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A new sandbee from the mountain region of central Taiwan: *Andrena taiwanella*, spec. nov.

(Insecta, Hymenoptera, Andrenidae)

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A new sandbee *Andrena (Micrandrena) taiwanella*, spec. nov. from Taiwan is described. It was caught at the beginning of July in the mountain region of central Taiwan at 1600-2500 m altitude. The new species is similar to *Andrena hirashimai* Tadauchi, 1985 and *Andrena sublevigata* Hirashima, 1966, both from Japan. From *A. hirashimai* Tadauchi *Andrena taiwanella* can be differentiated by the broader process of the labrum, the less tesselate structure of the scutum and the enclosure of propodeum wrinkled much more finer and being granulated in larger extension. By the more tesselate structure and the distinct punctation of the hairy scutum and scutellum the new species can be distinguished easily from *A. sublevigata* Hirashima. Up to now apart from *Andrena formosana* Cockerell, 1911 this sandbee is the second species of *Andrena* and the first species of the subgenus *Micrandrena* which is recorded from the main island of Taiwan.

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Introduction

Taiwan, with an total area of about 36,000 km², is located ca. 140 km east of the mainland of China on the Tropic of Cancer. The central mountain range from Keelung in the north to Kenting in the south (about 350 km in extension) is the dominant geological structure of the island with almost two third of its total area. It is characterised by 62 mountains over 3000 m altitude, with the 3997 m high Yushan (Jade Mountain) being the highest mountain of East Asia, east of the Himalaya. The climatic conditions of the higher mountain regions (over 2000 mts altitude) are temperate, even with snow in winter months, in contrast to the subtropical and tropical regions of Taiwan. Although the fauna of Taiwan is assigned to the Oriental region, parts of it (especially the fauna of the higher mountain regions) are very similar to the Eastern Palearctic region.

In June/July 2000 Miss Susanne Szczepanek and I had the possibility of joining Mr Wolfgang Schacht from the Munich Zoological Museum (Zoologische Staatssammlung München = ZSM) on a five weeks visit (15.6.-18.7. 2000) to Taiwan. By the great effort of Mr Keh Miin Chen (Taipei) and Prof. Jeng-Tze Yang (Department of Entomology, Chung-Hsing University, Taichung) we were able to collect insects in many interesting parts of Taiwan. At the beginning of July we visited the Rei En Shi region (at 2200-2500 m altitude) in the central mountain range about 40 km north east of Puli, where the new species of sandbee was collected. Further specimens of the new species were

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found near the TESRI-Station Ternge (at 1600 m altitude) and in the collection of the National Museum of Natural Science, Taichung.

The bee-fauna of Taiwan was studied mainly by Cockerell (1911a,b, 1912, 1927) and Strand (1913a, 1914a,b), who examined the extensive material of Sauter (Sauter's Formosa-Ausbeute) in the first half of last century. The bee fauna of mainland China was examined by Strand (1913b) Yasumatsu & Narisada (1935) and Yasumatsu (1946). The latter also studied the Far Eastern species of *Andrena* (Yasumatsu 1941). Wu (1982), Kim (1980) and Kim & Kim (1989) described species of *Andrena* of China (Xizang) and Korea. Detailed descriptions and records of the genus *Andrena* of Eastern Asia were given by Tadauchi & Lee (1992), Xu & Tadauchi (1995, 1996, 1997a,b, 2000) and Tadauchi & Xu (2000). Systematic studies on the species of *Andrena* of Japan were mainly done by Hirashima (1964, 1965a,b, 1966), Tadauchi (1985a,b) and Tadauchi et al. (1987a,b). The Japanese species of the subgenus *Micrandrena* were studied and described by Hirashima (1965b, 1966) and Tadauchi (1985a,b), both with keys to the species.

The collected females of *Micrandrena* from the Rei En Shi region of Taiwan are similar to the two Japanese species *Andrena hirashimai* Tadauchi, 1985 and *Andrena sublevigata* Hirashima, 1966, from which they can be distinguished by the characters given in the following description.

