Description of the lynx spiders of a canopy fogging project in northern Borneo (Araneae: Oxyopidae), with description of a new genus and six new species of *Hamataliwa*

Christa L. Deeleman-Reinhold

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C.L. Deeleman-Reinhold, Sparrenlaan 8, 4641 GA Ossendrecht (cdeeleman@planet.nl).

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All oxyopid spider species collected in a long-term ecological canopy project in northern Borneo are described. A total of nine species in three genera could be established, one of which belongs to a new genus. Four species could be assigned to known species, five are described as new species in the cosmotropical genus *Hamataliwa.* Description of one new species has been added from the ground collection. One species of *Oxyopes* was synonimised with *Hamataliwa incompta* (Thorell, 1895). *H. helia* Chamberlin, 1929, known hitherto only from southern U.S.A. and Mexico was found in the Bornean canopy. With nine species, Oxyopidae rank 10th on the list of 33 families in the Bornean canopy project.
Tapponia micans Simon, 1885, typus generis is redescribed from the Bornean canopy, all other *Tapponia* species listed in the World Spider Catalog are unrelated to this species and are removed from *Tapponia*. Five species are transferred to *Hamataliwa,* nine remaining species previously classified in the genus *Tapponia* are transferred to the new genus *Hamadruas*. All but one species placed in *Hamadruas* are "old" species, described in the 19th century; no new species are added to this genus, the type species and two others are redescribed, one of which (*H. superba* (Thorell, 1887)) from the Bornean tree canopy. For most of the canopy species additional records are given from hand-collected material from other localities in Borneo, Malaysia, Thailand, Indonesia, the Philippines and British Guyana. The genus *Megullia* Thorell, 1898 (type species *M. truncata* Thorell, 1898 from Burma) is synonymised with *Hamataliwa.*
An identification key is provided for the genera *Oxyopes, Tapponia, Hamataliwa, Peucetia* and *Hamadruas* gen. nov.
Nine immature specimens of a *Hamataliwa* species were found inside shells of living snails of the genus *Alycaeus* (Cyclophoridae), suspended with long thin lines on limestone walls. It is not known whether spiders produced the lines and attached them for some unknown purpose or whether the snails did it themselves. How they haul themselves up from their pending position remains to be investigated.

Introduction

The canopy fauna has intrigued me since my first encounter in the early 1990s. Tony Russell-Smith showed some specimens obtained by canopy fogging in Borneo and Sulawesi by Nigel Stork. Many of the specimens he showed seemed spectacular and quite unfamiliar, even though I had more than 10 years experience classifying rainforest spiders collected in a conventional way (i.e., without fogging) from the same regions.

This paper presents results of collections made by Andreas Floren (Würzburg, Germany) during ecological studies of the biodiversity of canopy arthropods in the forests of Borneo. The study area covered an array of forest types, from primary rainforest of different composition to patches of isolated degraded secondary forest at

different elevations (see also Floren & Deeleman, 2005). The spiders reported here were collected by means of canopy fogging.

The great majority of descriptions of spiders from Southeastern Asia were realised before 1900 and as usual in those days consisted of texts written in Latin. T. Thorell devoted more than 25 years of his life to describing new spider species from the Malaysian region of all major families during the last part of the 19th century. Specimens studied by him were collected mainly during special discovery expeditions to the mysterious, unexplored regions of the Oriental tropics. Thorell was a man of great expertise and reputation and laid the foundation for the taxonomy of spiders of Southeastern Asia. Unfortunately, he did not have an illustrator and none of his works were illustrated – and the great majority of his species still have not been illustrated till today. On the other hand, nearly all his type material has been very well preserved, predominantly in the museum in Genoa. This museum always has been very conservative in curating the collections. All material studied by Thorell still is in the original bocals. These are often huge, each containing the complete material of one publication, most often consisting of several hundreds of species of many different families together, and accompanied by the original handwritten labels of Thorell. These bocals are sealed with wax, and only very few staff members are authorised to open them. Removing and putting back the glass plates that serve as lid is an elaborate process demanding time and expertise. This system is not helpful to specialists who need to see more than a few specimens of the family they are working on!

The 20th century has been a period of stagnation regarding taxonomy of spiders from the Malay Region. In this period not a single publication treated oxyopids from that area. Only in Salticidae (jumping spiders) a number of substantial contributions were made by J. Proszyński and F. Wanless. More recently Peter Jaeger and Peter Schwendinger have become devoted to Southeast Asian spider taxonomy. John Murphy (2000) did a masterpiece by producing a comprehensive book as an overview of the spiders from this area.

The genus *Oxyopes* is dominant in the Oxyopidae worldwide. Surprisingly, no specimens of that genus were found in the canopy. The majority of the representatives in the canopy could be identified as *Hamataliwa*. This pantropical genus is found on all continents except Europe, biased towards the Neotropics where 54 species occur from Mexico to Florida; five taxa are known from tropical Africa and two from Australia (Brady, 1994, 1970; Platnick, 2009). The first Asian species to be described was *Hamataliwa sanmenensis* Song & Zheng, 1992 from China. Since then four more Asian species have been added to the fauna of China (Zhang *et al*., 2005). This genus also proves to be a common and diverse element in the canopy of Southeast Asian forests. Many oxyopid species from Asia have been described in the genus *Tapponia* Simon, but this placement was shown to be incorrect (Deeleman-Reinhold, 2004).

The spiders in the genus *Hamataliwa* are intriguing by their integument being coated with rusty, silvery white and black appressed flattened setae, often giving them a colourful, glittery appearance. When handling, and in alcohol, these setae are easily detached, and the picturesque appearance of the spiders is lost so that they appear as dull yellowish brown.

Examination of 150 adult specimens from Southeastern Asia revealed that *Hamataliwa* in fact consists of two related categories: the true *Hamataliwa*, and a group of

distinctive species probably limited to Southeastern Asia and of different habits, which will be transferred in this paper to *Hamadruas* gen. nov.
In all, nine species of oxyopids were found: one species of *Tapponia*, seven *Hamataliwa* species and one species in the new genus *Hamadruas*. Oxyopids were represented in about 50 of nearly 200 canopy fogging samples. Some of these species proved to be identical with species present among 58 samples of hand-collected *Hamataliwa* and *Tapponia* species from many non-canopy localities from Thailand through Indonesia to the Philippines. As stated earlier (Deeleman-Reinhold, 2004: 52), at present the species listed in *Tapponia* are not congeneric and justify the creation of the new genus *Hamadruas*.

Methods

Specimens were studied with Zeiss stereomicroscope ocular 10 × and 25 × and zoom objective 0.6-6.6. Drawings were made with the aid of a drawing tube. All measurements are in mm, width of head was measured at the level of PLE. Variability of leg measurements within one species of *Oxyopes* (Brady, 1964) was found to be 10-20%; therefore, measurements are reported to the nearest 0.1 mm. Measurements of the described species are given in the Appendix. Leg segments femur-patella-tibia-metatarsus-tarsus=total, palps femur-patella-tibia-tarsus. *Hamataliwa* and *Tapponia* are unusual in that the embolus is partly hidden underneath the conductor. By gently compressing the palp, the entire embolus becomes visible. The embolus proved to be very fragile. Epigynes were detached and immersed in clove oil for a few hours before drawing.

Identification of most of the "older" species was done by comparing type specimens, preferably by loans, but most often during personal visits to Paris, London and Genoa. The majority of types has been deposited in Genoa, and I spent more than a week at that museum. Unfortunately, only one of the several types of Thorell's *Tapponia* species could be found. Identifications of the latter had to be done on the base of the Latin descriptions and with the help of additional Thorell material kept in Stockholm.

Male palps consist of elements such as RTA, basal cymbial apophysis, median apophysis and conductor, which at different angles can produce quite different images. The genera treated here have in common an embolus that is hidden inside the conductor and uncovering it is a delicate affair. However, the hidden embolus tip provides most valuable specific characters. Viewing from slightly different angles may produce quite different images. Also, some elements, such as shape and width of the tegular lobe, can be quite variable within a population. It is not always simple to identify specimens from images rather than from material of the species. Unfortunately, the entire embolus has rarely been illustrated. One has to rely heavily on the females, but then, epigynes are so heavily sclerotized that fine structures cannot be easily observed.

Two or more similar species of *Hamataliwa* were often found mixed in the same sample or forest type, so that correctly matching sexes was imperative. Indeed, as we have frequently experienced in this canopy project, inadvertently combinations are formed of males of species A with females of species B if we are not alert. Assuming that the heavy rigid conductor is used for anchoring and fixing the palp to the epigyne, the conductor should fit into the space inside the U-shaped ridge of the epigyne (the "void"), so that the outer margin aligns the posterior curve of the ridge; a large part of the conductor penetrates the copulatory duct, pushing and guiding the embolus-tip towards the sper-

matheca. In some epigynes there is a small laterally extensible area posteriorly in the middle of the rim (see *Hamadruas* epigyne with stuck embolus, fig. 49).

It may be noted that colour patterns of species decorated with coloured appressed setae can only be of relative value. Colour-bearing setae are ephemeral and disperse rapidly. In *Hamadruas* pigment patterns probably are more reliable for identification.

Finally, the field numbers (indicated as e.g., "Loc. 5" or merely numbers, e.g., "1998.10") refer to data on details of the fogging process, that may be useful for future studies on the ecology of the species. These data will be made available in digital format through the National Museum of Natural History, Leiden.

Abbreviations: AME – anterior median eyes; ALE – anterior lateral eyes; ba – basal apophysis of cymbium; BMNH – The Natural History Museum, London; c – conductor; cd – copulatory duct; d – diameter; e – embolus; f – embolar flange; fd – fertilisation duct; ma – median apophysis; MCSNG – Museo Civico di Storia Naturale, Genoa; MNHN – Muséum National d'Histoire Naturelle, Paris; p – copulatory pore; PER – posterior eye row; PME – posterior median eyes; PLE – posterior lateral eyes; r – rim of conductor; RES – Riksmuseets Entomologiska afdelning, Stockholm; RMNH – National Museum of Natural History, Leiden; RTA – retrolateral tibial apophysis; tb – transverse bar; tl – tegular lobe; v – void.

Taxonomic part

Key to genera of Oxyopidae in Southeastern Asia

1. Chelicerae toothless ..... *Peucetia*
- Chelicerae with at least one tooth on retrolateral margin 2
2. AME more than their d apart (Brady, 1964: figs. 1, 110, 112); clypeus and femora usually lined with black; male palp: tegular lobe absent, retrolateral margin of cymbium without basal apophysis ..... *Oxyopes*
- AME their d or less apart; clypeus and femora rarely lined with black; male palp with tegular lobe; epigyne consists of a chitinized U-shaped rim and a pair of anterior spermathecae 3
3. PER almost straight, line connecting anterior margin of PME with posterior margin of PLE recurv; male palp with patellar apophysis; clypeus equal to distance between ALE; abdomen densely covered with iridescent setae (figs. 64-67); leg IV >leg III ..... *Tapponia*
- PER procurv; male palp without patellar apophysis; clypeus more than distance between ALE; no iridescent setae are present (except in tropical American species), only appressed flattened setae in white, black and red; leg IV<leg III 4
4. Carapace dorsally straight in lateral view rectangular, front face shorter than rear face, rear face vertical or receding (figs 7, 8); abdomen not more than 20% longer than carapace or shorter; tegular lobe sharply curved or hooked, not looping (figs 2, 9, 32), spider length 3-9 mm, abdomen rarely with geometric colour pattern ..... *Hamataliwa*
- Carapace dorsally with saddle (fig. 45); rear face of carapace sloping, abdomen 50-100% longer than carapace, narrow distally; tegular lobe of male palp looping, with pit (figs 46, 52, 59); spiders 7-15 mm, abdomen dorsally often with geometric colour pattern ..... *Hamadruas* gen. nov.

