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A review of the New Zealand stick insects: new genera and synonymy, keys, and a catalogue

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Abstract

This catalogue lists all genera and species of stick insects recorded or described from New Zealand. Genera are listed in alphabetical order within established subfamilies and tribes. Some taxonomic changes are made, with major changes as follows: 2 new genera in the subfamily Pachymorphinae are erected - *Niveaphasma* (type species - *Pachymorpha annulata* Hutton 1898) and *Asteliaphasma* (type species - *Spinotectarchus jucundus* Salmon 1991). *Mimarchus tarsatus* Carl 1913 is reduced to synonymy under *Argosarchus horridus* (White 1846), resulting in *Mimarchus* Carl 1913 becoming a synonym of *Argosarchus* Hutton 1898. Lectotypes are designated for *Argosarchus schauinslandi* Brunner 1907, *Clitarchus interruptelineatus* Brunner 1907, *Clitarchus laeviusculus* Stål 1875, *Micrarchus parvulus* Carl 1913, *Micrarchus tarsatus* Carl 1913 and *Pachymorpha bouvieri* Brunner 1907. Keys to adults and eggs of genera are given. The bibliography includes all references containing descriptions of species recorded or described from New Zealand.

Introduction

Whilst studying the New Zealand fauna, it became evident that a detailed catalogue was necessary in order to fully evaluate the largely endemic fauna. Salmon's 1991 book on the subject unfortunately omits certain references to the fauna. Brock (1997) made some taxonomic changes due to omissions in Salmon (1991). Further changes are made in this work.

All genera are endemic to New Zealand and have a close affinity within the subfamilies Pachymorphinae and Phasmatinae. Apart from the genus *Pachymorpha* Gray 1835, which may, despite genitalia differences, be close to *Micrarchus* Carl 1913, the wingless New Zealand fauna are not closely related to Australian phasmids (catalogued in Balderson *et al.* 1998), which include many winged species. Although *Clitarchus* Stål 1875 includes the Australian species *C. longipes* Brunner 1907, it belongs to another genus. *Acanthoxyla* Uvarov 1944 is represented by 8 parthenogenetic species and no males have been found. Whilst unusual not to find males in a genus of several species, this is not unique in phasmids, which often reproduce parthenogenetically.

Phasmids are found throughout New Zealand (including outlying islands), in forests, scrublands and often in gardens (Salmon 1991). Salmon (pers. comm. 1997) believed that *Argosarchus* species may be extinct, however they are currently known to exist, having been found in a number of locations. Generally, most New Zealand species are quite common but, being nocturnal, may easily be overlooked.

Further Studies

Whilst Salmon's book (1991) relies on morphological taxonomic principles, it is evident that a full evaluation of the fauna also requires genetic studies. The fauna is small enough to obtain meaningful results in a relatively short period of time. It is hoped that specialists will take up the challenge and undertake such studies, in order to clarify uncertain issues. For instance, are there 2 (or more) *Argosarchus* species, or only one? Is *Clitarchus tuberculatus* a 'form' of *C. hookeri*? Are the 4 *Tectarchus* species from the Port Hills, Banks Peninsula, distinct species, and are *Acanthoxyla* species correctly classified? Undescribed species, including some from mountainous areas, are currently being researched.

Treatment

Species are listed in alphabetical order within genera. Reported synonyms and variations in spelling for each species are listed in order, with a brief explanation of each record.

After details on genera (including any synonymy), references to the original description of species and type details are given, followed by any subsequent references to the same species, along with a summary of the main area(s) covered in each paper. Our research on type and non-type material and culture stocks has resulted in the necessity to make taxonomic changes. Type material has been examined, (several types deposited in Wellington by Salmon were only briefly checked and loan of material was not permitted due to the fragility of the specimens). Species described by Salmon are well illustrated in the literature, although they are in need of genetic studies as mentioned above (Further Studies). Lectotypes have been designated for 6 species in this paper.

Keys to adults and eggs of genera are provided. Species are not illustrated, as excellent figures of adults and eggs may be found in Salmon's 1991 book on New Zealand phasmids.

Unpublished work is included in the references section, but excluded from species listings. Parfitt (1975, 1980) and Buckley (1995) have completed projects on New Zealand phasmids without yet publishing results.

Abbreviations for Depositories

AMNZ	Auckland Institute and Museum, Auckland, New Zealand
BMNH	Natural History Museum, London, United Kingdom
CMNZ	Canterbury Museum, Christchurch, New Zealand
HLHD	Hessisches Landesmuseum, Darmstadt, Germany
MNHN	Museum National d'Histoire Naturelle, Paris, France
MHNG	Museum d'Histoire Naturelle, Geneva, Switzerland
MONZ	Museum of New Zealand, Wellington, New Zealand
NHMW	Naturhistorisches Museum, Wien, Austria
UMBB	Übersee-Museum, Bremen, Germany
ZMHB	Museum für Naturkunde der Humboldt Universität, Berlin, Germany
ZMUH	Universität von Hamburg, Hamburg, Germany

Key to adult females

- 1 Length of cerci slightly greater than length of anal segment . . 2
— Length of cerci distinctly shorter than length of anal segment 3
- 2 Cerci bluntly pointed; two black stripes beneath head *Clitarchus*
— Cerci with rounded tips; no black markings beneath head *Acanthoxyla*
- 3 Metatarsals of mid and hind limbs with a dorsal lobe *Argosarchus*
— Metatarsals of mid and hind limbs lacking a dorsal lobe 4
- 4 Operculum reaching to or beyond tip of anal segment 5
— Operculum reaching up to half-way along anal segment 7
- 5 Head smooth or with a pair of short stout spines between the eyes 6
— Numerous short slender spines across top of head *Pseudoclitarchus*
- 6 Operculum extends to, but not beyond, tip of anal segment *Asteliaphasma* n. gen.
— Operculum extends well beyond tip of anal segment *Spinotectarchus*
- 7 Cerci extend beyond tip of the anal segment 8
— Cerci do not reach the tip of the anal segment *Micrarchus*
- 8 Operculum with a pair of sub-apical, lateral carinae *Niveaphasma* n. gen.
— No lateral carinae on operculum *Tectarchus*

Key to adult males

- 1 Body length > 50 mm 2
— Body length < 50 mm 4
- 2 Thorax with several long, sharp spines *Argosarchus*
— Thorax smooth or at most with a few tubercles 3
- 3 Claspers each with a single tooth *Pseudoclitarchus*
— Claspers each with 4 to 5 teeth *Clitarchus*
- 4 Claspers extend into elongate tong-like pinchers, each with a series of separate black teeth 5
— Each clasper with one or more teeth arising from a single black swelling 6
- 5 Dorsal abdominal spines situated on anterior margin of tergites *Micrarchus*
— Dorsal abdominal spines situated on posterior margin of tergites *Niveaphasma* n. gen.

- 6 Antennae reach base of fore tibiae *Tectarchus*
— Antennae shorter than base of foretibiae *Spinotectarchus*

Key to eggs

- 1 Spine-like setae present on at least anterior dorsal region of capsule 2
— Setae completely absent 3
- 2 Setae numerous over entire egg; capsule length up to 2.2 times width *Spinotectarchus*
— Setae restricted to anterior and dorsal regions; capsule length at least 2.5 times width *Asteliaphasma* n. gen.
- 3 Capsule 1.7 or more times longer than broad 4
— Capsule up to 1.6 times as long as broad *Clitarchus* and *Pseudoclitarchus*
- 4 Capsule up to 2.4 times longer than broad 5
— Capsule at least 2.5 times longer than broad *Niveaphasma* n. gen.
- 5 Keel prominent, arising steeply ahead of micropylar plate 6
— Keel rudimentary or absent *Tectarchus*
- 6 Capitulum elongate with a broadly domed tip 7
— Capitulum very short, flatly conical with sharp tip *Micrarchus*
- 7 Margin between keel and main capsule defined by small scale-like plates *Acanthoxyla*
— Scale-like plates absent *Argosarchus*

Diapheromeridae, Pachymorphinae, Pachymorphini
Niveaphasma new genus

Type species.— *Pachymorpha annulata* Hutton, here designated.