Methods and material

The material was studied by lightmicroscopy with a Leica MZ 6 binocular. The morphological documentation of the species by SEM was made with a Philips XL 20 SEM. For this the pinned specimens were fixed with Leit-C-Plast on the object table and were analysed with a low voltage anode by 1,6 kV (spot 4, integrate 4, slow scan 3).

Examined species:

Andrena hirashimai: 1♀, Amami-Ohshima Islands, Japan, 2.4.1958, leg. O. Takahashi, det. O. Tadauchi, ex coll. Tadauchi

Andrena sublevigata: 2♀♀, Moya, Aomori (Honshu), Japan/Mt. Daisen, Masumizu (Honshu), Japan, 30.5.1975/26.4.1975, leg. O. Tadauchi, det. O. Tadauchi, ex coll. Gusenleitner/Tadauchi

Andrena kaguya: 1♀, Chikuho-machi, Kuroubaru (Kyushu), Fukuoka Pref., Japan, 9.4.1975, leg. O. Tadauchi, det. O. Tadauchi, ex coll. Gusenleitner

Andrena hanedai: 1♀, Suwara, Ohno, Fukui, Japan, 9.9.1973, leg. Y. Haneda, det. O. Tadauchi, ex coll. Tadauchi

Andrena brassicae: 1♀, Miyano, Hiroshima (Honshu), Japan, 15.4.1975, leg. O. Tadauchi, det. O. Tadauchi, ex coll. Gusenleitner

Andrena komachi: 1♀, Shimohanda, Ôita (Kyushu), Japan, 4.4.1975, leg. O. Tadauchi, det. O. Tadauchi, ex coll. Gusenleitner

Nearly all Central European species of *Micrandrena* were investigated with the material of the ZSM. Furthermore *Andrena alfkenella, A. minutula, A. minutuloides* and *A. subopaca* were studied by SEM during earlier investigations (Dubitzky 2000).

The used morphological terminology is according to Michener (2000).

Andrena taiwanella, spec. nov.

Figs 1-6, 9, 11, 14

Types. Holotype: ♀, Central Taiwan (Republic of China, R.O.C.), Rei En Shi region, Road No. 14, 40 km North East of Puli, ca. 4 km East of Tsuifeng, 2300-2500 m, 24°08'N/121°12'E, 1.7.2000, leg. Andreas Dubitzky. The Holotype is deposited at the collection of the Department of Entomology, Chung-Hsing University, Taichung, Taiwan. – Paratypes: 4♀♀, same data as Holotype, leg. Andreas Dubitzky; 1♀, same data as Holotype leg. Susanne Szczepanek; 1♀, Central Taiwan, Kaoshiung County, TESRI-Station Ternge, 1600 m, 23°07'N/120°47'E, 6.7.2001, leg. Andreas Dubitzky; 1♀, Taiwan, Kaoshiung, Yushan National Park, yellow pan trap, 24.-28.10.1990, leg. C. K. Starr. Two Paratypes are deposited at the Zoologische Staatssammlung München, the others are deposited at the National Museum of Natural Science, Taichung (1♀) and the private collections of the author (3♀♀) and Miss Susanne Szczepanek (1♀).

Floral record: The Holotype and all Paratypes from Tsuifeng were found on *Filipendula* spec. (Rosaceae), where they were collecting pollen of the flowers.

Description

Female. Length 6.8-7.1 mm ($\bar{x}$ = 6,95). Habitus see Figs 1 and 2.

Structure. Head ca. 1.2 times broader than long in frontal view (Figs 2, 3). Process of labrum rectangular, about two times broader than long, with convex apical margin (Figs 3, 6). Tip of mandibles with two teeth, inner margin of

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Figs 1, 2. Habitus of *Andrena taiwanella*, spec nov., ♀. **1.** Lateral view of holotype. **2.** Dorsal view of paratype.

mandibles angeled at ca. 100° (Fig. 2). Clypeus convex, weakly flattened in the middle. Cuticula of clypeus weakly tesselated, sometimes shiny, with dispersed large punctures (Fig. 6). Distance between the single punctures of the disc of clypeus ≥1 (about the diameter of one puncture or more), distance of punctures of the lateral front margin of clypeus <1. Disc of clypeus with impunctate median line. Facial fovea (FOV) with the upper end reaching the basal margin of lateral ocelli and with the lower end nearly reaching the upper margin of the clypeus (Fig. 3). Upper third of FOV almost twice as broad as in its lower two third (Fig. 4).