Note.— The genus *Megullia* Thorell, type and only species *M. truncata* Thorell 1898, female (Burma), was created for the species' unusually high carapace and clypeus and wide eye region. The revision of the New World species of *Hamataliwa* (Brady, 1970) shows that in this genus height of carapace and width of eye group are very variable. I consider the genus *Megullia* unnecessary and assign this species to the genus *Hamataliwa*.

Hamataliwa Keyserling, 1887

Hamataliwa Keyserling, 1887: 458. Type species: *H. grisea* Keyserling, 1887.
Megullia Thorell, 1898: 31, syn. nov.

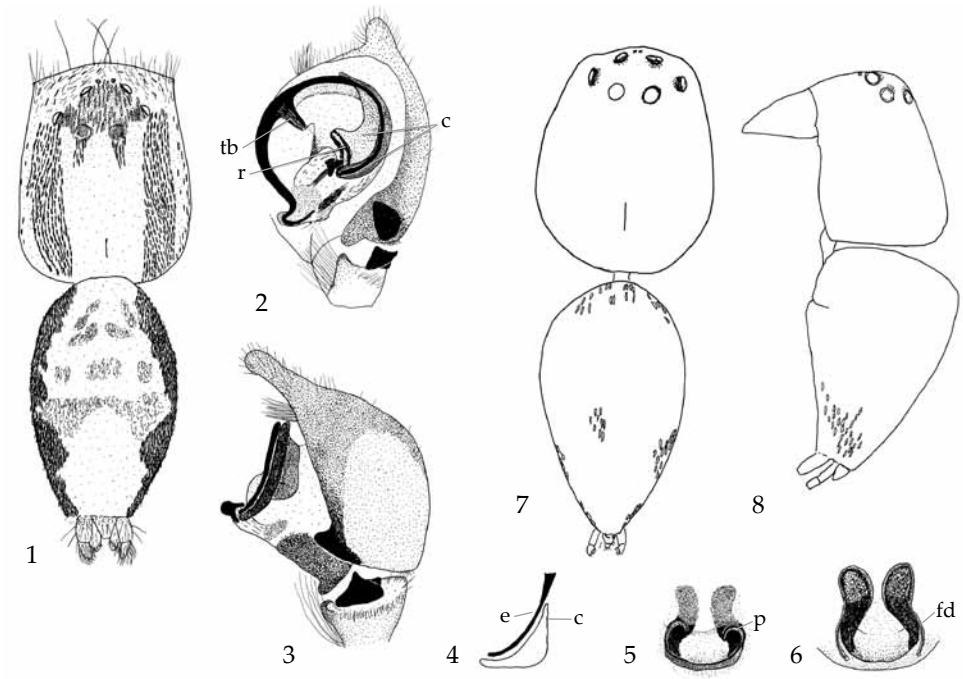
Diagnosis.— *Hamataliwa* species can be separated from *Oxyopes* by the AME close together, separated by less than their diameter and situated in front of the space between the ALE eyes. The PME are 1 to 4 times their d apart. Black lines on the clypeus and along the ventral side of femora and other leg segments are absent. Legs: I>II>III>IV, like *Oxyopes,* the patellae, tibiae and metatarsi of legs I-IV bear numerous very long and thin erect dorsal and lateral spines. Posterior legs are 30% shorter than anterior legs. The carapace is very high, almost square. The genital organs in both sexes are somewhat unusual because of their heavy sclerotisation. The male palp is characterized by the tegulum which is extended ventro-mesally into an U-shaped lobe (tegular lobe); the latter is traversed by the black spermophore, lining the posterior margin. The embolus arises mesally from the membranous part of the tegulum and arches clockwise around towards the lateral side, the tip joining the conductor and the median apophysis in the centre of the tegulum. The embolus is long and thin, flattened and shiny black; distally it is strongly thinning and completely hidden by the strongly sclerotised shield- or sheath-like conductor. The epigyne is characterized by the presence of a more or less U-shaped chitinized rim and a pair of spermathecae anterior to it. Copulatory pores usually are found underneath either inner side of the rim; on the outer, lateral side the long, thin fertilisation ducts can be seen. The rim, the copulatory ducts and the spermathecae are often heavily cuirassed and rigid. Differences with *Tapponia* and *Hamadruas* gen. nov., see there.

Remarks.— There is profuse presence of non-iridescent flattened appressed setae on carapace, abdomen and legs. These setae are responsible for colour patterns of silvery white, yellow, rusty red, brown or black, but at the same time make these patterns volatile; the skin underneath is devoid of any pigment and usually described as yellowish, pale brown etc. In *Tapponia* the abdomen is clothed in a dense sheet of iridescent setae, in *Hamadruas* the skin itself is often pigmented and also covered with correspondingly coloured setae. These setae are easily lost and in some alcohol specimens; especially in old material, they may be completely lost.

Note: In some New World *Hamataliwa* I observed species with pigment pattern and iridescent setae on the abdomen.

Hamataliwa incompta (Thorell, 1895)
(figs 1-8, 68)

Tapponia incompta Thorell, 1895: 259, ♀, description, Burma: Rangoon, Tharrawaddy.
Oxyopes bikakaeus Barrion & Litsinger, 1995: 312-314, figs 190, 191. ♂, ♀, Philippines, Luzon, Quezon Prov.; syn. nov.
Hamataliwa incompta; Deeleman-Reinhold, 2004: 51, ♀, fig. 46.
Hamataliwa sp. from Borneo; Deeleman-Reinhold, 2004: 45, ♂, figs 5-8.



Figs 1-8. *Hamataliwa incompta* (Thorell, 1890). 1, female, habitus (Mulu); 2, male palp, ventral [Loc. 60]; 3, male palp, retrolateral [Loc. 60]; 4, conductor and embolus (in black) retrolateral; 5, epigyne, ventral [Loc. 19]; 6, epigyne in clove oil, dorsal [Loc. 19]; 7, habitus dorsal [Loc. 29]; 8, habitus, lateral [Loc. 29].

Type material.— ♀ holotype "*Tapponia incompta* BM1999/128 Burma, Rangoon", examined (BMNH).
Other material.— **Malaysian Borneo**, East Sarawak, Gunung Mulu N.P., 1 ♀, lowland primary rainforest, running rapidly on plankwalk, 12.x.2003, C.L. Deeleman & P. Zborowski (fig. 68); W. Sabah: Mount Kinabalu area, Sorinsim, 6°06'N 116°50'E, 5 ♂, 7 ♀, 5 yr old and 15 yr old adjacent sec. forest, canopy fogging *Melochia umbellata* (Sterculiaceae) and *Vinex pinnata* (Verbenaceae) [Locs 19, 28, 29, 34], 18.ii – 16.iii.1997, A. Floren; Sorinsim, 6°6'N, 116°50'E, 2 ♂ 2 ♀, patch of 40 year old secondary forest regeneration adjacent to primary forest and older -regrowth forest, fogging canopy, *Vinex pinnata* (Verbenaceae) [Loc. 60], 7.iii.1997, A. Floren; Crocker Range, 5°26'N 116°08'E, 1 ♀, fogging fruit plantation tree 4, fog 1, 31.i.2001, A. Floren; Kinabalu N.P., Poring Hot Springs, 5°59'N 116°42'E, 1 ♂, primary forest, 600-700 m, on canopy walk, hand collecting 8.iv.1998, C.L. Deeleman & P. Zborowski; **Malaysian Peninsula**, Selangor, Gombak Research Station, secondary evergreen forest, 1 ♀, with egg sac wrapped in leaf fragments, 4.vi.1992, C.L. Deeleman & J.C. van Kempen; **Thailand,** Krabi, Had Naparatava Beach, 1 ♀, sweeping grass, 17.xii.1990, C.L. Deeleman; **Indonesia**, Sumatra, Gunung Leuser, 1 ♀, rubber plantation near Bukit Lawang, lowland, 10.ii.1982, P.R. & C.L. Deeleman; Lombok island, Kute, secondary forest, 10.i.1990, S. Djojosudharmo; **Philippines**, Mindanao, Davao, Eagle Reserve, 1 ♀, secondary forest, 26. iv.1982, P.R. Deeleman (All RMNH).

Diagnosis.— Middle-sized species, 5.4-5.5 mm long, with relatively long legs (leg I almost twice body length). Epigyne a wide, low U-shaped ridge two times wider than long (fig. 5), from which emanate anteriorly a pair of large bands curving gently outward. Females resemble *H. sanmenensis* by the shape of the epigyne: a wide, rounded

depression and thin copulatory ducts, however in *H. sanmenensis* the spermathecae are not curved outwards. Male palp with characteristic triangular shape of RTA (fig. 2, 3), often with acutely pointed tip in the middle; conductor boat-like, with from tip gradually widening keel (fig. 4), mesal-distal attachment branch with a strongly chitinized, undulating rim (r); embolus very thin and filiform, at the base of the embolus is a strongly chitinized transverse bar (tb).

Redescription.— Female, Mulu N.P. Carapace 3.2 long, white with on either side a broad band stretching till the posterior edge of rusty red flattened setae. Abdomen dorsally silvery white, lateral flanks covered with undulating bands of rusty red flattened hair, behind the middle a lateral rusty-red, protruding lobe. Venter pale. d of PME 0.2, distance PME-PME 1.5 d. Clypeus vertical. Epigyne strongly chitinized, a wide U-shaped ridge curving inward on either end where the copulatory openings are situated; laterally situated insemination ducts very thin. Anterior part with spermathecae shimmering through abdominal tegument.

Male. As female, carapace 2.6 long, carapace and abdomen virtually devoid of flattened setae. Legs as in female. Genital organ see diagnosis. Median apophysis distal margin wide, with retrolateral tooth and prolaterally a curved lobe. Conductor with proximal branch longer than distal branch.

Distribution.— Burma (Myanmar), Thailand, Malaysian Peninsula, Malaysian Borneo, Indonesia (Sumatra, Lombok), Philippines: Mindanao.

Remarks.— This species was numerous in the canopy of secondary rainforests, the males were, as in the other *Hamataliwa* species, much more numerous than females. In general, we found *Hamataliwa* species less frequently in the understorey habitats than in the canopy, whereas in the understorey we usually found only females.

Variability.— Additional measurements of females from other localities, here assigned to this species: Malaysia, Gombak, female, carapace 2.6 long abdomen 3.8 long. Epigyne arch width 0.55 wide, 0.37 long. Indonesia, Lombok, female, carapace 3.0, abdomen 4.0 long. Leg I 3.9-1.0-3.1-2.2-1.2 = 11.4; epigynal arch 0.45 wide, 0.32 long, distance spermathecae ½ d. Philippines, Mindanao, female, carapace 2.8 long, 2.1 wide, head 1.8 wide, eye group width 1.2, abdomen 3.4 long, 1.9 wide; epigyne 0.65 wide, 0.40 long, bottom almost flat.

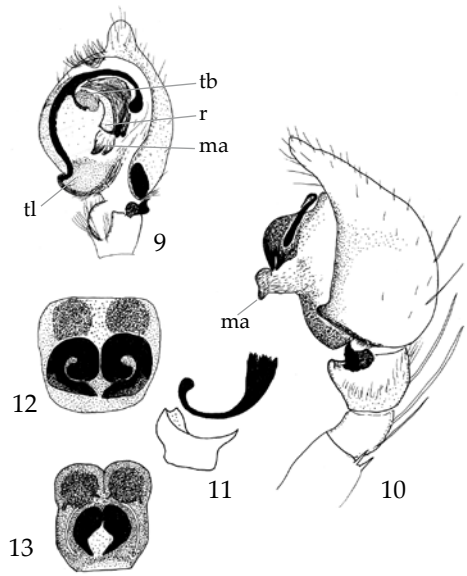
Hamataliwa vanbruggeni spec. nov.
(figs 9-13)

Type material.— Holotype ♂ (RMNH), **Malaysian Borneo**, W. Sabah, Mt. Kinabalu area, Sorinsim, 6°06'N 116°50'E, 15 year old secondary forest adjacent to primary forest, canopy fogging *Vinex pinnata* (Verbenaceae) [Loc. 37], 26.ii.1997, A. Floren; 1 ♀, same as holotype; Sorinsim, 5 yr old adjacent secondary forest, canopy fogging *Melochia umbellata* (Sterculiaceae); 1 ♂, jvs, same, tree 4, fog 1 [Loc. 25]; 1 ♂, refog same tree after 2 days [Loc. 27]; 6 ♂ together with ♂ ♀ *H. incompta*, same tree, refog after 12 days [Loc. 29]; 2 ♂, refog after 2 weeks [Loc. 34], 18.ii.-16.iii.1997, all A. Floren; Mt. Kinabalu N.P., Poring Hot Springs, 650 m, primary dipterocarp rainforest, 1 ♂, hand collecting, 6.iv.1998, C.L. Deeleman & P. Zborowski.

