

# *Microdon katsurai*, a New Species of Myrmecophilous Hoverfly (Diptera, Syrphidae) from Japan, Associated with *Polyrhachis lamellidens* (Hymenoptera, Formicidae)

Munetoshi Maruyama<sup>1</sup> and Teruhiko Hironaga<sup>2</sup>

<sup>1</sup> Department of Zoology, National Science Museum,  
Hyakunin-chô 3–23–1, Shinjuku-ku, Tokyo, 169–0073 Japan  
e-mail: maruyama@kahaku.go.jp

<sup>2</sup> Systematic Entomology, Graduate School of Agriculture, Hokkaidô University,  
Sapporo-shi, 060–8589 Japan  
e-mail: teruhiro@res.agr.hokudai.ac.jp

**Abstract** A new species of the myrmecophilous hoverfly genus *Microdon* (Syrphidae, Microdoninae), *M. katsurai*, associated with *Polyrhachis lamellidens*, is described in Honshû, Japan. This species is similar to *M. stilboides* Walker in its general appearance, but is easily distinguished by the coloration of its body and hairs and the shape of the scutellum. The symbiotic host, *P. lamellidens*, has rapidly declined in population throughout Japan as a result of residential and industrial development in its habitats. *Microdon katsurai* is probably an extremely rare species and will become endangered in the near future.

**Key words:**

## Introduction

Katsura (1996a) first reported the presence of an unknown species of the myrmecophilous hoverfly genus *Microdon* Meigen, 1803, in Ôsaka, Honshû, Japan. It was found near a nest of *Polyrhachis lamellidens* Smith, 1874 (Hymenoptera, Formicidae, Formicinae), and has attracted the attention of many Japanese dipterologists because of its large beautiful figure and brilliant green colour. After Katsura's (1996a) report, this hoverfly was recorded in several localities in Honshû, Japan: Tochigi-ken (Hironaga *et al.*, 1998; Iwai, 2000, 2004); Mie-ken (Kano, 1999); Yamaguchi-ken (Tanaka, 2002). Through the courtesy of Messrs. D. Iwai, K. Katsura and H. Ohishi, we have had the opportunity to examine most of the material describing this species that has been recorded in Japan.

Hironaga *et al.* (1998) observed ovipositional behaviour of this species in a nest entrance of *P. lamellidens*. The above authors (pers. comm.) and we have not been confirmed any other ant-

association with this species in the collecting sites. Therefore, *P. lamellidens* could be regarded as the only symbiotic host of this hoverfly.

In spite of eager research by many Japanese dipterologists, only a few habitats of this hoverfly have been found over the past eight years. The symbiotic host, *P. lamellidens*, is generally restricted to lowland wet forests in warmer areas of Japan. However, due to recent residential and industrial development, habitats of this ant species have been rapidly decreasing throughout Japan.

The purpose of this paper is to describe this hoverfly as a new species and discuss the possibility of its endangerment, in the hope of initiating conservation efforts.

The terminology used in the present study follows McAlpine (1981).

The holotype is located in the Ôsaka Museum of Natural History, and some paratypes can be found in the National Science Museum, Tokyo, as well as in the private collections of the authors.