Niveaphasma is erected for a species recorded from the far south and far north of South Island (Southland, Otago and Nelson provinces), from sea level up to 1360 m, although part of the range may not be accurate (undescribed taxa are being researched). The undescribed species which Salmon (1991) mistakenly included in his notes on *Mimarchus tarsatus* Carl, is excluded pending further investigation. The tong-like claspers of the male suggest *Niveaphasma* is most closely allied to *Micrarchus*. Dorsal abdominal spines are situated on the posterior margin of tergites in *Niveaphasma*, but on the anterior margin in *Micrarchus*. Females are distinguished by the shorter cerci in *Micrarchus*.

Diagnosis.—**Female:** Body stout, length 49 to 56 mm, wingless, median segment (= first abdominal segment) completely fused with metathorax. Head with pair of short stout spines between eyes. Antennae slightly shorter to slightly longer than fore femora. Whole body lightly granulated, thoracic spines absent or rudimentary. Abdomen with pair of small to large spines on posterior margin of tergites 5 to 8, fifth segment commonly with expanded lateral lobes. Operculum boat-shaped, reaching approximately half length of anal segment. End of anal segment truncated or slightly rounded. Cerci short, reaching just beyond tip of anal segment. Male short, length ca 40 mm, as for female except slenderer and less granulated, spines often rudimentary. Claspers extended into stout tong-like pinchers which extend well beyond abdomen, each clasper with a series of several black teeth along inner margin. Cerci elongate, of similar length to claspers. Egg elongate, cylindrical, finely pitted and often lightly rugose, sometimes with a rudimentary keel; capitulum elongate-conical.

Etymology.— From the Latin *niveus* (snow, snowy), plus the stem word for the order Phasmida. The intended meaning ('stick insects of the snow') alludes to the fact that many populations occur in alpine habitats where they must contend with regular snow cover.

Diapheromeridae, Pachymorphinae, Hemipachymorphini
***Asteliaphasma* new genus**

Type species.— *Spinotectarchus jucundus* Salmon, here designated.

Asteliaphasma is represented by two little-known species found in forest on North Island (collected up to 900 m above sea level). The genus is distinguished from the closely related *Spinotectarchus* Salmon by its more elongate female form. Eggs are also more elongate in *Asteliaphasma*, with setae restricted to anterior and dorsal regions of the capsule, unlike *Spinotectarchus*, where setae are numerous over the entire egg. *Asteliaphasma* may be a sister-genus of *Niveaphasma*, with which it shares similar (though more slender) adult morphology, and also eggs (although setae are absent in *Niveaphasma*). However, males and/or genetic data would be required to confirm such a relationship.

Diagnosis.— Only females known. Body slender (64 to 88 mm), wingless, median section completely fused with metathorax. Head with pair of short spines between eyes. Antenna slightly shorter than fore femora. Whole body lightly granulated, sometimes with a few tubercles present. Fifth abdomen segment sometimes with small lateral lobes. Operculum boat-shaped, reaching to tip of anal segment. End of anal segment slightly rounded or with a short median notch. Cerci short, reaching just beyond tip of anal segment. Egg elongate, cylindrical, finely pitted and lightly rugose with rudimentary keel, anterior and dorsal regions with numerous minute spine-like setae; capitulum elongate-conical.

Etymology.— From the plant genus *Astelia* (Lilaceae) and the stem word for the order Phasmida. *Asteliaphasma* species are so far known only from *Astelia* species and the *Astelia*-like *Freyinetia banksii* (Pandanaceae).

CATALOGUE OF SPECIES

Diapheromeridae, Pachymorphinae, Pachymorphini

***Micrarchus* Carl 1913**

Type species.— *Micrarchus parvulus* Carl by monotypy.

Micrarchus Carl 1913: 24.

Micrarchus; Salmon 1991: 88 (Synonym of *Pachymorpha* Gray 1835; incorrectly listing Kaup as author of the genus *Micrarchus*)

Micrarchus; Zompro and Brock [in press]. Revised status.

hystriculeus (Westwood) 1859: 16, pl. 1: 4 (*Pachymorpha hystriculea*).

Holotype ♀, New Zealand (BMNH).

Pachymorpha hystriculea Westwood; Hutton 1899: 52 (Returned to *Pachymorpha*); Tepper 1902: 279 (Catalog); Kirby 1904: 342 (Catalog); Brunner 1907: 214 (Redescription); Wise 1977: 51 (Catalog of NZ species); Salmon 1991: 88 (Taxonomy [distribution extended to 'Australia and Papua New Guinea' but considered unlikely, as no material has been traced during extensive studies on the Australian phasmids]; male; egg; figs).

Bacillus hystriculea (Westwood); Hutton 1881: 75 (Transfer

to *Bacillus*; Catalog).

Micrarchus histriculens [sic] (Westwood); Bandsma and Brandt 1963: 21, pl. 44 (photo of mating pair).

Micrarchus hystriculeus (Westwood); Zompro and Brock [in press] (Transfer to *Micrarchus*).

Micrarchus parvulus Carl 1913: 24, pl. 1: 12-13. Lectotype: ♂, New Zealand: Greymouth, Helms, Ref. no. 602/66, here designated. Paralectotype ♂, New Zealand: Heteraunga [Heretaunga on label], 623.5 (MHNG). (Synonymized by Salmon 1991). [This lectotype designation will guarantee the stability of the name]

Micrarchus parvulus Carl; Wise 1977: 51 (Catalog of NZ species); Salmon 1991: 88 (Synonym of *Pachymorpha hystriculea*; egg; figs).

***Niveaphasma* Jewell & Brock new genus**

Type species.— *Pachymorpha annulata* Hutton, by original designation.

annulata (Hutton) 1898: 162 (*Pachymorpha annulata*). Holotype ♀, New Zealand: Dunedin (CMNZ – in alcohol). **New combination.**

Pachymorpha annulata Hutton; Hutton 1899: 53 (Taxonomy); Tepper 1902: 279 (Catalog); Kirby 1904: 342 (Catalog); Wise 1977: 51 (Catalog of NZ species); Nicholls *et al.* 1998: 30 (Type data).

Mimarchus annulatus (Hutton); Salmon 1991: 96 (Transfer to *Mimarchus*; male; egg; figs); Brock 1997: 21 (Taxonomy).

Pachymorpha bouvieri Brunner 1907: 214. Lectotype ♀, New Zealand: Nelson 1876, leg. Filhol, "Mus. Paris" (NHMW, No. 378 – clearly part of the series originally obtained from Paris for examination), here designated. Paralectotypes: 3 ♂, 3 ♀, New Zealand, Invercargill, leg. Burr; ♂, ♀, New Zealand: Nelson 1876, leg. Filhol, "Mus. Paris"; ♂, no locality, labelled n.sp. (NHMW, No. 378); 2 ♀, New Zealand: Nelson, Filhol, 1878 (MNHN). (Synonymized by Brock 1997). [This lectotype designation will guarantee the stability of the existing synonymy – see below]

[3 further ♀ in NHMW without labels are not regarded as part of the type series]. Note: it is probable that specimens from Invercargill belong to an undescribed species (in progress).

