]. Nakata 1961, Pacific Ins. Monograph 2:117 [geographical distribution]. Wang & Chu 1982. Phytopath & Ent., Naatl. Taiwan Univ. 9: 98-109 [morphology]. Chow & Lin 1986. J. Ent. Sci. 21: 97-107 [Physiology].

Type.— Lectotype female, Taiwan: Kurar [Present: Hen Ch'un (Koshun) = Kuraru and Kankau – names used during the Japanese period] 31.VII. 1931, coll.T. Shiraki. [Deposited in the Entomological Museum, National Taiwan University, Taipei, Taiwan].

Description.— (Lectotype ♀) Antennae short, with twenty-four articles. Mesonotum much longer than broad, about 2.5× length of pronotum, its surface with about 78 granules quite evenly distributed over anterior 0.75 of its length. Tegmina elongate-ovate, about equal in length to mesonotum. Hind wings of moderate size, about 2.0× as long as tegmina, reaching a little beyond hind margin of 3rd abdominal tergum. Anterior femora about 0.33× longer than mesonotum; all femora with ridge bearing a few spines visible in ventral view. Tibiae of all legs without spines. Abdomen elongate, about 3.5× as long as mesonotum. Posterior margin of anal segment nearly round. Cerci broad, lamellate, apices rounded. Subgenital plate nearly as long as mesonotum.

Distribution.— Taiwan: Kuraru, Tse Lo Shui, O-Luan-Bi.

Measurements.—(mm) ♀♀: length of body: 110 to 111; median length of pronotum: 7.50 to 8.00; median length of mesonotum: 17.0 to 19.0; length of tegmen: 16.0 to 18.5; length of hind wing: 30.0 to 31.0; length of femora: anterior 26.0 to 27.0, middle 15.5 to 17.0, hind 17.5 to 18.0; length of tibiae: anterior 22.0 to 24.0, middle 14.0 to 14.5, hind 15.0 to 16.5.

Specimens examined.— 5 **nymphs**, Süd – Formosa, Taihanroku, Hans Santer. leg. 1-7 VII 1908 vend.10.X.1908; Z.M.H. Hamburg; *M. batesii* [ZMUH]. **6 ♀♀ and 10 nymphs**, Formosa, Taihanroku, 7. 1908. Eing. nr. 130, 1927; Z.M.H. Hamburg; *M. batesii* [ZMUH]. **1** ♀, Formosa, Taihanroku, Santer S.V.; 16-27. VII – 08; Zool. Mus. Berlin [MNHU]. **4** ♀♀ and **1 nymph**, Süd – Formosa, Taihanroku, Hans Sauteer, leg. 1.7.VII. 1908, Vend. 10. X. 1908; Z.M.H. Hamburg, *M. batesii* [ZMUH]. **1** ♀ **and 2 nymphs**, Formosa, Sauter leg. [SMT]. **2** ♀♀, Formosa, Sauter; Hebard collection [ANSP]. **1** ♀, Formosa, Sauter; Taihanordu 908; *M. alpheus* (Westwood) female, Hebard collection [ANSP]. **1 nymph**, Formosa, Sauter; Taihanrku, 1-7-VII. 908; *Megacrania alpheus* det. Pougraoz, Hebard collection [ANSP]. **1** ♀, Formosa, Taihanroku, H. Santer' 09; *Megacrania batesii* Kirby C, 1909 3; Staatliches Museum für Tierkunde, alpheus [SMT]. **3** ♀♀, Formosa, Taihanroku 7, 1908., Eing. nr 130°, 1927; Z.M.H. Hamburg; *M. batesii* [ZMUH].

4. *Megacrania batesii* Kirby, 1896

Megacrania batesii Kirby,1896. Trans. Linn. Soc. London 6: 471-472. Vickery 1983. CSIRO Australian division of Entomology, Technical paper 20. 8. Rentz 1996. Grasshopper Country. The Abundant Orthopteroid Insects of Australia. 256: 417-418. Balderson. Rentz & Roach 1998. Phasmatodea. (In) Zoological Catalog of Australia. 23: 372. Hsiung & Yang 2000. Journal of Orthoptera Research 9: 71. Otte & Brock 2005. Phasmida Species File. Catalog of Stick and Leaf Insects of the world. 197.

Megacrania alpheus [*nec* (Westwood)] Redtenbacher, 1908, In Brunner von Wattenwyl, K. & Redtenbacher, J., 1906 – 1908., Phasmidae Anareolatae, pp. 369 – 370, Pl. XVII (*partim*).

Megacrania alpheus [*nec* (Westwood)] Günther 1933, Sammlung von Phasmoĺden und Forficuliden aus Melanesien, pp. 151 –164 (*partim*).

Megacrania alpheus [*nec* (Westwood)] Günther, 1937, Vierteljahrsh. Naturf. Ges. Zürich, 82: p.95.

Type.— Lectotype ♀, Solomon Is.

Description.— (Lectotype ♀) Mesonotum slightly longer than head and pronotum together, the surface with 67 nearly round and distinct granules evenly distributed over the anterior 3/4 of its length, the posterior 1/4 with 34 indistinct and evenly distributed granules; first 3 spines of lateral margin of mesonotum stronger than the rest. Wings elongate-ovate, shorter than mesonotum; hind wings 1.89 × as long as tegmina, reaching a little beyond the hind margin of 2nd abdominal tergum. Posterior margin of anal segment not cleft. Anterior femora 1.4 × as long as mesonotum. Body generally pale green; head, thorax, mesothorax and legs darker than tegmina.

Measurements.— (lengths mm) ♂♂: body: 76.0 to 87.0; median of pronotum: 6.0 to 8.0; median of mesonotum: 12.0 to 14.0; tegmen: 15.0 to 19.0; hind wing: 35.0 to 37.0; femora: anterior 23.0 to 26.0, middle 14.0 to 15.0, posterior 15.5 to 18.0; tibia: anterior 21.0 to 23.0, middle 11.0 to 15.0, posterior 13.5 to 17.0. ♀♀: body: 98.0 to 136.5; median of pronotum: 7.5 to 10.0; median of mesonotum: 18.5 to 23.0; tegmen: 15.0 to 20.0; hind wing: 32.0 to 41.0; femora: anterior 28.0 to 32.0, middle 15.0 to 20.0, posterior 18.5 to 22.0; tibia: anterior 22.0 to 29.0, middle 16.0 to 19.0, posterior 18.5 to 22.0.

Distribution.— New Guinea, Bismarck Archipelago and Australia.

