

# Nest and species description of the Southeast-Asian hover-wasp *Eustenogaster gibbosa* n. sp. (Hymenoptera Vespidae)

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The females and males of *Eustenogaster gibbosa*, a new species of stenogastrine wasp from Peninsular Malaysia are described together with their nest.

KEY WORDS: Stenogastrinae, Vespidae, new species, nest architecture.

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## INTRODUCTION

Hover wasps (Vespidae Stenogastrinae) are a distinctive subfamily of 53 described species in seven genera (CARPENTER 2001), found in South Asia from India to New Guinea. The nesting and social biology of the group is reviewed by TURIL-

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LAZZI (1991). These are most commonly forest dwellers, although some species are often found in human habitats mainly in villages or at forest fringes. Present knowledge suggests that all the species are primitively eusocial even if there is reason to suspect that for some species this attribute may depend only from environmental and populational conditions (TURILLAZZI 1991).

Although present phylogenetic analysis treats the Stenogastrinae as the sister-group of the Polistinae + Vespinae (CARPENTER 1988, 1991), they have a number of outstanding peculiarities that set them apart from the other social wasps (TURILLAZZI 1991, HUNT & AMDAM 2005). Among these are several nest features. Unlike Vespinae and a majority of Polistinae, the nests lack petioles connecting the comb(s) to the substrate. In addition, they consist of relatively poor-quality material, resulting in an overall weak nest that may limit the size of colonies (HANSELL 1985, 1987).

At the same time, the nests of hover wasps are marked by a great diversity of form, which has given rise to a substantial literature on nest architecture (TURILLAZZI 1991). The nest comb — in species whose cluster of cells can be called a comb — may be surrounded by some sort of envelope, found in members of four of the seven genera and evidently evolved multiple times. In addition, an envelope effect is achieved through the arrangement of the cells in some members of the *Parischnogaster striatula*-group (YOSHIKAWA et al. 1969, COSTER-LONGMAN & TURILLAZZI 1995) and in *Liostenogaster pardii* Turillazzi & Carfi 1995 (TURILLAZZI & CARFI 1995).

*Eustenogaster* van der Vecht 1969 comprises 10 described species, with at least six undescribed species now recognized (CARPENTER & KOJIMA 1996, VAN DER VECHT & STARR unpubl.). The genus ranges from Sri Lanka and southern India to Hainan and Sulawesi. These are relatively large, robust hover wasps with a distinctive shared nest structure. In this, the central part of the nest is a comb of several (usually 8-20) cells that open below, the comb roof forming a very blunt cone. The number of cells appears to be fixed very early in nest development, and in all but one known species the peripheral cell walls are extended downwards past the cell mouths to form a narrow spout at least as long as the cells. In the one known exception, *E. calyptodoma* Sakagami & Yoshikawa 1968, a true envelope is formed around the comb, likewise extended down into a spout (SAKAGAMI & YOSHIKAWA 1968). This exception aside, variation in nest structure within the genus consists largely of the elaborations of the outer surface, or “pseudoenvelope”. Nests, while readily visible, tend to resemble such things as dead leaves, dried fruits or lumps of earth (KROMBEIN 1991, FRANCESCATO et al. 2002), which presumably provides protection against visually-hunting predators.

In January 2002, Mr Patrick Dohm of the University of Marburg showed one of us (R. Hashim) a new type of *Eustenogaster* nest near the University of Malaya Field Study Center (FSC) at Gombak. The FSC is located 15 km northeast of Kuala Lumpur, at an altitude of 300 m a.s.l. The nest was left in situ while it was under construction together with its foundress female. Regrettably, at collection the nest had been abandoned by the wasp. Three months later at the same locality, R. Hashim photographed and collected another nest of the same type, together with some of its wasps. These are known below as nests 1 and 2, respectively. This represents a new species, described here with its nest. PAGDEN (1958: figs 4-6) may have figured an old, battered nest and/or two immature nests of the same species, but we cannot be sure, as his figures were not accompanied by wasps or description.

## SYSTEMATICS

*Eustenogaster gibbosa* Starr & van der Vecht, n. sp.

The following description relies in part on notes by the late J. van der Vecht (1906-1992), used with his permission. Van der Vecht had recognized "*gibbosa*" as a new species and this is his ms name.

