APPENDIX A

Publication

Attasopa K., Tsuda Y., Harbach E. R., and Somboon P. Morphological studies of larvae and pupae of *Lutzia* species (Diptera: Culicidae) from Doi Inthanon and the plains of Chiang Mai Province. *Proceedings of the 8th ASEAN Microscopy Conference & 32nd Microscopy Society of Thailand.* 2015. (in press).

Morphological studies of larvae and pupae of *Lutzia* species (Diptera: Culicidae) from Doi Inthanon and the plains of Chiang Mai Province

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Abstract

Three species of *Lutzia* have been reported in Thailand, namely *Lt. fuscana* (Wiedemann, 1820), *Lt. halifaxii* (Theobald, 1903) and *Lt. vorax* Edwards, 1921. Morphologically, the adults of these species are distinct, but no distinct differences have been reported in the larval and pupal stages. We recently collected *Lt. vorax* on Doi Inthanon, Thailand's highest mountain, and found that the larval and pupal stages exhibit morphological differences from those collected in the plains of Chiang Mai Province. The objective of this study was to compare the larval and pupal morphology of the high altitude *Lt. vorax* from Doi Inthanon (LtVD) with *Lt. vorax*, *Lt. fuscana* and *Lt. halifaxii* from the plains using bright field and scanning electron microscopy. The results revealed that the larvae of LtVD differ from the other three species by having seta 1-M usually branched and setae 8-II,III usually single whereas those of the others are usually single and branched, respectively. The integument of LtVD is covered with relatively short pointed spicules whereas it is covered by denser, longer and more sharply pointed spicules in the other species. In addition, the comb scales are more numerous in LtVD. The pupa of LtVD clearly differs from the others in having setae 1 and 5 of abdominal segments V-VI single whereas those of the other species are branched. The larval and pupal characteristics of LtVD match well with topotypic *Lt. vorax* from Japan. The specific status of *Lt. vorax* in the plains of Chiang Mai Province is discussed.

Keywords: *Lutzia fuscana*, *Lt. halifaxii*, *Lt. vorax*, Doi Inthanon, scanning electron microscopy, taxonomy

Background

The genus *Lutzia* was established by Theobald in 1903 [1] based on a unique Neotropical species, *Culex bigoti* Bellardi. In 1932, Edwards [2] reduced *Lutzia* to a subgenus of *Culex* which had been widely accepted by subsequent authors until 2003 when Tanaka [3] restored *Lutzia* to its original generic status because it was morphologically more distinct than other subgenera of *Culex*. However, recent phylogenetic studies based on morphological and molecular data have provided conflicting support for the generic status of *Lutzia*: analyses of morphological data support the generic status whereas analyses based on DNA sequences do not [4]. Therefore, more information is required to confirm the position of *Lutzia* in relation to *Culex*.

Following Tanaka [3], *Lutzia* consists of eight species classified in three subgenera, i.e. *Insulalutzia, Lutzia* and *Metalutzia* (http://mosquito-taxonomic-inventory.info/). One species of subgenus *Insulalutzia*, *Lt. shinonagai* Tanaka, 2003, has been recorded on Ogasawara Island of Japan. Two species of subgenus *Lutzia* are found in the Neotropical Region, *Lt. allostigma* Howard, Dyar & Knab, 1915 and *Lt. bigoti* (Bellardi, 1862). Subgenus *Metalutzia* includes five species: *Lt. tigripes (*de Grandpre & de Charmoy, 1901), the only species found throughout the Afrotropical Region; *Lt. agranensis* Singh & Prakash 2008, found only in India; *Lt. fuscana* (Wiedemann, 1820) and *Lt. halifaxii* (Theobald, 1903), widely distributed in the Oriental, Australian and eastern Asia extending to Russia, and *Lt. vorax* Edward, 1921, found in the Oriental and Australian Regions.

