

Female terminalia of *Dioctria nakanensis* and *Microstylum dimorphum* (Diptera, Asilidae)^{1,2}

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Abstract

Two species belonging to the subfamily Dasypogoninae are described and illustrated as to the structure of female terminalia. They are *Dioctria nakanensis* (belonging to the tribe Dioctriini) and *Microstylum dimorphum* (Stenopogonini).

Key words: Taxonomy and morphology, Robber fly, Taiwan, Ryukyu Is., Japan proper.

Introduction

The structure of the female terminalia of the subfamily Dasypogoninae is divided into two types, that is, presence or absence of the circlets of stout spines on tergum 10. The spines in question are absent in *Dioctria nakanensis* (belonging to the tribe Dioctriini) and present in *Microstylum dimorphum* (Stenopogonini). The female terminalia of these two species are discussed in this paper.

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Abbreviations used in the figures

C, cercus; G, genital fork; S6-10, sterna 6-10; T6-10, terga 6-10; T9 + 10, tergum 9 + 10.

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Genus *Dioctria* MEIGEN

Dioctria MEIGEN, 1803, Mag. Insektenkunde, 2: 270. Type species. *Asilus oelandicus* LINNAEUS, 1758, by designation of LATREILLE, 1810.

Dioctria belongs to the tribe Dioctriini.

"The genus contains numerous species, mainly Holarctic, most species in Europe, a few species Mediterranean" (after THEODOR, 1980). Only one species is found in Japan.

The female terminalia are illustrated in several species by MELIN (1923), ADISOEMARTO and D. M. WOOD (1975), and THEODOR (1980).

MELIN (1923: 227) wrote, "As we have already seen, this genus [= *Dioctria*], like *Leptogaster*, has an abdominal apex very little specialized (fig. 251). Consequently it does not surprise us that these species also release their eggs in the air, so that they fall to the ground sooner or later."

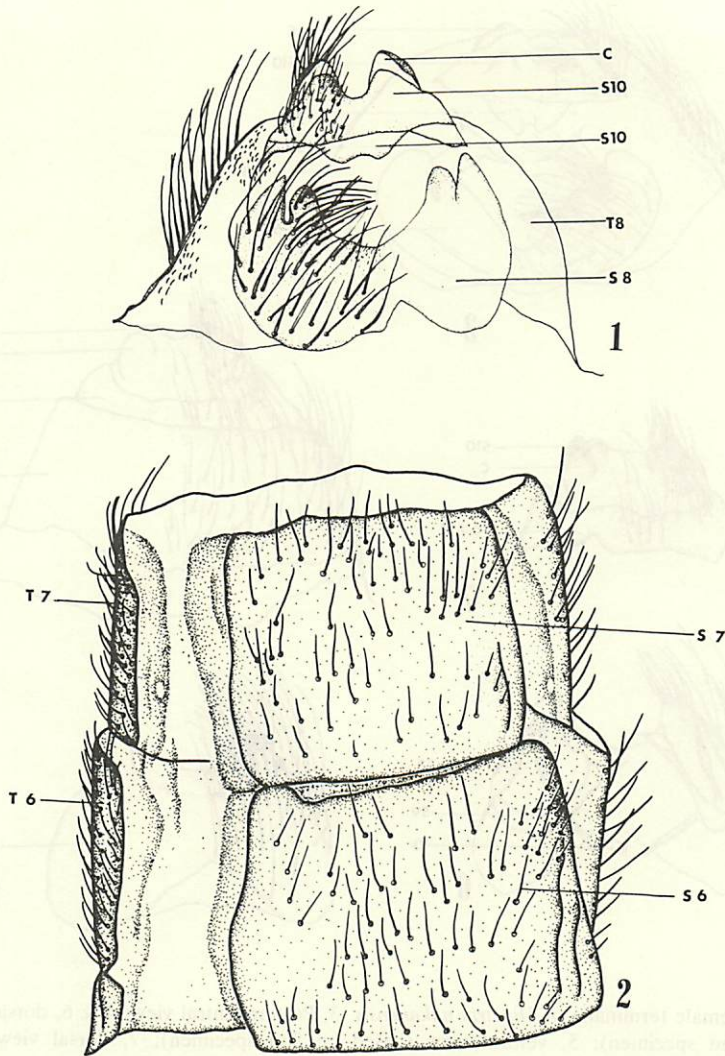
Dioctria nakanensis MATSUMURA

(Figs. 1-7)