Specimens examined.— Lectotype ♀, Solomon Is, 84.3; *Megacrania batesii* Kirby; Lectotype; *M. batesii* type (blue label);**1** ♂ and **1** ♀, Neu Pommern, Kinigyhang, C.Ribble [SMT]; **1**♀, Palao Is, Caroline Islands, Z. Ono collector, *Megacrania alpheus* Westw. Det. C. Willemse, Bishop Museum collection #51 [Bishop Museum]; **2** ♀♀, Bismarck ARC; Manus I.: Rossam 35-125m.,VI-29-'59, J.L. Gressitt collector, Bishop Museum collection #55 (one with #56) [BMH]; 1 ♀, Neu Guinea: SE Oni. Oni, Port Glasgow, 2.11.1965, Pandanus, Bishop Museum collection #58 [BMH]. **4 nymphs** and **2** ♂♂, Neu Pommern, S. Kuste, Luschau Hafen, 26.2.1909, Hambg. Südsee Exp., Dr. G. Dunker leg., Z.M.H. Hamburg, *M. batesii* [ZMUH]; **1** ♂, N. Guinea, Biro 1899, Gingala Huon-Golf, Neu-Guinea E. Heyne V. 1909, *Alegacrania batesii* Kirby, Z.M.H. Hamburg, *M. batesii* [ZMUH]; **1** ♀, Hamburg, Südsee – Expedition, Neu Pommern, S. Küste Luschau Hafen (150° 8′) Ves hohsm Gras. 232 Dr. duncker leg. 26. II. 1909, Z.M.H. Ha, nirg, *M. batesii*. [ZMUH]; **6 nymphs**, Hambg. Südsee – Exp. Neu Pommern Südküste, Fulic Bucht, 5- 18. 2 1909 Dr. G. Dunkep leg., *Megacrania alpheus* Westw. larvae!!, Z.M.H.Hamburg, *M. alpheus* [ZMUH]; **2 nymphs**, Hamburg Südsee – Exp. Neu Pommern Südküste, Fulie Bucht 5-18. 2 1909 Dr. G. Dunker leg, Hamburg Südess-Expedition, Neu Pommern S. Küste, Pule Bucht. Flussmündung 363 Dr. G. Duncker leg. 55- 18. 11. 1909, Z.M.H. Hamburg, *M. alpheus*. [ZMUH]; **1 nymph**, Hamburg Südsee – Exp. Neu Pommer Sud Küste Fulie Bucht 5 – 18. 2. 1909 Dr. Gunker leg, Hamb. Südesse – exped. Neu Pommer Südküste, Fulic Bucht Flussmündung, 5 – 18. 11. 1909 Dr. G. Duncker leg. Ham Wiss Stifung ded 1. 11. 1909, Z.M.H. Hamburg, *M.alpheus* [ZMUH]; **1**♀, Amboina 1930, Dr. M. V. Kühlewein leg. Eing. nr. 58, 193, Z.M.H.Hamburg, *M. batesii* [ZMUH]; **1** ♀, Hamburg Sudsee-Expedition, New Pommern, S. Küste, Pulle Bucht Flussm Undung, 364, Dr. G. Duncker leg. 5-18 II. 1909, *Megacrania batesii* Kirby C, neu Pommern, Süd Pommern, Süd Küsste, Pulle Bucht, *Megcrania batesii* Kirbym K. Günther det., Z.M.H. Hamburg [ZMUH]; **2** ♂♂ and **1** ♀, Neu Pommer, S. Küste, Lusschau Hafen, 26.2.1909, Hambg. Südsee Exp. Dr. G. Duncker leg., Z.M.H. Hamburg, *M. batesii* [ZMUH]; **1** ♀, 0 130 female, Pelew – Ins., MG 10096, 272, Z.M.H. Hamburg, *M. alpheus* [ZMUH]; **1** ♀ Neu-Guinea, --man, --fak(?), ex coll. Fruhstorfer, 226, Z.M.H. Hamburg, *M. batesii* [ZMUH]; **1** ♂, 0 125 male , Mioko, MG 1590 Z, 270, Z.M.H. Hamburg, *M. batesii* [ZMUH]; **1** ♂ and **1** ♀, Neu-Guinea, Carl Zeyen, Zool. Mus. Berlin [MNHU]; **1** ♀, Furhstofer, D.N.G., Zool. Mus. Berlin [MNHU]; **1** ♂, Neu Guinea, Bero 1898, Gingala, Huon-Golf, Zool. Mus.

Table 1. Morphological differences between females of *M. spina* (Finschhafen, New Guinea), *M. wegneri* (Biak Id) and *M. batesii* (Kalalo, New Guinea).

Character	*M. spina*	*M. wegneri*	*M. batesii*
Mesonotum	Surface with 95 very strong and sharp granules. Lateral margins very spiny: first two spines on each side large and blunt, united together	With 109 granules, sharp and narrow. Lateral margins very spiny with two nearly parallel rows of strong triangular spines, but less sharp than *M. spina*; first few spines on each side very small and united	Surface with 80 rather strong granules. Lateral margins moderately spiny: first 3 spines on each side more closely positioned and sharper than rest
Hind wing	Reaching 4th abdominal tergum, but not exceeding its posterior margin	Reaching posterior margin of 4th abdominal tergum	Reaching posterior margin of 2nd abdominal tergum
Subgenital plate	Surpassing extremites of cerci	Surpassing extremites of cerci	Not surpassing extremites of cerci
Coloration	Brownish-testaceous	Light brown in general	Head, pronotum, legs and wings pale green, rest of body reddish-brown

Table 2. Morphological differences between females of *M. batesii* collected in Umboi Isl., N.E. New Guinea and the lectotype of *M. batesii* (Solomon Is).

Character	*M. batesii* (Umboi Id)	*M. batesii* (Solomon Is)
Mesonotum	With 90 granules	With 80 granules
Subgenital plate	Surpassing extremities of cerci	Not surpassing extremities of cerci
Coloration	Testaceous in general, head, pronotum and wings pale green	Green

Berlin, *Megacrania batesii* K. [MNHU]; **1** ♀, Mioka (the following writing on the label unclear), Bismarck-Archipel, Dahl leg., 199, Zool. Mus. Berlin [MNHU]; **1** ♀, Mioko in fineborum (writing on label unclear), Bismarck-Archipel Fr. Dahl, *Megacrania batesii* Kirby, Brunner det., 10, Zool. Mus. Berlin [MNHU]; **1** ♀, Neu-Guinea, Karlei (Weite Bucht) 1930 Pat. J. Schneider leg., Zool. Mus. Berlin [MNHU]; **4** ♀♀, Nuknoro, Ost Karolinen, Tier Lebt auf Pandanuss büumen riecht sehr sttark nach pfefferwürze, *Megacrania batesii* Kirby det K K Günther 1990, Four labels are all like "Zool. Muss. Berlin" on their backs with number individually 12, 13, 14 & 15 [MNHU]; **1 nymph**, Neu Guinea, *Megacrania batesii* Kirby nymph det. K K Günther 1990, Zool. Mus. Berlin /16 [MNHU]; **1**♂ **and 1**♀, New Guinea: SE Mamai Pl'n, 60m, 1. 1965, P. Shanahan collector Bishop, # 59 (male with # 89) [Bishop Mus.]. **2** ♀♀, New Guinea: SE Mamai Plt'n nr. Glasgow II. 1964, P. Shanahan collector Bishop, 60 m., Bishop Museum collection # 88 (other one with # 90); **9** ♀♀, N E New Guinea, Kalalo 750 m, 20-30 VIII. 1966, Mena, collector, Bishop Museum collection # 65 (remaining specimens individually with # 67, 68, 69, 70, 71, 72, 73 and 74) [BMH.]; **1**♀, New Ireland (SW), Ridge above "Camp Bishop" 20 km up Kait R. 150 – 300 m. VII-8-1956, B.J. Ford, Jr. collector, 14 (small square label with ink writing), Bishop Museum collection # 66 [BMH]; **5** ♂♂ **nymphs**, **1**♀ **nymph**, New Guinea – SE Milne Bay, 14-23. 2. 69, J. Sedlacek collector Bishop Mus., Bishop Museum #76 [remaining specimens individually with # 77, # 84, # 85 (♀ **nymph**), # 86, # 87] [BMH]; **1** ♀ **nymph**, New Guinea: NE Kuper QA 1-80m, 25 km Salamanra, 25-26. I. 1969, J.R. Sedlacek collector Bishop, Bishop Museum collection # 80 [BMH]; **4** ♂♂ **and 2** ♀♀, NE New Guinea, Umboi I. Lab. 0 – 10 m. 6 –7 II 1967, G.A. Samuelson collector Bishop Mus., Bishop Museum collection # 81[(remaining specimens individually with # 82, # 83, # 109 (♀), # 110(♀) # 111] [BMH]; **9** ♀♀, 17. 345 146.05E, Etty Bay, 8 km ESE of Innisfail, Qld., 26 March, 1988, D.C.F. Rentz Stop A-37, Aust. Nat. Ins. Coll., Aus-1 [CSIRO]; **3** ♀♀, Papua New Guinea, Alotau, Milne, Bay Province 2.X. 1989, Coll. Bob Prior – on Pandanus [LEM]; **1**♀ **nymph**, Philippines, Romblon, V.II. 1979 [LEM]; **1** ♀ **nymph**, Philippines, 1979 [LEM]; **1** ♂, New Guinea, Biro 1899, Simbang, Huon Golf., *M. alpheus* (Westwood) Hebard collection [ANSP]; **1 nymph**, Micronesia, Carolina Isls. Palau group, Koror 2 miles N. of Airport, ca 7º 23' N 134º 32E 19-26 Feb. 1986 in forest on *E. reycinetia* (a pandan), (Cott Alexander Elinn) #13, *Megacrania* sp? *batesii* Kirby Jun det. D.K. McE Kevan 1989, ANSP [ANSP]; 1♀, Kais. Wilhelmsland Paup, Dr. Schlaginbafen, *Megacrania batesii* Kirby, female, Staatl. Museum für Tierkunde Dresden, 1910, *alpheus* [SMT]; **1** ♀ 17.34S 146.05E, Etty Bay, 8 km EsE of Innisfail, Qld. 26 March 1988, D.C.F. Rentz, Stop A-37 on *Pandanus tectorius* [LEM]; **3** ♀♀, K. Willhelms-land Bongu, Staatl. Museum für Tierkunde Dresden, *alpheus* [SMT]; **1** ♀ **nymph**, Kais. Willhelms land, Toricelli Gebirge, Dr. Schlaginhaufen, *Megacrania batesii* Kirby ♀ laval, 1910, Staat Museum für Tierkunde Dresden, *alpheus* [SMT]; **1** ♂ A.B.. Meyer, Mysore, Kordo 1873, Staatl. Museum für Tierkunde Dresden, *alpheus* [SMT]; **1** ♀ **nymph**, Misool Id. (W.), 14. IX. 1948. M.A. Lieftinck, *Megacrania alpheus* Westw. larvve Det. C. Willemse [NHNHL].

