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Jpn. J. Ent., 60 (1): 207–228. March 25, 1992

The Genus *Winthemia* (Diptera, Tachinidae) from Yunnan Province, China[1)]

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Abstract *Winthemia* species collected in Yunnan Province, China, are reviewed. Eleven species of the genus are found in Yunnan and 6 of them are described and illustrated as new to science: *proclinata* sp. n., *verticillata* sp. n., *aurea* sp. n., *angusta* sp. n., *marginalis* sp. n., and *brevicornis* sp. n. *Winthemia marginalis* and *W. angusta* are also found in Japan. An acraeid butterfly and 2 sphingid moths are added to the hosts of *Winthemia*. A key to 13 Chinese species of the genus is provided.

Key words: *Winthemia*; Tachinidae; systematics; new species; Yunnan Province.

Introduction

The genus *Winthemia* is worldwide in distribution except New Zealand. Up to the present day 12 species of the genus have been known from the Palearctic Region and 6 from the Oriental Region (CROSSKEY, 1976; HERTING, 1984). The genus has been poorly known from China. BARANOV (1932) recorded 5 species including 2 new species from Taiwan, but his identification of the known species is said to be unreliable (CROSSKEY, 1976). CHAO and SHI (1982) and CHAO and LIANG (1984) reported 2 species from China, respectively. Eventually 5 species of the genus are considered to have been recorded in China. However, it is likely that a larger number of species of the genus will be found in this area. The genus has been rather scarcely studied because of difficulties in identifying the species. They sometimes closely resemble each other in superficial characters and exhibit strong sexual dimorphism.

In this paper we treat 11 species of the genus from Yunnan Province, China,

1) This study is supported in part by a Grant-in-aid for Field Research of the Monbusho International Scientific Research Program, Japan (No. 01041071).

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six of which are considered new to science. Descriptions of these new species and brief notes on other species are given below. A key to the known species of the genus from China is provided for the convenience of future study.

The genus *Winthemia* is oviparous and many lepidopterous larvae including agricultural or forestry pests are recorded as hosts of some species of the genus. We have been unable to obtain host records of this genus from Yunnan, but add here an acraeid butterfly and 2 sphingid moths to the hosts of *Winthemia* from Taiwan and Japan, respectively.

The genus *Winthemia* is the largest group in the tribe Winthemiini. This genus is here treated in a narrow sense as differing from the genus *Timavia*, from which it may be distinguished only by the number of the katepisternal setae and the shape of the fifth abdominal tergum. These two genera seem to be very closely related to each other, but they are rather distinct in the structure of the male sixth abdominal tergum; males of *Winthemia* species have rather long sixth abdominal tergum which is medially divided into two hemitergites, whereas *Timavia* males have strongly reduced sixth abdominal tergum or lack it.

Material and Methods

Material has been studied from the collection of our own field research conducted in 1989 and 1990, that of Institute of Zoology, Academia Sinica, Beijing, and of Kunming Institute of Zoology, Academia Sinica, Kunming. Holotypes will be deposited in Kunming Institute of Zoology, Academia Sinica, Kunming (KIZ) and Institute of Zoology, Academia Sinica, Beijing (IZB) and paratypes in KIZ, IZB, and Biological Laboratory, College of General Education, Kyushu University, Fukuoka (BLKU). Type material of the known species has been studied from the Canadian National Collection, Ottawa (CNC), Deutsches Entomologisches Institut, Berlin (DEI), the Natural History Museum, London (BMNH), U. S. National Museum, Washington, D. C. (USNM), and Zoologisch Museum, Universiteit van Amsterdam, Amsterdam (ZMA).

Terminology follows MCALPINE (1981) and measurements of the head were made in a manner similar to that of SHIMA (1983).

Descriptions

Winthemia ROBINEAU-DESVOIDY

Winthemia ROBINEAU-DESVOIDY, 1830, 173. Type species: *Musca quadripustulata* FABRICIUS, 1794, by subsequent designation of DESMAREST in d'ORBIGNY, 1849 (after EVENHUIS & THOMPSON, 1990).

(For synonyms see CROSSKEY, 1977 and HERTING, 1984.)

Diagnosis: Medium-sized eryciine tachinids; eye densely hairy; male sometimes without reclinate orbital seta; parafacial hairy; 5 postpronotal setae, 3 basal

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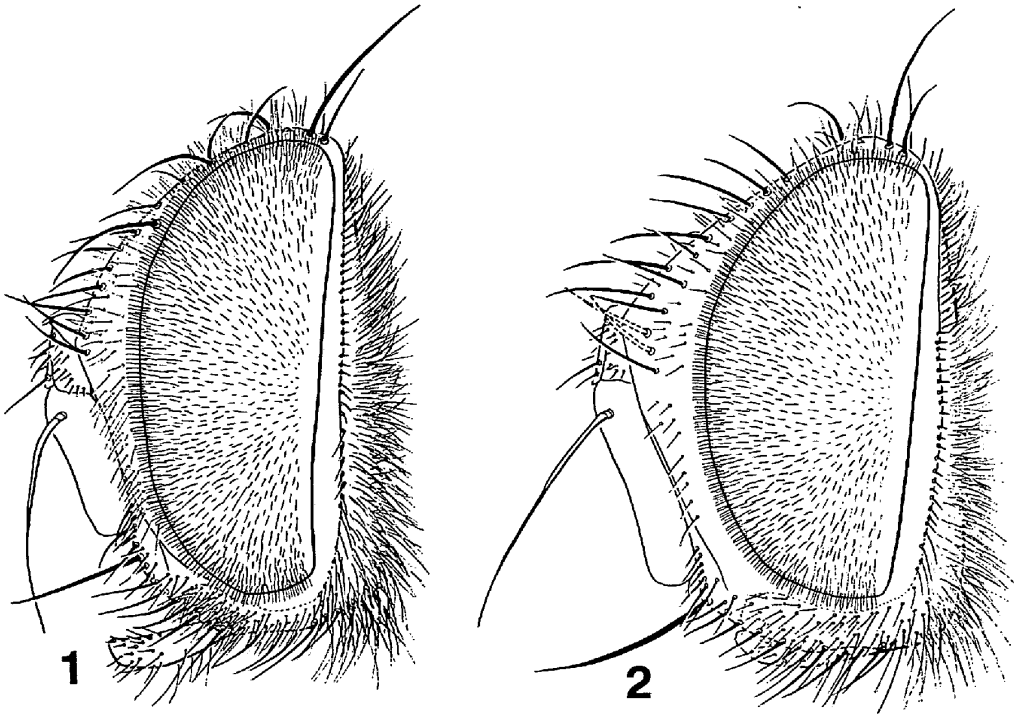

Figs. 1–2. *Winthemia* spp., male head in profile. —— 1, *W. proclinata*; 2, *W. verticillata*.

setae arranged in a triangle; 3+3 acr setae; 3+4 dc setae; 1+1 katepisternal setae; katepimeron hairy; scutellum usually with 4 pairs of marginal setae, subapical setae rather widely separated from each other, lateral seta short, and apical setae rather strong and crossing horizontally each other; wing usually short; fore tibia with 2 p setae; mid tibia with 1–3 ad, 2 pd and 1 v setae; fifth abdominal tergum short and wide, more than 2 times as long as wide at base, apex broadly truncated especially in male.

Key to Species of *Winthemia* from China

1. Anepisternum with dense and apically frizzled pale yellowish or pale brownish hairs behind row of anepisternal setae; parafacial with pale yellowish or black hairs 2
— Anepisternum with black or dark brownish hairs behind anepisternal setae; parafacial with black hairs 10
2. Males 3
— Females (females of *mallochi*, *remittens* and *brevicornis* unknown) 7
3. Second and third abdominal terga each with strong median marginal setae; abdominal venter with or without distinct hair fascicle 4
— Second and third abdominal terga without median marginal seta; venter of fourth and fifth abdominal terga with distinct hair fascicles 6
4. Head rather quadrate in profile, whitish pollinose; gena 1/5–1/6 of eye height;

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claws and pulvilli long; abdominal venter without hair fascicle; anepisternum with pale yellowish hairs behind anepisternal setae 5

— Head semicircular in profile, yellowish pollinose; gena about 1/9 of eye height; claws and pulvilli shorter than fifth tarsomeres; fourth and fifth abdominal venter each with a pair of broad hair fascicles; anepisternum with pale brownish hairs behind anepisternal setae (Taiwan) ..... *mallochi*

5. Antenna long, falling short of lower margin of face by about 1/2 length of pedicel, first flagellomere 3–3.5 times as long as pedicel ... *marginalis* sp. n.

— Antenna short, falling short of lower margin of face by about length of pedicel, first flagellomere at most 2.7 times as long as pedicel .... *brevicornis* sp. n.