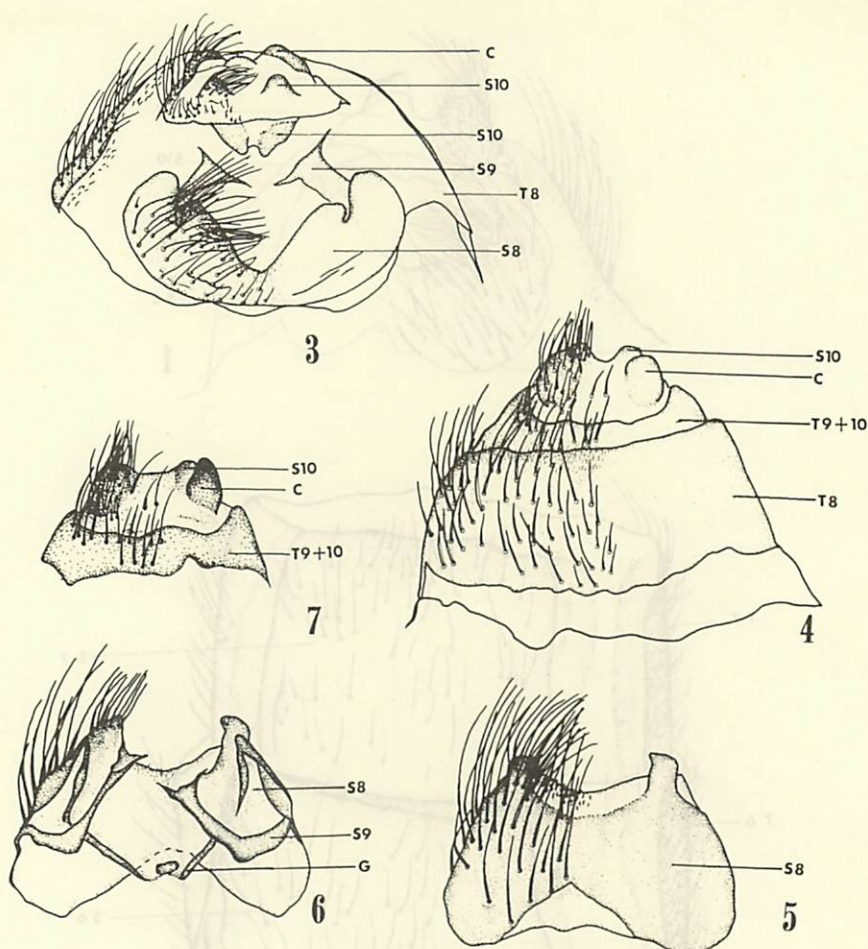
Dioctria nakanensis MATSUMURA, 1916, Thous. Ins. Japan, Addit. 2, p. 300. Type locality: Japan (Honshu: Nakano near Tokyo).

This species is well known and described and illustrated by several authors, e. g., AOKI (1950) and HISAMATSU (1965).

Female terminalia (Figs. 1-7): The following description is based upon only one species and no specific character is extracted. Abdomen is widest at segments 4-6. Terga 6-7 and sterna 6-7 rectangular, the former wider than long and the latter somewhat so; tergum 7 and sternum 7 somewhat narrower than tergum 6 and sternum 6; tergum 8 and sternum 8 rather trapezoid and wider than long; tergum 8 (except anterior border) with hairs; sternum 8 rather deeply concave at anterior margin, with posterolateral part protruded and acute at apex, and with posterior margin having a pair of convexities which are widely separated from each other; in other words, posterior margin of sternum 8 with lateral narrow concavities and a median wide concavity; sternum 8 with hairs which are long before posterolateral protruded bare part; tergum 9 + 10 rectangular, short, much wider than long, and with hairs at posterior part; paired cerci present, and each cercus somewhat longer than wide, elliptic or rectangular according to angle or viewpoint, and haired; sternum 10 divided into a pair of elongate sclerites at apical (= posterior) portion and with a median convexity at anterior margin; sternum 10 (except anterior part) haired. Sternum 9 divided into a pair of sclerites which are J or inverted J-shaped. Lateral sclerotized part of genital fork forming a strip running obliquely, inter-



Figs. 1-2. Posterior part of female abdomen in *Dioctria nakanensis*, ventral view.



