

STUDIES ON MEDICALLY IMPORTANT FLIES IN THAILAND. III.

Report of Species Belonging to the Genus *Musca* Linné,
Including the Taxonomic Key (Diptera: Muscidae)

BY

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ABSTRACT

Twenty species belonging to the genus *Musca* Linné are reported from Thailand with taxonomic key. This study is based on the specimens available in the authors' collection and 8 species are the new records from this country. The newly recorded species are *Musca interrupta pilifacies*, *M. lucens*, *M. fasciata*, *M. pattoni*, *M. planiceps*, *M. xanthomelas*, *M. bezzii* and *M. convexifrons*.

INTRODUCTION

The genus *Musca* Linné, which consists of a large number of species, has a worldwide distribution and is particularly a common and dominant genus in tropical Asia and Africa. Some species have great medical importance throughout the temperate and tropical zones of the world as carriers of many helminthic, protozoal, spirochetal, bacterial and viral infections^{2,3}. The important role known to be played by the members of the genus *Musca* in the transmission of these infections depends mainly upon their habit of alighting and feeding on human food and human excretions such as feces, sputum, pus and urine. Moreover, their habit and external morphology are particularly suitable for carrying pathogenic organisms from feces and other excretions to food.

KEY TO THE SPECIES OF *MUSCA* IN THAILAND

1. Propleuron hairy *M. domestica*
Propleuron bare (2)
2. Suprasquamal ridge bare (3)
Suprasquamal ridge hairy (13)
3. Eyes hairy; anterior sternopleural
bristles absent. Male: Abdomen
largely black, dark median vitta oc-
cupying more than half width of
2nd segment. Female: Parafrontalia
shining black
. *M. interrupta pilifacies*
Eyes bare; anterior sternopleural
bristles present (4)
4. Proboscis stout; mid tibia with an an-
teroventral bristle at apical third.
Male: Interfrontalia very narrow,
becoming linear behind middle.
Female: Interfrontalia somewhat

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- narrower to slightly wider than the parafrontalia *M. crassirostris*
 Proboscis normal, mid tibia without an anteroventral bristle (5)
5. Fore tibia without a posteroventral bristle (6)
 Fore tibia with a posteroventral bristle (12)
6. Abdomen entirely orange without any vitta in both sexes *M. ventrosa*
 Abdomen pale yellow to black with black or brown median vitta or tessellated pattern (7)
7. Fourth vein (m_{1+2}) bow-shaped; vittae of each side of thorax fused in front of suture; sternite black; second and 3rd tergites with black marginal bands. Female: Abdomen light brown, 3rd to 4th tergites with some gray dust *M. lucens*
 Fourth vein sharply bending anteriorly (8)
8. Thorax with 2 conspicuous vittae. (9)
 Thorax with 4 conspicuous vittae. (10)
9. Vittae of each side of thorax fused behind suture; sternites orange; hypopleuron with fine hairs just below metathoracic spiracle. Male: Second and 3rd tergites without marginal bands. Female: Abdomen wholly dark with silvery checkered pattern, rarely ventral surface of 2nd tergite yellowish; medium sized fly
 *M. sorbens*
 Vittae of each side of thorax fused in front of suture in both sexes; sternites black; hypopleuron without hairs below metathoracic spiracle
 *M. fasciata*
10. Second tergite pale yellow with a conspicuous median vitta; stem vein with 1 hair on upper posterior side. Male: Interfrontalia completely effaced behind middle; lower squama yellowish white. Female: Interfrontalia twice as wide as the parafrontalia; lower squama grayish white.
 *M. pattoni*
 Second tergite wholly or largely black (11)
11. Anterior part of 2nd tergite largely black with a conspicuous median vitta; stem vein with 4 fine setae on upper posterior part; lower squamae smoky. Male: Anterior part of 2nd tergite largely black; median vitta on 3rd tergite broader than that of 4th tergite, and 3rd and 4th tergites with tessellated patterns laterally; Female: Abdomen black with golden dust and with tessellated pattern; anterior margin of 2nd tergite reddish brown *M. fletcheri**
 Second tergite wholly black; 3rd to 5th tergites reddish-brown with a conspicuous median vitta; ventral part of 2nd tergite yellow; stem vein with 1 seta on upper posterior side; lower squamae dark brown; 4th tergite rarely with a dark marginal band on posterior margin *M. asiatica*
12. Male: Second tergite largely dark dorsally, 3rd and 4th tergites pale yellow with a black median vitta; 5th tergite dark brown with silvery pollinosity. Female: Abdomen dark brown with golden to silvery checkered pattern entirely
 *M. conducens*
 Male and female: Second, 3rd and 4th tergites largely pale yellow with a dark brown to black median vitta; abdomen somewhat more elongate and pointed *M. planiceps*

* *M. fletcheri* belongs to subgenus *Eumusca* which has short bristles on anterior part of suprasquamal ridge, but these bristles are often absent in this species.