Other material.— E. Sabah, Danum valley Field Centre, primary dipterocarp rainforest, 1 ♂, 1 ♀, hand collecting, 6.v.1991, C.L. Deeleman & M. Goodnight (All RMNH).

The majority of the specimens were collected by fogging trees which already had been fogged one or more days earlier.

Diagnosis.— Smaller in size than *H. incompta*, 3.9-4.5 mm long, leg I 1.5 times body length. The males can be distinguished in the RTA which is a black, arched ridge turned laterally, with a pointed apophysis flexed distally (fig. 9, 10). The tegular lobe is much wider than in the other species and the ma is quite different. Females can easily be recognised by the distinctive epigyne. Both species were dominant in the canopy samples from the same patch of secondary forest in Sorinsim. Matching the males was done by use of size difference and the shape of the conductor compatable with the shape of the central void in the centre of the epigyne.



Figs 9-13. *Hamataliwa vanbruggeni* spec. nov. (Sorinsim [Loc. 37]). 9, male palp, ventral; 10, male palp, retrolateral; 11, conductor and embolus (in black); 12, epigyne, ventral; 13, epigyne, dorsal, in clove oil.

Description.— Male. Carapace 2.0 long, with white appressed hair in the eye region, sides of the carapace with more rusty hair. Clypeus almost vertical. Palp, see diagnosis. Median apophysis drawn out distally in a lanceolate apophysis. Conductor shorter and more compact than in *incompta*, reflecting the narrower central void in the epigyne; "keel" of boat-shaped conductor (fig. 11) much deeper, with almost rectangular sides with concave distal rim; embolus very thin in distal part, tip disc-like (fig. 11).

Female [Loc. 37]. Carapace 1.9 long, carapace, abdomen and legs as male. Carapace with white appressed hairs in eye region, sides of carapace with more rusty hairs. PME d 0.15, distance PME-PME 0.30. Epigyne compact, with a diamond-shaped void in the middle, posterior part flat. Spermathecae large, globular.

Distribution.— Found till now only in Sabah in N. Borneo. In the Kinabalu area only in the canopy of young secondary forest adjacent to the primary forest, one specimen in the primary forest. In Danum Valley in East Sabah by hand collecting in the primary forest.

Variability.— The male and female in Danum are larger than those in Kinabalu.

Measurements (Danum).— Male carapace 2.5 long, 2.1 wide, abdomen 2.5 long, 1.1 wide. Femur leg I 2.5. PME d 0.17, and 0.25 apart. Female carapace 2.8 long, 2.3 wide, abdomen 3.6 long, 2.0 wide Femur leg I 2.5. PME same as male. Epigyne 0.4 wide, 0.55 long, epigynal arch 0.4 wide, 0.3 long. The male genital organs are as those in the Kinabalu area, the epigyne exhibits spermathecae that are smaller and a little less than their d apart.

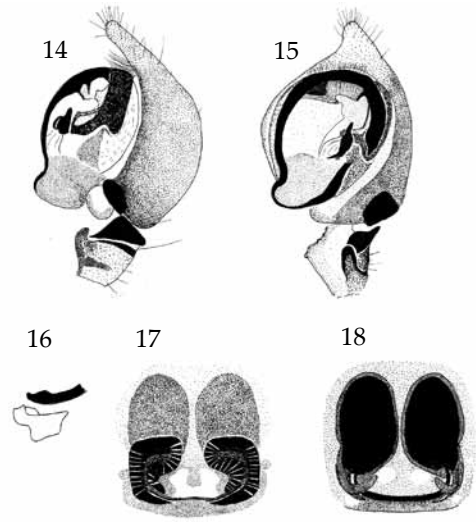
Etymology.— For Dolf van Bruggen, my study-mate and colleague for more than 60 years.

Hamataliwa floreni spec. nov.
(figs 14-18)

Type material.— Holotype ♂, 1 ♀ paratype (RMNH). **Malaysian Borneo**, W. Sabah, Crocker Range, 5°26'N 116°08'E, fogging fruit tree 3, fog 2, 22.ii.2001, A. Floren. This tree had also been fogged one day earlier.

Other material.— **Malaysian Peninsula**, Selangor, Templer's Park (Kuala Lumpur) evergreen secondary forest, 1 ♀, hanging inside a dead curled leaf; at disturbance, the female dropped 40 cm making a line, followed by a chain of immatures along the line, 30.xi.1990, C.L. Deeleman; **Indonesia**, N. Sumatra, Gunung Leuser N.P., Ketambe, primary lowland dipterocarp rainforest (destroyed since then), 1 ♀, Sudiro & Suharto, 24.viii.1984 (All RMNH).

Diagnosis.— One of the larger species, 5.6-6.4 mm long. Distinct from other species by a combination of the slanting clypeus, the RTA with black, transverse skewed triangle, with shortest side ventrally (fig. 14). The palp differs from that of *H. obtusa* (Thorell, 1890), described from Sumatra, by the RTA lacking a long, ventrally projected branch. The epigynal central depression has a wide, straight bottom, the ducts are convoluting inward then outward and down, delimiting a deep round pit. The spermathecae are massive, somewhat elongate, almost touching (fig. 18).



Figs 14-18. *Hamataliwa floreni* spec. nov. (Crocker Range, fruit plantation tree 3 fog 2). 14, male palp, retrolateral; 15, male palp, ventral; 16, conductor and embolus (in black); 17, epigyne, ventral; 18, epigyne, dorsal, in clove oil.

Description.— Male, holotype. Carapace 2.7 long, uniform reddish yellow (in alcohol), without trace of any setae. Abdomen uniform pale yellow, flanks with parallel thin black lines formed by black setae. Clypeus slanting. Male palpal median apophysis distally divergent, with concave apical edge, conductor short and square, distal prolongation strongly incurved, keel distally with concave margin, mesal attachment of conductor with chitinized margin; embolus fairly wide, uniform width, distal end strongly incurved.

Female. Carapace 2.9 long, uniform reddish yellow, without setae. Abdomen whitish, flanks with some thin parallel red lines, no setae apparent. Clypeus strongly slanting.

Distribution.— A rare but versatile species. Known from West Sabah only from a fruit tree plantation, also from Malaysia, Selangor (evergreen forest) and Sumatra from lowland rainforest.

Variability.— The only specimen from Malay peninsula is smaller than that from the type locality. Measurements of the female from Templer's Park (KL): carapace 2.5 long, 2.1 wide, head width 1.5, eye group width 1.0, clypeus slanting, abdomen 3.3 long, 1.5 wide, femur I 2.5 long, PME-PME twice d PME. Epigyne 0.5 wide, 0.6 long, epigynal arch 0.37 long.

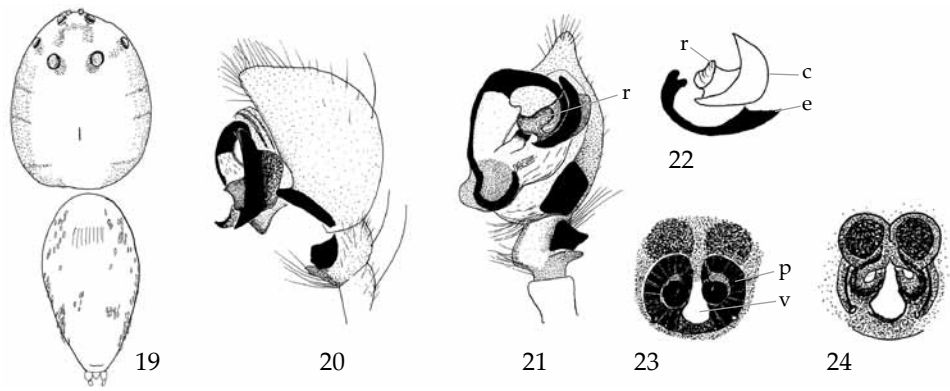
Etymology.— For Andreas Floren, who devoted the best period of his life to the rainforest, defiantly risking tropical hazardous germs, injuries, venomous snakes, obtrusive parasites and marital disharmony, for his well designed, original and ingenuous research up in the trees in Borneo.

Hamataliwa helia (Chamberlin, 1929)
(figs 19-24)

Oxyopes helius Chamberlin, 1929: 40, ♀, fig. 4, Georgia, USA.
Hamataliwa helia; Brady, 1964: 97, new combination, ♂ ♀, figs 112-114, 119-121, 124, 125, 130-133, map 5, Florida to Texas and Mexico south to Yucatan.

Material.— **Malaysian Borneo**, W. Sabah, Mt. Kinabalu area, Sorinsim, 6°06'N 116°50'E, canopy fogging, 5 year old secondary forest adjacent to primary forest, canopy fogging *Melochia umbellata* (Sterculiaceae), 2 ♂, tree 5, refog 6 after 18 days [Loc. 30], 11.iii.1997; same data, 1 ♂, tree 10, refog after 1 day [Loc. 34], 11.iii.1997; Sorinsim, 15 year old secondary forest adjacent to primary forest, canopy fogging *Vitex pinnata* (Verbenaceae), 1 ♂, tree 8, refog after 8 days [Loc. 46], 10.iii.1997, A. Floren (RMNH).
Other material.— **N. Borneo, Brunei**, Bukit Sulang, fogging canopy tree 8, 1 ♀, ix.1982, N. Stork (BMNH); **Indonesia**, Sumatra, Gunung Leuser N.P. at Bohorok, 1 ♀, 8.iii.1983, S. Djojosudharmo; W. Sumatra, Kerinci Seblat N.P., from leaves, 1 ♀, 20.vii.1983, S. Djojosudharmo; **Thailand,** Krabi Province, Had Naharatara Beach, 1 ♂, sweeping grass, 18.xii.1990, C .L. Deeleman. **South America**, British Guyana**,** Rupununi, Dadawana, savannah, 1 ♀ with egg sac containing 18 first instar young, with 1 ♂ of an undescribed species related to *H. peterjaegeri*, sweeping grass, ix.1989, G.F. and V. Mees (All RMNH).

Diagnosis.— Small species, 3.2–5.5 mm long (Brady, 1964: 497), related to *H. cordata* Zhang, Zhu & Song, 2005, with wide eye region occupying full head width, PME 3 times their d apart (fig. 19). Clypeus receding. Males are distinct by the conductor lacking the tongue-like process distally, and the epigyne with round spermathecae (figs 23, 24) (oval in *H. cordata*). Genital organs resemble *H. vanbruggeni*, but in male palpal conductor there is distally a chitinous outgrowth along the edge of the attachment membrane, serving as a roof over the tip of the embolus (fig. 21). The epigyne has a narrow, pear-shaped void, distinct from that of *H. vanbruggeni* by the presence of a distinct chitinized poste-



Figs 19-24. *Hamataliwa helia* (Chamberlin, 1929) (Sorinsim [Loc.30]). 19, habitus, male; 20, male palp, retrolateral; 21, male palp, ventral; 22, male palp, conductor and embolus (in black); 23, epigyne (Brunei, canopy), ventral; 24, epigyne, dorsal, in clove oil.

rior bridge with round black pitted discs in the middle, marking the copulatory pores.