6. Vertex about 1/5 of head width; proclinate orbital seta absent; claws and pulvilli long (Yunnan, Hainan) ..... *remittens*

— Vertex about 1/4 of head width; 2 proclinate orbital setae present; claws and pulvilli short ..... *proclinata* sp. n.

7. Upper occiput with a row of fine black hairs; femora reddish yellow, tibiae reddish near middle; postpronotal lobe and posterior portion of scutum broadly reddish brown; antenna reddish brown ..... undetermined sp.

— Upper occiput without black setulae behind postocular row; legs black; thorax black except reddish postalar callus and scutellum; antenna black, at most reddish on pedicel and inner portion of first flagellomere 8

8. Parafacial with pale yellowish or whitish hairs, at most mixed with black hairs on upper portion; abdominal apex usually reddish 9

— Parafacial with black hairs; apex of fifth abdominal tergum black .... *marginalis* sp. n.

9. Frontal vitta at most 1.5 times as wide as fronto-orbital plate (Zhejiang, Xizang, Yunnan, Taiwan) ..... *sumatrana*

— Frontal vitta about 2 times as wide as fronto-orbital plate ... *proclinata* sp. n.

10. Antenna with first flagellomere at most 2.5 times as long as pedicel 11

— First flagellomere more than 3 times as long as pedicel 13

11. Mid tibia with 2–3 strong ad setae; second and third abdominal terga each with 2 median marginal setae in male and female; thoracic dorsum whitish pollinose, with 5 broad and distinct longitudinal vittae, median vitta narrow, inner vitta subequal in width to pollinose portion between inner and outer vittae (Xinjiang, Xizang, Heilongjiang, Beijing, Jiling, Sichuan, Yunnan) ... . *quadripustulata*

— Mid tibia with only 1 ad seta; second and third abdominal terga usually without median marginal setae in male, rarely with 2 setae on third tergum; thoracic dorsum dark grayish or brownish pollinose in male, whitish gray in female, with 4 longitudinal vittae diffusing marginally in male, inner vitta always narrower than pollinose portion between inner and outer vittae 12

12. Male without hair fascicles on abdominal venter; abdomen broadly black in ground color, very densely and broadly whitish pollinose on dorsum, only

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very narrowly black on posterior margin of third and fourth terga and posterior 1/5 on fifth; first flagellomere 1.8–2 times as long as pedicel in male and female (Inner Mongolia, Liaoning, Jilin, Beijing, Hebei, Shanxi, Shandong, Jiangsu, Sichuan, Yunnan, Fujian, Guizhou, Hainan, Taiwan) . ..... *venusta*

— Male fourth and fifth abdominal venter each with a pair of hair fascicles; abdomen broadly reddish in ground color, rather thinly whitish pollinose, each of third to fifth terga blackish on posterior 1/3–1/4; first flagellomere 2–2.2 times as long as pedicel in male, 2.5 times in female ..... *angusta* sp. n.

13. Head and abdomen grayish white pollinose; male with or without hair fascicles on venter of fourth abdominal tergum; abdomen broadly blackish in ground color except on side and venter of third and fourth terga 14

— Head and abdomen densely golden yellowish pollinose; male without hair fascicle on abdominal venter; abdomen broadly reddish yellow in ground color except mid dorsal area ..... *aurea* sp. n.

14. Abdominal dorsum grayish white pollinose on anterior 1/2 of third tergum and 2/3 of fourth and fifth terga, with tessellate appearance; vertex wide, slightly less than 1/4 of head width in male, slightly less than 1/3 in female; parafacial with sparse hairs; venter of male fourth and fifth abdominal terga each with a pair of rather broad hair fascicles of dense long hairs .... *verticillata* sp. n.

— Abdominal dorsum with whitish pollinosity on anterior 1/2–2/3 of each of third to fifth terga, without tessellate appearance; vertex narrower in male; parafacial with dense hairs; venter of male fourth abdominal tergum with small discrete hair fascicle or without it 15

15. Antenna with first flagellomere about 3 times as long as pedicel; vertex 0.15–0.17 of head width in male, 0.25 in female; venter of male fourth abdominal tergum with small discrete hair fascicle ..... *sumatrana*

— First flagellomere about 4 times as long as pedicel; vertex about 0.19 of head width; abdominal venter without hair fascicle (female unknown) (Taiwan) . ..... *diversioides*

Winthemia quadripustulata (FABRICIUS)

Musca quadripustulata FABRICIUS, 1794, 324.
(For synonyms see HERTING, 1984.)

This species is widely distributed in the Palearctic Region. CHAO and SHI (1982) recorded it from northern and western China. We have examined several specimens of this species from northwest area of Yunnan Province.

Distribution. China (Xinjiang, Xizang, Heilongjiang, Jilin, Beijing, Sichuan, Yunnan); Palearctic.

Specimens examined from Yunnan. Deqin: 2 ♂, Deqin, 3,300 m, 15. vii. 1982,

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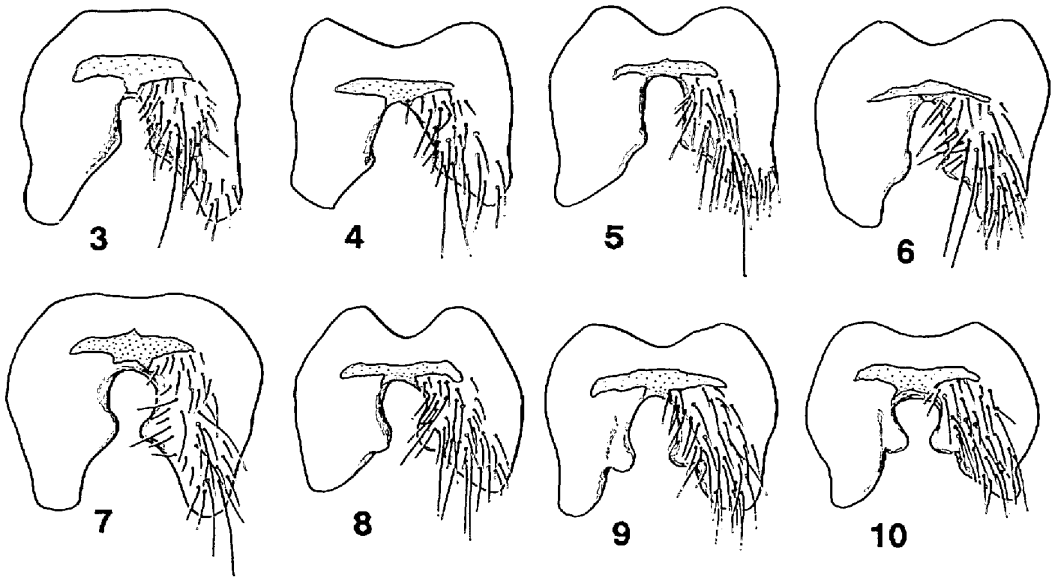

Figs. 3–10. *Winthemia* spp., male fifth abdominal sternum in ventral view (hairs on right side omitted). —— 3, *W. proclinata*; 4, *W. verticillata*; 5, *W. remittens*; 6, *W. aurea*; 7, *W. angusta*; 8, *W. sumatrana*; 9, *W. marginalis*; 10, *W. brevicornis*.

30. viii. 1981, X. ZHANG & S. LIAO, (IZB); 1 ♂, Deqin, 18. x. 1978, F. CHEN (KIZ); 1 ♂, Zhongdian, 3,200 m, 8. viii. 1981, X. ZHANG; 11 ♂, 1 ♀, Weixi, 2,920 m, 17–18. vii. 1981, X. ZHANG; 2 ♂, Weixi, 3,400 m, 13–15. viii. 1984, Z. LI & R. WANG; *Lijiang*: 1 ♂, Lijiang Lameirong, 2,800 m, 11. viii. 1984, S. WANG (all in IZB).

Winthemia venusta (MEIGEN)

Tachina venusta MEIGEN, 1824, 327.
Chaetolyga cilitibia RONDANI, 1859, 109 (after HERTING, 1984).

This Palearctic species is widely distributed in China and was recorded from Yunnan by CHAO and SHI (1982).

Distribution. China (Inner Mongolia, Liaoning, Jilin, Beijing, Hebei, Shanxi, Shandong, Jiangsu, Sichuan, Yunnan, Fujian, Guizhou, Hainan, Taiwan); Palearctic.

Specimens examined from Yunnan. Lijiang: 1 ♂, 2 ♀, Lijiang Lameirong, 2,800 m, 11. viii. 1984, S. WANG (IZB).

Winthemia proclinata sp. n.

