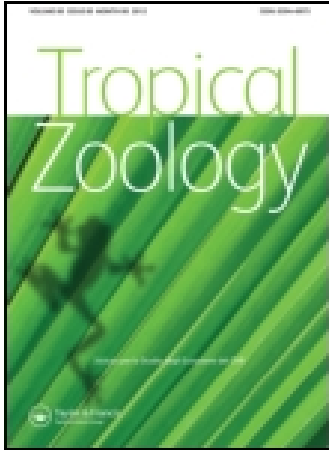


This article was downloaded by: [North Dakota State University]  
On: 14 October 2014, At: 02:02  
Publisher: Taylor & Francis  
Informa Ltd Registered in England and Wales Registered Number: 1072954  
Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH,  
UK



## Tropical Zoology

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/ttzo20>

### Adults and nest of *Liostenogaster pardii* n. sp. (Hymenoptera Stenogastrinae)

S. Turillazzi<sup>a b</sup> & S. Carfi<sup>a b</sup>

<sup>a</sup> Dipartimento di Biologia Animale e Genetica ,  
Università di Firenze , Via Romana 17, 50125 ,  
Firenze , Italy

<sup>b</sup> Centro di Studio per Faunistica ed Ecologia  
Tropicali del C.N.R. , Via Romana 17, 50125 ,  
Firenze , Italy

Published online: 01 Aug 2012.

To cite this article: S. Turillazzi & S. Carfi (1996) Adults and nest of *Liostenogaster pardii* n. sp. (Hymenoptera Stenogastrinae), *Tropical Zoology*, 9:1, 19-30, DOI: [10.1080/03946975.1996.10539300](https://doi.org/10.1080/03946975.1996.10539300)

To link to this article: <http://dx.doi.org/10.1080/03946975.1996.10539300>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

# Adults and nest of *Liostenogaster pardii* n. sp. (Hymenoptera Stenogastrinae)

S. TURILLAZZI and S. CARFÌ

*Dipartimento di Biologia Animale e Genetica, Università di Firenze, Via Romana 17,  
50125 Firenze, Italy*

*and  
Centro di Studio per Faunistica ed Ecologia Tropicali del C.N.R., Via Romana 17,  
50125 Firenze, Italy*

Received 5 February 1994, accepted 17 December 1994

The female and male of *Liostenogaster pardii*, a new species of stenogastrine wasp, are described. This wasp is very similar to *L. flavolineata* (Cameron 1902) and also the initial stages of its nest (which is globular when mature) suggests that it is derived from a *flavolineata* nest type.

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

---

Introduction . . . . .	19
<i>Liostenogaster pardii</i> n. sp. . . . .	20
The nest . . . . .	25
Discussion . . . . .	28
Key to the described species of <i>Liostenogaster</i> (adult females) . . . . .	29
Acknowledgements . . . . .	29
References . . . . .	30

## INTRODUCTION

*Liostenogaster* van der Vecht 1969 is one of the six genera belonging to the subfamily Stenogastrinae (CARPENTER 1988). This genus, together with *Parischnogaster* von Schulthess 1914 and *Eustenogaster* van der Vecht 1969, awaits revision. At present it comprises only six described species: *L. flavolineata* (Cameron 1902), *L. flaviplagiata* (Cameron 1902), *L. nitidipennis* (Saussure 1853), *L. picta* (Smith 1861), *L. varipicta* (Rohwer 1919) and *L. vechti* Turillazzi 1988.

We describe here a new species belonging to this genus. This wasp (Fig. 1), found on the Malaysian Peninsula, is not common but seems particularly interesting for its peculiar nest architecture which is described in detail together with the probable sequence of construction.



Fig. 1. — *Liostenogaster pardii* n. sp. female and her nest.

(MZUF = Museo di Storia Naturale dell'Università, Sezione di Zoologia, Florence, Italy; NHML = Natural History Museum, London; ML = Museum Leyden, Holland; AMNH = American Museum of Natural History, New York; DZUM = Department of Zoology Universiti Malaya, Kuala Lumpur, Malaysia).

***Liostenogaster pardii* n. sp.**

*Diagnosis*

*L. pardii* differs from other species of *Liostenogaster* especially in the second tooth of the mandible, pointed and with smooth margins, and in having eyes without bristles. Its globular mud nest, described below, differs from all the other known stenogastrine nests.