### Taxonomy

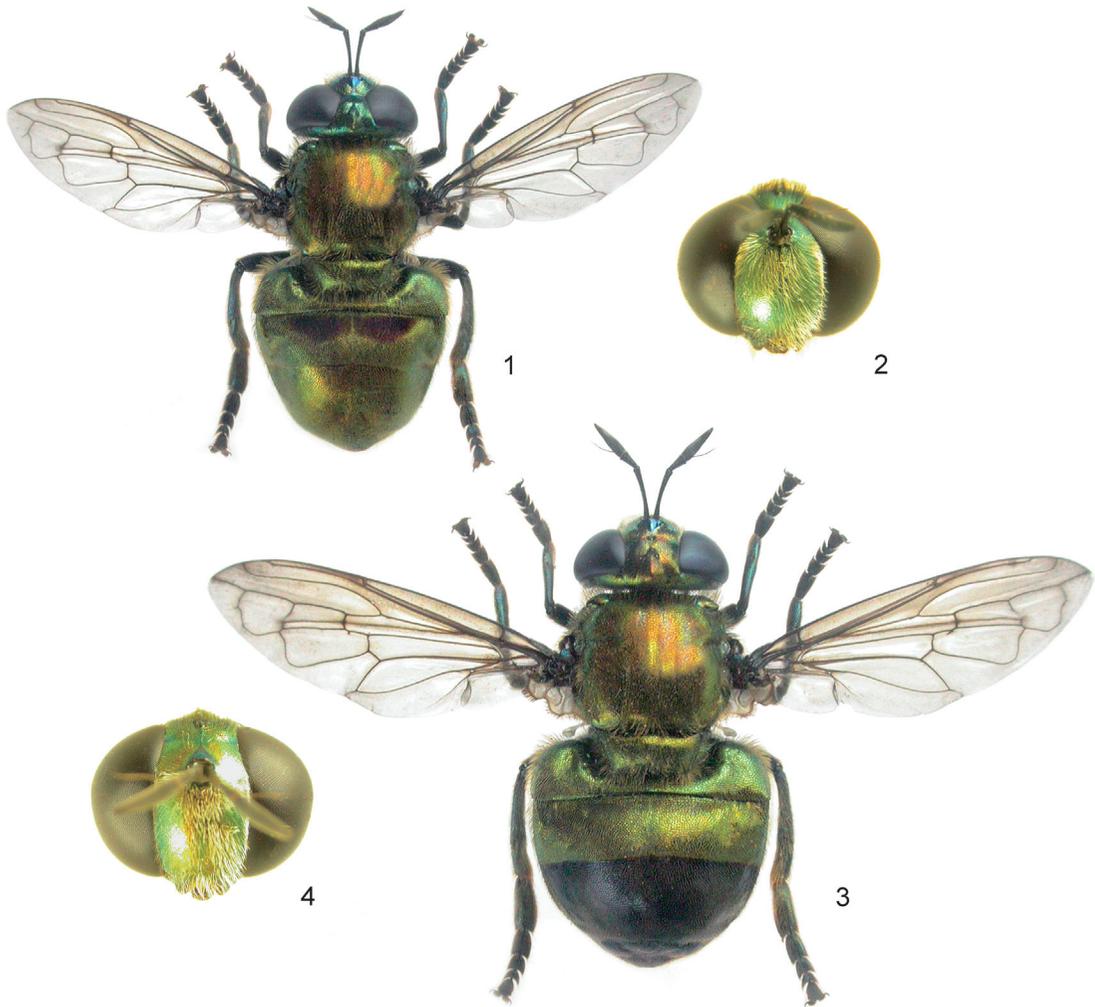
#### *Microdon katsurai* sp. nov.

[Japanese name: Kenran-arinosuabu]

*Microdon* sp. (as Japanese name: “Ôgon-arinosuabu”): Katsura, 1996a: 7; Katsura, 1996b: 26; Hironaga *et al.*, 1998: 17; Kano, 1999: 62; Iwai, 2000: 71; Iwai, 2004: 16; Tanaka, 2002: 10.

*Type series.* Holotype: ♂, Niryô, Takatsuki-shi, Ôsaka-fu, 22 VI 1996, K. Katsura leg. Paratypes: 1 ♀, same data as holotype; 2 ♀♀, same data, but K. & T. Hirooka leg.; 1 ♂, same data, but T. Takemoto leg.; 1 ♂, 2 ♀♀, same lo-

