

## Spermatophores in Phasmida

P.E. BRAGG, 8, Cornwall Avenue, Beeston Rylands, Nottingham, NG9 INL, UK.

**Key words:** Spermatophore, Phasmida, Bacteriinae, Necrosiinae, *Lonchodes jejunos*, *Haaniella saussurei*, *Extatosoma tiaratum*, *Staelonchodes* sp., *Parahyrtacus gorkomi*, *Centrophasma hellois*, *Aretaon asperrimus*, *Anchiale maculata*, *Acrophylla wuelfingi*, *Lamponius guerini*.

---

### Introduction

During 1989 and 1990 and early 1991 spermatophores were observed in nine species of Phasmida which were being reared in captivity: *Extatosoma tiaratum* (Macleay), *Lonchodes jejunos* Westwood, *Haaniella saussurei* Kirby, *Staelonchodes* Kirby sp., *Centrophasma hellois* (Brunner) *Aretaon asperrimus* (Redtenbacher), *Anchiale maculata* (Olivier) and *Acrophylla wuelfingi* (Redtenbacher), *Lamponius guerini* (Saussure).

### Materials and observations

A number of spermatophores from captive bred *Extatosoma tiaratum* have been observed during pairing and also found on the floor of the cage. These agreed with the drawing and description given by Clark (Clark 1975).

One male and three female nymphs of *Haaniella saussurei* were collected in Sarawak in January 1988. In the UK they were reared as a monoculture, on a diet of bramble (*Rubus* spp.) in a standard cage (Bragg 1989) with a humidity which varied between 75% and 95%. The male became adult in March 1989 and the females in June. Within 12 hours of the first female becoming adult she was mated by the male. These two were seen paired on three occasions during her first week as an adult. Two weeks after the first pairing two spermatophores were found on the floor of the cage. One was obviously not fresh, being flaccid and brown in colour. The second one was turgid and a milky white in colour. The latter was considered to be no more than two or three days old and is illustrated (Fig. 1). Some weeks later a third wrinkled, brown spermatophore was found.

Two adult female *Lonchodes jejunos* were collected in Sarawak during December 1987. Although both contained parasitic worms (Bragg, in press) they produced some eggs which resulted in four females and three males being reared to adults. These were reared on *Rubus* spp. in a standard cage, with humidity varying between 70% and 85%. Three females died soon after becoming adult. The fourth female was seen to be mated on a number of occasions. Shortly after one of these occasions an off-white object was seen protruding from the terminal segment of the female. Gentle pulling failed to remove what was apparently the end of a spermatophore. On two later dates dried pieces of material, of a similar texture to that of dried spermatophores of *Extatosoma tiaratum*, were found on the bottom of the cage. They measured approximately

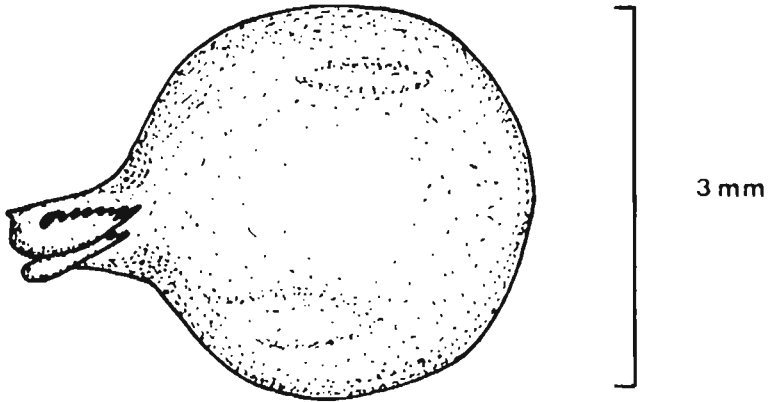


Fig.1. Drawing of spermatophore of *H. saussurei*

7mm in length and 3mm in width. In August 1990 a pair of this species were observed mating and a spermatophore was seen protruding from between the genitalia of the two insects.

The fourth species is an undetermined species of the genus *Staelonchodes* Kirby. A culture was raised from eggs which were obtained through the Phasmid Study Group who designate the culture as P.S.G. No. 96, the culture is derived from a single adult female which was collected in North East India by Purnendu Roy in September 1986 (Kneubuhler et al. 1989). In April 1990 a small white sphere was seen protruding from the terminalia of a male of this species. The spermatophore was removed from the male by gently pulling with a fine pair of forceps. During removal the spermatophore was ruptured and a small quantity of clear liquid was noted. The spermatophore was found to consist of an approximately spherical bag 1.2mm diameter with a thick strand 1mm long attaching it to the male. The ruptured wall of the spermatophore was estimated to be between 0.02mm and 0.04mm thick. The general appearance was similar to the spermatophore of *Haaniella saussurei* which is illustrated in Fig 1.