Description.— Male. Leg I twice body length. Carapace yellow or brown, with very few setae; sides ornamented with slightly darker, very finely dotted longitudinal lines and with transverse vague but fine stripes, more or less radiating from the fovea. Eye region occupying the full head width, PME 3 d apart. Anterior angle of abdomen with some thin black erect setae, rest of abdomen covered with appressed silvery white and rusty flattened setae. RTA embedded in concavity of distal surface of tibia, triangular with wide base. Tegulum with relatively large, widened tegular lobe. Median apophysis distally drawn out into a long, thin stick, curved and apically tapering. Embolus with wide base, narrowing considerably, apical end strongly curved inward and when in rest, inserted between conductor tip and chitinous roofing extension.

Female, Brunei. Leg I 1.5 × body length. Shape and ornamentation of carapace and abdomen as male. Clypeus straight and vertical. Abdomen dorsally occupied by broad white band, partly covered with silvery white setae. Anterior face of abdomen with a paired area with blackish setae, posteriorly continued with a zone striped with red and grey; venter uniform grey with two white lines. Epigyne, see diagnosis. The female is indistinguishable from an examined specimen of *H. helia* collected in British Guyana, South America.

Distribution.— USA: Florida, California, Texas; Mexico; British Guyana: Rupununi savannah, sweeping shrub. Malaysia, W. Sabah: Kinabalu N.P. at Sorinsim, young secondary forest, canopy fogging; Brunei: Bukit Sulang, primary forest, canopy fogging; Indonesia: Sumatra; S. Thailand: Krabi, sweeping grass near beach.

Remarks.— One specimen of this species from British Guyana from our general collection was compared with the Bornean material and the identity confirmed. This is the most ubiquitous species so far, travelling in tree tops of all kinds of forest, and equally haunting grassland and savannahs. It probably avoids dark and humid environments such as evergreen rainforest. In Brunei, the fogging allegedly was done relatively high up in the tree crowns of mature primary forest and the spiders may prefer tree tops rather than darker, more humid lower zones. In Sorinsim, trees were not yet very high and fogging was carried out from the ground. Remarkably, all specimens sampled in Sorinsim came from refogging trees which had been fogged shortly earlier. This confirms the high volatility of this species, moving around constantly.

The male from Thailand is somewhat different from that from the other localities. The carapace is uniform dark brown, 1.7 long, 1.3 wide; the eye group is 0.9 mm wide on a head width of 1.0; the distance between PME is 3.5 × their d. Abdomen covered with silvery appressed hairs, length 1.7, width 0.9. Leg I 1.5-0.4-1.3-1.3-0.8 = 5.3.

Hamataliwa pricompta spec. nov.
(figs 25-31)

Type material.— Holotype ♂ (RMNH), **Malaysian Borneo**, W. Sabah, Mt. Kinabalu area, Poring Hot Springs, 500-700 m, 5°59'N 116°42'E, canopy fogging, day fogging tree 52, *Aporusa* sp. (Euphorbiaceae) [Loc. 6], 27.ii.1996; 1 ♂, 1 ♀ paratypes, same data; Poring Hot Springs, 1 ♂, "ridge", canopy fogging [Loc. 18], 3.iii.1996, A. Floren.

Other material.— **Indonesia**, W. Sumatra, Kerinci Seblat N.P., 800 m, near river, 1 ♀, from leaves, 20.vii.1988, S. Djojosudharmo. All RMNH.

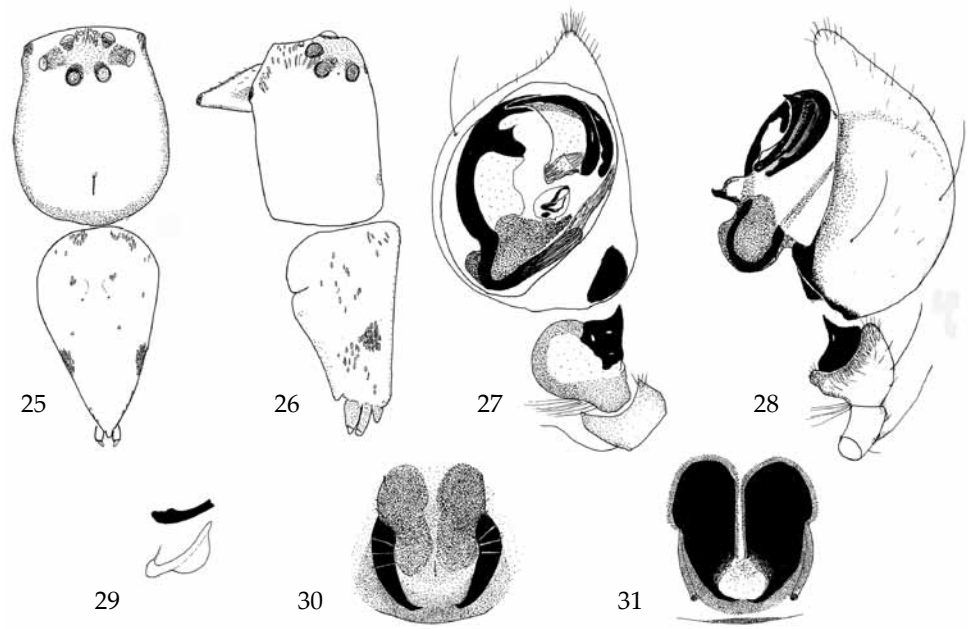
Diagnosis.— Larger species, 5.9-6.3 mm long, resembling *H. incompta* and *H. vanbruggeni*. These species share the presence of a transverse bar at the base of the embolus; the shape of the conductor is similar and all three species have a distal attachment branch with a strongly chitinized rim; it differs from both species by the much wider tegular lobe (fig. 28). Furthermore the RTA is larger and flatter, triangular with a pronounced thorn. The transverse branch at the base of the embolus is nearer to the conductor than in *H. inprompta*, the embolus is much thinner in *H. incompta*, in *H. pricompta* it is 2.5 times thicker and has small crescences near the tip; the tip of the conductor is wider accordingly. The epigyne is narrower and angular, the copulatory ducts are wider. The epigyne is allegedly (Thorell, 1890) wider than that in *H. latifrons*. Male palp resembles that in *H. ursa*, but the tegular lobe is much larger and the embolus is different.

Description.— Male. Carapace dark yellowish. Head relatively wide. Clypeus vertical. PME 1-1.5 d apart. Abdomen pale, with a few rusty, flattened setae, behind the middle a lateral protruding lobe composed of dark red-brown apressed hair. Venter pale. Median apophysis distally widely truncate, ventral angle produced into a tooth; conductor's distal end broadly rounded in ventral view, proximal branch barely longer than distal branch and shorter than in *H. incompta*.

Female as in male; abdomen devoid of setae, surface covered with irregular snowy patches. The central depression of the epigyne is almost circular.

Distribution.— Found in primary forest in Poring Hot Springs, in the canopy also in W. Sumatra in Kerinci Seblat N.P. by hand collecting.

Etymology.— From *incompta* and *pri*, near: species closely related to *incompta*, from primary forest.



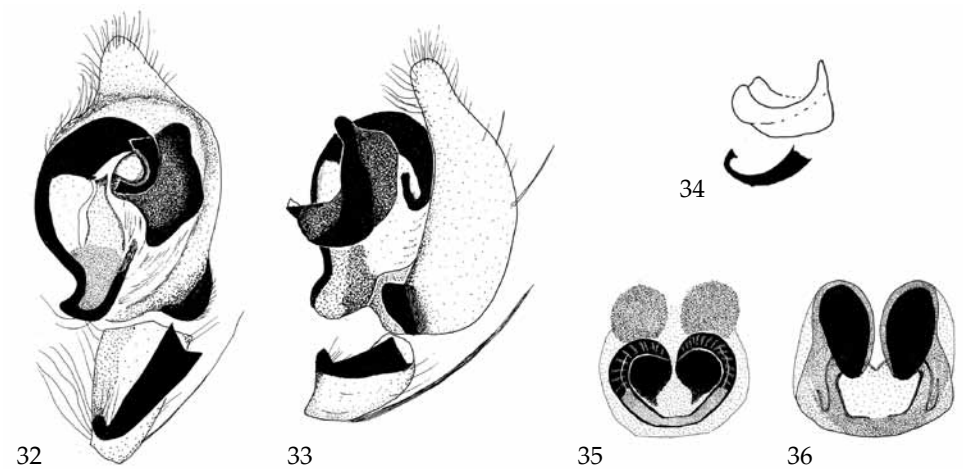
Figs 25-31. *Hamataliwa pricompta* spec. nov. (Poring Hot Springs [Loc. 6]). 25, habitus, male; 26, habitus, male, lateral; 27, male palp; 28, male palp, lateral; 29, male palp, conductor and embolus (in black); 30, epigyne, ventral; 31, epigyne, dorsal, in clove oil.

Hamataliwa peterjaegeri spec. nov.
(figs 32-36)

Type material.— Holotype ♂ (RMNH), **Malaysian Borneo**, W. Sabah, Mt. Kinabalu area, Poring Hot Springs, 500-700 m, 5°59'N 116°42'E, canopy fogging, night fogging *Aporusa* sp. (Euphorbiaceae) [Loc. 5], 26.ii.1996; 1 ♂, 1 ♀ paratypes, same data; 1 ♂, [Loc. 15], 20.iii.1996; 1 ♂, fogging *Aporusa subcaudata* tree 50, refog after 3 years [Loc. 13], 23.ii.1996; 1 ♂, 1 ♀, fogging *Aporusa subcaudata* tree 51, refog after 3 years [Loc. 14], 19.ii.1996; 1 ♂, 1 ♀, canopy fogging *Aglaia* sp. (Meliaceae), refog 5 after 2 days [Loc. 15], 20.iii.1996, 1 ♀, same tree, refog 5 [Loc. 17], 23.iii.1996; 1 ♂, tree on "ridge", first fog [Loc. 18], 3.iii.1996. All A. Floren (All RMNH).
Other material.— N. Borneo, Brunei, Bukit Sulang, fogging canopy tree 8, 1 ♀, ix.1982, N. Stork (BMNH).

Diagnosis.— Medium-sized species, 5.2-5.7 mm, related to *H. vanbruggeni*, but larger in size; characterized by the RTA which presents an elongate transverse ridge (fig. 32, 33), ending dorsally in a sharp angle. Epigyne resembling that of *H. pricompta*, but the epigynal rim is anteriorly strongly coiled inward, the void is apple-shaped (fig. 35), and in the anterior corners a black swelling is seen where the ducts twist towards the spermathecae.

Description.— Male, holotype. Carapace yellow or brown, with very few scales; some white setae in the eye region. PME eyes 1 d apart. Clypeus almost vertical. Abdomen pale, sides striated with rows of appressed, rusty red, flattened setae. Tibia I-IV with proximally a series of thin, erect recurved setae. RTA embedded in a concavity between the ventral projection, as a transverse black ridge oblique slanting the distal margin of the tibia, ending in a dorsal pointed angle. Median apophysis with sclerotized, distally oblique rim. Conductor compact, distally strongly tilted, cup-shaped with a little tooth. Embolus (fig. 34) with very wide base, narrowing considerably, apical end strongly curved inward and with slightly divergent tip.



Figs 32-36. *Hamataliwa peterjaegeri* spec. nov. 32, male palp, ventral (Poring Hot Springs, [Loc.15]); 33, male palp, retrolateral; 34, male palp, conductor and embolus (in black); 35, epigyne, ventral [Loc. 3]; 36, epigyne, dorsal, in clove oil [Loc. 15].

Female. Carapace and abdomen as in male. Ornamentation of carapace and abdomen as in male. Clypeus slightly slanting. Abdomen ventrally with broad band of rusty flattened setae. Anterior face of abdomen with some reddish setae. Posterior surface with white granulated snowy dots. Epigyne, see diagnosis.

Distribution.— Borneo: W. Sabah, Kinabalu N.P., only in old primary forest, by canopy fogging; Brunei: Bukit Sulang, primary forest, canopy fogging.

Etymology.— For Peter Jaeger, a colleague very dear to me and one of the very few arachnologist taxonomists, like myself, collecting and working on SE Asian spiders.