Pachymorpha bouvieri Brunner; Wise 1977: 51 (Catalog of NZ species); Brock 1997: 22 (Synonym of *Mimarchus annulatus*); Brock 1998: 19 (Type data; as synonym of *Mimarchus annulatus*).

Diapheromeridae, Pachymorphinae, Hemipachymorphini

***Asteliaphasma* Jewell & Brock new genus**

Type species.— *Spinotectarchus jucundus* Salmon, by original designation.

jucunda (Salmon), 1991: 116, figs, egg (*Spinotectarchus jucundus*).

Holotype ♀, New Zealand: Waipoua, Kauri Forest, Northland, 22.iii.1945, J.T. Salmon (MONZ).

Paratypes: ♀ ♀, New Zealand: Waipoua, Kauri Forest, Northland, J.T. Salmon; Mt Te Aroha, J.T. Salmon (MONZ). **New combination.**

naomi (Salmon), 1991: 114, figs, egg (*Spinotectarchus*). Holotype ♀, New Zealand: Lake Waikaremoana, 28.xii.1945, J.T. Salmon (MONZ). Paratype series: ♀ ♀, New Zealand: Lake Waikaremoana, 28.xii.1945 (MONZ). **New combination.**

Tectarchus Salmon 1954

Type species.— *Tectarchus diversus* Salmon, by original designation.

Tectarchus Salmon 1954: 161.

Tectarchus Salmon 1991: 100.

huttoni (Brunner) 1907: 213 (*Pachymorpha*). Syntype series: ♂, 2 ♀, New Zealand (NHMW, No. 383); ♀, ♀ nymph, New Zealand: Nelson, Filhol, 1878 (MNHN).

Pachymorpha huttoni Brunner; Wise 1977: 51 (Catalog of NZ species); Brock 1997: 21 (Transfer to *Tectarchus*); Brock 1998: 33 (Type data).

Pachymorpha finitima Brunner 1907: 215. Syntype ♀, New Zealand, [18]48-52, Petit, "mus. Paris" (NHMW, No. 380); ♀, New Zealand, [18] 48-52, Petit (MNHN) (Synonymized by Brock 1997).

Pachymorpha finitima Brunner; Wise 1977: 51 (Catalog of NZ species); Brock 1997: 21 (Synonym of *Tectarchus huttoni*); Brock 1998: 28 (Type data);

Tectarchus diversus Salmon 1954: 163, pl. 7: 1-2, pl. 8: 1, 2, 4, 8, pl. 9: 1, 5. Holotype ♀, New Zealand, Johnston's Hill, Karori, Wellington, 3.vi.1944, J.T. Salmon (MONZ). Paratypes: ♂ ♂ and ♀ ♀ as follows: Akatarawa Saddle; Balloon Saddle, Mt. Arthur Tableland; Days Bay; Johnston's Hill, Karori, Wellington; Kennedy's Bush, Banks Peninsula; Leslie Valley; Mt. Ross, Wairarapa; Miramar Reserve, Wellington; Orongorongo; Paremata; Picton; Silverstream, South Karori; Wilton's Bush, Wellington (MONZ); Upper Maitai, Nelson (coll. G. Ramsay)). (Synonymized by Brock, 1997).

Tectarchus diversus Salmon; Salmon, 1991: 100 (Taxonomy; egg; figs); Wise 1977: 51 (Catalog of NZ species); Brock 1997: 21 (Synonym of *Tectarchus huttoni*).

ovobessus Salmon 1954: 164, pl. 7: 3, pl. 8: 3, pl. 9: 2. Holotype ♀, New Zealand, Lake Waikaremoana, 25.iii.1945, J.T. Salmon (MONZ). Paratypes: ♀ ♀, New Zealand: Lake Waikaremoana, and throughout Urewera Country to 3200ft.; Kennedy's Bush, Banks Peninsula; Mt. Ross, Wairarapa, 3000ft.; Te Aroha Mountain to 3000ft. (MONZ).

Tectarchus ovobessus Salmon; Wise 1977: 51 (Catalog of NZ species); Salmon 1991: 106 (Taxonomy; egg; figs).

salebrosus (Hutton) 1899: 52 (*Pachymorpha salebrosa*). Holotype ♀, New Zealand: Dunedin (CMNZ). (new name for *Pachymorpha hystriculea*; Hutton 1898: 162 [not of Westwood 1859]). **new combination** (on basis of comparison of genitalia).

Pachymorpha salebrosa Hutton; Tepper 1902: 279 (Catalog); Kirby 1904: 342 (Catalog); Brunner 1907: 215 (Redescription); Wise 1977: 51 (Catalog of NZ species); Nicholls *et al.* 1998: 30 (Type data).

Mimarchus salebrosus (Hutton); Salmon 1991: 94 (Transfer to *Mimarchus*; male; egg; figs).

Tectarchus tuberculatus Salmon 1954: 167, pl. 7: 5-6, pl. 8: 7, 10, 12, pl. 9: 4, 7. Holotype ♀, New Zealand, Price's Bush, Banks Peninsula, 10.i.1944, J.T. Salmon (MONZ). Paratypes:

♂ ♂ and ♀ ♀, New Zealand: Price's Bush, Banks Peninsula, J.T. Salmon (MONZ). (Synonymized by Salmon 1991).

Tectarchus tuberculatus Salmon; Wise 1977: 51 (Catalog of NZ species); Salmon 1991: 94 (Synonym of *Mimarchus salebrosus*).

semilobatus Salmon 1954: 165, pl. 7: 4, pl. 8: 6, 9, 11, pl. 9: 3, 6. Holotype ♀, New Zealand, Kennedy's Bush, Banks Peninsula, 12.i.1944, J.T. Salmon (MONZ). Paratype ♂, New Zealand, Kennedy's Bush, Banks Peninsula, 12.i.1944, J.T. Salmon (MONZ).

Tectarchus semilobatus Salmon; Wise 1977: 51 (Catalog of NZ species); Salmon 1991: 108 (Taxonomy; egg; figs).

Spinotectarchus Salmon 1991

Type species.— *Pachymorpha acornuta* Hutton, by original designation.

Spinotectarchus Salmon 1991: 36, 111.

acornutus (Hutton) 1899: 52 (*Pachymorpha acornuta*). Holotype ♀, New Zealand: Great Barrier Island (CMNZ – in alcohol).

Pachymorpha acornuta Hutton; Tepper 1902: 279 (Catalog); Kirby 1904: 342; Brunner 1907: 214 (Redescription); Wise, 1977: 51 (Catalog of NZ species); Nicholls *et al.* 1998: 30 (Type data – syntype ♂ mentioned. Hutton stated 'male unknown', but did refer to a nymph 'probably belonging to this species').

Spinotectarchus acornutus (Hutton); Salmon 1991: 111 (Transfer to *Spinotectarchus*; egg; figs).

Phasmatidae, Phasmatinae, Acanthoxylini

Acanthoxyla Uvarov 1944

Type species.— *Acanthoderus prasinus* Westwood, by indication.

Acanthoxyla Uvarov 1944: 95 (New name for the preoccupied *Macracantha* Kirby).

Acanthoxyla; Salmon 1955: 1190; Wise 1977: 50; Salmon 1991: 57.

Macracantha Kirby 1904: 340 [Homonym]. New name for *Acanthoderus* of Hutton 1899: 56 [not of Gray 1835]. *Type species:* *Acanthoderus prasinus* Westwood, by original designation.

fasciata (Hutton) 1899: 58 (*Acanthoderus*). Holotype ♀ nymph, New Zealand: Great Barrier Island (CMNZ – in alcohol). Revised status.

