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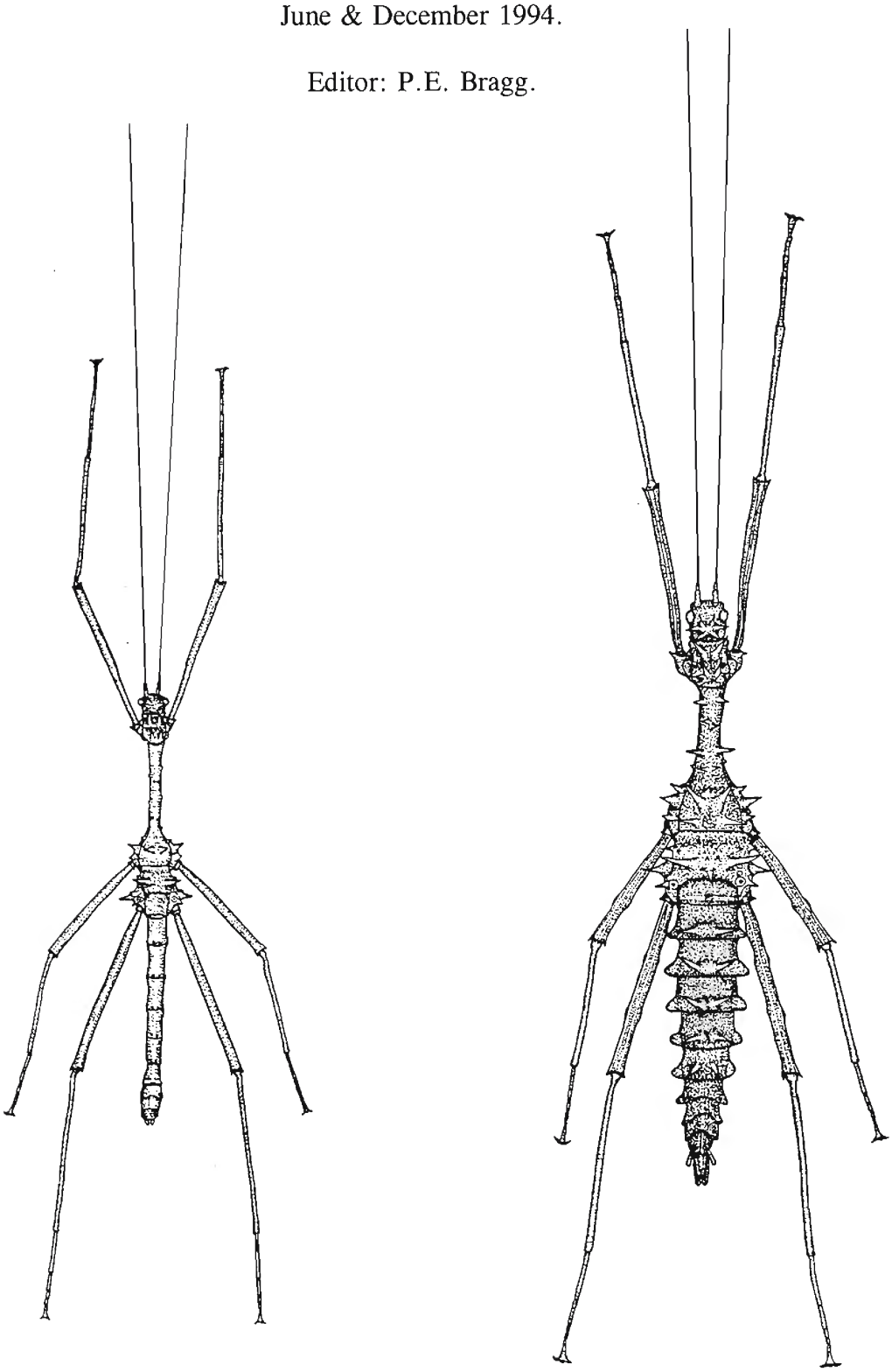
Editor: P.E. Bragg.



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Contents

Cover illustration: *Echinoclonia exotica* (Brunner), by P.E. Bragg.

A redefinition of the orientation terminology of phasmid eggs.

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Key words
Phasmida, Egg Terminology, Orientation.

The article on *Dinophasma guttigera* (Westwood) (Bragg 1993) raised the question of how one determines dorsal and ventral surfaces on eggs in which the micropylar plate circles the egg. In the case of this species (by comparison with other Aschiphasmatinae eggs) it would appear that the dorsal surface has been correctly identified as that bearing the micropyle, since it is typical in eggs of this group that the operculum should be tilted ventrally and the micropylar plate should bear a ventral central stripe. The orientation would be confirmed by examination of the internal plate as indicated below.

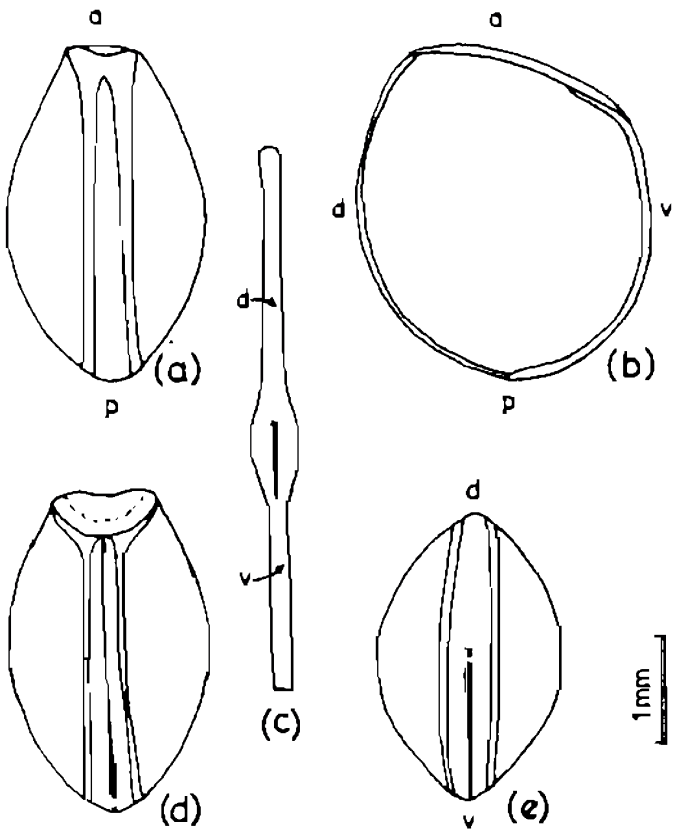

Figure 1. The egg of *Orthomeria superba* (Redtenbacher), **a)** dorsal view, **b)** lateral view, **c)** internal micropylar plate flattened out, **d)** ventral view, **e)** posterior polar view. (a = anterior, d = dorsal, p = posterior, v = ventral).

The orientation terminology for phasmid eggs (Clark 1976) was set up when only a small number of eggs had been studied and has been applicable with ease to the majority of eggs since examined. The operculum always defines the anterior end, although because it is sometimes set at a considerable angle it may appear to be on the dorsal surface at the anterior end (*Marmessoidea* and *Prisopus*) or tilted into the ventral surface (*Orthomeria* and *Dinophasma*). Where the micropylar plate appears on one surface only then that surface is clearly the dorsal surface. The dorsal surface in Aschiphasmatinae and similar eggs is determined by examination of the **internal** micropylar

plate. This shows clearly as a white shape on the inside of the egg capsule.

In all cases the internal plate bears a small stalk and behind this there is always a break in the plate. The two sides of the plate may reunite behind the break (a closed plate) or remain separate (an open plate) and this is the basis of the classification of plate types (Sellick 1987), but the break is always on the opposite end of the plate from the operculum. If the plate extends around the egg and the micropyle is near the pole, problems of orientation are solved because the part of the plate on the break side of the micropylar stalk is posterior, becoming ventral if the plate extends over the pole.

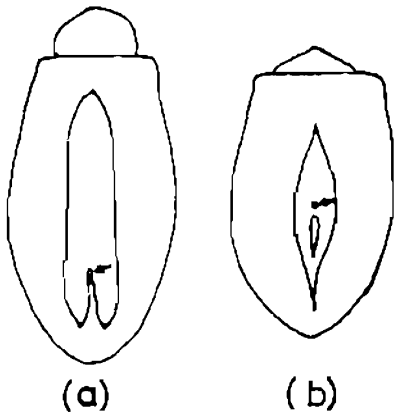

Figure 2. Internal micropylar plates:
a) open plate of *Ctenomorphodes tessulata* and
b) closed plate of *Clitarchus hookeri*.

This is illustrated by reference to figures 1 and 2. Figure 1 illustrates the egg of *Orthomeria superba* (Redtenbacher), from a female collected by Ian Abercrombie on Mt Serapi, Sarawak on 20-08-1991; the specimen is now in Phil Bragg's collection (PEB-51). Figure 2 illustrates the simple forms of the internal micropylar plate; the open plate of *Ctenomorphodes tessulatus* (Gray) and the closed plate of *Clitarchus hookeri* (White). In both cases the micropylar plates are shown against the outline of the whole egg and small arrows indicate the micropylar stalks.

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The evolution and subsequent classification of the Phasmatodea.

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Key words
Phasmida, Phasmatodea, Evolution, Natural selection, Classification, Phasmid Fossil, Mimicry, *Leptomyrmex*.

Millions of years of evolution by natural selection have given us what today we classify as the order Phasmatodea. At first glance the degree of sophistication seen in these insects is impressive, but one must remember that evolution is an entirely "blind" process with no goals and is still continuing. The evolutionary path travelled by the Phasmatodea is responsible for the way in which the order, and its subsequent classification within the class Insecta, are currently arranged. The correct classification of species within genera, families and orders should reflect evolutionary branching from common ancestors. Although tracing the one true evolutionary route to the present day may at first seem straight-forward, in fact it is near impossible and relies greatly on interpretation of data from two sources. The first source of data available is the fossil record. Much of the work performed so far using the fossil record has centred on placing the order correctly amongst the other orders of insects. Secondly, phasmids alive today have provided the classification scheme within the order. This is achieved by examination of morphological characteristics of the phasmids alive today for comparison with other phasmids which provides relationships of similarities between phasmids which can be interpreted as their degree of relatedness. The method assumes that a high similarity of characteristics is likely to represent closeness of divergence. This method can also be performed with representatives from other insect orders to try and locate the order within class insecta amongst the other orders.

The first step in classifying the order is to put it in its correct place amongst the other orders of insects, the second is to attempt to sort out the order itself into smaller subdivisions of families and finally genera. Both living relatives and the fossil record have been used to place the Phasmatodea amongst the other orders of insect. However, as stressed earlier these methods rely greatly on the data provided for the interpretation, and may be the reason why these two methods have given slightly different results.

Let us first consider what information the fossil record can provide in classifying the Phasmatodea. As insect bodies are made of soft material they require a particular set of circumstances to be fossilised, such fossils are therefore rare. One such set of conditions results if the insect is caught in tree resin which, over millions of years, turns to amber. Such preserved insects that resemble phasmids have been found and have even been named, such as *Pseudoperia lineata* (Pictet & Hagen). This species is thought to have been relatively common and has been found as nymphs of various sizes up to 30mm within baltic amber. Another fossil of an insect wing dating back to the Cretaceous period has been put forward as belonging to a phasmid (Birket-Smith, 1981), although evidence for this fossil is based entirely on the wing venation patterns and is somewhat doubtful.

The fossil record is only of use to provide fundamental evolutionary steps such as the branching from a common ancestor into what is now separate orders. Using this kind of information it is possible to attempt to piece together links between unlikely relatives. For instance the order Dictyoptera contains the cockroaches and mantids, which today appear very different from one another. However they share a common ancestor and so are assigned to the same order. Using this type of palaeontological detective work it has been suggested by Hennig (1981) that the order Phasmatodea branched off during the Permian from a common ancestor known as *Tcholmanvissia*. The other branch leading from *Tcholmanvissia* lead to the Caelifera, a suborder of Orthoptera. The branch that led to *Tcholmanvissia* originated from an ancestor known as *Oedischia* which led also

to the Ensifera, the other sub order of Orthoptera. So in fact perhaps the suborder Caelifera is more closely related to the Phasmatodea than to the suborder Ensifera (Figure 1).

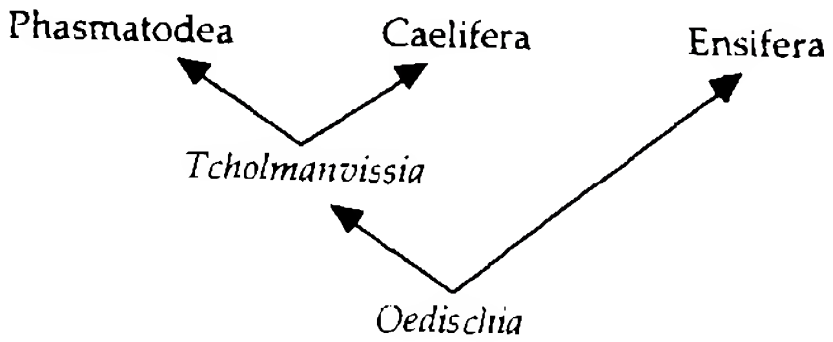

Figure 1. Possible evolutionary path of the Phasmatodea, as suggested by Hennig.

Living phasmids have also been used for the classification of the order within class Insecta and more importantly for closely related species and genera. Choosing the correct morphological feature to compare is important. For example body length is not good as this is a quantitative measure and is plastic in nature.

Discrete features are much better for this purpose such as the number of tarsi on the feet or wing venation patterns. By comparing features such as these an estimation of the degree of the evolutionary relationship can be obtained (Kamp, 1973). Firstly an attempt was made to put the order in its place amongst the other orders using various insect species which were compared with the Phasmatodea, whose representative was *Anisomorpha* sp. The degrees of similarity are computed and results used to produce a dendrogram showing the relationships between subjects. The dendrogram is a diagram which shows only current phenotypic relationships. Any attempt to read the branching as an evolutionary tree depends upon the assumption of equal evolutionary rates. One must take care with such analysis and realise that it is not straight forward to suggest that if features are very similar then those subjects are closely related, and similarly that markedly different subjects have only distant relationships. It depends upon the speed of the "evolutionary clock" as to how fast or slowly species diverge from one another. Species do not however only diverge they can also converge in a process of convergent evolution which can cause problems in this type of analysis.

It has already been put forward that natural selection has shaped the way in which the order appears today. But what is exactly meant by evolution by natural selection? In the vast majority of cases within the Phasmatodea the escape from predators involves mimicry, principally of plants upon which they live. The majority of predators of phasmids locate their prey mainly by sight and will therefore prey upon less camouflaged individuals in a population. It should be remembered that within a population of phasmids there is variation in the degree of mimicry, one has only to think of the coloration differences within a culture as well as the slight morphological differences. Those better camouflaged individuals manage to escape predation and go on to reproduce and pass on their characteristics, if they are determined genetically, to the next generation. This is what is meant by natural selection. However as the phasmid gets progressively better at camouflaging itself then this in turn puts a selection pressure on the predator population to select individuals that are better at being able to locate prey. This "arms race" between the predator and the prey has today given phasmids with incredible resemblance to plants and predators, such as birds, with incredible

eyesight to spot them.

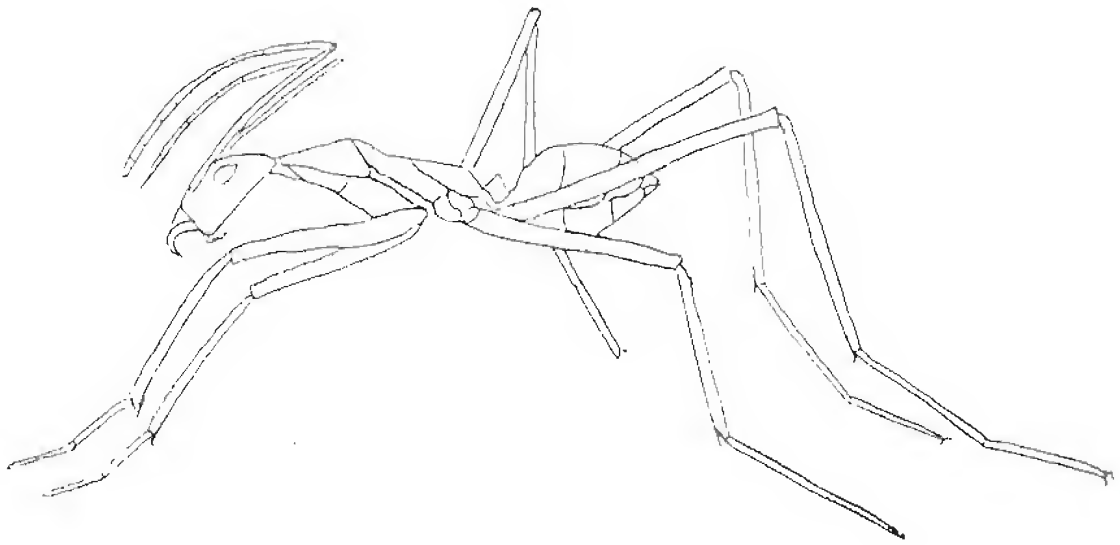

Figure 2. The ant *Leptomyrmex* sp.

It was mentioned earlier that phasmids resembled plant parts, but some have evolved to resemble, not plants, but other animals. An example of mimicry of other animals has been suggested by Key (1970) between first instar *Extatosoma tiaratum* and the foraging ant genus *Leptomyrmex* (Figure 2). The newly hatched *Extatosoma tiaratum* finds itself on the ground and needs to locate itself quickly into foliage, and mimicry of plants at this stage is not particularly helpful. However also running around on the ground are ants, the genus *Leptomyrmex* being one of them. The two insects share the same coloration and behaviour although they are not at all closely related. In fact this is an example of mimicry on the part of the *Extatosoma* which, over time, has had a selection pressure on it to select those individuals that look more ant like and therefore more likely to survive. Mimicry of the ant has presumably given it protection from predators during this vulnerable life stage until it can find the safety of foliage.

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Editor's note

Readers may recall a recent paper by Hughes & Westoby (1992: Capitula on stick insect eggs and elaiosomes on seeds: convergent adaptations for burial by ants. *Functional Ecology*, 6: 642-648.) concerning the collection of seeds and phasmid eggs by ants. The mimicry of *Leptomyrmex* sp. by *Extatosoma tiaratum* would be particularly useful if *Leptomyrmex* collected *E. tiaratum* eggs which then hatched in the nest. However, as far as I am aware, no one has produced any evidence of this.

PSG 149, *Achrioptera* sp.

Frank Hennemann, Gartenstrasse 14, 6702 Bad Dürkheim, Germany.
Taxonomic note by P.E. Bragg.

Key words
Phasmida, *Achrioptera* sp., rearing, breeding.

Taxonomy

This species has been listed on the PSG species list as *Achrioptera punctipes* (Audinet-Serville), however enquiries suggest that no one has actually made a proper attempt at identifying this culture; the name was applied to it on the basis of a general similarity. There are 8 described species in the genus which was originally described by Coquerel (1861: 495). All the known species are recorded from Madagascar or the Republic of Comoros.

Based on the illustrations and description given by Frank Hennemann, four of the six species in Redtenbacher's key (1908: 439) can be eliminated because of the spination or wing size. The two remaining possibilities are *A. punctipes* and *A. intermedia* Redtenbacher. The former, according to Redtenbacher's key, does not have spines on the head; a condition which is variable in the species described here, although head spines are usually present. The female of this species is larger than records for *A. punctipes* and the female of *A. intermedia* is unknown. Of the two species described since 1908, *A. composita* Carl (1913: 42) and *A. griveaudi* Paulian (1960: 272), the former seems a likely prospect. Without examining specimens of the species described here, and preferably also the type specimens involved, I would not like to put a name to this species. For the present it would seem best to refer to it as *Achrioptera* sp.

Culture origin & Distribution

The culture was originally imported by Frederic le Corre from Fianarantsoa, Madagascar. The wild caught male in my collection comes from Antananarivo, the capital of Madagascar.