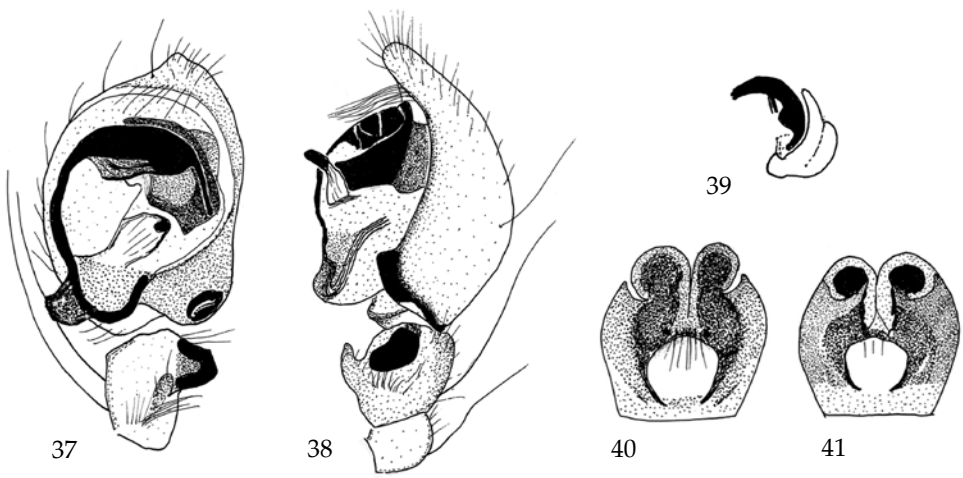
Note. A male of a closely related, probably undescribed species was found with the female of *H. helia*, in Rupununi, British Guyana.

Hamataliwa ignifuga spec. nov.
(figs 37-41)

Type material.— Holotype ♀ (RMNH), **Malaysian Borneo,** W. Sabah, Kinabalu N.P., Poring Hot Springs, 600-700 m, primary forest, night fogging *Aporusa lagenomorpha* (Euphorbiaceae), 29.iii.1998; 1 ♂, same data; 1 ♀, night fogging, *Ochanostachys amentata* (Oleaceae) [1998.1+2], 27.iii.1998; 1 ♀, night fogging *Ficus leptogramma* (Moraceae) [1998.11], 30.iii.1998. All A. Floren (RMNH).
Other material.— **Indonesia**, E. Kalimantan, Sepaku, remains of stand of primary rainforest 40 km N. of Balikpapan, from leaves, 1 ♂, 16.vii.1979, P.R. Deeleman (RMNH).

Diagnosis.— A small species, 4.2-4.6 mm, with PME 2 d apart. The epigyne has a circular, posteriorly open depression in the posterior half of the epigyne, rim and copulatory ducts are not touching anteriorly; the spermathecae are small, barely protruding anteriorly from ring. Male palpal conductor is short, when viewed from side it is distally broad and square, the keel deep and rounded (fig. 39).

Description.— Female. Carapace rusty yellow, sides marked with finely dotted, ra-



Figs 37-41. *Hamataliwa ignifuga* spec. nov. (Poring Hot Springs [1998]). 37, male palp, ventral [Xa 12 fog 1]; 38, male palp, retrolateral with short, thick conductor; 39, male palp, conductor and embolus (in black); 40, epigyne, ventral [1998.10]; 41, epigyne, dorsal, clove oil.

diating stripes along the flanks, clypeus almost vertical, rear face vertical. Abdomen dorsally covered with silvery shining, appressed setea, laterally with parallel lines of dark red setae.

Male as the female; abdomen lacking appressed setae. Palpal RTA base sunk in concavity, seen from side large and rounded. Median apophysis gradually tapering, distal part chitinized, curved. Embolus originating close to the conductor, very broad at base and fully covering the broad excavation of the conductor (fig. 37); tip of embolus thin and strongly coiled.

Distribution.— Borneo: in West Sabah in the canopy of primary forest at Poring Hot Springs. Also in the understorey in a stand of primary forest in eastern Kalimantan.

Etymology.— This species turned up in the samples from the canopy in March 1998, in the very same trees where *H. peterjaegeri* had been collected two years earlier. The year 1998 was most unusual, remembered by the extreme droughts after an El Niño event; in large parts of Borneo and Sumatra the forest was burning for months after, the smoke causing eye and respiration problems as far as northern Australia. *ignis* = fire, *fuga* = flee (Latin).

The following species is distributed over a large area in Malaysian Borneo and Indonesia. The epigyne is quite distinctive and although it was not found in the canopy, inclusion of this species would enhance the value of this paper because of its wide distribution.

Hamataliwa catenula spec. nov.
(figs 42, 43)

Type material.— Holotype ♀ (RMNH), **Malaysian Borneo**, E. Sabah, Danum Valley Field Centre, primary dipterocarp rainforest, hand collecting, 6.v.1991, C.L. Deeleman & M. Goodnight; this female was guarding an egg sac wrapped in leaf fragments.
Other material.— **Malaysian Peninsula**, Selangor, Gombak Research Station N. of Kuala Lumpur, secondary evergreen forest, 1 ♀, clinging on dead leaf which was hanging on thread, 4.vii.1992, C.L. Deeleman & J.C. van Kempen; **Indonesia**, Lesser Sunda Islands, Central Bali, Mekori Temple garden (Blimbing), 2 ♀, 31.viii.1992, C.L. Deeleman & J.C. van Kempen; Central Flores, Moni (Mount Kelimutu), 500 m, secondary forest, 1 ♀, in leaf litter, 19.viii.1992, C.L. Deeleman & J.C. van Kempen.

Diagnosis.— Small, pale spider, 3.4 – 3.5 mm, with a high carapace, slanting in front, rear face almost vertical. Distance PME 2 d. The epigyne does not resemble that of any of the species described from Borneo, China or the Americas. The rim (fig. 42) is ring-like, copulatory pores are situated at the posterior end in the middle, leading through a pair of arched outer ducts towards the spermathecae; the latter are round, almost touching. Fertilisation openings are probably situated inside the ring.

42

43

Figs 42-43. *Hamataliwa catenula* spec. nov. 42, epigyne, ventral; 43, epigyne, dorsal, in clove oil.

Description.— Some specimens virtually hairless, others with rusty flattened setae on sides of carapace, clypeus, front surface of abdomen and on flanks. Tibiae with a series of long curved trichobothria dorsally.

Variabililty.— Gombak: carapace 1.7 long, Mekori: 1.7, Flores: 1.6.

Distribution.— Malay peninsula, E. Sabah in Borneo; Indonesia: Lesser Sunda Islands Lombok and Flores.

Etymology.— (Latin) *catena*, chain. The epithet refers to the shape of the epigyne, resembling the beads of a chain.

Hamadruas nov. gen.

Type species: *Oxyopes hieroglyphicus* Thorell, 1887.

Diagnosis.— Large spiders, 7-15 mm, females usually larger than males; abdomen dorsally often with species-specific geometric colour pattern. Species in this genus are distinguished by the carapace being lower, the head having straight sides sinuating to the thorax instead of regularly convex as in *Hamataliwa* and *Tapponia;* the head width is 25% less than carapace width and the carapace dorsally has a shallow saddle, and is higher in front than behind; front and rear face are slightly sloping and rear slope is shorter than front slope: in *Hamataliwa* the rear slope is longer than the front slope. The legs are relatively much longer than in *Hawatalima*, I>II>III>IV. The abdomen is 50-100% longer than the carapace and differently shaped from that in *Tapponia* and *Hamataliwa*; it is parallel-sided. The epigyne is probably indistinguishable from that in *Hamataliwa* and *Tapponia*, the male palp is distinct by the tegular lobe in which the spermaphore loops around, crossing itself around a pit (figs 46, 52, 59), and by the presence of a flange on the basal part of the embolus (f in figs 46, 52, 59). The surface of the abdomen is green in life (*H. superba*), with a pattern of brown and white pigment causing for the colours, as opposed to *Hamataliwa,* where all colour is effected by non-iridescent setae, white, dark or rusty red (except in New World species).

Distinguishing between the species of *Hamadruas* is easiest by the abdominal pattern; in males by the shape of the embolus tip, shape of conductor and embolus and the distal chitin bulge on the RTA, females by the size, shape and structure of the epigyne.

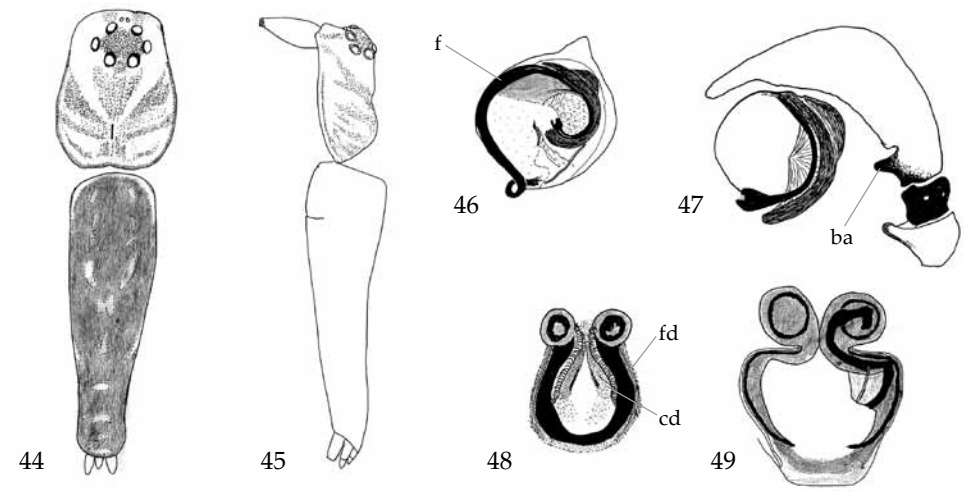
Remarks.— The illustrations of the genital organs of *H. sikkimensis* sensu Zhang, Zhu & Song (2005) do not agree with those of Tikader & Biswas (1981: pl. 8 fig. 108-109), neither does the description of the pattern of the venter.

Distribution.— At present known from Burma, Thailand, Malaysia, Borneo, Indonesia (Sumatra, Lombok), India and China.

Etymology.— From Greek mythology: *H. hamadruas* is a class of Nymphs of which each individual inhabits one tree all her life, guarding it and protecting it. May they fulfil their task successfully! The gender is feminine.

Hamadruas superba (Thorell, 1887) comb. nov.
(figs 44-49, 69)

Oxyopes superbus Thorell, 1887: 335, ♂, ♀, Burma: Bhamo (examined (RES)).
Tapponia superba; Thorell, 1895: 254.
Tapponia superba; Deeleman-Reinhold, 2004: 49, fig 18 (♂).
"*Tapponia cf. hieroglyphica*"; Deeleman-Reinhold, 2004: 42, figs 10-15 (♂ ♀).



Figs 44-49. *Hamadruas superba* (Thorell, 1887) (Poring Hot Springs). 44, habitus, male; 45, habitus from side; 46, palpal bulbus, ventral [Loc. 5]; 47, male palp, retrolateral [Loc. 5]; 48, epigyne, ventral [Xa 12 fog 1]; 49, epigyne with stuck embolus, dorsal.

Material.— 1 ♂, 1 ♀, **Burma**, Bhamo (RES 15986), 1 ♀, Tonghoo, leg. E.W. Oates (RES 1595c); **Malaysian Borneo**, W. Sabah, Kinabalu N.P., Poring Hot Springs 600-700 m, 5°59'N 116°42'E, primary dipterocarp rainforest, 1 ♂, canopy, fogging *Xanthophyllum affine* (Polygalaceae) [Xa 12], 20.iv.1992; 2 ♂, fogging *Aporusa* sp. (Euphorbiaceae) [Loc. 5], 26.ii.1996, leg. A. Floren; 1 ♂, hand collecting, both palps bitten off, 2.iv.1998, 1 ♀ hand collecting, with stuck embolus, 30.iii.1998, C.L. Deeleman & P. Zborowski; 2 ♂, Poring lowland, primary forest, canopy fogging, ix.2006, A. Floren; W. Sarawak, Semengoh Arboretum, experimental patch of primary dipterocarp rainforest, 1 ♀, hand collecting from leaves, 23.iii.1985, P.R. & C.L. Deeleman; **Indonesia**, Kalimantan (Borneo), Sepaku (40 km N. of Balikpapan), degraded remains of stand of primary rainforest, 1 ♂, hand collecting from leaves, 2.viii.1980, P.R. & C.L. Deeleman; **Thailand**, Nakhon Ratchasima Province, Khao Yai N.P., 800 m, evergreen forest, 1 ♀ with egg sac with immatures in curled brown leaf, 11.xi.1987 (All RMNH).

