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The genus *Leucophenga* (Diptera, Drosophilidae), part II: the *ornata* species group from East Asia, with morphological and molecular evidence (I)

JIA HUANG¹, TONG LI², JIANJUN GAO³ & HONGWEI CHEN^{1,4}

¹Department of Entomology, South China Agricultural University, Tianhe, Guangzhou, 510642 P. R. China

²Institute of Plant Protection, Henan Academy of Agricultural Science, Zhengzhou, 450002, China

³Laboratory for Conservation and Utilization of Bio-resources, Yunnan University, Kunming, 650091, China

⁴Corresponding author. E-mail: hongweic@scau.edu.cn

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Abstract

Fifteen new species of the *Leucophenga ornata* species group are described from East Asia: *L. apunctata* Huang & Chen, **sp. nov.**, *L. arcuata* Huang & Chen, **sp. nov.**, *L. brevifoliacea* Huang & Chen, **sp. nov.**, *L. euryphylla* Huang & Chen, **sp. nov.**, *L. falcata* Huang & Chen, **sp. nov.**, *L. fusciniotata* Huang & Chen, **sp. nov.**, *L. fuscithorax* Huang & Chen, **sp. nov.**, *L. glabella* Huang & Chen, **sp. nov.**, *L. hirsutina* Huang & Chen, **sp. nov.**, *L. hirudinis* Huang & Chen, **sp. nov.**, *L. piscifoliacea* Huang & Chen, **sp. nov.**, *L. rectifoliacea* Huang & Chen, **sp. nov.**, *L. serrateifoliacea* Huang & Chen, **sp. nov.**, *L. subulata* Huang & Chen, **sp. nov.**, *L. uncinata* Huang & Chen, **sp. nov.** Four known species, *L. ornata* Wheeler, 1959, *L. saigusai* Okada, 1968, *L. sculpta* Chen & Toda, 1994 and *L. todai* Sidorenko, 1991 are redescribed as supplementary. A key to all the examined species in the *ornata* group is provided. We try to improve our species delimitation by integrat-

ing the DNA sequences data with morphological information. The intra- and interspecific pairwise K-2P (Kimura's two-parameter) distances are summarized.

Key words: Drosophilidae, East Asia, *Leucophenga ornata* species group, new species

Introduction

Up to the present, a total of 25 species have been assigned into the *Leucophenga ornata* species group (Fartyal *et al.* 2005; Bächli 2013). Among these, seven are from the Afrotropical region and the rest were distributed from the Australasian region to East Asia (Brake & Bächli 2008). The known species of the *ornata* group share one important character, e.g. wing mostly with distinct patch(es). On the other hand, the majority of this group has pubescence on the distal portion of aedeagus (Okada 1968, 1990; Bächli 1971; Chen & Aotsuka 2003), with the exceptions of *L. interrupta* Duda, 1924, *L. japonica* Sidorenko, 1991, *L. neointerrupta* Fartyal & Toda, 2005, *L. ornata* Wheeler, 1959, *L. saigusai* Okada, 1968, *L. sculpta* Chen & Toda, 1994 and *L. trivittata* Okada, 1990; however, *L. interrupta* and *L. neointerrupta* distinctly differ from the other 'ornata' species in having the wing usually clear on r-m and dm-cu crossveins, with broad, dark longitudinal stripe along anterodistal portion (Fig. 17c in Okada 1956; Fig. 13 in Fartyal *et al.* 2005), the aedeagus with sclerotized processes basolaterally (Fig. 17d in Okada 1956; Fig. 17 in Fartyal *et al.* 2005); the two species maybe compose a subgroup or new group. *L. todai* Sidorenko, 1991 has been left out from the *ornata* group, because of the wing slightly clouded on r-m and dm-cu crossveins (Fig. 2D), but, the other characters are very close to this group, especially in male terminalia (Fig. 17).

Recently, the *abbreviata* species group has been established within the genus *Leucophenga* with the DNA barcoding by Su *et al.* 2013 as the first part of a series study on this genus. In the second part, 15 new species from East Asia were added to the *ornata* group; all of them lack pubescence on aedeagus. To evaluate the morphological hypotheses of these new species, we also conduct a molecular phylogenetic analysis for them and four known members of the *ornata* group; for this, the DNA sequences of the mitochondrial cytochrome *c* oxidase I gene (*COI*) are sequenced for 79 individuals of the 19 species employed (Table 1).

TABLE 1. Details of the samples using in the DNA and accession numbers of the *COI* sequences.

| Species | Sex | Localities | BOLD Process ID | GenBank |
|------------------------------------|-----|--------------------------------------|-----------------|----------|
| <i>ornata</i> Wheeler, 1959-1 | 1♂ | Tomochi, Kumamoto, Japan | BDOR001-12 | JX887657 |
| <i>ornata</i> Wheeler, 1959-2 | 1♂ | Tomochi, Kumamoto, Japan | BDOR002-12 | JX887658 |
| <i>ornata</i> Wheeler, 1959-3 | 1♂ | Iriomote Is., Okinawa, Japan | BDOR003-12 | JX887659 |
| <i>ornata</i> Wheeler, 1959-4 | 1♂ | Minamiohsawa, Hachioji, Tokyo, Japan | BDOR046-12 | KC292443 |
| <i>saigusai</i> Okada, 1968 | 1♂ | Maoniuhe, Danba, Sichuan, China | BDOR004-12 | JX887678 |
| <i>sculpta</i> Chen & Toda, 1994-1 | 1♂ | Maoershan, Guilin, Guangxi, China | BDOR017-12 | JX887651 |
| <i>sculpta</i> Chen & Toda, 1994-2 | 1♂ | Nanling, Shaoguan, Guangdong, China | BDOR018-12 | JX887652 |
| <i>sculpta</i> Chen & Toda, 1994-3 | 1♂ | Tianmushan, Linan, Zhejiang, China | BDOR019-12 | JX887650 |
| <i>sculpta</i> Chen & Toda, 1994-4 | 1♀ | Maoershan, Guilin, Guangxi, China | BDOR020-12 | JX887653 |
| <i>sculpta</i> Chen & Toda, 1994-5 | 1♀ | Jiaoye Park, Kunming, Yunnan, China | BDOR059-12 | KC292440 |
| <i>todai</i> Sidorenko, 1991-1 | 1♂ | Hesong, Menghai, Yunnan, China | BDOR009-12 | JX887643 |
| <i>todai</i> Sidorenko, 1991-2 | 1♂ | Wuliangshan, Jingdong, Yunnan, China | BDOR010-12 | JX887642 |
| <i>todai</i> Sidorenko, 1991-3 | 1♂ | Muyiji Park, Ximeng, Yunnan, China | BDOR052-12 | KC292434 |
| <i>todai</i> Sidorenko, 1991-4 | 1♂ | Hesong, Menghai, Yunnan, China | BDOR053-12 | KC292433 |
| <i>todai</i> Sidorenko, 1991-5 | 1♀ | Menglun, Mengla, Yunnan, China | BDOR054-12 | KC292435 |
| <i>apunctata</i> sp. nov.-1 | 1♂ | Maoniuhe, Danba, Sichuan, China | BDOR005-12 | JX887638 |
| <i>apunctata</i> sp. nov.-2 | 1♂ | Maoniuhe, Danba, Sichuan, China | BDOR006-12 | JX887639 |
| <i>arcuata</i> sp. nov.-1 | 1♂ | Wuyishan, Fujian and Jiangxi, China | BDOR007-12 | JX887640 |

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