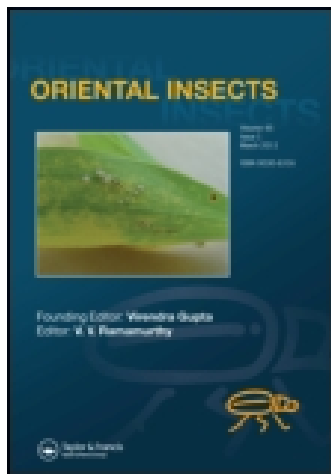


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## Oriental Insects

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### Monodontomerus Westwood (Hymenoptera: Torymidae) from China with description of a new species

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Published online: 17 Jul 2012.

To cite this article: Hui Xiao, Tian-Yang Jiao & Ya-Xue Zhao (2012) Monodontomerus Westwood (Hymenoptera: Torymidae) from China with description of a new species, *Oriental Insects*, 46:1, 69-84, DOI: [10.1080/00305316.2012.689483](https://doi.org/10.1080/00305316.2012.689483)

To link to this article: <http://dx.doi.org/10.1080/00305316.2012.689483>

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## ***Monodontomerus* Westwood (Hymenoptera: Torymidae) from China with description of a new species**

Hui Xiao<sup>a\*</sup>, Tian-Yang Jiao<sup>b</sup> and Ya-Xue Zhao<sup>b</sup>

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(Received 1 November 2011; final version received 14 February 2012)

Four species of *Monodontomerus* Westwood (Hymenoptera: Torymidae) from China are redescribed and a new species *M. longianellus* Xiao and Zhao sp. nov., reared from *Chalicodoma desertorum* Morawitz (Hymenoptera: Apidae) has been described. *Monodontomerus osmie* Kamijo is documented as a new species from China, and a key to the species has been provided. The voucher specimens are deposited with the Zoological Museum, Institute of Zoology, Chinese Academy of Sciences, Beijing.

**Keywords:** *Monodontomerus*; China; new record; key; *M. longianellus* sp. nov

### **Introduction**

*Monodontomerus* was erected by Westwood (1833) with the type species *Monodontomerus obscurus* under Toryminae (Torymidae). This genus resembles the *Amoturoides* Girault of Monodontomerini, but is distinguished in its scutellum and mesoscutum – its frenum is smooth, frenal line grooved and mesoscutum longer than scutellum; in *Amoturoides*, scutellum is without its frenum separated and mesoscutum shorter or only as long as scutellum. *Monodontomerus* also resembles the *Zdenekius* Grissell, but is distinguished by its distinct frenal line, hind femur narrow, with a sharp tooth, and hypopygium normal; in *Zdenekius* frenal line is shallow or indistinct, metafemur is somewhat swollen and with a broadly rounded tooth, and prominent hypopygium.

This genus is widespread with 39 species, of which three are from the mainland China. This study adds another species and a new record. The new species, *Monodontomerus longianellus* sp. nov., was reared from *Chalicodoma desertorum* Morawitz (Hymenoptera: Apidae). A key to the Chinese species is also provided based on females. The voucher material is deposited with the Institute of Zoology, Chinese Academy of Sciences, Beijing, China.

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**Material and methods**

The terminology follows mostly Graham (1969), Boucek (1988) and Gibson et al. (1997), and the specimens were studied in LEICA MZ16 stereozoom microscope. Body length given is excluding ovipositor and in mm, and other measurements are in ratios. Voucher specimens are in card-mounts and deposited with the Institute of Zoology, Chinese Academy of Sciences, Beijing (IOZCAS).

**Genus *Monodontomerus* Westwood**

*Monodontomerus* Westwood (1833: 443). Type species *Monodontomerus obscurus* Westwood

Liao *et al.* (1987: 39–41); Zerova *et al.* (1992: 185); Narendran (1994: 36–37); Zerova and Seryogina (1999: 18).

*Paroligosthenus* Cameron (1913: 94–95); Waterston (1922: 2)

*Diagnosis*

Head wider than height in front view; antennal insertion above lower ocular line, antenna longer and stout, formula 11173; thorax convex, pronotum narrower than and about 0.5× as long as mesoscutum; notauli distinct and complete; scutellum convex, frenal line distinct and frenum smooth without punctures; groove of punctures on posterior margin of scutellum complete or interrupted; propodeum with median foveolate area, median carina complete or bifurcated in basal part (Figures 5, 11, 17, 23 and 30); marginal vein longer than postmarginal, postmarginal vein longer than stigmal; metacoxa arched dorsally, metafemur with a single tooth beyond middle (Figures 6, 13, 18, 25 and 32), metatibia straight and with two spurs; gaster sessile, not compressed strongly; hind margin of tergites not emarginate and short ovipositor.

*Biology*

Some species develop as parasites in cocoons of Lepidoptera (sometimes as hyperparasites) and sawflies (Symphyta), others in cells of solitary bees and sometimes of wasps (Boucek 1988). More than 200 species of Diptera, Hymenoptera, Lepidoptera, Mantodea and Coleoptera under 36 families, such as Apidae, Braconidae, Cynipidae, Lasiocampidae, Lymantriidae, Sarcophagidae, Mantidae and Eucnemidae are known so far as hosts (Grissell 1995; Noyes et al. 2001).

*Distribution*

Widespread except the Australian region.

*A. Key to the species from China*

1. Groove of punctures on posterior margin of scutellum interrupted (Figure 4); first tergite smooth in dorsal view; metafemur with its tooth thin (Figure 6)..... *minor*

- Groove of punctures on posterior margin of scutellum deep and continuous; first tergite smooth or with sculpture; metafemur with tooth normal.....2
2. Area between sockets and inner eyes with longitudinal groove (Figure 8); median carina in the basal part of propodeum not bifurcated (Figure 11); thorax dark blue and with purple reflection ..... *osmiae*  
 Area between sockets and inner eyes smooth, without any groove; median carina in basal part of propodeum either bifurcated or not; thorax without purple reflection ..... 3
3. Median foveolate area on propodeum triangular (Figure 17); metafemur with the tooth as long as the one on its posterior margin (Figure 18)..... *dentipes*  
 Median foveolate area on propodeum not triangular (Figures 23, 30); metafemur with the tooth utmost half as long as the one on its posterior margin (Figures 25, 32) ..... 4
4. Anellus transverse, each funicular segment with two rows of sensilla (Figure 22); median carina in basal part of propodeum bifurcated (Figure 23)..... *aeneus*  
 Anellus squarish, each funicular segment with three rows of sensilla (Figure 28); median carina in basal part of propodeum not bifurcated (Figure 30)..... *longianellus* sp. nov.