Females (Figures 1a, 2a-c & 7)

This is a very beautiful, large, spiny and winged species. The females in captivity have body lengths reaching 225-242 (186-200mm excluding the operculum); the maximum body width is about 12mm when in full egg production. The leg lengths are: fore 46-48mm, mid 39-41mm, hind 62-64mm. The antennae are coloured dark reddish-brown, with the first segment coloured bright yellow, and are about 28-29mm long. Typical body colouring is a mixture of different shades of brown and green with some white markings on the head, mesonotum and sides of the metanotum. The mesonotum is quite long, uniform greyish-brown with a white patch at the end, and bears many long, pointed, black tipped thorns whose bases are coloured bright green. The metathorax has long thorns ventrally, they have the same colouring as those on the mesonotum. There are sometimes two yellow spines on the head, but these are totally absent in some individuals; there are also some individuals with only one spine.

The abdomen coloured creamy grey-brown with some white stripes on both sides of each abdominal segment. The first abdominal segment bears two little green spines, the others are always unarmed. The fleshy joints between the segments are all slightly red coloured. There is a very long chute at the end of the abdomen which is a uniform brown in colour, and about 40-45mm long. The cerci are small and leaf-like. The legs are all quite short and strong, covered with many lobes and serrations, especially the fore tibiae which bear some very large leaf-like and serrated lobes (Fig. 2a). Ventrally the hind legs bear many long spines (Fig. 2b) which are used for defence in a similar way to *Heteropteryx dilatata* (Parkinson) or *Haaniella* spp. The fore legs are coloured brown and the mid legs green; both have some small white spots on them. The hind legs are

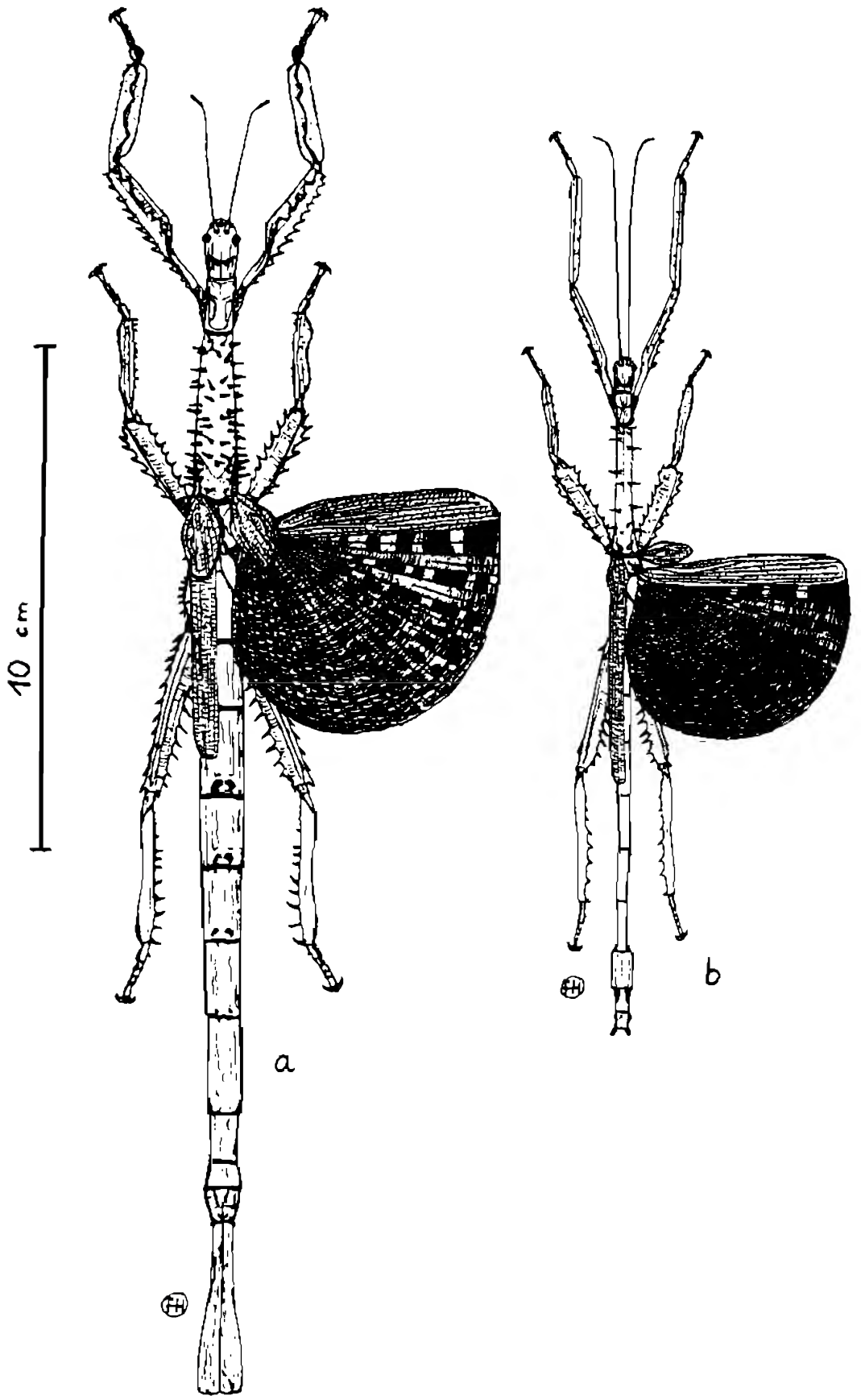

Figure 1. Adult *Achrioptera* sp. (a) Female. (b) Male.

mainly brown but are red ventrally. There is a well developed pair of wings which span about 100-110mm. They are mottled grey, black, and white. The edges are coloured in different shades of brown, green, yellow and red. The undersides of the wing edges are coloured dark red with some yellow shading.

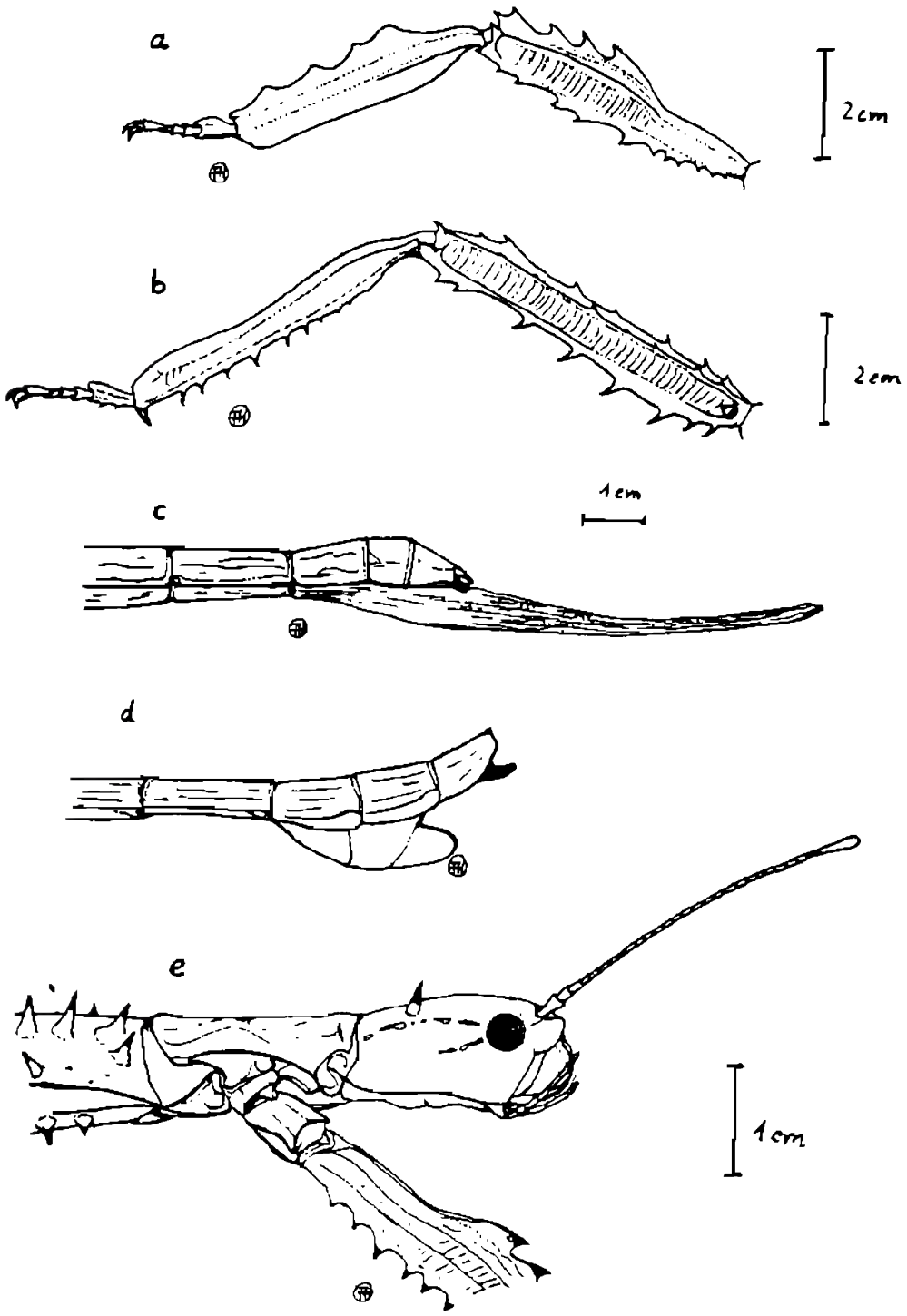

Figure 2. (a) ♀ Front leg (b) ♀ Hind leg (c) ♀ Operculum (d) ♂ Terminal segments (e) Lateral view of head.

Males

The male is one of the most beautiful phasmids that I have ever seen. In captivity they reach body lengths of 125-130mm, with a maximum width of about 5mm at wing level. The one wild caught specimen in my collection has a length of 134mm. The mesonotum bears many large pointed spines, as in the female. The head often bears two small yellowish spines. The males are very beautifully coloured, having a goldish-brown head, a bright yellow abdomen, with the pronotum and mesonotum a glossy blueish-green. There are some white stripes on the head and a bright red patch on both sides of the pronotum. The mid and hind legs are a blueish-green colour, and bright red ventrally. The front legs are the same colour as the head and all three pairs of legs are covered by many small white spots. All the legs are covered with long pointed spines which are used for

defence. The antennae are longer than the females', being about 48mm.

Like the females they possess a well developed pair of wings which span about 95mm. They are a similar coloration to those of the female but are much darker. The edges are coloured bright green and red with a white elongated patch at the joint.

Eggs (Figure 3)
These are irregularly formed, quite flattened and look a bit like a piece of bark. They are 9.5mm long, 4.5mm wide and 2.5mm high. The colouring is mostly straw but sometimes eggs are darker on the sides; when recently laid they look greenish. The operculum is a small greyish oval plate which is surrounded by a large cone shaped "coronet" (similar to *Extatosoma tiaratum* (Macleay)). The micropylar plate is elongated and almost reaches from one end of the egg to the other. It is interesting to see that, if you break an egg, the contents are a dark wine-red. This I have only previously seen in eggs of *Lonchodes haematomus* Westwood.

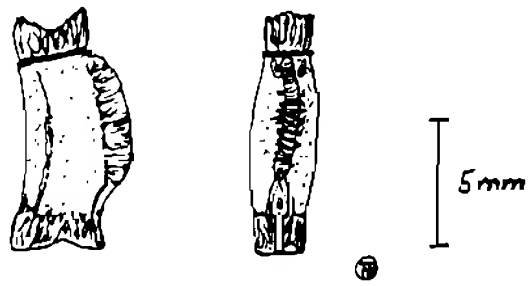

Figure 3. Lateral and dorsal views of eggs.

Each female lays about two eggs per 24 hours but I also had one which laid up to four per day. When females are near to death the eggs will shrink a little bit, as with all *Phyllium* species, and usually do not hatch. In my opinion the eggs are best incubated on damp peat at temperatures of about 25-30°C. The humidity should be kept high, so it is a good idea to spray the eggs every second day. In these conditions hatching takes about six months. Hanjo Hellmann (PSG member 956) kept eggs in the above conditions and told me that he had a hatching rate near to 100%. My hatching rate in the first generation was about 90%.

Nymphs (Figures. 4 & 5)
Eggs may hatch at any time but most of mine hatch in the afternoon, between 1400 and 1600. When newly hatched, nymphs have a body length of 24mm and an overall length of 32mm, with the antennae being 2mm long. The body colour is a uniform dark brown, becoming mid brown as they become older; sub-adult males have a white patch between the wings. The head is quite bulbous and the antennae are reddish-brown in colour. The legs are all the same colour as the body except that there is a small light brown patch on each joint, and the first segment of the tarsus is white. Even at first instar the legs bear some small lobes.

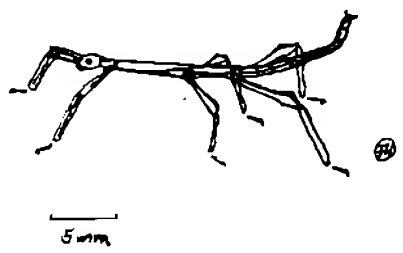

Figure 4. Newly hatched nymph.

They can be sexed when they reach the third instar, by the small knobs on the tail of the males. The operculum of the females can also be seen from the third instar onwards but does not look like that of the adult, it looks more like a drinking straw.

With last instar female nymphs it is always a good idea to keep them in separate cages, only one nymph to a cage, to give them plenty of room. Otherwise they should be kept in a very large cage. The typical resting position that is taken up by nymphs is quite interesting to look at (Fig. 5) because they hold the mid legs doubled up and then backwards against the metathorax; the other

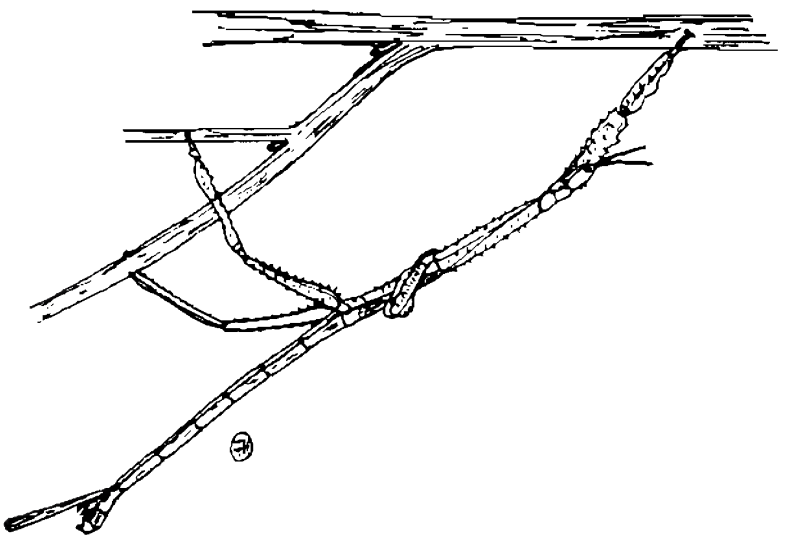

Figure 5. Female nymph in typical resting position.

legs are usually held stretched out. I have never seen adults doing this.

Defence

In general the defensive behaviour of phasmids is passive but this species shows a remarkable and active defensive behaviour. First instar nymphs are quite active and will run quickly when disturbed, sometimes with the abdomen rolled up like *Extatosoma tiaratum* nymphs. Larger nymphs do the same or remain still, while last instar nymphs will also try to pinch with their hind legs.

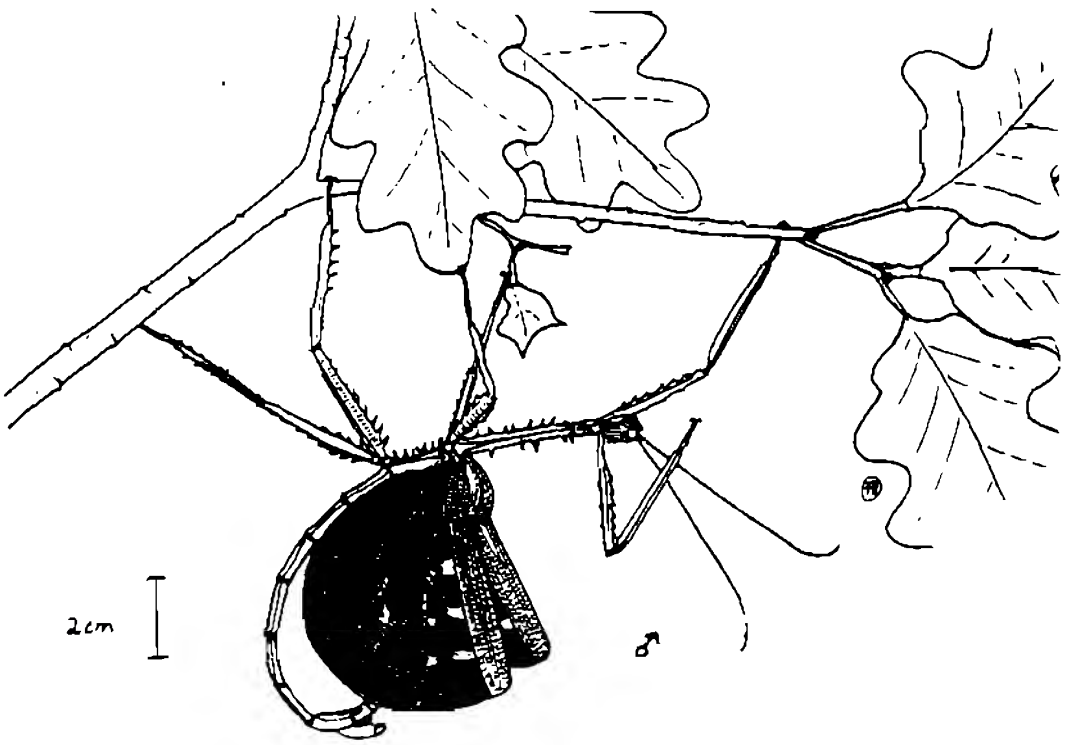

Figure 6. Defence reaction of the male.

When an adult female sitting on the foodplant in the cage is tapped sharply with a finger, at any part of the body or head, the insect quickly walks away, stretches the body, opens the wings, holding them up like sails, and pinches with the hind legs if the disturbance continues. Sometimes it may even be reason enough to do this if the twig they hang on is shaken or moved. When opening the wings they may sometimes even produce loud hissing noises like *Heteropteryx dilatata* and *Haaniella* spp.

Adult males will do all of the above but run much faster and will sometimes even walk around with the wings open for several minutes.

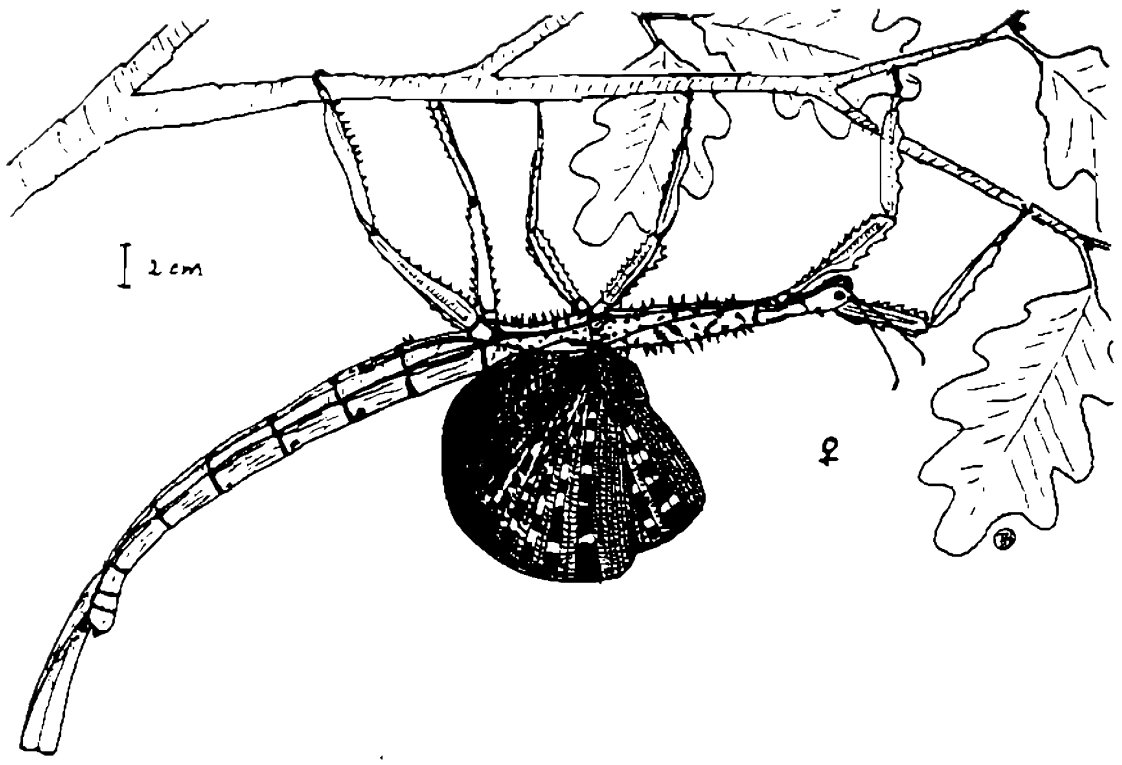

Figure 7. Defence reaction of the female.