There were very minor variations between females of *M. batesii* collected in Umboi , NE New Guinea and the lectotype of *M. batesii* from the Solomon Islands (Table 2), as well as between females from Umboi Island and Kakalo, New Guinea (Table 3), and also between males from Umboi Island and Kalalo, New Guinea (Table 4).

5. *Megacrania rentzi* Hsiung, 2001

Megacrania rentzi Hsiung, 2001. Journal of Orthoptera Research, 10(2): 295 – 296. Otte & Brock. 2005. Phasmida Species File. Catalog of Stick and Leaf Insects of the world. 198.

Type.— Holotype ♀, Tandjong. S.D. Borneo.

Description.— (holotype ♀) Pronotal disc as long as wide; mesonotal lobes much longer than broad, about 2.5× length of pronotum, mesotum with about 60 elongate granules evenly distributed on anterior 80% of surface, lateral margin not too spiny, the spines dull; tegmina elongate-ovate, slightly longer than mesonotum: hind wing surpassing posterior margin of the 2nd abdominal tergum; anterior femora 1.9× the length of mesonotum; posterior margin of anal segment nearly square; general color light brown. (Allotype ♂): agrees generally with holotype, but smaller and differing as follows: about 70 granules on surface of mesonotum, lateral margin of mesonotum more spiny; hind wings reach to middle of the 4th abdominal segment; coloration testaceous.

Table 3. Morphological differences between females of *M. batesii* collected in Umboi Id and specimens collected in Kalalo, New Guinea.

Character	*M. batesii* (Umboi Id)	*M. batesii* (Kalalo)
Mesonotum	With 90 moderately strong granules	With 80 large and very strong granules
Hind Wings	Reaching the 3rd abdominal tergum	Only reaching the posterior margin of 2nd abdominal tergum

Table 4. Morphological differences between males of *M. batesii* collected in Umboi Id and specimens collected in Kalalo, New Guinea.

Character	*M. batesii* (Umboi Id)	*M. batesii* (Kalalo)
Size	Body slightly longer and wider; 6.6× as long as mesonotum	Body short and slim; 6.3× as long as mesonotum
Wings	Tegmen 1.4× as long as mesonotum	1.2× as long as mesonotum
Mesonotum	Granules nearly round	Granules more elongate

Table 5. Morphological differences between males of *M. wegneri* (paratype – Obi Id) and specimens collected from Jef Vio I., Vogelkop, Northern New Guinea.

Character	*M. wegneri* (Obi Id)	*M. wegneri* (Jef Vio I.)
Mesonotum	Surface with 70 cone-like granules	Surface with 85 cone-like granules
Wings	Tegmina 1.7× length of mesonotum; hind wings surpassing posterior margin of 5th abdominal tergum	Tegmina 1.6× length of mesonotum; hind wings just reach posterior margin of 5th abdominal tergum
Coloration	Brown in general; pronotum and mesonotum dark brown, head dark green, legs light brown	Light brown in general; head, thorax, the joints between tibiae and femora and coxae, pinkish

Measurement.— (lengths mm) Holotype ♀: body 132.0; median of pronotum 11.5; median of mesonotum 21.0; tegmen 24.0; hind wing 40.0; femora: front 34.5, middle 21.0, hind 26.0; tibiae: front 31.00, middle 20.0, hind 23.0. Allotype ♂: body 80.5; median of pronotum 6.0; median of mesonotum 12.5; tegmen 15.0; hind wing 40.0; femur: front 24.0, middle 13.0, hind 16.0; tibiae: front 20.5, middle 11.5, hind 14.5.

Specimens examined.— **Holotype** ♀ , bearing three labels: 1. Tandjong. S.D. Borneo, Fr. Suck *leg*. Ded 31. XII. 1895; 2. Z.M.H. Hamburg; 3. *M. alpheus*. **Allotype** ♂, bearing three labels: 1. Borneo; 2. Staat Museum für Tierkunde Dresden; 3. *alpheus* The holotype is deposited in the Universität Hamburg Zoologisches Institut und Zoologisches Museum and the allotype is in the Staatliches Museum für Tierkunde.

Distribution.— Known only from Borneo.

6. *Megacrania wegneri* Willemse, 1955

Megacrania wegneri Willemse, 1955, Treubia 23: 41-44. Hsiung. 1991. Oriental Insects. 25:172 (key to species). Otte & Brock. 2005. Phasmida Species File. Catalog of Stick and Leaf Insects of the world. 198.

Type.— Holotype ♂: Central Obi, Telaga, 160 m, 1.8 1953. Allotype ♀: Central Obi, Telaga 160 m, 27. 7. 1953.

Description.— (♀) Body slim. Pronotum slightly longer than broad; mesonotal surface with 70 long and sharp granules, lateral margin strongly spined, first few anterior teeth not expanded. Tegmina oval, reaching middle of first abdominal tergite, anterior margin less rounded than posterior margin. Hind wing long, reaching to posterior margin of 4th abdominal tergum. Abdomen 4.6× as long as mesonotum; anal segment about as long as broad, posterior margin nearly rounded, slightly concave in central area, not cleft; cercus broad, lamellate, reaching beyond anal segment; operculum much longer than broad, not reaching beyond anal segment. General coloration green or greenish brown. Male: agrees generally with females, but smaller and differing as follows: tegmina oval, reaching tip of first abdominal tergite, its anterior and posterior margins regularly rounded. Hind wing long, reaching a little beyond hind margin of the fifth abdominal tergite. Anal segment longer than broad. Cercus broad, lamellate, apex rounded, and reaching a little beyond anal segment.

Measurements.—(lengths mm) ♀: body 105.0 to 112.0; median of pronotum 7.0; median of mesonotum 16.0 to 17.0; tegmen 19.0 to 21.0; hind wing 39.0; femora: front 28.0, middle 15.0 to 17.0 and hind 17.0 to 18.0; length of tibia: front 23.0, middle 10.0 to 14.0 and hind 16.0. ♂: body 85.0 to 88.0; median of pronotum 6.0; median of mesonotum 11.5; tegmen 19.0 to 20.0; hind wing 45.0 to 51.0; femora: front 22.0 to 23.0, middle 13.0 to 13.5, hind 15.0 to 15.5; tibia: front 20.0 to 21.0, middle 11.0 to 12.0, hind 14.0.

Specimens examined.—**Holotype** ♂: Central Obi, Telaga, 160 m, 1.8 1953. **Allotype** ♀: Central Obi, Telaga 160m, 27. 7. 1953; **1** ♀, Amborz, Pananus, 10-1-1961; *Megacrania batesii* Kirby, Det. S. Nakata 62; Bishop Museum 3.[BMH]. **1** ♂, New Guinea, Neth. Biak I. Kampong Landbouw, 50 – 100m. May 28, 1955; J.L. Gressit collector; T.C. Maa collector Bishop; Bishop Museum collector # 61. [BMH]. **1** ♀, New Guinea (Neth.): Vogelkop: Jef Vio I. Sele Straits 1 – 5m Aug 15, 1957; D. Elmo Hardy collector, Bishop Museum: Bishop Museum collection # 145. [BMH]. **1** ♀, New Guinea: Neth Biak I. Mangrowawa 50 – 100m, V-29-1959; Bishop Museum collection # 116. [BMH]. **1**♂, Obi Id, Telega (Lake) 4.9.1953; *Megacrania wegneri* n. sp. Det. C. Willemse; Paratype . [NMNHL]. **1** ♂, Obi Id,Telega (Lake) 3-VIII. 1953; *Megacrania wegneri* Det. C. Willems; paratype. [NMNHL]. **1 nymph** (♀) Obi Isl., Telega (Lake) 2. Sept. 1953; *Megacrania wegneri* n. sp. Det. C. Willemse. [NMNHL]. **1** ♀, Obi Id Telega (Lake) 1-8 1958; *Megacrania wegneri* n. sp. Det. C. Willemse; paratype. [NMNHL]. **1** ♀, Obi Id Telega (Lake); 4 Sept. 1953; *Megacrania wegneri* n. sp. Det. C. Willemse; paratype. [NMNHL];**1** ♀, 0 130 female, Pelew – Ins.,M G 10096; Z.M.H. Hamburg; 272 *M. alpheus*. [ZMUH]. **1** ♀, New-Guinea; 269; Z.M.H. Hamburg; *M. batesii* ex coll. Fruhstorfer. [ZMUH]. **1** ♂, Neu-Guinea –man, --fak (?), ex coll. Fruhstorfer; 226; Z.M.H. Hamburg; *M. batesii* [ZMUH]. The types are deposited in the national Museum of Natural History, the Netherlands.