(Figs. 1, 3, 13, 21, 31)

Male. Head whitish pollinose, fronto-orbital plate slightly grayish yellow and darkened near vertex; antenna brown-black, inner apical portion of pedicel and

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inner basal 1/2 of first flagellomere reddish. Vertex about 0.25 of head width, about 1.5 times as wide as face between vibrissae; frontal vitta 1.5 times as wide as fronto-orbital plate at middle; parafacial about 3/5 as wide as first flagellomere at middle height; gena 0.13–0.14 of eye height. Inner vertical seta about 1/3 of eye height; outer vertical seta strong, about 2/3 as long as inner seta; 1 reclinate orbital seta distinct; 2 proclinate orbital setae present, anterior seta inserted slightly anterior to 1/2 way of fronto-orbital plate in profile; 10–12 frontal setae, upper 1–2 setae weakly reclinate; parafacial with dense pale yellowish hairs mixed with several black ones on upper portion; gena with pale yellowish hairs mixed with black ones on posterior portion; vibrissa inserted above level of lower margin of face by about 1/2 length of pedicel. Antenna falling short of lower margin of face by about 1/2 length of first flagellomere; first flagellomere about 3 times as long as pedicel.

Thorax black in ground color, scutellum reddish yellow except for its base, rather densely grayish white pollinose on dorsum and pleura, thinly so on scutellum; 5 broad longitudinal vittae present on dorsum, median one narrowest, inner vitta slightly wider than pollinose portion between inner and outer vittae on postsutural scutum. Hairs black on dorsum except several pale yellowish hairs on anterodorsal portion of postalar wall; prosternum mainly with pale yellowish hairs; proepimeron with pale yellowish hairs on lower portion; anepisternum with short dense black hairs except long dense and apically frizzled pale yellowish hairs behind row of anepisternal setae; anepimeron with long and fine pale yellowish hairs; katepisternum with dense short and black hairs on anterior portion and pale yellowish ones on posterior portion; katepimeron with pale yellowish hairs.

Wing hyaline; calypter pale yellowish white; very short, at most about 1.5 times as long as abdomen. Second costal sector only slightly shorter than third, 2 times as long as fourth; bend of vein M slightly closer to dm–cu than to wing margin.

Legs black; pulvilli yellowish. Mid tibia with 1 ad seta; hind tibia with a closely set row of ad setae; claws and pulvilli short, shorter than fifth tarsomeres.

Abdomen broadly reddish brown in ground color; anterior and mid-dorsal portion of syntergum 1+2, mid-dorsal portion of third tergum, mid-dorsal and posterior portion of fourth and anterior 1/2–1/3 of fifth black; venter reddish, sterna black; dorsum rather densely pale yellowish white pollinose on anterior 1/2–1/3 of third tergum, 1/2–2/3 of fourth and 1/3 of fifth; venter thinly whitish pollinose on narrow anterior portion of third and fourth terga; pollinosity shifting in appearance with direction of light. Hairs fine short and recumbent, pale yellowish on first sternum and venter of narrow anterior portion of syntergum 1+2, black on other portion; second and third terga without median marginal seta, with 1–2 rather short lateral marginal setae; fourth with a row of 6–8 marginal setae; venter of fourth and fifth terga each with a pair of broad hair fascicles of rather long and dense hairs.

Male genitalia. Cerci in dorsal view well narrowed at apical 1/3; surstylus

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in lateral view broad, rounded at apex, with rather dense short hairs; epiphallus rather short and straight; dorsal portion of distiphallus membraneous on apical 3/5.

Female. Differing from male as follows: Antenna more broadly reddish on inner surface of first flagellomere; vertex 0.27–0.29 of head width; frontal vitta about 2 times as wide as fronto-orbital plate; all head setae stronger than in male; 2 reclinate orbital setae present, anterior one short; vibrissa inserted just above level of lower margin of face; antenna falling short of lower margin of face by about length of pedicel; first flagellomere 3–3.2 times as long as second; katepisternum entirely with pale yellowish hairs; second costal sector about 4/5 as long as third, 2 times fourth; second and third abdominal terga each with 2 median marginal setae; venter of fourth and fifth terga without hair fascicle.

Body length, 10.0–11.4 mm; wing length, 7.5–8.5 mm.

Distribution. China (Yunnan).

Holotype: ♂, CHINA, Yunnan Prov., Xishuangbanna, Meng-ya, 600–1,000 m, 17. x. 1989, H. SHIMA (KIZ).

Paratypes: CHINA, Yunnan Prov., *Xishuangbanna*: 2 ♂, Men-man, 800 m, 13. x. 1989, H. SHIMA & W. ZHANG (BLKU); 2 ♂, Menglun, Youleshang, 18. x. 1989, W. ZHANG (KIZ, IZB); 1 ♂, 2 ♀, Xiaomengyang, 6. x. 1989, W. ZHANG (KIZ, IZB); 1 ♀, Menghai, 12. x. 1989, W. ZHANG (BLKU); 3 ♂, Menglung, 500–700 m, 6–9. viii. 1990, H. SHIMA (BLKU, KIZ).

Remarks. This species is distinct in having the proclinate orbital setae in the male, but in other feature rather resembles *W. remittens*.

Winthemia verticillata sp. n.

(Figs. 2, 4, 14, 22, 32)

Male. Head densely whitish pollinose, upper portion of fronto-orbital plate grayish; antenna brown-black, basal 1/2 of posterior portion reddish. Vertex wide, about 0.23 of head width and about 1.3 times as wide as face between vibrissae; frontal vitta about 1.5 times as wide as fronto-orbital plate at middle; parafacial slightly narrower than first flagellomere at middle height (5: 6); gena about 0.21 of eye height. All head hairs black; inner vertical seta about 1/3 of eye height; outer vertical seta 2/3 as long as inner seta; reclinate orbital seta absent; 13–15 frontal setae, 3–5 setae making a row outside inner row at lower portion of fronto-orbital plate, lowest frontal seta nearly level with apex of pedicel; parafacial with rather sparse hairs; postocular setae short; vibrissa nearly level with lower margin of face. Antenna falling short of lower margin of face by about 2/5 length of pedicel; first flagellomere about 4 times as long as pedicel, about 1.3 times as long as palpus.

Thorax black in ground color, scutellum narrowly reddish brown at apex, densely grayish white pollinose, somewhat bluish on dorsum; 2 pairs of broad

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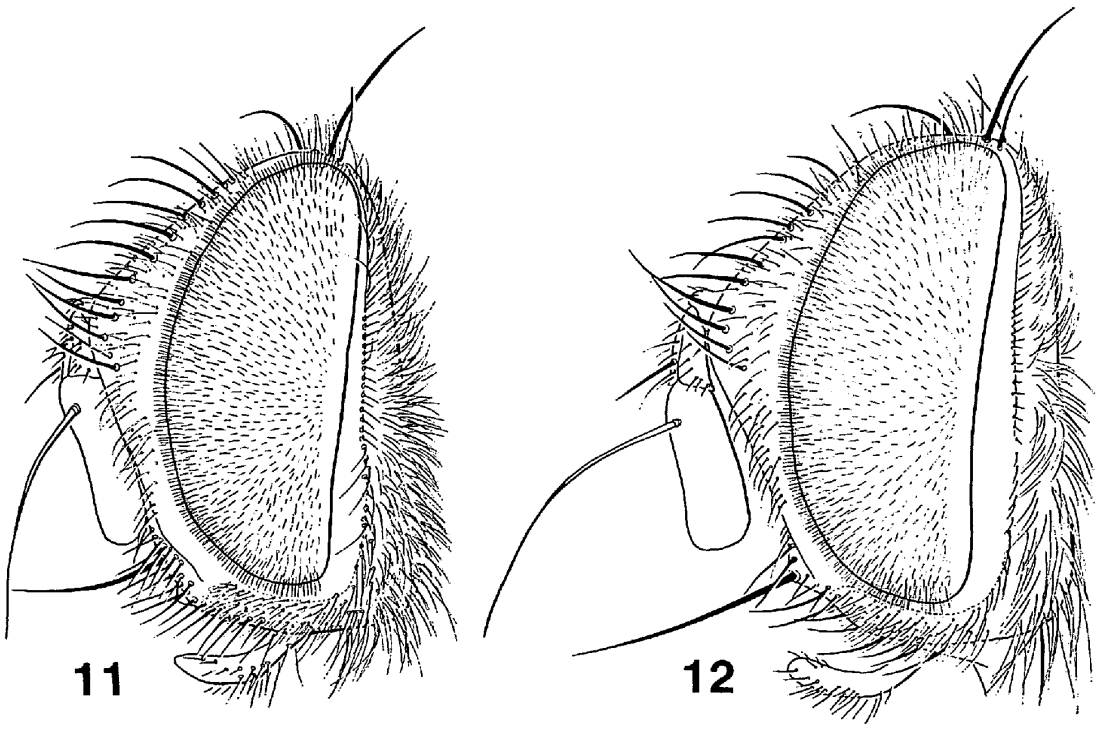

Figs. 11–12. *Winthemia* spp., male head in profile. —— 11, *W. aurea*; 12, *W. angusta*.

lateral and 1 narrow median longitudinal vittae present on dorsum, inner lateral vitta about 2 times as wide as pollinose portion between inner and outer vittae on postsutural scutum; scutellum brownish black on basal portion. All thoracic hairs black; anepisternal hairs behind row of anepisternal setae not dense and long, weakly frizzled apically.