Foodplants

This species readily eats guava (*Psidium guajava*), oak (*Quercus robor*) and bramble (*Rubus* sp.). Of these, guava seems to be the favourite food.

Rearing

This is one of the more difficult species to rear successfully and many people have reported having problems with them. However I have had good success by keeping them in the following conditions. I keep adults and nymphs together in a wooden, gauze covered cage which is covered all round by foliage to provide some humidity. However there is some ventilation which is important because they do not seem to like too damp conditions; in my first generation I lost most of my nymphs by keeping them too damp. I lightly spray them once per day because both nymphs and adults appreciate drinking the water droplets from the leaves. Large female nymphs in particular need plenty of space to shed their skins. Nymphs seem to die at all stages but mortality is especially high in the first instar.

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Reviews and Abstracts.

Book Reviews

by **Paul Brock**.

Camouflage and Mimicry of Insects.

by Kazuo Unno. Heibonsha Ltd. Publishers, Tokyo. (1993), 190cm x 290cm, 88 pages. ISBN 4-582-52932-1. Price: Japanese Yen 2900

Kazuo Unno's photography is more stunning than ever in this beautifully designed book, showing the world of camouflage and mimicry of insects. The reproductions often depict action shots of insects in the wild with stunning colours and variety. The colour reproductions are outstanding, always very sharp and detailed. The Japanese text (with English summary) is minimal.

Many insect orders are included in the three sections:

1. Camouflage. This section includes a remarkable full page example of camouflage in the West Malaysian leaf insect *Phyllium giganteum*, followed by nine extreme colour variations in the same species, reproduced on one page. The Orthoptera are well represented, with many bush crickets and mantids included.

2. Warning coloration and mimicry. A series of often very colourful examples are used.

3. Frightening display. The Saturniid genus *Automeris* is well represented, with a series of 12 "eye spot" pictures, and many other insects are included. Being biased towards stick insects, there are some superb reproductions of the defensive displays in the brightly coloured winged species *Tagesoidea nigrofasciata* from West Malaysia and *Prisopus flabelliformis* from Brazil.

I was asked to identify some Phasmida photographs prior to publication and it is a pleasure to be associated in a small way with this book. Some orders are however only identified to family or genus level; scientific names are given, where known, along with the country of origin.

The author's pleasure in seeking insects from West Malaysia, of which he has a vast knowledge, is evident in the photographs, although many other countries are represented. Those who own a copy of The Orchid Mantids & Insects of Malaysia (Nippon Television Network Corporation, Japan, 1989) will need no introduction to the superb standard of photography and I highly recommend this new volume to anyone interested in insect photography or the subject matter covered by the book. The Orthoptera enthusiast will particularly appreciate this book, with a beautiful cover design (and dust jacket) of two different colour forms of *Phyllium giganteum* on the front, and a mantis on the back.

Kazuo Unno's other photographic books are little known to many entomologists, although my own book collection includes fine volumes on beetles and South American insects. This latest book will enhance the author's reputation as one of the premier nature photographers in Japan.

The publishers do not have links with European or USA book dealers. However Shuji Misawi (editor of this volume) will be pleased to handle orders from PSG members. Address; Shuji Misawi, Staff of "The Sun Magazine", Heibonsha Ltd. Publishers, 5 Sanbancho, Chiyoda-ku, Tokyo 102, Japan. Payment by International Money Order (available from post offices) for Yen 3290 (about £22.00), this includes Yen 390 for surface mail postage.

The Insect and Spider Collections of the World (2nd Edition)
by Ross H. Arnett, G. Allan Samuelson & Gordon M. Nishida. Flora & Fauna Handbook No. 11. Sandhill Crane Press Inc., Gainesville, Florida, USA. (1993), 23cm x 15cm, 310 pages. ISBN 1-877743-15-1. US$30.

Having frequently used the first edition (1986), I feel qualified to comment on its practieal use to the researcher. The main aim of this book is to provide a standard, worldwide list of collections of insects and spiders useful for the location of specimens. This edition is cloth-bound and much more suited to the entomological library than the 1986 ring-bound version.

The list of public insect and spider collections, arranged alphabetically by country is followed by brief details of a few important private collections and a list of standard codes used for each collection mentioned. Not all minor collections are included e.g. many smaller British museums with insect collections are excluded from this volume, although the authors comment that these "are being described in several volumes".

How has the content been obtained for this book? Curators of collections were asked to complete a questionnaire. The response varied and in some cases the original information from 1986 has been retained. However the majority have updated information. On a topical point, the authors have specifically mentioned the decrease in staff curating museum collections; curator's names are given and sometimes the names of professional staff, where known, along with the telephone and/or fax number. Some institutions did not reply and the information about collections varies widely. For example, American museums are often covered in detail, with information on the size of the collection, special collections or orders, and details of how specimens are housed. Some important museum collections are covered in just a few lines, but curators are given the opportunity to write to the publishers for a fuller coverage in a future edition.

I give below brief details of how I benefited from the first edition.
Locating specimens. Details of collections may indicate how likely they are to contain specimens of interest. Addresses are located immediately, avoiding considerable research time on this task. [The new edition gives an "Index to personnel" which may help in locating where an author has deposited material. However, details of special collections are only given for some museums.]

Contacting institutions. I have successfully contacted museums and others to arrange to visit or borrow type material. When taking a holiday abroad, it has been very useful to make arrangements in advance and often see locally collected material.

My main interest is in phasmids, which are not specifically mentioned in the book. However it has

been straightforward to use the book as a guide and it would be suitable for the entomologist, regardless of the order(s) studied.

This book is a must for those interested in the taxonomy of insects or spiders, or enthusiasts wanting to seek out insect collections on holiday. Some out of date information is included, understandable in a publication of this nature, particularly where curators have not responded to the 1992 questionnaire. With a wealth of information on the subject matter covered, this book is very reasonably priced.

The book may be ordered from: American Insect Projects, 2406 NW 47th Terrace, Gainesville, Florida 32606, USA. The price, including post and packing, is US$35.

Journal Review

by **Phil Bragg**

Arthropoda ISSN 0943-7274.
Published in A5 format, in German with English abstracts and key words. The 20 pages of volume 1, number 4 contain three papers. The papers deal with Biological rhythms in theraphosid spiders from Cuba, Rearing cockroaches, and Coxae coloration in leaf insects. The latter (abstract in this issue of *Phasmid Studies*) includes two colour photographs. The publication is well laid out and smartly presented. The English abstracts and key words give a brief outline of the contents. There are a some taxonomic errors in the text and the abstracts could be improved by careful editing. This publication should be of interest to anyone interested in Arthropods and capable of reading German; I wish it every success.

Details of how to subscribe to *Arthropoda* may be obtained from: Jan-Peter Rudloff, Am Schloßgarten 5, D-06862 Roßlau, Germany.

Phasmid Abstracts

The following abstracts briefly summarise articles which have recently appeared in other publications. Some of these may be available from local libraries. Others will be available in university or college libraries, many of these libraries allow non-members to use their facilities for reference purposes free of charge.

The editor of *Phasmid Studies* would welcome recent abstracts from authors so that they may be included in forthcoming issues. In the case of publications specialising in phasmids, *Phasma* and *Le Monde des Phasmes*, only the longer papers are summarised.

Brock, P.D. (1994) Giant stick-insects in Australia: Notes on *Acrophylla titan* (Maeleay). *Bulletin of the Amateur Entomologist' Society*, **53**(393): 61-67, pl. QQ.

This paper reviews the existing records of *A. titan* and the author reports finding this species during a visit to Australia in 1993. Some information on rearing is given, in captivity it feeds on *Eucalyptus gunnii*. The paper includes illustrations of the eggs of 12 species of Australian phasmids and the plate shows two colour photographs, one of the female and one of the male *A. titan*.

Bueschges, A., Kittmann, R. & Ramirez, J.M. (1993) Octopamine effects mimic state-dependent changes in a proprioceptive feedback system. *Journal of Neurobiology*, **24**(5): 598-610.

The modulatory actions of the biogenic amine octopamine on the femur tibia (FT) control loop in the stick insect *Carausius morosus* were examined. The response properties of the FT control loop were determined under open loop conditions. Mechanical stimulation of the femoral chordotonal organ (fCO) was the input and tibial movement and motoneuronal activity were measured as the output of the system. Following octopamine injection into the hemolymph of intact, inactive animals, two consecutive phases occurred at the behavioral level. Octopamine caused initially an activation of the animal. During this first phase (3.5-12 min duration) the response properties of the FT control loop were similar to those found in animals that were activated by tactile stimuli under normal conditions. Afterward, animals became inactive. During this second phase (15-20 min duration), the gain of the control loop was zero and no resistance reflex in the FT joint was generated in response to fCO stimulation. However, active movements of the tibia could still be elicited. As we could show in restrained animals, where DL-octopamine was applied topically onto the undesheated mesothoracic ganglion, the complete suppression of the resistance reflex on the motoneuronal level was dose dependent starting at concentrations of 5 times 10-3 M octopamine. We could show that octopamine specifically suppressed the pathways involved in the resistance reflex, while feedback loop responses to fCO stimuli typical for active animals eould still be elicited. Our results indicate that an increase in the octopamine concentration mimics activation of the animal: Properties being characteristic for the control of the FT joint in the inactive animal are inhibited by octopamine, while properties of the FT control loop typical for the active animal appear to be facilitated following octopamine injection. The results clearly demonstrate that different pathways in the neuronal network underlying the FT control loop are involved in the responses of the control loop to fCO stimuli in the inactive and active behavioral states of the stick insect.

Cruse, H., Schmitz, J., Braun, U. & Schweins, A. (1993) Control of body height in a stick insect walking on a treadwheel. *Journal of Experimental Biology*, **181**: 141-155.

The properties of the system that controls the distance between body and ground was investigated in the stick insect *Carausius morosus*. The insect walked on a lightweight double treadwheel under open-loop or closed-loop conditions. The open-loop investigations show that the dynamic behaviour of the height-control system in the walking animal can be described in terms of a simple proportional system with negligible dynamic properties, and it is therefore much simpler than the height-control system in the standing animal. Under open-loop conditions, we found no coupling between contralateral or ipsilateral legs. This agrees with the findings on standing animals. The force-height characteristic shows two ranges, in each of which the system exhibits a linear relationship but a different slope. Under closed-loop conditions, the force-height characteristic shows the same two linear ranges, but the slopes are greater than under open-loop conditions. Because the height controller of each leg can be considered to act like a spring, this result means that under closed-loop conditions the controller is stiffer than it is under open-loop conditions.

Dean, J. & Schmitz, J. (1992) The two groups of sensilla in the ventral coxal hairplate of *Carausius morosus* have different roles during walking. *Physiological Entomology*, **17**(4): 331-341.

The ventral coxal hairplate (cxHPv) of the stick insect *Carausius morosus* Br. (Phasmida: Bacteriidae) contains two morphologically distinct groups of sensilla designated as group 1 and 2 (G1, G2). The function of these sensilla during walking was tested by selectively ablating one or both groups on one middle leg in thirty-four animals. It has previously been shown that ablation of the entire hairplate leads to two kinds of errors: the operated leg swings farther forward and the adjacent caudal leg ends its swing more to the rear relative to the operated leg. Following selective ablation of cxHPv G1 on the middle leg, the first kind of error is more pronounced, indicating that this group contributes more to limiting forward protraction during the swing. Following ablation of cxHPv G2, the second kind of error is more evident, indicating that during stance this group contributes more to the target information influencing the swing end-point of the adjacent caudal leg. These results are interpreted to reflect the phasic and phasic-tonic response characteristics of G1 and G2 hairs, respectively.

Deschandol, A. (1994) Graines de.....Phyllies. *Le Monde des Phasmes*, **25**: 3-4.

Compares and illustrates the eggs of *Phyllium bioculatum* Gray and *P. giganteum* Hausleithner, with the seeds of *Mirabilis jalapa* and *Conium maculatum*.

Fellenberg, S.V. (1993) Description of the egg of a species of *Onchestrus* Stål (Phasmatodea: Phasmatidae). *Australian Entomologist*, **20**(4): 117-120.

Describes and illustrates the egg of an unidentified species of *Onchestrus* from Australia. Illustrations include dorsal and lateral SEM photographs.

Gade, G., Kellner, R., Rinehart, K.L. & Proefke, M.L. (1992) A tryptophan-substituted member of the AKH/RPCH family isolated from a stick insect corpus cardiacum. *Biochemical and Biophysical Research Communications*, **189**(3): 1303-1309.

A neuropeptide, Cam-HrTH-I, has been isolated from the corpus cardiacum of the Indian stick insect *Carausius morosus*. The peptide causes hyperlipaemia in *Locusta migratoria* and hypertrehalosaemia in *Periplaneta americana* and is related to the previously isolated Cam-HrTH-II (pGlu-Leu-Thr-Phe-Thr-Pro-Asn-Trp-Gly-Thr-NH-2) by substitution, apparently by a hexose, on the Trp residue. This appears to be the first example of such substitution on a Trp residue.

Giorgi, F., Masetti, M., Ignacchiti, V., Cecchettini, A. & Bradley, J.T. (1993) Postendocytic vitellin processing in ovarian follicles of the stick insect *Carausius morosus* (Br.). *Archives of Insect Biochemistry and Physiology*, **24**(2): 93-111.

Newly laid eggs of the stick insect *Carausius morosus* contain two native vitellins (Vit A and Vit B). Under denaturing conditions, these vitellins resolved into 3 (A-1, A-2, and A-3) and 2 (B-1 and B-2) polypeptides. All of these polypeptides had counterparts in the female hemolymph from which they were shown to be derived by in vivo labelling. During ovarian development, the 2 vitellins changed both in charge and polypeptide composition. In EV and LV follieles, Vit A resolved into 4 distinct vitellin polypeptides (A-0, A-1, A-2 and A-3). Using a panel of monoclonal antibodies polypeptide A-0 proved to be immunologieally related to polypeptide A-2. In follicles about to begin choriongenesis, polypeptide A-3 was gradually replaced by a lower M-r polypeptide. Over the same time period, polypeptide B-1 ehanged in eharge, but not in M-r. To confirm the existenee of a polypeptide processing in *C. morosus*, ovarian follicles of different developmental stages were exposed in vivo to (35S)-methionine from 6 to 72 h. Data showed that A-0 and B-1 were the polypeptides most heavily labelled after short time exposures to the radioisotope. Polypeptides B-2 and A-3 were also labelled to some extent. With progressively longer exposures, polypeptides A-1 and A-2 also became labelled. In vivo exposure to (3H)-GlcNAc caused all vitellin polypeptides to become heavily lahelled. Autoradiographic analysis of ovarian follicles labelled this way showed that, during development, radioactivity was gradually transferred from newly formed yolk spheres in the cortical ooplasm to the central ooplasm. Data were interpreted as suggesting a causal relationship between polypeptide processing and progressive yolk sphere fusion to yield the central ooplasm.

Ho, H.Y, & Chow, Y.S. (1993) Chemieal identification of defensive secretion of stick insect, *Megacrania tsudai* Shiraki. *Journal of Chemical Ecology*, **19**(1): 39-46.

Volatile constituents of the defensive secretion of the stick insect, *Megacrania tsudai* Shiraki, in Taiwan have been analyzed by gas chromatography-mass spectrometry (GC-MS). In addition to the major component, actinidine, three more minor components of the seeretion are identified as boschniakine and two stereoisomers of 1-acetyl-3-methylcyclopentane by comparing GC retention times with the authentic samples and synthetic compounds. Other components are also tentatively assigned as derivatives of actinidine.

Kutsch, W. & Kittmann, R. (1991) Flight motor pattern in flying and non-flying phasmida. *Journal of Comparative Physiology. A. Sensory Neural and Behavioral Physiology*, **168**(4): 483-490.

The insect order Phasmida comprises species with a broad spectrum of wing morphism and flight ability. By monitoring the electrical activity of several pterothoracic muscles the motor output during tethered flight was recorded for several Phasmida, ranging from excellent fliers to non-winged species. Both winged and non-winged species can generate a motor pattern as judged by criteria used to identify the locust flight pattern. However, in non-fliers the probability of expressing this pattern, its duration and precision are reduced. The antagonistic activity of the chosen muscle pairs is clearly different from the motor output during leg movements, which argues for specific motoneuronal coordination released for different behavioural performances. The demonstration of flight motor output in all tested Phasmida indicates that neural structures including their functional connectivity can be maintained independently of the appropriate peripheral structures. With respect to evolution this supports the idea that central neuronal interactions can be more conservative compared to changes in the periphery.

Langlois, F. & Lelong, P. (1994) Observations sur *Bacillus rossius catalauniae* Nascetti & Bullini, 1983. *Le Monde des Phasmes*, **24**: 3-8.

This paper describes *Bacillus rossius catalauniae* Nascetti & Bullini and illustrates the male. Brief mention is made of conditions for captive rearing.

Lelong, P. (1994) Nouvelle decouverte de plusieurs gynandromorphes de *Clonopsis gallica* (Charpientier, 1825). *Le Monde des Phasmes*, **24**: 12-20.

Discusses & illustrates some gynandromorphs of *Clonopsis gallica* (Charpentier).

Lelong, P. (1994) La naturalisation des Phasmes. *Le Monde des Phasmes*, **25**: 5-11.

Deals with the preservation of phasmids under six headings: Killing, Preparation (including evisceration), Setting, Drying, Curation, and Repair.

Lelong, P. (1994) Cartographie des especes Francaises. *Le Monde des Phasmes*, **25**: 24-26.

Gives maps of France showing the distribution of *Clonopsis gallica* (Charpentier), *Bacillus rossius* (Rossi), and *Leptynia hispanica* (Bolivar).

Mazzini, M. & Giorgi, F. (1992) Ultrastructural observations on the secretory pathway in the adult fat body of the stick insect *Bacillus rossius* (Rossi) (Insecta Phasmatodea, Bacillidae). *Journal of Submicroscopic Cytology and Pathology*, **24**(4): 563-570.

The fat body of the adult female in the stick insect *Bacillus rossius* (Rossi) (Insecta Phasmatodea, Bacillidae) was examined ultrastructurally to study the secretory pathway. The results showed that secretion in *B. rossius* fat body entails packaging of newly synthesized products into composite granules. Due to the polarized distribution of all cell organelles in the fat body cell, the origin of composite secretory granules could be traced back to such organelles as the Golgi apparatus and a transformed type of multivesticular body. At their final stage of maturation, composite secretory granules in *B. rossius* fat body eonsist of a protein storing, electron dense compartment that encloses a translucent vesicle containing a urate crystalline inclusion. Our observations suggest also that secretion in *B. rossius* fat body entails exocytosis of only the electron dense compartment, the urate storing compartment being retained in the cell cytoplasm throughout vitellogenesis.

Pfeiffer, H.J., Koch, U.T. & Baessler, U. (1993) Mass-induced oscillations in the femur-tibia control system of stick insects. *Biological Cybernetics*, **68**(3): 259-266.

Attaching an inert mass to a freely moving tibia of an otherwise fixed stick insect *Carausius morosus*, induces undamped oscillations of the tibia. We describe the use of a rotational pendulum to observe these oscillations applying various amounts of inertia. The dependence of the frequency of these oscillations on the moment of inertia is similar to that of a purely mechanical system. The sequence of the oscillatory behaviour can be separated into 3 distinct behavioral states. The transitions between some of these states could be elicited by external stimuli and partly showed characteristics of habituation and dishabituation. With a rotational pendulum on each middle leg, simultaneous oscillations of both legs were measured to investigate coupling effects between the neural control systems of the two legs. In some cases, significant coupling effects could be observed in phase and frequency. In many other cases, no coupling was found. The habituation and dishabituation effects were not transferred between the middle legs.