*B. Descriptions of species*

1. *Monodontomerus minor* (Ratzeburg 1848) (Figures 1–7)

*Torymus minor* Ratzeburg (1848: 178); Steffan (1952: 293); Liao *et al.* (1987: 39–40).

*Monodontomerus interruptus* Forster (1860: 133–135); Steffan (1952: 293).

*Monodontomerus virens* Thomson (1876: 68); Boucek (1954: 68).

*Monodontomerus spectabilis* Matsumura (1926: 33–34); Kamijo (1963: 96).

*Monodontomerus dilinae* Palmen (1940: 32–34); Steffan (1952: 293).

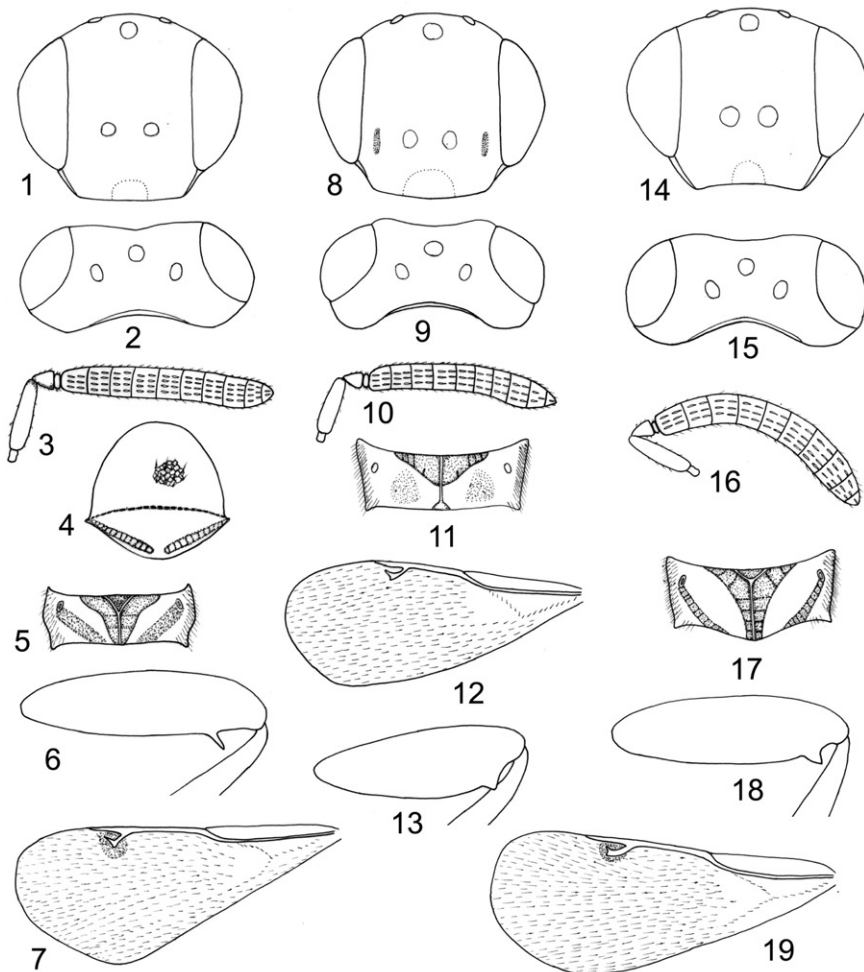
*Monodontomerus subobsoletus* Gahan (1941: 480–482); Steffan (1952: 293).

*Description*

*Female*

Body bluish green, gaster with metallic reflection; antennae dark brown; coxa concolorous with body, mid leg yellowish green, metafemur green and with metallic reflection; and tegula yellowish green.

Head 1.4× as height in front view, face with shallow reticulation and sparse hairs (Figure 1); eyes large, separated by about 1.2× eye height, malar space 0.28× as eye height; gena slightly convergent ventrally; and clypeal margin truncate. Head 1.97× as wide as long in dorsal view (Figure 2); and POL 2.5× OOL. Antennae not clavate (Figure 3); pedicel and flagellum combined 1.8× as long as head width; scape not reaching anterior ocellus, 0.64× as eye height, 3.8× as long as broad; pedicel 1.4× as long as broad; anellus transverse, F1 1.3× and F2-F7 1.1× as long as broad, respectively; and each funicular segment with two rows of sensilla. Relative



Figures 1–19. 1–7, *Monodontomerus minor*, female: 1, head frontal view; 2, head dorsal view; 3, antenna; 4, scutellum; 5, propodeum; 6, metafemur; 7, fore wing; 8–13, *M. osmiae*, female: 8, head frontal view; 9, head dorsal view; 10, antenna; 11, propodeum; 12, fore wing; 13, metafemur; 14–19, *M. dentipes*, female: 14, head frontal view; 15, head dorsal view; 16, antenna; 17, propodeum, 18, metafemur; 19, fore wing.

measurements: head width 66, height 47.5, dorsal length 33; eye height 28, eye length 23, eye space 34; temple 12; pedicel and flagellum combined 85.

Mesosoma 1.4× as long as broad; mesoscutum densely reticulate and with dispersed, small, piliferous puncturations; scutellum convex, 1.25× as long as broad, frenal line distinct, frenum smooth, and groove of puncturation along the margin of posterior scutellum interrupted in the middle (Figure 4). Median foveolate area in the hind margin of propodeum almost triangular (Figure 5), and median carina bifurcated in basal one third. Metacoxa 2.1× as long as broad, and with a slim tooth beyond middle (Figure 6), metafemur 3.3× as long as broad, and metatibia with two spurs. Fore wing 2.4× as long as broad, with brown infumation around stigmal vein (Figure 7); and costal cell with two rows of hairs on its upper surface, basal vein with 11 hairs. Gaster sessile, and ovipositor 0.37× as long as body.

Relative measurements: mesosoma length: width 105:54, marginal vein 31, postmarginal vein 21, stigmal vein 9, metacoxa length: width 63:30, metafemur length: width 72:22, and metatibia spur length: metatibia width 4:7.

Body length 4.0 mm, and ovipositor sheath 2.2× as long as hind tibia.