Acanthoderus fasciatus Hutton; Brunner 1907: 239 (Redescription); Günther 1931: 756 (Synonym of *Macracantha prasina*); Salmon 1955c: 1153 (Synonym of *Acanthoxyla suteri*); Wise 1977: 50 (Catalog of NZ species; as synonym of *Acanthoxyla suteri*); Nicholls *et al.* 1998: 30 (Type data; listed as ♂).

Macracantha fasciatus (Hutton); Kirby 1904: 340 (Transfer to *Macracantha*).

Acanthoxyla fasciatus (Hutton); Uvarov 1944: 94 (Transfer to *Acanthoxyla*); Salmon 1991: 69 (As synonym of *Acanthoxyla suteri*).

Stick insect sp – Moon 1994: 31, upper fig. (det. Jewell).

- geisovii* (Kaup), 1866: 578 (*Bacillus*). Holotype ♀ nymph, New Zealand (HLDH).
Bacillus geisovii Kaup; Hutton 1881: 75 (Catalog); Zompro 2001: 134, fig. 7 (Type data).
 [Clitarchus *geisovii*; Hutton 1898: 165 (Transfer to *Clitarchus*. Refers to ♂ – see Hutton (1899); specimen misidentified and given new name of *Acanthoderus suteri*).]
Acanthoderus geisovii (Kaup); Hutton 1899: 57 (Returned to *Acanthoderus*); Tepper 1902: 285 (Catalog); Brunner 1907: 239 (Redescription);
Macracantha geisovii (Kaup); Kirby 1904: 340 (Transfer to *Macracantha*); Günther 1931: 756 (Synonym of *Macracantha prasina*).
Acanthoxyla geisovii (Kaup); Uvarov 1944: 94 (Transfer to *Acanthoxyla*; British species cited as *prasina*); Salmon 1955c: 1154, figs 6, 16 (Taxonomy); Salmon 1955a: 1190 (Notes - parthenogenesis); Salmon 1955b: 79 (Notes; figs); Salmon 1970: 70 (Notes); Sharrell 1971: 126, fig. (Notes); Wise 1977: 49 (Catalog of NZ species); ; Mantovani & Scali 1987: 141 (Egg, comparison with other *Acanthoxyla* species); Brock 1999: 78, 132, pl. 21b, 22a-b (Notes in Britain and New Zealand).
Acauloxyla geisovii (Kaup) [sic]; Bandsma & Brandt 1963: 21, pl. 40, 43 (photos).
Acanthoxyla prasina (misidentification); Ragge 1965: 38, pl. 1: 1 (In Britain; egg).
Acanthoxyla prasina geisovii (Kaup); Salmon 1991: 71, figs (Subspecies of *prasina*).
- huttoni* Salmon 1955c: 1155, figs 5, 7, 9. Holotype ♀, New Zealand: Karori, Wellington, 3.v.1937, J.T. Salmon (MONZ). Paratype ♀, New Zealand: Karori, Wellington (MONZ).
Acanthoxyla huttoni Salmon; Wise 1977: 49 (Catalog of NZ species); Brock 1999: 132.
Acanthoxyla prasina huttoni Salmon; Salmon 1991: 74 (Egg; figs).
- inermis* Salmon 1955c: 1151, figs 18-20. Holotype ♀, New Zealand: Okoke, Taranaki, 25.vi.1945, D. Brooker (MONZ). Paratypes: ♀, New Zealand: Lake Waikaremoana, J.T. Salmon; ♀, New Zealand: Nelson, B.W. Hall (MONZ).
Acanthoxyla inermis Salmon; Wise 1977: 49 (Catalog of NZ species); Brock 1987: 129, figs 3, 4C (First record in Britain; correction of misidentification as *Clitarchus hookeri*; taxonomic notes; egg); Brock 1999: 132.
Acanthoxyla prasina inermis Salmon; Salmon 1991: 64 (Subspecies of *prasina*; figs).
- intermedia* Salmon 1955c: 1152, figs 11, 14. Holotype ♀, New Zealand: Karori, Wellington, 12.viii.1941, J.T. Salmon (MONZ). Paratypes: ♀ ♀, New Zealand: Johnson's Hill, Karori; Kilbirnie, Wellington; Makino; Tauwharenikau Valley; Wairarapa; Wairongomai; Wilton's Bush (MONZ).
Acanthoxyla intermedia Salmon; Wise 1977: 50 (Catalog of NZ species); Brock 1999: 132.
Acanthoxyla prasina intermedia Salmon; Salmon, 1991: 62 (Subspecies of *prasina*; egg; figs).
- prasina* (Westwood), 1859: 49, pl. 3: 2 (*Acanthoderus prasinus*). Holotype ♀, New Zealand (BMNH).
Acanthoderus prasinus Westwood; Hutton 1881: 77 (Catalog); Hutton 1899: 56 (Returned to *Acanthoderus*); Brunner 1907: 239 (Redescription).
Clitarchus prasinus (Westwood); Hutton 1898: 164 (Transfer to *Clitarchus*).
Macracantha prasinus (Westwood) [sic]; Kirby 1904: 340 (Transfer to *Macracantha*).
Macracantha prasina (Westwood); Günther 1931: 756, 766 (Taxonomic notes).
Acanthoxyla prasina (Westwood); Uvarov 1944: 95 (Transfer to *Acanthoxyla*); Salmon 1955c: 1149, 1152 (Revision; figs); Salmon 1955a: 1190 (Notes - parthenogenesis); Salmon 1955b: 79 (Notes; figs); Salmon 1970: 70 (Notes); Sharrell 1971: 127, pl. 173 (Notes); Wise 1977: 50 (Catalog of NZ species); Jackson 1982: 50 (Sketches; notes); Brock 1987: 125 (Taxonomic notes); Bragg 1988: 11 (Rearing notes); Salmon 1991: 58 (Taxonomic notes; egg, figs); Brock 1999: 132 (Notes).
Bacillus filiformis Colenso 1885: 153. Holotype [?sex], New Zealand: Seventy-mile Bush, Waipawa County, 1883, W. Colenso (not traced – believed lost). (Synonymized by Salmon 1991: 58).
B[acillus] filiformis Colenso; Hutton 1899: 59 (Synonym of *Argosarchus horridus*); Kirby 1904: 340 (As syn. of *Argosarchus horridus*).
Clitarchus filiformis (Colenso); Hutton 1898: 164 (Transfer to *Clitarchus*); Wise 1977: 50 (As syn. of *Argosarchus horridus*); Wise 1977: 50 (As syn. of *Argosarchus horridus*); Salmon 1991: 58 (Synonym of *Acanthoxyla prasina*).
Bacillus atroarticulus Colenso 1885: 154. Holotype ♀, New Zealand: Seventy-mile Bush, near Norsewood County, Waipawa, 1883, W. Colenso (not traced – lost?). (Synonymized by Hutton 1899: 56).
Bacillus atroarticulus Colenso; Kirby 1904: 340 (As syn. of *Macracantha prasinus*).
Clitarchus atroarticulus (Colenso); Hutton 1898: 164 (Transfer to *Clitarchus*); Hutton 1899: 56 (Synonym of *Acanthoderus prasinus*); Wise 1977: 50 (As syn. of *Acanthoxyla prasina*); Salmon 1991: 58 (Synonym of *Acanthoxyla prasina* [Also listed as syn. of *Argosarchus spiniger*, p. 53]).
- speciosa* Salmon 1955c: 1153, figs 13, 15, 17. Holotype ♀, New Zealand: Karori, Wellington, 23.iv.1944, J.T. Salmon (MONZ). Paratypes: ♀, New Zealand: Wilton's Bush Wellington, J.T. Salmon & G. Ramsay (MONZ); ♀, New Zealand: Nelson, Fereday (CMNZ).
Acanthoxyla speciosa Salmon; Wise 1977: 50 (Catalog of NZ species); Brock 1999: 132.
Acanthoxyla prasina speciosa Salmon; Salmon 1991: 67 (Subspecies of *prasina*; egg; figs).
- suteri* (Hutton) 1899: 56 (*Acanthoderus*), Holotype ♀, New Zealand: Morton, near Dunedin (see Salmon 1955c: 1154 – originally "Marton, near Wanganui", but Type locality in Canterbury Museum library volume later corrected by Hutton) (CMNZ – in alcohol) (new name for *Bacillus geisovii*; Hutton 1898: 165 [not of Kaup]).
Acanthoderus suteri Hutton; Brunner 1907: 239 (Synonym of *Acanthoderus geisovii*); Günther 1931: 756 (Synonym of *Macracantha prasina*); Nicholls *et al.* 1998: 30 (Type data).
Macracantha suteri (Hutton); Kirby 1904: 340 (Transfer to *Macracantha*).