*Material examined*

*Malaysian Peninsula.* Genting Sempah, Genting Tea Estate (elev. 610 m), Pahang State. Holotype ♂ (MZUF 322) and allotype ♀ (MZUF 323), paratypes 6 ♀♀ and 1 ♂ (MZUF 324) all from nest Q collected on Dec. 4, 1987, S. Turillazzi legit. Paratypes 4 ♀♀ from nest C (MZUF 325), Oct. 1985, S. Turillazzi legit. Paratypes 2 ♀♀ from nest J (ML); paratype 1 ♀ from nest E (MZUF 326); paratype 1 ♀ from nest N (MZUF 327); paratype 1 ♀ from nest L (MZUF 328); paratype 1 ♀ from

nest O (MZUF 329); paratypes 2 ♀♀ from nest M (DZUM), Nov.-Dec. 1987, S. Turillazzi legit. Paratypes 2 ♀♀ and 2 ♂♂ from nest K (AMNH), Dec. 1987, S. Turillazzi legit. Paratypes 2 ♀♀ from nest B (MZUF 330, in alcohol) and 1 ♀ from nest Z (MZUF 331, in alcohol), Oct. 1991, S. Turillazzi legit.

Selangor, Kuala Sleh, September 6, 1947, H.T. Pagden legit, 2 ♀♀ (NHML) (paratypes).

Fed. Malay States, extracted from nest collected on October 11, 1920, 1 ♀ (NHML) (paratype).

Northern Borneo. Sarawak, 4th Div. Gn. Mulu, RGS Exp., May-June 1978, M.N. Collins legit in a malaise trap placed in a mixed dipterocarp forest, 4 ♀♀ (NHML) (paratypes). All the specimens in NHML were labelled with an unpublished manuscript name by J. van der Vecht.

### *Description of the adults*

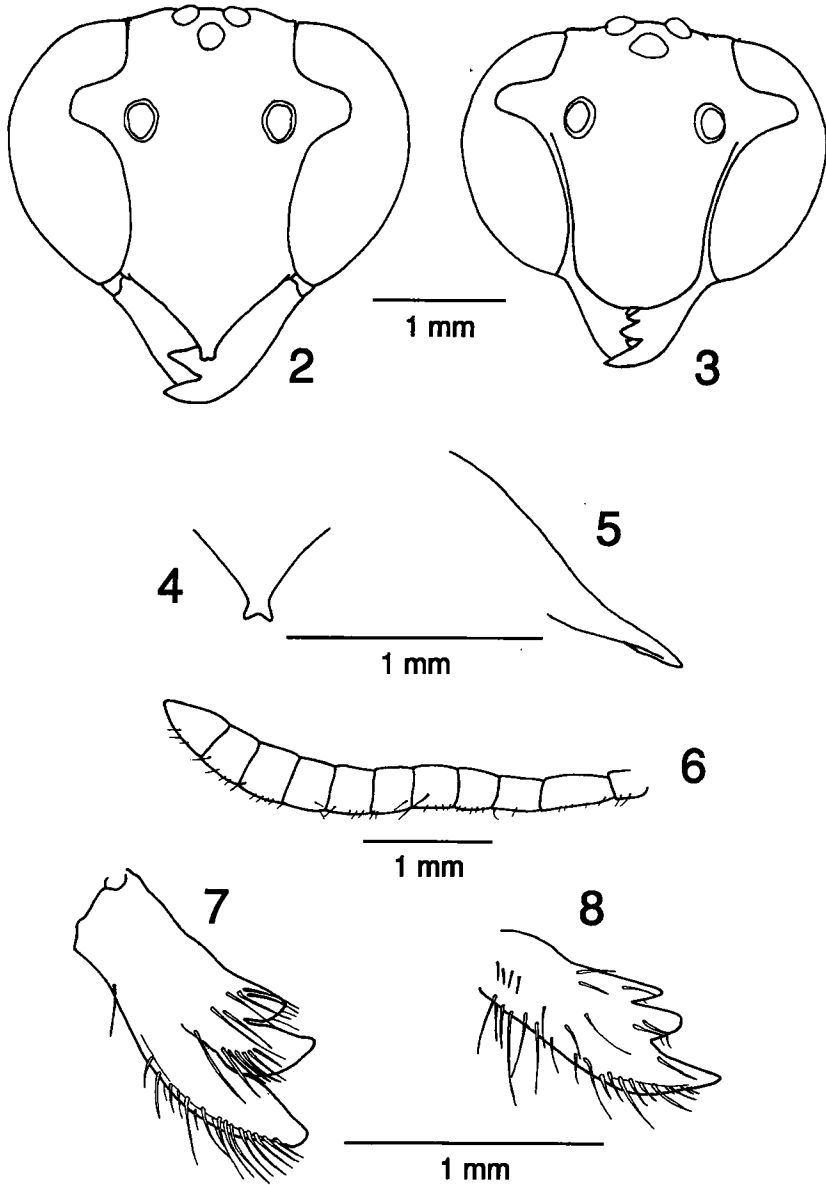
Female. Length (h + th + t1 + t2): 10.8-12.8 mm (n = 7).