In Thailand, the first records for *Lt. fuscana* and *Lt. halifaxii* appeared in the early 1900s [5]. Bram [6] considered that *Lt. vorax* (as *Cx.* (*Lut.*) *vorax*) was a synonym of *Lt. halifaxii* because of similarity of the male genitalia, and considered that this and differences of the abdominal banding patterns were due to intraspecific variation. Subsequent authors [7, 8, 9, 10] followed Bram's treatment, which caused confusion about the two nominal species. However, Tanaka [3] restored the specific status of *Lt. vorax* because he found only the abdominal banding typical of *Lt. vorax* – no specimens resembled the typical form of *Lt. halifaxii* or intermediate characteristics, although both species are difficult to separate in the adult (male genitalia), larval and pupal stages. Recently, Rattanarithikul *et al*. [11] listed three species of *Lutzia* in Thailand, *Lt. fuscana*, *Lt. halifaxii* and *Lt. vorax*, with illustrated keys for identifying females but for larvae by reason that they were inseparable.

In 2012, during our mosquito survey on Doi Inthanon, the highest mountain in Thailand, a number of *Lutzia* larvae were collected and brought back to our laboratory for rearing. We noticed that although the adults were morphologically identifiable as *Lt. vorax*, their larval and pupal exuviae exhibited morphological differences from those collected in the plains of Chiang Mai Province. This paper reports the results of our further investigations of the larval and pupal morphology of the high altitude *Lt. vorax* from Doi Inthanon (LtVD) in comparison with *Lt. vorax*, *Lt. fuscana* and *Lt. halifaxii* from the plains.

Materials and Methods

Collection sites

Mosquitoes were collected during 2012-2014 as larvae and pupae from three sites in Chiang Mai Province and one site in Tokyo; 1) Doi Inthanon (18°33'11.90" N, 98°28'47.83" E, 2,116 m altitude), Chom Tong District; 2) Mae Hia Subdistrict (18° 45'21.52" N, 98° 56'22.84" E, 322 m altitude) and 3) Ban Pang Mai Daeng, Mae Taeng District (19°08'19.78" N, 98°12'07.76" E, 415 m altitude) and 4) Tokyo, Japan (35°42'18.91" N, 139°43'11.54" E).

Mosquito examination

Larvae were examined under stereo and bright field microscopes and identified using illustrated keys [11]. As the larvae are predatory, they were reared individually to pupae by providing them with *Culex* larvae as prey. The emerging adults were pinned and identified morphologically by the aid of a stereomicroscope and the keys mentioned above. Their associated larval and pupal exuviae were preserved in 80% ethanol until mounted on slides with Hoyer's medium or Euparal. A number of fourth-instar larvae were also mounted.

Setal branching counts of pupae were obtained from both left and right sides of exuviae using a bright-field compound microscope. The morphological terminology and abbreviations follow the anatomical Glossary of the online Mosquito Taxonomic Inventory (http:// mosquito-taxonomic-inventory.info/ anatomical glossary-overview).

Scanning electron microscopy

The integument of larvae was examined in a JEOL-JSM6610LV scanning electron microscope as follows. The larvae preserved in 80% ethanol were dehydrated through a graded ethanol series. They were then attached to double stick tape on an aluminum stub and coated with gold in sputter-coating apparatus.

Results and Discussion

The adults obtained from larvae and pupae collected on Doi Inthanon were all identified as *Lt. vorax* (LtVD) whereas only *Lt. fuscana* were collected at Mae Hia. At Ban Pang Mai Daeng, *Lt. vorax* (LtVPMD), and less commonly *Lt. halifaxii*, were found. The adult specimens from Tokyo were all *Lt. vorax* as described by Edwards [12] (Tokyo is the type locality of the species).

Examination of LtVD and LtVPMD larvae revealed three distinct differences. Seta 1-M of LtVD is usually branched whereas that of LtVPMD is usually single. Seta 8-II,III of LtVD is usually single whereas that of LtVPMD is usually branched. *Lutzia vorax* larvae from Tokyo have setae 1-M usually branched and 8-II,III single. The modal number of comb scales in LtVD was 56 (42-62, mean 52.89) which was not significantly different from *Lt. vorax* from Tokyo (mode 44, 38-66, mean 48.78) but was significantly higher than LtVPMD (mode 38, 32-45, mean 38.70).