Distribution.— Indonesia, New Guinea and Pelew Is.

M. wegneri collected from Jef Vio I. Vogelkop, northern New Guinea was only slightly different from the paratype from Obi Id (Table 5).

Table 6. Morphological differences between females of *M. wegneri* (Paratype – Obi Id) and *M. batesii* (Kalalo, N.E. New Guinea).

Character	*M. wegneri* (Obi Id)	*M. batesii* (Kalalo)
Pronotum	Slightly narrowing posteriorly	Distinctly narrowing posteriorly
Mesonotum	Granules distinct and sharp; lateral margins very spiny	Granules not as sharp as *wegneri;* lateral margins less spiny
Wings	Hind wings quite long, reaching posterior margin of 4th abdominal tergum	Hind wings quite short, reaching posterior margin of 2nd abdominal tergum
Cerci	Cerci extending well beyond posterior margin of subgenital plate	Cerci not surpassing subgenital plate, only reaching its posterior margin

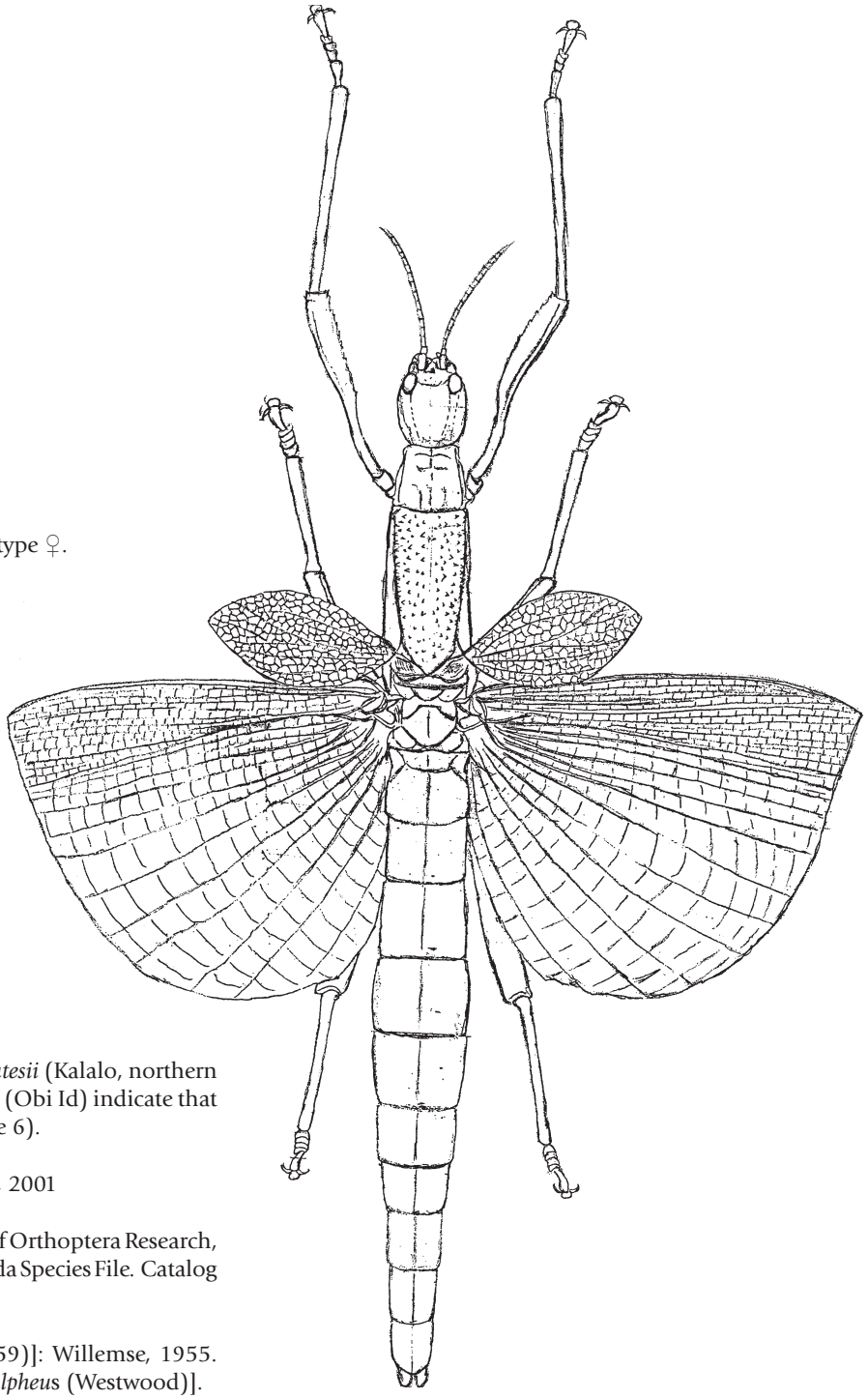

Fig. 3. *Megacrania spina* Hsiung n. sp. Holotype ♀.

Morphological differences between *M. batesii* (Kalalo, northern New Guinea) and the paratype of *M. wegneri* (Obi Id) indicate that the two are distinctly different species (Table 6).

7. *Megacrania brocki* Hsiung, 2001

Megacrania brocki Hsiung, 2001. Journal of Orthoptera Research, 10(2): 293 – 295. Otte & Brock. 2005. Phasmida Species File. Catalog of Stick and Leaf Insects of the world 197.

Megacrania alpheus [*nec* (Westwood, 1859)]: Willemse, 1955. Treubia, 23: 45 [taxonomy, remarks on *M. alpheus* (Westwood)].

Type.— Holotype ♀, Key-Inseln.

Description.— (♀) Pronotal disc as long as wide. Mesonotal surface bearing 60 elongate, narrow and prominent granules, lateral margins spiny, the first three anterior spines expanded and closely connected. Hind wings short, 11.8× as long as tegmina, reaching up to 2/3 length of 3rd abdominal tergum. Anterior femora 1.5× as long as mesonotum. Posterior margin of anal segment nearly rounded and distinctly cleft medially. Subgenital plate slightly longer than mesonotum. Color generally pale green.

Measurements.— (lengths mm) ♀♀: body 104.5 to 128.5; median of pronotum 8.0 to 9.0; median of mesonotum 17.0 to 20.0; tegmen 16.5 to 21.0; hind wing 30.0 to 36.5; femora: front 25.0 to 29.0, middle 15.0 to 17.0, hind 15.5 to 19.0; length of tibia: front 22.0 to 27.5, middle 12.5 to 15.0, hind 15.0 to 17.5.

Specimens examined.— **Holotype** ♀, Key-Inseln, 1912, P. Kibler *leg.* (holotype and paratypes were deposited in Staatliches Museum Tierkunde); **1** ♀, Key-Ins, *Megacrania batesii* Kirby; Z.M.H. Hamburg; *M. batesii*. [ZMUH]. **1** ♀, Key-Ins. Eing. 135, 1925; Key-Inseln; *Megacrania batesii* Kirby 1896 K. Günther det.; Z.H.M. Hamburg;

