

A Revision of the Genus *Formosotoxotus* (Coleoptera, Cerambycidae, Apatophyseinae), with Description of a New Species from Sikkim

Nobuo OHBAYASHI

Entomological Laboratory, Faculty of Agriculture, Ehime University,
Tarumi, Matsuyama, 790–8566 Japan

Abstract The cerambycid genus *Formosotoxotus* is revised. *Formosotoxotus masatakai* sp. nov. is described from Sikkim, and *F. fulvopilosus* HAYASHI, 1979 is synonymized with *F. malayanus* HAYASHI, 1977. The systematic position of the genus is discussed and it is placed in the subfamily Apatophyseinae.

Introduction

On my short trip to Paris made in 2005, I found a very old specimen belonging to the genus *Formosotoxotus* in the collection of the Muséum national d'Histoire naturelle. After a careful examination, it was concluded that the specimen belonged to a species new to science. Along with description of the new species, I take this opportunity to revise briefly the genus *Formosotoxotus* and bestow some considerations on its systematic position.

Taxonomic placement of the species of *Formosotoxotus* has frequently changed. KANO (1933) described the first species *Toxotinus auripilosus* from Taiwan as a close relative of *Toxotinus reinii* HEYDEN. In the same year, MATSUSHITA (1933) described *Artelida asiatica* from Taiwan (the genus *Artelida* had been used until then exclusively for Madagascan species).

GRESSITT (1951) placed *Toxotinus auripilosus* in the genus *Toxotus* (subgenus *Toxotinus*) of the Stenocorini. Simultaneously he erected a new genus *Paranthophylax* (in Xylosteini) for a new species, *P. sericeus* (designated as the type species) and *P. asiaticus*, transferred to this genus from *Artelida*. *Paranthophylax* is currently regarded as a junior synonym of the genus *Trypogeus* LACORDAIRE. In 1960, HAYASHI synonymized *Artelida asiatica* with *Toxotinus auripilosus* and established a new genus *Formosotoxotus* for it. Since then, five more species were added to the genus *Formosotoxotus*, viz., *F. malayanus* HAYASHI, 1977 and *F. fulvopilosus* HAYASHI, 1979, from Malaysia, *F. uenoi* N. OHBAYASHI, 1995, from Kalimantan, Indonesia, *F. takaoui* NIISATO, 1996, from North Vietnam, and *F. nobuoi* VIVES et NIISATO, 2006, from Nepal.

Up to now, all the authors regarded those species as members of the subfamily

Lepturinae except JENIŠ (2001) who illustrated an unidentified Malayan species of *Formosotoxotus* and placed it, without proper explanation, in the Apatophyseinae, together with many Madagascan species, the African *Dorcasomus* SERVILLE and *Cape-toxotus rugosus* TIPPMANN, and the Oriental genera *Protaxis* GAHAN and *Trypogeus* LACORDAIRE. The subfamily Apatophysinae LACORDAIRE was erected by DANILEVSKY (1979) for a single genus, *Apatophysis* CHEVROLAT, mainly based on the larval morphology (original LACORDAIRE's Apatophysides included also the South African genus *Pachyticon* THOMSON and the Oriental *Trypogeus* whose larvae were and still are unknown). The correct spelling of the subfamily name apparently should be Apatophyseinae, first used by LOBANOV *et al.* (1981). So far there have been few external adult characters distinguishing the Apatophyseinae from other subfamilies. However, the subfamily could be characterized by a combination of stridulatory file of mesonotum, hind wing venation and male genitalia (personal unpublished results). Based on my study of hind wing venation and male genitalia, I conclude that the genus *Formosotoxotus* is closely related to *Apatophysis*, and thus it belongs to the subfamily Apatophyseinae.

This short paper is dedicated to the memory of the late Prof. Dr. Masataka SATÔ, who was one of the most prominent Japanese coleopterist, and also had been my closest senior like a brother since fifty years ago.

I wish to thank Petr ŠVÁCHA (Czech Academy of Science, České Budějovice) for his useful advice and critical review of the manuscript. My thanks are also due to the following entomologists for their kind help, useful suggestions or offer of invaluable specimens for study: Gianfranco SAMA, Mikhail L. DANILEVSKY, Eduard VIVES and Tatsuya NIISATO. I was also much indebted to Thierry DEUVE and Azadeh TAGHAVIAN of the Muséum national d'Histoire naturelle, Paris for their kind help extended to me at my visit to the museum.

