

Vertical Distribution of *Trachypholis bicarinata* (PASCOE) (Coleoptera, Zopheridae) Collected by Hanging Traps Set on High Towers in the Forests of East Kalimantan, Indonesia

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Abstract Vertical distribution of a colydiine beetle, *Trachypholis bicarinata* (PASCOE), was investigated in tropical forests in Samarinda, East Kalimantan, Indonesia. The hanging traps set on high towers (30 m and 60 m high) yielded the largest number of beetles near the canopy of the forest. The white body of *T. bicarinata* caused by wax-like secretion must be effective as cryptic coloration. A redescription of the species is given together with photos.

Key words: *Trachypholis bicarinata*, East Kalimantan, tropical forests, vertical distribution.

As a short-term expert of JICA Tropical Rain Forest Project (III), one of the authors, H. MAKIHARA, carried out an investigation of insect fauna in Bukit Soeharto Education Forest of Mulawarman University located in Samarinda, East Kalimantan, Indonesia. Two towers were built for meteorological observations in the Education Forest, namely, a 30 m tower in the secondary forest and a 60 m tower in the natural forest. The hanging traps with chemical attractant (80% ethanol) were set in different heights on the two towers.

Most popular insect collected by this method is a zopherid beetle, *Trachypholis bicarinata* (PASCOE, 1885), which showed interesting tendency of vertical distribution. The greater part of specimens collected is deposited in the collection of Museum Zoologicum Bogorensis (MZB) and the remaining specimens are kept in the collection of J. AOKI.

Investigation Area

Bukit Soeharto Education Forest is a tropical rain forest situated in 0°41' to 1°S, 116° 50' to 117° 10' E, 20–120 m a.s.l. A part of the forest suffered from forest fire in 1983 and now consists of secondary and natural vegetation mixed. The 30 m tower was built in a regenerated forest of *Macaranga gigantea* (20 m high) and other pioneer trees (Figs. 1B & 2A). The 60 m tower was built in natural forest consisting of tall trees 50–55 m high such as *Shorea laevis* and *Dipterocarpus cornutus* (Figs. 1C & D).

Method and Schedule

The 30 m tower was equipped with yellow, white and black hanging traps (40 cm tall, 30 cm in diameter; Sankei Chemical Co. Ltd., Tokyo) at intervals of two meters in the heights of 1.5 m (Fig. 1E), 10 m, 20 m and 30 m. Hanging traps were set on the 60 m tower in the same manner, but adding traps at higher places, 40 m and 50 m above the ground (Fig. 1F). Vial of 30 ml stuffed tightly with cotton and poured 20 ml of 50% ethanol was attached to side of each hanging trap. Water (500 ml) and Solbin acetate (50 mg) as antiseptic were put in bucket for collecting dropped insects. The traps were set out during six days from October 18 to 23, 1996. Collection of dropped insects was made with a strainer bug usually used in the kitchen.

Table 1. Individual numbers of *Trachypholis (Optis) bicarinata* captured by hanging traps on the 30 m and 60 m towers.
— W, white, Y, yellow, B, black trap.

| 30 m Tower | W | Y | B | Total | 60 m Tower | W | Y | B | Total |
|------------|---|----|---|-------|------------|----|-----|----|-------|
| 1.5 m | 0 | 0 | 0 | 0 | 1.5 m | 1 | 2 | 2 | 5 |
| 10 m | 0 | 1 | 1 | 2 | 10 m | 14 | 1 | 10 | 25 |
| 20 m | 9 | 9 | 3 | 21 | 20 m | 24 | 16 | 10 | 50 |
| 30 m | 0 | 2 | 2 | 4 | 30 m | 16 | 18 | 13 | 47 |
| | | | | | 40 m | 33 | 54 | 25 | 112 |
| | | | | | 50 m | 8 | 15 | 6 | 29 |
| Total | 9 | 12 | 6 | 27 | | 96 | 106 | 66 | 268 |