#### Male

Body length 3.0 mm, almost same as female, but meso and metafemora yellowish green.

#### Specimens examined

4f, 2m, Gansu: Pingyuan, vii.1986, ex. *Illiberis pruni* Dyar, Coll. Shou-min Liu; 2f, m, Qinghai: Huangyuan, Shiyazhuang, 9.vi.1997, Coll. Chao-dong Zhu; 3f, m, Zhejiang: Yandang Mt, 27.vi.1964, Coll. Ding-xi Liao; 4m, Jiangsu: Nnanjing, iii.1980, Coll. Xue-zhong Zhang; m, Yunnan: Zhanyi, 19.iv.1957, Coll. Xiu-fu Zhao; f, Yunnan: Gejiu, Shiyanzai, vii.1980, Coll. Guo-xiu Li; 3f, Yunnan: Simao, 2.v.1962; 2m, Shanxi: Yanbei, 1978, Coll. Jian-guo Chu; 2m, Shanxi: Taigu, viii.1979, Coll. Zhan-gu Li; 2f, Shanxi: 10.v.1980, ex. pupae of *Melalopha anachoreta*, Coll. Ci Yu; f, Shanxi: Pianguan, Coll. Yong Jiao; m, Xinjiang: Aksu, 13.vi.1965, Coll. Ding-xi Liao; f, Xinjiang: Aksu, 16.vi.1965, Coll. Ding-xi Liao; f, Xizang: Qamdo, 3400m, 15.viii.2001, Coll. Chao-dong Zhu; m, Fujian: 1975, ex. pupae of *Dendrolimus* sp., Coll. You-gong Li; f, Guangzhou: Shibe, 10.iv.1955; f, Hainan: Tongshi, 23.iv.1960, Coll. Gui-fu Li; f, Liaoning: Benxi, 25.ix.1989; 2f, Guangxi: Bobei, Sheguang, 200 m, 30.x.1983, ex. pupae of conifer sawflies, Coll. Ji-jian Wang; f, Jiangxi: Nanchang, 2.v.1956, ex. *Pinus massoniana* Lamb, Coll. Chun-sheng Zhang; 4f, Jilin: Jian, 24.vi.1962, ex. larvae of *Malacosoma neustria testacea* Motsc, Coll. Tai-lu Chen; 2f, m, Jiling: Changchun, viii.1980, Coll. Yu-ying Qiu; 9f, 5m, Jiling: Yanji, 20.vi.1962, ex. larvae of *Illiberis pruni* Dyar, Coll. Tai-lu Chen; 6m, Jiling: Yanbian, 26.vi.1962, ex. larvae of *Illiberis pruni* Dyar larvae, Coll. Tai-lu Chen; 4m, Jiling: Da'an Xian, Anguang, 30.viii.1986, ex. *Clostera anachoreta* Fabricius, Coll. Yu-zhi Niu; 5f, m, Jiling: Daan, 1.ix.1986, ex. *Clostera anachoreta* Fabricius, Coll. Shu-hua Zhao; f, 7m, Shaanxi: Xianyang, 3.vi.1975, ex. Pupae of Noctuidae, Coll. Ding-xi Liao; 5f, Shaanxi: Liuba, 29.vi.1976; 2f, m, Shaanxi: Wugong, iv.1964, Coll. Yao Zhou; 3f, 3m, Ningxia: Yinchuan, viii.1978, ex. pupae of *Cerura menciiana* Moore; 2f, 5m, Ningxia: Yinchuan, 20.vi.1975, ex. pupae of brush-footed butterfly, Coll. Ding-xi Liao; f, m, Ningxia: 6.v.1978; 3f, 4m, Nei Mongol: 26.vi.1980, ex. pupae of *Aporia* sp., Coll. Xiu-yuan Bai; 4f, Nei Mongol: Hohhot, 4.v.1977, ex. *Cerura menciiana* Moore; m, Nei Mongol: Hohhot, viii.1977, Coll. Ding-xi Liao; 2f, Nei Mongol: Huangqi, 28.v.1985, Coll. Qiang-hua Shao; 4f, 2m, Nei Mongol: Jining, viii.1980, Coll. Xuchang Huang; 2f, Nei Mongol: Xiwuqi, 13.viii.1982, ex. ermine moths, Coll. Qiang-hua Shao; 4f, Nei Mongol: Xiwuqi, 5.viii.1982, ex. ermine moths, Coll. Qiang-hua Shao; 3f, Nei Mongol: Heling, 9.ix.1980, ex. *Gastropacha populifolia* Esper, Coll. Qiang-hua Shao; 4f, 2m, Nei Mongol: Baotou, 2.iv.1983, ex. pupae of *Cerura menciiana* Moore, Coll. Zong-ren Liu; fm, Nei Mongol: Baotou, 4.iv.1982, ex. pupae of *Cerura menciiana* Moore, Coll. Zong-ren Liu; 3f, 2m, Nei Mongol: Hohhot, 7.v.1981, ex. Pupae of *Cerura menciiana* Moore, Coll. Qiang-hua Shao; f, m, Nei Mongol: Baotou, 19.vii.1979, ex. *Malacosoma neustria testacea* Motsc, Coll. Qiang-hua Shao; 2f, 2m, Nei Mongol: Tucheng, 3.v.1981, Coll.