Figs. 3-7. Female terminalia of *Dioctria nakanensis*. 3, Posteroventral view; 4 & 6, dorsal view (based on 2nd specimen); 5, ventral view (based on 2nd specimen); 7, dorsal view (based on 3rd specimen).

rupted at apex or not connected with opposite piece. Specimens dissected (7 ♀♀): 2 ♀♀, Senjodake, Nagano Pref., Honshu, 5. vii. 1963, A. NAGATOMI; 1 ♀, Hikosan, Fukuoka Pref., Kyushu, 24. vii. 1950, S. NAKAO; 4 ♀♀, Kurinodake, Kagoshima Pref., Kyushu, 7. vi. 1963, A. NAGATOMI.

Japanese name: Haraboso-mushihiki.

Biology: This species lives in shadowy woods. The biology and immature stages are unknown.

Distribution. Japan (Honshu, Shikoku and Kyushu). AOKI (1950) recorded this species from the highland of Taiwan.

Female terminalia of *Dioctriini*

ADISOEMARTO and D. M. WOOD (1975) illustrated the female terminalia of a total of 21 species belonging to the genera *Bohartia* (2 species), *Dicolonus* (1), *Dioctria* (3), *Echthodopa* (1), *Eudioctria* (12), *Metadioctria* (1) and *Myelaphus* (1). In the seven genera and 21 species above, the posterior margin of sternum 8 has three incisions or concavities, that is, the posterolateral protruded parts and a pair of inner processes are always present; sternum 9 is divided into a pair of sclerites; the genital fork is usually divided into a pair of sclerites which are smaller than sternum 9 (genital fork is often U-shaped).

Judging from figures 110-130 in ADISOEMARTO and D. M. WOOD (1975), sternum 9, the genital fork, the posterolateral protruded part of sternum 8, and a pair of processes at the posterior margin of sternum 8 may vary in shape with species. However, no definite generic character is detected among the seven genera in question. Judging from the structure of female terminalia, the seven genera above form a monophyletic group.

Distinction between *Dioctria* and *Molobratia* in female terminalia

In *Dioctria nakanensis*, (1) the posterolateral part of sternum 8 has two processes, that is, the posterior margin of sternum 8 has three incisions or concavities; (2) a pair of sclerites are present as sternum 9; (3) the lateral sclerotized portion of the genital fork forms a strip running diagonally (not longitudinally), and its apex is not connected to opposite piece; (4) the apex of sternum 10 divided into a pair of sclerites.

Four species of *Molobratia* were described and a key to the species were prepared by NAGATOMI, IMAIZUMI and H. NAGATOMI (1989) as to the female terminalia. In *Molobratia (japonica, kanoi, nipponi and sapporensis)*, (1) the posterior margin of sternum 8 smooth and without any process; (2) a sclerotized sternum 9 entirely lacking; (3) the genital fork U-shaped, longer than wide, and with a lateral sclerotized margin run-

ning longitudinally; (4) sternum 10 not divided into a pair of sclerites at apex.

Systematic positions of *Dioctria* and *Molobratia*

THEODOR (1980: 27-28) wrote:

The tribe Stenopogonini is distinguished from the Dasypogonini by the absence of a strong spine at the apex of the fore tibiae, and from Stichopogonini by the form of the head and the isolated prosternum. Tergite 9 [= tergum 10 in the present authors' interpretation] of the female with spines in most genera, without spines in other genera. The tribe Dioctriini of HULL is based on the absence of spines on tergite 9 of the female; however, spines are also absent in some species of other tribes which belong to these tribes according to some very distinct characters, while other species have spines on tergite 9. *Dioctria* is here included in the Stenopogonini, as this character does not seem to justify the establishment of a separate tribe.

However, *Dioctria* is here placed in Dioctriini. G. C. WOOD (1981) and LEHR (1988) put *Dicolonus*, *Dioctria*, *Myelaphus*, etc. in Dioctriini. These genera may form an independent tribe which is separable from Stenopogonini.

Molobratia was also put in Dioctriini by HULL (1962) and LEHR (1988). THEODOR (1976: 93) wrote:

This species [= *Molobratia teutonius*] was placed in the tribe Dioctriini by HULL (1962) because of the absence of spines on the ovipositor. But the structure of the fore tibia, with an apical process and a strong spur, and a tubercle with denticles on the basitarsus on which the spur rests, resembles the structure in *Dasypogon* and *Saropogon* so closely that it seems more correct to place *Molobratia* in the Dasypogonini and to consider the absence of spines in the female genitalia as secondary.

THEODOR's view just quoted seems to be quite correct. *Molobratia* must be moved from Dioctriini to Dasypogonini.