Result

The result of the investigation is shown in Table 1. Total number of *Trachypholis bicarinata* caught by traps is 268 from 60 m tower and 27 from 30 m tower, the former number about ten times as many as the latter. The difference of colors of the traps affected largely the collected number of *T. bicarinata*. On the 30 m trap nine beetles were collected by white traps, 12 by yellow traps and six by black traps. On the 60 m tower 96 beetles were collected by white traps, 106 by yellow traps and 66 by black traps. Collected numbers of the beetles were also quite different according to the setting heights of the traps. On the 30 m tower no beetle was collected at 1.5 m, 2 at 10 m, 21 at 20 m, and 4 at 30 m above the ground. On the 60 m tower 5 beetles at 1.5 m, 25 at 10 m, 50 at 20 m, 47 at 30 m, 112 at 40 m, and 29 at 50 m (Table 1).

Discussion and Conclusion

It was found that *Trachypholis bicarinata* prefers the height near canopy in the secondary as well as natural forests, mostly in the height of 20 m in the 30 m tower and in the heights of 20–40 m in the 60 m tower (Table 1). Far more *T. bicarinata* were collected in the natural forest than in the secondary forest and the fact indicates *T. bicarinata* must be an inhabitant of well-preserved forests in Kalimantan area. The other collecting tool, Malaise trap, was tried each one in each forest, but only one individual was captured in the natural forest. The result may suggest that *T. bicarinata* is attracted to ethanol and almost none of the species was captured by Malaise trap without ethanol as attractant.

The main habitat of *T. bicarinata* must be tree trunks and canopies of big living trees. The dirty white body color caused by thick secretion appears to be very similar to that of tree trunks and must be effective as cryptic colorations to defend themselves against their enemies.

As the concluding remarks the following facts should be mentioned.

- (1) *Trachypholis bicarinata* (PASCOE) prefers to natural forest than secondary one and far more individuals were collected in the former.
- (2) The main habitat of the species exists near canopy of trees, high above the ground.
- (3) The dirty white body color of the species is similar to that of tree trunks and may be effective as cryptic coloration. The white secretion covering whole body of all the specimens examined is unknown at least among the colydiid beetles. It is easily soluble by caustic potash, but its true character is unknown.