Ramirez, J.M., Bueschges, A. & Kittmann, R. (1993) Octopaminergic modulation of the femoral chordotonal organ in the stick insect. *Journal of Comparative Physiology a Sensory Neural and Behavioral Physiology*, **173**(2): 209-219.

The modulatory action of DL-octopamine on the multicellular femoral chordotonal organ (fCO) of the stick insect *Cuniculina impigra* was examined using extracellular recordings from the fCO nerve and intracellular recordings from single sensory neurons. To determine the octopaminergic effect on position, velocity and/or acceleration sensitivity of mechanoreceptors direct mechanical stimulations with defined parameters were applied to the fCO apodeme. The spontaneous activity in the fCO nerve was enhanced in a dose-dependent manner by octopamine (threshold at 5 times 10-7 M). This was based on enhanced activity of position sensitive neurons as the fCO activity for all position stimuli was shifted to higher values. Intracellular recordings of single sensory cells showed that velocity-sensitivity of single sensory cells was not altered by octopamine. Similarly, the response of fCO afferents to ramp-and-hold stimuli revealed that acceleration sensitivity was unaffected by octopamine. The observed alterations in the fCO activity indicate that responses to static stimuli are enhanced while responses to motion stimuli are not affected by octopamine. These findings suggest that the octopaminergic modulation of the fCO may affect the animals' posture and those leg movements that rely on position information.

Sandlin, E.A. & Willig, M.R. (1993) Effects of age, sex, prior experience, and intraspecific food variation on diet composition of a tropical folivore (Phasmatodea: Phasmatidae). *Environmental Entomology*, **22**(3): 625-633.

Recent attention in ecology has focused on factors that influence the foraging behaviour of herbivores. We evaluated responses to different arrays of food plants exhibited by an abundant folivore within the tabonuco forest of Puerto Rico. Previous work indicates that the walkingstick *Lamponius portoricensis* Rehn forages on a limited array of plant species and selects habitats that contain high densities of *Piper treleaseanum* Britton & Wilson. We designed three separate experiments to evaluate (1) if walkingsticks of different ages or of different sex have different food preferences, (2) if previous exposure to only one food type affects subsequent diet composition, and (3) if walkingsticks distinguish among leaves of different quality from the same plant. Four plants (*Dendropanax arboreus* (L.) Decne & Planch, *Piper hispidum* Sw., *P. treleaseanum* and *Urera baccifera* (L.) Gaud.) known to be forage for this insect were used in food choice experiments. Multivariate analyses revealed that, at different ages, males and females exhibit different patterns of consumption. Likewise, preexposure to only one food influences subsequent diet differently depending upon preexposure regimen and sex. In addition, preferences are shown for different qualities of leaves within single forage species. In particular, lower (older) leaves of *P. treleaseanum* are preferred, whereas leaves of *D. arboreus* and *U. baccifera* are eaten indiscriminately. These results are consistent with the contention that herbivores forage within nutritional constraints. In addition, walkingsticks distinguish between plant species, recognize differences in leaf quality associated with age or position, and modify their diet to reflect past experience.

Scali, V. & Tinti, F. (1992) Rapid assessment of maturation stage and reproductive model in centrolecytic eggs of stick insects (Phasmatodea) using DAPI stain. *Biotechnic & Histochemistry*, **67**(6): 356-359.

A rapid three-step DAPI technique is proposed for detecting meiotic stages and sperm head evolution in yolky, fertilized stick insect eggs, which were difficult to analyze with other methods. Fixed eggs were freed from chorionic envelopes and stained directly in DAPI/PBS solution. After rinsing, eggs were singly squashed in a drop of mounting buffer and examined under a microscope with incident fluorescent illumination. The method was almost uniformly successful, and direct

observation of nuclear structures, coupled with fluorometry, allowed easy recognition of bivalents, diads, pronuclei and their DNA content. The DAPI method proposed here appears particularly helpful for investigating unusual reproductive modes in eggs with large amounts of yolk.

Scapigliati, G. & Mazzini, M. (1992) Morphological characterization of *Bacillus rossius* (Rossi) (Phasmatodea, Bacillidae) haemocytes. *Redia*, **75**(1): 233-240. [In Italian with English summary]

The authors performed a preliminary characterization of the haemocytes of the stick insect *Bacillus rossius*. According to their relative dimensions, the cells can be divided in three main populations: granulocytes (ca. 21 mu-m), small granulocytes (ca. 11 mu-m) and plasmatocytes. Morphologically, the granulocytes are round or spindle-shaped and contain vesicles, whereas the plasmatocytes are very irregular, possess a lot of filopodia, and do not seem to have evident vesicles. When the haemocytes are cultured, both granulocytes and plasmatocytes adhere to the substrate, but the granulocytes can be depleted by extensive washing. Intracellular F-actin content was investigated using rhodamine-labelled phalloidin (rh-phalloidin), and the distribution of F-actin in granulocytes and plasmatocytes was remarkably different. Studies are in progress to determine if the differences observed in F-actin distribution reflect different functional properties of granulocytes and plasmatocytes.

Seow-Choen, F. & Brock, P.D. (1994) Colour variations of the stick insect *Necroscia roseipennis* Serville (Phasmida = Phasmatodea) in Singapore. *Bulletin of the Amateur Entomologist' Society*, **53**(393): 71-73, pls. OO & PP.

Necroscia roseipennis feeds exclusively on wild cinnamon (*Cinnamomum iners*). Three colour forms of the male and four of the female are reported. Some of the colour forms are illustrated in the four photographs on the two colour plates.

Sordet, F. (1984) Mecanisme de la mue chez les phasmes. *Le Monde des Phasmes*, **24**: 21-23.

Discusses and illustrates the structure of the cuticle of phasmids.

Spreter, V. (1994) Pour que dansent les phyllies (Suite). *Le Monde des Phasmes*, **25**: 12-15.

Continues a series of articles on rearing *Phyllium* spp. Previous articles appeared in *Le Monde des Phasmes*, **19**: 16-21, **21**: 4-5, and **22**: 15-16.

Taddei, C., Maurizii, M.G., Chicca, M. & Scali, V. (1993) The germarium of panoistic ovarioles of *Bacillus rossius* (Insecta-Phasmatodea): Structure and function during imaginal life. *Invertebrate Reproduction and Development*, 23(2-3): 203-210.

In adult females of *Bacillus rossius* (Insecta Phasmatodea) the germarium, localized at the ovariole tip just below the terminal filament and above the vitellarium, progressively reduces in size and eventually disappears at the end of the ovulatory period. The observations with light and electron microscopes show that in the end-chamber most germ cells are arrested in a post-pachytenic diffuse stage, which just precedes diplotenic oocyte growth. These observations also indicate that the reduction in size of the germarium of ovulating females should probably be ascribed to a progressive and extensive activation of the resting germ cells. The average number of ovulated eggs per ovariole (6.7+-0.9) is consistent with this view. However, occasional findings of leptozygotenic germ cells in some preovulatory ovarioles of adult females do not completely rule out the persistence of scarce undifferentiated germ elements (oogonia) in the larval germarium at the onset of adult life. Furthermore, the reduction of the germarium in ovulating females and its subsequent disappearance in post-ovulating ones also includes the somatic cells, which are always present among the germ cells in previous stages. Since each early growing oocyte becomes surrounded by a thin monolayer of follicle cells, the diminution of end-chamber

somatic cells supports the view that they actually represent prefollicular cells, which are progressively utilized from the onset of imaginal life onwards.

Tinti, F. & Scali, V. (1993) Chromosomal evidenee of hemiclonal and all-paternal offspring production in *Bacillus rossius-grandii benazzii* (Insecta Phasmatodea). *Chromosoma (Berlin)*, **102**(6): 403-414.

The stick insects *Bacillus rossius-grandii benazzii* and *B. rossius-grandii grandii* naturally reproduce by hybridogenesis and androgenesis. The hybrid karyotype of the former (2n = 35, XX female; 34, X0 male) clearly sums up a *B. rossius* haploset (r) with n = 18 and a *B. grandii benazzii* one (gb) with n = 17. The two sets keep the parental features for C-heterochromatin amount (much larger in the gb complement) and satellites/NORs (nuclear organizer regions) (more numerous and variably located in the r set); hybridogenetically produced males always show severely impaired gametogenesis and are therefore sterile, whereas hybridogenetic females are fertile. Reproductive, karyological and cytogenetical properties of the hybridogenetic system have been exploited to obtain the chromosomal evidence of whole haploset exchanges. In progenies obtained by crossing *B. rossius-grandii benazzii* females to *B. rossius* males with either standard or repatterned (with Robertsonian fusions) karyotypes, there has always been complete agreement between electrophoretically genotyped and karyologically analyzed hybridogenetic offspring: the unassorted maternal r haploset (r-m) is transmitted and the g b-m haploset replaced by that of the fathering male (r-p), thus evidencing the hemiclonal reproduction and the new r-m-r-p chromosomal constitution. New karyotype traits of the offspring relate to chromosome number (2n = 36, female; 35, male), C-heterochromatin pattern (the heterochromatin-rich g b haploset completely disappears) and satellite/NOR features (corresponding to r-m plus r-p locations). The same crosses also produce genetically and chromosomally all-paternal descendants (androgenetics), of both sexes and fully fertile, with an r-p r-p structure. These androgenetic progeny show segregation for alleles and chromosomes at which fathering males are heterozygous: it was therefore possible to demonstrate that androgenetics can derive from syngamy of two sperm nuclei, of the several present in the polyspermic hybridogenetic egg. The production of androgenetics from field fertilized females of *B. rossius-grandii benazzii*, *B. rossius-grandii grandii* and parthenogenetic *Bacillus whitei* (= *B. rossius/grandii grandii*) suggests the occurrence of unsuspected relationships between hybrids and their parental species, so that the hybrids cannot be simply considered as 'sexual parasites'. Furthermore, there is a suggestion of evolution of parthenogenetic clonal species from selection of initially hybridogenetic strains. The ability to produce uniparental progeny naturally from the spermatic genome may open a new field of investigation on genomic imprinting.

Vickery, V.R. (1993) Revision of *Timema* Scudder (Phasmatoptera: Timematodea) including three new species. *Canadian Entomologist*, **125**: 657-692.

The nine species of *Timema* Scudder known previously from California, Arizona, and Nevada are redescribed and three new species are added: *Timema nakipa* from Baja California, Mexico; *T. tahoe* from Nevada; and *T. christinae* from Santa Barbara County, California. *Timema nakipa* and *T. podura* Strohecker are the only representatives of *Timema* known from Mexico. Keys and identification tables are presented for identification of species.

Willig, M.R., Sandlin, E.A. & Gannon, M.R. (1993) Structural and taxonomic components of habitat selection in the neotropical folivore *Lamponius portoricensis* (Phasmatodea: Phasmatidae). *Environmental Entomology*, **22**(3): 634-641.

Lamponius portoricensis Rehn is a folivorous neotropical walkingstick that is a common light-gap inhabitant of the tabonuco forest in Puerto Rico. Little is known concerning the spatial distribution of this phasmatid or the manner in which it selects habitats. Based on multiple

regression analysis of a suit of taxonomic and structural characteristics of understorey flora, we determined that the density of walkingsticks was associated with patches that exhibit high apparency values for *Piper treleaseanum* Britton & Wilson and *Symplocos martinicensis* Jacq., and low apparency values for *Dryopteris deltoidea* (Sw.) Kuntze. The total development of the understorey regardless of taxonomic composition at 76 cm (2.5 ft) and 107 cm (3.5 ft) also contributes to high walkingstick density, based on correlative analyses. Moreover, nonparametric analysis suggests that *L. portoricensis* disproportionately occurs on *P. treleaseanum* (approximately twice as often as expected based on plant apparency) Despite these associations, only a third of the variation in walkingstick density is accounted for by this suite of floral characteristics. The low vagility of *L. portoricensis* may result in its having incomplete information about the abundance and distribution of forage plants, whereas patch-dynamic processes involving changes in quality of forage can confound the significance of apparency alone in predicting density. The production of aromatic attractants by *Piper* may act as the proximate cue affecting patch selection.

Ziegler, U. (1993) Einige Bermerkungen zu *Phyllium siccifolium* (Linné 1758). *Arthropoda*, **1(4)**: 18-20.

The coxae coloration of *Phyllium siccifolium* is described and figured with colour pictures. The difference between original material and material from captive stocks is described. At the moment we are not able to breed this species in captivity for more than one generation.

Publications noted

The following papers have recently been published but copies or abstracts have not yet been received.

Estridge, B., Cecchetini, A., Bradley, J. & Giorgi, F. (1992) Follicle-specific protein in the stick insect, *Carausius morosus* (Br.). *Molecular Biology of the Cell*, **3**(suppl.): 8A.

Giorgi, F., Cecchettini, A., Lucchesi, P. & Mazzini, M. (1993) Oocyte growth, follicle cell differentiation and vitellin processing in the stick insect, *Carausius morosus* Br. (Phasmatodea). *International Journal of Insect Morphology and Embryology*, **22**(2-4): 271-293.

Mazzini, M., Carcupino, M. & Fausto, A.M. (1993) Egg chorion architecture in stick insects (Phasmatodea). *International Journal of Insect Morphology and Embryology*, **22(2-4)**: 391-415.

PSG 146, *Centema hadrillus* (Westwood).

P.E. Bragg, 51 Longfield Lane, Ilkeston, Derbyshire, DE7 4DX, U.K.
Illustrations of adults and eggs by J. Potvin.

Key words
Phasmida, *Centema hadrillus*, Distribution, Sarawak, Brunei, Kalimantan, Borneo, Rearing.

This species was first described and illustrated by Westwood in 1859, based on four specimens from Sarawak, one adult and three nymphs. When establishing the genus *Lopaphus* (Westwood, 1859: 99), he commented that the genus was rather artificial and contained several different forms; since then the nine original species have been moved and now occupy eight different genera! *Centema hadrillus* appears to be quite common and has been mentioned several times in various publications.

Lopaphus hadrillus Westwood, 1859: 100, pl. 28.4.
Lopaphus (?) hadrillus (Westwood), Kirby, 1904: 360.
Centema hadrillus (Westwood), Redtenbacher, 1908: 490.
Centema hadrillus (Westwood), Günther, 1935: 11.
Centema hadrillus (Westwood), Günther, 1943: 155.
Centema hadrillus (Westwood), Bragg, 1993: 40. [Lectotype designated]
Centema longipennis Günther, 1944: 78. [Synonymised by Bragg, 1993: 40.]

Culture stocks
The PSG culture originates from two places: Badas in Brunei, and Simunjan in Sarawak. There are some differences between the two stocks and some people are keeping the two separate. The Simunjan stock originates from one female found by Ian Abercrombie and myself in 1991. The Badas stock was originally collected by Mel Herbert.

Distribution
This species seems to be widely distributed in Borneo and is common in some areas. I have collected it from eight localities, in Sarawak, Brunei and Kalimantan. The distribution map (Fig 1) shows my own records and one previously published record for Batu Tiban (Günther, 1935). I have been unable to locate the exact position of two localities mentioned by Günther: the Kapah river in north eastern Sarawak is in the area marked by a dotted line, and Smitan is somewhere on the river Mahakam in Kalimantan. The Sarawak Museum contains three specimens but only one gives a localty, Sadong, the river which runs through Simunjan.

At Tarum, in Sarawak (E 111° 28' N 001° 34') it was very common, with over a dozen specimens, a mixture of adults and nymphs, being seen on one evening. The Natural History Museum, London, contains several specimens collected by Allan Harman in 1980 from Niah National Park, Sarawak; I collected two females from the same locality in 1992. Mel Herbert has found *C. hadrillus* to be quite common at Badas, Brunei. In other localities where I have collected this species only single specimens have been found.

Adults (Fig 2)
Males and females are both quite spiny, however the number and size of the spines does vary. Both sexes have wings but the females have short wings which do not reach to the end of the second abdominal segment and are of no use for flight; the male has wings which reach to the end of the sixth abdominal segment and can fly quite well.

The head has spines on the top and back, although specimens from most places other than Simunjan

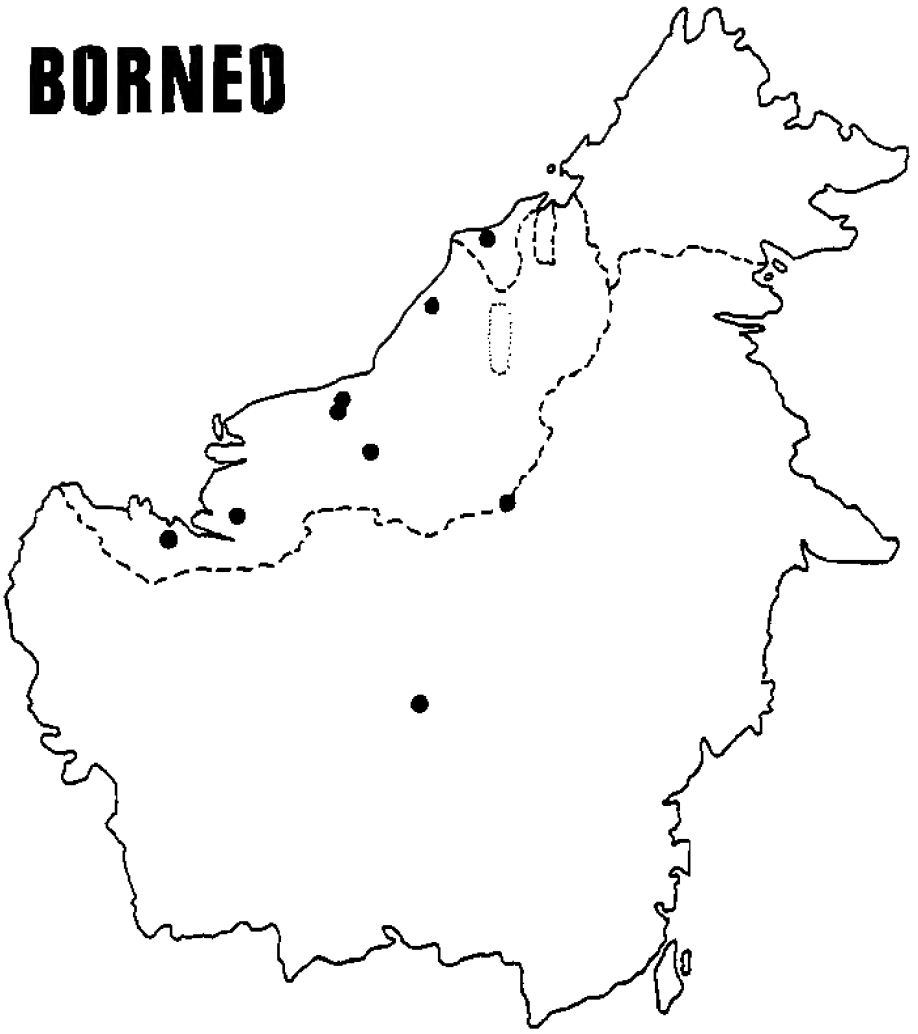
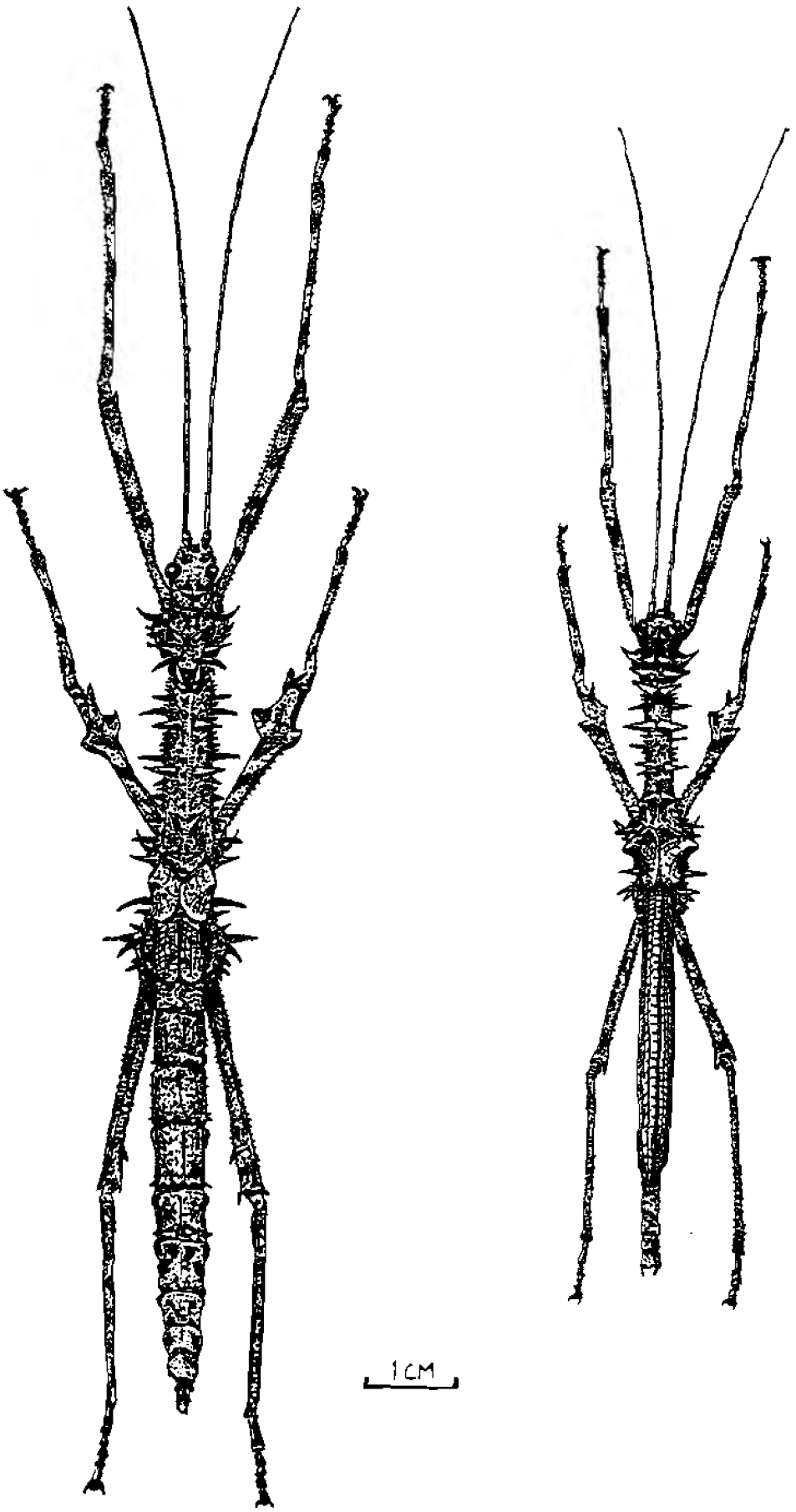