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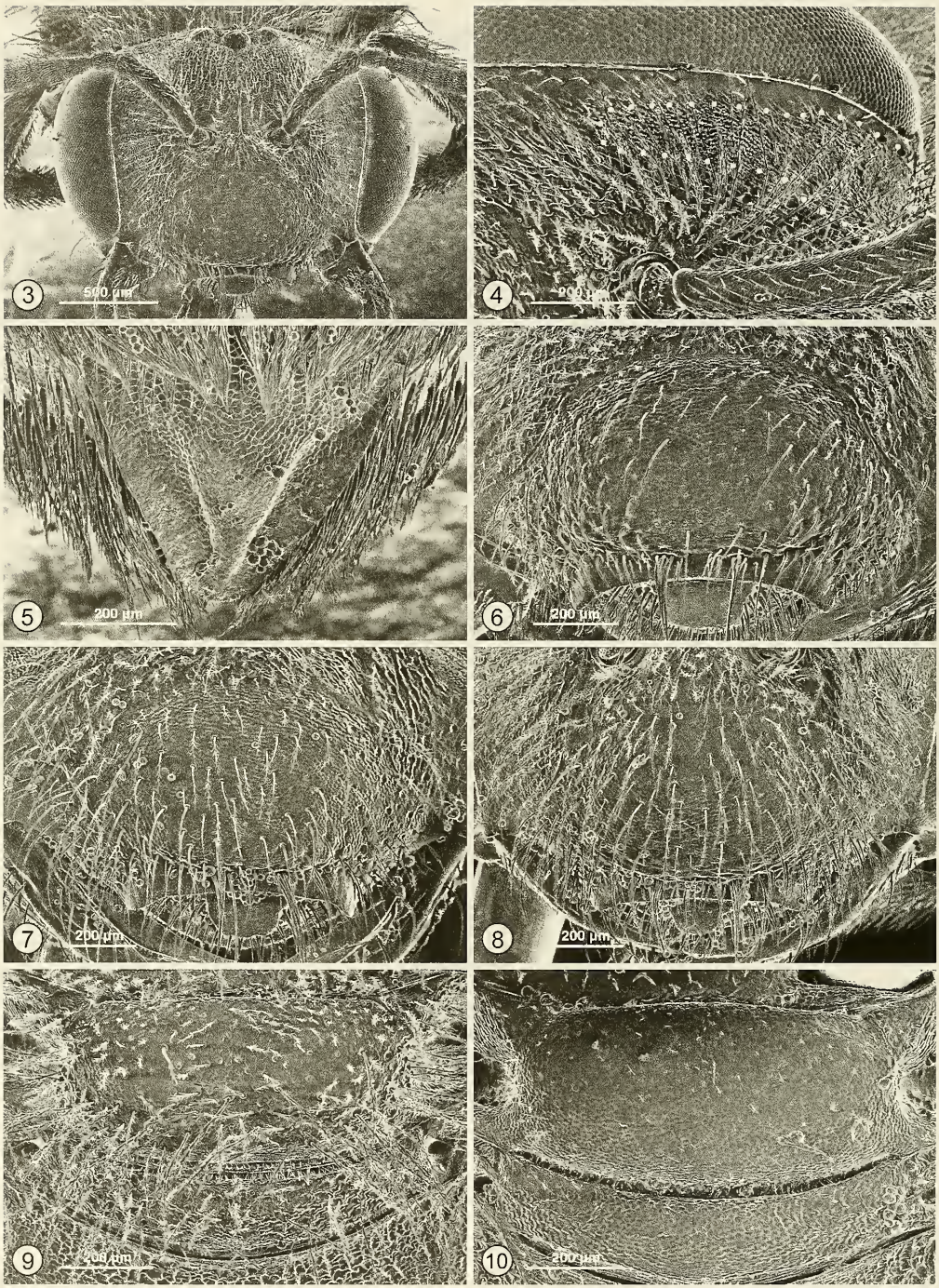