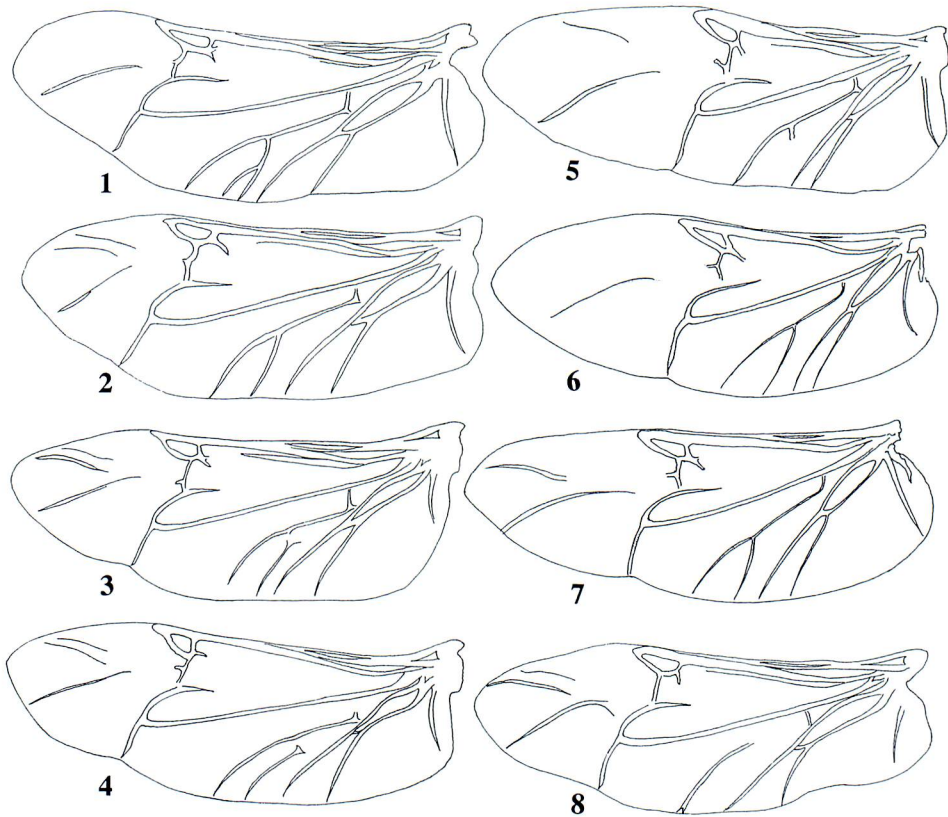
Subfamily A p a t o p h y s e i n a e LACORDAIRE, 1869

Apatophysides LACORDAIRE, 1869, 234.

Apatophysinae: DANILEVSKY, 1979, 827.

Apatophyseinae: LOBANOV *et al.*, 1981, 786, 794. — ŠVÁCHA & DANILEVSKY, 1988, 125. — ŠVÁCHA *et al.*, 1997, 364, fig. 55.

Notes. After DANILEVSKY (1979) erected the subfamily Apatophysinae LACORDAIRE for receiving the genus *Apatophysis*, ŠVÁCHA (in ŠVÁCHA & DANILEVSKY, 1987) made the following comment: "The genus *Apatophysis* has no direct relation to the Lepturinae, and it has been placed in a separate subfamily Apatophyseinae (DANILEVSKY, 1979). . . . Despite DUFFY (1957, 1980), the genus *Dorcasomus* can be on no account retained in Lepturinae, and, although differing in some characters from *Apatophysis*, it should be provisionally included in the *Apatophyseinae*. . . . The writer suspects all the Lepturine-like forms occurring in the Ethiopian Region (incl. Madagascar) to be of a similar taxonomic position." According to P. ŠVÁCHA (pers.



Figs. 1–8. Hind wing venation of the subfamily Apatophyseinae. — 1, *Apatophysis barbara* LUCAS; 2, *Apatophysis sinica* SEMENOV TIAN-SHANSKIJ; 3, *Artelida* sp.; 4, *Mastododers nodicollis* KLUG; 5, *Formosotoxotus auripilosa*; 6, *F. malayanus*; 7, *F. nobuoi*; 8, *Tripogeus cabigasi* VIVES.

comm.), after inclusion of *Dorcasomus* the Apatophyseinae should be renamed Dorcasominae for priority reasons (Dorcasomides were established in LACORDAIRE, 1869 a, 456). After discussions with some European entomologists, it is becoming clear that the majority of the so-called lepturine-like forms of Madagascar should be included in this subfamily, but there are different opinions concerning the position of the genus *Dorcasomus* distributed in continental Africa. Not having examined specimens of *Dorcasomus*, I cannot contribute to solving the problem and therefore I retain the name Apatophyseinae until the change to Dorcasominae is formally published.