Diagnosis.— This species is closely related to *H. hieroglyphica*, and probably often incorrectly identified because the epigynes are very similar, but of smaller size (6.7-9.5 long). It is distinguishable from all other species by the contrasting, dark brown distal part of the chelicerae. The abdominal pattern of series of central white spots is characteristic; the rusty spot in the centre of the anterior half, visible in the live specimen (fig. 69) shows as pale violet in alcohol. The venter is as in *H. hieroglyphica*. Legs much darker, the ventral side of femora entirely dark brown. The embolus tip is distinctive, excavated; the embolar base is further removed from the conductor and the flange is larger and extended much further than in *H. hieroglyphica*, to halfway the conductor (fig. 46). The epigyne is indistinguishable from *H. hieroglyphica;* Thorell himself admits (Thorell, 1887: 336) that he is unable to provide differences.

Description.— Total length male 9 mm, female 11 mm according to original description. The smallest male in Borneo is 6.6 mm, the largest 8 mm, the smallest female is 9.5 mm, the largest 11.9 mm. Male palp as in *H. hieroglyphica*, RTA similar but more produced and acuminate dorsally and lacking fractures-like basal strip; median apophysis'

distal rim S-shaped. The embolar flange includes part of a thin sperm-duct; in the embolus the widened tip is apically excavated.

Distribution.— Burma, Thailand, Borneo.

Hamadruas severa (Thorell, 1895)
(figs 50-56)

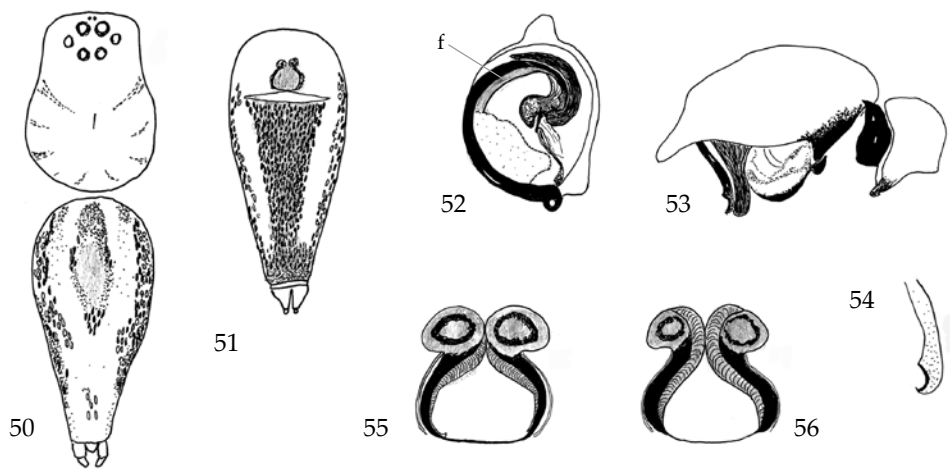
Tapponia severa Thorell, 1895: 255, ♂, ♀, Burma, Tharrawaddi, Rangoon (BMNH).

Type material.— 1 ♂, 3 ♀, Tharrawaddy; 1 ♀, Rangoon, 1971/26 BMNH (females in alcohol, 2 ♀ pinned (!)), E.W. Forbes, examined.
Other material.— Indonesia, Lombok Island, Kute, 1 ♂ 1 ♀, secondary forest, from leaves, 10.i.1990, S. Djojosudharmo (RMNH).

Diagnosis.— Medium-sized species, 7.3-8.9 mm long; carapace yellow-brown in alcohol with deep brown clypeus and chelicerae. Legs uniform dark, with lighter bands on tibiae and metatarsi in the female. Abdomen in male damaged, in female light dorsum with in anterior half an elongate band with lighter centre (fig. 50). Venter all dark with adjacent white lateral bands. Sides with anteriorly a white stripe, ventral to it and posteriorly with alternative black and white narrow stripes continued to spinnerets. All mentioned surfaces covered with flattened setae, coloured correspondingly white or dark brown.

Description.— Male from Lombok, RTA a distal chitin bulge, from side shiny black, wider than long, distal margin slightly excavated, ending dorsally in a sharp tip (fig. 53). Median apophysis fan-shaped with wider than long, smooth and slightly concave edge; conductor's mesal-distal attachment branch with a conspicuous, strongly chitinized, undulating rim (fig. 53); embolus with thin flange, tip narrow, with shallow excavation (fig. 53, 54). Base of embolus well distantiated from conductor (fig. 52).

Distribution.— Burma (Myanmar); Indonesia, Lombok.



Figs 50-56. *Hamadruas severa* (Thorell, 1895) (Indonesia, Lombok). 50, female, habitus dorsal; 51, abdomen, ventral; 52, palpal bulbus, ventral; 53, male palp, retrolateral; 54, tip of embolus, 55, epigyne, ventral; 56, epigyne, dorsal, in clove oil.

Hamadruas hieroglyphica (Thorell, 1887)
(figs 57-63)

Oxyopes hieroglyphicus Thorell, 1887: 332, ♀, Burma, Bhamo, Shwegoo-myo.
Tapponia hieroglyphica, Thorell, 1895: 254, ♂, Rangoon.

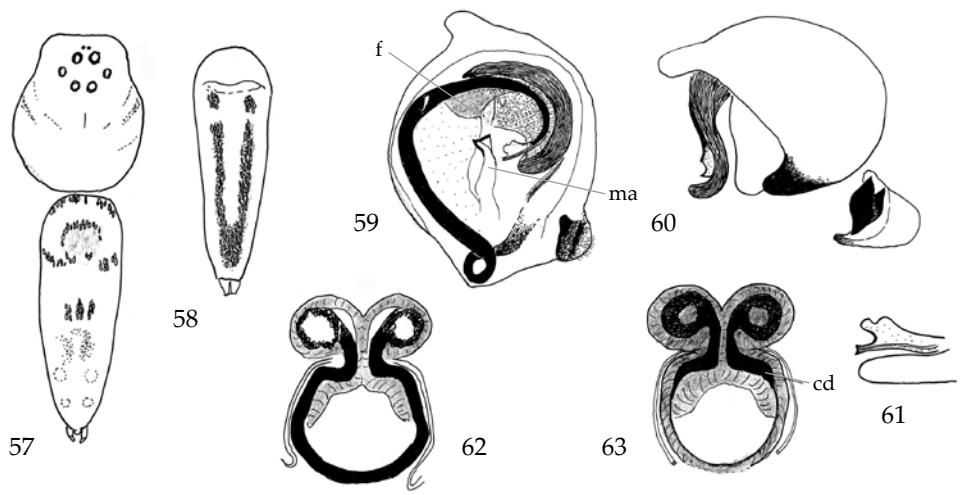
Material.— 1 ♂(lectotype), 1 ♀, 1 subad. ♀, labelled "*Tapponia hieroglyphica* Bhamo" (not in Thorell's hand-writing); type ?, MCSNG, examined; 2 ♂, 1 sub ♀, Burma, Palon (RES 15956), examined.

Note.— The original description (1887) was based on a female from Bhamo; no male was then available to Thorell. In 1895 Thorell obtained the first male of presumably this species (Thorell, 1895: 254); this material came from Rangoon, collected by Oates and probably deposited in London. Other material of this species from Palon and Tonghoo (Burma) have been deposited in Stockholm, but cannot be considered to be type material. Subsequently Thorell described two other closely related species from Burma. Epigynes in these spiders are rather similar. The species *H. hieroglyphica, H. superba* and *H. severa* differ furthermore in size, pattern of the abdomen and male palpal structures. The male from Bhamo is, like the female type specimen, of large size and therefore I consider it to be true *H. hieroglyphica,* although the abdominal pattern is completely faded.

Diagnosis.— Large species, female total length 14-15 mm, leg I 1.5 times total length.

Epigyne dorsally flat as opposed to *H. severa* where the copulatory ducts are arching up dorsally (internally). Abdomen with numerous small white spots over the whole length, round or elongate, surrounded by black; some are arranged in longitudinal rows, others dispersed (according to the original description). Chelicerae uniform greyish yellow. Carapace as long as tibia + ¼ patella of leg IV (description Thorell, 1887).

Redescription.— The lectotype (here designated) has lost all pattern. The male and female from Palon (RES 15956) show the abdominal pattern as described. Abdominal



Figs 57-63. *Hamadruas hieroglyphica* (Thorell, 1887) (Bhamo). 57, subadult female, dorsal; 58, subadult female abdomen, ventral; 59, palpal bulbus, ventral; 60, male palp, retrolateral; 61, tip of embolus and conductor; 62, epigyne, ventral; 63, epigyne, dorsal, in clove oil.

ventral pattern as in fig. 58, coloured bands are effected by pigment in the skin and partly covered with flattened appressed setae; rear end with four round dots in a square; femora with double ventral dark line of grey pigment. Male palps (separated from body): RTA with distal chitin bulge, seen from side shiny black, evenly rounded, with blunt tip in the middle; at the base a fractured strip is seen. Median apophysis with square, straight distal rim. Embolus flange overlapping conductor base, with a narrow oval space in between; embolus widening at tip, frayed (fig. 61).

Distribution.— Only recorded from Burma.

Tapponia Simon, 1885

Tapponia Simon, 1885: 37. Type species *Tapponia micans* Simon, 1885.

Other species.— None.

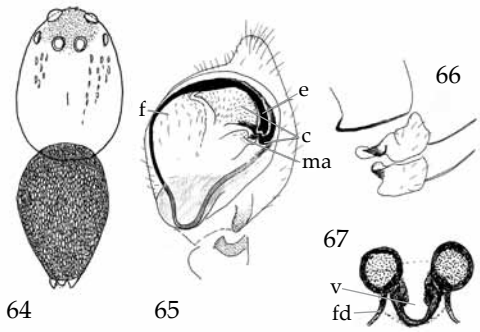
Tapponia micans Simon, 1885
(figs 64-67)

Tapponia micans Simon, 1885a: 37 (♀, Sumatra).
Tapponia micans; Simon, 1898a: 380, fig. 381.
Tapponia micans; Deeleman-Reinhold, 2004: 42, fig. 1-4, ♂, Sumatra, Borneo, Malaysia.

Type material.— 1 ♂, 1 ♀, 1 juv, MNHN 20886, Sumatra, leg. Weyers, examined.
Other material.— **Indonesia**, Sumatra, Gunung Leuser National Park, Bohorok, primary dipterocarp rainforest; Ketambe, primary dipterocarp rainforest; Kerinci Seblat N.P., 800 m, evergreen forest; Borneo, Kalimantan, 2°02'S 113°40'E, Kaharian, primary bog forest, all S. Djojosudharmo; **Malaysian peninsula,** Selangor, Templer's Park, secondary forest, 1 ♀, 19.iii.1985, P.R. & C.L. Deeleman; **Malaysian Borneo**, Kinabalu area, 1 ♀, Sorinsim , 6°06'N 116°50'E, 15 year old adjacent secondary forest, fogging canopy *Vinex pinnata* (Verbenaceae) [Loc. 40], refog after one day, 27.ii.1997, A. Floren; 1 ♂, Poring Hot Springs, 5°59'N 116°42'E , 600-700 m, primary dipterocarp rainforest, fogging canopy *Aporusa* sp. (Euphorbiaceae) [Loc. 5], 26.ii.1996, A. Floren (All RMNH).