Structure. Head (Fig. 2): mandibles (Fig. 7) tridentate. Clypeus sparsely but uniformly punctate, apex usually emarginate with the two sides pointing slightly laterally (Figs 4-5), covered with long and silver hairs denser on the sides and anterior part. Supraclypeal area and frons punctate; punctures closer than on clypeus, separated by less than a diameter. Frons covered by hairs shorter than those on clypeus, very short near the antennal sockets. Median frontal carina divided into two parts; the superior, just under the median ocellus, is less than half the length of an ocellus while the inferior is narrower and as long as an ocellus. Ocular sinu covered with short, sparse pubescence. Genae densely pubescent. Antennae club-shaped and last antennomere, viewed from side, triangular, almost one and one half times longer than wide (Fig. 6). (In *L. flavolineata* the antennae are more cylindrical and the last antennomere is almost twice as long as wide).

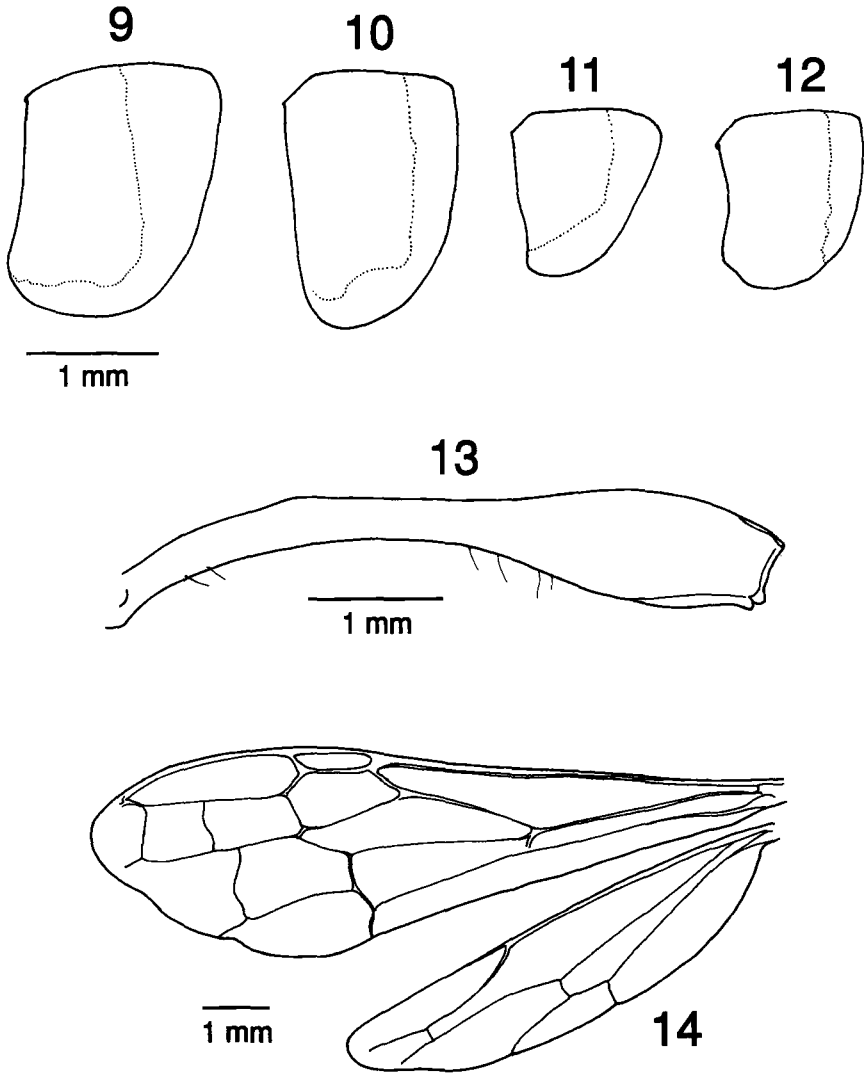
Thorax and gaster: mesoscutum densely punctate, pubescent; scutellum punctate, with very long hairs; postscutellum and propodeum sparsely punctate, with hairs longer on superior and posterior region of propodeum. Gastral petiole (Fig. 13) 4 times longer than the maximum width in dorsal view.

