

A Revision of the Subgenus *Chlorandrena* of the Genus *Andrena* of Eastern Asia (Hymenoptera, Andrenidae)

Xu, Huan-li

Tadauchi, Osamu

<https://doi.org/10.5109/2662>

出版情報 : ESAKIA. 42, pp.55-73, 2002-03-31. Entomological Laboratory, Faculty of Agriculture, Kyushu University

バージョン :

権利関係 :

A Revision of the Subgenus *Chlorandrena* of the Genus *Andrena* of Eastern Asia (Hymenoptera, Andrenidae)^{1), 2), 3)}

Huan-li XU⁴⁾ and Osamu TADAUCHI

Entomological laboratory, Faculty of Agriculture
Kyushu University, Fukuoka, 812-8581 Japan

Abstract. The subgenus *Chlorandrena* of the genus *Andrena* of eastern Asia is revised, and eight species are recognized. Two new species, *Andrena* (*Chlorandrena*) *talina* and *A. (Chl.) yunnanica* are described from China. A key to species of *Chlorandrena* in eastern Asia is given.

Key words: taxonomy, Hymenoptera, Andrenidae, *Andrena*, *Chlorandrena*, revision, new species, eastern Asia.

Introduction

The Palearctic subgenus *Chlorandrena* Pérez is represented by 30 species (Hirashima, 1963; Warncke, 1968, 1975; Dylewska, 1987; Osytshnjuk, 1993). Warncke (1968) divided the European species of this subgenus into three species groups, *A. humilis* group (including 10 spp.), *A. taraxaci* group (3 spp.) and *A. livens* group (8 spp.) based on the features of female facial fovea and male gonostylus. Dylewska (1987) treated Middle and North European species and named species of this subgenus *A. humilis* group.

In eastern Asia, Alfken (1900) described one species from Japan, and Strand (1915) recorded two species from China. Matsumura & Uchida (1926), Hirashima (1952, 1957,

-
- 1) Contribution from the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka (Ser. 5, No. 75).
 - 2) This work was supported by a Grant-in-Aid for Scientific Research of an International Scientific Research Program from the Ministry of Education, Science, Sports and Culture, Japan (No. 07041144) (Head Investigator: O. Tadauchi).
 - 3) Results from the China-Japan Co-operative Study on "Studies on Systematics, Evolution and Biogeography of Asian *Andrena* (Hym., Apoidea, Andrenidae)" No. 13.
 - 4) Present address: Department of Vegetable and Flower Research, National Agricultural Research Center for Kyushu Okinawa Region, 1823-1 Miimachi, Kurume-shi, Fukuoka, 839-8503 Japan.

1960, 1963) recorded Japanese species and Tadauchi (1988) placed the species of the subgenus *Chrysandrena* of Hirashima (1952, 1963) to *Chlorandrena*. From China Yasumatsu (1935) described three species under the subgenus *Chlorandrena*, but all of them were identified as the other subgenera in the present study. After that Hirashima (1952) described one species and Wu (1982) reported three species and one subspecies under the subgenus *Chrysandrena*. Tadauchi & Lee (1992) and Tadauchi *et al.* (1997) recorded the Korean species and Osytshnjuk (1995) reported the species from Russian Far East.

In this paper, we give a revision of East Asian species of this subgenus, and recognize eight species including two new species from China. The holotypes will be preserved in the Institute of Zoology, Academia Sinica, Beijing.

Subgenus *Chlorandrena* Pérez

Chlorandrena Pérez, 1890, Act. Soc. Linn. Bordeaux, 44: 172; Hedicke, 1933, Mitt. Zool. Mus. Berlin, 19: 211; Hirashima, 1962, J. Fac. Agr., Kyushu Univ., 12: 255; Warncke, 1968, Mem. Est. Mus. Zool. Univ. Coimbra, (307): 30-31. Type species: *Andrena humilis* Imhoff, 1832, by designation of Hedicke, 1933.

Diagnosis: Medium-sized bees; facial quadrangle as broad as long or broader; facial fovea moderate; subgenal coronet present; malar space short; pronotum without humeral angle and ridge; three submarginal cells present; propodeal corbicula poorly developed; hind femora with a row of spines; tibial scopa developed with plumose hairs throughout. Male clypeus black or yellow; flagellar segment 1 long; sterna with short, complete white subapical fimbriae.

Key to species of the subgenus *Chlorandrena* in eastern Asia

Female

1. Process of labrum triangular; head and mesoscutum with blackish hairs; tibial scopal hairs weakly plumose; hind femora with a row of long spines
..... *yunnanica* n. sp.
- Process of labrum not triangular; head and thorax with uniformly yellow hairs; tibial scopal hairs strongly plumose; hind femora with a row of short spines
..... 2
2. Clypeus densely tessellate-punctate, roughened; dorsal face of propodeum roughened; process of labrum broad and short, weakly emarginate apically
..... *taraxaci orienticola* Strand
- Clypeus tessellate basally, at least shiny apically, dorsal face of propodeum smooth

- and shiny with punctures 3
3. Propodeal enclosure strongly rugose nearly all over; clypeus smooth and shiny nearly all over; process of labrum strongly emarginate; legs with hind tibiae and tarsi yellow *talina* n. sp.
- Propodeal enclosure rugose 1/2 or less basally; clypeus tessellate at least basally; process of labrum weakly emarginate, round or transverse; legs with hind tibiae and tarsi brown 4
4. Process of labrum round; facial fovea deep, curved inwardly in the middle *emeiensis* Wu
- Process of labrum weakly emarginate or entire; facial fovea shallow 5
5. Propodeal enclosure strongly rugose at 1/2 basally 6
- Propodeal enclosure weakly rugulose at 1/3 basally 7
6. Flagellum reddish yellow below; clypeus smooth and shiny apicomediaally; process of labrum weakly emarginate *tsingtauica* Strand
- Flagellum reddish brown below; clypeus widely tessellate; process of labrum transverse *okinawana* Matsumura et Uchida
7. Process of labrum weakly emarginate apically; metasomal terga densely punctate *knuthiformis* Hirashima
- Process of labrum narrow, entire; metasomal terga minutely and sparsely punctate *knuthi* Alfken

Male

1. Clypeus black, shagreened by crowded and minute punctures; dorsal face of propodeum coarsely rugulose; metasomal sternum 6 flat, not emarginate *taraxaci orienticola* Strand
- Clypeus yellow; dorsal face of propodeum not coarsely rugulose; metasomal sternum 6 emarginate, reflexed apicolaterally 2
2. Clypeus with yellow maculae only apically and lower paraocular area without yellow maculae; process of labrum weakly emarginate *knuthi* Alfken
- Clypeus and lower paraocular area with yellow maculae 3
3. Metasomal tergum 1 distinctly and finely punctate; terga 2-5 densely punctate; process of labrum deeply emarginate *knuthiformis* Hirashima
- Metasomal tergum 1 with scattered microscopic punctures; process of labrum entire 4
4. Propodeal enclosure strongly rugose at basal 1/2 to 2/3; metasomal terga densely punctate *okinawana* Matsumura et Uchida
- Propodeal enclosure weakly rugose basally; metasomal terga sparsely punctate; *emeiensis* Wu

I. Species group of *Andrena taraxaci*

In eastern Asia only one species has been known in this species group. The species of *A. taraxaci* group have the facial fovea abruptly narrowed below and the male gonostylus not widened.