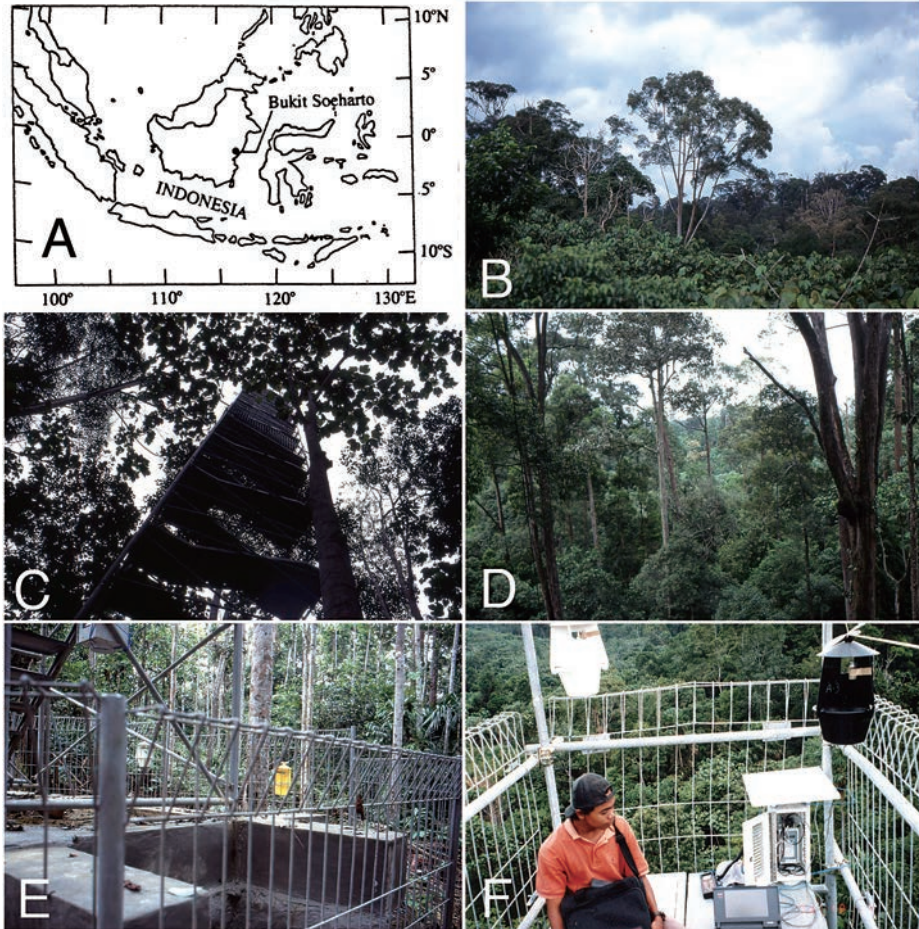


Fig. 1. Study area in Borneo. — A, Location map of Bukit Soeharto in East Kalimantan; B, secondary forest around the 30 m tower; C, the 60 m tower standing in natural forest; D, natural forest around the 60 m tower; E, hanging traps set on the 30 m tower in the height of 1.5 m; F, hanging traps set on the 60 m tower in the height of 50 m.

Redescription of the Species

Trachypholis (Optis) bicarinata (PASCOE, 1885)

(Figs. 2B–2E & 3A–G)

Optis bicarinata PASCOE, 1885: xiii; ŚLIPINIŃSKI & Lawrence, 1997: 424.

Trachypholis (Optis) bicarinata: IVIE & ŚLIPINIŃSKI, 1990: 12.

Body length 2.7–4.5 mm; width 1.2–2.0 mm.

Color. Whole body dark brown, glossy (Figs. 2D & E), but usually covered by thick white secretion except on eyes, antennae and legs (Figs. 2B & C).

Head transverse, 2.3 times as wide as long in exposed part (including eyes); vertex elevated medially, with concaved part on each side; frons flat mostly, convex on each side in front of eye, whole area densely covered with squamiform setae. Eyes (Fig. 3A) prominent, well produced, densely pro-