Figs 3-5. *Andrena taiwanella*, spec nov., ♀. **3**. Head in frontal view. **4**. Facial fovea (FOV), orientation: left side – anterior, right side – posterior, dotted line: outline of FOV. **5**. Pygidial plate.
Figs 6-10. Comparison of *Andrena taiwanella*, spec nov., ♀ (Figs 6, 9) with *Andrena hirashimai* Tadauchi, ♀ (Fig. 7) and *Andrena sublevigata* Hirashima, ♀ (Figs 8, 10). **6-8**. Clypeus and process of labrum. **9, 10**. Scutellum (top) and metanotum (bottom).

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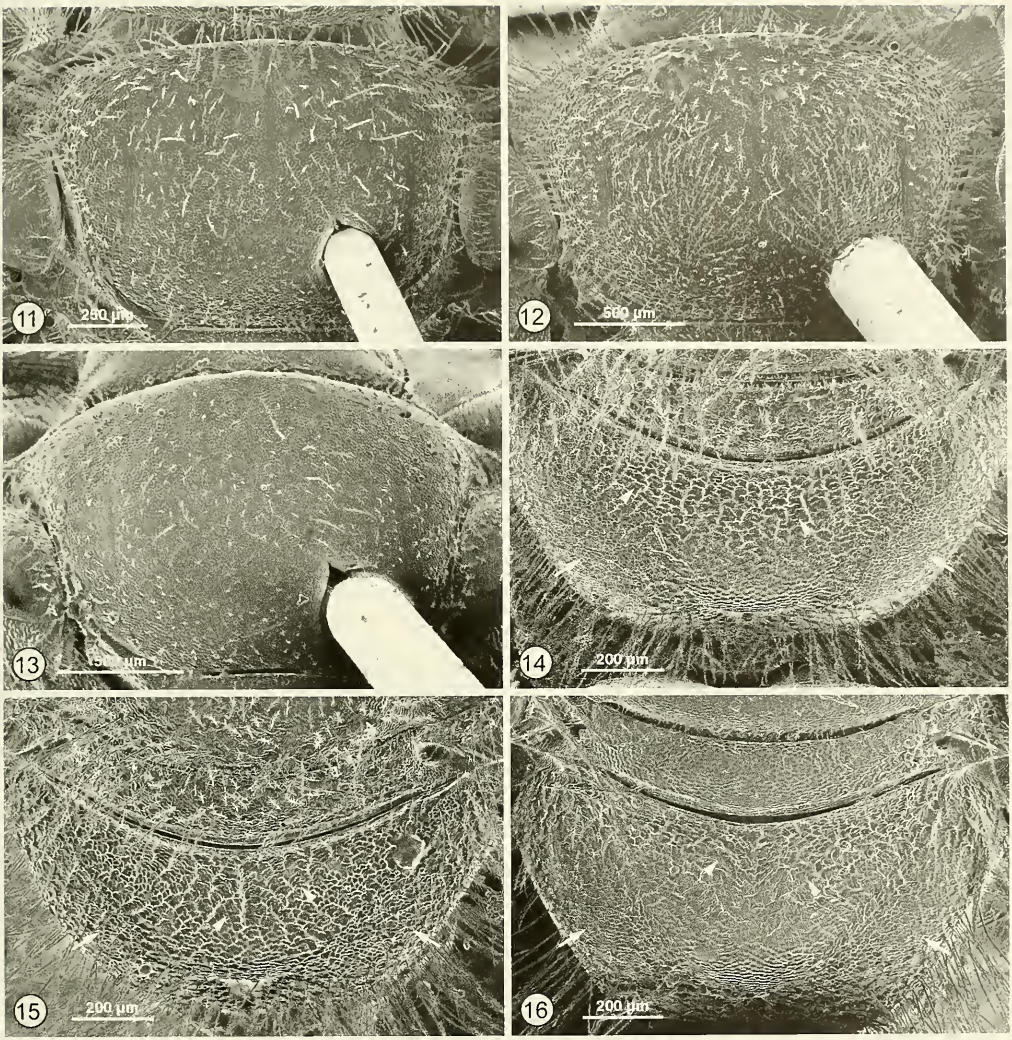