1. *Andrena (Chlorandrena) taraxaci orienticola* Strand

Andrena humilis var. *orienticola* Strand, 1915, Ent. Mitt., 4: 72 [female, China]; Yasumatsu, 1941, Peking nat. Hist. Bull., 15: 276 [in list].

Andrena taraxaci orienticola: Warncke, 1967, Eos, 43: 204, 295 [note, in list].

Andrena taraxaci: Osytsnjuk, 1995, Key Insects Russian Far East Six Vol. 4: 491, 523 [Russian Far East, in key].

Andrena (Chlorandrena) taraxaci orienticola: Xu & Tadauchi, 1998, Esakia, (38): 97.

Andrena (Chlorandrena) taraxaci chikuzenensis Hirashima, 1957. Mushi, 30: 52 [female & male, Japan]; Hirashima, 1963. J. Fac. Agr., Kyushu Univ., 12: 255-258 [redescription, Japan]; Hirashima, 1966, J. Fac. Agr., Kyushu Univ., 14: 97, 118 [female & male, in key]; Tadauchi *et al.*, 1997, Esakia, (37): 198 [Korea].

Redescription. See Hirashima (1963).

Photos. See Tadauchi *et al.* (2001): <http://konchudb.agr.agr.kyushu-u.ac.jp/hanabachi/>

Specimens examined: CHINA: Qinghai Province: 1 male, Guinan, 3,300-3,800 m, 28. v. 1957 (Y-r. Zhang). Gansu Province: 1 female, Chinkiang, 1. iv. 1918; 1 male, Jiuquan City, 5. v. 1996 (O. Tadauchi). Beijing: 1 male, 25. iv. 1961 (S-m. Ge); 1 male, 10. v. 1961 (S-m. Ge); 1 female, 12. v. 1981 (Y-r. Wu). Hebei Province: 3 males, Beidaihe, 3. v. 1962 (T-r. Chen). Jilin Province: Kaigen (now is Kaiyuan): 1 male, 22. v. 1936 (R. Kimishima); 1 female, 2. vi. 1936; 3 females, 11-15. vi. 1937 (I. Okada); 1 male, 25. v. 1957 (T-r. Chen). Liaoning Province: 1 male, Yuncheng, 5. v. 1962 (T-r. Chen). JAPAN (only a few specimens cited): Honshu: 14 females & 3 males, Sekigahara, Gifu Pref. 7. v. 1976 (O. Tadauchi); Tsushima Is.: 1 female, Yora-najjin, Izuhara, 5. v. 1986 (O. Tadauchi). KOREA: 2 females & 1 male, Koryo (= Kwangneung), 9. v. 1937 (T. Kusanagi).

Remarks: This subspecies is separated from the European nominate subspecies by the head with much paler hairs and the mesoscutum, scutellum and metasomal terga less tessellate and more shiny. In eastern Asia it widely distributes from Russian Far East to China, Korean Peninsula and Japan.

Distribution: Japan (Honshu, Shikoku, Kyushu, Tsushima Is.); China (Beijing, Qinghai, Gansu, Hebei, Jilin, Liaoning, Shandong Provs.); Korea (central and north); Russia (Far East area).

Floral association: Japan: *Taraxacum platycarpum*, *Sonchus oleraceus*, *Stellaria*

media, *Lactuca stolonifera*, *Lactuca dentata*.

Flight records: Japan: Female: mid April to early May; male: early April to early May.

II. Species group of *Andrena knuthi*

In eastern Asia this species group is diversified and six species are known. It has the dorsal face of propodeum and mesepisternum smooth and shiny with distinct punctures.

2. *Andrena (Chlorandrena) knuthi* Alfken

Anthrena knuthi Alfken, 1900, Ent. Nachr., 26: 178 [female, Japan].

Andrena knuthi: Cockerell, 1911, Proc. U. S. nat. Mus., 40: 243 [male, Japan]; Cockerell, 1913, Ann. Mag. nat. Hist., (8)11: 189; Alfken, 1932, Mitt. Deut. Ent. Ges., 3: 117; Yasumatsu, 1941, Peking nat. Hist. Bull., 15: 277 [in list]; Kim, 1970; Ill. Faun. & Flor. Kor., 11(3): 661 [Korea].

Andrena (Chrysandrena) knuthi: Hirashima, 1952, Mushi, 23: 41; Hirashima, 1963, J. Fac. Kyushu Univ., 12: 259-262 [redescription]; Hirashima, 1966, J. Fac. Agr., Kyushu Univ., 14: 97, 114 [female & male, in key].

Andrena (Chlorandrena) knuthi: Tadauchi, 1988, Trans. Nagasaki biol. Soc., (33): 7-8 [Japan, Tsushima Is.].

Redescription. See Hirashima (1963).

Photos. See Tadauchi *et al.* (2001): <http://konchudb.agr.agr.kyushu-u.ac.jp/hanabachi/>

Specimens examined: JAPAN (only a few specimens cited): Honshu: 1 female, Tochiuda, Murayama, Yamagata Pref., 26. v. 1975 (O. Tadauchi); 3 females, Iriyamabe, Matsumoto, Nagano Pref., 18. v. 1975 (O. Tadauchi); Shikoku: 1 female, Hashikura, Ikeda, Tokushima Pref., 1. v. 1975 (O. Tadauchi); Kyushu: Hokuzan Dam, Ozeki, Saga Pref.: 7 females & 14 males, 6. v. 1976 (O. Tadauchi); Tsushima Is.: Izumi, Kamitsushima: 1 female & 1 male, 2. v. 1986; 2 females & 3 males, 3. v. 1986 (O. Tadauchi).

Remarks: It is similar to *Andrena knuthiformis* Hirashima in the propodeal enclosure less rugose and the clypeus shiny and smooth at apicomedian area. But it is separated from *knuthiformis* by the process of labrum entire or very weakly emarginate, the male clypeus with yellow maculae at apical 1/2 and lower paraocular area without yellow maculae. It is one of the common species in Japan. Kim (1970) recorded this species from Korea, but Tadauchi has only collected *Andrena okinawana* Matsumura et Uchida from Korea and it is necessary to re-examine Korean material.

Distribution: Japan (Hokkaido, Honshu, Sado Is., Shikoku, Kyushu, Tsushima Is., Tanegashima Is, Yakushima Is., Kuchinoerabu Is., Kuchinoshima Is., Suwanose Is.); Korea?

Floral associations: Japan: *Sonchus oleraceus*, *Youngia japonica*, *Picris hieracioides*

var. *glabrescens*, *Lactuca stolonifera*, *Lactuca dentata*, *Lactuca dentata* var. *amplifolia*, *Erigeron annuus*, *Heracleum lanatum*, *Oxalis corniculata*, *Chrysanthemum leucanthemum*, *Rosa multiflora*, *Brassica campestris*, *Taraxacum japonicum*, *Ranunculus acris* var. *japonicus*, *Ranunculus glaber*, *Ranunculus repens*, *Trigonotis peduncularis*, *Capsella bursa-pastoris*, *Potentilla wallichiana*, *Rubus palmatus* f. *coptophyllus*, *Raphanus sativus* var. *acanthiformis*, *Astragalus sinicus*, *Calystegia soldanella*, *Torilis japonica*.