13. Posterior part of suprasquamal ridge without erect bristly hairs(14)
 Posterior part of suprasquamal ridge with erect bristly hairs(17)
14. Mid tibia with 2 conspicuous anteroventral bristles; abdomen with a complete undusted black median vitta, broad anteriorly and narrower posteriorly and with a row of elongate spots at middle of each lateral side forming a complete, dark brown vitta on either side in both sexes; abdomen of female darker than that of male *M. seniorwhitei*
 Mid-tibia without anteroventral bristle(15)
15. Setulae on ventral surface of vein r_{4+5} almost reaching apex; stem vein with 3-5 setulose hairs; anterior *post dc* indistinct; abdomen of male dark brown with a black median vitta, in female similar but a median vitta narrower *M. fletcheri*
 Setulae on ventral surface of vein r_{4+5} confined to base, not reaching r-m.(16)
16. Stem vein with 1 to 2 sutulose hairs; 2nd tergite largely yellow in both sexes; eyes with microscopic hairs *M. xanthomelas*
 Stem vein with 1 to 4 setulose hairs; 2nd tergite largely black on dorsal surface; eyes virtually bare *M. craggi*
17. Parafacialia and lower squamae bare(18)
 Parafacialia bare; lower squamae hairy; anterior *post dc* indistinct; abdomen dark brown with a black median vitta, with 1 stripe and 2 silvery spots on each side of each tergite; anterior part of 2nd tergite largely black; 3rd tergite of female paler than that of male *M. inferior*
18. Second tergite mainly or wholly black(19)
 Second tergite mainly or wholly pale(20)
19. Eyes with sparse minute hairs in male; 3rd to 5th tergites yellow in male, with a black median vitta, which is strongly broadened at base of 2nd tergite; 3rd and 4th sternites yellow; 1st, 2nd and 5th black. Female: sternite largely pale yellow *M. bezzii*
 Eyes bare; 3rd to 4th tergites pale yellow with a black median vitta, which is slightly dilated towards fore margin of each segment; 5th darkened with 3 shifting dark vittae as in female; 1st to 5th sternites black *M. bakeri*
20. Eyes distinctly hairy; abdomen yellowish orange in male; a median vitta on 2nd tergite strongly dilated behind; a median vitta on 3rd tergite less than twice as long as wide, and slightly dilated at hind margin; 5th tergite largely infuscated; abdomen of male somewhat wider than long. Abdomen of female orange with tessellated pattern *M. convexifrons*
 Eyes with sparse minute hairs. Male: Abdomen yellow, median vitta narrow; median vitta on 2nd tergite slightly dilated posteriorly and median vitta on 3rd tergite more than twice as long as wide at middle; 5th tergite largely infuscated. Female: Ground color of abdomen black with tessellated pattern; 2nd tergite and lateral parts of 3rd tergite wholly pale *M. formosana*