Diagnosis.— Small species, 3.3 – 3.4 mm long. PER almost straight, line connecting anterior margin of PME with posterior margin of PLE recurving. Clypeus relatively short, equal to distance ALE-ALE, receding. Abdomen and carapace with iridescent flat setae. Legs: I>II>IV> III. Epigyne similar to *Hamataliwa* species: a U-shaped chitinized ridge, posterior part a semicircular bridge, anteriorly open and connected with a pair of black globular spermathecae.

Description.— Male (Sumatra, Kerinci Seblat). Carapace shiny brown, eye area black, length eye region ¼ of carapace length. Surface densely covered



Figs 64-67. *Tapponia micans* Simon, 1885. 64, male, habitus (Borneo); 65, male palp, ventral (Borneo); 66, male palp, patella, tibia, basal part of cymbium, retrolateral; 67, female epigyne, ventral (Sumatra Kerinci).

with very fine rowes of shallow dots. Carapace egg-shaped, anteriorly regularly arched, sides not sinuated. From side carapace higher behind than in front, clypeus and rear face receding. Distance PME-PME 1 d or less. Mouthparts as in *Hamataliwa,* chelicerae almost 3 times longer than clypeus, receding under carapace. Head and dorsal side and flanks of abdomen densely covered with appressed, greenish iridescent setae. Venter dark, smooth. Male palp patella with short apophysis, tibia with long transverse finger-like retrolatral apophysis situated proximally; in the distal tibial depression a thin lobed ridge. Tegulum with wide U-shaped tegular lobe, somewhat variable in shape, median apohysis with chitinized acuminate tip, conductor boat-shaped, proximal end shorter than distal end, embolus with thick white flange in the basal part, distally very thin and strongly curved towards the tip.

Female (Sumatra, Kerinci) as male. Abdomen, dorsum and sides densely covered with deep purple, iridescent, appressed, flattened setae. Venter pale, with thin hairs.

Species transfers from *Tapponia*.— Apart from the type species, all species listed in *Tapponia* (see Platnick, 2009) are unrelated to the type species and belong either in *Hamataliwa* or in *Hamadruas*. As a consequence, the following transfers are proposed: *Hamataliwa incompta* (Thorell, 1895) comb. nov., Malaysian Borneo, Malaysian Peninsula, Thailand, Indonesia, Philippines; *Hamataliwa fronto* (Thorell, 1890) comb. nov., Sumatra; *Hamataliwa latifrons* (Thorell, 1890) comb. nov., Sumatra; *Hamataliwa obtusa* (Thorell, 1890) comb. nov., Sumatra; and *Hamataliwa cornuta* (Thorell, 1895) comb. nov., Burma.

The following species are to be transferred from *Tapponia* to *Hamadruas*: *Hamadruas hieroglyphica* (Thorell, 1887) comb. nov., Burma; *Hamadruas superba* (Thorell, 1887) comb. nov., Burma, Thailand, Borneo; *Hamadruas severa* (Thorell, 1895) comb. nov., Burma, Indonesia; *Hamadruas pupula* Thorell, 1890, comb. nov., Nias; *Hamadruas signifera* (Doleschall, 1859) comb. nov., Java; *Hamadruas insulana* (Thorell, 1891) comb. nov., Nicobar Islands; *Hamadruas austera* (Thorell, 1894) comb. nov., Singapore; *Hamadruas heterosticta* (Pocock, 1897) comb. nov., Bacan Island (Halmahera) and *Hamadruas sikkimensis* (Tikader, 1970) comb. nov., India, China.

Remarks on mobility and dispersal in Asian *Hamataliwa* species

Some sampled trees were fogged several times with intervals of one day to several weeks, as an experiment to assess the volatility and migrating activities of the arthropod fauna. The majority of captured males of *Hamataliwa* species were in such refogging samples. Thus all specimens of *H. helia* and *H. floreni* and part of the specimens (all males) of *H. vanbruggeni* and *H. incompta* were found in refogging samples from the crowns of the younger (5-15 years old) regrowth of deforested patches adjacent to primary forest and in the fruit plantation, indicating a high mobility and volatility. This shows that *Hamataliwa* can be very mobile and actively moving from tree to tree. The species mentioned were not found in any of the sampled trees in primary forest. As fogging was done in the lower canopy only (10-20 m), it can be imagined that these species do occur in primary forest too, but prefer the lighter parts higher up in the trees. There is evidence that females behave somewhat differently and come down to the ground more often.

Hamataliwa does not make webs for catching prey, but forrage by active hunting. In Mulu several specimens of *H. incompta* were found running on the plank walk at high speed; when disturbed they made big leaps; several individuals escaped that way. Prob-

Figs 68-70. Photographs of spiders (courtesy of P. Zborowski). 68, *Hamataliwa incompta*, female (Sarawak); 69, *Hamadruas superba*, Kinabalu (Poring Hot Springs); 70, Live *Alycaeus* snails suspended on a vertical limestone wall (Gunung Mulu, Sarawak).

ably they move from tree to tree, as usual in spiders, by bridging with strands of silk, but maybe they occasionally also walk along branches and jump to the next tree. *Hamataliwa helia* has an amazing distribution pattern across the Pacific Ocean. Dispersal of this species appears to be autogenic, as it cannot be attributed to human activities such as transport of ground or organic material, with which other spiders often hitch-hike. Locality citations of *H. helia* suggest that the species is anthropophobous rather than anthropophilous. It could even be hypothetised that they travel long-distance trajects through the air with the aid of a ballooning line; the numerous, unusually long, thin, erect leg spines may enhance air friction too. It is known that vertical air currents may rise up to 10 kilometres, transporting spores and seeds. Spiders have been observed travelling eastwards in cy-

clones over the Pacific, bridging thousands of kilometres; birds also use these air currents to make long-distance flights effortlessly (Geiger, 1965; Stoutjesdijk & Barkman, 1991: 28). *H. helia* may be the species with the largest autonomous distribution of the genus so far, if not of all spiders, as it was found in all kinds of forest from tropical Asia to South and North America; it also haunts grassy savannahs (see record from British Guyana). Future studies may show that relatives of *H. helia* are also very widespread.

Interestingly, the versatile canopy species of *Hamataliwa* mentioned seem to live entirely separated from three other species (all new), all collected in the primary forest: *H. peterjaegeri, H. pricompta* and *H. ignifuga* were not found in any of the secondary forest plots.

The species of *Hamadruas* probably have a different way of life, and are much easier to catch by hand. All specimens of the latter genus (11) came from either canopy or hand-collecting in primary forest.

Spiders and snails

During a visit to Gunung Mulu Park in northern Borneo in October 2003, when kneeling on the ground next to a vertical limestone slab, small objects suspended by thin lines on the slab surface were noticed. These objects proved to be small land snails. Other vertical walls nearby also bore similar dangling shells. The lines looked like silk lines (fig. 70). It appeared logical to associate the lines with spiders, supposing that spiders might use empty shells as shelter: free hanging, the shells would provide a safe place to rest. In total 28 shells containing spiders were collected and preserved in alcohol. Back in the lab, the shells were examined under a microscope. A total of nine spiderlings in their third or fourth instar were found. The lines had disappeared in alcohol and their origin could not be examined.

All the shells were sealed inside and the snails were apparently alive when collected. In one of the shells a spiderling was still present in the cavity formed by the shell aperture and the lid. No adult spiders were found near or in the shells, but one adult and several immature *Hamataliwa incompta* were seen and caught not far from the collecting site. The morphology of the spiderlings found in snail shells was consistent with *H. incompta*. Dolf van Bruggen (pers. comm.) identified the snails as a species of *Alycaeus* (Cyclophoridae).

Spiders are known to hide their egg sac inside rolled or folded leaves, in fissures, under bark etc. But doing that inside a shell on the outer surface of the lid of a live snail would make no sense, as the available space left by the living snail seems insufficient for an oxyopid egg sac. One case of sparassid spiders has been described and well documented from Madagascar (Fage, 1926), where the spiders were observed gathering empty snail shells on the ground, attaching a silk line, then walking up into the shrubbery along with the other end of the line and hauling up the shell towards their resting place, where they settled inside their acquisition for resting, and laying and guarding egg sacs. This behaviour can be ruled out in this case, as it has been reported that related snails of the genus *Alycaeus* have a habit of suspending themselves from rocks (Schilthuizen, Vermeulen & Davison, 1999). It would, however, be interesting to pay more attention in the future to possible interactions between snails and spiders in the field, and how snails are able to haul themselves up towards firm ground to resume their feeding activities.

Conclusions

Nine species of Oxyopidae from the canopy have been classified in three genera. Surprisingly, none belong to the globally dominant genus *Oxyopes.* Of the four previously described species, three were described in the nineteenth century and were not recorded again until now; the fourth species is shown here to have a cosmotropical distribution. Considering the seven species of *Hamataliwa* and one of *Hamadruas* from the canopy, these were segregated into four species of primary and four of secondary forests. The secondary forest species seemed to segregated further by forest age and by whether arthropods had recently been removed by fogging: there was strong evidence that they had a preference for such trees. The latter also seemed to be capable to distinguish between different ages of secondary forest and appeared, amazingly, to actively move towards trees of which the fauna had recently been removed by fogging (see material data). Four species from secondary regrowth forest were not found in adjacent primary forest; three of these were shown occur also outside Borneo. Two of four "primary forest" species were also found outside Borneo. Only *Tapponia micans* has been found in both primary and secondary forest, most often in the understorey, also in Sumatra and Malaysia.

Canopy fogging as a collecting method has proved very valuable, among other things because of its high yield. This method aims at catching all specimens living in a particular tree at a particular moment (Floren, 1996) and it often yields good series of species, including both sexes.

The knowledge of the species composition and distribution of the *Hamataliwa-Tapponia-Hamadruas* complex in the Malaysian region still remains very fragmentary. This is the second publication presenting new information on oxyopid spiders from this region since 1897 (see also Deeleman-Reinhold, 2004). It is expected that the known range of many species will be extended. Future workers on the spiders from this region can expect innumerable discoveries, and hence additions and corrections to this paper.

Acknowledgments

This paper is dedicated to Dr A.C. van Bruggen on the occasion of his 80th birthday, as a token of appreciation for his lifelong interest in my work on spider taxonomy on different continents.

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Appendix

Measurements (in mm).

Hamataliwa incompta (Thorell, 1895)

Female (Mulu): Carapace 3.2 long, 2.3 wide, head 2.0 wide, eye group 1.3 wide, clypeus 0.5, height carapace 1.4. Abdomen 3.3 long, 2.0 wide in the middle.

Leg I: 4.0-0.9-3.4-2.5-1.2=12.0; Leg II: 3.5-1.0-2.9-2.2-1.1=10.7; Leg III: 2.4-1.0-1.9-1.9-0.8=8.0; Leg IV: 2.5-1.0-1.7-2.0-0.8=8.0; Palp: 1.0-0.4-0.7-0.9; Epigyne 0.6 wide, 0.55 long, epigynal arch 0.6 wide, 0.3 long.

Male (Kinabalu, Sorinsim) [Loc. 60]: Carapace 2.6 long, 2.0 wide, 1.2 long in the middle, head 1.3 wide, eye group 1.2 wide, clypeus 0.5. Abdomen 2.8 long, 1.7 wide in the middle.

Leg I: 3.0-0.6-2.8-2.2-1.1=9.7; Leg II: 2.5-0.6-2.5-2.0-1.0=8.6; Leg III: 1.9-0.6-1.6-1.5-0.9=6.5; Leg IV: 1.8-0.5-1.4-1.6-0.8=6.1; Palp: 0.75-0.25-0.25-1.3.

Hamataliwa vanbruggeni spec. nov.

Male, holotype: Carapace 2.0 long, 1.6 wide, head 1.3 wide, eye group 0.9 wide. Abdomen 1.9 long, 1.0 wide in the middle.

Leg I: 1.7-0.6-2.2-1.4-0.7=6.6; Leg II: 1.7-0.6-1.9-1.2-0.8=6.2; Leg III: 1.3-0.5-1.3-1.05-0.55 =4.7; Leg IV: 1.1-0.45-0.9-1.0-0.65=4.1; Palp: 0.35-0.15-0.25-0.8.