Flight records: Japan: Female: late April to mid June; male: late March to late May.

2-2 *Andrena (Chlorandrena) knuthi chinensis* Wu

Andrena (Chrysandrena) knuthi chinensis Wu, 1982, *Sinozoologia*, 2: 65-66 [female & male, China].

We could not examine the type specimen of this subspecies. We think it may be a subspecies or synonymy of *Andrena okinawana* Matsumura et Uchida. Because of not enough specimens in our hand we leave this subspecies as it is in this paper.

Distribution: China (Sichuan, Zhejiang Provs., Beijing).

3. *Andrena (Chlorandrena) knuthiformis* Hirashima

(Figs. 1: A-E, 2: A-E)

Andrena (Chrysandrena) knuthiformis Hirashima, 1952, *Mushi*, 23: 43 (female & male, China & Korea); Wu, 1982, *Sinozoologia*, 2: 63, 65 [female & male, in key, China].
Andrena (Chlorandrena) knuthiformis: Tadauchi *et al.*, 1997, *Esakia*, (37): 200.

Redescription.

Female: BL 9.5mm, WL 7.5 mm (n = 1).

Color: Flagellum reddish brown beneath; mandible with apical half reddened; wing membranes infumate, moderately brown, veins and pterostigma yellowish brown; tibial spurs yellowish; posterior depressions of metasomal terga yellowish brown subhyaline.

Pubescence: Hairs on head moderately dense, dull yellowish; those on clypeus 400-500 μ ; those on vertex 500-600 μ ; those on genal area short; facial fovea bright yellow. Hairs on mesoscutum and scutellum 300-700 μ , sparse, longer peripherally; those on mesepisternum about 600 μ ; propodeal corbicula poorly developed, internal area with sparse, simple hairs; trochanteral floccus well developed, branched, curling, yellowish; femoral floccus loose; tibial scopal hairs rather long, branched throughout. Hairs on metasomal terga rather short, sparse, yellowish; tergum 2 with yellowish hairs laterally, terga 3-4 with

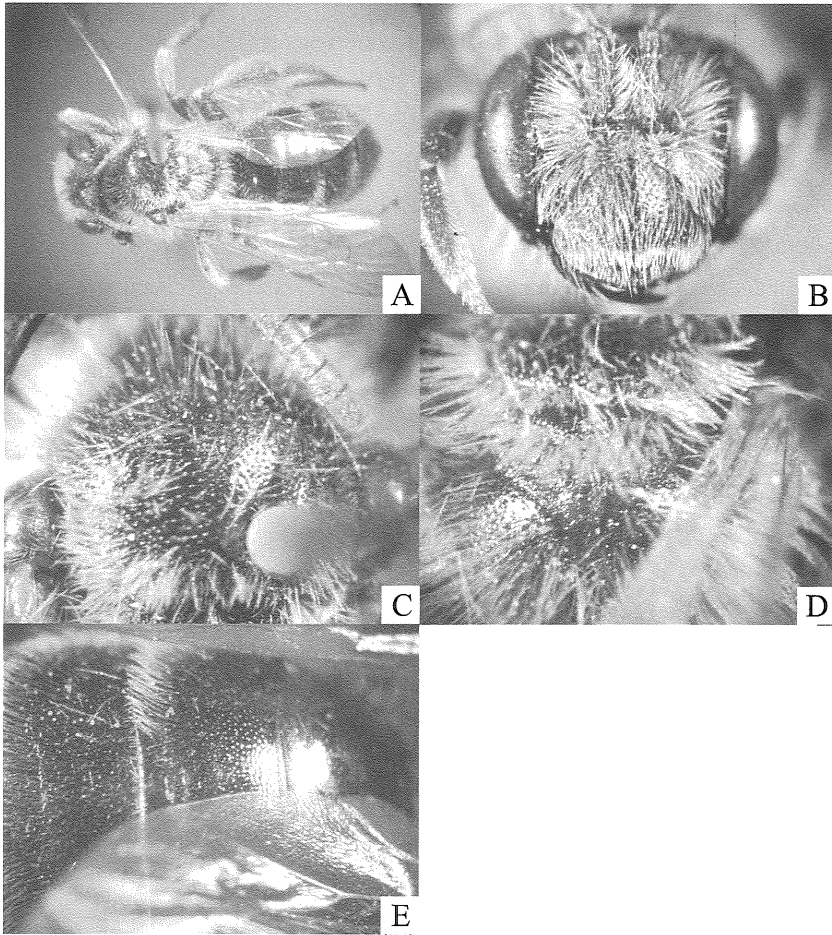


Fig. 1: A - E. *Andrena (Chlorandrena) knuthiformis* Hirashima, female. A: general habitus; B: head in frontal view; C: mesoscutum; D: propodeum; E: metasomal terga.

obscure apical fasciae; caudal fimbria bright yellow; sterna 2-5 with erect, sparse subapical fimbriae, dull yellow.

Structure: Head: HL/HW = 0.82. HW: MsW: MtW = 2.9: 2.9: 3.0. Vertex round, densely tessellate with close minute PP. OOD: POD: OCD = 0.7: 0.5: 0.3. FL1 > FL2+3, FL2 = FL3, which is broader than long, intermediate flagellar segments broader than long. Eyes with inner margins paralleled. Facial fovea shallow, not narrowed below, not separated from eye by narrow polished space, extending to below a line at lower margin of antennal fossae, FVL = 0.96 mm, FVW = 0.32 mm. Supraclypeal area densely tessellate with shallow PP. Face above antennal fossae with fine longitudinal rugulae and weak interrugal PP, dulling surface. Facial quadrangle quadrate (about 1.0: 0.98). Clypeus well convex, finely tessellate basally, smooth and feebly shiny apically with weak, sparse PP \varnothing 15-20 μ , IS = 0.5-1, CPL = 0.8 mm. Process of labrum weakly emarginate apically. Labrum apical to

process flat, without crista. Lower paraocular area smooth and shiny with minute PP. Malar space linear. Genal area as broad as eye, GW: EW = 0.6: 0.6, surface weakly tessellate posteriorly, smooth and shiny with fine minute PP near eye. *Mesosoma*: Pronotum weakly tessellate, with obscure PP. Mesoscutum nearly smooth and shiny with PP \varnothing 20-30 μ , IS = 0.5-1.5. Scutellum as in mesoscutum. Propodeal enclosure densely tessellate at apical 2/3, finely rugulose at basal 1/3; dorsal face smooth and polished with distinct PP. Mesepisternum finely tessellate, weakly shiny medially, PP distinct. *Metasoma*: Metasomal terga smooth and shiny, tergum 1 with scattered microscopic PP, irregular in distribution; terga 2-4 with same microscopic PP \varnothing 20 μ , IS = 0.5-3 at basal areas, impunctate apically; posterior depressions of terga broad, weakly indicated; pygidial plate V-shaped with weakly raised triangular area. Sterna 2-5 weakly tessellate, shiny with minute PP, IS = 0.5-1 at apical