Wings. See Fig. 14.

Colour. Dark brown with yellow maculations. Yellow genae; mandibles except teeth; clypeus except a median brown spot on the superior part and apical margin below; lateral spots on the frons reaching the antennal sockets; lateral spots on vertex from posterior ocelli to inner orbits of eyes; lateral part of propleuron; lateral stripes on the superior part of the pronotum almost touching in the middle; two narrow parallel, longitudinal stripes on mesoscutum, with an apical enlargement, beginning near the pronotum and ending posteriorly at the level of the median part of the tegulae; large transverse band divided by a thin brown carina on the anterior part of the scutellum; anterior part of the postscutellum; propodeum, except a large triangular dorsal spot and two narrow lateral stripes, sometimes reaching the posterior part; subtriangular dorsal spot on the first gastral tergum in front of the bulb, sometimes divided in two; spot on the anterior part of the second gastral tergum merging with two lateral spots; narrow, spindle-like, spot along the median part of the same tergum; band on the anterior part of other gastral terga; gastral sterna, except the anterior part of first, second and tip of the last one; front and median legs, except brownish tarsi, and anterior part of the front legs; coxae, and distal parts of hind tibiae and femura; mesepisternum except more anterior and ventral parts; dorsal metapleuron.

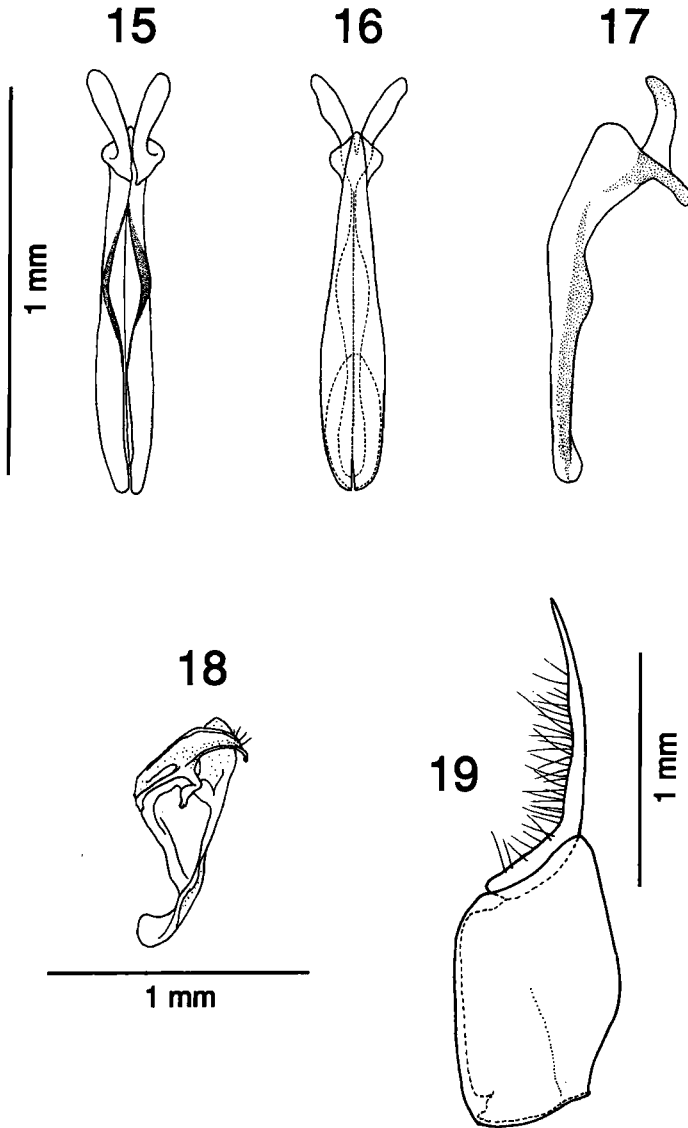


Figs 2-8. — *Liostenogaster pardii* n. sp.: female, head (Fig. 2); male, head (Fig. 3); female, apex of the clypeus, frontal (Fig. 4) and lateral (Fig. 5) view; female, antenna, lateral view (Fig. 6); female, right mandible, frontal view (Fig. 7); male, right mandible, frontal view (Fig. 8).



Figs 9-14. — *Liostenogaster pardii* n. sp.: male, lateral view of the third to seventh gastral terga (Figs 9-12); female, lateral view of the gastral petiole (Fig. 13); female, left fore and hind-wing (Fig. 14).