Scanning electron microscopy revealed that the integument of LtVD is covered with relatively short pointed spicules, similar to *Lt. vorax* from Japan, whereas it is covered by denser, longer and more sharply pointed spicules in LtVPMD (Figure 1). We found no variation in the integumental spicules of LtVD and consider this to be a diagnostic character. The integumental spicules of *Lt. fuscana* and *Lt. halifaxii* observed under bright field microscopy are similar to those of LtVPMD.

The pupa of LtVD clearly differs from the pupae of *Lt. fuscana*, *Lt. halifaxii* and LtVPMD in having setae 1 and 5 of abdominal segments V and VI mostly single whereas those of the other species are branched (Table 1). The setae of LtVD, particularly setae 1-V,VI and 5-VI, are similar to those of *Lt. vorax* from Japan reported by Tanaka [3]. No clear differences on setal branching were observed in pupae of *Lt. fuscana*, *Lt. halifaxii* and LtVPMD.

The current study clearly shows that the larvae and pupae of *Lt. fuscana*, *Lt. halifaxii* and LtVPMD are difficult to separate based on morphology. Previous authors [6,11] did not recognized any differences between the larvae of *Lutzia* species found in Thailand, probably because all the specimens examined were collected from the plains. So far, LtVD larvae have been collected on Doi Inthanon and probably exists at other high altitudes in northern Thailand. Our ongoing molecular study also indicates that LtVD is closely related with *Lt. vorax* from Tokyo, but distinctly different from LtVPMD, *Lt. fuscana* and *Lt. halifaxii* (P. Somboon, unpublished data).

Conclusion

It is possible that LtVD may be conspecific with topotypic *Lt. vorax* from Tokyo. Our results suggest that LtVPMD may be an unknown species of *Lutzia*. Further study is required to determine the specific status of LtVPMD and its distribution.

Acknowledgement

This study was financially supported by the Diamond Research Grant of Faculty of Medicine, Chiang Mai University to P. Somboon.

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Table 1. Range (mode) of the branching of abdominal setae 1-III,VI,V,VI and 5-III,IV,V,VI of pupae of *Lt. fuscana* (5 males, 5 females), *Lt. halifaxii* (4 males, 4 females), *Lt. vorax* (LtVPMD) (5 males, 5 females) and *Lt. vorax* (LtVD) (10 males, 10 females) compared with *Lt. vorax* from Japan.

Seta No.	Species	Abdominal segments			
		III	IV	V	VI
1	*Lt. fuscana*	4-10 (7)	3-7 (5)	2-4 (2)	1-3 (2)
	Lt. halifaxii	2 -16 (8)	3-7 (5)	2-3 (3)	2-3 (2)
	Lt. vorax (LtVPMD)	5-13 (7)	4-7 (5)	2-4 (2)	2-3 (2)
	Lt. vorax (LtVD)	3-6 (5)	1-2 (2)	1 (1)	1 (1)
	Lt. vorax Tanaka [3]	4-14 (7)	2-9 (3)	1-4 (1)	1-2 (1)
5	*Lt. fuscana*	2-6 (4)	3-8 (4)	2-4 (2)	2-3 (2)
	Lt. halifaxii	3-5 (3)	3-6 (4)	2-4 (3)	2-3 (3)
	Lt. vorax (LtVPMD)	3-6 (3)	3-7 (4,5)	2-4 (3)	1-3 (2)
	Lt. vorax (LtVD)	1-3 (1)	1-3 (2)	1-2 (1)	1-2 (1)
	Lt. vorax Tanaka [3]	1-5 (2)	1-7 (2)	1-4 (2)	1-3 (1)