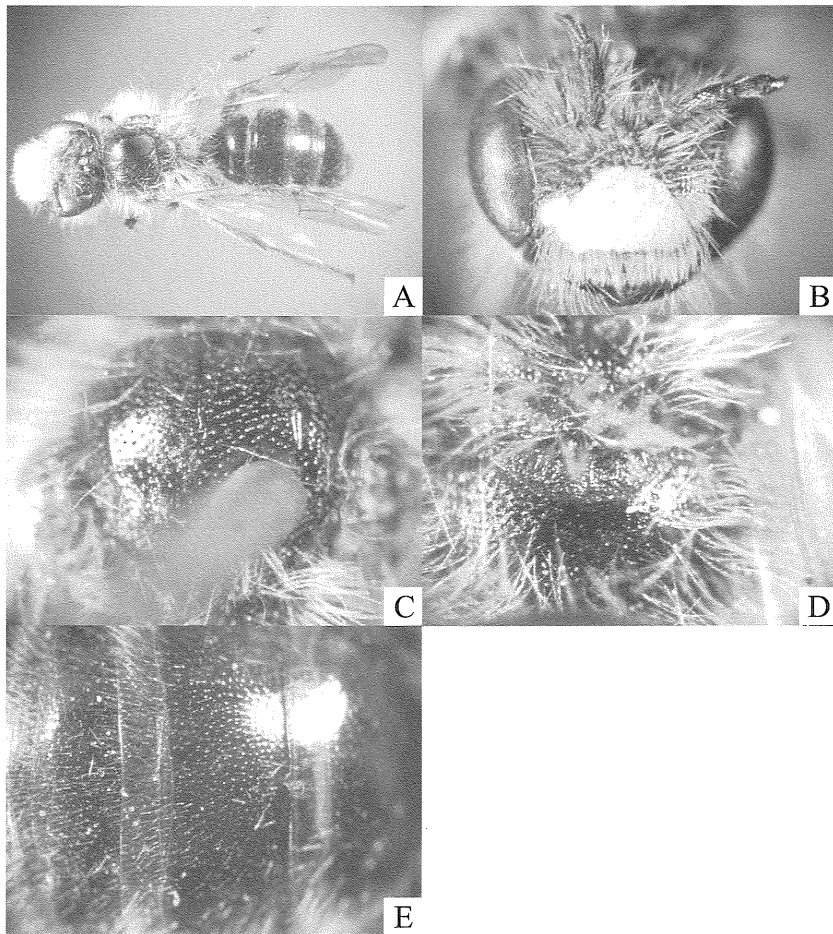


Fig. 2: A - E. *Andrena (Chlorandrena) knuthiformis* Hirashima, male. A: general habitus; B: head in frontal view; C: mesoscutum; D: propodeum; E: metasomal terga.

areas.

Male: BL 8.0 mm, WL 6.5 mm (n=1).

Color: Flagellum yellowish brown beneath; mandible with apical half reddened; clypeus and lower paraocular area with yellow maculae; wing membrane subhyaline, veins and pterostigma yellowish brown; hind tibiae and basitarsi reddish brown, tibial spurs yellow; terga 1-4 reddish partly; posterior margins of terga yellowish, transparent.

Pubescence: Hairs on head abundant, pale yellowish; those on clypeus and genal area 400-500 μ ; those on vertex 500-600 μ . Hairs on mesoscutum almost scanty, pale yellowish laterally; those on scutellum and propodeum dense, longer; those on mesepisternum long, whitish to white. Hairs on metasomal terga scanty, very short, whitish medially, relatively abundant, longer laterally; terga 2-5 with obscure, suberect whitish hair bands; sterna 2-5 with well-formed, whitish subapical fimbriae.

Structure: Head: HL/HW = 0.78. HW: MsW: MtW = 3.5: 3.3: 3.4. Vertex rounded, roughened at middle, tessellate with PP near top of eyes. OOD : POD : OCD = 0.48: 0.40: 0.28. FL1 longer than FL3, which slightly longer than FL2, FL2 broader than long. Eyes with inner margins slightly converging toward mandibles. Supraclypeal area and face above antennal fossae roughened. Facial quadrangle as long as broad (about 2.2: 2.2). Clypeus well convex, smooth and shiny with PP ϕ 20-30 μ , IS = 0.5-1, sparser toward apicomedial margin, CPL = 0.8 mm. Process of labrum deeply emarginate in the middle. Labrum apical to process with distinct crista. Mandibles decussate. Lower paraocular area as in clypeus. Malar space linear. Genal area broader than eye, GW: EW = 1.4: 1.1, surface finely tessellate posteriorly, broadly smooth and shiny with minute PP, IS = 1 near eye. *Mesosoma:* Pronotum weakly tessellate with obscure PP. Mesoscutum smooth and shiny except weakly tessellate anteriorly, surface with minute PP ϕ 20-30 μ , IS = 0.5-1, denser near posterior margin. Scutellum as in mesoscutum. Propodeal enclosure tessellate at apical 2/3, rugose at basal 1/3; dorsal face weakly tessellate with PP. *Metasoma:* Metasomal terga smooth and shiny with shallow, sparse small PP ϕ 10-20 μ , IS = 1-4; posterior depressions of terga weakly indicated. Sterna 2-5 weakly tessellate with PP; sternum 6 weakly reflected, emarginate apically.

Specimens examined: Holotype male and allotype female (Kyushu Univ.), Kaigen (now is Kaiyuan), Jilin Province, 12. vi. 1936 (I. Okada). Other material: CHINA: Jilin Province: 2 males, same locality as the holotype, 1 male, 12. vi. 1937 (I. Okada), 1 male, 12. vi. 1937 (R. Kimishima); 1 male, Anshan, 4. vi. 1962 (T-r. Chen). Beijing: 1 female, 16. vi. 1963; 1 male, Xiangshan, Wofosi; 1 male, Dazhongsi, 12. v. 1961 (S-m. Ge); 1 male, Beijing, Badaling, 5. v. 1961 (S-m. Ge). Fujian Prov.: 1 female, Jianyang Hunagkeng, Youtou, 30. iv. 1960 (Y-r. Zhang).

Remarks: It is very similar to *Andrena knuthi* Alfken, but is separated from *knuthi* by the antennae yellowish brown, the process of labrum weakly to strongly emarginate and

the clypeus and lower paraocular area with yellow maculae.

Distribution: China (Jilin, Fujian Provs., Beijing).

Floral association: *Brassica* sp.

Flight records: Female: early to mid June; male: early to mid June .

4. *Andrena (Chlorandrena) okinawana* Matsumura et Uchida

Andrena okinawana Matsumura et Uchida, 1926, Ins. Mats., 1: 69 [female, Japan: Okinawa Is.]; Yasumatsu, 1941, Peking nat. Hist. Bull., 15: 279 [in list]; Ikudome, 1999, Ident. Guide Aculeata Nansei Isls., Jap.: 607.

Andrena knuthi okinawana: Hirashima, 1958, Mushi, 32: 72; Hirashima, 1960, Mushi, 33: 54 [male, Japan]; Yasumatsu & Hirashima, 1965, Kontyu, 33: 252.

Andrena (Chrysandrena) knuthi okinawana: Hirashima, 1962, J. Fac. Agr., Kyushu Univ., 12: 262-263 [redescription]; Hirashima, 1966, J. Fac. Agr., Kyushu Univ., 14: 97 [female, in key]; Wu, 1982, Sinozoologia, 2: 63 [female, in key, China].