Acanthoxyla suteri (Hutton); Uvarov 1944: 94 (Transfer to *Acanthoxyla*); Salmon 1955c: 1153, figs 1, 8, 12 (Taxonomy); Wise 1977: 50 (Catalog of NZ species); Brock 1999: 132.
Acanthoxyla prasina suteri (Hutton); Salmon 1991: 69 (Subspecies of *prasina*; egg, figs).

References to 3 *Acanthoxyla* species established in the United Kingdom and Ireland (alien introductions) include a number of misidentifications. Our view on the correct species names for reports is as follows: *A. prasina*: Haes 1991: 7; Haes 1992: 371; Haes 1999: 9. *A. geisovii* (often misidentified as *prasina* until Brock 1987): Kirby 1910: 197; Rivers 1953: 206; Rivers 1953: 92; Harz & Kaltenbach 1976: 31; Grimwade 1982: 87; Waller 1983: 2; Brock, 1984: 8; Brock 1985b: 133, pl. B; Bysouth 1985: 11; Turk 1985: 129; Bysouth 1985: 11; Brock 1986: 2; James 1986: 3, figs; Brock 1987: 125; Marshall & Haes 1988: 140, pl. 10: 1; Brock 1991: 41, pl.; Haes 1990: 31; Haes 1991: 7; Haes 1992: 371, fig.; Lee 1993: 25; Lee 1995: 15; Haes & Harding 1997: 52; Lee 1998: 18; Haes 1999: 9, 62; Haes 2002: 45, 2 pls. *A. inermis* (misidentified as *Clitarchus hookeri* until Brock 1987): Fahy 1973: 14; Turk 1985: 129 [in part]; Haes 1990: 31; Brock, 1991: 44, figs; Haes 1991: 7; Haes 1992: 371; Lee 1993: 25; Haes 1994: 8; Lee 1995: 15; Haes & Harding 1997: 52; Lee 1998: 18; Haes 1999: 9, 62; Viney 2001: 2; Haes 2002: 45.

Argosarchus Hutton 1898

Type species.— *Phasma* (*Acanthoderus*) *horridus* White by subsequent designation of Kirby 1904: 340. (Kirby designated Species No. 1, which he listed as *Phasma* (*Acanthoderus*) *spiniger* White, with *horridus* listed as a synonym; *horridus* (not *spiniger*) was listed as one of the species by Hutton, hence it is the type species).

Argosarchus Hutton 1898: 165.

Argosarchus; Hutton 1899: 58; Kirby 1904: 340; Brunner 1907: 237; Wise 1977: 50; Salmon 1991: 48.

Mimarchus Carl 1913: 22. *Type species*: *Mimarchus tarsatus* Carl, by monotypy **new synonymy** [examination of the lectotype of *tarsatus*, shows it to be a nymph of *Argosarchus horridus*, the type species of *Argosarchus*]

Pachymorpha Hutton [not Gray] [in part] 1898: 161; 1899: 52.

Mimarchus; Salmon 1991: 91 [of Carl – not of Kaup (error)].

horridus (White) 1846: 24, pl. 5: 3 (*Phasma* (*Acanthoderus*)). Holotype ♀, New Zealand (BMNH).

Acanthoderus horridus (White); Westwood 1859: 49 (Redescription); Hutton 1881: 76 (Catalog); Hudson 1892: 110, pl. 19;

Argosarchus horridus (White); Hutton 1898: 165 (Transfer to *Argosarchus*); Hutton 1899: 59 [part] (Notes. Salmon (1991: 48) regards Hutton's *Argosarchus spiniger* [not of White] as *horridus*); Kirby 1904: 340 (As syn. of *Argosarchus spiniger*); Brunner 1907: 238 (Redescription); Günther 1931: 766 (Notes); Wise 1977: 50 (Catalog of NZ species); Salmon 1991: 48 (Desc. / clarification of ♂, egg, figs).

Bacillus gerhardii Kaup 1866: 577. Holotype ♀ nymph [not ♂], New Zealand [possibly nr. Invercargill, G. Müller] (HLDH). (Synonymized by Hutton 1899: 59).

Bacillus gerhardii Kaup; Hutton 1881: 75 (Catalog); Hutton 1899: 59 (Synonym of *Argosarchus horridus* - ♀ listed); Kirby 1904: 340 (As syn. of *Argosarchus horridus*); Zompro 2001: 134, fig. 8 (Type data).

Argosarchus gerhardii (Kaup); Hutton 1898: 166 (Transfer to *Argosarchus*); Salmon 1991: 48 (As syn. of *Argosarchus horridus*).

Bacillus sylvaticus Colenso 1882: 278. Holotype ♀, New Zealand (not traced – believed lost). (Synonymized by Salmon 1991: 48).

Argosarchus sylvaticus (Colenso); Hutton 1898: 166 (Transfer to *Argosarchus*); Kirby 1904: 341 (Catalog); Wise 1977: 50 (Catalog of NZ species); Salmon 1991: 48 (Synonym of *Argosarchus horridus*).

Argosarchus schauinslandi Brunner 1907: 238, pl. 10: 3. Lectotype ♀, New Zealand, Greymouth, Helms, Ref. no. 602/66 (MHNG), here designated. Paralectotypes: ♀, 2 ♀ nymphs, New Zealand: Gomolka (ZMHB), ♀, New Zealand: Chatham Is. (not traced in UMBB, believed lost). (Synonymized by Salmon 1991: 48). [This lectotype designation shall guarantee the stability of the name; Brunner's figure resembles the selected specimen]

Argosarchus schauinslandi Brunner; Günther 1931: 766 (Notes); Salmon 1991: 48 (Synonym of *Argosarchus horridus*); Dugdale & Emberson 1996: 98 (Mention from Chatham Is.).

Argosarchus schainslandi [sic]; Salmon, 1970: 70 (Brief note).

Mimarchus tarsatus Carl 1913: 23. Lectotype ♀ nymph, New Zealand: Greymouth, Blue Cliffs, Helms, Ref. no. 602/66 (MHNG), here designated. Paralectotypes: ♀ nymph, New Zealand: Blue Cliffs, 623.5 (immature specimen of *Argosarchus horridus* White, det. J.T. Salmon 1946); ♀ nymph, New Zealand, Marcet. **new synonym** [This lectotype designation shall guarantee the stability of the name/in accordance with the synonymy proposed]

Mimarchus tarsatus Carl; Wise 1977: 51 (Catalog of NZ species); Salmon 1991: 92 [in part] (Taxonomy; male; egg; figs [but misidentification of Carl's species]).

spiniger (White) 1846: 24 (*Phasma* (*Acanthoderus*)). Holotype ♂, New Zealand (BMNH).