cality, but 26 V 1998, K. Katsura leg.; 1 ♂, same locality, but 26 VI 2001, K. Katsura leg.; 1 ♂, Tobiyama-jôshi, Takeshita-chô, Utsunomiya-shi, Tochigi-ken, 29 VI 1997, T. Hironaga leg.; 5 ♂♂, 1 ♀, same data, but 17–18 VI 1998, M. Maruyama leg.; 1 ♂, 1 ♀, Shimokômagi, Môka-shi, Tochigi-ken, 27 VI 1997, T. Hironaga leg.; 1 ♂, same data, but 18 VI 1998, M. Maruyama leg.; 2 ♂♂, same locality, but 18 VI 1998, D. Iwai leg.; 1 ♀, same data, but 16 VI 1999; 1 ♂, 1 ♀, Isezaki, Môka-shi, Tochigi-ken, 14 VI 2004, M. Maruyama leg.; 1 ♂, Shimokomoriya, Môka-shi, Tochigi-ken, 14 VI 2004, M. Maruyama leg.; 1 ♂,



Figs. 1–4. *Microdon katsurai* sp. nov.—1, Male facies, dorsal view; 2, male head, anterior view; 3, female facies, dorsal view, 4, female head, anterior view.

Akiba-jinja, Kamimitani, Nabari-shi, Mie-ken, 13 VI 2004, K. Katsura leg.; 1 ♀, Chôjagahara, Tokuji-chô, Saba-gun, Yamaguchi-ken, 5 VI 2002, S. Tanaka leg.

*Type locality.* Takatsuki-shi, Ôsaka-fu, Honshû, Japan.

*Distribution.* Honshû (Tochigi-ken, Mie-ken, Ôsaka-fu, Yamaguchi-ken).

*Symbiotic host.* *Polyrhachis lamellidens*.

*Etymology.* Named in honour of Mr. Kohjiro Katsura who discovered and recorded this new species for the first time.

*Diagnosis.* This species is quite distinctive among the Japanese *Microdon* species in having the pale brilliant green body and the orange yellow terminalia. As was already mentioned by Katsura (1996b), *M. katsurai* is rather similar to *M. stilboides* Walker, 1849, known from the Indian and Indo-Chinese subregions. Our interpretation of *M. stilboides* is based on the redescrptions by Brunetti (1923) and Shiraki (1930), and a specimen from Taiwan (1 ♂, Taihoku, VI 1925, T. Yoshida leg. (Systematic Entomology, Hokkaidô University)), which could be identified



Figs. 5, 6. *Microdon katsurai* sp. nov., living individuals. 5, Male, anterolateral view; 6, female, ditto.

with *M. stilboides* by Shiraki's (1930) key. *Microdon katsurai* may be easily distinguished from *M. stilboides* by the pale greenish body mainly clothed with pale yellow hairs, the broader face (0.43–0.47 times as wide as the head), and the sub-trapezoidal scutellum. (In *M. stilboides*, the body is darker, bluish or purplish, the thorax and abdomen are mostly clothed with black hairs, the face is narrower, about 0.4 times as wide as the head, and the scutellum is almost rectangular.)

*Description.* Male (Figs. 1, 5). Body length: 12.8–14.1 mm; wing length: 10.9–11.5 mm.

*Coloration:* Mostly pale brilliant green with yellowish reflection, somewhat variable in tint of basic colour; dorsal surface with gold lustre under sunlight as in Fig. 5 (also in female: Fig. 6). Head (Fig. 2) with bluish lustre around antennal cavity and weakly so on vertex; eyes reddish brown in fresh specimen; antennae black, slightly brownish; arista dark brown. Thorax with lateral area of scutum and upper part of anepisternum with bluish lustre; anatergite pale brown with bluish lustre. Abdomen becoming yellowish posteriorly, with a pair of brownish spots in anterior area of tergite II, terminalia orange yellow. Legs blackish with bluish shimmer. Wings hyaline, slightly brownish; around veins black tinged; veins dark brown; squamae yellowish white; halteres yellowish.