Figure 1. Distribution of *Centema hadrillus*.

in Sarawak have only very small spines; specimens from Simunjan have a pair of large spines and often several medium and small spines. The pronotum always has a pair of large spines near the front and a more widely spaced pair near the back, there are often other medium or small spines on the back half of the pronotum although this is another variable feature. The mesonotum has a large pair of spines at the front; the rest of the mesonotum is covered in variable numbers of spines, ranging from a few thin spines to numerous strong spines. There are no spines on the metanotum of either sex, or on the abdomen of the male, because they would damage the wings; the female has a few minute spines on the top of the abdomen. The sides of the thorax are spiny, particularly in the female.

The legs have no significant spines apart from the ends of the femora which have a small spine on each side of the joint with the tibiae. About two thirds of the way along the mid femora there are pointed lobes on both the upper and lower surfaces. The antennae are long, reaching beyond the ends of the front legs in both males and females. The female has an appendicular ovipositor (i.e. one formed by the operculum and ovipositor valves, not by the operculum and an elongated 11th tergum) and it is quite common to see an egg protruding from the ovipositor while she searches for a suitable place to deposit the egg.

Figure 2. *Centema hadrillus*, female and male.



Coloration varies greatly, the basic colour can be brown or green, but is often a mixture of both. A mottled appearance on the body is not uncommon and is usual on the legs. The leading edge of the wing is the same basic colour as the body, the folding part of the wing is translucent grey with brown veins. The males have a white mark on the elytra, usually a diagonal stripe or a triangle; in some specimens, particularly those from Simunjan, the white mark can be rather indistinct.

Nymphs
The pointed lobes on the mid femora are proportionally larger in the nymphs than in the adults. They are a useful characteristic for identification as the nymphs have very few spines and could be confused with other species.

Egg (Fig 3)
Capsule mid brown, micropylar plate dark brown or black. Capsule more or less cylindrical, tapering to a point at the polar end. The dorsal surface is flat, the lateral and ventral surfaces are slightly convex. The eggs vary in size but typically have the following dimensions: length 6.8mm, height 2.0mm and width 1.9mm. The opercular end has a ring of 0.5mm long hair-like projections. The operculum is circular and flat. The micropylar plate is almost oval but narrows at the opercular end.

The eggs take about four months to hatch if kept humid at about 25°C. The hatch rate can be quite high, Ian Abercrombie estimates about 80%.

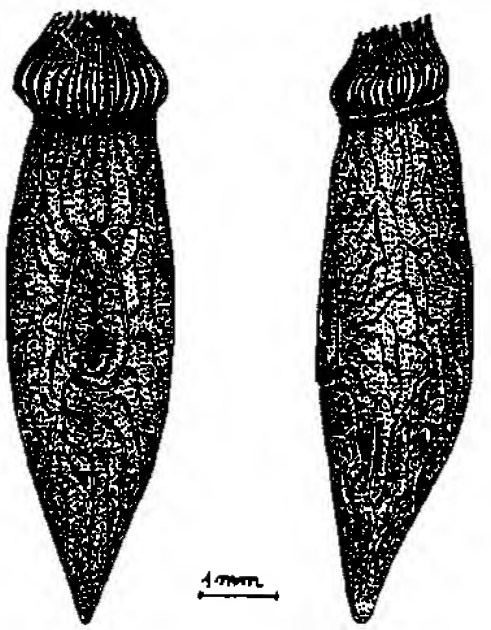


Figure 3. Egg of *C. hadrillus*, dorsal and lateral views.

Variation
There is considerable variation within this species, even within the same population. The spination of the head and thorax is particularly variable, as is the coloration of the insects. One interesting colour variation was noticed at Tarum: the females were predominantly brown and several female specimens had notable white markings. One specimen had white blotches on the elytra, leading edges of the wings and on the fifth to eighth abdominal segments; the seventh and eighth segments were completely white. A second specimen from Tarum was completely brown except for the margins of the wings and elytra and a white stripe running the length of the pronotum and front part of the mesonotum. The high proportion of brown specimens observed at Tarum could be due to the area being relatively dry compared to other areas where I have collected this species.

Rearing
Like most of the bornean species which are in culture, *C. hadrillus* needs quite humid conditions to do well; if kept dry they will soon die. It will feed on a variety of foodplants, including apple, bramble, cherry, oak, pyracantha, raspberry, and rose. Ian Abercrombie reports his eating apples, half an apple put in the cage would be eaten during the following few days. *Centema hadrillus* often eat the soft green stems of bramble in preference to the leaves and will also gnaw off the soft outer layer of harder stems. Ian also reports being bitten by the adults, both males and females;

although they readily bit through the skin they did not draw blood. Eggs are pushed into small cracks or laid into a suitable substrate, if there is no alternative they will lay the eggs on the ground. Ian Abercrombie recommends "Oasis" as the best medium for egg laying; other alternatives are "Vermiculite", peat or the plastic "Scotch pads"; all need to be damp. Ian has found that they will partly immerse themselves if given a bowl of water, this could be a reaction to being kept too dry.

Acknowledgements
I am grateful to Ian Abercrombie for his comments on rearing this species, and to Jacques Potvin for providing the illustrations of the adults and eggs.

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A Check List of Type Species of Phasmid Genera.

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Key words
Phasmida, Type species, Phasmid Database.

Introduction

For those unfamiliar with the concept of type species, a few words of explanation may be helpful. Once a genus has been described species can be moved in or out of that genus as opinions of the relationships between the species change. If a genus is split into two there is the problem of deciding which of the new groups keeps the old name and which gets a new name. This is one of the problems which the type species was created to solve. It is important to remember that, particularly in the past, people in different countries made changes unaware that someone had also made recent changes; some of these changes may not be discovered for years and resolving the situation could be difficult without the rules about type species. The most important rule is that when a genus is described, one of the included species should be designated as the type species; this species then cannot be separated from the name of the genus. Two genera may be synonymised (i.e. united as a single genus), perhaps because an author considers they are not sufficiently distinct, or because the two type species are subsequently considered to be a single species (with phasmids it is not uncommon for males and females to have been described as separate species); in such cases the older name is used for that genus and the younger name becomes a junior synonym. The junior synonym cannot be used independently unless an author subsequently decides that it is a valid genus, in which case it would retain its original type species. Thus the type species "fixes" the concept of the genus. Obviously knowing the type species of a genus is important if you are going to make any changes to a genus. However prior to 1931 there was no obligation to designate a type species for a genus so with older genera it is not always clear which is the type species. In the past the term genotype was sometimes used to refer to the type species of a genus, this term is no longer used in this context because of the possibility of confusion with the use of the term in genetics.

Previous lists of type species

In 1904 Kirby produced volume one of his *Synonymic Catalogue of Orthoptera* in which he deals with phasmids. In this work he designated type species for all the valid genera which were included in the book. This remains the only comprehensive list of type species which has ever been produced for the Phasmida. A few years later Brunner von Wattenwyl (1907) and Redtenbacher (1906, 1908) produced their three part monograph *Die Insektenfamilie der Phasmiden* which gives keys to, and descriptions of, all known species. However they seem to have ignored the concept of type species, or at least totally disregarded Kirby's book (it seems unlikely that they could have been unaware of Kirby's book). As a result, there are many taxonomic errors in the monograph, with several existing generic names being used incorrectly. Corrections have subsequently been made by several authors; Karny (1923) produced a paper dealing just with corrections to their monograph.

The rules on zoological nomenclature state that new genera described after 1930 must include the designation of a type species. However there are many genera described between Kirby's book in 1904 and 1930, most of these were described by Brunner and Redtenbacher and most had no type species designated or indicated. Although various authors during the past 90 years have selected type species for some of these genera, they are scattered throughout the many journals which have published papers on phasmids over the years; checking the type species of a genus is therefore very difficult.

The aim of this list

What I am attempting to do here is provide a comprehensive list of type species which have been designated. Although this may seem an ideal opportunity to designate the type species for the remaining genera, consideration of Brunner and Redtenbacher's monograph makes this unwise. If I were to select type species without first doing a detailed study of each genus, it would be easy to select an inappropriate species and create a worse problem. For example, I recently showed that *Asceles horni* Redtenbacher 1908 belongs in the genus *Presbistus* (Bragg, 1993: 42); Redtenbacher had described it in the wrong suborder! If someone had previously selected *Asceles horni* Redtenbacher 1908 as the type species then *Asceles* would have become a junior synonym of *Presbistus* and a new name would have been required for all the other species which had originally been in *Asceles*. Clearly this would have caused a lot of avoidable name changes. Type species should only be designated when a review of the whole genus, or at least a significant portion of it, is undertaken. Blank spaces in the list indicate that no type species has yet been selected (or rather I have been unable to find reference to the selection of a type species).

Type species may be fixed by several means, these and other rules on zoological names are governed by the Articles in the International Code of Zoological Nomenclature (The International Commission on Zoological Nomenclature 1985). In my list of type species I identify five methods of fixation as outlined below.

Original designation: The type species is stated when the genus is originally described.

Monotypy: If the genus only contained one species when it was originally described that species becomes the type species. Technically this is a form of type fixation by indication (see below) but I have chosen to distinguish between monotypy and other forms of fixation by indication in this list.

Subsequent monotypy: If a genus was described without any species being included and one species is later placed in that genus on its own, it becomes the type species.

Indication: On occasions, for various reasons, although a type species may not be stated, the type species may be identified by something that the author said or did when describing the genus. For example if the new genus is a replacement name the type species of the genus being replaced becomes the type species of the new genus, without the author having to state this.

Subsequent designation: If there is no type species for a genus, a type species can be designated later.

An asterisk (*) before the name indicates that the genus is a junior synonym or junior homonym, or that the genus no longer includes phasmids (this applies to *Gryllus* and *Mantis* which included phasmids before they were treated as a distinct group).

GENUS	AUTHOR	DATE	TYPE SPECIES	SPECIES AUTHOR	SELECTION
**Abrachia*	Kirby	1889	*brevicornis*	Kirby	Monotypy
**Agondasoidea*	Brunner	1893	*agondas*	(Westwood)	Subsequent designation
**Allophylus*	Brunner	1907	*peruana*	(Saussure)	Subsequent designation
**Antillophilus*	Carl	1913	*brevitarsus*	Carl	Monotypy
**Apora*	Brunner	1907	*laetior*	Brunner	Subsequent designation
**Apterrhidaeus*	Karny	1923	*apterus*	(Redtenbacher)	Original designation
**Arrhidaeus*	Stål	1875	*stygius*	(Westwood)	Subsequent designation

**Bactridium*	Saussure	1868	*coulonianum*	Saussure	Monotypy
**Battacus*	Werner	1918	*schneideri*	Werner	Monotypy
**Brachyrhamphus*	Carl	1915	*fecundus*	Carl	Monotypy
**Cacomorpha*	Sharp	1898	*aberrans*	Sharp	Monotypy
**Camax*	Karsch	1898	*acutus*	Karsch	Monotypy
**Candovia*	Stål	1875	*coenosa*	(Gray)	Monotypy
**Carnacia*	Sjöstedt	1918	*obscura*	Sjöstedt	Monotypy
**Caulonia*	Stål	1875	*bifolia*	Stål	Subsequent designation
**Chersaeus*	Redtenbacher	1908	*struthioneus*	(Westwood)	Monotypy
**Cladomorphus*	Gray	1835	*phyllinus*	Gray	Subsequent designation
**Clemacantha*	Rainbow	1897	*regale*	Rainbow	Monotypy
**Clitumnus*	Stål	1875	*nematodes*	(de Haan)	Subsequent designation
**Clonaria*	Stål	1875	*natalis*	(Westwood)	Subsequent designation
**Cranidium*	Westwood	1843			
**Cuniculina*	Brunner	1907			
**Cyphocrania*	Audinet-Serville	1825	*gigas*	(Linnaeus)	
**Dina*	Redtenbacher	1906			
**Diura*	Gray	1833	*violescens*	(Leach)	Subsequent designation
**Dixippus*	Stål	1875	*crawangensis*	(de Haan)	Subsequent designation
**Donusa*	Stål	1875	*prolixia*	Stål	Subsequent designation
**Dubreuilia*	Brunner	1907			
**Ectus*	Redtenbacher	1908	*solitarius*	Redtenbacher	Monotypy
**Enetia*	Kirby	1891	*spinosissima*	Kirby	Monotypy
**Ernodes*	Redtenbacher	1908			
**Eurynecroscia*	Dohrn	1910	*festiva*	Dohrn	Monotypy
**Giglotosea*	Aulmann	1918	*wallacei*	Stål	Indication
**Gratidia*	Stål	1875	*sansibara*	Stål	Monotypy
**Gryllus*	Linnaeus	1758	[No longer includes phasmids]		
**Ischnopoda*	Grandidier	1869	*reyi*	Grandidier	Monotypy
**Karabidion*	Montrouzier	1855	*horrida*	(Boisduval)	Indication
**Lamachus*	Stål	1877			
**Leocrates*	Stål	1875	*graciosa*	(Westwood)	Monotypy
**Leprocaulus*	Redtenbacher	1908			
**Leptyniella*	Bolivar	1926	*attenuata*	(Pantel)	Original designation
**Linocerus*	Gray	1835	*gracilis*	Gray	Monotypy
**Lopaphodes*	Karny	1923	*zeuxis*	(Westwood)	Original designation
**Macella*	Stål	1875	*souchongia*	(Westwood)	Subsequent designation
**Macracantha*	Kirby	1904	*prasinus*	(Westwood)	Original designation
**Mantis*	Linnaeus	1758	[No longer includes phasmids]		
**Menaka*	Wood-Mason	1877	*scabriusculus*	Wood-Mason	Monotypy
**Metriotes*	Westwood	1859	*diocles*	Westwood	Subsequent designation
**Micrarchus*	Carl	1913	*parvulus*	Carl	Monotypy
**Mylothrus*	Günther	1935	*oligarches*	Günther	Original designation
**Neanthes*	Stål	1875	*brunneri*	Stål	Monotypy
**Neocles*	Stål	1875	*simyra*	(Westwood)	Subsequent designation
**Ocellata*	Redtenbacher	1908	*filum*	(Westwood)	Indication
**Orobia*	Stål	1875	*nigro-lineata*	Stål	Monotypy
**Parabacillus*	Schulthess	1911	*femoratus*	Schulthess-Rechberg	Monotypy
**Paraclonaria*	Brunner	1893	*hamuligera*	Schulthess	Subsequent designation
**Paradipheromera*	Brunner	1907	*strumosa*	Brunner	Subsequent designation
**Paradoxomorpha*	Brancsik	1897	*bruchi*	Brancsik	Monotypy
**Peloria*	Redtenbacher	1908	*lobiceps*	(Macleay)	Monotypy
**Perisceles*	Redtenbacher	1908			
**Perlamorphus*	Gray	1835	*hieroglyphicus*	Gray	Subsequent designation
**Perliodes*	Redtenbacher	1906			
**Phanocles*	Stål	1875	*burkartii*	(Saussure)	Subsequent designation
**Phantasis*	Saussure	1872	*saussurei*	Bolivar	Indication
**Phasgania*	Kirby	1896	*everetti*	Kirby	Original designation
**Phasmilliger*	Carrera	1960	*gibbosa*	(Burmeister)	Original designation

**Phocylides*	Stål	1875	*bicarinatus*	Stål	Indication
**Platymorpha*	Redtenbacher	1906			
**Platyphasma*	Uvarov	1940	*cochinchinensis*	(Redtenbacher)	Indication
**Platytelus*	Gray	1835	*horridus*	Gray	Monotypy
**Plocaria*	?				
**Poecilobactron*	Günther	1953	-	-	
**Promachus*	Stål	1875	*wallacei*	Stål	Subsequent designation
**Pseudophasma*	Bolivar	1896	*auriculatum*	Bolivar	Monotypy
**Pteropus*	Thunberg	1815	*siccifolius*	(Linnaeus)	Monotypy
**Scaphegyna*	Karsch	1898	*tropinus*	(Westwood)	Subsequent designation
**Stheneboea*	Stål	1875	*malaya*	Stål	Subsequent designation
**Taenionema*	Bolivar	1906	*sanchezi*	(Bolivar)	Indication
**Taeniophasma*	Uvarov	1940	*sanchezi*	(Bolivar)	Indication
**Taeniosoma*	Bolivar	1897	*sanchezi*	Bolivar	Monotypy
**Trigonoderus*	Gray	1833	*childrenii*	Gray	Monotypy
**Xenophasma*	Redtenbacher	1908			
Abrosoma	Redtenbacher	1906			
Acacus	Brunner	1907			
Acanthoclonia	Stål	1875	*tisiphone*	(Westwood)	Original designation
Acanthoderus	Gray	1835	*spinosus*	Gray	Subsequent designation
Acanthodyta	Sharp	1898	*spiniventris*	Sharp	Monotypy
Acanthograeffea	Günther	1931	*denticulata*	(Redtenbacher)	Original designation
Acanthometriotes	Hebard	1924	*crassus*	Hebard	Original designation
Acanthomima	Kirby	1904	*rhipheus*	(Westwood)	Original designation
Acanthoxyla	Uvarov	1944	*prasinus*	(Westwood)	Indication
Achrioptera	Coquerel	1861	*fallax*	Coquerel	Monotypy
Adelungella	Brunner	1907	*insignis*	Brunner	Monotypy
Acrophylla	Gray	1835	*titan*	(MacLeay)	Subsequent designation
Agamemnon	Moxey	1971	*iphimedeia*	Moxey	Original designation
Agathemera	Stål	1875	*pardalina*	(Westwood)	Subsequent designation
Agrostia	Redtenbacher	1906			
Alloeophasma	Redtenbacher	1906	*poeyi*	(Saussure)	Monotypy
Anarchodes	Redtenbacher	1908			
Anasceles	Redtenbacher	1908	*divergens*	Redtenbacher	Monotypy
Anchiale	Stål	1875	*maculata*	(Olivier)	Monotypy
Andropromachus	Carl	1913			
Anisa	Redtenbacher	1906	*flavomaculata*	(Gray)	Monotypy
Anisacantha	Redtenbacher	1906			
Anisomorpha	Gray	1835	*buprestoides*	(Stoll)	Subsequent designation
Anophelepis	Westwood	1859	*telesphorus*	Westwood	Subsequent designation
Antherice	Redtenbacher	1906	*gracilis*	Redtenbacher	Monotypy
Antongilia	Redtenbacher	1906			
Aploploides	Rehn & Hebard	1938	*stenocephalum*	Rehn & Hebard	Original designation
Aplopus	Gray	1835	*micropterus*	(Lept. & Serville)	Monotypy
Aretaon	Rehn & Rehn	1938	*asperrimus*	(Redtenbacher)	Original designation
Argosarchus	Hutton	1898	*horridus*	(White)	Subsequent designation
Arphax	Stål	1875	*australis*	(Charpentier)	Subsequent monotypy
Aruanoidea	Brunner	1893	*aruana*	(Westwood)	Subsequent designation
Asceles	Redtenbacher	1908			
Aschiphasma	Westwood	1830	*annulipes*	Westwood	Monotypy
Aschiphasmodes	Karny	1923	*ascepasmoidea*	(Redtenbacher)	Original designation
Asprenas	Stål	1875	*femoratus*	Stål	Monotypy
Asystata	Redtenbacher	1908	*brevipes*	Redtenbacher	Monotypy
Athertonia	Sjöstedt	1918	*prasina*	Sjöstedt	Monotypy
Austroclonistra	Redtenbacher	1908	*serrulata*	Redtenbacher	Monotypy
Autolyca	Stål	1875	*palidicornis*	Stål	Subsequent designation
Bacillidium	Uvarov	1939	*coulonianum*	Saussure	Indication
Bacillus	Latreille	1825			