Wing hyaline, weakly tinged with brown on anterior portion; lower calypter pale brownish white. Second costal sector slightly more than 2/3 length of third, slightly less than 1.5 times of fourth; bend of vein M about equidistant between dm–cu and wing margin.

Legs black; pulvilli yellowish. Mid tibia with 1 ad seta; hind tibia with a row of ad setae not much closely set; claws and pulvilli long, fore claw and pulvillus longer than fifth tarsomere.

Abdomen broadly black on dorsum, reddish brown on posterolateral portion of second tergum, side of third, anterolateral portion of fourth and entire venter; sterna black; dorsum rather thinly whitish pollinose on anterior 1/2 of third tergum, rather densely yellowish white pollinose on anterior 2/3 of each fourth and fifth terga; the pollinosity with tessellate appearance; venter thinly and evenly whitish pollinose except on area of hair fascicles; a narrow mid-dorsal longitudinal vitta present on third and fourth terga. Hairs black, rather dense short and suberect on dorsum, longer on venter; second and third terga usually without distinct median marginal seta, with 1–2 strong lateral marginal setae; fourth tergum with a row

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of 8 marginal setae; fifth tergum with a row of marginal setae, discal setae indistinct among strong erect hairs; venter of fourth and fifth terga each with a pair of rounded hair fascicles of long dense and recumbent hairs.

Male genitalia. Cerci in dorsal view broad, apices narrowly separated from each other and weakly directed outward; surstylus in lateral view rather narrow, with sparse short hairs; epiphallus long and rather broad, weakly curved posteriorly; distiphallus broadly membraneous on dorsal portion.

Female. Differing from male as follows: Fronto-orbital plate yellowish white pollinose; vertex about 0.31 of head width and about 1.6 times as wide as face between vibrissae; all head setae stronger than in male; 1 reclinate and 2 proclinate orbital setae present; 8–9 frontal setae; palpus strongly clavate; thorax more densely yellowish white pollinose; claws and pulvilli shorter than fifth tarsomeres; abdomen more densely pale yellowish white pollinose on dorsum of anterior 2/3 of third tergum, 3/4 of fourth and fifth; second and third terga each with strong median marginal setae; abdominal venter without hair fascicle.

Body length, 8.6–8.8 mm; wing length, 7.2–7.4 mm.

Distribution. China (Yunnan).

Holotype: ♂, CHINA, Yunnan Prov., 15 km S of Simao, 1,200 m, 2. x. 1989, H. SHIMA (KIZ).

Paratypes: CHINA, Yunnan Prov., *Simao*: 1 ♀, same locality as holotype, 1. x. 1989, H. SHIMA (BLKU); *Xishuangbanna*: 1 ♂, 1 ♀, Meng-ya, 600–1,000 m, 18. x. 1989, H. SHIMA & W. ZHANG (IZB, KIZ); 1 ♂, Mengla, 700–1,000 m, 3–5. viii. 1990, H. SHIMA (BLKU).

Remarks. This species is characteristic in its tessellate appearance of the abdomen and wide vertex. SHIMA has seen specimens from northern Thailand which closely resemble this species.

Winthemia remittens (WALKER)

(Figs. 5, 15, 23, 33)

Eurygaster remittens WALKER, 1859, 125.

This species was originally described from Makassar (Ujung Pandang), Celebes (Sulawesi), Indonesia. CROSSKEY (1976) and DEAR and CROSSKEY (1982) recorded it from the Philippines. SHIMA has seen the type specimen of this species and some specimens from southeast Asia, the latter corresponding quite well to the type specimen. We have examined 24 males of this species from Yunnan. This species seems to be widely distributed in the tropical and subtropical area of Asia.

This species is characteristic in its narrow vertex, dense and apically frizzled pale yellowish hairs on the anepisternum and broad hair fascicles on the venter of the male fourth and fifth abdominal terga. The female of this species is unknown, but it is possible that the female closely resembles that of *sumatrana*. The identification of the females of this species must be confirmed by reared specimens.

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Distribution. China (Yunnan, Hainan); Laos, Thailand, Singapore, Indonesia (Sulawesi, Lombok), Philippines (Luzon, Basilan, Mindanao).

Type specimen examined. Holotype ♂ of *Eurygaster remittens* WALKER, Makassar, Celebes, A. R. WALLACE (BMNH).

Specimens examined from Yunnan. Simao: 8 ♂, Jing-gu, Zhongshan, 16–17. viii. 1990, S. LIN (KIZ, BLKU, IZB); *Xishuangbanna*: 1 ♂, Xiaomengyang, 850 m, 6. vii. 1957, Y. ZHANG (IZB); 1 ♂, Xiaomengyang, 6. viii. 1989, W. ZHANG (KIZ); 2 ♂, Meng-man, 800 m, 13. x. 1989, H. SHIMA & W. ZHANG (IZB, KIZ); 1 ♂, Meng-ya, 600–1,000 m, 17. x. 1989, H. SHIMA (BLKU); 4 ♂, Meng-la, 700–1,000 m, 3–5. viii. 1990, H. SHIMA & S. LIN (BLKU, IZB); 4 ♂, Meng-lung, 7–9. viii. 1990, S. LIN (KIZ); 1 ♂, Damenglong, 650 m, 4. v. 1956, K. ZANG (IZB); *Honghe*: 2 ♂, Hekou, 80–200 m, vi. 1956, KUANG (IZB).

Winthemia aurea sp. n.

(Figs. 6, 11, 16, 24, 34)

Male. Head densely golden yellowish pollinose, upper portion of fronto-orbital plate blackish and parafacial whitish; antenna dark brown, base of first flagellomere narrowly reddish. Vertex 0.21–0.23 of head width, slightly wider than face between vibrissae; frontal vitta about 2 times as wide as fronto-orbital plate at middle; parafacial subequal in width to first flagellomere at middle height; gena 0.20–0.22 of eye height. Hairs on head black; inner vertical seta slightly less than 1/3 of eye height; outer vertical seta indistinct; no reclinate orbital seta; 9–13 frontal setae, lowest seta inserted at the level slightly below middle of pedicel; parafacial with dense hairs; gena with very dense short hairs on upper anterior portion; vibrissa inserted slightly above level of lower margin of face; upper occipital setae long and directed forward. Antenna falling short of lower margin of face by about length of pedicel; first flagellomere about 3 times as long as pedicel, subequal in length to palpus.

Thorax blackish brown in ground color, upper portion of postpronotal lobe, lateral portion of postsutural scutum outside intra-alar setae and apical portion of scutellum reddish brown; dorsum thinly brownish gray pollinose except densely yellowish gray pollinose postpronotal lobe and lateral portion outside intra-alar setae; pleura rather densely grayish pollinose; 2 pairs of broad lateral and 1 narrow median longitudinal vittae present on dorsum, inner pair and median one diffusing marginally, inner lateral vitta subequal in width to pollinose portion between inner and outer vittae on postsutural scutum. Hairs black; anepisternal hairs behind row of anepisternal setae rather short dense and apically frizzled.

Wing hyaline, weakly and evenly tinged with pale brown; calypter pale brownish. Second costal sector about 5/7 as long as third, about 1.7 times as long as fourth; bend of vein M about equidistant between dm–cu and wing margin.