In August 1990 a collection of phasmids was made on Mt. Kinabalu, Sabah. Some specimens of *Haaniella scabra* were collected near the National Park Headquarters and several *Aretaon asperrimus* were collected at Poring Hot Springs. Both species were brought back to the UK in the same container. On arrival in the UK a single slightly dehydrated spermatophore was found on the bottom of the container. The general appearance was similar to the spermatophore of *H. saussurei* and the size was about 2mm diameter. The specimens which consisted of one adult pair and one female nymph of *H. scabra*, 2 adult females, 3 adult males and several nymphs of *A. asperrimus*, were housed together. Both of the adult *H. scabra* died within a few days. The dried remains of two spermatophores were found on the floor of the cage when it was cleaned out. Several days later a pair of the *A. asperrimus* were observed while mating at night. The end of a spermatophore was seen in the genital region of the two copulating insects and

was removed with a pair of forceps. This closely resembled the remains of the two spermatophores found on the bottom of the cage. Although the spermatophore which was produced in transit and those from the floor of the cage could have come from the *H. scabra* seems more likely that these were also produced by the *A. asperimus*.

The sixth species in which I have observed a spermatophore is *Centrophasma hellotis* (Westwood), a number of which were collected as adults or nymphs at Kampung Bengoh and Mt. Serapi, in the First Division of Sarawak during July and August 1989. Although a number of specimens of both sexes were collected only one male nymph survived more than a few weeks of captivity in the UK. This specimen, which was feeding on bramble and rose, died in July 1990 and was found to have a spermatophore attached to the terminalia. This is white in colour, 3 mm wide and 2.5 mm long in the dehydrated state; when rehydrated to enable the insect to be set, there was a slight increase in size. Although there were other phasmids in the cage, none were adult and none were even members of the same subfamily so the production of a spermatophore is surprising. The most likely possibility would seem to be that it was in some way connected with the approaching death of the insect.

In January 1991 a piece of spermatophore was found on the floor of a cage containing two different species. The two species were then separated and two spermatophores were subsequently found on the floor of the cage containing a number of *Lamponius guerini*. This culture was obtained through the Phasmid Study Group and originates from Guadeloupe. The spermatophores were approximately the same diameter but have different length strands attached to them. Both were about 1.4mm in diameter with overall lengths of 4.8mm and 1.8mm. Both were creamy white in colour but were wrinkled, as if they had lost a large portion of their original contents. The cage was checked daily and was maintained at a humidity of 80% so the wrinkled appearance could not have been due to dehydration; it seems likely that some of the contents had been removed by the female before they were dropped to the bottom of the cage. On a later occasion part of what appeared to be a spermatophore was seen protruding from the terminalia of a copulating female.

The final two species, *Anchiale maculata* and *Acrophylla wuelfingi* have recently been reported to me by Paul Jennings (personal communication). Both these cultures were obtained through the Phasmid Study Group and originate from New Guinea and Australia respectively. Jennings states that in both species he has seen white spermatophores, like those of *E. tiaratum*, attached to the terminalia, furthermore, in the case of *A. wuelfingi* he also reports finding them on the floor of the cage on several occasions.

## Discussion

The occurrence of spermatophores in *Extatosoma tiaratum* is well documented (Clark 1977, Lau 1979, Harrison 1980). It is now clear that *Haaniella saussurei*, *Staelonchodes* sp. [P.S.G. No. 96.], *Lonchodes jejunos*, *Areton asperimus*, *Centrophasma hellotis*, *Anchiale maculata*, *Acrophylla wuelfingi* and *Lamponius guerini* also produce spermatophores.