Andrena (Chlorandrena) okinawana: Tadauchi, 1988, Trans. Nagasaki biol. Soc., (33): 8 [Japan, Tsushima Is.]; Tadauchi & Lee, 1992, Esakia, (32): 54-55 [Korea].

Redescription. See Hirashima (1962).

Photos. See Tadauchi *et al.* (2001):<http://konchudb.agr.agr.kyushu-u.ac.jp/hanabachi/>

Specimens examined: CHINA: Beijing: 1 female, 16. vi. 1963. Zhejiang Province: 1 female, Chusan (now is Zhoushan Is.), 21. v. 1931 (O. Piel); 1 male, Hangzhou, 1. v. 1980 (P-y. Yu). Henan Province: 1 female, Dayong, 250m, 9. vi. 1988 (L-l. Yang). Sichuan Province: 1 male, Emeishan, Baoguosi, 550-750m, 27. v. 1957 (Y-c. Lu). JAPAN (only a few specimens cited): Tsushima Is.: Tsutsu, Izuhara, 7 females & 1 male, 13. v. 1983 (O. Tadauchi); 7 females, 17. v. 1987 (O. Tadauchi). Amami-Oshima Is.: Cape Ayamaru, 4 females & 20 males. 26. iii. 1973 (O. Tadauchi). KOREA: 1 male, San Lyong Li, San Nae Meon, Nam Weon Gun, Cheon-La Buk Do, 12. v. 1991 (O. Tadauchi); 2 females, Kan-Ki Li, Ii Paek Meon, Nam Weon Gun, Cheon-La Buk Do, 16. v. 1991 (O. Tadauchi) .

Remarks: It is closely similar to *Andrena knuthi* Alfken but is separated from *knuthi* by the clypeus strongly tessellate at basal 1/2, the process of labrum not emarginate, the propodeal enclosure more rugosed (1/2 to 2/3 basally), the metasomal terga more strongly punctate and the male clypeus and lower paraocular area with yellow maculae. This species occurs in Tsushima Is., Japan with a closely species *A. knuthi*, but the distribution area of this species is limited to the southernmost of the island. Some Chinese specimens from Sichuan and Zhejiang have variation on punctures of metasomal terga, less distinct.

Distribution: Japan (Tsushima Is, Amami-Oshima Is., Kikai Is., Okinoerabu Is., Tokunoshima Is., Okinawa-honto Is., Izena Is., Kume Is., Ishigaki Is., Iriomote Is.); China

(Zhejiang, Sichuan, Henan Provs., Beijing); Korea (South).

Floral association: Japan: *Sonchus oleraceus*, *Brassica* spp.

Flight records: Japan: Female: mid February (Ryukyu Is.) to late May, male: late January (Ryukyu Is.) to late May.

5. *Andrena (Chlorandrena) tsingtauca* Strand

Andrena tsingtauca Strand, 1915, Ent. Mitt., 4: 70-72 [female, China: Tsingtau]; Yasumatsu, 1941, Peking nat. Hist. Bull., 15: 281 [in list].

Andrena (Chlorandrena) tsingtauca: Xu & Tadauchi, 1998, Esakia, (38): 97-99 [redescription].

Redescription and photos. See Xu & Tadauchi (1998).

Type material examined: Holotype female (DEI, Eberswalde, Germany), Juni, Tsingtau, Prof. Hoffmann.

Remarks: This species is similar to *Andrena okinawana* Matsumura et Uchida, but is separated from *okinawana* by the clypeus smooth and shiny apically, the flagellum reddish yellow and the metasomal terga with close, distinct punctures.

Distribution: China (Shandong Prov.).

Floral association: Not available.

Flight records: Female: June.

6. *Andrena (Chlorandrena) emeiensis* Wu

(Fig. 3: A-E)

Andrena emeiensis Wu, 1982, Sinozoologia, 2: 64-65 (female & male, China: Sichuan); Gusenleitner & Schwarz, 2001, Entomofauna, 22:292-293.

Redescription.

Female: BL 9.5mm, WL 9.0mm (n = 1).

Color: Flagellum reddish brown beneath; mandible with apical third reddened; wing membranes infumate, moderately brown, veins and pterostigma brownish; tibial spurs testaceous; posterior depressions of metasomal terga reddish brown subhyaline.

Pubescence: Hairs on head relatively sparse, dull yellowish, short; those on clypeus 300-400 μ ; those on vertex 400-500 μ ; those on genal area short; facial fovea bright yellow. Hairs on mesoscutum and scutellum 300-500 μ , sparse, longer peripherally; those on mesepisternum paler, 600-800 μ ; propodeal corbicula poorly developed, internal area with sparse, simple hairs; trochanteral floccus well developed, branched, curling, bright

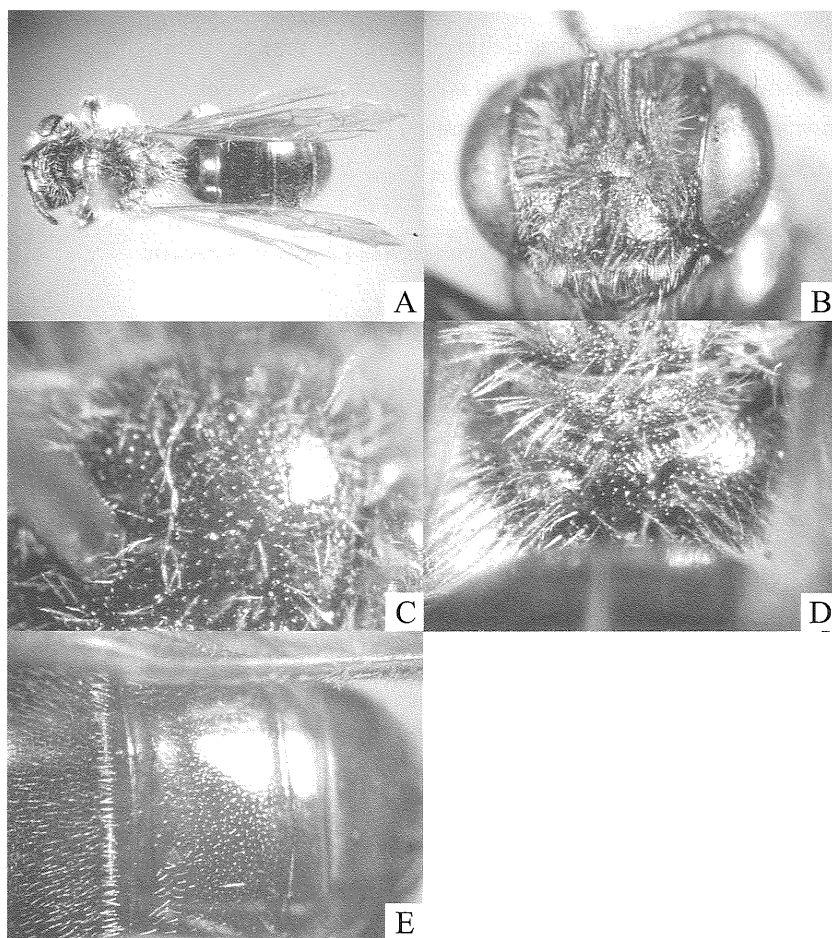


Fig. 3: A - E. *Andrena (Chlorandrena) emeiensis* Wu, female. A: general habitus; B: head in frontal view; C: mesoscutum; D: propodeum; E: metasomal terga.

yellowish; femoral floccus loose; tibial scopal hairs rather long, branched throughout, bright yellowish. Hairs on metasomal terga rather short, sparse, yellowish; terga 3-4 with obscure sparse, apical fasciae; caudal fimbria pale yellow; sterna 2-5 with suberect, sparse subapical fimbriae, yellowish.