*Diagnosis.* Similar to *E. micans* (Saussure 1852), with which it is broadly sympatric. Both sexes of *E. gibbosa* are readily distinguished from all other known *Eustenogaster* by the shape of gastral tergum 2 in profile; the apical third is distinctly swollen, the swelling bounded anteriorly by a shallow transverse impression (Fig. 1e). The denticle near the tip of the 6th gastral tergum in the female is usually distinct and acute, but small (Fig. 1g). The indentation between the proximal and middle teeth of the female mandible is relatively deep (Fig. 1c). The cutting edge of the male mandibles is relatively smooth, without distinct teeth.

*Colour pattern.* Female — Ground colour black. Extensive yellow marks: clypeus, except for very narrow dark margin at sides and below, and median, elongate black stripe on about basal third, may be interrupted (Fig. 1a); clypeal marks extending above, usually coalescent with spots above antennae; spots in orbits and at top of head beside eyes; genae; anterior margin of pronotum, extending back to tegulae; large dorsal and ventral spots on mesopleura; pair of large spots on scutellum; transverse band on postscutellum, sometimes narrowly interrupted; small dot on each side of metapleuron below, may be absent; pair of broad bands on propodeum behind; spot on gastral tergum 2 near base, another large spot on each side (Fig. 1e); transverse band on tergum 3, may be interrupted; pair of spots on each of terga 4-5; pair of spots on each of gastral sterna 2-4, usually pair of smaller spots on sternum 5. Legs almost entirely yellow and reddish. Gastral tergum 1 mostly reddish.

Male — Marks similar to female. Face usually only slightly more extensively yellow, clypeus usually with rudimentary dark mark at base.

There is some variation in the extent of yellow marks within localities, even within nest series.

Specimens from the Mentawai Islands share the diagnostic physical characters and the overall colour pattern of the typical form, but with the yellow marks reduced. Among others, the clypeal marks are limited to a pair of spots at the base, with no extension into the supraclypeal area; that of the pronotum is limited to a pair of spots; base of gastral tergum 2 black, other yellow gastral marks smaller than in the type series; legs entirely brownish black.

*Holotype.* ♀ Malaysia, Gombak FSC, V.2001, R. Hashim [Museum of the University of Malaya, Kuala Lumpur, Malaysia; at present on long-term loan at the Museo di Storia Naturale — Zoologia "La Specola", Firenze, Italy].

*Paratypes.* 3 ♀♀ and 1 ♂ pupa (without head), same data as holotype [Museum of the University of Malaya, Kuala Lumpur, Malaysia; at present on long-term loan at the Museo di Storia Naturale — Zoologia "La Specola", Firenze, Italy].