Concerning the Asian genera of this subfamily, VIVES (2006) described a new genus *Borneophysis* from Sabah, Malaysia, and also upgraded two former subgenera of *Apatophysis* to generic status: *Paratophysis* GRESSITT et RONDON, 1970, and *Epitophysis* GRESSITT et RONDON, 1970. In addition, the genus *Trypogeus* should be included in this subfamily (E. VIVES, pers. comm.). As the result, six genera of Apatophyseinae occur

in Asia: *Apatophysis*, *Formosotoxotus*, *Paratophysis*, *Epitophysis*, *Borneophysis* and *Trypogeus*.

Hind wing venation of the genera *Apatophysis*, *Artelida*, *Mastododera*, *Formosotoxotus* and *Tripogeus* are illustrated in Figs. 1–8 for comparison.

Genus *Formosotoxotus* HAYASHI, 1960

Formosotoxotus HAYASHI, 1960, 1; type species: *Artelida asiatica* MATSUSHITA, 1933 = *Toxotinus auripilosus* KANO, 1933. — HAYASHI & VILLIERS, 1985, 27, 31.

Body stout, short, entirely covered with adpressed long hairs. Head short; mandibles large and sharp; gena as long as the width across eye; antenna inserted laterally at some distance before eye; eye coarsely faceted and emarginate behind antennal insertion; tempora gradually narrowed posteriorly, not constricted. Pronotum with conical lateral tubercles and two pairs of discal tubercles, the anterior pair of which is larger than the posterior one; prosternal process narrow and slightly dilated at apex; acetabula of procoxae closed or narrowly opened posteriorly; mesosternum without stridulatory files and with a complete subcuticular longitudinal median black line visible through the translucent cuticle; surface of cuticle without transverse striation, indistinctly reticulate. Elytra broader than pronotum, almost twice as long as basal width, almost parallel-sided or slightly narrowed posteriad. Hind wing venation as in Figs. 5–7. Legs rather long; tibia dilated and usually flattened apically; hind tarsus with first segment as long as second and third combined. Median lobe of male genitalia longer than tegmen, widened from median struts in dorsal view; median struts longer than half of total length of median lobe; median foramen roundly opened.

Notes. This genus has very close relation with the genus *Apatophysis*, in particular by the features of hind wing venation, the structure of male genitalia, laterally inserted antennal scape, and two pairs of discal tubercles of pronotum, but it is distinguishable by rather short antennae, irregularly arranged pubescence on dorsal surface, hind tarsus with first segment not longer than second and third combined, abdomen of female entirely covered by elytra, and so on.

Formosotoxotus auripilosus (KANO, 1933)

(Figs. 5, 9, 13–14)