RECORDS

1. *Musca (Musca) domestica* Linné

M. domestica L., 1758, Syst. Nat. 10: 596;
Emden, F. (1965): Fauna of India,
Diptera, 7(1): 54.

Specimens examined: THAILAND: 1 ♀, Sam Sane, Bangkok, 29 VIII 1975, R. Kano; 1♂♂, 19♀♀, Bangna Nai, Bangkok, 28 VIII 1975, R. Kano & W. Tumrasvin; 2♂♂, Kasetsart University, Bang Khen, 31 VIII 1975, R. Kano; 19♂♂, 5♀♀, Mahidol University, Bangkok, 26 VIII 1975, R. Kano; 1♂, beach, C. 30 km. S. Chon Buri, 30 VIII 1975, R. Kano; 2♂♂, 3♀♀, town, Sara Buri, 2 X 1975, R. Kano; 1♂, 1♀, Khao Yai, 800 m., 60 km. S. Pak Chong, 3 X 1975, R. Kano; 4♂♂, 2♀♀, nr. Sai Yok, 500 m., Kanchana Buri, 6, 11 IX, 1975, H. Kurahashi; 1♂, 1♀, Erawan waterfall, 500 m., Kanchana Buri, 5 IX 1975, R. Kano; 3♂♂, Pak Chong, 24 XII 1975, S. Shinonaga & W. Tumrasvin; 1♂, 1♀, Doi Pui, 1985 m., C. Chiang Mai, 21 IX 1975, R. Kano; 1♂, hill, C. 300 m., Sa Kaeo, 30 km. S.E., 3 IX 1975, H. Kurahashi; 2♂♂, 2♀♀, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, R. Kano; 2♀♀, Doi Inthanon, Chiang Mai, 19 XII 1975, S. Shinonaga; 1♂, 1♀, Ban Yang, 1400 m., Doi Inthanon, 17 IX 1975, H. Kurahashi.

2. *M. (Plaxemyia) interrupta pilifacies* Emden

M. interrupta pilifacies Emden, 1965,
Fauna of India, Diptera 7(1): 58.

M. dasyops Stein, of Patton, Philip. J. Sci. 23: 326; Ho, 1938, Ann. Trop. Med. Parasit. 32: 287.

M. sp. n. Patton, 1937, Ann. Trop. Med. Parasit. 31: 209.

Specimens examined: THAILAND: 2♀, top, 2667 m., Doi Inthanon, 19, 23 IX 1975, H. Kurahashi.

3. *M. (Philaematomyia) crassirostris* Stein

M. crassirostris Stein, 1903, Mitt. Zool. Mus. Berlin, 2: 99.

M. modesta de Meijere, 1904, Bijdr. Dierk. 18: 106.

Philaematomyia insignis Aust., 1909,
Ann. Mag. N. H. 3(8): 298.

Emden, F. (1965): Fauna of India, Diptera, 7(1): 71.

Specimens examined: THAILAND: 6♂♂, Kasetsart University, Bang Khen, 31 VIII 1975, R. Kano & W. Tumrasvin; 1♀, Mahidol University, Bangkok, 26 VIII 1975, R. Kano; 2♀♀, woods and grass ld., Ayutthaya, 1 IX 1975, R. Kano; 2♂♂, 2♀♀, village, nr. Nakhon Pathom, 12 IX 1975, R. Kano; 1♂, nr. Ban Sap Bon, 30 km. E. Sara Buri, 4 X 1975, H. Kurahashi; 2♂♂, 2♀♀, Sai Yok, 500 km., Kanchana Buri, 9-13 XII 1975, S. Shinonaga; 2♀♀, Erawan waterfall, 500 m, Kanchana Buri, 7 IX 1975, R. Kano; 3♀♀, Pak Chong, 24 XII 1975, S. Shinonaga; 3♀♀, Doi Pui, Chiang Mai, 17 XII 1975, S. Shinonaga; 1♀, Doi Saket, 300 m., C. Chiang Mai, 15 IX 1975, H. Kurahashi.

4. *M. (Byomyia) ventrosa* Wiedemann

M. ventrosa Wied., 1830, Aussereur, zweifl. Insekt., 2: 656.

M. xanthomelas Walk., 1860, J. Proc. Linn. Soc. 4: 139.

M. nigrithorax Stein, 1909, Tijdschr. v. Ent., Deel, 52: 212.

M. kasauliensis Awati, 1917, Ind. J. Med. Res., 5: 160.

Emden, F. (1965): Fauna of India, Diptera, 7(1): 60.

Specimens examined: THAILAND: 2♂♂, Bangna Nai, Bangkok, 28 VIII 1975, R. Kano; 2♂♂, 12♀♀, Kasetsart University, Bang Khen, 31 VIII 1975, R. Kano & W. Tumrasvin; 1♂, 1♀, beach, 30 km. S. Chon Buri, 30 VIII 1975, W. Tumrasvin; 1♀, village, nr. Nakhon Pathom, 12 IX 1975, R. Kano; 2♂♂, 2♀♀, nr. Ban Sap Ben,