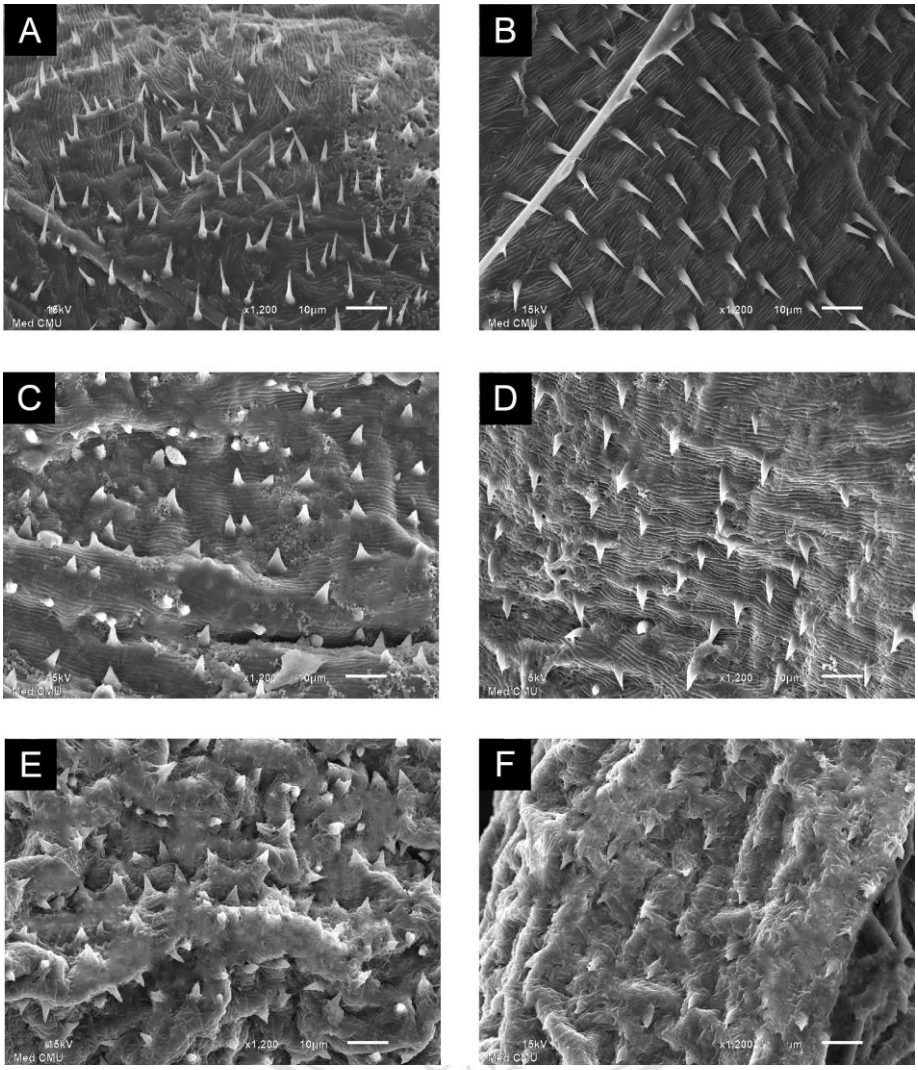

Figure 1. Scanning electron microscopy of *Lutzia* larvae showing spicules on the dorsal mesothorax (left) and abdominal segment VIII (right): A, B, *Lt. vorax* (LtVPMD); C, D, *Lt. vorax* (LtVD) and E, F, *Lt. vorax* Tokyo.

APPENDIX B

Collecting data of *Lutzia*

Lt. fuscana

Codes	Sexes	Dates	Collecting sites	Examined stages	Collectors
MHP01	♀	24/12/2012	Mea Hia	pupal exuvia, adult	P. Somboon
MH01	♀	16/11/2012	Mea Hia	pupal exuvia, adult	K. Attasopa
MH02	♂	16/11/2012	Mea Hia	pupal exuvia, adult	K. Attasopa
MH03	♀	16/11/2012	Mea Hia	pupal exuvia, adult	K. Attasopa
MH04	♂	16/11/2012	Mea Hia	larval & pupal exuvia, adult	K. Attasopa
MH05	♂	16/11/2012	Mea Hia	pupal exuvia, adult	K. Attasopa
MH07	♀	16/11/2012	Mea Hia	pupal exuvia, adult	K. Attasopa
MH08	♀	16/11/2012	Mea Hia	pupal exuvia, adult	K. Attasopa
MH09	♂	16/11/2012	Mea Hia	pupal exuvia, adult	K. Attasopa
MH10	♂	16/11/2012	Mea Hia	adult	K. Attasopa
MH12	♀	16/11/2012	Mea Hia	adult	K. Attasopa
MH13	♀	16/11/2012	Mea Hia	adult	K. Attasopa
MH(L)01	–	16/11/2012	Mea Hia	whole larva	K. Attasopa
MH(L)02	–	16/11/2012	Mea Hia	whole larva	K. Attasopa
MH(L)03	–	16/11/2012	Mea Hia	whole larva	K. Attasopa