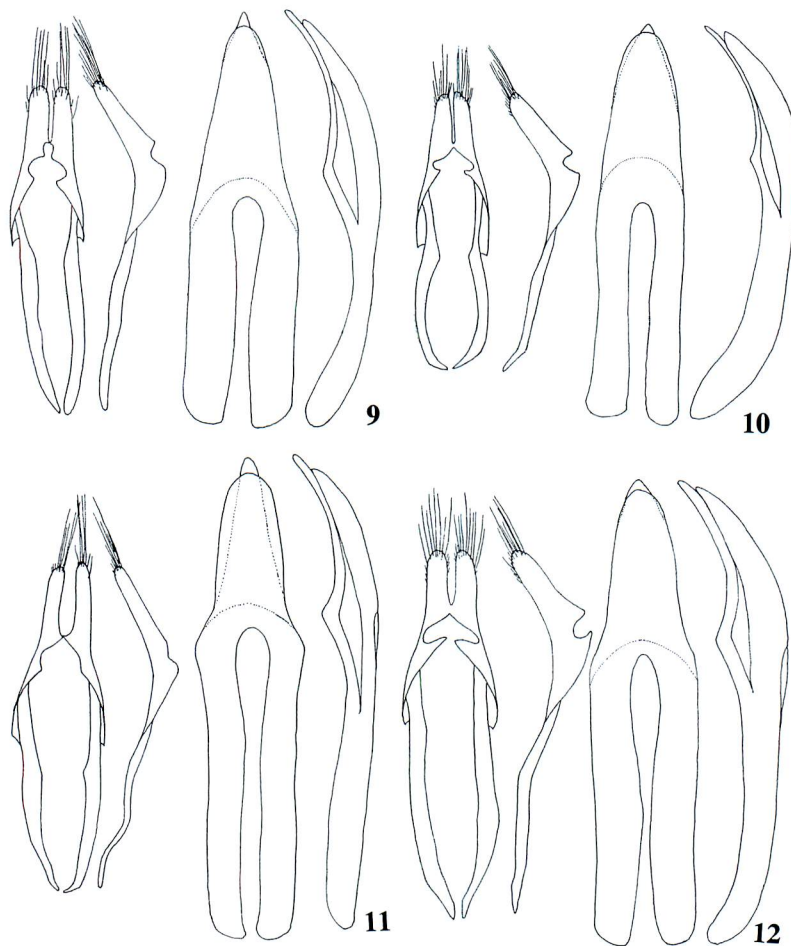
Toxotinus auripilosus KANO, 1933, 263; type locality: Tattaka (7,300 ft. in alt.) near Musha, Central Formosa. (Cerambycinae, sensu lato). — TAMANUKI, 1939, 69, fig. 25. (Senocorini)

Artelida asiatica MATSUSHITA, 1933, 172; type locality: Hôzan, Formosa. (Toxotini)

Paranthophylax asiaticus: GRESSITT, 1951, 50, 51. (Xylosteini)

Toxotus (*Toxotinus*) *auripilosus*: GRESSITT, 1951, 56, 58. (Stenocorini)

Specimens examined. 1♂, Sziuaniakou, Taichung, Taiwan, 25–V–1999, M. SATÔ leg.; 1♂, Anmashan, Taichung, Taiwan, 25–28–IV–2002, N. OHBAYASHI leg.; 1♂, Meifeng, Nantow, Taiwan, 25–IV–1976, K. MASUMOTO leg.; 1♀, Sungkang — Meifeng



Figs. 9–12. Male genitalia of *Formosotoxotus* spp. — 9, *F. auripilosus* (Sziuniakou, Taichung, Taiwan); 10, *F. malayanus* (Tanah Rata, CHL, Malaysia); 11, *F. takaoi* (Mt. Phu-Pan, Laos); 12, *F. masatakai* sp. nov. (Sikkim).

(2,044–2,127 m), Nantow, Taiwan, 19–V–1969, S. HISAMATSU leg.; 1♀, Pilu Shenmu (2,200 m), Hualien, Taiwan, 25–VI–1989, M. SATÔ leg.

***Formosotoxotus malayanus* HAYASHI, 1977**

(Figs. 6, 10, 15–20)

Formosotoxotus malayanus HAYASHI, 1977, 95; type locality: Cameron Highlands, Pahang, Malaysia. (Xylosteini). — HAYASHI & VILLIERS, 1985, 33, pl. 5, fig. 13. (Xylosteini)

Formosotoxotus fulvopilosus HAYASHI, 1979, 3; type locality: Cameron Highlands, Tana Rata, Pahang,

Malaysia. (Xylosteini). — HAYASHI & VILLIERS, 1985, 33, pl. 5, fig. 14. (Lepturinae). *Syn. nov.*
Formosotoxotus sp.: JENIŠ, 2001, 34 (pl. 20), fig. 137/101. (Apatophyseinae)

Notes. HAYASHI (1977) first described *F. malayanus* from the Cameron Highlands. Two years later in 1979, he added another new species, *F. fulvopilosus* from the same locality. According to the original descriptions, body lengths of the former species are 10 mm (the holotype male) and 15 mm (a paratype female), and that of the latter species are 17 mm (holotype male) and 21 mm (a paratype female). In 1985 HAYASHI & VILLIERS re-described these two species, and distinguished them by the following key:

1. Body brownish red, covered with fulvous hairs; frons separated from clypeus by an arcuate groove; antennae shorter than body in male, gena shorter than eye-diameter; elytra about twice as long as basal width, disc rather simple. 10–15 mm*F. malayanus*.
- Body dark reddish brown, covered with pale fulvous hairs; frons separated from clypeus by a straight transverse groove; antennae fairly longer than body in male, gena as long as eye-diameter; elytra a little longer than twice as long as the basal width, disc with four discal costae. 17–21 mm*F. fulvopilosus*.