The last treatment of spermatophores in the Phasmida (Carlberg 1981) listed eight species from five subfamilies. Since then Jennings (in Raper 1988) has reported in a possible spermatophore in P.S.G. No. 90, which has recently been described as a new species, *Parahyrtacus gorkomi* Hausleithner (Hausleithner 1990), and D'Hulster (D'Hulster 1990) has

FAMILY	SUB FAMILY	SPECIES
Bacillidae	Bacillinae	<i>Bacillus rossius</i> (Rossi)
Bacillidae	Bacillinae	<i>Phalces longiscarpus</i> (de Haan)
Bacillidae	Heteropteryginae	<i>Haaniella mulleri</i> (de Haan)
Bacillidae	Heteropteryginae	<i>Haaniella saussurei</i> Kirby
Bacillidae	Heteropteryginae	<i>Aretaon asperrimus</i> (Redtenbacher)
Heteronemiidae	Lonchodinae	<i>Lonchodes jejunos</i> (Brunner)
Heteronemiidae	Lonchodinae	<i>Staelonchodes</i> Kirby sp. (PSG.96.)
Heteronemiidae	Lonchodiane	<i>Parahyrtacus gorkomi</i> Hausleithner
Heteronemiidae	Necrosciinae	<i>Centrophasma hellotis</i> (Westwood)
Phasmatinae	Bacteriinae	<i>Lamponius guerini</i> (Saussure)
Phasmatidae	Phasmatinae	<i>Acrophylla wuelfingi</i> (Redtenbacher)
Phasmatidae	Phasmatinae	<i>Anchiale maculata</i> (Olivier)
Phasmatidae	Phasmatinae	<i>Baculum extradentatum</i> (Brunner)
Phasmatidae	Phasmatinae	<i>Baculum</i> Saussure sp.
Phasmatidae	Phasmatinae	<i>Clitarchus hookeri</i> (White)
Phasmatidae	Tropidoderinae	<i>Extatosoma tiaratum</i> (Macleay)
Phyllidea	–	<i>Phyllium biculatum</i> Gray
Timematidae	–	<i>Timema californica</i> (Scudder)

**Table 1** Species of Phasmida known to produce spermatophores.

reported spermatophores in *Haaniella mulleri* (de Haan). Recently Jennings (personal communication) has confirmed spermatophores in *Parahyrtacus gorkomi*, reporting seeing them both during copulation and on the floor of the cage. The latter he describes as being about 12 mm long and 1 mm diameter, almost transparent and quite brittle.

The Table 1 lists the taxonomic groups (classification is that of Bradley & Galil 1977) known to produce spermatophores. One family, three subfamilies and ten species have now been added to Calberg's list of spermatophore producers.

When Clark added a third subfamily to the known spermatophore producers (Clark 1975) he hypothesised that spermatophores may be the normal mode of sperm transfer in the Phasmida. The observations summarized in Table 1 strongly support this hypothesis as there are now records from a total of nine subfamilies.

## Summary

Spermatophores have been found in eight species of Phasmida not previously known to produce spermatophores. Two of these are from the subfamilies Bacteriinae and Necrosciinae which have not previously been recorded as producing spermatophores. A spermatophore of *Haaniella saussurei* Kirby is illustrated. A summary of the species known to produce spermatophores is given.

## References

- Bradley, J.C. & Galil, B.S. (1977) The taxonomic arrangement of the Phasmatodea with keys to the subfamilies and tribes. *Proceedings Entomological Society of Washington* **79**: 176-208.
- Bragg, P.E. (1989) A cage constructed for stick insects. *Bulletin Amateur Entomologists Society* **48**: 160-161.
- Bragg, P.E. (in press) Parasites in the Phasmida.
- Carlberg, U. (1981) Spermatophores of *Baculum extradentatum* (Brunner von Wattenwyl) and other Phasmida. *Entomological Monthly Magazine* **117**: 125-127.
- Clark, J.T. (1976) A conspicuous spermatophore in the Phasmid *Extatosoma tiaratum* Macleay. *Entomological Monthly Magazine* **110**: 81-82.
- D'Hulster, K. (1990) *Haaniella mulleri*. *The Phasmid Study Group Newsletter*, **44**: 18.
- Harrison, A. (1980) A different view of *Extatosoma tiaratum*. *The Phasmid Study Group Newsletter*, **4**: 2.
- Hasusleithner, B. (1990) *Parahyrtacus gorkomi* n. gen., n. sp. – eine neue Stabschrecke von den Philippinen (Phasmatodea: Lonchodinae: Neopromachini). *Entomologische Zeitschrift* **100(15)**: 282-289.
- Kneubuhler, B., Springett, S., Outrad, M., & Brock, P. (1989) P.S.G. No. 96. *Menexenus* sp., *The Phasmid Study Group Newsletter*, **41** 21-22.
- Lau, D. (1979) Beobachtungen über die fortpflanzung und entwicklung der Australischen Gespensteuschrecke, *Extatosoma tiaratum* Macleay. *Zoologische Garten Jena*, **49**: 17-64.
- Raper, C. (1988) P.S.G. No. 90: PHU2. *The Phasmid Study Group Newsletter*, **34**: 13-14.