Genus *Microstylum* MACQUART

Microstylum MACQUART, 1838, *Diptères exotiques*, 1(2): 26. Type species: *Dasypogon venosum* WIEDEMANN, 1821, by designation of BACK (1909).

Microstylum belongs to the tribe Stenopogonini.

HULL (1962) wrote, "The species [of the genus *Microstylum*] are most numerous in South Africa and Madagascar, but are also numerous in southern Asia. From Australia 1 species has been questionably recorded; 1 is recorded from Mexico, but these flies are

absent from South America, and the presence of 3 or 4 species in North America of this African and Asian genus is curious. None are recorded from Europe but 2 species are recorded from North Africa."

SHIRAKI (1932, 1950) described and illustrated *Microstylum spectrum* (WIEDEMANN, 1828) and wrote, "common in Honshu, Kyushu, Taiwan and China." *Microstylum oberthuerii* van der WULP, 1896 is listed by LEHR (1988) as "Distr: Asia: China, Japan; Oriental Region." However, it is highly probable that the two species above are not present in Japan. If so, there is only one Japanese species, i. e., *Microstylum dimorphum* MATSUMURA distributed in Yaeyama Is., Okinawa I. and Amami Oshima.

The apparatus of the ovipositor clearly shows that the eggs in *Microstylum* species are laid in soil.

Microstylum dimorphum MATSUMURA

(Figs. 8-13)

Microstylum dimorphum MATSUMURA, 1916, Thous. Ins. Japan, Addit 2, p. 290. Type locality: "Okinawa (Riukiu)."

This species is finely illustrated by HISAMATSU (1965), and has a striking sexual dimorphism. The body (including wing and legs) is almost wholly blackish in male but largely brownish (partly reddish brown) in female. Among the Japanese asilids, *Microstylum dimorphum* is the biggest.

Female terminalia (Figs. 8-13): The following description is based upon only one species and no specific character is extracted. Abdomen gradually narrower posteriorly. Abdominal segments 5-8 is shining or more polished than preceding segments and may form an ovipositor. Terga 7-8 wider than long, almost rectangular, and with lateral parts folded ventrally; tergum 8 shorter and somewhat narrower than tergum 7; sternum 7 rectangular, longer than wide, and much narrower than tergum 7; sternum 8 somewhat wider than long and so than sternum 7, roughly rectangular with lateral margins arched or rather circular; posterior margin of sternum 8 with a pair of median rounded convexities; sternum 8 with hairs which are longer on paired apical convexities; tergum 9 strongly sclerotized or blackish, rather vertical, with a mid-anterior small process, and with a posterior elongate horizontal portion which is tapering posteriorly and situated between a pair of tergum 10; tergum 10 divided into a pair of sclerites, each of which is rather elliptic and with circlets of stout 8-9 spines along posterior and inner margins; hairs on tergum 10 sparse; sternum 10 consists of a larger anterior rectangular part and a smaller posterior trapezoid part; sternum 10 whitish or less sclerotized along posterolateral margins (except apical portions) and median longitudinal line; sternum 10 with setae varying in length and thickness, except for bare anterior part, bare posterolateral part, and haired apical portion; a pair of cerci present and each cercus thickened, with