Legs black, pulvilli dull yellowish. Mid tibia with 1 ad seta; hind tibia with a

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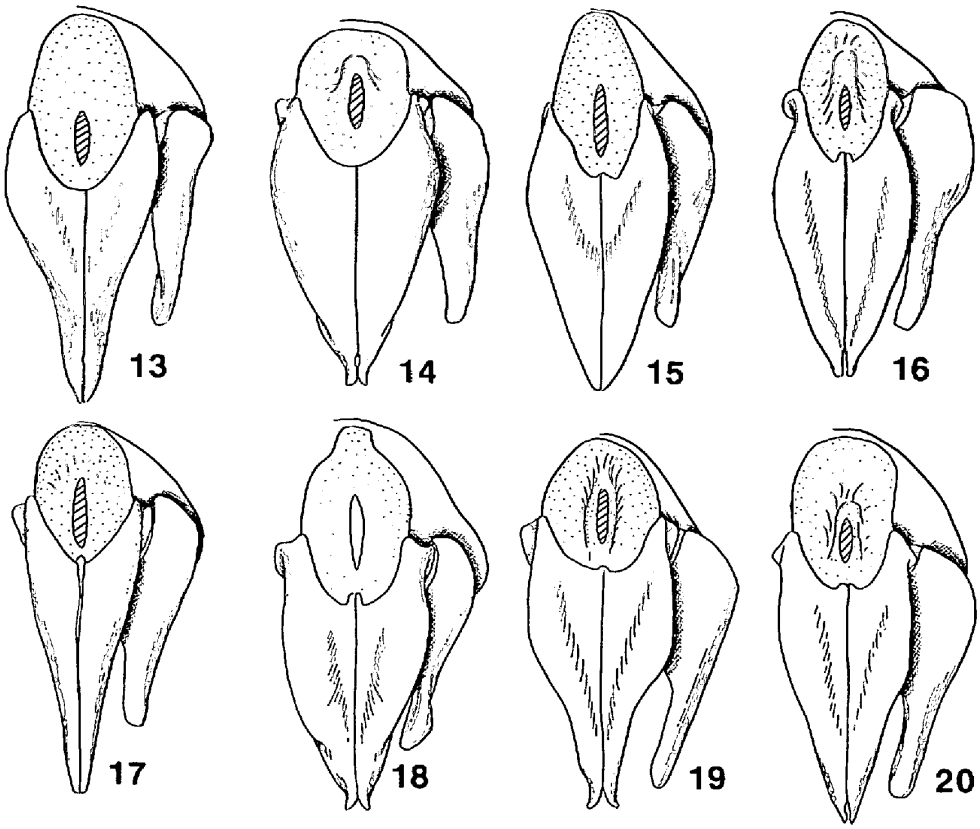

Figs. 13–20. *Winthemia* spp., epandrium, cerci and surstylus in dorsal view (hairs omitted). —— 13, *W. proclinata*; 14, *W. verticillata*; 15, *W. remittens*; 16, *W. aurea*; 17, *W. angusta*; 18, *W. sumatrana*; 19, *W. marginalis*; 20, *W. brevicornis*.

row of rather densely set ad setae; claws and pulvilli very long, longer than fifth tarsomeres.

Abdomen broadly reddish yellow in ground color; broad mid basal portion of syntergum 1+2, narrow mid dorsal longitudinal portion of third and fourth terga, narrow posteromedian portion of fourth, anteromedian portion of fifth, mid ventral margin of second to fourth terga, and entire sterna black; dorsum of third and fourth terga densely golden yellowish or yellowish white pollinose, narrow posterior portion of each tergum without pollinosity; fifth tergum rather thinly yellowish brown pollinose dorsally; narrow mid dorsal longitudinal vitta distinct on fourth and fifth terga; venter thinly and evenly whitish pollinose on third and fourth terga. Hairs black, rather short and recumbent on dorsum of third and fourth terga, dense and erect on fifth; venter with fine and dense hairs; second and third terga without median marginal seta, with 1–2 lateral marginal setae; fourth tergum with a row of 8 strong marginal setae; fifth tergum with a row of marginal setae and many strong hairs on discal portion; fourth and fifth terga without hair fascicle on venter; fifth sternum with weak swelling on inner basal portion of posterior lobe.

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Male genitalia. Cerci rather broad in dorsal view, apices weakly separated from each other; surstylus narrowed to apex in lateral view, with very short sparse hairs; epiphallus slender and long, weakly curved posteriorly; distiphallus membraneous on dorsal and apical 1/2.

Female. Differing from male as follows: Head more whitish pollinose on lower portion of parafacial, face, gena and lower postorbit; all head setae stronger than in male; gena with more sparse hairs; outer vertical seta strong; 1 reclinate and 2 proclinate strong orbital setae developed; vertex 0.29–0.31 of head width, 1.5 times as wide as face between vibrissae; frontal vitta only slightly wider than fronto-orbital plate at middle; parafacial slightly narrower than first flagellomere at middle height; gena slightly wider than in male; thoracic dorsum densely yellowish pollinose, with 4 broad longitudinal vittae; anepisternal hairs sparse; claws and pulvilli shorter than fifth tarsomeres; abdominal dorsum densely and evenly golden yellow pollinose; second and third abdominal terga each with 2 median marginal setae.

Body length, 8.8–10.9 mm; wing length, 6.8–7.8 mm.

Distribution. China (Yunnan).

Holotype: ♂, CHINA, Yunnan Prov., Xishuangbanna, Meng-hai, 1,200 m, 12. x. 1989, H. SHIMA (KIZ).

Paratypes: CHINA, Yunnan Prov., *Simao*: 1 ♀, Simao, 22. x. 1989, W. ZHANG (KIZ); *Xishuangbanna*: 11 ♂, 3 ♀, same data as holotype except collector, H. SHIMA & W. ZHANG (KIZ, IZB, BLKU).

Remarks. This species is characteristic in its golden yellow pollinose body and broadly reddish abdomen in ground color.

Winthemia angusta sp. n.

(Figs. 7, 12, 17, 25, 35)

Male. Head pale yellowish white or grayish pollinose, fronto-orbital plate darkened toward vertex; antenna brown-black, inner apical portion of pedicel and inner basal 1/2 of first flagellomere reddish yellow; palpus reddish yellow, darkened basally. Vertex 0.2–0.22 of head width, about 1.2 times as wide as face between vibrissae; frontal vitta about 2 times as wide as fronto-orbital plate at middle; parafacial about 3/5 as wide as first flagellomere at middle height; gena 0.12–0.14 of eye height. All head hairs black; inner vertical seta about 1/3 of eye height; outer vertical seta fine but distinct, about 2/3 as long as inner seta; reclinate orbital seta absent; 12–14 frontal setae, lowest seta nearly level with apex of pedicel; fronto-orbital plate with dense fine hairs; parafacial with rather dense fine hairs; vibrissa nearly level with lower margin of face; upper occipital setae rather long, not well directed forward. Antenna falling short of lower margin of face by about 3/5 length of pedicel; first flagellomere 2–2.2 times as long as pedicel. Palpus subequal in length to first flagellomere.

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Thorax black in ground color, scutellum reddish brown; dorsum broadly grayish brown pollinose, whitish on postpronotal lobe, narrow lateral portion of presutural area of scutum and supra-alar area; 5 rather narrow longitudinal vittae present on dorsum, middle vitta narrowest, pollinose portion between inner and outer vittae distinctly broader than inner vitta on postsutural scutum; pleura rather densely grayish white pollinose. All thoracic hairs black; anepisternum with rather dense hairs behind row of anepisternal setae, which are rather weakly frizzled at apices.

Wing faintly tinged with pale brown on anterior portion; lower calypter pale brownish yellow. Relative lengths of costal sectors second, third and fourth approximately as 3: 5: 2; vein M from dm–cu crossvein to its bend subequal to distance between the bend and wing margin.

Legs black, pulvilli dull yellowish. Mid tibia with 1 ad seta; hind tibia with a row of rather densely set ad setae, without strong median seta among them. Fore claw and pulvillus longer than fifth tarsomere.

Abdomen broadly reddish brown in ground color, mid dorsal longitudinal portion black; dorsum rather densely grayish white pollinose, posterior 1/3–1/4 of third tergum and 1/4–1/5 of fourth and fifth terga without pollinosity; venter thinly whitish pollinose; mid dorsal longitudinal vitta present, broad and diffusing marginally on third tergum and narrow and well defined on fourth and fifth. Hairs dense fine recumbent and black; second and third terga without marginal seta; venter of fourth and fifth terga each with a pair of hair fascicles of rather sparse hairs; fifth sternum with weak swelling on inner basal portion of posterior lobe.

Male genitalia. Cerci in dorsal view slender, evenly narrowed to apex; surstylus in lateral view nearly triangular on apical 1/2, with long and rather dense hairs; epiphallus rather slender and short, weakly curved posteriorly; distiphallus with membraneous portion on its entire length of dorsal 1/4.

Female. Differing from male as follows: Head more whitish pollinose; vertex wide, 0.27–0.28 of head width, about 1.5 times as wide as face between vibrissae; frontal vitta only slightly wider than fronto-orbital plate at middle; all setae strong; 1 rather fine but distinct reclinate orbital seta present; 2 proclinate orbital setae strong; 7–10 frontal setae; parafacial rather sparsely haired; first flagellomere about 2.5 times as long as pedicel; thorax and abdomen more densely whitish or pale yellowish white pollinose; claws and pulvilli short; third abdominal tergum with 2 strong median marginal setae; venter of fourth and fifth abdominal terga without hair fascicle.

Body length, 7.9–11.2 mm; wing length, 6.2–8.0 mm.