Figs 11-16. Comparison of *Andrena taiwanella*, spec nov., ♀ (Figs 11, 14) with *Andrena hirashimai* Tadauchi, ♀ (Figs 12, 15) and *Andrena sublevigata* Hirashima, ♀ (Figs 13, 16). **6-8**. Clypeus and process of labrum. **9, 10**. Scutellum (top) and metanotum (bottom). **11-13**. Scutum, orientation: anterior – top, posterior – bottom. **14-16**. Dorsal propodeum with propodeal enclosure (arrowheads) and lateral parts (arrows), orientation: anterior – top, posterior – bottom. The arrowheads indicate the space between the wrinkles of the propodeal enclosure.

Almost no free space between the upper third of the FOV and the compound eye, between the lower two third of the FOV and the compound eye free space of nearly half of the lateral extension of the lower FOV. Frons with clear, longitudinal grooves from the ocelli down to the upper margin of the clypeus (Fig. 3). Distinct keel between the basis of antennae. Cuticula between ocelli and the compound eyes dull to weakly shiny. Distance between lateral ocelli and the upper margin of the vertex only a little bit shorter than the diameter of lateral ocellus (ca. 0.8×∅). Scape short, not reaching lower margin of the median ocellus. Third antennal segment as long as fourth and fifth together (Fig. 2). Segments 4 and 5 broader than long, 6-10 as long as broad, 11 to 12 longer than broad (in frontal view). Genal area tesselate, in lateral

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view as broad as compound eye. Pronotum dull, the apical transverse groove not notched in middle. Scutum weakly tesselate, dull (area along posterior margin) to shiny (disc area), with indistinct dense punctation (Fig. 11). Distance of the small weak punctures <1. Scutellum weakly tesselate with two flat, smooth and shiny lateral humps (Fig. 9). Punctation of scutellum dispersed and indistinct (distance >1). Metanotum tesselate to granulate, dull (Fig. 9). Propodeal enclosure with fine, dense wrinkles only in basal half, apical half totally granulated (Fig. 14). Lateral parts of dorsal propodeum smooth to weakly granulated, shiny (Fig. 14). Lateral propodeum weakly tesselate, shiny. Metasomal terga 1-4 tesselate and impunctate. Metasomal tergum 5 with irregular, basal punctation. Depressions of metasomal terga weakly (1-3) to clearly (4) indicated. Depression of metasomal tergum 2 less than the half of the tergums length in extension (ca. 0.4), depressions 2-4 over the half of the length of their terga (ca.0.6). Metasomal sternits weakly tesselate, shiny, with distinct, dense punctation (>1). Pygidial plate triangular, weakly tesselated, dull (Fig. 5). Elevated triangular centre surrounded by lower edge of ca. ¼ of basal pygidial plate's extension.

Tab. 1. Abbreviations: d: distance, l/w: length extension/wide extension, ldp: lateral parts of dorsal propodeum, pe: propodeal enclosure.