Bacteria	Latreille	1825	*ferula*	(Fabricus)	Subsequent designation
Bactricia	Kirby	1896	*trophimus*	(Westwood)	Original designation
Bactrododema	Stål	1858	*tiarata*	Stål	Subsequent designation
Baculum	Saussure	1870	*cunicularis*	(Westwood)	Subsequent designation
Bacunculus	Burmeister	1838	*spatulata*	Burmeister	Subsequent designation
Bathycharax	Kirby	1896	*granulatus*	Kirby	Monotypy
Bostra	Stål	1875	*turgida*	(Westwood)	Original designation
Brachyelena	Hebard	1933	*hirsuta*	Hebard	Original designation
Brachyrtacus	Sharp	1898	*celatus*	Sharp	Monotypy
Brasidas	Rehn & Rehn	1938	*samarensis*	Rehn & Rehn	Original designation
Brizoides	Redtenbacher	1906			
Burria	Brunner	1900	*longixipha*	Brunner	Subsequent designation
Calvisia	Stål	1875	*sangarius*	(Westwood)	Subsequent designation
Calynda	Stål	1875	*bicuspis*	Stål	Monotypy
Canachus	Stål	1875	*crocodilus*	Stål	Subsequent designation
Candaules	Stål	1875	*sparnius*	Stål	Monotypy
Canuleius	Stål	1875	*euterpinus*	(Westwood)	Monotypy
Carausius	Stål	1875	*strumosus*	Stål	Subsequent designation
Carlius	Uvarov	1939	*fecundus*	(Carl)	Indication
Centema	Redtenbacher	1908			
Centrophasma	Redtenbacher	1908			
Ceratiscus	Caudell	1904	*laticeps*	Caudell	Original designation
Cercophylla	Redtenbacher	1908	*sphalera*	Redtenbacher	Monotypy
Ceroys	Audinet-Serville	1838	*perfoliatus*	Gray	Subsequent designation
Charmides	Stål	1875	*cerberus*	(Westwood)	Monotypy
Chitoniscus	Stål	1875	*lobiventris*	(Blanchard)	Monotypy
Chlorophasma	Redtenbacher	1906	*hyalina*	Redtenbacher	Monotypy
Chondrostethus	Kirby	1896	*woodfordi*	Kirby	Monotypy
Cirsia	Redtenbacher	1906			
Citrina	Redtenbacher	1906			
Cladomimus	Carl	1915	*grisens*	Carl	Monotypy
Cladoxerus	Latreille	1825			
Clitarchus	Stål	1875	*laeviusculus*	Stål	Subsequent designation
Clonistria	Stål	1875	*bartholomaea*	Stål	Monotypy
Clonopsis	Pantel	1915			
Cnipsus	Redtenbacher	1908			
Cooktownia	Sjöstedt	1918	*plana*	Sjöstedt	Monotypy
Cotylosoma	Wood-Mason	1878	*dipneusticum*	Wood-Mason	Monotypy
Craspedonia	Westwood	1841	*gibbosa*	Burmeister	Monotypy
Creoxylus	Audinet-Serville	1838	*corniger*	Serville	Monotypy
Ctenomorpha	Gray	1833	*marginipennis*	Gray	Subsequent designation
Ctenomorphodes	Karny	1923	*briareus*	Gray	Original designation
Cylindomena	Günther	1935	*acuminata*	(Redtenbacher)	Original designation
Dagys	Günther	1935	*balia*	Günther	Original designation
Dajaca	Brunner	1893	*monilicornis*	Redtenbacher	Subsequent monotypy
Damasippoides	Brancsik	1893	*xanthostictus*	Brancsik	Monotypy
Damasippus	Stål	1875	*westwoodi*	Stål	Subsequent designation
Dares	Stål	1875	*validispinus*	Stål	Subsequent designation
Datames	Stål	1875	*oileus*	(Westwood)	Subsequent designation
Decidia	Stål	1875	*soranus*	(Westwood)	Monotypy
Dematobactron	Karny	1923	*fuscipennis*	(Redtenbacher)	Original designation
Diacanthoidea	Redtenbacher	1908			
Diagoras	Stål	1877	*ephialtes*	Stål	Monotypy
Diangelus	Brunner	1907	*helleri*	Brunner	Monotypy
Diapherodes	Gray	1835	*gigantea*	(Gmelin)	Subsequent designation
Diapheromera	Gray	1835	*sayi*	Gray	Monotypy
Diardia	Redtenbacher	1908			
Didymuria	Kirby	1904	*violescens*	Leach	Original designation
Diesbachia	Redtenbacher	1908			

Dilophocephalus	Toledo Piza	1938	*paradiacanthoides*	Toledo Piza	Original designation
Dimorphodes	Westwood	1859	*prostasis*	Westwood	Monotypy
Dinelytron	Gray	1835	*grylloides*	Gray	Subsequent designation
Dinophasma	Uvarov	1940			
Dryococelus	Gurney	1947	*australe*	(Montrouzier)	Original designation
Dyme	Stål	1875	*bifrons*	Stål	Monotypy
Echetlus	Stål	1875	*peristhenes*	(Westwood)	Subsequent designation
Echinoclonia	Carl	1913	*borneensis*	Carl	Monotypy
Echinothorax	Günther	1931	*gazellae*	(Brunner)	Original designation
Ectentoria	Brunner	1907	*bilobatus*	Brunner	Monotypy
Elicius	Günther	1935	*microbasileus*	Günther	Original designation
Entoria	Stål	1875	*denticorne*	Stål	Subsequent designation
Epibacillus	Redtenbacher	1906	*lobipes*	Redtenbacher	Monotypy
Epicharmus	Stål	1875	*marchali*	(Serville)	Subsequent designation
Epidares	Redtenbacher	1906			
Erastus	Redtenbacher	1908			
Erringtonia	Brunner	1907	*malaccensis*	Brunner	Monotypy
Eubias	Günther	1935	*athlius*	Günther	Original designation
Eubulides	Stål	1877	*alutaceus*	Stål	Monotypy
Eucarcharus	Brunner	1907			
Eucles	Redtenbacher	1906			
Euobrimus	Rehn & Rehn	1938	*atherura*	Rehn & Rehn	Original designation
Euphasma	Redtenbacher	1906			
Eupromachus	Brunner	1907			
Eurycantha	Boisduval	1835	*horrida*	Boisduval	Monotypy
Eurycnema	Audinet-Serville	1838	*versirubra*	Serville	Subsequent designation
Eustygera	Brunner	1907	*godeffroyi*	Brunner	Monotypy
Extatosoma	Gray	1833	*tiaratum*	(Macleay)	Monotypy
Galactea	Redtenbacher	1908			
Gargantuoidea	Redtenbacher	1908			
Gharianus	Werner	1908	*klapotoczi*	Werner	Monotypy
Gigantophasma	Sharp	1898	*bicolor*	Sharp	Subsequent designation
Gongylopus	Brunner	1907	*adiposus*	Brunner	Monotypy
Graeffea	Brunner	1868	*purpuripennis*	Brunner	Subsequent designation
Greenia	Kirby	1896	*furcatus*	(Bates)	Monotypy
Haaniella	Kirby	1904	*muelleri*	(de Haan)	Original designation
Harpuna	Redtenbacher	1906	*neptunus*	(Kaup)	Monotypy
Hemipachymorpha	Kirby	1904	*omphale*	(Westwood)	Monotypy
Hemiplasta	Redtenbacher	1908			
Hemisosibia	Redtenbacher	1908	*incerta*	Redtenbacher	Monotypy
Hermarchus	Stål	1875	*pythonius*	(Westwood)	Subsequent designation
Hesperophasma	Rehn	1901	*saussurei*	Bolivar	Subsequent designation
Heterocopus	Redtenbacher	1906			
Heteronemia	Gray	1835	*mexicana*	Gray	Monotypy
Heterophasma	Redtenbacher	1908	*gaudichaudi*	Redtenbacher	Monotypy
Heteropteryx	Gray	1835	*dilatata*	(Parkinson)	Monotypy
Hirtuleius	Stål	1875	*laeviceps*	Stål	Monotypy
Holca	Redtenbacher	1906			
Holcoides	Hebard	1919	*forceps*	Hebard	Original designation
Hoploclonia	Stål	1875	*gecko*	(Westwood)	Original designation
Hovaspectrum	Rehn	1940	*lobipes*	Rehn	Original designation
Hypocyrtus	Redtenbacher	1908			
Hyrtacus	Stål	1875	*tuberculatus*	Stål	Subsequent designation
Ignacia	Rehn	1904	*auriculatum*	(Bolivar)	Indication
Ilocano	Rehn & Rehn	1938	*hebardi*	Rehn & Rehn	Original designation
Isagoras	Stål	1875	? (see below)	?	Subsequent designation
Ischnophasma	Uvarov	1940	*reyi*	(Grandidier)	Indication
Jeremia	Redtenbacher	1908	*grossedentata*	Redtenbacher	Monotypy

Kalocorinnis	Günther	1944	*calopteryx*	Günther	Original designation
Kimberleyana	Sjöstedt	1918	*gracilifemur*	Sjöstedt	Monotypy
Korinnis	Günther	1932	*potameis*	Günther	Original designation
Labidiophasma	Carl	1915	*rouxi*	Carl	Monotypy
Laciphorus	Redtenbacher	1908	*lobulatus*	Redtenbacher	Monotypy
Lamachodes	Redtenbacher	1908	*laevis*	Redtenbacher	Monotypy
Lamarchinus	Uvarov	1940			
Lamponius	Stål	1875	*guerini*	(Saussure)	Monotypy
Leiophasma	Uvarov	1940			
Leosthenes	Stål	1875	*aquatilis*	Stål	Monotypy
Leprocaulinus	Uvarov	1940			
Leprodes	Redtenbacher	1906			
Leptynia	Pantel	1890	*attenuata*	Pantel	Subsequent designation
Libethra	Stål	1875	*nisseri*	Stål	Subsequent designation
Libethroidea	Hebard	1919	*inusitata*	Hebard	Original designation
Litosermyle	Hebard	1919	*ocanae*	Hebard	Original designation
Lobophasma	Günther	1935	*rex*	Günther	Original designation
Lonchodes	Gray	1835	*brevipes*	Gray	Subsequent designation
Lopaphus	Westwood	1859	*brachypterum*	(de Haan)	Subsequent designation
Loxopsis	Westwood	1859	*conocephalum*	(de Haan)	Monotypy
Lysicles	Stål	1877	*hippolytus*	Stål	Monotypy
Macellina	Uvarov	1940	*souchongia*	(Westwood)	Indication
Macynia	Stål	1875	*labiata*	(Thunberg)	Subsequent designation
Malacomorpha	Rehn	1906	*androsensis*	Rehn	Original designation
Malandania	Sjöstedt	1918	*pulchra*	Sjöstedt	Monotypy
Malandella	Sjöstedt	1918	*queenslandica*	Sjöstedt	Monotypy
Manduria	Stål	1877	*systropedon*	(Westwood)	Original designation
Manomera	Rehn & Hebard	1907	*tenuescens*	(Scudder)	Monotypy
Maransis	Karsch	1898	*mozambicus*	(Westwood)	Monotypy
Marcenia	Sjöstedt	1918	*cunctatrix*	Sjöostedt	Subsequent designation
Marmessoidea	Brunner	1893	*marmessus*	(Westwood)	Original designation
Mearnsiana	Rehn & Rehn	1938	*bullosa*	Rehn & Rehn	Original designation
Medaura	Stål	1875	*brunneri*	Stål	Subsequent designation
Megacrania	Kaup	1871	*phelaus*	(Westwood)	Subsequent designation
Megaphasma	Caudell	1903	*dentricus*	Stål	Monotypy
Meionecroscia	Redtenbacher	1908	*biroi*	Redtenbacher	Monotypy
Melophasma	Redtenbacher	1906	*vermiculare*	Redtenbacher	Monotypy
Menexenus	Stål	1875	*lacertinus*	(Westwood)	Monotypy
Mesaner	Redtenbacher	1908	*lineatus*	Redtenbacher	Monotypy
Metentoria	Brunner	1907			
Metriophasma	Uvarov	1940	*diocles*	(Westwood)	Indication
Micadina	Redtenbacher	1908			
Microcanachus	Donskoff	1988	*matileorum*	Donskoff	Original designation
Mimarchus	Carl	1913	*tarsatus*	Carl	Monotypy
Miroceramia	Günther	1934	*pterobrimus*	Günther	Original designation
Miroceroys	Toledo Piza	1936	*redtenbacheri*	Toledo Piza	Original designation
Mirophasma	Redtenbacher	1906			
Mithrenes	Stål	1877	*asperulus*	Stål	Monotypy
Mnesilochus	Stål	1877	*capreolus*	Stål	Subsequent designation
Monandroptera	Audinet-Serville	1838	*inuncans*	Serville	Monotypy
Moritasgus	Günther	1935	*stresemanni*	Günther	Original designation
Mortites	Günther	1935	*enarges*	Günther	Original designation
Myronides	Stål	1875	*pfeifferae*	(Westwood)	Subsequent designation
Nanophyllium	Redtenbacher	1906	*pygmaeum*	Redtenbacher	Monotypy
Nearchus	Redtenbacher	1908			
Necroscia	Audinet-Serville	1838	*roseipennis*	Serville	Subsequent designation
Necrosciodes	Karny	1923	*lampetia*	(Westwood)	Original designation
Neoclides	Uvarov	1940	*simyra*	(Westwood)	Indication
Neophasma	Redtenbacher	1906			

Neopromachus	Gigilo-Tos	1912	*wallacei*	(Stål)	Indication
Nescicroa	Karny	1923	*terminalis*	(Redtenbacher)	Original designation
Nesiophasma	Günther	1934	*eremothocus*	Günther	Original designation
Nisyrus	Stål	1877	*spinulosus*	Stål	Subsequent designation
Obrimus	Stål	1875	*bufo*	(Westwood)	Subsequent designation
Ocnobius	Redtenbacher	1906	*lobulatus*	Redtenbacher	Monotypy
Ocnophila	Brunner	1907	*integra*	Brunner	Subsequent designation
Oestrophora	Redtenbacher	1906	*triangulifera*	Redtenbacher	Monotypy
Olcyphides	Griffini	1899	*bicarinatus*	Griffini	Original designation
Olinta	Redtenbacher	1906	*bubastes*	(Westwood)	Monotypy
Ommatopseudes	Günther	1942	*paradoxus*	Günther	Monotypy
Onchestus	Stål	1877	*gorgus*	(Westwood)	Subsequent designation
Oncotophasma	Rehn	1904	*martini*	(Griffini)	Original designation
Onogastris	Redtenbacher	1906			
Ophicrania	Kaup	1871	*striatocollis*	Kaup	Monotypy
Oreophasma	Günther	1929	*polyacanthum*	Günther	Original designation
Oreophoetes	Rehn	1904	*peruana*	(Saussure)	Original designation
Orestes	Redtenbacher	1906	*verruculatus*	Redtenbacher	Monotypy
Orthomeria	Kirby	1904	*forstenii*	(de Haan)	Subsequent designation
Orthonecroscia	Kirby	1904	*filum*	(Westwood)	Original designation
Orxines	Stål	1875	*xiphias*	(Westwood)	Subsequent designation
Otocrania	Redtenbacher	1908			
Otraleus	Günther	1935	*hypsimelathrus*		Original designation
Oxyartes	Stål	1875	*despectus*	(Westwood)	Subsequent designation
Pachymorpha	Gray	1835	*squalida*	Gray	Monotypy
Pachyphloea	Redtenbacher	1906	*aberrans*	Redtenbacher	Monotypy
Pachyscia	Redtenbacher	1908			
Palophus	Westwood	1859	*centaurus*	Westwood	Subsequent designation
Papuanoidea	Werner	1930	*straeleni*	Werner	Monotypy
Parabacillus	Caudell	1903	*coloradus*	Scudder	Subsequent designation
Parabactridium	Redtenbacher	1908	*mirum*	Redtenbacher	Monotypy
Parabrosoma	Giglio-Tos	1910	*bigibbum*	Giglio-Tos	Monotypy
Paracanachus	Carl	1915	*circe*	(Redtenbacher)	Monotypy
Paracentema	Redtenbacher	1908	*stephanus*	Redtenbacher	Monotypy
Paraclitumnus	Brunner	1893	*lineatus*	Brunner	Subsequent designation
Paracyphocrania	Redtenbacher	1908	*lativentris*	Redtenbacher	Monotypy
Paradiacantha	Redtenbacher	1908			
Parahyrtacus	Hausleithner	1990	*gorkomi*	Hausleithner	Original designation
Paraleptinia	Carl	1913	*schulthessi*	Carl	Monotypy
Paraleptynia	Caudell	1904	*fosteri*	Caudell	Monotypy
Paraloxopsis	Günther	1932	*korystes*	Günther	Original designation
Paramenexenus	Redtenbacher	1908			
Paramyronides	Redtenbacher	1908			
Paranecroscia	Redtenbacher	1908			
Paranisomorpha	Redtenbacher	1906	*insignis*	Redtenbacher	Monotypy
Parapachymorpha	Brunner	1893	*nigra*	Brunner	Subsequent designation
Paraphasma	Redtenbacher	1906			
Paraprisopus	Redtenbacher	1906			
Parasipyloidea	Redtenbacher	1908	*aenea*	Redtenbacher	Subsequent designation
Parasosibia	Redtenbacher	1908	*ceylonica*	Redtenbacher	Subsequent designation
Parastheneboea	Redtenbacher	1908	*insignis*	Redtenbacher	Monotypy
Parastratocles	Redtenbacher	1906	*aeruginosus*	Redtenbacher	Monotypy
Parectatosoma	Wood-Mason	1879	*hystrix*	Wood-Mason	Subsequent designation
Paronchestus	Redtenbacher	1908	*charon*	Redtenbacher	Monotypy
Parorobia	Chopard	1952	*lobiventris*	Chopard	Original designation
Paroxyartes	Carl	1913	*dohertyi*	Carl	Monotypy
Peloriana	Uvarov	1940	*lobiceps*	(Macleay)	Indication
Pericentropsis	Günther	1936	*aculeata*	Günther	Original designation