Xu-chang Huang; f, Nei Mongol: Chifeng, 20.vii.1988, ex. Pupae of *Dendrolis tabulaeformis* Tsai et Liu, Coll. Ding-xi Liao; f, Nei Mongol: Chifeng, 20.xi.1980; 7f, Liaoning: Liaoyang, 23.vi.1982, ex. *Malacosoma neustria testacea* Motsc, Coll. Xing-bo Li; 3f,2m, Liaoning: Liaoyang, 8.vii.1980, Coll. Yu-bao Zhang; m, Liaoning: Liaoyang, 17.iv.1980, ex. *Cnidocampa flavescens* (Walker), Coll. Yu-bao Zhang; 5f,m, Liaoning: Liaoyang, 27.vi.1982, ex. *Malacosoma neustria testacea* Motsc; 2f,2m, Liaoning: Liaoyang, 9.viii.1982, ex. Larvae of *Lymantria dispar* (L.), Coll. Xing-bo Li; 3f, Liaoning: Liaoyang, Tangma, 31.viii.1980, Coll. Cheng-pu Tang; f, Liaoning: Xingcheng, 30.xi.1981, Coll. Yan-wu Zhao, Yan Li; f, Liaoning: Xingcheng, 30.viii.1981, ex. pupae of *Dendrolimus* sp., Coll. Yan-li Zhao; fm, Liaoning: Xingcheng, 30.xi.1981, Coll. Yan Li; f, Liaoning: Shenyang, Beiling, 1978, ex. *Narosoideus flavidorsalis* (Staudinger), Coll. Gong-tian Xu; m, Liaoning: Jinzhou, vi.1973, ex. pupae of *Pandemi heparana* Schifferrn, Coll. Bin Zhou; f,m, Liaoning: Zhaomeng, 12.viii.1978, Coll. Gui-wen Wang; 2m, Liaoning: Zhaomeng, 12.viii.1978, Coll. Gui-wen Wang; 2f, Liaoning: Tieling, 27.xi.1976, Coll. Hong-kui Wang; 2f, Liaoning: Lushun, viii.1978, ex. pupae of *Malacosoma neustria testacea* Motsc, Coll. Ding-xi Liao; 3f,23 m, Hebei: Xinglong, v.1979, ex. pupae of *Dendrolimus* sp., Coll. Wei-liang Qin; m, Hebei: Changli, 21.vii.1957, Coll. Ding-xi Liao; 3f, Hebei: Luanping Xian, viii.1979, ex. pupae of *Dendrolis tabulaeformis* Tsai and Liu; 3f,5 m, Hebei: Zhangbei, 21.vii.1983, ex. larvae of *Stilpnotia salicis* (L.), Coll. Xing-jun Li; f,2m, Hebei: Zhangbei Xian, 21.vii.1983, ex. larvae of *Stilpnotia salicis* (L.), Coll. Xing-jun Li; f, Hebei: Xiaowutai, 1200m, 2.ix.1964, Coll. Yan-heng Han; 3f, Hebei: Qianxi, 23.iv.1953; 3f,m, Hebei: Qinglong Xian, vii.1978, ex. pupae of *Dendrolimus spectabilis* Butler; 6f,4m, Hebei: Tangshan, ii.2002, ex. *Hyphana cunea* Drury; f, Hebei: Laiyuan, 1400–1600m, 13.vi.1985, Coll. Hua-fu Zhu; f,m, Hebei: Yi Xian, 12.v.1977, ex. *Dendrolimus* sp., Coll. Wei-liang Qin; 27f,5 m, Heilongjiang: Yichun, Dailing, 390 m, 1.ix.1959, Coll. Zhong He; f,m, Heilongjiang: vi.1977, Coll. Huai-yi Ma; 13f, Beijing: 11.viii.1981, ex. pupae of *Pieris rapae* (L.), Coll. Li-feng Zhang; 2f,m, Beijing: Sijiqing, 23.viii.1981, Coll. Bao-cai Shi; 8f, Beijing: vii.1984, ex. larvae of *Lymantria dispar* (L.), Coll. Mu-zong Cheng; 3m, Beijing: Yanqing Xian, 21.vii.1983, Coll. Da-wei Huang; 2f,m, Beijing: Yanqing, Ling Mt, Coll. Li Li; 2 m, Beijing: Yanqing, 22.vii.1983, Coll. Da-wei Huang; 2f,m, Beijing: Haiding, 24.vii.1984, ex. pupae of *Pieris rapae* (L.), Coll. Bao-cai; 4f, Beijing: Dongbeiwang, 29.i.1963, Coll. Ding-xi Liao; 2f,2 m, Beijing: ix. 1980, Coll. Xue-jun Li; 2f, Beijing: 3.x.1957, ex. pupae of *Melalopha anachoreta* F.; f, Beijing: Yingtaogou, 18.v.1984, Coll. Da-wei Huang; f, Beijing: Bada ling, 14.vii.1963, Coll. Ding-xi Liao; m, Beijing: Bada ling, 16.v.1984, Coll. Da-wei Huang; f, Beijing: Wofuo Si, 24.iv.1982, Coll. Ding-xi Liao; f, Beijing: 29.viii.1963, ex. pupae of *Stilpnotia salicis* (L.); 3f,5 m, Shandong: Zaozhuang, 1989, ex. larvae of *Cryptothelea variegata* Snellen, Coll. Xu-hui Zhao; 3f,6 m, Shandong: Zaozhuang, vi.1989, ex. pupae of tachinid fly on *Cryptothelea variegata* Snellen, Coll. Xu-hui Zhao; 3f,2 m, Shandong: Zaozhuang, 10.vi.1989, ex. pupae of tachinid fly on *Cryptothelea variegata* Snellen, Coll. Xu-hui Zhao (IOZCAS).

#### Comments

This species is distinguished by its scutellum posteriorly with frenal area clearly defined by a line of punctures, the groove of puncturation interrupted in the middle; first tergite smooth and metafemur with a slim tooth.

*Distribution*

China (Beijing, Hebei, Shaanxi, Nei Mongol, Liaoning, Jilin, Heilongjiang, Jiangsu, Zhejiang, Fujian, Jiangxi, Shandong, Guangdong, Guangxi, Hainan, Yunnan, Xizang, Shaanxi, Gansu, Ningxia, Qinghai, Xinjiang); Palearctic, Nearctic, Neotropic and Oriental.

*Biology*

This species develops as parasite and sometimes as hyperparasite of Hymenoptera and Diptera via some species of Lepidoptera and Hymenoptera (Steffan 1952; Iwata and Tachikawa 1996; Kulman 1965). More than 50 species are known as hosts such as Hymenoptera (*Diprion pini*, *Neodiprion sertifer*, *Cotesia glomerata*, *Trichiosoma lucorum*, *Eurytoma verticillata*, *Gregopimpla himalayensis*, *Itopectis conquisitor* and *Megachile centuncularis*), Diptera (*Masicera zimini*) and Lepidoptera (*Hyphantria cunea*, *Lymantria dispar*, *Euproctis chrysorrhoea*, *Bena prasinana*, *Pieris rapae*, *Clania pryeri*, *Hyalophora cecropia*, *Mimas tiliae*, *Thaumetopoea processionea*, *Pandemis cerasana* and *Rhyacionia buoliana*) (Peck 1963; Herting 1977, 1978; Grissell 1995).

**2. *Monodontomerus osmiae* Kamijo (Figures 8–13)**

*Monodontomerus obscurus* var. *japonicus* Masi (1937: 101–102); *M. japonicus* Ashmead (1904: 83, preocc.); Kamijo (1963: 93–94).