Structure. Head: HL/HW = 0.79. HW: MsW: MtW = 2.9: 2.9: 3.1. Vertex flat, weakly tessellate and shiny with close shallow PP. OOD: POD: OCD = 0.75: 0.5: 0.25. FL1 > FL2+3, FL2 = FL3, which is broader than long, intermediate flagellar segments broader than long. Eyes with inner margins paralleled. Facial fovea deep, not narrowed below, not separated from eye by narrow polished space, extending to below a line at lower margin of antennal fossae, FVL = 1.2 mm, FVW = 0.30 mm. Supraclypeal area densely tessellate with rugulae. Face above antennal fossae with fine longitudinal rugulae and weak interrugal PP, dulling surface. Facial quadrangle quadrate (about 0.9: 0.95). Clypeus slightly convex,

finely tessellate all over and feebly shiny with weak, sparse $PP\varnothing 20\mu$, $IS = 1.5-2$, $CPL = 0.8$ mm. Process of labrum broad triangular. Lower paraocular area nearly smooth and shiny with minute PP. Malar space linear. Genal area broader than eye, $GW:EW = 1.0:0.85$, surface weakly tessellate posteriorly, broadly smooth and shiny with fine minute PP near eye. *Mesosoma*: Pronotum weakly tessellate, with obscure PP; subapical margin emarginate in the middle with a median longitudinal line. Mesoscutum smooth and shiny with $PP\varnothing 20-30\mu$, $IS = 0.5-1.5$. Scutellum as in mesoscutum. Propodeal enclosure densely tessellate at apical 1/2, finely rugulose at basal 1/2; dorsal face smooth and polished with distinct PP. Mesepisternum smooth and shiny medially, PP distinct. *Metasoma*: Metasomal terga smooth and shiny, tergum 1 with scattered microscopic PP, irregular in size and distribution; terga 2-4 with same microscopic $PP\varnothing 10-20\mu$, $IS = 1-3$ at basal areas, impunctate at apical areas; posterior depressions of terga broad, weakly indicated; pygidial plate V-shaped with weakly raised triangular area. Sterna 2-5 weakly tessellate, feebly shiny with minute PP, $IS = 0.5-1$ at apical areas.

Specimen examined: CHINA: Sichuan Province: 1 female, Wushan, Liziping, 1800m, 5. vii. 1993 (W-z. Li).

Remarks: This species is similar to *Andrena knuthi* Alfken and *A. knuthiformis* Hirashima in having the clypeus weakly smooth and shiny apically, the propodeal enclosure rugose at basal 1/3 to 1/2 and the metasomal terga with weak punctures, but it is recognized by the process of labrum round in female and entire in male, the facial fovea deep and curved inwardly in the middle.

Distribution: China (Sichuan Prov.).

Floral association: Not available.

Flight records: Female: mid May to early July; male: mid to late May.

7. *Andrena (Chlorandrena) talina* n. sp.

(Fig. 4: A-E)

Female: BL 11.5mm, WL 9.0 mm ($n = 1$).

Color: Flagellum reddish brown beneath; mandible with apical third reddened; wing membranes infumate, moderately brown, veins and pterostigma brown; hind tibiae and tarsi reddish yellow; tibial spurs yellowish; metasomal terga 2-4 partly reddened; posterior depressions of metasomal terga reddish yellow subhyaline.

Pubescence: Hairs on head moderately dense, bright yellowish; those on clypeus 400-500 μ ; those on vertex 500-600 μ ; those on genal area short; facial fovea bright yellow. Hairs on mesoscutum and scutellum sparse, longer peripherally; those on mesepisternum about 600 μ ; propodeal corbicula poorly developed, internal area with sparse, simple hairs;

trochanteral floccus well developed, branched, curling, yellowish; femoral floccus loose; tibial scopal hairs rather long, branched, golden yellow throughout. Hairs on metasomal terga rather short, sparse, yellowish; terga 2-3 with obscure apical fasciae laterally; caudal fimbria bright yellow; sterna 2-5 with erect, sparse subapical fimbriae, yellow.

Structure: Head: HL/HW = 0.84. HW: MsW: MtW = 3.2: 3.3: 3.3. Vertex round, smooth and shiny with close distinct PP. OOD: POD: OCD = 0.8: 0.6: 0.3. FL1 > FL2+3, FL2 > FL3, which is broader than long, intermediate flagellar segments broader than long. Eyes with inner margins paralleled. Facial fovea shallow, not narrowed below, not separated from eye by narrow polished space, extending to below a line at lower margin of antennal fossae, FVL = 1.4 mm, FVW = 0.4 mm. Supraclypeal area smooth and shiny with distinct PP. Face above antennal fossae with fine longitudinal rugulae and weak interrugal PP, dulling surface. Facial quadrangle quadrate (about 1.1: 1.0). Clypeus well convex, smooth

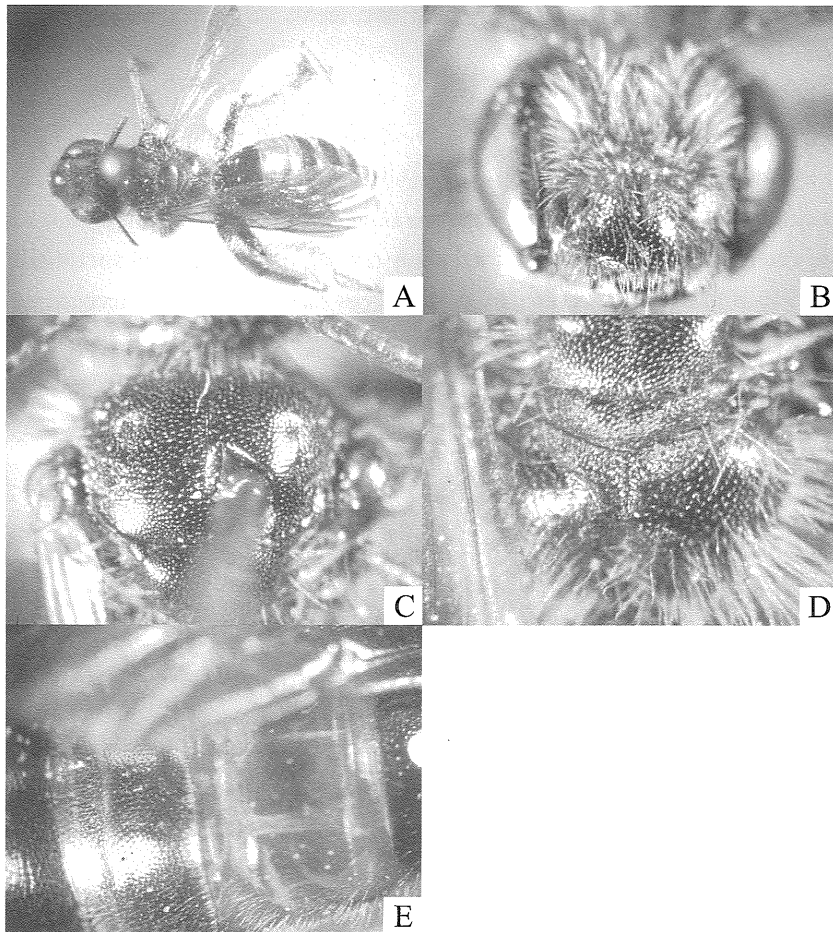


Fig. 4: A - E. *Andrena (Chlorandrena) talina* n. sp., female. A: general habitus; B: head in frontal view; C: mesoscutum; D: propodeum; E: metasomal terga.