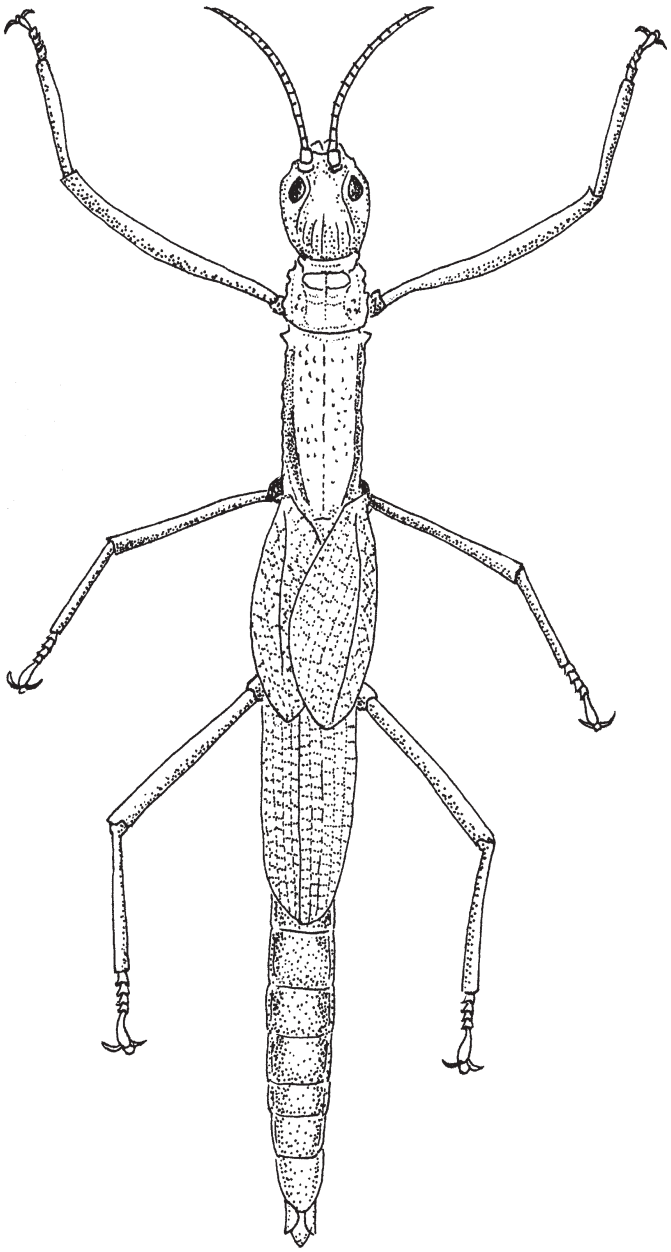

Fig. 4. *Megacrania obscurus* Hsiung n. sp. Holotype ♀.

M. batesii. [ZMUH]. **1 nymph**, Isl. Obi, Obi Lake 160m. VIII. 1953; *Megacrania wegneri* n. sp. Det. C. Willemse. [NMNHL]. **85 ♀♀**, Key-Inseln, 1912, P. Kibler leg. [SMT]. **1 ♀**, Isl. Obi, Kasowari –Lodii, 19-8-1953; *Megacrania alpheus* West. Det. C. Willemse. [NMNHL]. **1 ♀**, Hoedt, Boeroe 1884; *Megacrania alpheus* Westw. K. Günther [NMNHL]. **1 nymph**, Isl. Obi, Kasowari, 20-8-1958; *Megacrania alpheus* Westw. larve Det. C. Willemse [NMNHL].

Distribution.— Known only from S. Moluccas.

8. *Megacrania spina* Hsiung new species

Holotype.— female (Fig. 3, Table 1, 7)

Description.—**Head**: oval, slightly porrect, a little longer than broad. **Thorax**: pronotal disc as long as broad, slightly narrowed at antero-lateral angles, the dorsal surface uneven and with strongly defined margins; mesonotum about 2.6× length of pronotum, its surface with numerous very sharp and elongate granules, sublaterally with two nearly parallel rows of very strong triangular, needle-like spines, gradually turning inward posteriorly, but not meeting; a median sulcus or keel distinctly present on mesonotum. **Wing**: tegmina elongate-ovate, slightly longer than mesonotum (1.1×); hind wing 2× as long as tegmina, reaching the posterior margin of 4th tergum. **Legs**: anterior femora about 1.5× as long as mesonotum, with ridge bearing two very weak spines visible in ventral view; tibae of all legs without spines; first tarsal article of front leg as long as following three combined; first three articles of middle and hind legs of equal length, the fourth smaller, the fifth elongate with apex expanded. **Abdomen**: elongate, segments I-V wider than those remaining; posterior margin of anal segment nearly rounded, slightly concave medially; cerci broad, lamellate, apices rounded; subgenital plate gradually narrowing apically, not attaining extremities of cerci, its ventral surface with a longitudinal ridge.

Coloration.— Brownish-testaceous.

Measurements.— (lengths mm) (Holotype ♀) body 104.0; pronotum 7.5; mesonotum 18.5; tegmen 21.0; hindwing 41.0; front femur 28.0 median femur 17.0; hind femur 19.0; front tibia 26.0; median tibia 14.5; hind tibia 18.0.

Type material.— **Holotype** ♀, bearing five labels: 1. Neu-Guinea, Finschhafen 1891, coll. Fruhstorfer; 2. H. fruhstorfer vend. 6. III. 1898; 3. 267 (Green & white label); 4. 2. M.H., Hamburg; 5. *M. batesi* (typed label). The type is deposited in the Universtät Hamburg, Zoologisches Institut und Zoologisches Museum, Germany.

Distribution.— Known only from New Guinea.

Etymology.— This new species is named based on its unique morphological character: the surface of the mesonotum bears numerous sharp and elongate granules and has two nearly parallel rows of very strong triangular, needle-like spines near the lateral margins.

I have examined all available New Guinea specimens of *Megacrania* from different museums and have concluded there are four species in New Guinea, namely *M. batesii*, *M. wegneri*, *M. nigosulfurea* and *M. spina* n. sp.

M. batesii, *M. wegneri* and *M. spina* all have strong spines along the lateral margin of the mesonotum, but the degree of sharpness is quite different. Also the shape of the granules on the mesonotum and the lengths of the hind wings are distinctly different.

Table 1 presents a comparison of the morphological features of *M. spina* n. sp. with *M. batesii* and *M. wegneri*, to which *M. spina* is more closely related. *M. nigrosulfurea* is not included in the comparison as it is so distinct from the others (Hsiung 1991).

9. *Megacrania artus* Hsiung, 2003

Megacrania artus Hsiung, Journal of Orthoptera Research 12(1): 31-35. Otte & Brock. 2005. Phasmida Species File. Catalog of Stick and Leaf Insects of the world. p.197.

Type.— Holotype ♀, Admiralitäts Inseln.

Description.— (♀) Surface of mesonotum with 86 small, narrow granules; mesonotum 2.8× length of pronotum, along its lateral margin: first spine sharper than rest, those following equal, slightly dull. Tegmina elongate-oval, as long as mesonotum; hind wing 1.68× as long as tegmina, nearly reaching posterior margin of 3rd abdominal tergum. Posterior margin of anal segment smooth, without split. Subgenital plate slightly surpassing extremities of cerci. Male agrees generally with female, but smaller, differing as follows: about 60 very distinct granules on surface of mesonotum; hind wings reach to anterior margin of 5th abdominal segment; coloration brown; all femora with a few more spines visible in ventral view; anterior femora with 5 on both left and right; middle with 4 on left, 2 on right; posterior 5 on left, 4 on right.

Measurements.— (lengths in mm). ♀, body 17.0; median of pronotum 8.0; median of mesonotum 22.5; tegmina 22.5; hind wing 38.0; femora: front 33.0, middle 21.0, hind 24.0; tibia: front 30.5, middle 16.0, hind 19.0. ♂: body 82.0; median of pronotum 9.0; median of mesonotum 14.0; tegmen 19.0; hind wing 41.0; femora: front 24.0; middle 15.0; hind 18.0; tibia: front 24.0; middle 13.0; hind 16.0.

Specimens examined.—**Holotype** ♀, bearing five labels: 1. Admiralitäts – Inseln, Pak Insel 1909, Kpt. Martens leg; ded 17. 12. 1908; 2. K. Günther determ, Versand nr. 21, 1930; pub: Mttlg. Zfoologg. Muss. Berlin Bd. 17H.6; 3. *Megacrania batesii* Kirby (hand written label); 4. Z.M.H. Hamburg; 5. *M. batesii*. **Allotype** ♂, bearing five labels: same as in holotype. The type specimens are deposited in the Zoologisches Museum, Universität Hamburg, Hamburg, Germany.

Distrbution.— Known only from the Admiralty Islands.

10. *Megacrania obscurus* Hsiung new species (Fig. 4, Table 7).

Description.—**Head**: oval, slightly porrect, longer than broad. **Thorax**: pronotum nearly as long as broad, slightly narrowed at anterolateral angles; mesonotum much longer than broad 2.7× length of pronotum, the surface with 70 indistinct granules evenly distributed over anterior 2/3, and with two nearly parallel rows of very blunt spines, the most anterior in each row long and strong. **Wing**: 2× as long as tegmina, extending a little beyond posterior margin of third abdominal tergum. **Abdomen**: elongate, about 4.37× as long as mesonotum. Posterior margin of anal segment nearly rounded, central margin slightly cleft. Cerci quite broad and lamellate, apices narrow. Subgenital plate 1.37× as long as mesonotum, gradually narrowing apically, and extending beyond the cerci; its ventral surface with a median longitudinal ridge. **Legs**: anterior femora about 1.75× longer than mesonotum. All femora with a ridge bearing a few spines; anterior femora with 7 distinct spines, the mid femora with 4, the hind femora with 3 on the right and 4 on the left. Tibiae of all legs without spines; the first tarsal article of anterior leg as long as following three articles combined; the first three tarsal articles of middle and hind legs of equal length, fourth smaller, fifth elongate, and expanded at apex.