Head (Fig. 2) wider than mesonotum, about 2.1–2.2 times as wide as long, 1.4–1.5 times as high as long; frons 0.15–0.18 times as wide as head at the narrowest part, and clothed with yellowish hairs, which are becoming black at middle of head; vertex clothed with yellow hairs; face 0.43–0.47 times as wide as head at middle level, slightly broadened ventrally, and clothed with light yellow hairs; occiput clothed with pale yellow hairs, which are becoming whitish below occiput; genae very small, and clothed yellowish pubescence. Eyes about 1.6 times as high as long in profile and sparsely covered with minute hairs. Antennae (Figs. 7, 8) with scape slightly shorter than two apical segments combined; flagellomere I about twice as long as pedicel; arista shorter than flagellomere I and about 0.7 times of its

length; ratio of scape, pedicel and flagellomere I:— 2.4–2.7: 1: 1.8–2.1.

Thorax: scutum clothed with pale yellow hairs; scutellum sub-trapezoidal, slightly shorter than half width, with posterior margin truncated, bearing a lateral spine in each lateral side, and clothed with long pale-yellow hairs; anepimeron and upper areas of anepisternum and katepisternum clothed with pale yellow hairs.

Legs clothed with rather short yellowish hairs; ventral side of each tarsus clothed with orange hairs; fore tarsus with tarsomere I about 1.5 times as long as wide and with tarsomere II wider than long, about 0.7 times as long as wide; hind tarsus with tarsomere I about twice as long as wide and about as long as combined lengths of tarsomeres II–IV, and with tarsomere II about 1.4 times as long as wide.

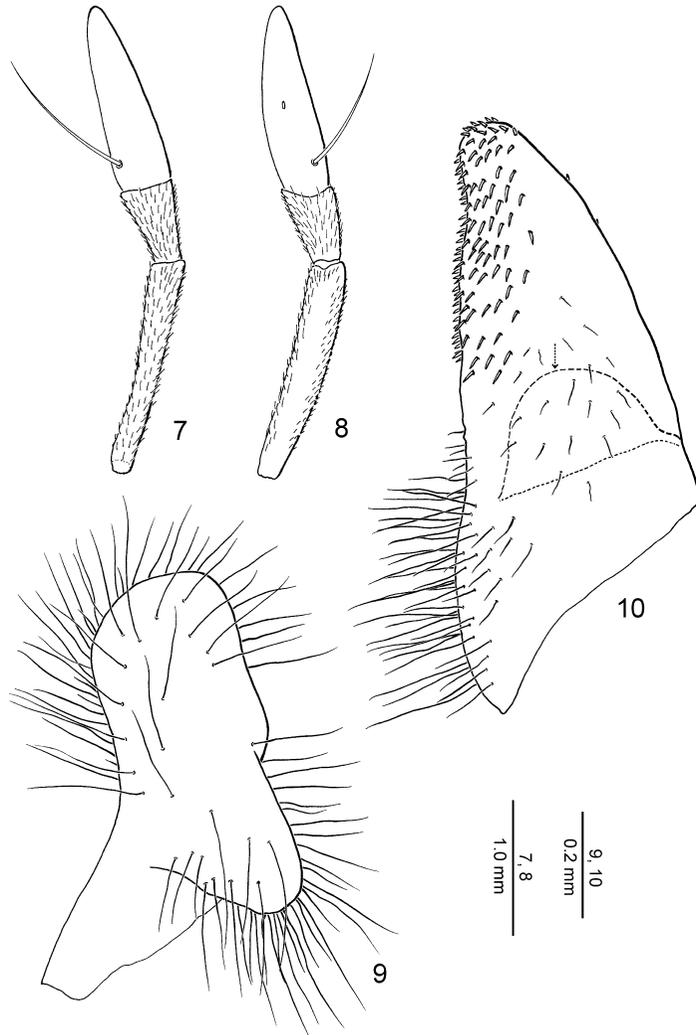
Wings about three times as long as wide and about 1.7 times as long as head and thorax combined; squamae with pale brown fringes.