Female: Carapace 1.9 long, 1.5 wide, head 1.1 wide, eye group 0.9 wide. Abdomen 2.6 long, 1.6 wide in the middle.

Leg I: 2.0-0.6-1.7-1.3-0.8=6.4; Leg II: 1.9-0.6-1.6-1.4-0.6=6.1; Leg III: 1.5-0.45-1.05-1.1-0.5=4.6; Leg IV: 1.3-0.5-1.0-1.0-0.6=4.4; Palp: 0.5-0.25-0.4-0.65; Epigyne 0.4 wide, 0.5 long, epigynal arch 0.4 wide, 0.27 long.

Hamataliwa floreni spec. nov.

Male: Carapace 2.7 long, 2.1 wide, head 1.4 wide, eye group 0.9 wide. Abdomen 2.9 long, 1.2 wide in the middle, PME 5/4 their d apart.

Leg I: 2.7, rest lost; Leg II: 2.6, rest lost; Leg III: 2.2-0.7-2.0-2.0-0.9=7.8; Leg IV: 2.0-0.5-1.6-2.1-lost; Palp: 0.75-0.3-0.4-1.15.

Female: carapace 2.9 long, 2.5 wide, head 2.0 wide, eye group 1.2 wide. Abdomen 3.5 long, 1.5 wide, PME 5/4 their d apart.

Leg I: 3.1, rest lost; Leg II: 2.7-0.7-3.1-2.6-0.7=9.8; Leg III: 2.6-1.0-2.0-2.2-0.9=8.7; Leg IV: 2.6-0.8-1.9-2.5-0.8=8.6; Palp: 0.8-0.42-0.5-0.9; Epigyne 0.6 wide, 0.7 long, epigynal arch 0.4 wide, 0.42 long.

Hamataliwa helia (Chamberlin, 1929)

Male: Carapace 2.0 long, 1.4 wide, head 1.0 wide, eye group 1.0 wide. Abdomen 1.5 long, 0.9 wide in the middle.

Leg I: 1.8-0.7-1.7-1.3-0.7=6.2; Leg II: 1.5-0.5-1.5-1.3-0.6=5.4; Leg III: 1.4-0.5-0.9-1.0-0.5=4.3; Leg IV: 1.1- 0.5-0.7-1.0-0.4=3.7; Palp: 0.42-0.2-0.25-0.8.

Female: Carapace 1.7 long, 1.4 wide, head 0.9 wide, eye group 0.9 wide. Abdomen 1.7 long, 1.1 wide, PME almost 3 d apart.

Leg I: 1.8-0.5-0.9-1.2-0.7=5.1; Leg II: 1.6-0.5-1.2-1.0-0.6=4.9; Leg III: 1.3-0.5-0.8-1.1-0.4=4.1; Leg IV: 1.1-0.5-0.7-1.0-0.4=3.7; Palp: 0.6-0.25-0.25-0.5; Epigyne 0.30 wide, 0.35 long, epigynal arch 0.30 wide, 0.22 long.

Hamataliwa pricompta spec. nov.

Male: Carapace 3.1 long, 2.5 wide, head 2.1 wide, eye group 0.9 wide. Abdomen 3.2 long, 1.7 wide.

Leg I: 3.3-0.9-2.9-2.4-1.2=10.7; Leg II: 2.8-0.7-2.7-2.1-1.0=9.3; Leg III: 2.1-0.8-1.8-1.8-0.8=7.3; Leg IV: 2.5-0.8-1.5-1.7-0.8=7.3; Palp: 0.6-0.3-0.425-1.2.

Female: Carapace 2.5 long, 2.1 wide, head 1.6 wide, eye group 1.2 wide. Abdomen 3.4 long, 2.3 wide.

Leg I: 3.5, rest lost; Leg II: 3.0, rest lost; Leg III: 12.0-0.7-1.6-1.6-tarsus lost; Leg IV: 2.3 -0.7-1.7-1.7-0.8=7.2; Palp: 0.6-0.25-0.25-0.5; Epigyne 0.57 wide, 0.62 long, epigynal arch 0.30 wide, 0.45 long.

Hamataliwa peterjaegeri spec. nov.

Male: Carapace 2.7 long, 2.1 wide, head 1.5 wide, eye group 1.1 wide. Abdomen 2.5 long, 1.4 wide in the middle.

Leg I: 3.2-0.7-2.5-2.5-1.0=9.9; Leg II: 2.6-0.7-2.6-2.3-0.8=9.0; Leg III: 2.0-0.7-1.6-1.7-0.7=6.7; Leg IV: 2.1-0.7-1.6-1.7-0.8=6.9; Palp: 0.65-0.35-0.50-1.1.

Female [Loc 15]: Carapace 2.8 long, 2.4 wide, 1.2 high, head 1.7 wide, eye group 1.3 wide, clypeus 0.4. Abdomen 2.9 long, 1.9 wide, PME 1 d apart.

Leg I: 3.7-0.9-3.4-2.3-1.1=11.4; Leg II: 3.3-0.9-3.0-2.5-0.9=10.6; Leg III: 2.3-0.8-1.9-1.8-0.7=7.5; Leg IV: 2.3-0.8-1.7-1.7-0.8=7.3; Palp: 0.75-0.37-0.65-1.0; Epigyne 0.6 wide, 0.70 long, epigynal arch 0.57 wide, 0.40 long.

Hamataliwa ignifuga spec. nov.

Female, holotype: Carapace 2.3 long, 1.5 wide, head 1.3 wide, eye group 1.0 wide. Abdomen 2.3 long, 1.5 wide.

Leg I: 2.3.-0.7-1.8-1.5-0.8=7.1; Leg II: 1.9-0.6-1.6-1.5-0.7=6.3; Leg III: 1.5-0.6-1.1-1.1-0.6=4.7; Leg IV: 1.3-0.5-1.0-1.1-0.4=4.3; Palp: 0.45-0.20-45-0.60; Epigyne 0.45 wide, 0.40 long, epigynal arch 0.45 wide, 0.35 long.

Male: Carapace 1.7 long, 1.4 wide, head 1.1 wide, eye group 0.9 wide. Abdomen 2.5 long.

Leg I: 1.8-0.5-1.6-1.4-0.7=6.0; Leg II: 1.8-0.5-1.5-1.2-0.4=5.4; Leg III: 1.4-0.5-1.0-1.1-0.4=4.4; Leg IV: 1.0-0.4-0.8-1.1-0.4=3.7; Palp: 0.50-0.2-0.3-0.82.

Hamataliwa catenula spec. nov.

Female, holotype: Carapace 1.5 long, 1.2 wide, head 0.9 wide, eye group 0.80 wide. Abdomen 1.9 long, 1.12 wide, PME 2 d apart.

Leg I: 1.5.-0.4-1.5-1.2-0.6=5.2; Leg II: 1.5-0.4-1.4-1.2-0.7=5.2; Leg III: 0.9-0.45-1.0-0.95-0.6=3.9; Leg IV: 1.0-0.4-0.9-1.0-0.55=3.85; Palp: 0.4-0.20-0.35-0.40; Epigyne 0.30 wide, 0.35 long, epigynal arch 0.30 wide, 0.20 long.

Hamadruas superba (Thorell, 1887)

Male [Xa 12]: Carapace 2.7 long, 2.1 wide, head 1.1 wide. Abdomen 4.0 long, 1.1 wide.

Leg I: 4.1-0.8-4.4-4.0-1.0=14.3; Leg II: 4.3-1.0-4.3-3.9-0.9=14.4; Leg III: 4.1-0.9-4.2-3.8-1.2=14.2; Leg IV: 4.0-1.0-3.7-3.9-1.3=13.9; Palp: 0.8-0.4-0.25-1.2.

Female: Carapace 3.4 mm long, 2.3 wide, head width 2.0. Abdomen 6.1 mm long, 2.0 wide.

Leg I: 4.1-1.1-4.6-4.5-1.6=15.9; Leg II: 4.5-1.0-4.2-3.9-1.5=15.1; Leg III: 4.5-1.2-4.0-4.0-1.3=15.0; Leg IV: 4.0-1.2-3.9-4.2-1.4=14.7; Palp: 1.2-0.5-0.8-1.3; Epigynal arch 0.62 wide, 0.62 long.

Hamadruas severa (Thorell, 1890)

Male: Carapace 3.3 long; 2.3 wide, head 1.5 wide, eye group 1.0, clypeus 0.3; height carapace in the middle 1.0. Abdomen 4.0 long, 1.4 wide, damaged and shrunk.

Leg I: lost; Leg II: 3.8-1.1-3.4-3.7-1.4=13.4; Leg III: 3.0-1.0-2.4-3.1-1.1=10.6; Leg IV: 3.4, rest lost; Palp: 1.0-0.32-0.4-1.35.

Female: Carapace 3.9 long, 3.1 wide, head 2.2 wide, eyegroup 1.2 wide, clypeus 0.5, height carapace 1.1. Abdomen 6.2 long, 2.7 wide.

Leg I: 4.5-1.1-5.0-4.5-1.9=17.0; Leg II: lost; Leg III: 4.0-1.3-3.5-3.3-1.2=13.3; Leg IV: 4.0-1.2-3.1-4.2-1.4=13.9; Palp: 1.5-0.4-1.0-1.3; Epigyne 0.7 wide, 0.8 long, arch 0.7 wide, 0.5 long.

Hamadruas hieroglyphica (Thorell, 1887)

Female (Bhamo, holotype ?, MCSNG no number): Carapace 5.2 long, 4.3 wide, head 3.1 wide, eyegroup 1.5 wide, clypeus 1.1, height carapace 2.0. Abdomen 10.0 long, 4.0 wide. Legs all lost. Epigyne 0.9 wide, 1.2 long, arch 0.9 wide, 0.9 long.

Subadult female (Bhamo, MCSNG no number): Carapace 4.3 long, 3.5 wide, head 2.6 wide, eyegroup 1.4 wide, clypeus 0.9, height carapace 1.7, height front 2.0, height rear 1.4. Abdomen 6.5 mm long, 2.2 wide.

Leg I: 4.6-1.6-4.6-4.8, tars lost; Leg II: 4.6-1.5-4.5-4.5, tars lost; Leg III: 4.6-1.4-3.8-4.2, tars lost; Leg IV: 4.9, rest lost; Palp: 1.4-0.6-0.9-1.6.

Male (Bhamo, MCSNG no number): Carapace 4.2 long, 3.5 wide, head width 2.3, eyegroup 1.3 wide, clypeus 0.8, femur I 4.6, femur II 4.7, femur IV 4.8, rest lost.

Tapponia micans Simon, 1885

Male (Sumatra, Kerinci): carapace 1.7 long, 1.4 wide, head 1.1 wide, eyegroup 1.0 wide, clypeus 0.25, height carapace 0.8 in the middle. Abdomen 1.6 long, 0.8 wide.

Leg I: 1.7-0.4-1.8-1.3-0.8=6.0; Leg II: 1.5-0.4-1.5-1.2-0.7=5.3; Leg III: 1.2-0.3-0.9-1.0-0.5=3.9; Leg IV: 1.2-0.25-1.05-1.1-0.7=4.3; Palp: 0.45-9.25-0.3-0-0.82.

Female (Sumatra, Kerinci): Carapace 1.8 long, 1.4 wide, head 1.1 wide, eyegroup 1.0 wide, clypeus 0.25, height carapace 0.5. Abdomen 1.6 long, 0.8 wide.

Leg I: 1.7-0.5-1.8-1.4-0.7=6.1; Leg II: 1.7-0.5-1.5-1.2-0.6=5.5; Leg III: 1.4-0.3-0.9-0.9-0.5=4.0; Leg IV: 1.2-04-0.8-1.1-0.5=4.0; Palp: 0.5-0.2-0.25-0.5; Epigyne 0.25 wide, 0.26 long, arch 0.14 wide, 0.15 long.