Coloration.—Generally pale green, mesonotum and abdomen light brown.

Measurements.— (lengths mm) Holotype ♀: body 116.0; median of pronotum 7.0; median of mesonotum 16.0; tegmen 37.0; femora: anterior 28.0, middle 16.5, hind 17.0; tibiae: anterior 23.0, middle 14.0, hind17.0.

Type material.— Holotype female. Bears three labels: 1. New Hebrides: Efate, 40 km. NE villa, 4.VIII. 1967; 2. J&M. Sedlacek, Bishop; 3. Bishop Museum.

The holotype is deposited in the Bishop Museum, Honolulu, Hawaii.

Distribution.— Known only from Efate, New Hebrides.

Etymology.— The specific name *obscurus* refers to the indistinct granules on its mesonotum.

11. *Megacrania nigrosulfurea* Redtenbacher

Type.— Holotype ♀, Neu-Guinea (Hofmus. Wien, Coll. FRUHSTORFER) (Topotype in Academy of Natural Science, Philadephia).

Redtenbacher, 1908. In Brunner von Wattenwyl K. & Redtenbacher: 369-370. Günther. 1933. Verhandlungen der Naturforschenden Gesellschaft, Basel. 44(2): 154. Brock. 1998. Catalogue of type-specimens of Stick- and Leaf-Insects in Naturhistorisches Museum Wien. 13(5): 46 (type data). Hsiung. 1991. Oriental Insects. 25: 172 (key to species). Otte & Brock. 2005. Phasmida species File. Catalog of stick and Leaf Insects of the World. 197.

Description.— Antennae short, with twenty four articles. Surface of mesonotum smooth, its lateral margin moderately spiny. Hind wing only slightly surpassing hind margin of 2nd abdominal tergum. Last abdominal tergum lamellate, surpassing subgenital plate. Color yellowish black.

Measurements.—(lengths mm) ♀♀: body 96.0 to 105.0; median of pronotum 7.0 to 7.5; median of mesonotum 15.0 to 17.0; tegmen 14.0 to 18.2; hind wing 21.5 to 30.5; femora: front 22.0 to 25.0, middle 13.5 to 16.0, hind 16.0 to 18.0, tibia: front 20.0 to 22.0, middle 11.5 to 14.5, hind 15.0 to 18.0.

Specimens examined.—**6**♀♀: New Britain, Gazelle pen MT. Sinewit, 900 m, 7-16. XI. 1962; J. Sedlacek collector Bishop; Bishop Museum collection #62, 97, 100, 102, 103, 104 (each specimen with individual number) [BMH]. 5♀♀: New Britain, Gazelle pen., Upper Warangoi, 250–600 m 28-30. XI. 1962; J. Sedlacek collection Bishop; Bishop Museum collection #91, 92, 93, 94, 95 (each specimen with individual number) [BMH]. **1** ♀: Neu-Guinea, ex coll. Fruhstorfer; *Megacrania nigro-sulfurea* Redt., Det. Hebard 1917, Hebard CLU; *Megacrania nigro-sulfurea* Redt. "new Guinea" Topotype Prob. taken w. type [ANSP]. **1** ♀: Hamburg südsee – Expedition, New Pommern, S. Küste, Jacquinot Bay, 258, Dr. Dunker leg. 19/20 XII. 1908; *Megacrania nigrosulfurea* Redt. of K. Gunther, Uerh. Naturl. Yes (?) Bascl. p 154; a long ink writen note; Z.M.H. Hamburg; *M. nigrosulfurea* [ZMUH]; **1** ♀: Neu pPommern, S. Küste, Jacquinot Bay. Dr. Duncker10/20 XII. 1908; Z.M.H. Hamburg; *M. nigrosulfurea* [ZMUH]; **1 nymph**: Zoolog. Museum Berlin, Fundort: matupi, Bismarck-Archipel, Sammler Dr. Heinroth, get. am. Jr. na; A.J. Jülsorhser (unclear?) 30.XII.)) Dr. Heinroth; *Megacrania nigrosulfurea* Redt. K. Günther Det.; Zool. Mus. Berlin /15 [MNHU].

12. *Megacrania phelaus* Westwood

Type.— Fiji (Feejee) Islands (D. Macgillivray, deposited BMHH).

Table 7. Morphological differences between *Megacrania obscurus* and its other more closely related species of *Megacrania*.

Character	*Megacrania obscurus* (Efate, New Hebrides)	*Megacrania vickeri* (Admiralty Is)	*Megacrania alpheus* (lectotype)	*Megacrania rentzi* (Tandjjong, S.D. Borneo)
1. Mesonotum	Dorsum with 70 indistinct granules quite evenly distributed over anterior 0.65	Dorsum with 88 distinct, nearly oval, granules	Dorsum with 45 large, not very distinct, sparsely distributed granules; 2 nearly parallel rows of small distinct spines near lateral margins	Dorsum with 60 elongate granules, lateral margins with very blunt spines
2. Hind Wing	2.0 × as long as tegmina, extending a little beyond hind margin of 3rd abdominal tergum	1.9 × as long as tegmina, reaching center of 4th abdominal tergum	1.57 × as long as tegmina, reaching middle of the 2nd abdominal tergum	2.0 × as long as tegmina, surpassing posterior margin of 2nd abdominal tergum
3. Femora	Anterior femora about 1.75 × as long as mesonotum. Fore, mid, hind femoral ridges with 4-9 spines visible in ventral view	Anterior femora about 1.57 × as long as mesonotum. A11 femoral ridges with 1-3 spines visible in ventral view.	Anterior femora about 1.69× as long as mesonotum. All femoral ridges with spines visible in ventral view	Anterior femora about 1.7× as long as mesonotum. All femoral ridges with 9-11 spines visible in ventral view
4. Subgenital Plate	Surpassing extremities of cerci	Just reaching extremities of cerci	Surpassing extremities of cerci	Not surpassing extremities of cerci
5. Anal Segment	Posterior margin slightly cleft medially	Posterior margin not cleft	Posterior margin nearly rounded, slightly concave	Posterior margin nearly square

Platycrania phelaus, Westwood,1859 Cat. Phas. p.113, pl.27, fig. 5 female.
Megcrania phelaus Kaup, 1871, Berl. Ent. Zeitschr. 15, p. 38. Kirby 1871. Transactions of the Linnean Society, London. (2)6: 470; 1904. A synonymic catalogue of Orthoptera. 1: 385. Redtenbacher. 1908 Die Insektenfamilie der Phasmiden. 3: 370. Hsiung. 1991. Oriental Insects. 25: 172 (key to species). Otte & Brock. 2005. Phasmida Species File. Catalog of Stick and Leaf Insects of the world. 197.

Description.— ♀: head obovate and convex, slightly porrect. Antennae longer than pronotum and mesonotum combined. Mesonotum longer than broad, > 2× length of pronotum, its surface smooth. Tegmina elongate-ovate, very strongly and thickly reticulated, slightly longer than mesonotum. Hind wing nearly 2× as long as tegmina, reaching to middle of 3rd abdominal tergum. Posterior margin of anal segment nearly rounded, slightly cleft medially. Subgenital plate not attaining extremities of cerci.

Measurements.— (length mm) ♀♀: body 94.5 to 118.0; median of pronotum 7.0 to 8.5; median of mesonotum 15.2 to 19.5; tegmen 17.5 to 20.0; femora: front 24.5 to 28.0, middle 14.0 to 16.5, hind 15.5 to 19.0; tibia: front 19.9 to 23.5, middle 11.5 to 15.0, hind 14.0 to 18.8. ♂♂: body 75.0 to 94.5; median of pronotum 4.5 to 6.5; median of mesonotum 7.0 to 14.0; tegmen 15.0 to 21.0; hind wing 39.0 to 57.0; femora: front 19.5 to 25.0, middle 11.5 to 14.5, hind 13.5 to 17.0; tibia: front 17 to 22, middle 10.0 to 13.0, hind 11.5 to 16.0.