Male. Very similar to the female. Length ( $h + th + t1 + t2$ ): 11.5-11.9 mm ( $n = 4$ ). It differs from the female in the antennae which are yellow on their inner side and, in some specimens, dorsally with brown spots on the anterior part of the antennomeres of the funiculus; the clypeus entirely yellow and covered with longer hairs (Fig. 3); the mandibles with smaller teeth, yellow with only brown dental margins (Fig. 8). The gastral terga 3-7 are whitish anteriorly. Terga 4-6 in side view, present a dorsal profile with a distinct obtuse angle at the anterior part (see Figs 9-12).



Figs 15-19. — *Liostenogaster pardii* n. sp.: male, aedeagus, dorsal, ventral and lateral view (Figs 15-17); male, volsella (Fig. 18); male, paramere (Fig. 19).

Male genitalia: parameral plate longer than half of the paramere itself; parameral spine with long hairs along its dorsal part (Fig. 19); broad volsella and beak-shaped digitus (Fig. 18); aedeagus flattened and slightly enlarged at apex with straight ventral profile (Figs 15-17).



*Etymology*

The species is dedicated to Professor Leo Pardi (1915-1990), pioneer of ethological studies on social wasps.

THE NEST

*Material examined*

Genting Sempah, Genting Tea Estate (elev. 610 m), Pahang State, three nests (C, D, R), Oct. 1985, S. Turillazzi legit; 12 nests (E, F, G, H, I, J, L, M, N, O, P, Q), Nov.-Dec. 1987, S. Turillazzi legit; 1 nest (K), Dec. 1989, S. Turillazzi legit; 3 nests (A, B, S), Oct. 1991, S. Turillazzi legit. All nests are deposited at the MZUF 332.

*Description*

PAGDEN (1958: 136) provided a very brief description and illustration of a nest of this species found under a leaf of an *Orchidantha*.

Nests of this species have been found only at Genting Sempah. This area, which lies on the hills near the road from Kuala Lumpur to Bentong and Kuantan, at the border between the states of Selangor and Pahang and at a height of about 600 m, has abundant precipitation and presents a well preserved forest habitat.

The nests were attached to the underside of leaves of trees and plants. At least three of the 18 collected nests were found under the leaves of ferns of the genus *Asplenium*. At least eight nests were under the leaves of latifolia trees. Only one nest (nest B) was found attached to the ceiling of an old cement gazebo, covered with abundant vegetation, near a waterfall. When on plants the nests are attached to the central vein of the leaves. Nests can be found at heights of 1.5 to 5 m and more above the ground.

*Nest material*

Nest are entirely composed of mud. At a survey under light microscope, mud particles appear extremely small, with scarce granules of quartz not exceeding 0.5 mm. Particles of organic origin are also found, although in very small quantity. Nests are creamy in colour and can be easily seen from below on account of their striking contrast with the green of the leaves.

*Nest architecture and development*

The external appearance of a mature nest is evocative of an almost spherical clay pot (Fig. 20). A small circular entrance with an average diameter of 4.49 mm (SD = 0.236, n = 8 intact nests) is usually hidden in the upper part of the nest near the juncture with the substrate. Sections of the collected nests along the plane which