Distribution. China (Beijing, Shandong, Shanxi, Liaoning, Yunnan); Japan (Honshu, Kyushu).

Hosts. *Dolbina tancrei* STAUDINGER; *Smerinthus planus* WALKER (Lep., Sphingidae) (Japan).

Holotype: ♂, CHINA, Yunnan Prov., Lushui, 1,670 m, 25. vi. 1981, X.

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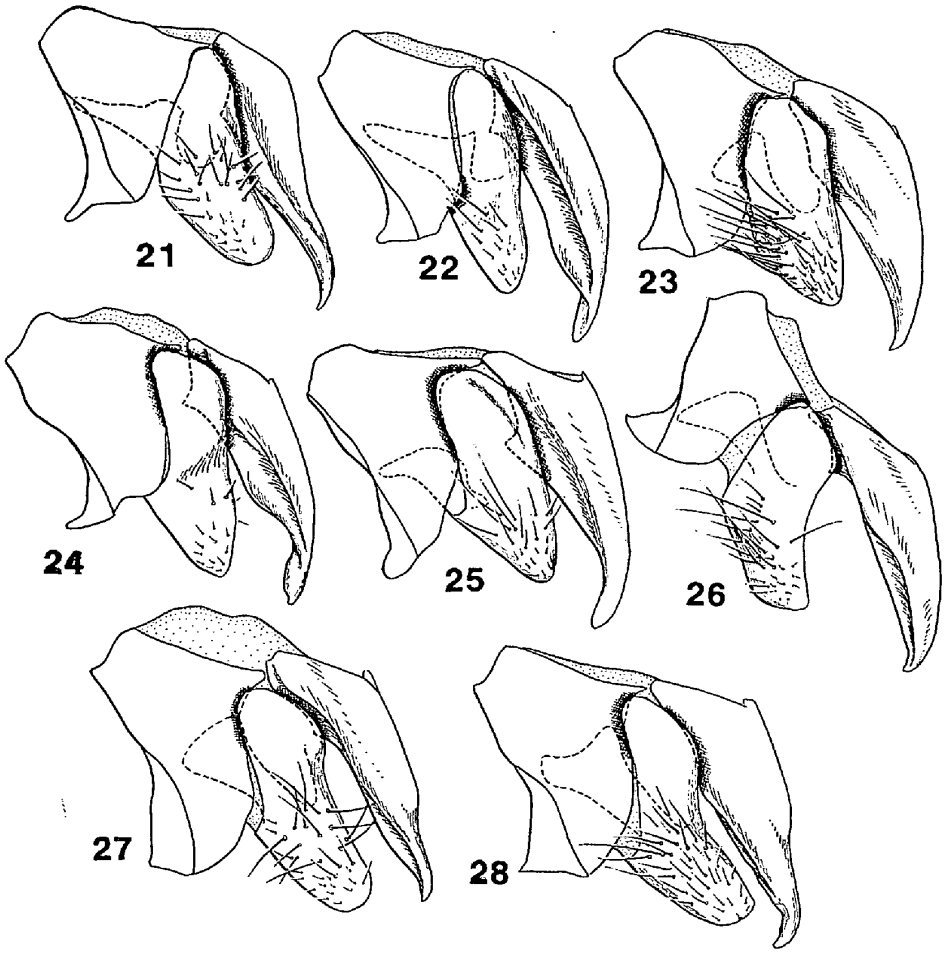

Figs. 21–28. *Winthemia* spp., epandrium, cerci and surstylus in lateral view (hairs on epandrium and cerci omitted). —— 21, *W. proclinata*; 22, *W. verticillata*; 23, *W. remittens*; 24, *W. aurea*; 25, *W. angusta*; 26, *W. sumatrana*; 27, *W. marginalis*; 28, *W. brevicornis*.

ZHANG (IZB).

Paratypes: CHINA, *Beijing*: 7 ♂, Sanpu, 600 m, 23. vi. 1980, 5. vii. 1980, 3. viii. 1980, 21. viii. 1964, 7 & 9. ix. 1980, S. JIANG, & E. LIANG (IZB, BLKU); 3 ♂, Badaling, 700 m, 23. viii. 1980, 29. viii. 1979, E. LIANG & S. ZHOU; 2 ♂, Qinglongquiao, 700 m, 25. vi. 1980, E. LIANG; 10 ♂, Yingtaogou, 24. v. 1982, 6 & 7. x. 1982, Z. JIN; 2 ♂, Wofosi, iv. 1984, 3. ix. 1986, J. SHI & C.-m. CHAO; Shangdong Prov.: 1 ♂, Yashan, 4. vi. 1964, S. SONG; Shanxi Prov., *Yuncheng*: 2 ♂, Pinglu, 20. viii. 1980; Liaoning Prov., *Dandong*: 4 ♂, Fengcheng, 13–16. vi. 1962, C.-m. CHAO (all in IZB); Yunnan Prov., *Nujiang*: 5 ♂, same data as holotype (IZB, BLKU). JAPAN, *Honshu*: 4 ♂, 8 ♀, Ishikawa Pref., Nonoichi, Suematsu, 6. xi. 1984, ex *Dolbina tancrei* larvae, I. TOGASHI; 1 ♀, Kobe City, Karato, 21. ix. 1974, ex *Smerinthus planus* larva, K. IWATA; *Kyushu*: 3 ♂, Fukuoka City, Aburayama, 5. vii. 1989, 5. ix. 1987, H. SHIMA (all in BLKU).

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Remarks. In general appearance this species resembles *W. venusta*, but they are easily separable by the abdominal color pattern and presence or absence of the hair fascicles on the male abdominal venter. This species is widely distributed in China and Japan. Japanese specimens are slightly different from Chinese ones in having slightly broader male cerci, but they are almost the same in other features.

Winthemia sumatrana (TOWNSEND)

(Figs. 8, 18, 26, 36)

Pseudokea sumatrana TOWNSEND, 1927, 69.
Pseudokea neowinthemioides TOWNSEND, 1928, 394.
Winthemia diversa MALLOCH, 1930, 348 (after CROSSKEY, 1973).
?*Winthemia albidopilosa* MESNIL, 1949, 83.

In this study we have identified 10 specimens from Yunnan as *W. sumatrana*. CHAO and LIANG (1984) confused two species, *W. sumatrana* and *W. angusta*, under the name of *W. neowinthemioides*. This species is widely distributed in tropical or subtropical areas of the Indo-Australasian region and some lepidopterous larvae have been recorded as hosts of this species (CROSSKEY, 1973, 1976). SHIMA has seen some specimens of this species reared from pupae of *Acraea issoria formosana* (Lep., Acraeidae) in Taiwan.

This species is similar in general appearance to *diversioides* from Taiwan, but is distinguished from it by the narrower vertex, shorter first flagellomere and presence of the small hair fascicles on the venter of the fourth abdominal tergum.

Distribution. China (Xizang, Zhejiang, Yunnan, Taiwan); Japan (Ryukyus), Indonesia (Sumatra, ? Flores), Philippines (Mindanao), Papua New Guinea, Australia.

Host. *Acraea issoria formosana* FRUHSTORFER (Lep., Acraeidae) (Taiwan).

Type specimens examined. Type ♂ of *Pseudokea sumatrana* TOWNSEND, Gunung Singalang (Sumatra Westkust), 1,600 m, viii. 1925, E. JACOBSON (ZMA); type ♂ of *Pseudokea neowinthemioides* TOWNSEND, Cagayan, Mindanao, BAKER (USNM); type ♀ of *Winthemia albidopilosa* MESNIL, Sude Flores, 13. vi. 1927, RENSCH (CNC).

Specimens examined from Yunnan. Simao: 1 ♂, 15 km E Jing-gu, 900 m, 17. viii. 1990, H. SHIMA (BLKU); *Xishuangbanna*: 3 ♂, Xiaomengyang, 4–6. x. 1989, H. SHIMA & W. ZHANG (BLKU, KIZ); 1 ♀, Xiaomenglun, 650 m, 13. vii. 1964, B. ZHANG (IZB); 1 ♂, Mengzhe, 750 m, 3. vii. 1958; Z. CHEN (IZB); 1 ♀, Meng-Zhe, 1,200 m, 11. x. 1989, H. SHIMA (IZB); 2 ♂, Meng-man, 800 m, 13. x. 1989, H. SHIMA & W. ZHANG (IZB); 1 ♀, Meng-ya, 600–1,000 m, 17. x. 1989, H. SHIMA (BLKU); 1 ♂, Meng-la, 5. viii. 1990, S. LIN (KIZ); 1 ♂, Damenlong, 650 m, 13. iv. 1958, S. WANG (IZB); 5 ♂, Meng-lung, 500–700 m, 3–5. viii. 1990, H. SHIMA & S. LIN (KIZ, IZB, BLKU); *Honghe*: 1 ♂, Hekou, 80 m, 12. vi. 1956, C. LI (IZB); 1 ♀, Jinping, 500 m, 2. v. 1956, K. HUANG (IZB).