Lt. halifaxii

Codes	Sexes	Dates	Collecting sites	Examined stages	Collectors
PMD25	♂	17/12/2012	Pang Mai Dang	pupal exuvia, adult	K. Attasopa
PMD29	♂	17/12/2012	Pang Mai Dang	larval exuvia	K. Attasopa
PMD30	♂	17/12/2012	Pang Mai Dang	pupal exuvia, adult	K. Attasopa
PMD37	♀	17/12/2012	Pang Mai Dang	larval & pupal exuvia	K. Attasopa
PMD38	♂	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD39	♀	17/12/2012	Pang Mai Dang	larval & pupal exuvia	K. Attasopa
PMD44	♂	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD46	♀	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD47	♀	17/12/2012	Pang Mai Dang	larval & pupal exuvia	K. Attasopa

Lt. vorax Ban Pang Mai Daeng

Codes	Sexes	Dates	Collecting sites	Examined stages	Collectors
PMD01	♂	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD02	♂	17/12/2012	Pang Mai Dang	larval exuvia	K. Attasopa
PMD03	♂	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD04	♀	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD05	♀	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD06	♀	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD07	♀	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD08	♂	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD09	♂	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD10	♀	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD11	♀	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD12	♂	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD13	♂	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD14	♀	17/12/2012	Pang Mai Dang	adult, larval exuvia	K. Attasopa
PMD16	♀	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD20	♂	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD21	♀	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD23	♂	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD28	♂	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD31	♂	17/12/2012	Pang Mai Dang	larval & pupal exuvia, adult	K. Attasopa
PMD32	♂	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD33	♂	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD34	♀	17/12/2012	Pang Mai Dang	larval exuvia	K. Attasopa
PMD36	♂	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD40	♂	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD41	♂	17/12/2012	Pang Mai Dang	adult	K. Attasopa
PMD43	♀	17/12/2012	Pang Mai Dang	adult	K. Attasopa

Lt. vorax from Tokyo

Codes	Sexes	Dates	Collecting sites	Examined stages	Collectors
Tokyo01	♂	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo02	♂	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo03	♂	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo04	♂	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo05	♂	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo07	♀	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo08	♀	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo09	♀	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo11	♀	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo13	♂	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo17	♀	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo18	♂	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo19	♀	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo20	♀	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo21	♀	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
Tokyo22	♀	28/10/2014	Tokyo	larval exuvia	Y. Tsuda
TOK(L)03	–	2/10/2014	Tokyo	larval exuvia	Y. Tsuda
TOK(L)04	–	2/10/2014	Tokyo	larval exuvia	Y. Tsuda