Abdomen oval, about 1.25 times as long as wide, much wider than thorax, widest at tergite II, almost as long as head and thorax combined, densely clothed with pale yellow hairs which are becoming longer apically; sternites moderately densely clothed with long pale-yellow hairs; sternite IV with posterior margin truncate; cerci (Fig. 9) expanded and rounded dorsally; surstyli (Fig. 10) rather long, gently narrowed apically, and inner side with a large, apically-round projection (Fig. 10, arrow)

Female (Figs. 3, 6). Clearly different from male in coloration of abdomen. Body length: 13.6–15.3 mm; wing length: 11.5–13.3 mm.

*Coloration:* Abdomen with tergites IV and V brilliant dark purple, apical half of sternite V darkened.

Head (Fig. 4) with frons 0.31–0.33 times as wide as head, gradually broadened forwards, and clothed with black hairs, which are becoming pale yellow at sides of anterior half of head; face 0.43–0.44 times as wide as head at middle level. Antennae with scape almost as long as flagellomere I; ratio of scape, pedicel and flagellomere I:— 2.4–2.5: 1: 2.3–2.4.



Figs. 7–10. *Microdon katsurai* sp. nov.—7, Left antenna, male, lateral view; 8, ditto, dorsal view; 9, cercus, lateral view; 10, surstylus, lateral view.

Abdomen: Tergite V with a large, inverted V-shaped depression.

*Bionomics.* The adults are observed in the end of May to the first week of July at the collecting sites. In most cases, they are hovering or resting, and sometime mating near the nest entrances of the host ants. On two occasions, the senior author witnessed ovipositional behaviour of the hoverflies in the field. The hoverfly walked around an entrance of a host nest, extended its very long ovipositor beneath the body, and laid eggs under bark near the nest entrance. The eggs

were usually laid as a cluster of two or three eggs.

#### Possibility of Endangerment

*Microdon katsurai* was found rather recently (in 1996), considering that it is a very noticeable insect, living in the lowland forests near areas of human habitation. This suggests that *M. katsurai* is generally a rare species, has very local distributions, and does not have a strong ability to distribute (Katsura, 1996b). Only a few habitats of

this hoverfly have been found in Honshû over the past eight years, despite considerable search on the part of many Japanese dipterologists, search that has brought attention to its host ant, *Polyrhachis lamellidens*. Incidentally, *P. lamellidens* has recently been declining in Honshû. For example, in Kanagawa-ken of central Honshû, this ant species was among the most common species in the lowlands about 20 years ago; however, only a few localities have been confirmed in recent years (Kubota, pers. comm.). Similar situations have been observed throughout the lowland areas in the Kantô area (Maruyama, unpubl. data), and probably also occurred in the other lowland areas of Japan.

The habitat of *Microdon katurai* and *Polyrhachis lamellidens* in Tochigi-ken, an area of previously abundant habitat for *M. katurai*, has vanished. In Shimokômagi of Môka-shi, there once existed a large secondary forest in which an oak tree, *Quercus acutissima* Carruth, dominated. It constituted a very wet environment with high groundwater levels. *P. lamellidens* prefers such an environment. We confirmed many nests of these ants, and observed more than ten individuals of *M. katurai* per day during the season of adult emergence. However, seven years later, in 2004, almost all areas of Shimokômagi have been exploited and transformed into residential zones. All the trees have been cut down, and no *P. lamellidens* and *M. katurai* can be found. In other words, an ideal habitat for these creatures has disappeared. The surroundings of Shimokômagi contain one of the finest oak forests in lowland Tochigi-ken. Fortunately, we found another habitat of *P. lamellidens* and *M. katurai* near Shimokômagi in 2004, but the area is very small and will be opened up for development within one or two years. Residential and industrial development has rapidly been proceeding in Tochigi-ken, especially in the lowland areas that are suitable for such development. In the near future, habitats of *P. lamellidens* and *M. katurai* in Tochigi-ken will become seriously reduced, or ever will go extinct.