30 km. E. Sara Buri, 4X 1975, R. Kano & H. Kurahashi; 1♀, Sai Yok, 500 m., Kanchana Buri, 27-29 X 1975, S. Shinonaga; 1♀, nr. Sai Yok, 500 m., Kanchana Buri, 8 X 1975, R. Kano; 5♂♂, 5♀♀, Pak Chong, 24 XII 1975. S. Shinonaga & W. Tumrasvin; 2♂♂, 1♀, Doi Pui, 1685 m., Chiang Mai, 16 IX, 17 XII 1975, R. Kano & S. Shinonaga; 1♀, hill, C. 300 m., Sa Kaeo, 30 km. S.E., 3 IX 1975, R. Kano; 1♀, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, R. Kano; 1♂, Doi Saket, 300 m., Chiang Mai, 15 IX 1975, H. Kurahashi; 3♂♂, 4♀♀, Ban Yang, 1400 m., Doi Inthanon, 17, 19 IX 1975, R. Kano & H. Kurahashi.

5. *M. (Byomyia) lucens* (Villeneuve)

Pristirynchomyia lucens Villen., 1922, Ann. Sci. Nat. (Zool), 5(10): 336.

M. lucens Villen., 1923, Patton, Philip. J. Sci., 23: 332; Patton and Senior White, 1924, Rec. Ind. Mus., 26: 567; Patton, 1937, Ann. Trop. Med. Paras., 31: 134; Emden, F. (1965): Fauna of India, Diptera, 7(1): 63.

Specimens examined: THAILAND: 1♂, 1♀, Khao Yai, 800 m., 60 km. S. Pak Chong, 3, 6 X 1975, R. Kano & H. Kurahashi.

6. *M. (Byomyia) sorbens* Wiedemann

M. sorbens Wied., 1830, Aussereur. zweifl. Ins., 2: 418.

M. humilis Wied., 1830, l.c., 418.

M. latifrons Wied., 1830, l.c., 656.

M. mediana Wied., 1830, l.c., 657.

M. vetustissima Walk., 1849, List. Dipt., 4: 902

M. primitiva Walk., 1849, List. Lipt., 4: 903.

M. bivittata Thoms., 1868, Eugenes Resa Dipt., 547.

M. niveisquamata Thoms., 1868, l.c., 467.

M. scapularis Rond., 1875, Ann. Mus.

Gen., 7: 428.

M. eutaeniata Blg., 1887, Bull. Soc. Ent. France, 12: 605.

M. promisca Awati, 1917, Ind. J. Med. Res., 5: 548.

Specimens examined: THAILAND: 1♂, 2♀♀, Samsane, Bangkok, 29 VIII 1975, R. Kano; 5♂♂, 6♀♀, Bangna Nai, Bangkok, 28 VIII 1975, R. Kano & W. Tumrasvin; 4♂♂, 3♀♀, Kasetsart University, Bang Khen, 31 VIII 1975, R. Kano & W. Tumrasvin; 2♂♂, Mahidol University, Bangkok, 26 VIII 1975; R. Kano; 5♀♀, beach, C. 30 km. S. Chon Buri, 30 VIII 1975, R. Kano & W. Tumrasvin; 1♂♂, 4♀♀, salt pond, 6 km. N. Chon Buri, 2 IX 1975, R. Kano & W. Tumrasvin; 1♂, 4♀♀, wood and grass ld., Ayutthaya, 1 IX 1975, R. Kano; 1♀, town, Sara Buri, 2 X 1975, R. Kona; 1♂, Khao Yai, 800 m., 60 km. S. Pak Chong, 6 X 1975, R. Kano; 1♂, 1♀, Sai Yok, 500 m., Kanchana Buri, 27-29 XII 1975, S. Shinonaga; 1♀, Erawan waterfall, 500 m., Kanchana Buri, 5 IX 1975, R. Kano; 3♂♂, 4♀♀, hill, C. 300 m., Sa Kaeo, 30 km. S.E., 3 IX 1975, R. Kano, H. Kurahashi & W. Tumrasvin; 1♂, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, R. Kano; 1♀, Doi Inthanon, Chiang Mai, 19 XII 1975, S. Shinonaga.

7. *M. (Byomyia) fasciata* Stein

M. fasciata Stein, 1910, J. Proc. Linn. Soc. London, 14: 149.

M. minuta Awati, 1917, Ind. J. Med. Res., 5: 160.

Emden, F. (1965): Fauna of India, Diptera, 7(1): 67.