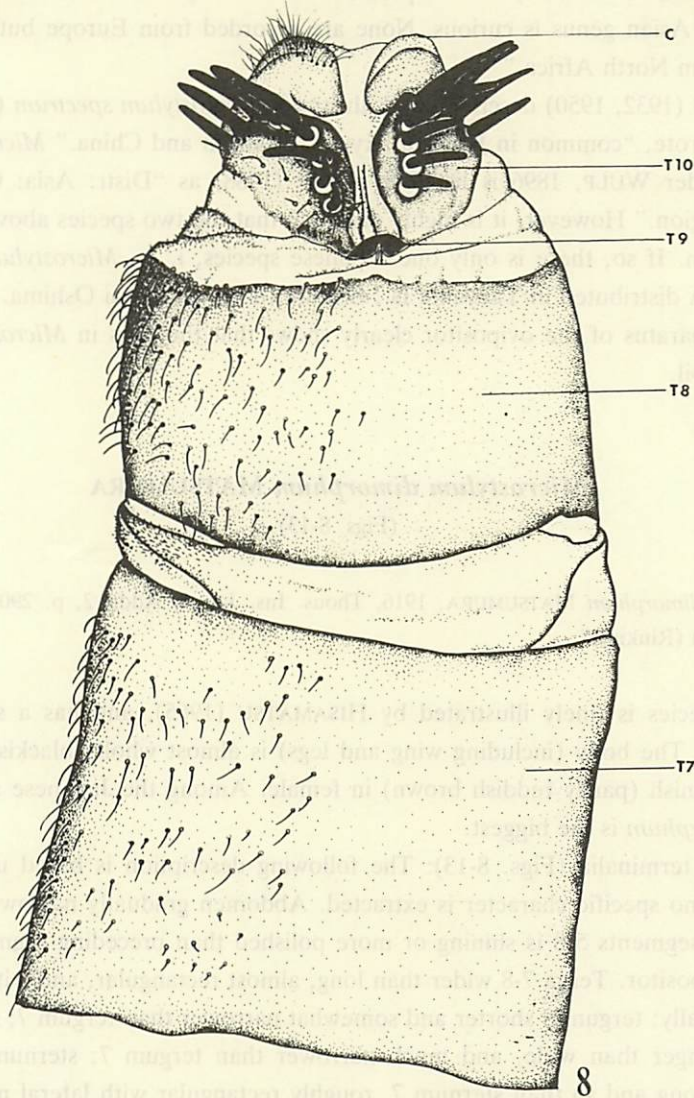
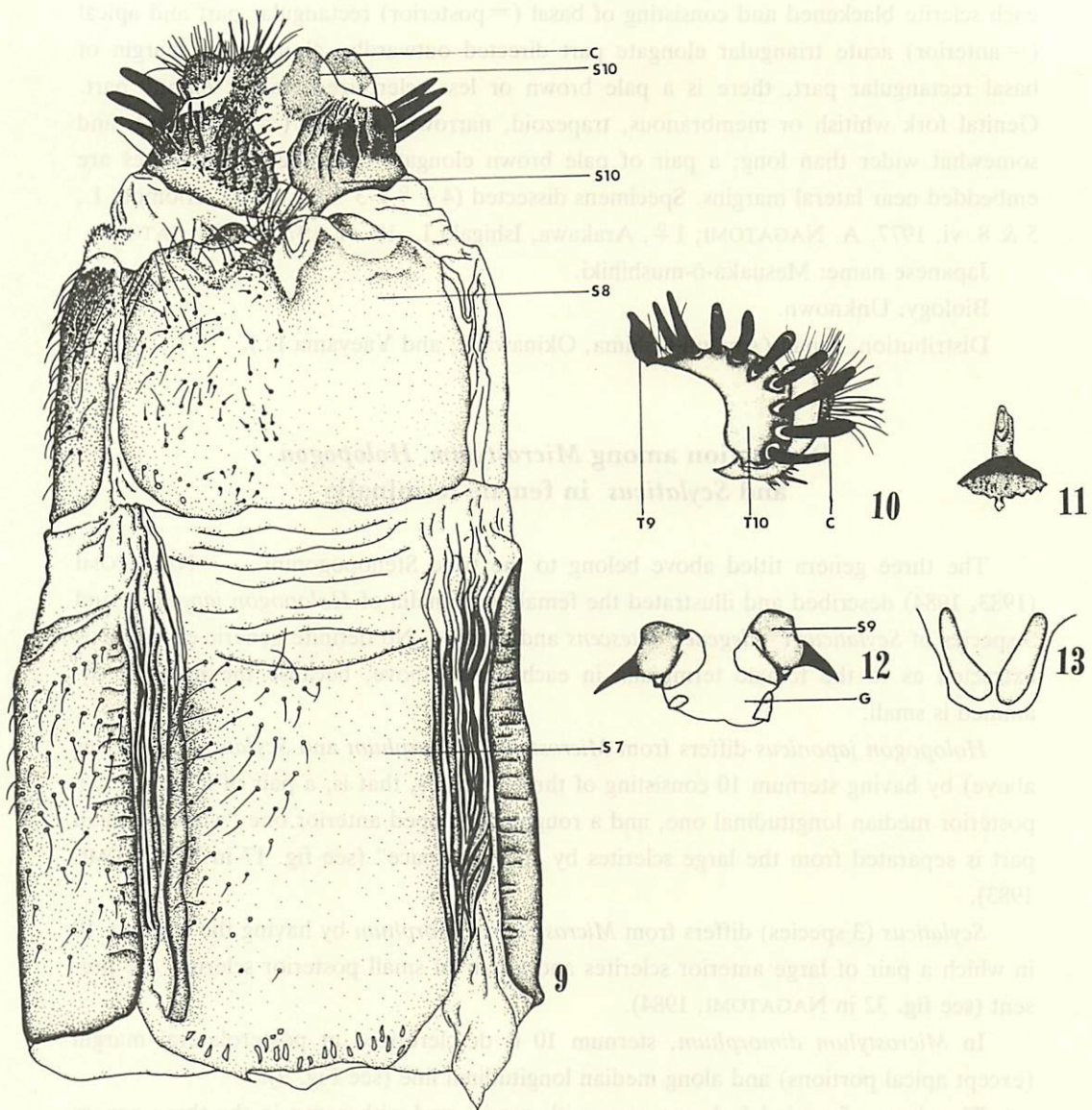