Pericentrus	Redtenbacher	1908	*mowisi*	Redtenbacher	Subsequent designation
Periphetes	Stål	1877	*graniferum*	(Westwood)	Original designation
Periphloea	Redtenbacher	1906	*corticina*	Redtenbacher	Monotypy
Phaenopharos	Kirby	1904	*struthioneus*	(Westwood)	Original designation
Phaeophasma	Redtenbacher	1906	*alatum*	Redtenbacher	Monotypy
Phalces	Stål	1875	*coccyx*	(Westwood)	Monotypy
Phantasca	Redtenbacher	1906			
Pharnacia	Stål	1877	*ponderosa*	Stål	Monotypy
Phasma	Lichtenstein	1796	empusa (= *gigas)*	Lichtenstein	
Phasmotaenia	Navas	1907	*sanchezi*	(Bolivar)	Indication
Phenacephorus	Brunner	1907	*cornucervi*	Brunner	Subsequent designation
Phenacocephalus	Werner	1930	*coronatus*	Werner	Monotypy
Phibalosoma	Gray	1835	*lepelletieri*	Gray	Monotypy
Phobaeticus	Brunner	1907			
Phraortes	Stål	1875	*elongata*	(Thunberg)	Monotypy
Phryganistria	Stål	1875	*sarmentosus*	(Westwood)	Original designation
Phthoa	Karsch	1898	*prolixa*	Karsch	Original designation
Phyllium	Illiger	1798	*siccifolium*	(Linnaeus)	Monotypy
Planispectrum	Rehn & Rehn	1938	*cochinchinensis*	(Redtenbacher)	Original designation
Planudes	Stål	1875	*perillus*	Stål	Subsequent designation
Platycrana	Gray	1835	*viridana*	(Olivier)	Subsequent designation
Platysosibia	Redtenbacher	1908			
Podacanthus	Gray	1833	*typhon*	Gray	Monotypy
Pomposa	Redtenbacher	1908	*moesta*	Redtenbacher	Monotypy
Presbistus	Kirby	1896	*peleus*	(Gray)	Original designation
Prexaspes	Stål	1875	*servillei*	(Gray)	Subsequent designation
Prisomera	Gray	1835	*spinicollis*	Gray	Subsequent designation
Prisopus	Latreille	1825			
Prosceles	Uvarov	1940			
Prosentoria	Brunner	1907			
Pseudobacteria	Saussure	1872	*antillarum*	(Saussure)	Subsequent designation
Pseudoceroys	Hebard	1922	*harroweri*		Original designation
Pseudoclitarchus	Salmon	1991	*senta*	(Salmon)	Original designation
Pseudodatames	Redtenbacher	1906			
Pseudodiacantha	Redtenbacher	1908	*obscura*	Redtenbacher	Monotypy
Pseudolcyphides	Karny	1923	*spinicollis*	(Burmeister)	Original designation
Pseudoleosthenes	Redtenbacher	1906			
Pseudophasma	Kirby	1896	*necydaloides*	Linnaeus	Original designation
Pseudopromachus	Günther	1929	*perspinosus*	(Brunner)	Original designation
Pseudosermyle	Caudell	1903	*banksii*	Caudell	Original designation
Pseudostheneboea	Carl	1913			
Pterinoxylus	Audinet-Serville	1838	*difformipes*	Serville	Monotypy
Pterobrimus	Redtenbacher	1906	*depressus*	Redtenbacher	Monotypy
Pterolibethra	Günther	1940	*heteronemia*	Günther	Original designation
Pygirhynchus	Audinet-Serville	1838	*subfoliatus*	Serville	Subsequent designation
Pylaemenes	Stål	1875	*coronatus*	(de Haan)	Subsequent designation
Ramulus	Saussure	1870	*carinulatus*	(Saussure)	Monotypy
Rhamphophasma	Brunner	1893	*modestum*	Brunner	Monotypy
Rhamphosipyloidea	Redtenbacher	1908			
Rhaphiderus	Audinet-Serville	1838	*scabrosus*	Percheron	Monotypy
Rhynchacris	Redtenbacher	1908	*ornata*	Redtenbacher	Monotypy
Sadyattes	Stål	1875	*borrii*	Stål	Monotypy
Scionecra	Karny	1923	*osmylus*	(Westwood)	Original designation
Sermyle	Stål	1875	*mexicana*	(Saussure)	Subsequent designation
Setosa	Redtenbacher	1906	*versicolor*	Redtenbacher	Monotypy
Sinophasma	Günther	1940	*klapperichi*	Günther	Original designation
Sipyloidea	Brunner	1893	*sipylus*	(Westwood)	Original designation
Sosibia	Stål	1875	*nigrispina*	Stål	Subsequent designation
Spinotectarchus	Salmon	1991	*acornutus*	(Hutton)	Original designation

Staelonchodes	Kirby	1904	*geniculatus*	Gray	Original designation
Steleoxiphus	Rehn	1907	*catastates*	Rehn	Original designation
Stenobrimus	Redtenbacher	1906	*bolivari*	Redtenbacher	Monotypy
Stephanacris	Redtenbacher	1908			
Stratocles	Stål	1875	*cincitipes*	Stål	Subsequent designation
Syringodes	Redtenbacher	1908			
Tagesoidea	Redtenbacher	1908			
Taraxippus	Moxey	1971	*paliurus*	Moxey	Original designation
Tectarchus	Salmon	1954	*diversus*	Salmon	Original designation
Tenerella	Redtenbacher	1906	*tenerrima*	Redtenbacher	Monotypy
Tersomia	Kirby	1904	*braziliensis*	Kirby	Monotypy
Thaumatobactron	Günther	1929	*poecilosoma*	Günther	Original designation
Theramenes	Stål	1875	*olivacea*	(Westwood)	Monotypy
Thrasyllus	Stål	1877	*macilentus*	Stål	Monotypy
Timema	Scudder	1895	*californica*	Scudder	Monotypy
Tirachoidea	Brunner	1893	*cantori*	(Westwood)	Subsequent designation
Tisamenus	Stål	1875	*serratorius*	Stål	Subsequent designation
Trachythorax	Redtenbacher	1908			
Trapezaspis	Redtenbacher	1908			
Trigonophasma	Kirby	1904	*rubescens*	(Saussure)	Original designation
Tropidoderus	Gray	1835	*childrenii*	(Gray)	Indication
Trychopeplus	Shelford	1908	*multilobatus*	(Redtenbacher)	Monotypy
Vasilissa	Kirby	1896	*walkeri*	Kirby	Monotypy.
Vetilia	Stål	1875	*enceladus*	(Gray)	Monotypy
Wattenwylia	Toledo Piza	1938	*foliata*	Toledo Piza	Original designation
Woodlarkia	Günther	1931	*scorpionides*	(Montrouzier)	Original designation
Woodmasonia	Brunner	1907	*oxytenes*	(Wood-Mason)	Monotypy
Xenomaches	Kirby	1896	*incommodus*	(Butler)	Monotypy
Xenophasmina	Uvarov	1940			
Xera	Redtenbacher	1906	*debilis*	Redtenbacher	Monotypy
Xerantherix	Brancsik	1893	*nossibianus*	Brancsik	Monotypy
Xeroderus	Gray	1835	*kirbii*	Gray	Monotypy
Xeropsis	Redtenbacher	1906	*sicca*	Redtenbacher	Monotypy
Xerosoma	Audinet-Serville	1831	*canaliculatum*	Audinet-Serville	Monotypy
Xiphophasma	Rehn	1913	*missionum*	Rehn	Original designation
Xylica	Karsch	1898	*oedematosa*	Karsch	Monotypy
Xylobacillus	Uvarov	1940	*femoratus*	(Schulthess-Rechberg)	Indication
Zehntneria	Brunner	1907			

The above list was generated from the *Phasmid Database* version 1.5. The database contains references to the publication in which the type species was fixed and, in confused or unusual cases, an explanation of the situation. For example, Vickery (1983: 8) inadvertently selected the type species of *Marcenia* Sjöstedt by stating that *cunctatrix* Sjöstedt was the type species "by subsequent monotypy, all other originally included species removed to other genera"; such removal of other species is elimination, not subsequent monotypy. Although elimination is not a valid form of type selection (Article 69b), Vickery's statement that it is the type species, although incorrect, is itself a valid selection (Article 69aiv).

Kirby did not state that he was selecting a species as the type species in cases where he only listed one species in the genus. However as he selected types for all genera in which he included more than one species, selection of the type is implied in cases where only one species was included. Although type fixation by elimination does not normally apply, in the case of Kirby's book designation is clearly implied and it is therefore reasonable to treat such cases as valid subsequent designations. The genera affected are: *Acanthoderus* Gray, *Acrophylla* Gray, *Donusa* Stål, *Macynia* Stål, and *Platycrana* Gray. At least one such case, *Acrophylla* Gray, has subsequently been treated

as a valid designation (Vickery, 1983: 3).

Problems arise if there is doubt about the identity of the material on which a generic description is based. Usually these problems can be resolved, such as that surrounding *Hesperophasma* Rehn (a replacement name for *Phantasis* Saussure). Rehn (1904: 47) selected *Phasma planulum* Westwood as the type species. However Bolivar (1888: 136) had already stated that the *Phantasis planula* of Saussure was not the same as *Phasma planula* of Westwood and had renamed the species *Phantasis saussurei*. Thus Rehn's selection is incorrect because *Phasma planula* Westwood was not a species originally included in the genus *Phantasis*; Kirby's selection of *saussurei* (Kirby, 1904: 343) is the valid selection.

There is however one problem which remains unresolved. There is doubt about the identity of the specimen on which the genus *Isagoras* Stål was based. Kirby (1904: 415) considered the species to have been wrongly identified, and considered the generic description to be based on *I. bubastes* (Westwood) which he therefore selected as the type species. Rehn (1947: 1) makes no mention of Kirby's selection or any doubt about the identity of the specimen, and states that the type species is *Phasma obscurum* Guérin-Méneville. The situation has a further complication: if Kirby (1904: 415) was correct in designating *I. bubastes* (Westwood) as the type species of *Isagoras* Stål, then as the type species of *Olinta* Redtenbacher is *O. bubastes* (Westwood) [by monotypy], *Olinta* would fall as a junior synonym of *Isagoras* Stål, and a replacement name would be required for *Isagoras* Redtenbacher (not Stål). However if Kirby was wrong *Olinta* would remain a valid genus. According to Article 70a, which deals with cases of misidentification, this situation should be referred to the International Commission on Zoological Nomenclature for a ruling.

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The Distribution of *Asceles margaritatus* in Borneo.

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Key words
Phasmida, *Asceles margaritatus*, Distribution, Sarawak, Sabah, Brunei, Borneo.

Asceles margaritatus Redtenbacher is a common and widely distributed species in northern Borneo. It occurs in a short winged form on Mt Kinabalu in addition to the usual fully winged form which is found elsewhere. Both the males and females of the normal form are quite distinctive and easily identified. The females are unusually plump, have a wide head and thorax, and wings which stop well short of the end of the abdomen. Males have a black line along the centre of the head, pronotum and front of the mesonotum, and a distinctive black spot just in front of the elytra; although not unknown, it is rare for these characteristic markings on the male to be indistinct. Although easily recognised and quite common, previous records of this species are quite limited:

Asceles margaritatus Redtenbacher, 1908: 496, pl. 25.6a [♂] & 25.6b [♀], Syntypes ♂♂ & ♀♀ (NHMW).
Asceles margaritatus Redtenbacher, Günther, 1932: 316.
Asceles margaritatus Redtenbacher, Hausleithner, 1991: 222, fig 3 [short winged ♂].
Asceles margaritatus Redtenbacher, Sellick, 1993: 54, fig 1 [egg].

The fully winged form has only been recorded from a few areas: Ulu Dusun and Sepilok (Hausleithner, 1991) and Mt Kinabalu (Redtenbacher, 1908). The rather vague "Kina-Balu, Borneo" which is given as the type locality is of limited use; the mountain and its foothills spread over a wide area and no indication of altitude is given. Günther (1932) recorded this species from 1500m on Mt Kinabalu and Hausleithner recorded the short winged form from Kinabalu National Park Head Quarters at 1580m.

The distribution map shows all previous recorded localities, the single specimen in the Sarawak Museum (from Trusan) and my own previously unpublished records. Each site is indicated by a dot, except for the short winged form on Mt Kinabalu which is indicated by a cross. The records are from the following localities:

SARAWAK	Mt Serapi, 60-460m	E 110° 11'	N 1° 35'
	3km NE of Tatau	E 112° 52'	N 2° 54'
	17km SW of Selangau	E 112° 15'	N 2° 26'
	43km NE of Selangau	E 112° 39'	N 2° 40'
	3km NE Sungai Arip	E 112° 40'	N 2° 45'
	Niah National Park	E 113° 43'	N 3° 52'
	Trusan	E 115° 16'	N 4° 48'
BRUNEI	Teraja, waterfall trail	E 114° 25'	N 4° 17'
	Kuala Belalong, 100m	E 115° 09'	N 4° 32'
SABAH	Poring Springs	E 116° 43'	N 6° 03'
	Sepilok Forest Reserve	E 117° 57'	N 5° 50'
	Ulu Dusun	E 117° 45'	N 5° 46'
	Mt Kinabalu Park H.Q. 1580m	E 116° 33'	N 6° 00'

At these localities the number of specimens encountered has varied from single specimens (usually males) to an estimated 20 specimens of the short winged form on one night at Mt Kinabalu. When they have been found feeding there are usually several specimens on the same plant and often more on neighbouring plants. The method of egg laying, pinning the eggs to the leaves (see Sellick,

1993: 54), probably reduces predation and ensures a good survival rate. The nymphs and females are quite fat and soft bodied so they must be quite desirable to potential predators.

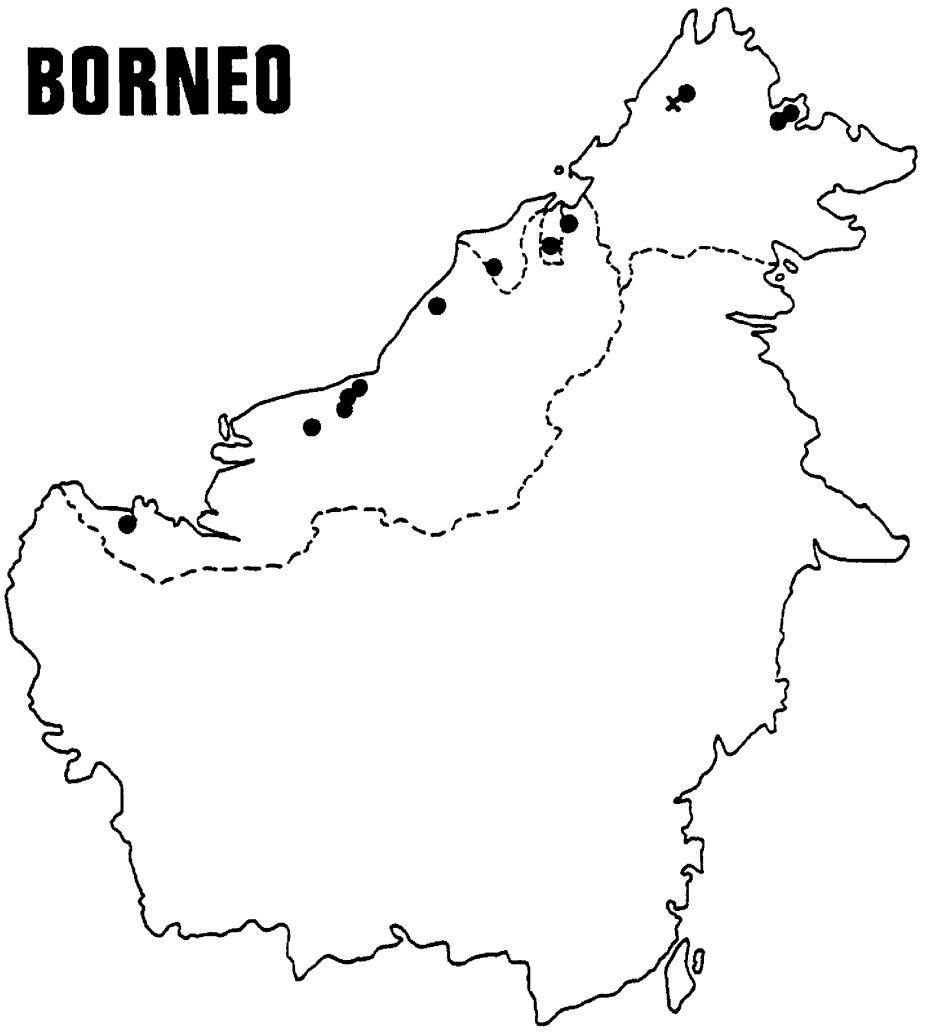

Figure 1. Distribution of *Asceles margaritatus*.

I have collected this species from a total of 11 localities and have successfully bred the short winged form for five generations. On a number of occasions I have found specimens feeding; in every case the foodplant was *Macaranga*, although not always the same species. In captivity the short winged form feeds on bramble, rose, raspberry, oak and eucalyptus. Eucalyptus is much preferred and is necessary to maintain a thriving culture; my culture has almost died out since I moved house and lost my supply of eucalyptus. When I had surplus specimens there were no requests for this species and as far as I am aware there are no other cultures of this species. The eggs of the short winged form take up to four months to hatch in the U.K.

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The Phasmid Database: version 1.5.

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Key words
Phasmida, Phasmatodea, Taxonomic Database, Generic names.

Originally the second version of *The Phasmid Database*, to include the correct generic and specific name combinations for all species, was intended for release in 1993. However it became necessary to identify the type species of all genera in order to trace the valid combination for many species. This has occupied a great deal of time with the result that the second version is not yet available. It is hoped that the second version will be released during 1995, possibly in combination with the third version, a complete synonymic catalogue. The current release is intended to update the **species** file and to expand the **genera** file.

The **genera** file has been modified to contain details of the type species and to include genera which are junior synonyms or homonyms. This file has been used to generate a list of type species (see this issue of *Phasmid Studies*). The database file has an associated memo file which contains references and explanations for some of the type fixations.

The **species** file now contains 2923 entries, a number of species have been added since the release of version 1.0 and some duplicated entries have been removed.

A number of changes should be made to the list of genera which I gave in the December 1992 issue of *Phasmid Studies* (Bragg, 1992), these are in addition to the previously published corrections (Bragg, 1993).

The genus *Paraloxopsis* Günther 1934 should read *Paraloxopsis* Günther 1932 (wrong date), and *Steleoxiphus* Rehn 1906 should read *Steleoxiphus* Rehn 1907 (date wrong).
The genus *Woodmansonia* should read *Woodmasonia* (spelling error).

The following genera appear to be valid, and have been added to the database:

Adelungella	Brunner	1907
Alloeophasma	Redtenbacher	1906
Austroclonistra	Redtenbacher	1908
Charmides	Stål	1875
Eustygera	Brunner	1907
Laciphorus	Redtenbacher	1908
Lobophasma	Günther	1935
Malacomorpha	Rehn	1906
Maransis	Karsch	1898
Paraleptinia	Carl	1913
Xylobacillus	Uvarov	1940

Two of the above were omitted from Brunner & Redtenbacher's monograph (Brunner 1907; Redtenbacher 1906, 1908): *Malacomorpha* and *Maransis*; in both cases both the genus and the type species were omitted. Several genera added since version 1.0 have yet to be placed in a subfamily or tribe.

The genus *Perliodes* Redtenbacher 1906 is a junior synonym of *Olcyphides* Griffini 1899, as Karny (1923: 234) has already pointed out; *Perliodes* should therefore be deleted from the list.

The genus *Leptyniella* Bolivar 1926 was established with *Leptyniella attenuata* (Pantel) as the type species, however this is the type species of *Leptynia* Pantel 1890 (by selection of Kirby 1904: 335) so *Leptyniella* is a junior synonym and hence not valid. This leaves *Leptynia* Bolivar (not Pantel) without a valid name, however subsequent authors have treated *Leptynia* Pantel and *Leptynia* Bolivar as one genus so a replacement name seems unnecessary.

To obtain a copy of *The Phasmid Database 1.5* send a formatted disk(s) and the return postage to the above address. Version 1.5 occupies 0.8MB.

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Reviews and Abstracts.