Specimens examined: THAILAND: 1♀, Kasetsart University, Bang Khen, 31 VIII 1975, R. Kano; 1♂, 1♀, woods and grass ld., Ayutthaya, 1 IX 1975, R. Kano; 1♂, Pak Chong, 24 XII 1975, S. Shinonaga.

8. *M. (Byomyia) pattoni* Austen

M. pattoni Aust., 1910, Ann. Mag. N. H., 5(8): 114.

M. spinosa Awati, 1917, Ind. J. Med. Res., 5: 162.

M. incerta Patton, 1922, Ind. J. Med. Res., 10: & 1.

M. yerburyi Patton, 1923, Philip. J. Sci., 23: 329.

Emden, F. (1965): Fauna of India, Diptera, 7(1): 64.

Specimens examined: THAILAND: 1♂, beach, C. 30 km. S. Chon Buri, 30 VIII 1975, R. Kano; 1♂, woods and grass ld., Ayutthaya, 1 IX 1975, R. Kano; 1♀, nr. Sai Yok, 500 m., Kanchana Buri, 8 X 1975, R. Kano; 1♀, Doi Saket, Chiang Mai, 16 XII 1975, S. Shinonaga; 1♀, Ban Yang, Doi Inthanon, 17 IX 1975, R. Kano.

9. *M. (Byomyia) asiatica* Shinonaga et Kano

M. asiatica Shinonaga and Kano, 1977 Jap. J. Sanit. Zool., 28(2):

Specimens examined: 4♂♂, 1♀, Khao yai, 800 m., 60 km. S. Pak Chong, 3 X 1975, H. Kurahashi; 1♂ same locality, 25 XII 1975, S. Shinonaga.

10. *M. (Byomyia) conducens* Walker

M. conducens Walk., 1860, J. Proc. Linn. Soc. London, 4: 138.

M. praecox Walk., 1864, J. Proc. Linn. Soc. London, 7: 236.

Pristirhynchomyia lineata Brun., 1910, Rec. Ind. Mus., 4: 91.

M. lati-parafrons Awati, 1917, Ind. J. Med. Res., 5: 160.

Emden, F. (1965): Fauna of India, Diptera, 7(1): 68.

Specimens examined: THAILAND: 2♀, Bangna Nai, Bangkok, 28 VIII 1975, R. Kano & W. Tumrasvin; 1♂, 1♀, Kasetsart

University, Bang Khen, 31 VIII 1975, R. Kano & W. Tumrasvin; 1♂, 3♀, woods and grass ld., Byutthaya, 1 IX 1975, R. Kano; 1♂, Khao Yai, 800 m., 60 km. S. Pak Chong, 3 X 1975, R. Kano; 1♀, Fang Exp. St., 500 m., Fang, 25 IX 1975, R. Kano.

11. *M. (Byomyia) planiceps* Wiedemann

M. planiceps Wied., 1824, Anal. Ent., 48; 1830, Aussereur. Zweifl. Ins., 2: 414.

M. cingalaisina Big., 1887, Bull. Soc. Zool. France, 12: 606.

M. pollinosa Stein, 1909, Tijdschr. Ent., 52: 211.

M. indica Awati, 1917, Ind. J. Med. Res., 5: 160.

M. (Awatia) formosana Mall., 1936, of Patton, Ann. Trop. Med. Paras., 30: 130; Ch'i Ho, 1938, Ibid., 32: 307.

Emden, F. (1965): Fauna of India, Diptera, 7(1): 70.

Specimens examined: THAILAND: 1♂, Erawan waterfall, 500 m., Kanchana Buri, 5 IX 1975, Kano; 2♂♂, 1♀, Doi Saket, Chiang Mai 16 XII 1975, S. Shinonaga.

12. *M. (Eumusca) seniorwhitei* Patton

M. seniorwhitei Patton, 1922, Ind. J. Med. Res., 10, 73; Patton and Senior White, 1924, Rec. Ind. Mus., 26: 576; Patton, 1937, Ann. Trop. Med. Paras., 31: 134.

Byomyia tibiseta Malloch, 1928, Ent. Mitt., 17: 334.

Emden, F. (1965): Fauna of India, Diptera, 7(1): 73.

Specimens examined: THAILAND: 2♀, beach, C. 30 km. S. Chon Buri, 30 VIII 1975, R. Kano; 3♂♂, 1♀, woods and grass ld., Ayutthaya, 1 IX 1975, R. Kano.