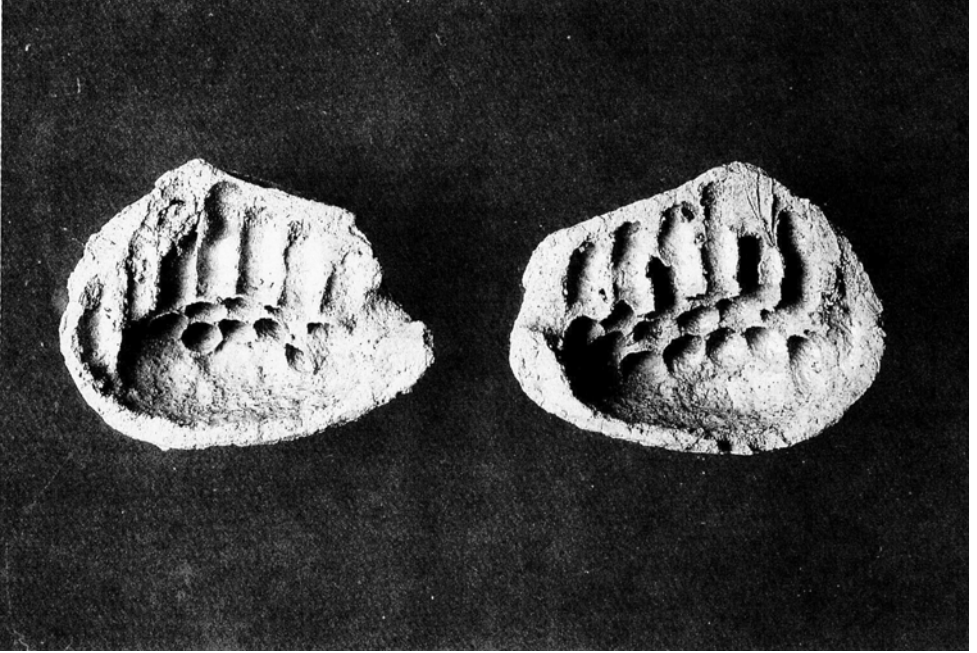


Fig. 20. — Longitudinal section of a mature nest of *Liostenogaster pardii* n. sp.



Fig. 21. — Female and first cell nest of *Liostenogaster pardii* n. sp.

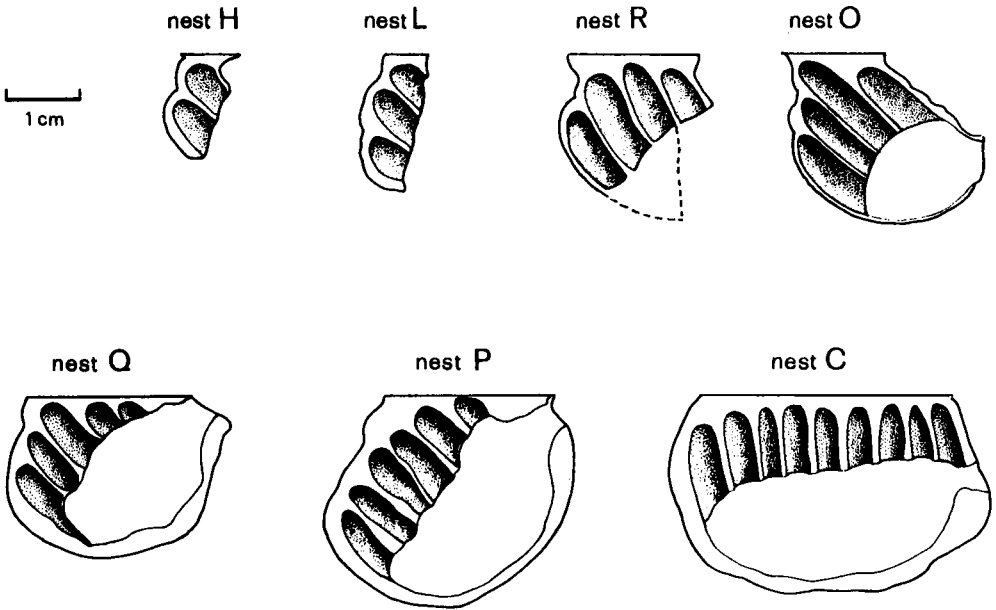


Fig. 22. — Longitudinal sections of some nests of *Liostenogaster pardii* n. sp. arranged in a hypothetical developmental series.

Table 1.

Characteristics of nests of *Liostenogaster pardii* n. sp. All measurements are in mm, except weight. In brackets number of measurements taken.

Nest	Number of cells	Nest length	Nest width	Nest height	Average envelope thickness	Entrance hole diameter	Average cell diameter	Max. cell	Weight (g)
A	11	—	22.34	21.04	2.01 (3)	—	3.88 (4)	—	—
B	9	—	—	22.20	1.50 (3)	—	4.20 (4)	—	—
C	45	45.3	33.49	27.60	3.83 (3)	4.30	4.08 (4)	10.30	—
D	—	—	—	—	1.73 (3)	4.54	—	—	15.91
E	10	—	18.34	—	0.60 (1)	—	4.03 (4)	—	—
F	—	—	—	—	1.38 (3)	4.52	—	—	—
G	52	48.5	48.00	28.00	3.60 (3)	—	4.21 (4)	9.56	21.73
H	8	7.6	16.80	17.00	—	—	—	—	0.81
I	23	34.8	31.50	25.20	2.88 (3)	4.66	3.94 (2)	—	10.37
J	53	51.0	38.80	—	3.30 (3)	—	4.06 (4)	—	—
K	20	32.3	28.45	24.90	2.90 (3)	4.40	4.25 (4)	7.30	—
L	10	9.3	19.00	19.20	—	—	4.02 (4)	—	1.12
M	35	43.5	31.20	29.30	2.49 (3)	4.94	—	—	—
N	16	28.0	19.80	21.80	1.70 (3)	5.54	4.03 (4)	11.00	3.58
O	8	26.7	15.70	20.40	0.73 (3)	8.66	3.83 (3)	12.70	1.91
P	33	34.6	31.60	28.30	2.56 (3)	4.40	—	—	11.19
Q	20	31.0	26.80	25.50	2.46 (3)	4.17	—	—	6.94
R	10	—	—	14.70	—	—	4.18 (4)	9.80	—