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Winthemia marginalis sp. n.

(Figs. 9, 19, 27, 29, 37)

Male. Head densely whitish pollinose, fronto-orbital plate yellowish gray and gena grayish; antenna brown-black, inner basal portion of first flagellomere narrowly reddish; palpus reddish yellow, basal 1/2 brown. Vertex 0.2–0.23 of head width, slightly wider than face between vibrissae; frontal vitta 1.5–2 times as wide as fronto-orbital plate at middle; parafacial slightly narrower than first flagellomere at middle height; gena 0.18–0.20 of eye height. Hairs black; inner vertical seta 2/5–3/8 of eye height; outer vertical seta undeveloped; 8–10 frontal setae, lowest seta inserted slightly below level of middle of pedicel; parafacial rather sparsely haired; vibrissa nearly level with lower margin of face; upper occipital setae long. Antenna falling short of lower margin of face by about 1/2 length of pedicel; first flagellomere 3–3.5 times as long as pedicel, subequal in length to palpus.

Thorax black in ground color, scutellum broadly reddish brown except narrow base; dorsum densely pale yellowish gray, or somewhat white, pollinose, with 4 rather broad longitudinal vittae, pollinose portion between inner and outer vittae about 2 times as wide as inner vitta on postsutural scutum; pleura densely grayish white pollinose. Hairs mainly black; prosternum with pale yellowish hairs mixed with several black ones; anepisternum with dense and apically frizzled pale yellowish white hairs behind anepisternal setae; anepimeron with pale yellowish hairs on upper portion.

Wing hyaline, faintly tinged with pale brown along veins on anterior portion; calypter pale yellowish white. Second costal sector about 2/3–5/7 as long as third, 1.6–1.7 times as long as fourth; vein M from dm–cu crossvein to its bend 1.3–1.5 times as long as distance between the bend and wing margin.

Legs black, pulvilli dull yellowish. Mid tibia with 1 ad seta; hind tibia with a row of closely set ad setae; claws and pulvilli very long, longer than fifth tarsomeres.

Abdomen black in ground clolor, broadly reddish dorsally on posterolateral portion of syntergum 1+2, lateral 1/3 of third, anterolateral portion of fourth; venter reddish on posterior 1/3 of syntergum 1+2, entire third and anterior 2/3 of fourth except mid ventral portion of each tergum; third tergum rather thinly pale yellowish white pollinose dorsally; fourth tergum densely pale yellowish white pollinose on dorsum of anterior 2/3, and fifth on anterior 1/2; mid dorsal longitudinal vitta weakly developed on third to fifth terga; venter thinly whitish pollinose on anterior portion of third to fifth terga. Hairs black, dense and suberect on dorsum of third and fourth terga and erect on fifth; venter with longer hairs; second tergum with 2 rather short median marginal and 1 strong lateral marginal setae; third tergum with 2 strong median marginal and 1–2 strong lateral marginal setae; fourth tergum with a row of 8–10 strong marginal setae; fifth tergum with rows of strong discal and marginal setae mixed with strong erect hairs; venter of fourth

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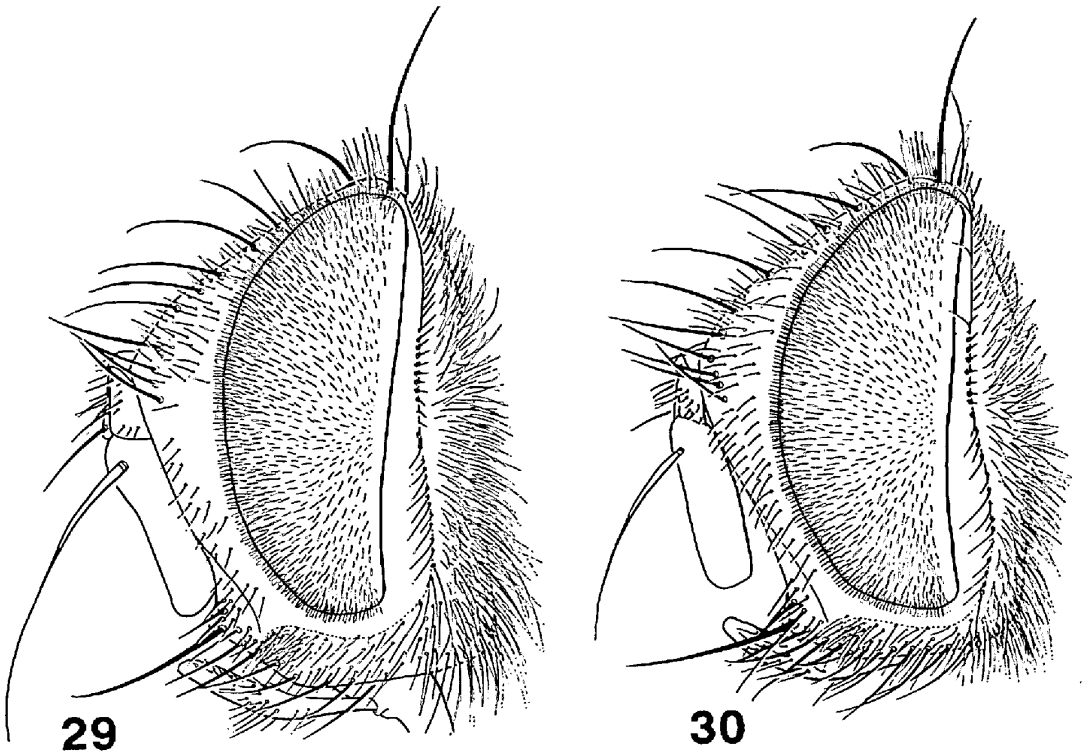

Figs. 29–30. *Winthemia* spp., male head in profile. —— 29, *W. marginalis*; 30, *W. brevicornis*.

and fifth terga without distinct hair fascicle, with denser and longer hairs than other portion; fifth sternum with rather large swelling on inner basal portion of posterior lobe.

Male genitalia. Cerci in dorsal view broad at base and well narrowed at apical 1/2, apices narrowly separated from each other and weakly directed outward; surstylus broad, with dense and long hairs; epiphallus long, apex directed posteriorly; distiphallus rather narrowly membraneous on apical 1/3 of dorsal portion.

Female. Differing from male as follows: Vertex 0.26–0.28 of head width; frontal vitta subequal in width to fronto-orbital plate at middle; parafacial about 2/3 as wide as first flagellomere at middle height; head setae stronger than in male; strong outer vertical seta developed; 1 reclinate and 2 proclinate orbital setae present; uppermost frontal seta strong and reclinate; antenna falling only slightly short of lower margin of face, first flagellomere 3.5–4 times as long as pedicel; thorax with pale yellowish white hairs on prosternum, posterior portion of anepisternum, entire katepisternum and anepimeron, and anterior portion of katepimeron; claws and pulvilli shorter than fifth tarsomeres; first abdominal sternum and anterior portion of venter of syntergum 1+2 with pale yellowish white hairs; abdominal hairs sparser than in male.

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Body length, 7.7–13.4 mm; wing length, 6.6–10.5 mm.

Distribution. China (Liaoning, Jilin, Yunnan); Japan (Honshu, Tsushima, Kyushu).

Holotype: ♂, CHINA, Yunnan Prov., Xishuangbanna, Meng-gao, 1,100 m, 9. x. 1985, H. SHIMA (KIZ).