**13. *M. (Eumusca) fletcheri* Patton
et Senior White**

M. fletcheri Patton and Senior White, 1924, Rec. Ind. Mus. 26: 574; Patton, 1937, Ann. Trop. Med. Paras., 31: 200; Emden, F. (1965): Fauna of India, Diptera, 7(1): 80.

Specimens examined: THAILAND: 2♂, beach, C. 30 km. S. Chon Buri, 30 VIII 1975, R. Kano; 1♂, woods and grass ld., Ayutthaya, 1 IX 1975, R. Kano; 2♀♀, Erawan waterfall, 500 m., Kanchana Buri, 7 IX 1975, R. Kano.

**14. *M. (Eumusca) xanthomelas*
Wiedemann**

M. xanthomelas Wied., 1824, Anal. Ent., 49; Patton and Senior White, 1924, Rec. Ind. Mus. 26: 571; Patton, 1933, Ann. Trop. Med. Paras., 27: 423; 1936, Ibid., 30: 481; 1937, Ibid., 31: 199; Emden, F. (1965): Fauna of India, Diptera, 7(1): 74.

Specimens examined: THAILAND: 1♀, woods and grass ld., Ayutthaya, 1 IX 1975, R. Kano; 1♂, Fang Exp. St., 500 m., Fang 25 IX 1975, W. Tumrasvin.

15. *M. (Eumusca) craggi* Patton

M. craggi Patton, 1922, Ind. J. Med. Res., 10: 75; 1923, Philip. J. Sci., 23: 315; 1937, Ann. Trop. Med. Paras., 31: 136.

M. pulla Bezzi, 1924, of Patton and Senior White, Rec. Ind. Mus., 26: 568.

Emden, F. (1965): Fauna of India, Diptera, 7(1): 77.

Specimens examined: THAILAND: 5♀, woods and grass ld., Ayutthaya, 1 IX 1975, R. Kano; 1♀, Ban Yang, 1400 m., Doi Inthanon, 17 IX 1975, H. Kurahashi.

16. *M. (Ptilolepis) inferior* Stein

M. inferior Stein, 1909, Tijdschr. Ent.,

52: 213; 1918, Ann. Mus. Hungar., 16: 147; 1919, Tijdschr. Ent., 62: 40; 1922, Patton, Bull. Ent. Res., 12: 422; 1923, Philip. J. Sci., 23: 319; 1924, Patton and Senior White, Rec. Ind. Mus., 26: 576; 1937, Patton, Ann. Trop. Med. Paras., 31: 207; 1938, Ho, Ibid., 32: 305.

Philematomyia gurneyi Patton and Cragg, 1912, Ann. Trop. Med. Paras., 5: 513; 1913, Ind. J. Med. Res., 1: 28; 1913, Textbook Med. Ent., 356, Cragg, 1913, Sci. Mem. Officers Med. San. Depts. India, 60: 23; Castellani and Chalmers, 1913, Man. Trop. Med., 709; 1918, Awati, Ind. J. Med. Res., 5: 538. *P. inferior* Stein, Bezzi, Philip. Bur. Sci. Publ., 10: 29 (=1917, Philip. J. Sci., 12(D): 130); Banks, 1919, Ibid., 14(D): 187.

Ptilolepis inferior Stein, Bezzi, Ann. Trop. Med. Paras., 14: 333; Malloch, 1925, Ann. Mag. N. H., 16(9): 377; Emden, F. (1965): Fauna of India, Diptera, 7(1): 89.

Specimens examined: THAILAND: 12♂, 100♀♀, Kasetsart University, Bang Khen, 31 VIII 1975, R. Kano & W. Tumrasvin; 3♂♂, 3♀♀, beach, C. 30 km. S. Chon Buri, 30 VIII 1975, R. Kano & W. Tumrasvin; 1♂, Erawan waterfall 500 m., Kanchana Buri, 5 IX 1975, R. Kano; 1♀, Pak Chong, 24 XII 1975, S. Shinonaga.

**17. *M. (Viviparomusca) bezzii*
Patton et Cragg**

M. bezzii P. and C., 1913, Ind. J. Med. Res., 1: 19; 1913, Textbook Med. Ent., 352; Patton, 1922, Ind. J. Med. Res., 9: 130; 1922, Bull. Ent. Res., 12: 421; 1923, Philip. J. Sci., 23: 334; Patton and Senior White, 1924, Rec. Ind. Mus., 26: 573; Patton and Evans, 1929, Insects, ticks, etc., 394; Patton, 1937,

Ann. Trop. Med. Paras., 31: 204; Ho, 1938, Ann. Trop. Med. Paras., 32: 289; Muirhead Thomson, 1947, Proc. R. Ent. Soc. Lond. (A) 22: 93.