Acanthoderus spiniger (White); Westwood 1859: 48; Hutton 1881: 75 (Catalog); Hutton 1899: 59 [not of White] ((Synonym of *Argosarchus horridus*)).

Clitarchus spiniger (White); Hutton 1898: 164 (Transfer to *Clitarchus*).

Argosarchus spiniger (White); Alfken 1901: 143 (Wise 1977 - in error for *A. horridus*); Alfken 1904: 600 (Wise 1977 - in error for *A. horridus*); Hutton 1904: 234 (Wise 1977 - in error for *A. horridus*); Kirby 1904: 340 (Catalog; with *horridus* as syn.); Brunner 1907: 238 (As syn. of *Argosarchus horridus*); Caudell 1927: 19 (As syn. of *Argosarchus horridus*); Wise 1977: 50 (Catalog of NZ species; as syn. of *Argosarchus horridus*); Salmon 1991: 53 (Desc. / clarification of ♀, egg, figs).

Notes on genus: The exact specific relationship is being studied by rearing specimens from different localities and checking variation within species and by comparing them with type material. So far, results indicate some geographical variation and our preliminary view is that the type of *spiniger* is almost certainly the male of *horridus*, confirming Hutton's view as first reviser (1899); hence *horridus* would take priority. The synonymy above follows Salmon (1991), but may have to be revised once additional studies have been made.

Clitarchus Stål 1875

Type species.— *Clitarchus laeviusculus* Stål, by subsequent designation of Kirby 1904: 339.

Clitarchus Stål 1875: 34, 82.

Clitarchus; Hutton 1898: 162; Hutton 1899: 54; Kirby 1904: 339; Brunner, 1907: 235; Salmon 1991: 81.

hookeri (White) 1846: 24, pl. 6: 6 (*Phasma*). Holotype ♀, New Zealand (BMNH).

Bacillus hookeri (White); Westwood 1859: 14 (Transfer to *Bacillus*); Hutton 1881: 74 (Catalog).

Clitarchus hookeri (White); Stål 1875: 83 (Transfer to *Clitarchus*); Hutton 1898: 163; Hutton 1899: 54 (Male); Tepper, 1902: 280 (Catalog); Kirby 1904: 339 (Catalog); Brunner 1907: 236 (Redescription); Günther 1931: 756, 765 (Notes); Salmon 1955a: 1189 (Notes - parthenogenesis); Salmon 1955b: 78 (Notes; figs); Ragge 1965: 39, pl. 1: 2 (In Britain; egg); Stringer 1969: 41 (Embryology); Stringer 1970: 85 (Taxonomy, nymphs and adults); Sharrell 1971: 126, pl. 172 (Notes); Wise 1977: 51 (Catalog of NZ species); Salmon 1991: 82 (Taxonomy; figs); Brock 1999: 80, 132, pl. 23a-b (Notes in Britain and New Zealand).

Clitarchus laeviusculus Stål 1875: 82. Lectotype ♀, New Zealand, Boucard (NHMW), here designated. Paralectotypes: 3 ♀, New Zealand, Boucard (NHMW). (Synonymized by Ragge 1965). [This lectotype designation will guarantee the stability of the name]

Clitarchus laeviusculus Stål; Hutton 1898: 163; Hutton 1899: 55; Kirby 1904: 339 (Catalog); Brunner 1907: 236 (Redescription); Ragge 1965: 39 (Synonym of *Clitarchus hookeri*); Harz & Kaltenbach 1976: 31 (As synonym of *Clitarchus hookeri*); Wise 1977: 51 (Catalog of NZ species); Salmon 1991: 82 (As synonym of *Clitarchus hookeri*); Brock 1998: 38 (Type data; as synonym of *Clitarchus hookeri*)

Bacillus colereus Colenso 1885: 151. Syntypes ♀, New Zealand: Pourerere, E. Coast, near Blackhead, Waipawa County, 1884, W. Scott; ♂, ♀, New Zealand: same data? (not traced – believed lost). (Synonymized by Brunner 1907).

Clitarchus colereus (Colenso); Hutton 1898: 163 (Transfer to *Clitarchus*); Hutton 1899: 55 (Taxonomy); Kirby 1904: 339 (Catalog); Brunner 1907: 237 (Synonym of *Clitarchus hookeri*); Wise 1977: 51 (Catalog of NZ species); Salmon 1991: 82 (As synonym of *Clitarchus hookeri*).

Bacillus minimus Colenso 1885: 151. Holotype ♀, New Zealand: Norsewood, Waipawa County, 1884, W. Colenso (not traced – lost?). (Synonymized by Salmon 1991).

Bacillus minimus Colenso; Hutton 1898: 166 (Uncertain status).

Bacillus minimum [sic] Colenso; Salmon 1991: 82 (Synonym of *Clitarchus hookeri*).

Argosarchus minimus (Colenso); Kirby 1904: 341 (Transfer to *Argosarchus*); Caudell 1927: 20; Wise 1977: 50 (Catalog of NZ species).

Clitarchus reductus Hutton 1899: 55. Holotype ♀, New Zealand: Canterbury (Not traced in CMNZ, believed lost). (Synonymized by Salmon 1991).

Clitarchus reductus Hutton; Kirby 1904: 339 (Catalog); Brunner 1907: 237 (Redescription); Günther 1931: 756, 765 (Synonym of *Clitarchus hookeri*); Wise 1977: 51 (Catalog

of NZ species).

Bacillus reductus (Hutton); Salmon 1991: 82 (As synonym of *Clitarchus hookeri*).

Clitarchus interruptelineatus Brunner 1907: 236, pl. 10: 4a-d. Lectotype ♂, New Zealand (NHMW, No. 445, with large white species label), here designated. Paralectotypes: 2 ♀, New Zealand (NHMW, No. 445); ♂, New Zealand: Great Barrier Island (ZMUH – not traced); 2 ♀, New Zealand, Finsch (ZMHB). (Synonymized by Brock 1997). [This lectotype designation shall guarantee the stability of the name, in accordance with existing synonymy]

Clitarchus interruptelineatus Brunner; Günther 1931: 765 (Notes); Wise 1977: 51 (Catalog of NZ species); Brock 1997: 22 (Synonym of *Clitarchus hookeri*); Brock 1998: 36 (Type data; as synonym of *Clitarchus hookeri*).

tuberculatus Salmon 1991: 85. Holotype ♀, New Zealand: South Karori, Wellington, 2.i.1943, J.T. Salmon (MONZ). Paratypes: ♀ ♀, New Zealand: South Karori, Wellington; Great Barrier Island; Kennedy's Bush, Banks Peninsula; Mt. Ross, Haurangi Mountains, Wairarapa; Silverstream, South Karori; Wadestown, Stokes Valley and Days Bay, Wellington; Wilton Bush, Wellington (MONZ).

Notes on *C. hookeri* in the United Kingdom (an alien introduction) are as follows: Uvarov 1950: 174 (as *C. laeviusculus*); Harz & Kaltenbach 1976: 31; Waller 1983: 2; Brock 1984: 9; Brock 1985b: 134; Turk 1985: 129 [in part]; James 1986: 3, figs; Brock 1986: 2; Brock 1987: 127; England 1998: 11; Marshall & Haes 1988: 143, pl. 10: 3; Haes 1990: 32; Brock 1991: 41, pl.; Lee 1993: 25; Brock 1995: 11; Lee 1995: 15; Haes & Harding 1997: 52; Lee 1998: 18; Haes 1999: 9, 62.

Pseudoclitarchus Salmon 1991

Type species.— *Acanthoxyla senta* Salmon, by original designation.