Fig. 8. Posterior part of female abdomen in *Microstylum dimorphum*, dorsal view.



Figs. 9-13. Posterior part of female abdomen in *Microstylus dimorphus*. 9, Ventral view; 10, terga 9-10 and cercus, lateral view; 11, tergum 9, dorsal view (anterior wide part is kept nearly horizontal); 12, sternum 9 and genital fork, ventral view (genital fork is folded); 13, genital fork, ventral view. Figs. 10-13 are based on 2nd specimen.

posterior margin rounded, and with hairs at apical portion. A pair of sternum 9 present; each sclerite blackened and consisting of basal (=posterior) rectangular part and apical (=anterior) acute triangular elongate part directed outwardly; along inner margin of basal rectangular part, there is a pale brown or less sclerotized, rather elliptic part. Genital fork whitish or membranous, trapezoid, narrower apically (=anteriorly), and somewhat wider than long; a pair of pale brown elongate cucumber-like sclerites are embedded near lateral margins. Specimens dissected (4 ♀♀): 3 ♀♀, Ôhara, Iriomote I., 5 & 8. vi. 1977, A. NAGATOMI; 1 ♀, Arakawa, Ishigaki I., 10. vi. 1977, A. NAGATOMI.

Japanese name: Mesuaka-ô-mushihiki.

Biology: Unknown.

Distribution. Japan (Amami Oshima, Okinawa I., and Yaeyama Is.).

Distinction among *Microstylum*, *Holopogon* and *Scylaticus* in female terminalia

The three genera titled above belong to the tribe Stenopogonini. NAGATOMI (1983, 1984) described and illustrated the female terminalia of *Holopogon japonicus* and 3 species of *Scylaticus* (= *degener*, *lutescens* and *sayano*). No definite generic character is extracted as to the female terminalia in each genus above, because the material examined is small.

Holopogon japonicus differs from *Microstylum dimorphum* and *Scylaticus* (3 species above) by having sternum 10 consisting of three sclerites, that is, a pair of large ones, a posterior median longitudinal one, and a roughly U-shaped anterior one "whose median part is separated from the large sclerites by an open space" (see fig. 17 in NAGATOMI, 1983).

Scylaticus (3 species) differs from *Microstylum dimorphum* by having the sternum 10 in which a pair of large anterior sclerites and a pair of small posterior sclerites are present (see fig. 32 in NAGATOMI, 1984).

In *Microstylum dimorphum*, sternum 10 is desclerotized at posterolateral margin (except apical portions) and along median longitudinal line (see Fig. 9).

The shape of genital fork may vary with species and with genus in the three genera titled above.

Presence or absence of the circlets of stout spines on tergum 10 in the subfamily Dasypogoninae

HULL (1962) wrote, "Five tribes of Dasypogoninae are regarded as being essentially *generalized*. All lack the acanthophorites and their accompanying spines. These tribes are the Dioctriini, Phellini, Chrysopogonini, Damalini and the Laphystini. Five other

tribes have present the circlets of stout spines on the acanthophorites of the ninth tergite [=tergum 10 in the present authors' interpretation] in the female sex."

The phylogenetic relationships among the tribes and genera of Dasypogoninae may still be vague and the tribe classification varies considerably with the author. Our knowledge of the subfamily Dasypogoninae is very limited and no broad comment is possible on the tribe classification.

As already discussed, we think that the position of *Molobratia* is not Dioctriini but Dasypogonini and the absence of stout spines on the female tergum 10 is not generalized or primitive but specialized or advanced in condition.

Dioctria, a member of Dioctriini, also has no stout spines in question. The degree of specialization in the structure of female terminalia may even be stronger in *Dioctria* than in *Molobratia*.

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