M. pilosa Awati, 1916, Ind. J. Med. Res., 4: 137; 1917, l.c., 5: 165.

Emden, F. (1965): Fauna of India, Diptera, 7(1): 83.

Specimens examined: THAILAND: 1♂, 4♀♀, Doi Pui, 1685 m., C. Chiang Mai, 16 IX 1975, R. Kano & H. Kurahashi; 8♂♂, 4♀♀, Ban Yang, 1400 m., Doi Inthanon, 17 IX 1975, R. Kano & H. Kurahashi.

18. *M. (Viviparomusca) bakeri illingworthi* Patton

M. illingworthi Patton, 1923, Philip. J. Sci., 23: 323; Patton and Senior White, 1924, Rec. Ind. Mus., 26: 572; Patton, 1937, Ann. Trop. Med. Paras., 31: 199.

M. (Viviparomusca) planiceps Wied., 1925, of Malloch, Ann. Mag. N. H. 16(9): 375; 1926, l.c., 17(9): 489.

Emden, F. (1965): Fauna of India, Diptera, 7(1): 84.

Remarks: This species from Biserat, Thailand, was recorded by Emden (1965), but no material available in the authors' collection. These specimens are preserved in the British Museum (Natural History).

19. *M. (Viviparomusca) convexifrons* Thomson

M. convexifrons Thomson, 1868, Eugen. Res., Dipt.: 547 (Shinonaga and Kano, 1971).

M. gibsoni P. and C., 1913, Ind. J. Med. Res., 1: 14; 1913, Textbook Med. Ent., 350; Patton, 1923, Philip. J. Sci., 23: 333; Patton and Senior White, 1924, Rec. Ind. Mus., 26: 570; Patton, 1937, Ann. Trop. Med. Paras., 31: 138; Emden, F. (1965): Fauna of India, Diptera, 7(1): 86.

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20. *M. (Viviparomusca) formosana* Malloch

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Specimens examined: THAILAND: 4♂♂, 2♀♀, woods and grass ld., Ayutthaya, 1 IX 1975, R. Kano & W. Tumrasvin; 1♀, Khao Yai, 30 km. S. Pak Chong 25, 26 XII 1975, S. Shinonaga; 2♂♂, nr. Ban Sap Bon, 30 km. E. Sara Buri, 4 X 1975, R. Kano & H. Kurahashi; 1♂, 23♀♀, Doi Pui, 1685 m., C. Chiang Mai, 16 IX 1975, R. Kano & H. Kurahashi, 2♂♂, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, H. Kurahashi; 1♂, top, 2667 m., Doi Inthanon, 23 IX 1975, R. Kano; 1♂, 2♀♀, Doi Inthanon, Chiang Mai, 19 XII 1975, S. Shinonaga, 3♂♂, 5♀♀, Ban Yang, 1400 m., Doi Inthanon, 17 IX 1975, R. Kano & H. Kurahashi; 4♂♂, 1♀, Fang Exp. St., 500 m., Fang 25 IX 1975, R. Kano; 6♂♂, 1♀, Doi Huai Hwer, 1231 m., Fang, 27 IX 1975, R.

Kano; 1 ♂, nr. Burma Bord., 1200 m., Fang, 26 IX 1975, W. Tumrasvin.

The materials examined in this study are preserved in the Department of Medical Zoology, Faculty of Medicine, Tokyo Medical and Dental University, Tokyo, Japan, and Department of Medical Entomology, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

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EXPLANATION OF FIGURES

- Fig. 1. Proboscis of *M. crassirostris*
 Fig. 2. Wing of *M. fasciata*
 Fig. 3. Wing of *M. lucens*
 Fig. 4. Abdomen of *M. asiatica* (male)
 Fig. 5. Abdomen of *M. fletcheri* (male)

- Fig. 6. Abdomen of *M. convexifrons* (male)
 Fig. 7. Abdomen of *M. formosana* (male)
 Fig. 8. Abdomen of *M. bezzii* (male)
 Fig. 9. Abdomen of *M. bakeri* (male)