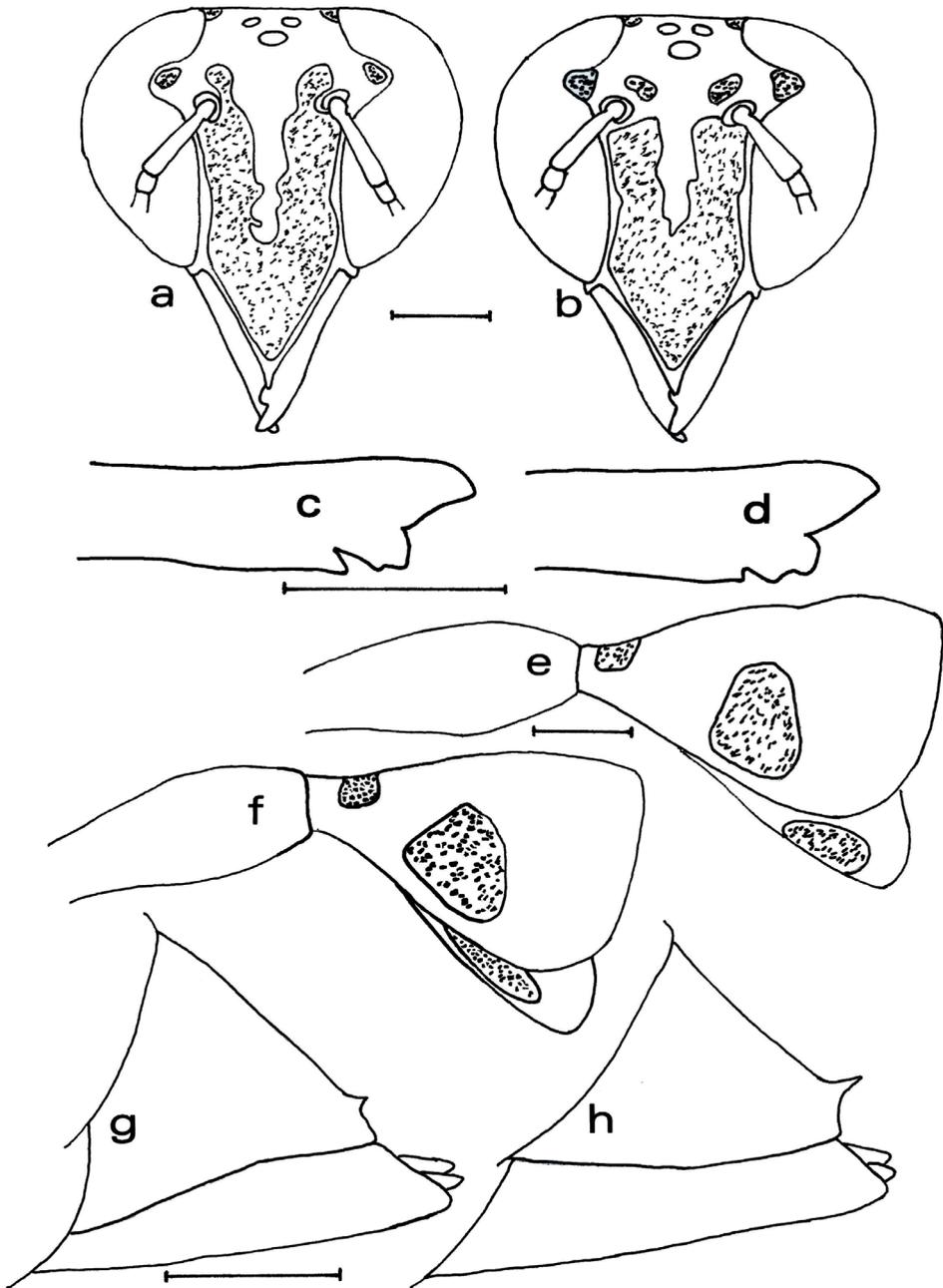


Fig. 1. — Female characters of *Eustenogaster gibbosa* n. sp. in comparison with *E. micans* (Saussure). Stippled areas are yellow. Head of *E. gibbosa* holotype (a) and *E. micans* (b) in face view to show extent of yellow marks. Left mandible of *E. gibbosa* (c) and *E. micans* (d) to show teeth. Gastral segment 2 of *E. gibbosa* (e) and *E. micans* (f) in side view to show profile of tergum and yellow marks. Gastral segment 6 in *E. gibbosa* (g) and *E. micans* (h) in side view to show sub-apical denticle on tergum. All scale bars = 1 mm.

♀ Indonesia, Sumatra, Aceh, G. Leuser Nat. Pk., Ketambe Res. Sta., Sep 1989, IIS 89007 per DC Darling; Malaise trap, primary rainforest, 350 m, Young forest, Terrace 3, Light gap [Museum Zoologicum Bogoriense, Bogor, Indonesia].

♀ Indonesia, Sumatra, Aceh, G. Leuser Nat. Pk., Ketambe Res. Sta., Mar 1990, IIS 900021 per DC Darling; Malaise trap (head), primary rainforest, 350 m, Terrace 4, Light gap, 400 m [Royal Ontario Museum, Toronto, Canada].

♀ Indonesia, W. Kalimantan, Gunung Palung Nat. Pk., June 15-Aug 15 1991, Darling, Rosichon, Sutrisno, IIS 910122; Cabanpanu Res. Sta., primary rainforest, 100-400 m, Malaise trap (head), Alluvial gap [Natural History Collection, Ibaraki University, Mito, Japan].

*Localities of other specimens examined.*

Malay Peninsula, Bukit Bintung, Perlis; Gurun, Kedah; near Kuala Lumpur; Kuala Tahan, Pahang; Pasoh Forest Reserve, Negri Sembilan; Singapore.

Mentawai Archipelago, Siberut I.; Sipura I.

Sumatra, Bangkinan, Riau; near Kotatjane, Aceh.

Riau Archipelago, Durian I.

Bangka I., Mt Menumbing; Mt Mangkol.

Legundi I.

Java, Bantar Gebang, W. Java; Tjisolok, W. Java.

Borneo, Balikpapan, Kalimantan; Kapit, Sarawak; near Kuching, Sarawak; Kudat, Sabah; Putatan, Sabah; Rajang River, Sarawak; Sandakan, Sabah; Mt Santubong, Sarawak; Tenggarong, Kalimantan.