character	*A. taiwanella*, spec nov.	*A. hirashimai* Tadauchi	*A. sublevigata* Hirashima
process of labrum	broad, rectangular l/w = 0.47 (Fig. 6)	narrower, l/w = 0.67 (Fig. 7)	small triangular, l/w = 0.71 (Fig. 8)
clypeus	punctation big, distinct; impunctate median line; sparse, indistinct, scanty hairs only along lateral and lower margin; disc without any hairs (Fig. 6)	punctation small, indistinct, regular without impunctate median line; distinct, dense hairs regularly spread all over the clypeus (Fig.7)	punctation distinct; impunctate median line; dense distinct hairs regularly spread all over the clypeus (Fig. 8)
facial fovea (FOV)	upper third of FOV ca.2 times broader than lower ⅔ of FOV; pubescence brownish to yellowish (Fig. 4)	FOV scarcely getting narrower from up to down; pubescence whitish	FOV continuously getting narrower to ⅓ of maximum wide from up to down; pubescence yellowish white
genal area	sparse hairs	dense hairs	sparse short hairs
scutum	weakly tesselate, disc shiny to dull, dense punctation (d >1), disc less hairy (Fig. 11)	tesselate, disc dull, very dense punctation (d<1), disc more hairy (Fig. 12)	smooth to weakly tesselate disc shiny, indistinct dispersed punctation (d>1) of very small punctures, disc nearly bare (Fig. 13)
scutellum	weakly tesselate, with shiny lateral parts, dispersed punctation and scanty long hairs (Fig. 9)	tesselate, dull all over, punctation and hairs more distinct and dense than by *A. taiwanella*	smooth and shiny all over small, indistinct, dispersed punctation, completely bare (Fig. 10)
metanotum	dispersed hairs, dull (Fig. 9)	dispersed hairs, dull	completely bare, dull (Fig. 10)
propodeum	fine, dense wrinkles with almost no space between only in basal half of pe; apical half granulated; ldp granulate to smooth, shiny, without any hairs (Fig. 14)	pe with strong, wide wrinkles, extended nearly to apical end of pe, with dull, granulated space between; ldp granulate to slightly wrinkled, dull, with single sparse hairs (Fig. 15)	pe with fine, wide wrinkles only in basal half of pe, with smooth, shiny space between; at least apical half granulated; ldp granulate to smooth, without hairs (Fig. 16)

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Integumental colour. Colour of body black. Mandibles black, reddened apically. All segments of antennae black, also beneath. Legs and basitarsi black, tarsi and claws brownish, spurs pale yellowish brown. Tegulae dark brown anteriorly to semihyaline posteriorly. Wings slightly brownish to transparent, stigma dark brownish, veins paler brown. Pygidial plate black, sometimes dark reddened apically.

Pubescence. Hairs on head pale yellowish grey. Clypeus with sparse, pale hairs only at the ventral and lateral margins. Labrum and posterior margin of mandibles with long, yellowish brown hairs. Frons with scanty, sparse hairs and long, distinct hairs between FOV and basis of antennae. FOV brownish above, yellowish brown below. Genal area with dispersed, whitish-transparent, short to medium-long hairs. Vertex with scanty, long and sparse greyish hairs. Occiput with distinct, long and dense yellowish grey, strong hairs. Scape anteriorly with yellowish grey hairs (length: ca. ∅ scape). Apical part of scutum with strong, long, yellowish grey hairs; lateral and posterior parts of scutum with strong, short, yellowish grey hairs. Disc of scutum with very short, indistinct, sparse hairs and few, scanty long hairs (Fig. 11). Lateral and posterior parts of scutellum and metanotum with long, distinct, strong yellowish grey hairs (Fig. 9). Lateral parts of thorax with long, yellowish grey to whitish hairs. Propodeum broadly bare dorsally. Dorsal fringe of propodeal corbicula of long yellowish grey, branched hairs, bottom of propodeal corbicula with single, dispersed, simple, transparent hairs. Hairs on legs short, pale yellowish brown; inner side of basitarsi with brownish hairs. Flocculus of long, branched, silvery whitish hairs. Tibial scopa with yellowish to brownish grey, simple hairs; along upper and lower margin with single dispersed feathered hairs. First metasomal tergum almost naked, with only few dispersed, small, whitish hairs laterally. Metasomal terga 2 and 3 with poorly developed lateral white hair fringes with an extension of only ⅕ of the tergas wide on each side (Figs 1,2). Tergum 4 with sparse, dispersed, whitish transparent hairs on disc and long, strong hairs along lateral and posterior margins. Tergum 5 and 6 with strong, feathered, brownish grey hairs. Metasomal sternits 2-4 with indistinct, sparse, short (basal half) and long (posterior ending of sternits), whitish hairs. Sternites 5 and 6 with distinct yellowish grey hairs.

Male. unknown.

Diagnosis: By the first transverse cubital vein ending very close to the pterostigma, the rather large enclosure of dorsal propodeum, the incomplete propodeal corbicula and the lack of prominent hair bands at the end of metasomal terga the new species of *Andrena* is clearly characterised as a member of the subgenus *Micrandrena*.