Paratypes: CHINA, Liaoning Prov., *Dandong*: 15 ♂, 1 ♀, Fengchen, 15–29. vi. 1962, 1. vii. 1962, C.-m. CHAO & Y. SHI (IZB, BLKU); Jilin Prov., *Siping*: 2 ♂, Dongfeng, 20. vi. 1982, H. YAN (IZB); Yunnan Prov., *Simao*: 1 ♂, Puer—Jing-gu, 1,150 m, 13. v. 1957, S. WANG (BLKU); 1 ♀, 15 km E Jig-gu, 900 m, 17. viii. 1990, H. SHIMA (BLKU); 1 ♂, 15 km S of Simao, 1,200 m, 2. x. 1989, H. SHIMA (BLKU); 1 ♂, 1 ♀, Simao, 21–22. x. 1989, W. ZHANG (KIZ); *Xishuangbanna*: 1 ♀, Xiaomengyang, 900–1,100 m, 6. v. 1957, G. HONG (IZB); 1 ♂, Yunjinghong, 850 m, 26. vi. 1958, Y. ZHANG (IZB); 2 ♂, 1 ♀, Meng-hai, 12. x. 1989, W. ZHANG (KIZ, BLKU); 1 ♀, same data as holotype (KIZ); 6 ♂, Meng-man, 800 m, 13. x. 1983, H. SHIMA & W. ZHANG (BLKU, KIZ, IZB); 1 ♀, Meng-zhe, 1,200 m, 11. x. 1989, H. SHIMA (KIZ); 1 ♀, Meng-ya, 600–1,000 m, 17. x. 1989, H. SHIMA (IZB); 1 ♂, 2 ♀, 26. ix. 1957, 28. viii. 1958, 11. x. 1958, L. ZANG, S. WANG, & Z. CHEN (IZB). JAPAN, *Honshu*: 1 ♂, Mt. Iwaki, Tokiwano, 28. vii. 1966, S. FUKUSHI; 1 ♂, Saitama, Kodama, 10. vi. 1972, K. HARA; 1 ♀, Saitama, Minano, 29. vi. 1974, K. HARA; 1 ♂, Ishikawa, Nanao, Joyama, 4. viii. 1970, H. KURAHASHI; *Tsushima*: 1 ♂, 31. vii. 1965, Y. IKEZAKI; 1 ♀, Shimoagata-gun, Kamisaka Pass, 7. viii. 1982, H. SHIMA; *Kyushu*: 1 ♂, Mts. Kuju, Mt. Kuroiwa, 19. viii. 1986, H. SHIMA (all in BLKU).

Remarks. This species occurs both in China and Japan. This species is easily distinguishable from other species in its strong median marginal setae on the second and third abdominal terga and long antennae.

Winthemia brevicornis sp. n.

(Figs. 10, 20, 28, 30, 38)

Male. Closely resembling *W. marginalis*, but differing as follows: Antenna short and narrow, falling short of lower margin of face by about length of pedicel, first flagellomere at most 2.7 times as long as pedicel, subequal in width to parafacial at middle height, slightly shorter than palpus; hairs on thoracic pleura more extensively pale yellowish white, proepimeron, anepimeron and katepimeron with pale hairs; first abdominal sternum with pale yellowish hairs.

Male genitalia. Differing from in *marginalis* as follows: Cerci in dorsal view evenly narrowed, apices narrowly separated from each other but not directed outward, in lateral view apex rather strongly bent ventrally.

Female. Unknown.

Body length, ca. 11.4 mm.; wing length, ca. 9.2 mm.

Distribution. China (Yunnan).

Holotype: ♂, CHINA, Yunnan Prov., Xishuangbanna, Meng-man, 800 m,

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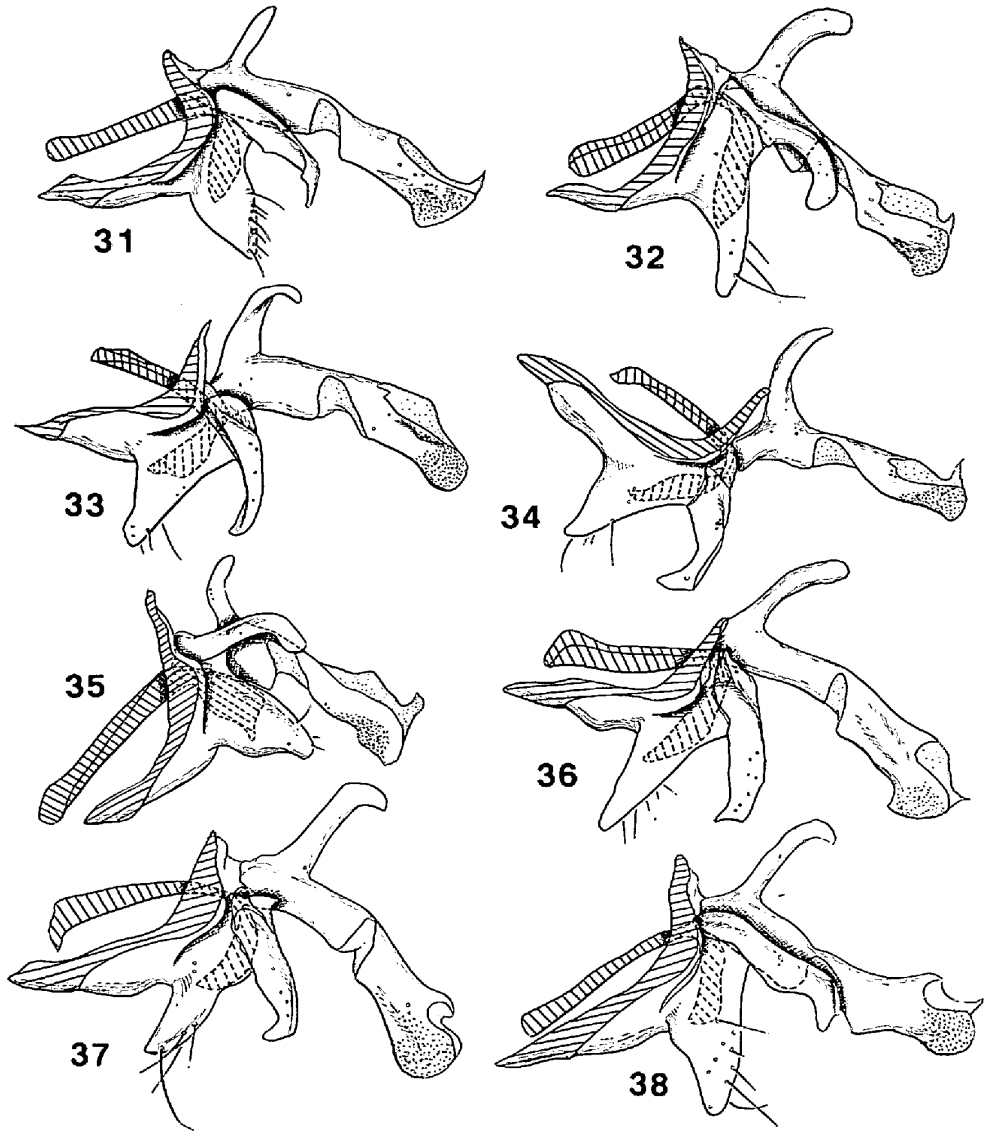

Figs. 31–38. *Winthemia* spp., hypandrium, gonopod, paramere and aedeagus in lateral view. —— 31, *W. proclinata*; 32, *W. verticillata*; 33, *W. remittens*; 34, *W. aurea*; 35, *W. angusta*; 36, *W. sumatrana*; 37, *W. marginalis*; 38, *W. brevicornis*.

13. x. 1989, H. SHIMA (KIZ).

Paratype: CHINA, Yunnan Prov., *Xishuangbanna*: 1 ♂, Cheli, 31. iii. 1957, A. MONTSCHADSKY (IZB).

Remarks. This species seems to be closely related to *marginalis*. We have not seen this species from Japan. The paratype specimen lacks ocellar setae, but this condition is considered aberrant.

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Winthemia sp.

A female specimen collected in Xishuangbanna is very distinctive in having broadly reddish abdomen and thorax, fine black hairs behind the row of postocular setae and reddish femora. SHIMA has seen several males of an undescribed species from Japan, which may belong to the same species as this female. As many *Winthemia* species exhibit strong sexual dimorphism, identification of this species is left for further study until the opposite sex will be found in China or Japan.

Specimen examined. Xishuangbanna: 1 ♀, Menda, 9. x. 1989, W. ZHANG (KIZ).

Discussion

Among 11 *Winthemia* species from Yunnan treated in this paper, 2 species are widely distributed in the Palearctic Region and 2 are in the Indo-Australian Region. The remaining 7 are endemic to Yunnan or restricted to China and Japan. It is especially interesting that 4 of 11 species, *marginalis*, *brevicornis*, *angusta* and undetermined sp., occur both in China and Japan or are closely related to Japanese species.

It is probable that these endemic species and their allies will be found in the area around Yunnan, such as northern Thailand or northern Burma, but it is unlikely that they are distributed in tropical Asia. They seem to represent one of the components of insect fauna ranged from Nepal through southwest China to southwest Japan. It may become clear that this kind of fauna is dominant in this area, when the fauna is investigated in detail in southwest China and adjacent areas.

Acknowledgements

SHIMA and ZHANG are grateful to the Director Dr L. SHI, Kunming Institute of Zoology, Professor T. HIDAKA, Kyoto University, and the staff of the field surveys in Yunnan for their kind support in carrying out the surveys successfully. The surveys were supported in part by the fund from the Kyoto Science Association for Japan-China Collaboration Projects. Curators of museums and institutes listed kindly arranged the loan of types and many entomologists mentioned in the text helped us in getting materials. We are thankful for their kind help.

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(Received December 18, 1991; Accepted January 14, 1992)

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