Specimens examined.— **4** ♀♀: Solomon Is, Bougainville(s), Kokure, nr. Crown, Prince Ra 900m., VI-11-1956; E.J. Ford Jr. (only one specimen with such label); one specimen with #19, one with #21 and the remainder without such labels; one specimen also with #97, one with #92, one with #93 and one with #94; Bishop Museum collection #25 (one with #26, the remaining specimens individually with #27 and #47) [BMH]. **3** ♀♀: Solomon Is, R. Straatman collector, Bishop New Malaita Dala, Vi, 1964; Bishop Museum Collection #28 (the other two specimens individually with #29, #30) [BMH]. **2** ♀♀: Solomon Is., Russell. I. Pavuvu I., Pepesala, 0 – 100 m, 16. VII. 1964; R. Straatman collector, Bishop; Bishop Museum Collection # 36 (the other one with # 37) [BMH]. **1** ♂: Solomon Is., Hageulu 400-650 m. 13. IX. 1964; R. Straatman collector, Bishop; Bishop Museum # 39. [BMH]**1**♂: Solomon Is, Santa Ysabel, Hageula, 600 –650 m, 13. IX. 1964; R. Straatman collector, Bishop; Bishop Museum Collection # 42 [BMH]. **2** ♂♂: Solomon Is., Bougainville: N.E. Matahi 700m 18 km SE Timputz; 1-7 III 1968 (one specimen with 15 – 21 III 1968); Tawi collector Bishop; Bishop Museum Collection #45 (one with # 46) [BMH]. **1** ♂: Solomon Is, Guadalcanal I., Mauda, 25m. 19 – 20 VII. 1959; Pandanus; J.L. Gressitt collector Bishop Museum; #86; Bishop Museum #50. (BMH). **1** ♀: Solomon Islands; Ugi Island, VI – 28, 33; Templeton, Crocker Exped. 1933; M. Willowa Jr. collector; 76; *Megacrania phelaus* Westood ? S. Nakata '65 [CAS]; **1** ♂ and **1** ♀: Solomon Islands; Kungana Bay, Redicil lad. VI-15-33; Tampleton Crocker Exped. 1933; M. Willowa Jr. collector; Megacrania sp. [CAS]. **1** ♂ **and 1 nymph**: New Britain, Gazelle pen., Mt. Sinewit, 900 m, 14 –16 XI. 1962; J. Sedlacek collector Bishop; Bishop Musseum Collection #75 (the nymph with #78). [BMH]. **1**♀: Solomon Is, Bougainville I. Mt. Balbi Togergo 700 m. 21. IV. 1968; R. Straatman collector Bishop; Bishop Mus. Collection # 105; **1**♀: Kira-Kira (Makira), Solomonen, 1. 1999 E. Paravicini; Staatl. Museum für Tierkunde Dresden; *phelaus;* 1937, 3 [SMT]. **1**♂: Salomanen, Mgi-Insel. R.J.A. Rever; 2620; *Megacrania phelaus*, K.S. Günther det. ; 1938 14; Staatl. Museum für Tirkunde Dresden; *phelaus* [SMT]. **1**♂: Kira-Kira (Maakiira), Salomonen I. 29 E. Paravicini; Staatl Museum für Tirkunde Dresden; 1937 3; phelaus [SMT]. **5 nymphs**: Soloman Is: Santa Isabel I: Trirotongna 300-600 m, 14. X. 1981; J.L. Gresitt. coll. Bishop Mus. Acc. 1981. 505; Bishop Museum collection #4 [BMH]. **1**♀ **nymph**: Soloman Is., Santa Ysabel, Ovi Vill. near Tatamba, 16. IX. 64; R. Straatman, collector

Table 7. Continued.

Megacrania tsudai (Kuraru, Taiwan)	*Megacrania wegneri* (Obi Id)	*Megacrania artus*	*Megacrania phelaus* (Holotype) Fiji Is
Dorsum with 70 slightly stronger sharper granules distributed on anterior 2/3 of surface; lateral margin with very distinct spines	Dorsum with 70 long sharp granules; lateral margin strongly spiny	Dorsum with 86 small narrow granules; lateral margin moderately spiny, first spine sharper than rest	Dorsum absolutely smooth, with two nearly parallel keels; lateral margins without spines
2.0 × as long as tegmina, reaching a little beyond hind margin of 3rd abdominal tergum	2.05 × as long as tegmina, reaching posterior margin of the 4th abdominal tergum	1.68 × as long as tegmina, nearly reaching hind margin of 3rd abdominal tergum	1.84 × as long as tegmina, reaching near hind margin of 3rd abdominal tergum.
Anterior femora about 0.33× longer than mesonotum. All femoral ridges with a few spines visible in ventral view; 6-7 distinct spines on each front femur; median and hind femora with 2 or 3 distinct,1-4 indistinct, spines respectively	Anterior femora about 1.64 × as long as mesonotum; all femoral ridges with a few spines visible in ventral view; 2 spines on each femur	Anterior femora about 1.46 × longer than mesonotum; all femoral ridges with a few spines visible in ventral view: 6 distinct spines on front femora, 2-4 spines on mid and 4-5 on hind	Anterior femora 1.9 × as long as mesonotum. All femoral ridges with a few spines visible in ventral view; 10-15 distinct spines on each front femora; 5-6 on mid, 6-7 on hind
Not attaining extremities of cerci	Not attaining extremities of cerci	Slightly surpassing extremities of cerci	Not attaining extremities of cerci
Posterior margin nearly round	Posterior margin not cleft medially	Posterior margin rounded, smooth, not cleft medially	Posterior margin nearly rounded, slightly cleft medially

Bishop; Bishop Museum Collection #9 [BMH]. 7♀♀; Solomon Is., San Cristobal Kira-Kira, 0-50 m. 8. XI. 1964 (one label with 10.XI. 1964); from pandanus leaves (ink writing); R. Straatman collector Bishop; Bishop Museum #10, 11, 14, 15, 16, 17, 23 (each specimen with an individual number) [BMH]. **1 nymph and 1** ♀: Solomon Is, New Georgia Group, Kolombangra I: 5-300m, VII-9-1959; J.L. Gressitt collector; Bishop Museum Collection #18 (the female with #20) [BMH]. **1** ♀: Solomon Is., Malaita: Auki, 2-20 m., X-3-'57; Pandanus; J.L.Gressitt collector; Bishop Museum collection # 19 [BMH]. **1 nymph**: Solomon Is: New Georgia Group: Buruku summit of Rendova PK., 1050 m. July 17, 1959; J.L. Gressitt collector; Bishop Museum Collection #21 [BMH]. **1**♀: Solomon Is. Malaita: E. of Kwalo (E. of Auki) 350 m Sept. 29, 1957; J. L. Gressitt collector; 102 (ink writing); 16# (ink writing); Bishop Museum Collection #22 [BMH]. **3** ♂♂: Solomon Is., Guadalcanal: Gold Ridgo-Suta (Jonapau) 1100m, VI-26-1956 (the other two specimens: one with 600m, VI-22-1956 and the other with 1000m V-29-1956); J.L. Gressitt collector; #79; Bishop Museum collection #24 (the other two: one with #44 and the other with #48) [BMH].

Acknowledgments

The author is indebted to Dr. R. Manuel for a critical review of the manuscript. Thanks are also due Miss Stéphane Boucher for computer assistance, Julia Mlynarek for preparing the map, Paul Brock for the gift of specimens, authorities of the Institutions listed under "Repositories" for the loan of specimens. I am also greatful to the British Museum of Natural History for allowing the late D.K. McE. Kevan to examine the collections of *Megacrania* on my behalf in 1990, as well as for the loan of three type specimens of *Megacrania*.

References

Balderson J., Rentz D.C.F., Roach A.M.E. 1998. Phasmatodea, pp.347-376, 451-456. In: Houston W.W.K.,Wells A. (Eds) Zoological Catalogue of Australia. Vol. 23 CSIRO Publishing. Melbourme, Australia [p. 372].

Brock, P.D. 1998. Catalogue of type specimens of stick-and leaf-insects in the Naturhistorisches Museum Wien (Insecta: Phasmida). Kataloge der wissenschaftlichen Sammlungen des Naturhistorischen Museums Wien. Vol. 13 (5), pp 1-72. [p. 46].

Brock P.D., Hasenpusch J. 2007. Studies on the Australian stick insects (Phasmida), including a checklist of species and bibliography. Zootaxa, Magnlolia Press, Auckland, New Zealand. 1570: 1-81 [p.74].

Carl J. 1915. Phasmiden von Neu-Caledonien und den Loyalty-Inseln, pp 173-178. In: Sarasin F., Roux J. (Eds) Nova Caledonia, Recherches scientifiques en Nouvelle-Caledonie et aux iles Loyalty. Zoologie A 2.

Chow Y.S., Lin Y.M. 1986. Actinidine, a defensive secretion of stick insect *Megacrania alpheus* Westwood (Orthoptera: Phasmatidae). Journal Entomological Science, Taiwan 21: 97-101.

Günther K. 1929. Die Phasmoiden der Deutschen Kaiserin Augusta-Fluss-Expedition 1912/13. Ein Beitrag Zur Kenntinis der Phasmoidenfauna Neu Guineas. Mitteilungen aus dem Zoologischen Museum Berlin 14: 600-747 [p. 624].