Pseudoclitarchus Salmon 1991: 35, 77.

sentus Salmon 1948: 301, pl. 56: 1-4, pl. 57: 1-3. Holotype ♀, New Zealand: Three Kings Islands (AMNZ). Paratypes: ♂, New Zealand: Three Kings Islands (AMNZ). Paratypes ♂, ♀, New Zealand: Three Kings Islands (MONZ).

Pseudoclitarchus senta; Salmon 1991: 77 (Transfer to *Pseudoclitarchus*; egg; figs [egg on p. 79 = duplication of *Clitarchus tuberculatus*]).

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References

In order to allow a full account of the literature on New Zealand phasmids, general publications such as Miller and Cumber (on eggs) are included, although as species are generally not mentioned, they are not cited above. Minor newspaper reports are omitted.

- Alfken J.D. 1901. Neue Orthopteren von Neu-Seeland und den Hawaiischen. In: H.H. Schauinsland: Ergebnisse einer Reise nach dem Pacific (Schauinsland 1896/97). Abhandlungen Herausgegeben vom Naturwissenschaftlichen Verein zu Bremen 17: 141-152.
- Alfken J.D. 1904. Beitrag zur Insektenfauna der Hawaiischen und Neu-seeländischen Inseln (Ergebnisse einer Reise nach dem Pacific) Schauinsland 1896-97. Zoologische Jahrbücher 19: 561-628.
- 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. Archaeognatha, Zygentoma, Blattodea, Isoptera, Mantodea, Phasmatodea, Embioptera, Zoraptera. CSIRO Publishing, Melbourne, Australia.
- Bandsma A.T., Brandt R.T. 1963. The Amazing World of Insects. George Allen and Unwin Ltd, London.
- Bradley J.C., Galil B.S. 1977. The taxonomic arrangement of the Phasmatodea with keys to the subfamilies and tribes. Proceedings Entomological Society of Washington 79: 176-208.
- Bragg P. 1988. *Acanthoxyla prasina* (Westwood). Phasmid Study Group Newsletter No. 36: 11-12.
- Brock P.D. 1984. European Stick Insects. Phasmid Study Group Spec. Publ., pp. 10.
- Brock P.D. 1985a. The Phasmid Rearer's Handbook (Stick-Insects and Leaf-Insects). Amateur Entomologists' Society, Handbook 20: 1-41.
- Brock P.D. 1985b. New Zealand Phasmids established in South-West England: A brief account with notes on their distribution. Bulletin Amateur Entomologists' Society 44: 133-136, pl. B.
- Brock P.D. 1986. 'British' Stick Insects. Phasmid Study Group Newsletter 26: 2.
- Brock P.D. 1987. A third New Zealand stick-insect (Phasmatodea) established in the British Isles, with notes on the other species, including a correction. In: Mazzini, M., Scali, V. (Eds) 1st International Symposium on Stick Insects. University of Siena, pp. 125-132.
- Brock P.D. 1991. Stick Insects of Britain, Europe and the Mediterranean. Fitzgerald Publishing, London.
- Brock P.D. 1992. Rearing and studying stick and leaf-Insects. The Amateur Entomologists' Society, Feltham. The Amateur Entomologist Vol. 22., 73 pp.
- Brock P.D. 1995. Notes on the smooth stick-insect *Clitarchus hookeri* (White) in Tresco Abbey Gardens. BRICS Journal 1: 11-14.
- Brock P.D. 1997. Taxonomic changes relating to New Zealand stick insects. Phasmid Studies 6: 21-23.
- 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 in Wien 13, 72 pp., Wien.
- Brock P.D. 1999. The Amazing World of Stick and Leaf-Insects. The Amateur Entomologists' Society, Orpington. The Amateur Entomologist Vol. 26, 165 pp.
- Brock P.D. 2000. A Complete Guide to Breeding Stick and Leaf Insects. T.F.H. Kingdom, Havant.
- Brunner von Wattenwyl K. 1907. Die Insektenfamilie der Phasmiden, pp.181-338, plates 7-15. In: Brunner von Wattenwyl K., Redtenbacher J., 1906-1908. Verlag Engelmann, Leipzig.
- Buckley T. 1995. An Allozyme Survey of Stick Insects (Insecta: Phasmida) from the Wellington Region. Unpub. Thesis, Victoria University of Wellington.
- Bysouth E. 1986. No sex please, were stick insects. Roseland Magazine, Oct. 1985: 11.
- Carl J. 1913. Phasmides nouveaux ou peu connus du Muséum de Genève. Annales de la Société Zoologique Suisse et du Muséum d'Histoire Naturelle de Genève 21: 1-56.
- Caudell A.N. 1927. University of Iowa Studies Natural History 12: 19.
- Colenso W. 1882. On some new and undescribed species of New Zealand insects of the orders Orthoptera and Coleoptera. Transactions New Zealand Institute 14: 277-282.
- Colenso W. 1885. A description of some newly discovered New Zealand insects believed to be new to science. Transactions New Zealand Institute 17: 151-155.
- Cumber R.A. 1961. Eggs of phasmid species in the North Island. New Zealand Entomologist 2: 1-2.
- Dugdale J., Emberson, R. 1996. In: The Chatham Islands Heritage and Conservation. Canterbury University Press, Christchurch.
- England S. 1998. New Zealand Trip. Phasmid Study Group Newsletter No. 75: 11 (without mention of collecting area also on same page Scilly sticks).
- Fahy E. 1973. Stick Insects in Ireland. Irish Times, March 1973.
- Gray G.R. 1835. Synopsis of the Species of Insects Belonging to the Family of Phasmidae. Longman, Rees, Orme, Brown, Green and Longman, London.
- Grimwade D. 1982. Notes on *Acanthoxyla*, the New Zealand Spiny sticks in the wild now in culture. AES Exotic Entomology Group 86-96.
- Günther K. 1931. Beiträge zur Systematik und Geschichte der Phasmoidenfauna Ozeaniens. Mitteilungen aus dem Zoologischen Museum in Berlin 17: 753-835.
- Haes E.C.M. 1990. Cornish Biological Records 12. Grasshoppers and Related Insects in Cornwall. Cornish Biological Records Unit, Redruth. (Includes survey on *Acanthoxyla geisovii* in St Mawes 1985, by Eve Bysouth.)
- Haes E.C.M. 1991. Phasmids. Orthoptera Recording Scheme Newsletter 18: 7.
- Haes E.C.M. 1992. Grasshoppers and relatives. British Wildlife 3: 371.
- Haes E.C.M. 1994. Phasmids. Orthoptera Recording Scheme Newsletter 20: 1-8.
- Haes E.C.M. 1999. Orthopteroid insects of Cornwall and the Isles of Scilly: a revised provisional atlas. CISBR Occasional publication 1.
- Haes E.C.M. 2002. A menu of phasmid fodder. Bulletin of the Amateur Entomologists' Society 61(441): 45-47.
- Haes E.C.M., Harding, P.T., 1997. Atlas of grasshoppers, crickets and allied insects in Britain and Ireland. The Stationery Office, London.
- Harz K., Kaltenbach, A. 1976. The Orthoptera of Europe III. Ser. Ent. 12: 1-434.
- Hudson G.V. 1892. An Elementary Manual of New Zealand Entomology. West, Newman & Co., London.
- Hutton F.W. 1881. Catalogues of New Zealand Diptera, Orthoptera, Hymenoptera with descriptions of the species. Wellington. Colonial Museum and Geological Survey of New Zealand, 132pp. (phasmid section pp. 75-77).
- Hutton F.W. 1898. The Phasmidae of New Zealand. Transactions New Zealand Institute 30: 160-166.
- Hutton F.W. 1899. Revision of New Zealand Phasmidae. Transactions New Zealand Institute 31: 50-59.
- Hutton F.W. 1904. Index Faunae Novae-Zelandiae. Philosophical Institute, Canterbury.
- Jackson R. 1982. Wildlife New Zealand. David Bateman Ltd, Auckland.
- James T. & P. 1986. A Scilly Expedition. August 1984. The Phasmid Study Group Newsletter 26: 3-5.
- Kaup J.J. 1866. Descriptions of two new species of the genus *Bacillus* Latr. Proceedings Zoological Society of London, 577-578.
- Kirby W.F. 1904. A Synonymic Catalogue of Orthoptera. Vol. 1, Orthoptera, Euplexoptera, Cursoria, et Gressoria (Forficulidae, Hemimeridae, Blattidae, Mantidae, Phasmidae). Longmans, London.