Lt. vorax from Doi Inthanon

Codes	Sexes	Dates	Collecting sites	Examined stages	Collectors
INT01	♀	20/4/2012	Doi Inthanon	pupal exuvia, adult	P. Somboon
INT02	♀	20/4/2012	Doi Inthanon	pupal exuvia	P. Somboon
INT03	♂	20/4/2012	Doi Inthanon	pupal exuvia, adult	P. Somboon
INT04	♀	20/4/2012	Doi Inthanon	pupal exuvia, adult	P. Somboon
VI02	♂	7/5/2014	Doi Inthanon	pupal exuvia	W. Srisuka
VI03	♀	7/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
VI04	♀	7/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
VP01	♂	7/5/2014	Doi Inthanon	adult	W. Srisuka
VP02	♂	7/5/2014	Doi Inthanon	adult	W. Srisuka
VP03	♀	7/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
VP04	♂	7/5/2014	Doi Inthanon	adult	W. Srisuka
VP05	♀	7/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
VP06	♂	7/5/2014	Doi Inthanon	adult	W. Srisuka
VP07	♂	7/5/2014	Doi Inthanon	pupal exuvia, adult	W. Srisuka
VP08	♂	7/5/2014	Doi Inthanon	pupal exuvia	W. Srisuka
VP09	♀	7/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
VP10	♀	7/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
VP11	♂	7/5/2014	Doi Inthanon	adult	W. Srisuka
VP16	♀	7/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
VP18	♂	7/5/2014	Doi Inthanon	adult	W. Srisuka
VP23	♂	7/5/2014	Doi Inthanon	adult	W. Srisuka
VP24	♀	7/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi1.02	♂	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi1.03	♀	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi1.05	♀	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi1.06	♀	13/5/2014	Doi Inthanon	pupal exuvia, adult	W. Srisuka & K. Attasopa
Vi1.07	♂	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi1.08	♂	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi1.10	♂	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi1.11	♂	13/5/2014	Doi Inthanon	pupal exuvia, adult	W. Srisuka & K. Attasopa
Vi1.12	♀	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi1.14	♀	13/5/2014	Doi Inthanon	pupal exuvia, adult	W. Srisuka & K. Attasopa
Vi1.15	♀	13/5/2014	Doi Inthanon	pupal exuvia, adult	W. Srisuka & K. Attasopa
Vi1.16	♂	13/5/2014	Doi Inthanon	pupal exuvia, adult	W. Srisuka & K. Attasopa
Vi1.18	♀	13/5/2014	Doi Inthanon	pupal exuvia, adult	W. Srisuka & K. Attasopa
Vi1.19	♀	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi1.20	♀	13/5/2014	Doi Inthanon	pupal exuvia, adult	W. Srisuka & K. Attasopa
Vi1.24	♂	13/5/2014	Doi Inthanon	pupal exuvia	W. Srisuka & K. Attasopa
Vi1.25	♂	13/5/2014	Doi Inthanon	pupal exuvia, adult	W. Srisuka & K. Attasopa
Vi1.26	♀	13/5/2014	Doi Inthanon	pupal exuvia	W. Srisuka & K. Attasopa
Vi1.27	♂	13/5/2014	Doi Inthanon	pupal exuvia, adult	W. Srisuka & K. Attasopa
Vi1.35	♂	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa

Lt. vorax from Doi Inthanon (continued)

Codes	Sexes	Dates	Collecting sites	Examined stages	Collectors
Vi1.39	♂	13/5/2014	Doi Inthanon	pupal exuvia, adult	W. Srisuka & K. Attasopa
Vi2.01	♀	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi2.02	♀	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi2.03	♀	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi2.04	♀	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
Vi2.05	♀	13/5/2014	Doi Inthanon	adult	W. Srisuka & K. Attasopa
INT(L)01	–	20/4/2012	Doi Inthanon	whole larva	P. Somboon
INT(L)02	–	20/4/2012	Doi Inthanon	whole larva	P. Somboon
INT(L)03	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)04	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)05	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)06	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)07	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)08	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)09	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)10	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)11	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)12	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)13	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)14	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)15	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)16	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)17	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa
INT(L)18	–	13/5/2014	Doi Inthanon	whole larva	W. Srisuka & K. Attasopa

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Publications	Attasopa K. and Warrit N. The subgeneric position and a redescription of an Oriental burrowing bee, *Amegilla fimbriata* (Hymenoptera: Apidae; Anthophorini). *The Pan-Pacific Entomologist*. 2012. 88: 281–291. Attasopa K., Tsuda Y., Harbach E. R., and Somboon P. Morphological studies of larvae and pupae of *Lutzia* species (Diptera: Culicidae) from Doi Inthanon and the plains of Chiang Mai Province. *Proceedings of the 8th ASEAN Microscopy Conference & 32nd Microscopy Society of Thailand*. 2015. (in press).
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Attasopa K. and Warrit. Taxonomy of *Amegilla* (Hymenoptera: Apidae): A Case Study of Collections in Thailand. The Proceedings of the 6th Conference on Science and Technology for Youths: 18–19 March 2011. Bangkok International Trade and Exhibition Centre (BITECT) Bangkok, Thailand.

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Poster presentations

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