Günther K. 1931. Beitrage zur Systematik und Geschichte der Phasmoidenfauna Ozeaniens. Mitteilungen aus dem Zoologischen Museum in Berlin 14: 753-831 [pp.779-828].

Günther K. 1933. Uber enie kleine Sammlung von Phasmoiden und Forficulen aus Melanesien. Verhandlungen der Naturforschenden Gesellschaft in Basel 44: 151-161.

Günther K. 1937. Die von Dr. Schlaginhaufen 1909 in Neuguinea gesammelten Phasmoiden (Orth). Viertelijahrsschrift der Naturforschenden Gesellschaft in Zürich. 82: 77-99.

Hsiung C-C. 1991. The identity of *Megacrania* species of Taiwan (Cheleutoptera: Phasmatidae). Oriental Insects 25: 171-177.

Hsiung C-C. 2001. *Megacrania* species in Indonesia (Cheleutoptera: Phasmatidae). Journal of Orthoptera Research. 10: 293-301.

Hsiung C-C. 2003. Two new species of *Megacrania* Kaup (Cheleutoptera: Phasmatidea) from the Admiralty Islands. Journal of Orthoptera Research 12: 31-35.

Hsiung C-C., Yang J.-T. 2000. Systematic study of *Megacrania* species of Australia (Cheleutoptera: Phasmatidea). Journal of Orthoptera Research 9: 71-75.

Kaup J. J. 1871. Neue Phasmidae. Berliner Entomologische Zeitschrift 15: 25-42 [p.38].

Kirby W.F. 1896. On some new or rare Phasmidae in the collection of the British Museum. Transactions Linnean Society London 6: 447-475 [p.471, 472].

Kirby W.F. 1904. A Synonymic Catalogue of Orthoptera, Vol. 1, 501 pp. Orthoptera , Euplexoptera, Cursoria, et Gressoria (Forficulidae, Hemimeridae, Blattidae, Mantidae, Phasmidae). Longman, London [p.385].

Nakata S. 1961. Some notes on the occurrence of Phasmatodea in Oceania. Pacific Insects Monograph 2: 107-121.

Otte D. & Brock P.D. 2005. Phasmida Species File. Catalog of the Stick and Leaf Insects of the World. 2nd Edition. The Insect Diversity Association at the Academy of Natural Sciences, Philadelphia 74: 197-198.

Redtenbacher J. 1908. Der Insektenfamilie der Phasmiden. III. Phasmidae Anareolatore (Phibalosomini, Acrophyllini, Necrosciini), pp. 339-589. Wilhelm Engelmann, Leipzig [p.362-370].

Rentz D.C.F. 1996. Grasshopper Country: the Abundant Orthopteroid Insects of Australia. University of New South Wales Press, Sydney [p. 256].

Shiraki T. 1932. Phasmidae, *Megacrania*. Dobutsugaku Zasshi, Zoological Society Japan 45: 108-111.

Shiraki T. 1935. Orthoptera of the Japanese Empire (Part IV). Memoirs Faculty of Science and Agriculture, Taihoku Imperial University, Formosa 14: 24-88 [p.70].

Vickery V.R. 1983. Catalogue of Australian Stick Insects (Phasmida, Phasmatodea, Phasmatoptera, or Cheleutoptera). CSIRO Australia Division of Entomology Technical Paper 20, 19pp.

.Wang C.H, Chu Y. I. 1982. The morphological study of the egg shell of Tsuda's giant stick insect *Megacrania alpheus* Westwood. Phytopathologist and Entomologist, Taiwan 9: 98-109.

Westwood J.O. 1859. Catalogue of Orthopterous Insects in the Collection of the British Museum of London, Part 1, Phasmidae. British Museum, London, pp. 195.

Willemse C. 1926. Contribution a la faune des Orthoptères des Nouvelles Hebrides. Transactions Entomological Society London 1925: 513-529.

Willemse C. 1955. Description of *Megacrania* from Obi (Moluccas) with remarks on *Megacrania alpheus* Westwood (Orthoptera, Phasmidae). Treubia 23: 41-47.

Yamasaki T. 1991. Occurrence of *Megacrania alpheus* (Cheleutoptera: Phasmatidae) in Iriomote-jima Island, the Ryukyus. Proceedings Japanese Society of Systematics 44: 49-56.

Yasumatsu K. 1942. Stick insects' eggs. Bulletin Takaraguka Insectarium, Konty kan P , Japan 18: 1-20.

Yeh W.Y., Chu, Y.I. 1981. The biological study of the Tsuda's giant stick insect *Megacrania alpheus* Westwood. (Unpub., presented to Chinese Entomological Society, Taiwan, Taipei).

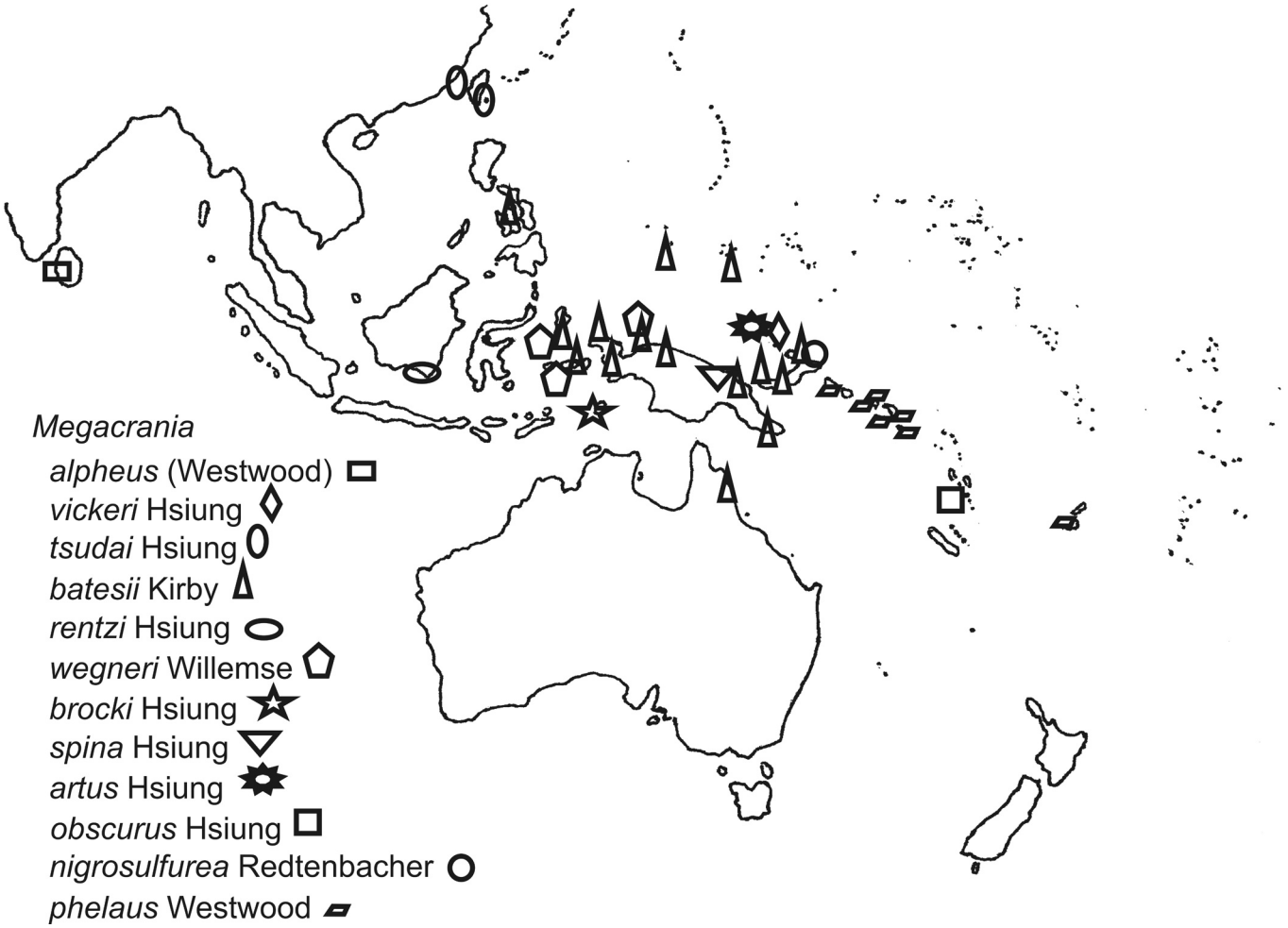

Fig. 5. Distribution of genus *Megacrania*.