The new species is similar to *Andrena hirashimai* Tadauchi, 1985 and *Andrena sublevigata* Hirashima, 1966, both from Japan. From *A. hirashimai* the new species is separated mainly by the broader process of labrum, the shape of FOV, the less tesselated structure of the scutum and the propodeal enclosure wrinkled much more finer and closer and granulated in larger extension. The more hairy, tesselate and punctate scutum and scutellum as well as the closer wrinkled propodeal enclosure are the main characters of which *A. taiwanella* can easily be distinguished from *A. sublevigata*.

In Table 1 the differences between *Andrena taiwanella*, spec. nov. and the closely resembled species *A. hirashimai* Tadauchi and *A. sublevigata* Hirashima are shown.

Determination key

For recognition of *A. taiwanella*, spec. nov. the new species has been integrated in the key of Japanese *Micrandrena* (Tadauchi 1985b), which therefore should be modified as follows:

4. Propodeal enclosure finely wrinkled only in basal half, at least half of its total length widely granulate apically ..... 5.
– Propodeal enclosure strongly wrinkled at least ⅔ in extension, only about ⅓ of its total length apically granulate ..... 6.

5. Propodeal enclosure densely wrinkled, with almost no free space between single wrinkles; mesoscutum hairy, with distinct, dense punctation; scutellum with distinct, long, yellowish grey hairs, punctate ..... *taiwanella*, spec. nov.
– Propodeal enclosure dispersed wrinkled, with smooth distinct space between the

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weak wrinkles; mesoscutum nearly bare, with small, indistinct, dispersed puncturation; scutellum totally bare, impunctate ..... *sublevigata*

6.(5) Mesepisternum smooth to weakly tesselate, shiny; mesoscutum nearly smooth to weakly tessellate ..... *brassicae*

– Mesepisternum densely tesselate .... 7(6).

Numbers in brackets: corresponding numbers in Tadauchi 1985b. For continuation see Tadauchi 1985b No. 6!

Discussion

A. taiwanella, spec. nov. is the 13th species of *Micrandrena* which is recorded from East Asia (Tadauchi 1985, Tadauchi & Lee 1992).

Apart from *Andrena formosana* Cockerell, 1911, *Andrena taiwanella*, spec. nov. is the second species of *Andrena* and the first record of the subgenus *Micrandrena* recorded from the main island of Taiwan. Tadauchi recorded another species of *Micrandrena* from the Nansei Islands near Taiwan (Tadauchi, pers. com.). Possibly the new sandbee is an endemic species of the higher mountain regions (>2000 m) of central Taiwan. Because of the palearctic character of this region certainly some more species of *Andrena* can be expected there. For the distribution of *Andrena taiwanella* further investigations and data of other parts of the central mountain range of Taiwan would be necessary. Perhaps the new species also occurs in other, higher mountain regions of Asia, especially the Himalaya as it is known for other insects e.g. the Ichneumon-fly *Stenodontus regieri* (Diller et al. 1996).

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Chinese Abstract

本文描述臺灣地花蜂科 *Micrandrena* 亞屬一新種 *Andrena taiwanella* spec. nov.。此新種於七月上旬採自台灣中部瑞岩溪海拔 2300 至 2500 公尺處。本新種與日本產 *A. hirashimai* TADAUCHI 1985 和 *A. sublevigata* HIRASHIMA 1966 相似。*A. taiwanella* 與 *A. hirashimai* TADAUCHI 之差異在於具較寬廣上唇突起，盾片花紋較少以及環繞前伸腹節之皺折較細微且大部分區域具有粒狀突起；與 *A. sublevigata* HIRASHIMA 1966 之不同在於本種具毛的盾片及小盾片上有較多花紋及明顯的斑點。至目前爲止，在台灣除原有之記錄之 *A. formosana* COCKERELL 1911 外，本種爲臺灣 *Andrena* 屬中被發現的第二個種類，而所屬 *Micrandrena* 亞屬則是首度記錄於台灣。

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