Similar development will probably occur, or is

occurring, in the other habitats of *Microdon katurai*, as most secondary lowland forests are not protected in Japan.

*Microdon katurai* appears already to be extremely rare species and will become endangered in the near future if no conservation efforts are made. Immediate conservation measures must be undertaken for *M. katurai* and its symbiotic, *P. lamellidens*.

### Acknowledgements

We thank Mr. Keitaro Harusawa (Ôsaka-fu), Mrs. Kazuko Hirooka (Ôsaka-fu), Mr. Takuto Hirooka (Ôsaka-fu), Mr. Daisuke Iwai (Saitama-ken), Mr. Yasutsugu Kanô (Mie-ken), Mr. Kohjiro Katsura (Ôsaka-fu), Dr. Takato Kobayashi (Yamanashi-ken), Mr. Hisashi Ohishi (Kyôto-fu), Mr. Seizo Okuno (Ôsaka-fu), Mr. Masahiro Ôtsuki (Ôsaka-fu), Dr. Yoshiaki Nishikawa (Ôsaka-fu), Mr. Takuya Takemoto (Ôsaka-fu), Mr. Shin'ichi Tanaka (Yamaguchi-ken) and Mr. Kazuo Yamazaki (Ôsaka-fu) for their cooperation in the present study. We also acknowledge Dr. Akihiko Shinohara (NSMT) for reading and commenting on the manuscript and Mr. Masao Kubota (Kanagawa-ken) for information of *Polyrhachis lamellidens*.

This study is supported in part by a Research Fellowship of the Japan Society for the Promotion of Science for Young Scientists (Postdoctoral Fellow) to M. M., and by a 21st Century Centre of Excellence (COE) Program on "Neo-Science of Natural History" (Program Leader: Hisatake Okada) at Hokkaidô University financed by the Ministry of Education, Culture, Sports, Science and Technology, Japan to T. H.

### References

- Brunetti, E., 1923. Subfamily Microdontinae. *The Fauna of British India* 3: pp. 307–321. London.
- Hironaga, T., D. Iwai, and M. Maruyama, 1998. New knowledge on "Ôgon-arinosuabu" in Tochigi-ken. *Hana Abu, Kyôto*, 6: 17–18. (In Japanese.)
- Iwai, D., 2000. New knowledge on "Ôgon-arinosuabu" in Tochigi-ken (2). *Hana Abu, Kyôto*, 9: 71–72. (In Japanese.)

- ese.)
- Iwai, D., 2004. Distributional data on Syrphidae of Tochi-gi-ken. *Hana Abu, Kyôto*, **17**: 15–16. [In Japanese.]
- Kano, Y., 1999. “Ôgon-arinosuabu” was collected in Nabari-shi, Mie-ken. *Hana Abu, Kyôto*, **8**: 62. (In Japanese.)
- Katsura, K., 1996a. A strange *Microdon* species collected in the orientation course of insect collecting. *Nature Study, Ôsaka*, **42**(3): 7. (In Japanese.)
- Katsura, K., 1996b. A large and beautiful *Microdon* collected in Takatsuki-shi, Ôsaka-fu. *Hana Abu, Kyôto*, **2**: 26–28. (In Japanese.)
- McAlpine, J. F., 1981. Morphology and Terminology-adults, *In*: McAlpine, J. F., *et al.* (eds.), *Manual of Nearctic Diptera 1*, pp. 9–63. Research Branch, Agriculture Canada Monograph, 27, Canadian Government Publishing Center, Hull, Canada.
- Shiraki, T. 1930. Die Syrphiden des Japanischen Kaiserreichs, mit Berücksichtigung benachbarter Gebiete. *Mem. Fac. Sci. Agric. Taihoku imp. Univ.*, **1**: 1–446.
- Tanaka, S., 2002. Three rare hoverflies found in Yamaguchi-ken. *Hana Abu, Kyôto*, **14**: 10. (In Japanese.)