and shiny nearly all over with sparse PP \varnothing 20-30 μ , IS = 0.5-2, CPL = 1.0 mm. Process of labrum emarginate apically. Lower paraocular area smooth and shiny with denser PP. Malar space linear. Genal area broader than eye, GW: EW = 0.9: 0.8, surface weakly tessellate posteriorly, broadly smooth and shiny with fine minute PP near eye. *Mesosoma*: Pronotum weakly tessellate, with obscure PP. Mesoscutum smooth and shiny with PP \varnothing 20-30 μ , IS = 0.5-1.5. Scutellum as in mesoscutum. Propodeal enclosure densely tessellate at apical 1/3, finely rugulose at basal 2/3; dorsal face smooth and polished with distinct PP. Mesepisternum smooth and polished with PP distinct. *Metasoma*: Metasomal terga smooth and shiny, tergum 1 with scattered microscopic PP, irregular in distribution; terga 2-4 with denser microscopic PP \varnothing 20 μ , IS = 0.5-1.5 at basal areas, impunctate at apical areas; posterior depressions of terga broad, weakly indicated; pygidial plate V-shaped with weakly raised triangular area. Sterna 2-5 weakly tessellate, shiny with minute PP, IS = 0.5-1 at apical areas.

Male: Unknown.

Type material: Holotype female, Qingshuihe, Inner Mongol Auton. Region, China, 16. vi. 1989 (H-l. Xu).

Remarks: This species is somewhat similar to *Andrena okinawana* Matsumura et Uchida, but is easily recognized from *okinawana* by the clypeus smooth and shiny all over, the process of labrum strongly emarginate, the flagellar segments reddish yellow beneath, the propodeal enclosure rugose all over, the legs with hind tibiae and tarsi yellow, the metasomal terga smooth and shiny with strong punctures.

Distribution: China (Inner Mongol Auton.Reg.).

Floral associations: Not available.

Flight records: Female: mid June.

Etymology: The specific name is derived from a Mongolian word, tal, meaning broad grassy plain.

III. Species group of *Andrena yunnanica*

This species group is represented by only one species. It is very characteristic by having a row of long spines on the hind femora and the tibial scopal hairs less branched.

8. *Andrena (Chlorandrena) yunnanica* n. sp.

(Fig. 5: A-E)

Female: BL 8.0 mm, WL 7.3 mm (n = 1).

Color: Flagellum brown beneath; mandible with apical third reddened; wing membranes infumate, moderately brown, veins and pterostigma brown; tibial spurs reddish brown;

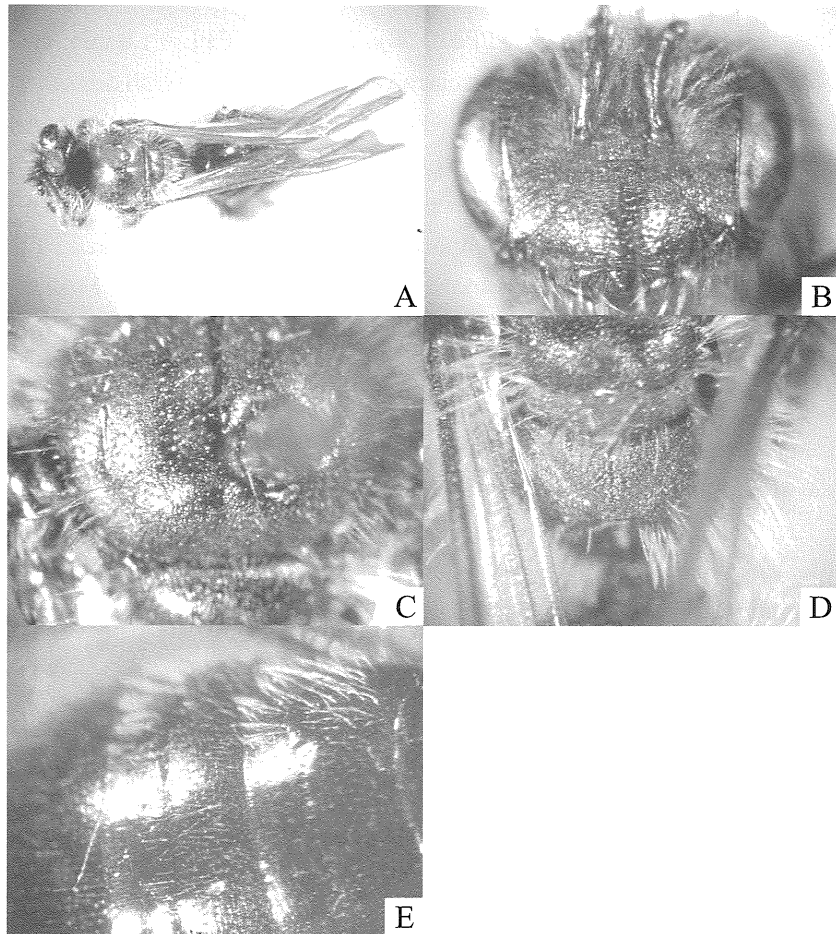


Fig. 5: A - E. *Andrena (Chlorandrena) yunnanica* n. sp., female. A: general habitus; B: head in frontal view; C: mesoscutum; D: propodeum; E: metasomal terga.

posterior depressions of metasomal terga reddish brown subhyaline.

Pubescence. Hairs on head moderately dense, blackish brown except vertex intermixed with dull white; those on clypeus $400\text{-}500\mu$; those on vertex $500\text{-}600\mu$; those on genal area short; facial fovea black. Hairs on mesoscutum and scutellum $300\text{-}700\mu$, sparse, brown mixed with long whitish peripherally; those on mesepisternum about 600μ , whitish; propodeal corbicula poorly developed, internal area with sparse, short, simple hairs; trochanteral floccus sparse, curling, dull whitish; femoral floccus loose; tibial scopal hairs rather long, loose, branched throughout. Hairs on metasomal terga rather short, sparse, brown; terga 2-3 with white hairs laterally; apical fasciae indistinct; caudal fimbria brown; sterna 2-5 with erect, sparse subapical fimbriae, dull white.