- Kirby W.F. 1910. An undetermined species of stick-insect found in Devonshire. *Zoologist* (Ser. IV) 14: 197-198.
- Lee M. 1993. A survey of the distribution of the unarmed stick insect *Acanthoxyla inermis* in Port Gaverne and Port Isaac, North Cornwall in 1992. *Phasmid Studies* 2: 25-32.
- Lee M. 1995. A survey into the distribution of the stick insects of Britain. *Phasmid Studies* 4: 15-23.
- Lee M. 1998. An updated survey of the distribution of stick insects in Britain. *Phasmid Studies*, 7: 18-25.
- Mantovani B., Scali V. 1987. The eggs of three *Acanthoxyla* species, pp.141-147. In: Mazzini M. and Scali V. (Eds) 1st International Symposium on Stick Insects. University of Siena.
- Marshall J.A., Haes E.C.M. 1988. Grasshoppers and Allied Insects of Great Britain and Ireland. Harley Books, Colchester. (Includes color sketches of all British species).
- Miller D. 1956. Bibliography of New Zealand Entomology. N.Z. Dep. Sci. Industr. Res. Bull. 120: 1-492.
- Miller D. 1971. Common Insects in New Zealand. AH and AW Reed, Wellington.
- Moon G. 1994. New Zealand Wildlife. Reed Books, Auckland.
- Nicholls D.C., Urquhart E.M., Ward J.B., Johns P.M. 1998. A list of insect primary types held in the Canterbury Museum, Christchurch, New Zealand. *Records of the Canterbury Museum* 12: 1-43.
- Parfitt R. 1975. Chromosome Number and Egg Surface Morphology of some New Zealand Phasmatidae. Unpub. B.Sc. Honours Thesis, Victoria University of Wellington.
- Parfitt R. 1980. The Cytology and Feulgen-DNA Microdensitometry of some New Zealand Stick Insect Species. Unpub. MSc. Thesis, Victoria University of Wellington.
- Powell A.W.B. 1947. Animals of New Zealand. Auckland Museum Handbook, Unity Press, Auckland.
- Ragge D.R. 1965. Grasshoppers, Crickets and Cockroaches of the British Isles. Frederick Warne and Co., London.
- Ragge D.R. 1973. The British Orthoptera: a supplement. *Entomologists Gazette* 24: 227-245.
- Ramsay G.W. 1978. Seasonality in New Zealand Orthoptera. *New Zealand Entomologist* 6: 357-358.
- Rivers C. 1953a. An insect mystery. *Country Life* 23: 206-207.
- Rivers C. 1953b. A New Zealand stick-insect in South Devon. *Bulletin Amateur Entomologists' Society* 12: 92-94.
- Salmon J.T. 1948. New genera, species and records of Orthoptera from the Three Kings Islands New Zealand. *Records Auckland Institute Museum* 3: 291-311.
- Salmon J.T. 1954. A new genus and species of Phasmatidae from New Zealand. *Transactions Royal Society of New Zealand* 82: 161-168.
- Salmon J.T. 1955a. Stick Insects. *Tuatara* 5: 77-81.
- Salmon J.T. 1955b. Parthenogenesis in New Zealand stick insects. *Transactions Royal Society of New Zealand* 82: 1189-1192.
- Salmon J.T. 1955c. The genus *Acanthoxyla* (Phasmatidae). *Transactions Royal Society of New Zealand* 82: 1149-1156.
- Salmon J.T. 1970. Phasmatidae of New Zealand. *New Zealand Entomologist* 4: 70-71.
- Salmon J.T. 1991. The Stick Insects of New Zealand. Reed Books, Auckland.
- Redtenbacher J. 1908. Die Insektenfamilie der Phasmiden III. Phasmida Anareolatae (Phibalosomini, Acrophyllini, Necrosiini), pp. 339-589, pls. 16-27. In: Brunner von Wattenwyl K., Redtenbacher J. 1906-1908. W. Engelmann, Leipzig.
- Sellick J. 1997. The range of egg capsule morphology within the Phasmatodea and its relevance to the taxonomy of the order. *Italian Journal of Zoology* 64: 97-104.
- Sharrell R. 1971. New Zealand Insects and Their Story. Collins, Auckland.
- Stål C. 1875. *Recensio Orthopterorum*. *Revue critique des Orthoptères décrits par Linné, de Geer et Thunberg*. Vol. 3. P.A. Norstedt & Söner, Stockholm.
- Stringer I.A.N. 1968. Aspects of reproduction and development of *Clitarchus hookeri* White. Unpub. Thesis, University of Auckland.
- Stringer I.A.N. 1969. Blastokinensis and embryology of the Phasmid *Clitarchus hookeri* White. *Tane* 15: 41-52.
- Stringer I.A.N. 1970. The nymphal and imaginal stages of the bisexual stick insect *Clitarchus hookeri* (Phasmatidae: Phasminae). *New Zealand Entomologist* 4: 85-95.
- Tepper J.G.O. 1902. List of the described genera and species of the Australian and Polynesian Phasmatidae (Spectre-Insects). *Transactions Royal Society South Australia* 26: 278-287.
- Tillyard R.J. The Insects of Australia and New Zealand. Angus and Robertson Ltd, Sydney.
- Turk S. 1985. Two New Zealand stick-insects naturalised in mainland Cornwall. *Entomologist's Record* 97: 129-130.
- Uvarov B.P. 1944. A New Zealand Phasmid (Orthoptera) established in the British Isles. *Proceedings Royal Entomological Society of London (B)* 13: 94-96.
- Uvarov B.P. 1950. A second New Zealand stick-insect (Phasmatodea) established in the British Isles. *Proceedings Royal Entomological Society of London (B)* 19: 174-175.
- Walker A.K. 1984. Common Insects in New Zealand. Reed, Wellington.
- Waller M. 1986. *Clitarchus hookeri* in the Scilly Isles, August 1982. *Phasmid Study Group Newsletter* 16: 2.
- Westwood J.O. 1859. Catalogue of Orthopterous Insects in the Collection of the British Museum. Part 1, Phasmatidae. British Museum, London.
- White A. 1846. The Zoology of the Voyage of H.M.S. Erebus and Terror, 1. Insects of New Zealand. E.W. Janson, London.
- Wise K.A.J. 1977. A Synonymic Checklist of the Hexapoda of the New Zealand Sub-Region. The Smaller Orders. *Bulletin of the Auckland Institute and Museum* 11 (phasmid section pp. 49-51).
- Zompro O. 2001. The type-material of the insect order Phasmatodea, described by Johann Jacob Kaup. *Senckenbergia Biologica* 81: 133-145.
- Zompro O., Brock P.D. (in process). Catalogue of type material in the insect order Phasmatodea housed in the Muséum d'Histoire Naturelle, Geneva (Insecta: Phasmatodea). *Revue Suisse de Zoologie*.