*Description**Female*

Head, thorax and propodeum dark blue and with purple reflection, gaster black. Antennae brown except scape yellow; legs yellowish brown except coxa and metafemur concolorous with body, prefemur, mesofemur and metatibia dark brown; and tegula yellowish brown.

Head  $1.23\times$  as wide as height in front view, area between sockets and inner eyes with longitudinal groove (Figure 8); eyes separated by about  $1.1\times$  eye height, malar space  $0.25\times$  eye height; gena slightly convergent ventrally; clypeus with epistomal sulcus distinct, and clypeal margin truncate. Head  $2.03\times$  as wide as long in dorsal view (Figure 9), and POL  $2\times$  OOL. Antenna not clavate, pedicel and flagellum combined shorter than head width (Figure 10); scape not reaching anterior ocellus,  $0.47\times$  as eye height,  $3.4\times$  as long as broad; pedicel  $1.2\times$  as long as broad; anellus transverse; each funicular segment transverse or subtransverse, with two rows of sensilla; and clava  $1.75\times$  as long as broad, slightly shorter than F5-F7 combined. Relative measurements: head width 64, height 52, dorsal length 31; eye height 36, eye length 23, eye space 39; temple 6; pedicel and flagellum combined 62.

Mesosoma  $1.73\times$  as long as broad; pronotum  $0.37\times$  as long as broad; mesoscutum  $0.71\times$  as long as broad, notauli complete; scutellum slightly convex in the middle,  $1.27\times$  as long as broad, frenal line distinct, frenum smooth, groove of puncturation along the margin of posterior scutellum complete. Median foveolate area on propodeum almost triangular, and its median carina not bifurcated in basal part (Figure 11). Metacoxa  $1.45\times$  as long as broad; metafemur  $3.04\times$  as long as broad, with one tooth (Figure 13); and metatibia with two spurs. Fore wing  $2\times$  as



long as broad, without brown infumation around stigmal vein (Figure 12); costal cell hairy in posterior part. Gaster sessile,  $2.8\times$  as long as broad, longer than mesosoma, and ovipositor sheath  $0.72\times$  as long as gaster. Relative measurements: mesosoma length: width 109:63, marginal vein 34, postmarginal vein 15, stigmal vein 10, metacoxa length: width 48:33, metafemur length: width 64:21, metatibia spur length: metatibia width 12:10, and gaster length: width 121:43.

Body length 3.0–3.5 mm, and ovipositor sheath  $1.47\times$  as long as hind tibia.

#### *Specimens examined*

3f, China, Shandong: Weihai, v.1988, ex. *Osmia cornifrons* (Rodoszkowski) (IOZCAS).

#### *Comments*

This species is a new record from China and it is distinguished by the characters of the area between sockets and inner eyes with longitudinal groove; median carina not bifurcated in the basal part of propodeum; and groove of puncturation along the margin of posterior scutellum complete.

#### *Distribution*

China (Shandong); and Palearctic.

#### *Biology*

This species is mainly parasitic on species of *Osmia*. Iwata and Tachikawa (1966) reported that it was reared from *Osmia cornifrons*, while Kamijo (1963, 1965) reported it on *O. cornifrons*, *O. excavate* and *O. taurus*.

### 3. *Monodontomerus dentipes* (Dalman) (Figures 14–19)

*Torymus dentipes* Dalman (1820: 173, 178); Walker (1847: 227); Grissell (1995: 211–212); Liao et al. (1987: 40–41).

*Torymus dentipes* Boheman (1834: 335–336); Grissell (1995: 211).  
*Monodontomerus viridaeneus* Provancher (1881: 290–291); Burks (1963: 1259).

#### *Description*

##### *Female*

Body bluish green, gaster with metallic reflection. Antenna blackish brown except base of scape yellow; coxa concolorous with body, femur green, otherwise yellow; and tegula yellowish green.

Head  $1.25\times$  as wide as height in front view (Figure 14), eyes separated by about  $1.1\times$  eye height, malar space  $0.28\times$  as eye height; gena convergent ventrally; and clypeus with epistomal sulcus distinct and its margin truncate. Head  $2.6\times$  as wide as long in dorsal view, and POL  $1.9\times$  OOL (Figure 15). Antenna with pedicel and flagellum combined  $1.5\times$  as long as head width; scape not reaching anterior ocellus,  $0.6\times$  as eye height, and  $3.6\times$  as long as broad; pedicel as long as broad; anellus

transverse; F1–F2 longer than broad, F3 squarish, each funicular segment with two rows of sensilla (Figure 15); and clava as long as F5–F7 combined. Relative measurements: head width 54, height 44, dorsal length 22; eye height 28, eye length 21, eye space 30.5; temple 6; pedicel and flagellum combined 65.

Mesosoma 1.5× as long as broad; mesoscutum with dense reticulations; scutellum convex in the middle, 1.1× as long as broad, frenal line distinct, frenum smooth, groove of puncturation along the posterior margin of scutellum complete. Median foveolate area on propodeum not triangular, median carina bifurcated in basal part (Figure 17). Metacoxa 1.7× as long as broad; metafemur 3.5× as long as broad (Figure 18); metatibia with two spurs, the longer one 1.6× as long as width of metatibia, and the shorter one 0.6× as long as metatibia. Fore wing 2.2× as long as broad, with brown infumation around stigmal vein (Figure 19); and basal cell with rows of hairs on upper and lower surface. Gaster sessile and slightly longer than mesosoma; T1 with sculpture on hind margin; and ovipositor sheath 0.1× as long as gaster. Relative measurements: mesosoma length: width 65:44, scutellum length: width 29:27, fore wing length 83, marginal vein 34, postmarginal vein 16, stigmal vein 8, metacoxa length: width 48:33, metafemur length: width 53:15, metatibia spur length: metatibia width 13:8, and gaster length 85.

Body length 4.0 mm, and ovipositor sheath 2× as long as hind tibia.

#### Male

Body 3.0 mm, bluish green; antennae blackish brown; coxa concolorous with body, prefemur yellowish green; meso and metafemur metallic green. Otherwise same as female.