My examination of a series of specimens collected on the Cameron Highlands showed that the differences between the two species described by HAYASHI are intra-specific variations. The difference of antennal length and elytral proportion indicated in the key is not a specific feature but a sexual difference, because the holotype of *Formosotoxotus malayanus* described as male in his original description was a female. Other differential characteristics also depend on the sexual dimorphism, or on the difference of body size. Body lengths of the specimens examined are quite variable as follows: 6.8, 11.2, 11.5, 11.9, 12.0, 12.7, 16.0, 17.1 mm in male and 7.5, 8.6, 9.9 (holotype of *F. malayanus*), 11.0, 11.2 mm in female, respectively. Discal costae of the elytra are distinct in large specimens, and the condition of fronto-clypeal suture differs with individuals. As a result, *F. fulvopilosus* is here placed as a junior synonym of *F. malayanus*.

Specimens examined. 1♀ (Holotype), Tana Rata, Malaysia, 22-I-1976, Y. KIYOYAMA leg. (*Formosotoxotus malayanus* HAYASHI ♂) (M. HAYASHI coll. OMNH [98-32]); 6♂♂, 4♀♀, Mt. Jasar, Cameron Highlands, Pahang, Malaysia, III-1985, native collector; 1♂, Tana Rata, C. H. L., Malaysia, 16-I-1980, coll. H. DETANI; 1♂, Tana Rata, Malaysia, 14-I-1980, coll. N. NISHIKAWA.

Formosotoxotus uenoi N. OHBAYASHI, 1995

(Figs. 21–22)

Formosotoxotus uenoi N. OHBAYASHI, 1995, 437, figs. 1–6; type locality: Mt. Berangin, W. Kalimantan, Indonesia. (Lepturinae)

Specimens examined. 1♂ (Holotype), Mt Berangin, W. Kalimantan, Indonesia,

VIII-1992, collected by a native; 1♀ (Allotype), Mt. Saran, W. Kalimantan, Indonesia, IX-1992, collected by a native.

Formosotoxotus takaoi NIISATO, 1996

(Figs. 11, 23)

Formosotoxotus takaoi NIISATO, 1996, 101, figs. 1 & 2; type locality: Near Sapa, Lao Cai Province, North Vietnam. (Stenocorini)

Notes. This species was first described from a single specimen collected in North Vietnam, and a second specimen is newly recorded from northern Laos. The specimen from Laos shows some differences in the proportion of pronotum which is slenderer than that of the Vietnamese specimen. For example, pronotal length is 0.90 times as long as maximum width of pronotum instead of 0.84, and also pronotal length is 1.27 times as long as apical width of pronotum, instead of 1.14. Until further specimens become available, this difference is considered intraspecific or local variation.

Specimens examined. 1♂ (Holotype), near Sapa, Lao Cai Province, North Vietnam, 25-III-1995, N. KATSURA leg.; 1♂, Mt. Phu-Pan, Ban Saleui, Xam Neua Prov., Laos, 28-III-2005, J. YAMASAKO leg.

Formosotoxotus nobuoi VIVES et NIISATO, 2006

(Figs. 7, 24-25)

Formosotoxotus nobuoi VIVES et NIISATO, 2006, 273, figs. 1 & 2; type locality: Taplejung, ca. 2,000 m in alt., Nechi Province, E. Nepal. (Xylosteini)