includes the base of the nest (i.e. the junction with the substrate) and the entrance hole, reveal their internal architecture (Fig. 20); the construction sequence is clear when comparing nests in various phases of development. Nest foundation occurs with the construction of the base of the first cell on a flat surface (Fig. 21). The axis of the first cell is bent towards the substrate of an angle  $\alpha$  of about  $45^\circ$  ( $\Phi = 47.1^\circ$ ,  $r = 0.992$ ,  $n = 6$ ). Lateral cells are certainly added very soon to form a comb. The bases of the cells under the first one are displaced with respect to the vertical at the substrate plane and the line from the base of the first cell to that of the lowest one forms an angle  $\beta$  of about  $116^\circ$  ( $\Phi = 115.8^\circ$ ,  $r = 0.969$ ,  $n = 6$ ) with the substrate; however, in more mature nests (nest C, Fig. 22) we find that the axis of most cells is almost vertical to the substrate. The envelope begins to be built at the stage of 8-10 cells and derives from prolongations of the external walls of the peripheral cells of the comb. The envelope is not complete in the upper part of the nest, leaving a more or less wide access to the cells. The enlargement of the nest also proceeds with the addition of other cells to the substrate (so enlarging the base of the nest) and is also achieved with the addition of new cells to the outside of the envelope as the traces of new bases found in young nests indicate. This implies that the envelope must be in part destroyed and then extended to include the new cells. The vestibulum protected by the envelope roughly forms the lower hemisphere in the mature nest (nest C, Fig. 22). Table 1 gives the measurements from 18 nests ranging from 8 to 53 cells. The maximum size was registered in nest G (52 cells) which was 48 mm wide  $\times$  48.5 mm long  $\times$  28 mm high. Most measures correlate quite well with cell number. Weight ranged from a minimum of 0.81 g (nest H, 8 cells) to a maximum of 21.73 g (nest G).

#### DISCUSSION

*L. pardii* is characterized by a peculiar nest architecture quite unlike any other known in the subfamily. A comparable architecture can be found in some neotropical swarm-founding Polistinae such as *Synoeca* Brèthes 1906, *Metapolybia* Ducke 1905, *Clypearia* Saussure 1854 (JEANNE 1975), *Occipitalia* Richards 1978, and *Asteloecca* Raw 1985 (WENZEL 1991), which build astelocytarous, calyptodomous nests with vegetable material. According to some authors, these nests present an envelope which, arising from the walls of the external cells, is called a "pseudoenvelope" (but see WENZEL 1991). If we maintain this structural, but not functional, distinction, only the nest of *Eustenogaster calyptodoma* (Sakagami & Yoshikawa 1968), within the Stenogastrinae, possesses a true envelope (SAKAGAMI & YOSHIKAWA 1968). The "pseudoenvelope" of the nest of *L. pardii* represents the third independent example, in the subfamily, of calyptodomous nest architecture together with those of the nests belonging to species of the *Parischnogaster striatula* group (including *P. alternata*) and those of all the species of *Eustenogaster*. According to HANSELL & TURILLAZZI (1991), who described a flask-shaped mud nest found in New Guinea and attributed it to an unknown species of *Stenogaster*, this genus would also present nests with "pseudoenvelopes".

The reconstructed development sequence of the nest of *L. pardii* indicates a probable derivation from a *L. flavolineata* nest type. This species presents a nest with an incomplete, thin envelope of mud which more likely functions to facilitate landing

by returning wasps rather than defence (SAMUEL 1987). The defensive function of the *L. pardii* nest seems, in contrast, rather obvious, as a single wasp can guard the nest entrance against ants and other small predators and parasitoids. The thick mud envelope is also very resistant against the ovipositors of parasitoids. But, above all, this nest architecture seems to be an adaptation to the high predatory pressure of hornets (*Vespa* spp.). This may permit *L. pardii* to nest in open places, even with respect to the very similar *L. flavolineata*, avoiding the use of mimetic nest structures such as those of other Stenogastrinae.