Structure: Head: HL/HW = 0.85. HW: MsW: MtW = 2.3: 2.3: 2.3. Vertex convex, densely tessellate with fine minute PP. OOD: POD: OCD = 0.5: 0.35: 0.2. FL1 > FL2+3,

FL2 = FL3, which is broader than long, intermediate flagellar segments about quadrate. Eyes with inner margins paralleled. Facial fovea deep, separated from eye by narrow polished space, extending to below a line at lower margin of antennal fossae, FVL = 1.0 mm, FVW = 0.2 mm. Supraclypeal area densely tessellate with weak rugulae. Face above antennal fossae with fine longitudinal rugulae and weak interrugal PP, dulling surface. Facial quadrangle quadrate (about 1.6:1.6). Clypeus well convex, finely tessellate, surface feebly shiny with weak, sparse PP $\approx 15\text{-}20\mu$, IS = 1-1.5, with median indistinct impunctate line, CPL = 0.7 mm. Process of labrum triangular, apex thickened and rounded. Labrum apical to process flat, without crista. Lower paraocular area shagreened. Malar space linear. Genal area broader than eye, GW:EW = 0.9 : 0.6, surface coarsely tessellate posteriorly, weakly tessellate with fine minute PP near eye. *Mesosoma*: Pronotum densely tessellate, with PP obscured. Mesoscutum finely tessellate, weakly shiny medially, surface with minute PP, IS = 1 or more. Scutellum as in mesoscutum. Propodeal enclosure large, well defined, apical area with truncated margin, densely tessellate at apical half, finely rugulose at about basal half; dorsal face densely tessellate with weak, minute PP. Mesepisternum finely tessellate, weakly shiny medially, PP obscured. Vein 1st *m-cu* meeting second submarginal cell at near end of cell. *Metasoma*: Metasomal terga smooth and shiny, tergum 1 with scattered microscopic PP, irregular in distribution; terga 2-4 with same microscopic PP, IS = 1.5-2 basally, impunctate apically; posterior depressions of terga broad, well indicated; pygidial plate V-shaped with raised triangular area. Sterna 2-5 weakly tessellate, shiny with minute PP, IS = 2-3 at apical areas.

Male : Unknown.

Type material: Holotype female, Xiaozhongdian, 3,200m, Yunnan Province, southwest China, 31. vii. 1984 (S-y. Wang).

Remarks: This is a unique species in this subgenus and can be separated from the other species in female by the tibial scopa with weakly branched hairs, the process of labrum triangular, the head and thorax with blackish hairs and the hind femur with a row of very long spines basally. It is apparently similar to some species of the subgenus *Oreomelissa* in the shapes of head and propodeum, but can be separable by the branched tibial scopal hairs and a row of spines on the hind femora.

Distribution: China (Yunnan Prov.).

Floral association: Not available.

Flight record: Female: late July.

Etymology: The specific name is derived from the type locality, Yunnan Province, China.

Acknowledgments

We are grateful to Prof. Emeritus Y. Hirashima and Prof. J. Yukawa of Kyushu University, Fukuoka, Prof. Yan-ru Wu of Institute of Zoology, Academia Sinica, Beijing, and Mr. F. Gusenleitner of Biol.-Zentr. Oberösterreichisches Landesmuseum, Linz, Austria and Mr. Dawut of Kyushu Univ. for their various help.

References

- Alfken, J. D., 1900. Drei neue *Anthrena*-Arten aus Japan. *Ent. Nachr.*, **26**: 177-179.
- Dylewska, M. 1987. Die Gattung *Andrena* Fabricius (Andrenidae, Apoidea) in Nord- und Mitteleuropa. *Acta Zool. Cracoviensia, Poland*, **30** (2) 12: 359-708.
- Gusenleitner, F. & M. Schwarz, 2001. Angaben zur Morphologie verschiedener, meist asiatischer *Andrena*-Arten (Hymenoptera: Apidae: Andrenidae). *Entomofauna*, **22** : 273-356.
- Hirashima, Y., 1952. Descriptions and records of bees of the genus *Andrena* from eastern Asia I (Hymenoptera, Andrenidae). *Mushi*, **23**: 37-43.
- Hirashima, Y., 1957. Descriptions and records of bees of the genus *Andrena* from eastern Asia III (Hymenoptera, Andrenidae). *Mushi*, **30**: 49-57.
- Hirashima, Y., 1960. Bees of the Amami Islands II (Hymenoptera, Apoidea). *Mushi*, **33**: 53-62.
- Hirashima, Y., 1963. Systematic and biological studies of the family Andrenidae of Japan (Hymenoptera, Apoidea) Part 2. Systematics, 2. *J. Fac. Agr., Kyushu Univ.*, **12**: 241-263
- Ikudome, S., 1999. Apoidea Apiformis. pp. 549-679, In Yamane, S., S. Ikudome & M. Terayama, *Identification Guide to the Aculeata of the Nansei Islands, Japan*. Hokkaido Univ. Press, Sapporo.
- Kim, C-w., 1970. *Illustrated Fauna & Flora of Korea*. 11(3). Seoul, 835 pp.
- Matsumura, S. & T. Uchida, 1926. Die Hymenopteren-Fauna von den Riukiu-Inseln. *Ins. Mats.*, **1**: 32-52, 63-77.
- Osytsnjuk, A. Z., 1993. New subgenera and new species of Palaearctic *Andrena* bees (Hymenoptera, Andrenidae). *Vestn. Zool.*, (3): 17-23.
- Osytsnjuk, A. Z., 1995. Andrenidae. pp. 489-527. In Lehr, P. A. (ed.) *Key to the Insects of Russian Far East in Six Volumes. Vol. IV. Neuropteroidea, Mecoptera, Hymenoptera*. Part 1. Nauka, St. Petersburg.
- Schmid-Egger, C. & E. Scheuchl, 1997. *Illustrierte Bestimmungstabellen der Wildbienen Deutschlands und Österreichs unter Berücksichtigung der Arten der Schweiz. Band III: Andrenidae*. Eigenverlag, Velden/Vils, 180 pp.
- Strand, E., 1915. Apidae von Tsingtau. *Ent. Mitt.*, **4**: 69-75.

- Tadauchi, O., 1988. A list of the family Andrenidae (Hymenoptera, Apoidea) of the Tsushima Island. *Trans., Nagasaki biol. Soc.*, (33): 1-9. (In Japanese.)
- Tadauchi, O. & C-e. Lee, 1992. The family Andrenidae of Korea (Hymenoptera, Apoidea) I. *Esakia*, (32): 47-58.
- Tadauchi, O., H-l. Xu & J-c. Paik, 1997. The family Andrenidae of Korea (Hymenoptera, Apoidea) II. *Esakia*, (37): 187-202.
- Warncke, K., 1968. Die Untergattungen der westpaläarktischen Bienengattung *Andrena* F. *Mem. Est. Mus. Zool. Univ. Coimbra*, (307): 1-110.
- Wu, Y-r., 1982. Studies on Chinese *Andrena* (*Chrysandrena*) with descriptions of a new species and a new subspecies (Hymenoptera: Andrenidae). *Sinozoologia*, 2: 63-66. (In Chinese with English summary.)
- Xu, H-l. & O. Tadauchi, 1998. Subgeneric positions and redescription of Strand's Chinese *Andrena* preserved in the German Entomological Institute (D.E.I., Eberswalde) (Hymenoptera: Andrenidae). *Esakia* (38): 89-103.