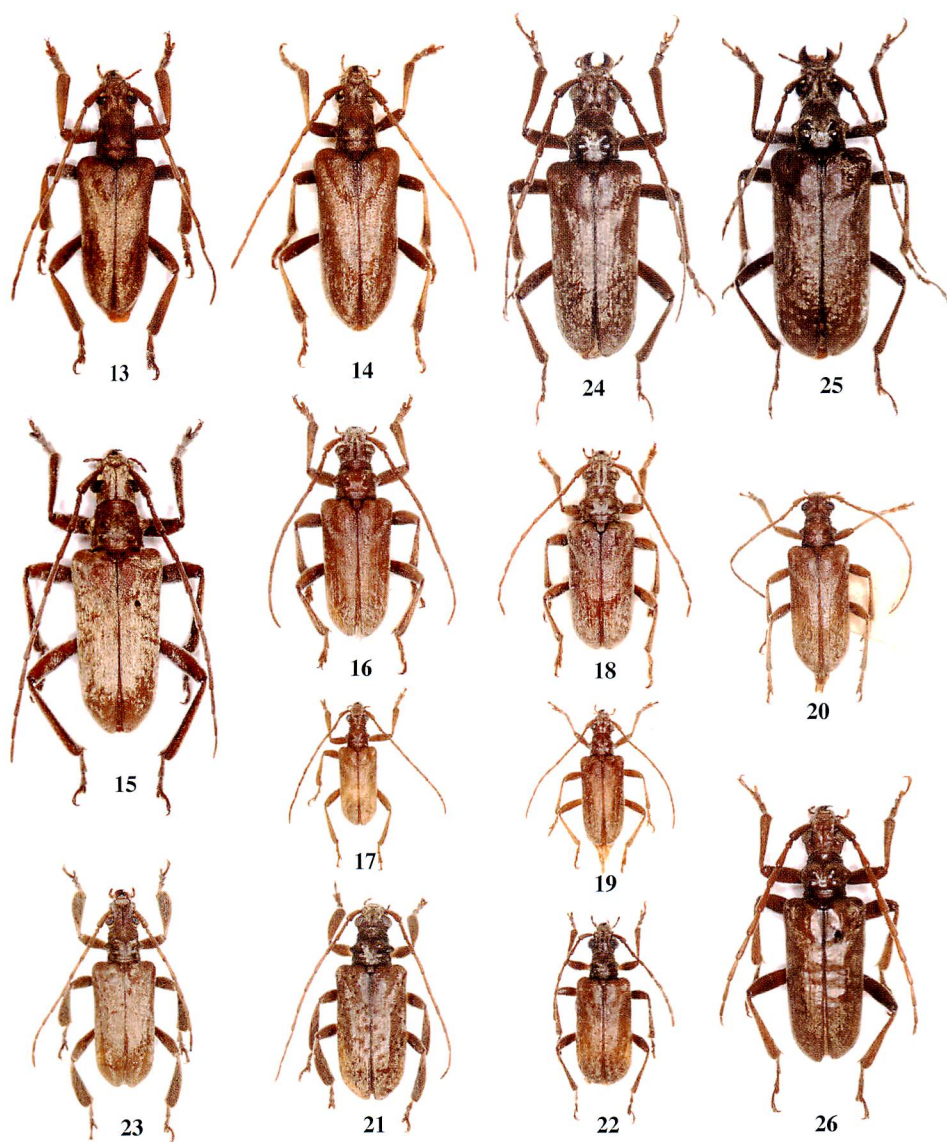
Specimens examined. 8♂♂, 3♀♀ (Paratypes), Taplejung, ca 2,000 m in alt., Nechi Province, E. Nepal, 13~18-VI-2000, local collectors.

Formosotoxotus masatakai sp. nov.

(Figs. 10, 26)

Male. Length 13.5 mm, width 4.5 mm. Body robust, rather short; color chestnut brown; maxillary palpus reddish brown; mandibles, lateral margin of labrum, and marginal area of scutellum blackish; antenna yellowish brown except for scape and pedicel, which are darker than the remaining segments; legs yellowish brown except for darkened apical area of femora and first tarsal segments. Body entirely clothed with adpressed pale yellow pubescence, rather long on head, short and fine on pronotum, and on elytra arranged in whorls causing marbled appearance.

Head including mandibles longer than pronotum, gradually narrowed posteriad behind eyes; mandibles stout, long, glossy dorsally, protruding medially and provided with hairs on outer sides of basal half; labrum twice as wide as long, gently arcuate at side and subtruncate at apical margin, clypeus narrowly transverse; frons depressed



Figs. 13–26. Habitus of *Formosotoxotus* spp. — 13, *F. auripilosus* (Taiwan), male; 14, ditto, female; 15–17, *F. malayanus* (CHL, Malaysia), male; 18–20, ditto, female (20=holotype); 21, *F. uenoi* (W. Kalimantan, Borneo), holotype male; 22, ditto, paratype female; 23, *F. takaoi* (Laos); 24, *F. nobuoi* (Nepal), paratype male; 25, ditto, paratype female; 26, *F. masatakai* sp. nov. (Sikkim), holotype.