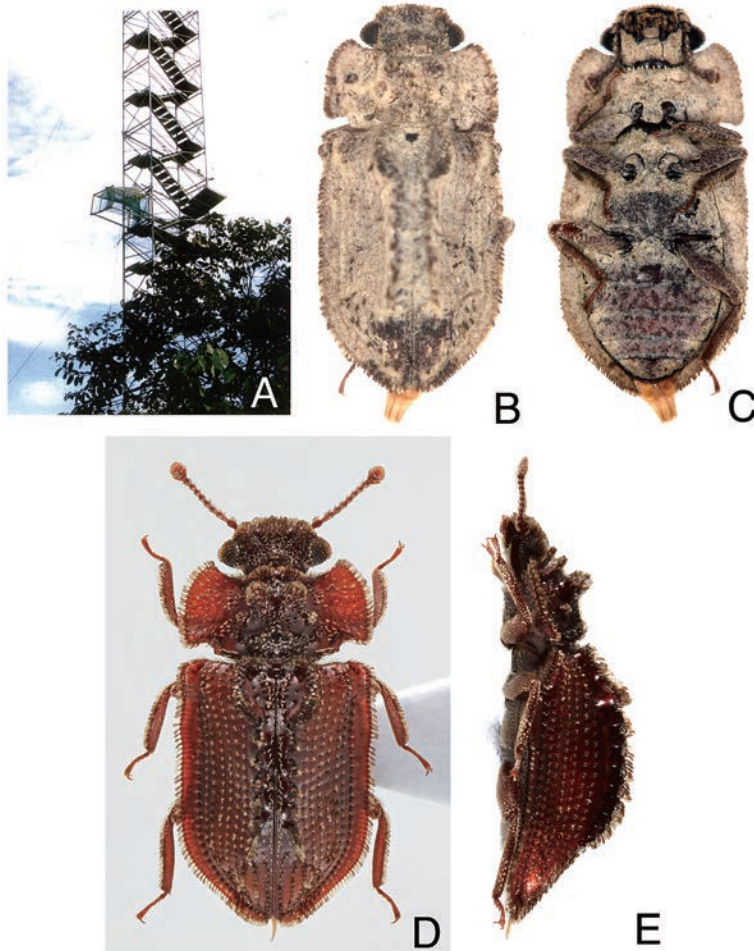


Fig. 2. Tower and the colydiine beetle. — A, The 30 m tower standing in secondary forest; B–E, *Trachypholis bicarinata* (PASCOE); B & C, specimens in natural condition, covered thick by white, wax-like secretion (B, in dorsal view; C, in ventral view); D & E, specimens after cleaning, removing secretion (D, in dorsal view; E, in lateral view).

vided with squamiform setae except in posterior part. Antenna (Fig. 3D) 11-segmented; terminal antennomere XI transverse and elliptical, densely covered with whip-like setae mixed with several longer setae; antennomere X cup-shaped, 1.1–1.2 times as broad as XI, densely covered with stronger setae; antennomeres I–IX provided with strong setae mixed with leaf-like setae; antennomeres in order of length: I > III > X > II > XI > IV = V = IX > VI = VII = VIII.

Pronotum transverse, 1.9–2.3 times as wide as long, widest at base, strongly elevated in median part, with a pair of humps on anterior margin and one more larger pair behind, and with a pair of deep grooves between humps and posterior elevation; lateral parts of pronotum (Fig. 3C) broadly flattened, with anterior margin shallowly gouged out and posterior margin deeply so; lateral margins densely provided with squamose setae; median swollen part covered with large granules, each bearing squamose seta.

Elytra (Figs. 2D & 3E) short, 1.44–1.56 times as long as wide, widest somewhat behind shoul-

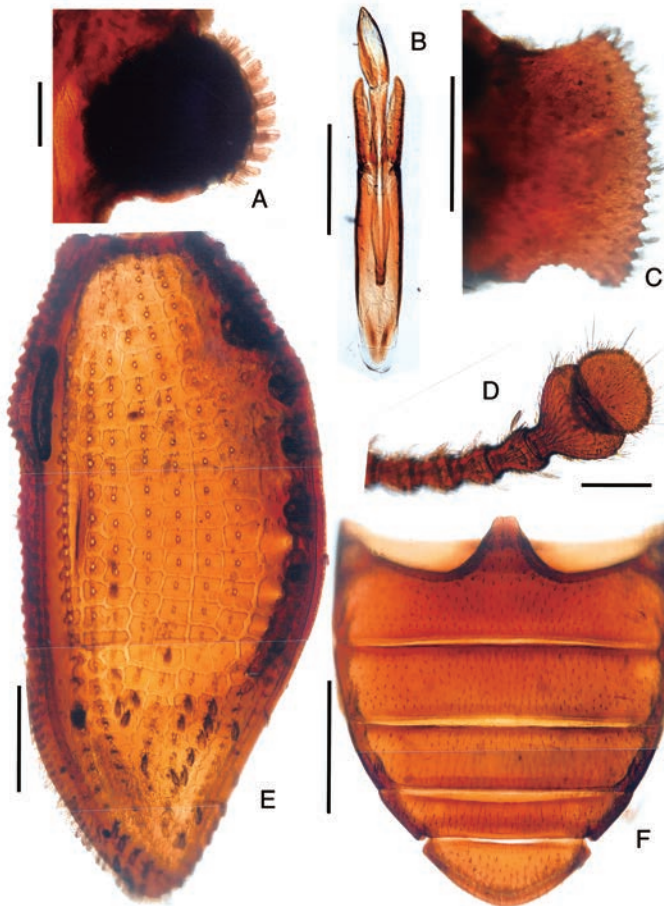


Fig. 3. Dissected parts of *Trachypholis bicarinata* (PASCOE). — A, Eye (right side); B, male genitalia; C, pronotum (right half); D, antenna (right side); E, elytron (left side); F, ventrite. Scales: 0.1 mm for A & D; 0.30 mm for B; 0.50 mm for C, E & F.

ders; scutellum and its posterior area surrounded by a pair of strongly elevated round ridges, which are extending in parallel along median edges of elytra to make steep cliff on each side, and disappearing at apical 1/3 along the length of elytra (Fig. 2E); squamose setae growing densely on median and lateral margins of elytra and rather sparsely on posterior part of elytra.