#### Specimens examined

China: 28f,3m, Guangdong: Yangdong, 10.i.1994, ex. pupae of *Dendrolimus punctatus* Walker, Coll. Zhao-ke Liang; 2f,2m, Guangdong: Yangdong, 10.xi.1994, ex. pupae of *Dendrolimus punctatus* Walker, Coll. Zhao-ke Liang; 8f, Guangdong: Yangdong, 10-13.i.1994, Coll. Zhao-ke Liang; 2f,m, Jiangsu: Lishui Xian, 20.v.1984, Coll. Fan-jun Qian; 13f,8m, Jiangsu: Nanjing, vi.1982, Coll. Qu-xian Peng; 6f,2m, Zhejiang: Lin'an, ix.1978, ex. *Dendrolimus punctatus* Walker; 3m, Zhejiang: Lin'an, 8.x.1979, ex. *Dendrolimus punctatus* Walker, Zhejiang: Lin'an; f, Zhejiang: Lin'an, Tianmu Mt., 1.vi.1999, Coll. Ming-yong Zhao; f, Zhejiang: Changshan, viii.1955, ex. *Dendrolimus* sp.; 18f,m, Fujian: Fuzhou, 16.x.1954, ex. pupae of *Dendrolimus* sp., Coll. Xiu-fu Zhao; 2f, Fujian: Fuzhou, 1975, ex. pupae of *Dendrolimus* sp., Coll. You-gong Li; 13f,5m, Fujian: Fuzhou, 20.v.1957, Coll. Xiu-fu Zhao; f, Fujian: Xiamen, 27.xi.1974, Coll. Ji-kun Yang; 10f, Sichuan: 27.x.1983, ex. pupae of *Dendrolimus* sp., Coll. Su-fen Chen; 9f,m, Sichuan: 27.x. . . . .ex. pupae of *Dendrolimus* sp., Coll. Su-fen Chen; f,2m, Guizhou: Suiyang Xian, 10.ix.1980, ex. pupae of *Dendrolimus houi* Lajonquiere, Coll. Qing-qiang Li; 2f, Guizhou: Anshun, 27.x.1983, ex. pupae of *Dendrolimus houi* Lajonquiere, Coll. Jing-rong Zhou; 5f,m, Guangxi; 3f,m, Guangxi: Nanning, Genling, 160 m, 15.viii.1983, Coll. Chun Li; 2f,m, Guangxi: Nanning, Yinling, ix.1982, ex. *Dendrolimus* sp., Coll. Chun Li; f,m, Guangxi: Bobai, 200 m, 31.x.1983, Coll. Ji-jian Wang; 10f,2m, Jiangxi: Geyang, 10.v.1959, ex. *Hyposoter takagii* (Matsumura), Coll. Ding-xi Liao; 8f,2m, Jiangxi: Geyang, 30.vii.1959, ex. pupae of conifer sawflies; 1f, Jiangxi: Geyang, 11.vii.1957;

5f, Jilin: Changchun, 24.v.1957, ex. *Dioryctria rubella* Hampson; 4f, Jilin: Changbai Mt, 1160m, 5.viii.1978; 2f, Anhui: Huangpu Mt, 9.ix.1965; 2f,m, Anhui: Huangpu Mt, 5.viii.1965; 4f, Anhui: Huangpu Mt; f,m, Anhui: Quanjiao, 12.viii.1972, ex. *Dendrolimus* sp., Coll. Ding-xi Liao; f, Anhui: Coll. Ding-xi Liao; f, Beijing: Daxing, Coll. Zong-you Xu; 2f, Beijing: x.1942; f, Shandong: Ya Mt., 28.vi.1964, Coll. Zi-qing Wang; f, Shandong: Fushan, 18.vi.1958, Coll. Jin-long Mao; f, Shandong: Fushan, 14.vi.1958, Coll. Jin-long Mao; f, Shanxi: Pianguan, Coll. Yong Jiao; m, Liaoning: Zhaomeng, 11.viii.1978; m, Hebei: Qingliong Xian, vii.1978, ex. pupae of *Dendrolimus spectabilis* Butler; f, Hebei: Fengning, 22.viii.1985, Coll. Hua-fu Mi; m, Xinjiang: Zhaosu Xian, Xiata, 2000m, 19.viii.1978, Coll. Yan-heng Han; f, Xinjiang: Taxkor, 8.viii.1965, Coll. Ding-xi Liao; 4f, Yunnan: Wenshanzhou, 1200m, 30.v.1979, ex. conifer sawflies, Coll. Zhao-long Jiang; 2f, Yunnan: Gejiu, Shiyanzai, viii.1980, Coll. Guo-xiu Li; 2f,m, Yunnan: Jingdong, 4.ii.1980, Coll. Ren-qi Liu; 4f,m, Yunnan; 5f, Yunnan: Gejiu, 1981, ex. *Dendrolimus* sp., Coll. Guo-xiu Li; 3f,5 m, Yunnan: ex. egg of *Dendrolimus* sp., Coll. Guo-xiu Li; f,m, Yunnan: Chuxiong, 1830m, 1.vi.1980, ex. conifer sawflies, Coll. Guang-yue Liu; 4 m, Yunnan: Kunming, 8.vi.1956, ex. pupae of *Dendrolimus punctatus wenshanensis* Tsai and Liu, Coll. Jing-liang Qi; f, Yunnan: Diqingzhou, 7.viii.1984, Coll. Chang-fang Li; 2f, Yunnan: Simao, vii.1983; 8f,3 m, Hunan: Liuyang, iv.1973, ex. *Rogas dendrolimi* (Matsumura), Coll. Ding-xi Liao; 2f, Hunan: Lianyuan, 2.ix.1973; 6f,2 m, Hunan: Dao Xian, 9.x.1979, ex. pupae of *Dendrolimus* sp., Coll. Xin-wang Tong; 2f,m, Hunan: ex. pupae of *Dendrolimus punctatus* Walker, Coll. Feng Ge (IOZCAS).

### Comments

This species is distinguished by its groove of puncturation on the posterior margin of scutellum complete, median foveolate area on propodeum triangular; metafemur with its tooth as long as the length of the one on its posterior margin.