medially with elevated lateral ridges; a groove extending from base of frons to vertex but not reaching occiput; antennal tubercles strongly elevated and extending forwards to lateral ridges of frons; vertex slightly swollen on both sides of median groove; occiput transversely depressed. Eyes very coarsely faceted, large, distinctly prominent laterad, almost oval and slightly emarginate behind antennal insertions. Antenna slender though each segment is thickened apically, flattened from fifth to the last segments, not reaching the apex of elytra; scape gently curved, thickened apicad and produced ecto-apically; third segment slightly shorter than scape and longer than fourth, seventh segment the longest; relative length of each segment as follows: 26 : 10 : 24 : 21 : 28 : 27 : 29 : 25 : 25 : 21 : 27. Maxillary palpus with last segment widest near the middle, 2.6 times as long as wide, slightly narrowed toward the roundly truncate apex.

Pronotum trapezoidal with conical and nearly rectangular lateral tubercles, widest across the tubercles, 1.42 times wider than long, narrowly margined at apex and base; base 1.20 times as wide as apex; disc provided with two distinct pairs of oblique anterior and rounded posterior swellings. Prosternal process strongly narrowed between coxal cavities, then triangularly dilated apically; acetabula of procoxae closed posteriorly; mesosternum without stridulatory files, with a black median longitudinal line; scutellum nearly tongue-shaped.

Elytra widest at humeri, twice as long as wide, slightly narrowed from humeri to apical fifth, then gently rounded to blunt sutural apex; disc slightly convex at both sides behind scutellum, then flattened around both sides along suture, densely covered with shallow and minute setigerous punctures throughout.

Legs stout and moderate in length; femora clavate; all tibiae compressed and widened apicad with rounded outer angles; hind tarsus with the first segment as long as second and third combined.

Male genitalia:— Median lobe 1.27 times as long as tegmen, slightly curved, ventral side bisinuate in lateral view; dorsal plate wider than ventral plate, gradually narrowed apicad with rounded apex in apical third, not reaching the apex of ventral plate in dorsal view; median struts 0.62 times as long as the total length of median lobe; median foramen opened as round emargination. Tegmen with lateral lobes short, one-sixth as long as its total length; apical area of lateral lobes provided with moderately long setae; roof once deeply emarginate behind the base of lateral lobes; ringed part thick, almost parallel-sided, then narrowed toward unconnected base.

Holotype. ♂, Sikkim, 1890, HARMAND (MUS. HIST. NAT.). No further data are available. The holotype is preserved in the collection of the Muséum national d'Histoire naturelle, Paris.

Etymology. The species is dedicated to the late Prof. Dr. Masataka SATÔ for the memory of his great contribution to the entomology.

Notes. This new species can be distinguished from the known species by the following key.

Key to the Species of the Genus *Formosotoxotus*

1. Elytra distinctly convergent posteriorly. *F. auripilosus*
- Elytra almost parallel-sided or slightly narrowed posteriad. 2.
2. Elytra provided with several large deeply impressed punctures, the pubescence around those punctures radially arranged. *F. uenoi*
- Elytra without large punctures; elytral pubescence irregularly arranged. 3.
3. Apices of eighth to tenth antennal segments angulate externally. *F. nobuoii*
- Apices of eighth to tenth antennal segments not angulate. 4.
4. Vertex deeply and widely concave. *F. malayanus*
- Vertex shallowly and narrowly concave. 5.
5. All tibiae strongly compressed and arcuately dilated outwards (female unknown). *F. takaoi*
- All tibiae slightly compressed and not distinctly dilated outwards (female unknown). *F. masatakai* sp. nov.

要 約

大林延夫: *Formosotoxotus* 属の再検討とシッキム産 1 新種の記載。—— 台湾のキンケカタビロハナカミキリを基準種として創設された *Formosotoxotus* 属には、これまで 6 種が知られていたが、このうちマレーシアのキャメロンハイランドから記載された *F. fulvopilosus* HAYASHI, 1979 は、同じ産地から記載された *F. malayanus* HAYASHI, 1977 と同種と認め、前者を後者のシノニムとした。また、パリの自然史博物館に所蔵されていたシッキム産の 1 新種を、故佐藤正孝博士に献名して *F. masatakai* として記載した。また、従来ハナカミキリ亜科に含められていた本属の分類学的位置について検討し、後翅翅脈や雄交尾器などの形態が *Apatophysis* 属にきわめて近いことから、ニセハナカミキリ亜科 *Apatophyseinae* に含めるべきであるとした。

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