Ventral side. Meso- and metasternum covered with short and fine setae; prosternal process tongue-like, anterior margin shallowly concave, lateral margins somewhat narrowed in middle part; mesosternal process trapezoid, anterior corners roundly projecting with deep concavity between them. Ventrites (Fig. 3F) broad, segments in order of length: I > II > V > III > IV; segments I – IV with minute setae, V with longer setae near posterior margin.

Male genitalia (Fig. 3B). Ratio in length of lateral lobe: basal piece = 5 : 11; lateral lobes with fine shining spots on anterior half; median lobe with bud-like tip and long stem; no setae on genitalia.

Specimens examined. 295 exs., Bukit Soeharto, East Kalimantan, Indonesia. Hanging trap set on tower 1.5–50 m high above the ground, 18–23.X.1996, H. MAKIHARA leg.

Distribution. Indonesia: North Borneo and East Kalimantan.

Remarks. About thirty species of the genus *Trachypholis* are known from Indo-Pacific area. A pe-

cular species, *T. bicarinata*, is easily distinguished from the congeners by the following features: (1) the strongly elevated dorsal side of abdomen, (2) the conspicuous carinae surrounding scutellum and extending along the mid-line of elytra, (3) the pronotum with posterior corners strongly gouged out, (4) the male genitalia bearing no setae, and (5) the white secretion covering whole body.

In the present study the type specimen of the species (*Optis bicarinata*) is not examined, but identification was made only based on the original description, because no redescription was found. The original description of the species did not appear on any publication of scientific society, but introduced by unusual way on minutes of annual meeting of a society. The minutes were made as those of “the Entomological Society of London for the Year 1885”. Mr. R. M^oLACHLAN, the president in the chair reported on the “exhibition” by Mr. F. P. PASCOE accompanied by description of a new genus *Optis* and a new species *Optis bicarinata*. In such a case, name of the new species becomes valid (International Code of Zoological Nomenclature, Fourth Edition 50.2.), though it is not desirable (Recommendation 50B).

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要 約

榎原 寛・青木淳一：インドネシア・東カリマンタンの熱帯林内のタワーに設置された吊り下げトラップによって得られたホソカタムシ *Trachypholis (Optis) bicarinata* (PASCOE) の垂直分布 (鞘翅目コブゴミムシダマシ科ホソカタムシ亜科)。——— 東カリマンタンの熱帯林中に建設された気象観測用タワー (高さ 30 m および 60 m) 上に高さ 10 m おきに設置した吊り下げ式トラップによって捕獲された甲虫類を調査した。最も多く得られたホソカタムシの一種 *Trachypholis (Optis) bicarinata* (PASCOE) の垂直分布を調べた結果、本種は二次林よりも自然林にはるかに多く生息し、しかも生息の中心は林冠部にあることが分かった。また、本種の再記載を行った。

References

- IVIE, M. A., & A. ŚLIPINŃSKI, 1990. Catalog of the genera of world Colydiidae (Coleoptera). *Annales Zoologici, Warszawa*, **43**: 1–32.
- MAKIHARA, H., & H. KINUURA, 1996. Vertical distribution of insect fauna on the towers, and Cerambycid and Scolytid beetles fauna in Bukit Soeharto Education Forest. *JICA Experimental Report*, **1996–2**: 1–23, 8 figs.
- PASCOE, F. P., 1885. “A report on the exhibition accompanied by description of a new genus and a new species *Optis bicarinata*”. *Proceedings of the Entomological Society of London for the Year 1885*: xiii–xiv.
- ŚLIPINŃSKI, A., & J. F. LAWRENCE, 1997. Genera of Colydiinae (Coleoptera: Zopheridae) of the Australo-Pacific Region. *Annales Zoologici, Warszawa*, **47**: 341–440.