Phasmid Abstracts

The following abstracts briefly summarise articles which have recently appeared in other publications. Some of these may be available from local libraries. Others will be available in university or college libraries, many of these libraries allow non-members to use their facilities for reference purposes free of charge. The editor of *Phasmid Studies* would welcome recent abstracts from authors so that they may be included in forthcoming issues. In the case of publications specialising in phasmids, *Phasma* and *Le monde des phasmes*, only the longer papers are summarised.

Baarda, G. (1994) Voer!!! *Phasma*, **4**(13): 1-3.

Another in the series of articles on foodplants for rearing phasmids in captivity. Thirteen species which eat *Geum* are listed. The article deals mainly with suggestions for using alternative foodplants to bramble in spring.

Beccaloni, G.W. (1993) A new species of *Extatosoma* Gray (Phasmatodea: Phasmatidae) from Papua New Guinea, with remarks on the species in the genus. *Tijdschrift voor Entomologie*, **136**(2): 113-123.

Extatosoma carlbergi sp. n. (Phasmatidae), is described from Papua New Guinea. The biology, ecology and distribution of this and the three other species of *Extatosoma* Gray is discussed and a hypothesis is advanced to explain the discrete altitudinal ranges of the two new Guinean species. The phylogenetic relationships of the species are considered and a key to the adult females is presented.

Brock, P.D. (1994) Notes on the giant leaf-insect *Phyllium giganteum* Hausleithner (Insecta: Phasmida, Phylliidae) with a description of the newly discovered male. *Malayan Nature Journal*, **48**: 53-57.

Until now the giant leaf-insect *Phyllium giganteum* was only known from one sex. Only females had been collected from the wild and bred from culture stocks kept mainly in Europe and Peninsular Malaysia. A recently discovered male from the Tapah Hill, Perak, Peninsular Malaysia is described in this paper, along with a further male from Sarawak, a new locality for this species. Different colour forms are briefly mentioned. The male and female are both illustrated.

Bueschges, A., Kittmann, R. & Schmitz, J. (1994) Identified nonspiking interneurons in leg reflexes and during walking in the stick insect. *Journal of Comparative Physiology A Sensory Neural and Behavioral Physiology*, **174**(6): 685-700.

In the stick insect *Carausius morosus* identified nonspiking interneurons (type E4) were investigated in the mesothoracic ganglion during intra- and inter-segmental reflexes and during searching and walking. In the standing and in the actively moving animal interneurons of type E4 drive the excitatory extensor tibiae motoneurons, up to four excitatory protractor coxae motoneurons, and the common inhibitor 1 motoneuron (Figs. 1-4). In the standing animal a depolarization of this type of interneuron is induced by tactile stimuli to the tarsi of the ipsilateral front, middle and hind legs (Fig. 5). This response precedes and accompanies the observed activation of the affected middle leg motoneurons. The same is true when compensatory leg placement reflexes are elicited by tactile stimuli given to the tarsi of the legs (Fig. 6). During forward walking the membrane potential of interneurons of type E4 is strongly modulated in the step-cycle (Figs. 8-10). The peak depolarization occurs at the transition from stance to swing. The

oscillations in membrane potential are correlated with the activity profile of the extensor motoneurons and the common inhibitor 1 (Fig. 9). The described properties of interneuron type E4 in the actively behaving animal show that these interneurons are involved in the organization and coordination of the motor output of the proximal leg joints during reflex movements and during walking.

Cai, B.L. & Liu, S.L. (1993) A new species of *Phobaeticus* from China (Phasmatodea: Phasmatidae). *Acta Entomologica Sinica*, **36**(4): 469-471. [in Chinese with English summary]

Some two hundred mu of the trees in Sichuan Province were damaged by stick insects in 1986. The damaged plants were: *Vernicia fordii*, *Cupressus funebris*, *Platycarya strobilacea*, *P. orientalis*, *Sapium sebiferum*, *Cyclobalanopsis* sp., *Salix cheilophila*, also *Zea mays* and *Solanum tuberosum*. In 1989, more than twenty mu of *Cupressus funebris* were eaten by the same species pests. We examined and found out a new species of phasmid. In this paper, the new species *Phobaeticus sichuanensis* is described. The types are preserved in the Department of Biology Nankai University. The measurements are all in millimeters. Female of the new species is similar to *Phobaeticus incertus* Brunner 1907, but can be distinguished by its body bigger and the operculum a little longer than 2 times of 8th, 9th and 10th tergites together (in *P. incertus* operculum nearly 3 times long).

Carlberg, U. (1994) Cost of autotomy in the Phasmida (Insecta): II. Species with high autotomy frequency. *Zoologischer Anzeiger*, **232**(1-2): 41-49.

The effect of autotomy of different numbers of legs was studied in stick-insects (order Phasmida) with respect to survival time (S-t), following the method recently developed by Carlberg (1992). Species belonging to the genus Baculum Saussure which have high frequency of autotomy were studied, viz. *B. extradentatum* (Brunner von Wattenwyl) and *Baculum* sp. 1 sensu Carlberg (= *Cuniculina impigra* Brunner von Wattenwyl sensu Bassler), *B. thaii* Hausleithner and *B. insignis* (Wood-Mason). S-t for all four species was more or less unaffected by autotomy. The S-t varied considerably between the species, and was not correlated to mass of body (m). By using the ratio of mass related survival S-m (= S-1/m), the species distributed themselves into two groups. One group had high values of S-m and round eggs, while the other had low values of S-m and flat shaped eggs, thus indicating that autotomy might be a useful character in the systematics of the complex genus *Baculum*.

Chen, S.C. & He, Y.H. (1993) A new species of the genus *Baculum* from Shaanxi, China (Phasmida: Phasmatidae). *Acta Entomologica Sinica*, **36**(3): 357-358. [in Chinese with English summary].

The present paper deals with a new species of the genus *Baculum* Saussure, collected from Lueyang County, Shaanxi. The type specimen is deposited in Beijing Forestry University. All measurements in descriptions are in mm. *Baculum brunneum* sp. nov. (figs. 1-2). This new species allied to *B. granulatus* Shiraki, but differs from the latter in the following points: with two conical spines between eyes, the granules of body not pointed, lateral lobe of 9th tergite horned, the numbers and arrangements of dentations on the legs are different. Body 122; head 5.0; pronotum 4.1; mesonotum 24.0; metanotum & median segment 23.3; median segment 2.3; first tergite 8.6; ninth tergite 3.7; abdomen 65.6; operculum 11.4; front, middle and hind femora respectively 35.5, 22.0, 24.5. Male: unknown. Holotype female, Lueyang, Shaanxi Province, 1st August 1986. Collected by Yang Zhong-qi.

Chen, S.C. & Wang, J.J. (1993) A new species of the genus *Macellina* Uvarov from Guangxi (Phasmida: Heteronemiidae). *Acta Entomologica Sinica*, **36**(4): 472-474. [in Chinese with English summary].

In the present paper, a new species is described. Type specimens are deposited in Beijing

Forestry University. This new species *Macellina digitata* is similar to *Macellina souchongia* (Westwood), but can be distinguished by the following characters: 1. The antennae with 19 segments; 2. The front femora longer than 1.5 times the length of the mesonotum; 3. The subgenital plate nonlanceatus.

D'Hulster, K. (1994) Diapause en spermatoforen. *Phasma*, **4**(13): 4-5.

A brief discussion of dipause in phasmid eggs and a short explanation of the form and function of spermatophores.

Floyd, D. (1994) Stick insects. *Journal of Biological Education*, **28**(1): 19-22.

Stick insects are becoming increasingly popular in schools. Easy to handle and observe, these fascinating creatures can be used extensively in project work. It is also beneficial to have some living creatures in the laboratory; stick insects are ideal as they require minimal care. They are very popular with pupils, and can stimulate those who do not usually take an interest in biology. The article includes four suggested projects.

Gorkom, J. van (1994) Phasmiden uit Sabah. *Phasma*, **4**(13): 23-25.

A summary of the species of phasmids in culture which originate from Sabah. Includes details of the culture origin, and illustrations, of seven species.

Huang, C.M. (1993) *The Series of the Bioresources Expedition to the Longqi Mountain Nature Reserve: Animals of Longqi Mountain.* China Forestry Publishing House: Beijing, China. [in Chinese].

Longqi Mountain Natural Preserve is located near the western edge of Fujian Province in eastern China. It is undeveloped and heavily forested. This text presents the results of a large-scale collecting expedition to this preserve undertaken during 1990-1991. Collected or observed were 2127 species of animals, including insects, various other invertebrates, fish, herpes, birds, and mammals. The bulk of the Chinese text uses the standard format; each taxonomic group is briefly described and illustrated with salient anatomical features. Dichotomous keys are provided at all levels. Brief English summaries close each chapter. Seventy-three new species are described in both Chinese and English. New species are distributed in the following orders: Phasmatodea, Orthoptera, Hemiptera, Neuroptera, Lepidoptera, Diptera, Hymenoptera, Acari, and Decapoda. The text closes with a list of references and indices to Chinese names and scientific names.

Lawson, T. (1994) Stuck on sticks. BBC Wildlife magazine, **12**(8): 40-44.

This general interest article discusses the public's interest in phasmids and relates a number of interesting facts. Seven colour photographs are included.

Manaresi, S., Marescalchi, O. & Scali, V. (1993)
The trihybrid genome constitution of *Bacillus lynceorum* (Insecta Phasmatodea) and its karyotypic variations. *Genome*, **36**(2): 317-326.

The standard karyotype and a wide array of repatterned cytotypes from 21 demes of the double-allotriploid thelytokous *Bacillus lynceorum* have been analyzed by means of Giemsa, C-banding, and silver-staining techniques. The present study substantially amends the first karyotype description and also analyzes in detail the chromosomal rearrangements to trace their most likely derivation. *Bacillus lynceorum* cytotypes also provide a well-documented instance of an intraspecific gain of centromeric function. The contribution of three different specific haplosets is particularly evidenced from centromeric heterochromatin pattern and satellite/Ag-NOR locations. In stick insects, both hybridogenetic and parthenogenetic *Bacillus* hybrids, including *B. lynceorum*,

can utilize the rDNA of all available parental haplosets, although a hierarchical role of the *B. rossius* genome seems to emerge. Satellite/Ag-NOR patterns, besides clearly allowing the recognition of ancestral parental genomes, also suggest a polyphyletic origin for *B. lynceorum*, which, to our knowledge, represents the only described karyotype of a trihybrid invertebrate.

Mantovani, B. & Scali, V. (1993) Genetic characterization of *Bacillus grandii maretimi* (n. subsp.) (Insecta Phasmatodea) in relation to its ecology. *Vie et Milieu*, **43**(4): 241-246.

The genetic structure of two *Bacillus grandii* populations collected on Levanzo and Marettimo (Egadi Archipelago) was studied by means of the analysis of allozyme frequencies. On the basis of the rather low genetic distance value (D = 0.075) and of the lack of distinctive morphological characters, the sample from Levanzo appears to pertain to the Northwestern Sicilian race *B. g. benazzii*; on the contrary, the Marettimo deme is to be ascribed to the new subspecies *B. g. maretimi*, because electrophoretic data are in good agreement with morphological differentiation (body and egg). The two Northern subspecies are, in turn, well differentiated from the third Southern one, i.e. *B. g. grandii* both for trophic niche and for polymorphism parameters. *B. g. benazzii* and *B. g. maretimi* feed on lentisk bushes and show a higher level of variability than *B. g. grandii*, a bramble feeder. Factors affecting population size are considered: for *B. g. maretimi* a vegetational threshold is suggested as it seems to occur for the Levanzo population of *B. g. benazzii*, while for *B. g. grandii* and *B. g. benazzii* of the Sicilian mainland the competition with hybridogenetic strains and/or with parthenogenetic hybrids is taken into account together with their heterotic and demographic advantages. Genetic affinity relationships between the *B. grandii* races are analyzed, as well as of *B. grandii* as a species versus *B. rossius* and *B. atticus*; their very different level of genetic differentiation is evaluated and discussed.

Mantovani, B. & Scali, V. (1993) Genetic structure and phyletic relationships of eastern Mediterranean *Bacillus atticus* Brunner (Insecta Phasmatodea): A biochemical study. *Biochemical Genetics*, **31**(9-10): 343-362.

The allozymic characterization of several new Croatian, Greek, and Turkish samples thought to belong to different subspecies of *Bacillus atticus* or to *atticus*-like taxa is given. Several allelic combinations (zymotypes) were observed among both diploid and triploid samples; the occurrence of highly different levels of heterozygosity for the same locus among populations is also common. The biochemical-genetic features of the numerous zymotypes are interpreted on the basis of the recently assessed cytology of their parthenogenetic reproduction. Biochemical and meiotic features also allow one to suggest that both diploid and triploid cytotypes of *B. atticus* are more likely interracial hybrids in origin. The new triploid Greek samples show only small genetic distances from the Turkish triploid and diploid ones; also, they do not show clear-cut morphological differences, so that all triploids and Turkish diploid samples are together referred to as *B. a. carius*. On the other hand, all Croatian, Greek, and Italian diploids appear to belong to the same electrophoretic cluster, biochemically differentiated at a subspecific level from *B. a. carius*. This newly defined comprehensive group of diploid samples, which also morphologically show gradual patterns of variation, is referred to as *B. a. atticus*.

Marescalchi, O., Pijnacker, L.P. & Scali, V. (1993) Automictic parthenogenesis and its genetic consequence in *Bacillus atticus atticus* (Insecta Phasmatodea). *Invertebrate Reproduction and Development*, **24**(1): 7-12.

The meiotic divisions in the eggs of the diploid thelytokous stick insect *Bacillus atticus atticus* (2n=34 or 33) were examined in Feulgen squashes. The reduction division is normal and results in two interphase nuclei. These nuclei fuse at the onset of prophase II and a diploid meiotic division II follows. One of the resultant nuclei degenerates and the other starts embryogenesis.

This automictic type of parthenogenesis explains the clonal maintenance of cytotypes and also the transmission of different levels of heterozygosity. The degree of heterozygosity is determined by the position of the chiasmata and the orientation of the chromosomes at metaphase II. The production of diploid *B. atticus/rossius* hybrids and its underlying mechanism are discussed.

Nijsen, F. (1994) Takkenreis naar Ecuador (18 juli t/m 11 augustus). *Phasma*, **4**(13): 11-16.

A description of the first part of a phasmid collecting trip to Ecuador made by the author and Oscar van Gorkom. The article details areas visited, methods used and species collected at Las Cajas, Macas, and Banos. Phasmids collected included *Oreophotes peruana*, *Bacteria* sp., *Dyme* sp., *Calynda* sp., *Creoxylus* sp., *Libethra* sp. and *Paraphasma* sp. The description of the trip will be continued in a subsequent issue of *Phasma*.

Sandoval, C.P. (1994) Differential visual predation on morphs of *Timema cristinae* (Phasmatodeae: Timemidae) and its consequences for host range. *Biological Journal of the Linnean Society*, **52**: 341-356.

Timema cristinae is a herbivorous insect that exhibits polymorphism for the body coloration (green, red, and grey morphs) and for pattern (striped, expressed only in the green morph and unstriped). The striped green morph is associated with ceanothus (*Ceanothus spinosus*) and the unstriped green morph is associated with chamise (*Adenostoma fasciculatum*). This study examines the relative vulnerabilities to predation of the different pattern and colour morphs on their natural backgrounds. The vulnerabilities of the striped and unstriped morphs on their two food plants were tested using uncaged wild birds (Scrub Jays) and captive western fence lizards. Strong differential predation was observed suggesting that each morph is most cryptic on the food plant on which it is most common. Furthermore, in a mark-recapture experiment in a patch of ceanothus the unstriped and red morphs were recaptured in a higher proportion than the other morphs. The vulnerabilities of the grey and green morphs on the ground and foliage were tested using lizards. The grey morph was more vulnerable on the plants than the green morph, but the inverse was observed on the ground (where they drop after a disturbance). This may be why the grey morph is not associated with specific food plants. The striped and colour polymorphisms in *T. cristinae* appear to be an evolutionary consequence of differential predation on different backgrounds. The implications of differential predation to food-plant utilization are discussed.

Seow-Choen, F., Brock, P.D. & Seow-En, I. (1994) The stick insects of Singapore. *Singapore Scientist*, 70: 10-14.

The article gives a brief introduction to phasmids of Singapore and includes 24 colour photographs, however some of the species shown have not been recorded from Singapore (they were photographed in West Malaysia), this point is not made clear in the article. A number of species are recorded from Singapore for the first time: *Asceles inquinatus* Redtenbacher, *Asceles malaccae* (Saussure), *Baculum nematodes* (de Haan), *Carausius nodosus* (de Haan), *Diesbachia tamyris* (Westwood), *Gargantuoidea triumphalis* Redtenbacher, *Lopaphus brachypterus* (de Haan), *Necroscia adspera* (Redtenhbacher), *Necroscia inflata* (Redtenbacher), *Presbistus peleus* (Gray), *Prisomera malayana* (Stål), *Sosibia solida* Redtenbacher, and *Staelonchodes geniculatus* (Gray). *Lonchodes thoracicum* Brunner is given as a junior synonym of *Staelonchodes geniculatus* (Gray), although it is not made clear that this is a new synonym. Due to mistakes by the editor, some of the photographs have the wrong captions: 4 and 19 have been transposed, as have 20 and 21. In addition *Sipyloidea meneptolemus* (Westwood) is marked as a new record for Singapore although this is the type locality; *Sosibia solida* Redtenbacher is not marked as a new record for Singapore although the caption clearly states it is found here and it has not previously been recorded from Singapore.

Seow-Choen, F., Tay, E.P., Brock, P.D. & Seow-En, I. (1994) Foodplants of some stick-insects (Phasmida = Phasmatodea) from Singapore. *Malayan Nature Journal*, **47**: 393-396.

Lists foodplants for 16 species and lists species which have fed on bramble or guava in captivity.

Seow-Choen, F., Seow-En, I. & Seow-An, S. (1994) Nature's mimics. *Nature Malaysiana*, **19**(3): 89-96.

Includes 33 colour photographs of phasmids from Singapore and West Malaysia, ranging from a nymph emerging from an egg to adults. The single page of text gives a brief introduction to phasmids.

Shilan, C., Xu, S., Lai, X., Hu, S. & Lin, L. (1994) A study on the biological characteristics and control of *Micadina yingdensis*. *Forest Research*, **7**(2): 187-192. [in Chinese, with English summary].

Micadina yingdensis Chen & He is a new species of Phasmida which was first discovered in the forest of Yingde County of Guangdong Province where it caused serious damage to *Castanopsis fissa* Rehd. & Wils. forest. Nymphs and adults fed on leaves of Fagaceae, especially on the leaves of *Castanopsis fissa*. The damage caused by the adults was the most. It has 2 to 3 generations a year with generations overlapping. The eggs deposited by the adults of the first and second generations overwintered under the leaf litter. During the last ten days of the following February, the eggs began hatching. The peak period of the overwintered adults was from mid-May to late-May. During this period an applications of 3% BHC smoke with a dosage of 15 kg/hm-2 could kill this pest and resulted in over 85% mortality. Spraying with Metarhizium anisopliae powder at a dosage of 1.5 times 10-13 spores/hm-2 also gave an effective control of 70% mortality.

Tinti, F. (1993) Morphological, genetic and chromosomal characterization of Corsican and Spanish *Bacillus rossius* (Insecta, Phasmatodea). *Vie et Milieu*, **43**(2-3): 109-117.

Chorionic pattern, allozymic and chromosomal analysis allow to assign the parthenogenetic Corsican *Bacillus rossius* to the *B. r. rossius* subspecies. Although some distinguishing chromosomal features have been detected (Robertsonian fusions), karyotype and general genetic characteristics indicate their high similarity to the parthenogenetic North-Sardinian and Elban demes, suggesting a common derivation during the Tertiary. Allozyme analysis of Spanish bisexual samples from *B. r. catalauniae* area (Tossa) reveals that these populations too belong to *B. r. rossius*.

Publications noted

The following publications have been noted but no abstracts have been received.

Alcock, J. (1994) Postinsemination associations between males and females in insects: The mate-guarding hypothesis. in: Mittler, T. E., F. J. Radovsky and V. H. Resh (Ed.). Annual Review of Entomology, 39: 1-21.

Dorai, R.S. & Bradley, J. (1993) Ubiquitinated yolk polypeptides in insect eggs and embryos. *Molecular Biology of the Cell*, **4**(suppl.): 25A.