### Distribution

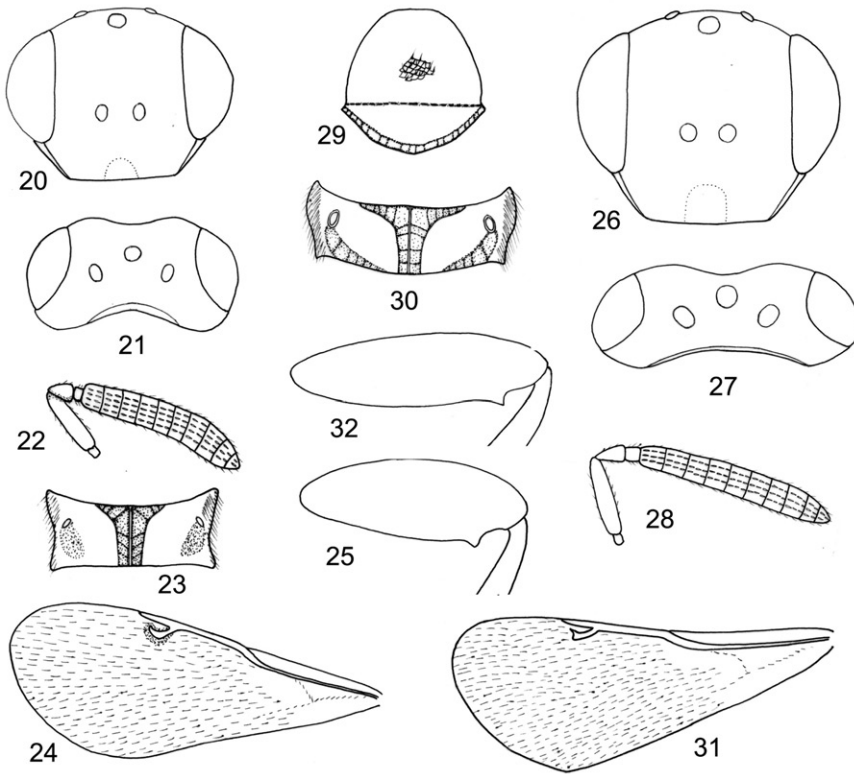
China (Beijing, Hebei, Shanxi, Liaoning, Jilin, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Hunan, Guangdong, Guangxi, Sichuan, Guizhou, Yunnan, Xinjiang); Palearctic, Nearctic and Oriental.

### Biology

More than 40 species are known as hosts such as Hymenoptera (*Aleiodes pallidator*, *Meteorus versicolor*, *Cimbex connata*, *Gilpinia polytoma*, *Neodiprion pinetum*, *Ancistrocerus tigris*), Diptera (*Parasetigena agilis*) and Lepidoptera (*Euproctis phaeorrhoea*, *Lymantria dispar*, *Samia cynthia*, *Rhyacionia buoliana*, *Aporia crataegi*, *Yponomeuta malinella*) (Thompson 1958; Peck 1963; Herting 1976, 1977; Grissell 1979). *Monodontomerus dentipes* was used against *Diprion similis* (Drooz et al. 1985).

### 4. *Monodontomerus aeneus* (Fonscolombe) (Figures 20–25)

*Cinip aenea* Fonscolombe in Fonscolombe and Boyer (1832: 286); Graham (1992: 143).



Figures 20–31. 20–25, *Monodontomerus aeneus*, female: 20, head frontal view; 21, head dorsal view; 22, antenna; 23, propodeum; 24, fore wing; 25, metafemur; 26–31, *M. longianellus* sp. nov., female: 26, head frontal view; 27, head dorsal view; 28, antenna; 29, scutellum; 30, propodeum; 31, fore wing; 32, metafemur.

*Ichneumon obsoletus* Fabricius 1798: 230, preocc. *Ichneumon obsoletus* Gmelin (1790: 2687) in Linnaeus.

*Monodontomerus obsoletus* (Fabricius); Westwood (1839: 160); Graham (1992: 143).

*Monodontomerus nitidus* Newport (1849: 25–26); Graham (1992: 143).

*Monodontomerus vacillans* Forster (1860: 106–107); Dalla Torre (1898: 288).

*Monodontomerus punctatus* Thomson (1876: 69); Graham (1992: 143).

*Monodontomerus retusa* Dalla Torre (1898: 288). *Nomem nudum*. Grissell (2000: 11).

*Description*

*Female*

Body dark green, gaster with metallic reflection. Antenna blackish brown except scape yellow; legs yellow except precoxae, mesocoxa and mesofemur dark brown, metacoxa and metafemur concolorous with body; and tegula brown.

Head width  $1.28\times$  as height in front view (Figure 20), eyes separated by about  $1.17\times$  eye height, malar space  $0.41\times$  as eye height; gena slightly convergent ventrally;

clypeus with epistomal sulcus distinct, and clypeal margin truncate. Head  $2.08\times$  as wide as long in dorsal view (Figure 21), temple  $0.25\times$  as long as eye, and POL  $2.6\times$  OOL. Antenna with pedicel and flagellum combined shorter than head width, about  $0.93\times$  as head width; scape not reaching anterior ocellus,  $0.62\times$  as eye height, and  $3\times$  as long as broad; pedicel  $1.75\times$  its width; anellus transverse; F1 shorter than pedicel ( $0.7\times$ ), F2-F6 all  $0.5\times$  as broad as long; clava  $1.5\times$  as long as broad, shorter than F5-F7 combined; each funicular segment with two rows of sensilla (Figure 22). Relative measurements: head width 55, height 43, dorsal length 26; eye height 29, eye length 20, eye space 34; temple 5; scape length 18, clava length: width 12: 8, pedicel and flagellum combined 51.

Mesosoma  $1.93\times$  as long as broad; pronotum  $0.4\times$  as long as broad; mesoscutum  $0.64\times$  as long as broad; scutellum  $1.1\times$  as long as broad, frenal line distinct, frenum with shallow sculpture, and groove of puncturation along the margin of posterior scutellum complete. Propodeum about  $0.5\times$  as long as scutellum (Figure 23), median carina bifurcated in basal part, and its median foveolate area not triangular. Metacoxa  $1.68\times$  as long as broad; metafemur  $2.85\times$  as long as broad, with one tooth (Figure 25); metatibia with two spurs, the longer one  $1.1\times$  as long as width of metatibia, and the shorter one  $0.63\times$  as long as metatibia. Fore wing  $2.7\times$  as long as broad (Figure 24), with brown infumation; basal and cubital veins complete. Gaster sessile,  $2.1\times$  as long as broad, shorter than mesosoma; T1 with sculpture on hind margin; and ovipositor sheath  $0.1\times$  as long as gaster. Relative measurements: mesosoma length: width 56:36, scutellum length: width 32: 26, marginal vein 35, postmarginal vein 13, stigmal vein 8, metacoxa length: width 37:22, metafemur length: width 57:20, gaster length: width 95: 45, and ovipositor length 60.