Within the species already described (see key at the end of the paper), *Liostenogaster flavolineata* appears to be the more similar to *L. pardii* also from the morphological point of view. For example, the two species are similar in having rounded male clypeus and in the moderate scutal and frontoclypeal punctation. The main differences are the smaller size of *L. pardii* and its naked eyes — and in these features *L. pardii* is like *L. vechti* — the broader last antennal segment and the fourth, fifth and sixth gastral terga of the male lacking a clear transverse ridge (“scrapper”, see TURILLAZZI & FRANCESCATO 1990).

KEY TO THE DESCRIBED SPECIES OF *LIOSTENOGASTER*  
(ADULT FEMALES)

- |   |   |                                |   |
|---|---|--------------------------------|---|
| 1 | Mandibles with two teeth, rarely with an extremely small third one. Mesoscutum with four longitudinal stripes, two marginal and two paramedian. Malaya, Sarawak, Philippines, Sumatra | <i>varipicta</i> (Rohwer)      |   |
| — | Mandibles with three obvious teeth. Mesoscutum with two or no yellow stripes  |                                | 2 |
| 2 | Propodeum and mesoscutum densely punctate. Borneo, Malaya, Sumatra  | <i>vechti</i> Turillazzi       |   |
| — | Propodeum and mesoscutum smooth or only sparsely punctate   |                                | 3 |
| 3 | Second tooth of mandible pointed with smooth margins  |                                | 4 |
| — | Second tooth of mandible square with sharp margins  |                                | 5 |
| 4 | Eyes with long bristles. Length > 15 mm   | <i>flavolineata</i> (Cameron)  |   |
| — | Eyes bare, length < 13 mm. Malaya, Sarawak  | <i>pardii</i> n. sp.           |   |
| 5 | Large species, length about 20 mm, brown. Sulawesi  | <i>picta</i> (Smith)           |   |
| — | Species < 15 mm, clear in colour  |                                | 6 |
| 6 | Supraclypeal area and frons punctate. Malaya, Borneo, Sumatra, Philippines, Java  | <i>nitidipennis</i> (Saussure) |   |
| — | Supraclypeal area smooth. Malaya, Borneo, Sumatra   | <i>flaviplagiata</i> (Cameron) |   |

ACKNOWLEDGEMENTS

We are much indebted to Prof. J. van der Vecht (1906-1992) for freely sharing his extensive knowledge of *Liostenogaster* and for encouraging one of us (S. Turillazzi) to persevere in the revision of this genus. We also thank Mr H. Barlow who kindly welcomed us on to his property where all the nests of this species were collected, and Messrs S. Bambi and R. Innocenti who helped in the collection and took the photographs. Finally we thank Prof. Yong Hoy Sen of the University of Malaya (Malaysia) for valuable assistance in Malaysia and Dr J.M. Carpenter (American Museum of Natural History, New York) for a critical review of an earlier version of this paper. We are also indebted to Dr C.K. Starr (University of West Indies) for his useful suggestions for improving the manuscript. This research has been supported by funds from the Consiglio Nazionale delle Ricerche and the Ministero dell'Università e della Ricerca Scientifica e Tecnologica (40% and 60%).

## REFERENCES

- CARPENTER J.M. 1988. The phylogenetic system of the Stenogastrinae (Hymenoptera: Vespidae). *Journal of the New York Entomological Society* 96: 140-175.
- HANSELL M.H. & TURILLAZZI S. 1991. A new stenogastrine nest from Papua New Guinea probably belonging to the genus *Stenogaster* Guerin 1831 (Hymenoptera Vespidae). *Tropical Zoology* 4: 81-87.
- JEANNE R.L. 1975. The adaptiveness of social wasp nest architecture. *Quarterly Review of Biology* 50: 267-287.
- PAGDEN H.T. 1958. Some Malayan social wasps. *Malay Nature Journal* 12: 131-148.
- SAKAGAMI S.F. & YOSHIKAWA K. 1968. A new ethospecies of *Stenogaster* wasps from Sarawak, with a comment on the value of ethological characters in animal taxonomy. *Annotationes Zoologicae Japonenses* 41: 77-84.
- SAMUEL C.T. 1987. Factors affecting colony size in the stenogastrine wasp *Liostenogaster flavolineata*. *Ph.D. Dissertation, University of Malaya, Kuala Lumpur, Malaysia*.
- TURILLAZZI S. & FRANCESCATO E. 1990. Patrolling behaviour and related secretory structures in the males of some stenogastrine wasps (Hymenoptera Vespidae). *Insectes Sociaux* 37: 146-157.
- WENZEL J.W. 1991. Evolution of nest architecture, pp. 480-519. In: Ross K.G. & Matthews R.W., Edits. *The social biology of wasps*. Ithaca & London: Cornell University Press, XVII + 678 pp.