These specimens were examined and returned to their respective collections before this description was undertaken, so they are not designated as formal paratypes.

*Distribution.* Throughout the Malay Peninsula south of the Isthmus of Kra, and the Greater Sunda Islands, except possibly absent from eastern Java. Known from some smaller islands fringing these areas.

*Etymology.* The species epithet is a Latin adjective meaning “humped” or “convex”. It refers to the main diagnostic character of the species, the swollen distal part of gastral tergum 2.

*Description of the nest.* Nest 1 hung from hyphae of a horse-hair fungus enveloping a dead branch and leaves of a tree in dense vegetation. It was about 160 cm above the ground. Nest 2 was about 70 cm above ground hanging on similar hyphae attached to a sapling in the forest undergrowth.

Nest 1 (Fig. 2) has a total length of 6.7 cm; the length from the top of the roof comb to the lowest part of the entrance hole, excluding the tip of the combined flanges that extends below the entrance hole is 4.6 cm. Nest 2 (Fig. 3) has a total length of 7.4 cm, the length from the top of the roof comb to the lowest part of the entrance hole, excluding the tip of the combined flanges that extends below the entrance hole is 4.7 cm. The maximum comb width of nest 1 is 2.4 cm (but the width at flanges level is 3.4 cm). Nest 2 has a maximum comb width of 3.0 cm (4.8 cm at flanges level). The comb consists of eight cells in nest 1, 12 cells in nest 2, each with a maximum length of about 1.5 cm. The pseudenvelopes below the combs have many small perforations, which tend to be larger toward the tip.

The general form, then, is that of a typical *Eustenogaster* nest. The outstanding peculiarity of the nest of *E. gibbosa* is an elaboration of the spout. There is a pair of very flat, broad flanges, one on each side, standing out from the main



Fig. 2. — Nest 1 of *Eustenogaster gibbosa* n. sp. photographed from two sides.

body of the nest and uniting into a sharp point below the nest entrance. These flanges resemble nothing so much as the fins of a squid. An additional elaboration is a set of very low ridges (eight in nest 1, nine in nest 2) running down the pseudenvelope at an angle from the level of the comb. In *E. gibbosa*, the ridges are arranged in a 'twirl' rather than generally 'vertically' top-down as found in *E. fraterna*, *E. micans*, *E. calyptodoma* and to some extent in *E. hauxwellii* (Bingham 1894). Both nest 1 and nest 2 showed this characteristic quite distinctly. Another feature of nest 2 is a set of three blunt projections from the roof, extending outward and slightly upward.

Nest material comprises short wood fibers, creamy in colour, with the incorporation of occasional small fragments of insect cuticle. To our eyes, the overall shape and colour of the nest are that of a hanging dead leaf, with the narrow ridges resembling veins.

#### DISCUSSION

It frequently happens that congeneric species of Stenogastrinae are more readily distinguished by features of their nests than of the wasps themselves (e.g. TURILLAZZI 1999). In the case of *E. gibbosa*, the diagnostic physical character of the



Fig. 3. — Nest 2 of *Eustenogaster gibbosa* n. sp. with a female occupant photographed in the field.

adult wasps is unusually distinctive. Even so, if we may judge by the two examples described above, the nest can be distinguished from all known congeners at a glance.

Of all known nest types in *Eustenogaster*, the most similar to *E. gibbosa*'s is that of *E. fraterna* (Bingham 1897) (FRANCESCATO et al. 2002). The two species are broadly sympatric, although *E. fraterna* tends to be found at higher elevations. While *E. fraterna* commonly has flanges on the spout, these are much less prominent than in *E. gibbosa* and restricted to the area around the nest entrance (YOSHIKAWA et al. 1969: photos 4 and 25). The low ridges on the pseudenvelope surface, where they exist, are much more vertical in *E. fraterna* than in the two known nests of *E. gibbosa*. While one *E. gibbosa* nest had blunt peripheral projections from the roof, *E. fraterna* tends to build much more prominent, lamellar projections in this position (PAGDEN 1958: fig. 9; YOSHIKAWA et al. 1969: photos 4 and 25). In addition, *E. fraterna* typically builds larger combs, with a mean of 14.4 cells ( $n = 20$ ) (TURILLAZZI & GERACE 1992). Nests of other studied *Eustenogaster* species lack flanges on the pseudenvelope and usually lack the other shared features of *E. gibbosa* and *E. fraterna* nests.

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