Body length 3.5–4.0 mm, and ovipositor sheath  $1.18\times$  as long as hind tibia

### Male

Body 3.0 mm; head, thorax and propodeum dark green, gaster black with metallic reflection; antenna blackish brown except scape and pedicel yellowish brown; coxa and femur concolorous with body.

### Specimens examined

China: 9f,m, Beijing: 15.v.1994, ex. larva of *Megachile rotundata* Fabricius, Coll. Jun Chen; 3f,2m, Beijing, 24.v.1994, ex. *Megachile rotundata* Fabricius, Coll. Jun Chen; 9f, Beijing: Daxing Xian, viii-ix.1991, ex. *Megachile rotundata* Fabricius, Coll. Weiwei Zhang; f, Beijing: 12.iv.1997, Coll. Chao-dong Zhu; f, Shandong: Qingdao, viii.1958, Coll. Jin-long Mao; f, Xinjiang: Aksu, 19.vi.1965, Coll. Ding-xi Liao; 3f, Heilongjiang: Yichun, Dailing, 30.v.1962; f, Heilongjiang: Yichun, Dailing, 27.v.1962 (IOZCAS).

### Comments

This species is similar to *M. longianellus* sp. nov., but median carina is bifurcated in the basal part of propodeum, anellus transverse, each funicular segment with two rows of sensilla; and head  $2.08\times$  as wide as long in dorsal view.

*Distribution*

China (Beijing, Heilongjiang, Shandong, Xinjiang); Palearctic, Nearctic and Neotropics.

*Biology*

More than 40 species of hosts are known, such as Hymenoptera (*Aleiodes esenbecki*, *Ancistrocerus parietum*, *Megachile rotundata*, *Osmia cornigera*, *Megachile centuncularis*, *Diprion pini*, *Neodiprion sertifer*), Diptera (*Compsilura concinnata*) and Lepidoptera (*Hyphantria cunea*, *Aporia crataegi*, *Lymantria dispar*, *Lobesia botrana*, *Malacosoma neustria*) (Thompson 1958; Herting 1976, 1977; Mamedov 1988; Grissell 1995). In this study, it was reared from *Megachile rotundata* Fabricius.

### 5. *Monodontomerus longianellus* Xiao and Zhao sp. nov. (Figures 26–31)

*Description**Female*

Body length 3.0–3.5 mm, and ovipositor sheath  $1.18\times$  as long as hind tibia. Body dark green, gaster with metallic reflection. Antenna black brown except scape yellow, pedicel brown and anellus yellowish brown; coxa and femur dark green, tibia yellowish brown, tarsi yellow; and tegula yellowish brown.

Head width  $1.23\times$  as height in front view (Figure 26), eyes separated by about  $1.22\times$  eye height, malar space  $0.37\times$  as eye height; gena slightly convergent ventrally; clypeus with epistomal sulcus distinct, and its margin truncate. Head  $2.57\times$  as wide as long in dorsal view (Figure 27), occiput distinct, temple  $0.23\times$  as eye length, and POL  $2.29\times$  OOL. Antenna not clavate; pedicel and flagellum combined shorter than head width, about  $0.87\times$  as head width; scape not reaching anterior ocellus,  $4.8\times$  as long as broad, and  $0.6\times$  as eye height; pedicel  $1.8\times$  as long as wide; anellus squarish (Figure 28); F1  $1.17\times$  as long as broad, shorter than pedicel ( $0.79\times$ ); F2–F7 transverse; clava  $1.44\times$  as long as broad, shorter than F5–F7 combined; each funicular segment with three rows of sensilla. Relative measurements: head width 76, height 62, dorsal length 30; eye height 41, eye length 22, eye space 50; temple 5; scape length 24, pedicel length 9, and clava length: width 13: 9.

Mesosoma  $1.9\times$  as long as broad; pronotum  $0.49\times$  as long as broad; mesoscutum  $0.68\times$  as long as broad, notauli complete; scutellum as long as broad, frenal line distinct, frenum smooth, and groove of puncturation along its posterior margin complete (Figure 29). Propodeum more than  $0.5\times$  as long as scutellum (Figure 30), median carina not bifurcated basally, and median foveolate area on its posterior part not triangular. Metacoxae  $2.06\times$  as long as broad; metafemur  $3.45\times$  as long as broad (Figure 32), with one tooth; metatibia with two spurs, the longer one as long as metatibia width, the shorter one  $0.83\times$  as long as the longer one. Fore wing  $2.5\times$  as long as broad, without brown infumation (Figure 31); and basal and cubital veins complete. Gaster sessile,  $1.84\times$  as long as broad, shorter than mesosoma; and ovipositor sheath  $0.69\times$  as long as gaster. Relative measurements: mesosoma length: width as 52:77, scutellum length: width 41: 41, marginal vein 42, postmarginal vein 17, stigmal vein 12, metacoxa length: width 66:32, metafemur length: width 76:22, gaster length: width 129: 70, and ovipositor length 89.

### Male

Body 2.5 mm; body colour same as female, and its gaster almost squarish in dorsal view.

### Holotype

China: f, Nei Mongol: Wuhai Shi, 15.v.2004, ex. *Megachile (Chalicodoma) desertorum* Morawitz, Coll. Qiang Liu; *paratypes*, 10f,m, with data same as holotype (IOZCAS).

### Comments

This new species has its groove of puncturation on the posterior margin of scutellum complete. It is similar to *M. aeneus* but median carina in the basal part of propodeum is not bifurcated, anellus squarish, each funicular segment with three rows of sensilla; and head  $2.57\times$  as wide as long in dorsal view.

### Etymology

The species name is derived from its character of anellus, which is almost squarish, and also longer than other species, hence 'longi' and 'anellus' = longianellus.

### Biology

All specimens were reared from *Megachile (Chalicodoma) desertorum* Morawitz.

### Acknowledgments

We express our thanks to: the Royal Society KC Wong Fellowship, for offering the opportunity to study in BMNH in UK for one year in 2001 to 2002; Dr. Zdenek Bouček and Dr. John Noyes, the Natural History Museum, London, for helping us to examine the collections in BMNH. This work was supported by the National Natural Science Foundation of China (No. 30970392) and the Presidential Foundation of the CAS, Ministry of Science and Technology of China (No. 2006FY110500).

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