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A NEW SPECIES OF EMBOLEMIDAE (HYMENOPTERA: CHRYSIDOIDEA) FROM CHINA

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Abstract

Embolemidae (Hymenoptera: Chrysidoidea) are parasitoids of Hemiptera Auchenorrhyncha. The genus *Embolemus* Westwood, 1833 is present in all zoogeographical regions and 32 species have been described. *Embolemus sensitivus* **sp. nov**. is described from the following localities of China: Naban River National Nature Reserve (Yunnan), Mt. Lushan (Taiwan), Mt. Wuyishan (Fujian), Mt. Qinliangfeng and Mt. Wuyanling (Zhejiang).

Key Words: *Embolemus sensitivus*, new species, Yunnan, Taiwan, Fujian, Zhejiang, China

Resumen

Los Embolemidae (Hymenoptera: Chrysidoidea) son parasitoides de Hemiptera Auchenorrhyncha. El género *Embolemus* Westwood, 1833 está representado en todas las regiones zoogeográficas y contiene 32 especies descritas. Se describe por primera vez a *Embolemus sensitivus* **sp. nov.**, colectado en las siguientes localidades de China: Naban River National Nature Reserve (Yunnan), Mt. Lushan (Taiwan), Mt. Wuyishan (Fujian), Mt. Qinliangfeng y Mt. Wuyanling (Zhejiang).

Palabras Clave: *Embolemus sensitivus*, nuevas especies, Yunnan, Taiwan, Fujian, Zhejiang, China

Translation provided by the authors.

Embolemidae (Hymenoptera: Chrysidoidea) are parasitoids of Hemiptera Auchenorrhyncha (Olmi 1996, 1999). *Embolemus* Westwood 1833, is found in all zoogeographical regions. About 32 species have been described (Olmi 1996, 1997, 1998, 1999, 2004a, 2004b, 2004c, 2006, 2010; Amarante et al. 1999; van Achterberg & van Kats 2000; Olmi & Portuondo Ferrer (2003), Azevedo & Amarante 2005; Ortega-Blanco et al. 2011) and the genus was revised by Olmi (1996, 1997) and van Achterberg & van Kats (2000).

The species of *Embolemus* from China have been studied mainly by Xu et al. (2001). In 2012 the authors examined additional specimens of *Embolemus* from China, and have found one new species described herein.

Materials and Methods

The descriptions follow the terminology used by Olmi (1994, 1996, 1999). The measurements reported are relative, except for the total length (head to abdominal tip, without the antennae). In the descriptions, POL is the distance between the inner edges of the two lateral ocelli; OL is the distance between the inner edges of a lateral ocellus and the median ocellus; OOL is the distance from the outer edge of a lateral ocellus to the compound eye; OPL is the distance from the posterior edge of a lateral ocellus to the occipital carina; TL is the distance from the posterior edge of an eye to the occipital carina.

The types of all species of *Embolemus* have been examined.

The material studied in this paper is deposited in the following collections:

AEIC American Entomological Institute, Gainesville, Florida, USA.

AMNH American Museum of Natural History, New York, USA.

BMNH The Natural History Museum, London, United Kingdom.

BPBM Bernice P. Bishop Museum, Honolulu, Hawaii, USA.

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CAS California Academy of Sciences, San Francisco, California, USA.

CNC Canadian National Collection of Insects, Ottawa, Canada.

DETAM Department of Entomology, Texas A. & M. University, College Station, Texas, USA.

ELKU Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan.

MOLC Tropical Entomology Research Center, Viterbo, Italy (Massimo Olmi's collection).

SCAU Hymenopteran Collection of South China Agricultural University, Department of Entomology, Guangzhou, Guangdong Province, P.R. China.

TARI Taiwan Agricultural Research Institute (TARI), Department of Applied Zoology, Wufeng, Taichung, Taiwan, China.

ZJUC Department of Plant Protection, Zhejiang University, Hangzhou, Zhejiang Province, China.

Systematic Accounts

Embolemus sensitivus **sp. nov.** (Fig. 1C)

Material Examined

HOLOTYPE: Male, CHINA, Yunnan, Jinghong, Naban River National Nature Reserve, 19-23.VII.2011, yellow pan trap, Nasen Wei et al. leg. (SCAU). Paratypes: CHINA: Fujian, Mt. Wuyishan, 10.VII.1991, Wu Hong leg., one male (SCAU);Taiwan, Nantou, Mt. Lushan, 19.VI.2011, Pu Tang leg., one male (SCAU); Yunnan, same locality label as holotype, 15 males (14 in SCAU, one in MOLC); Zhejiang, Linan, Mt. Qinliangfeng, 9.VIII.2005, 11.VIII.2005, 12.VIII.2005, Shi Min leg., three males (SCAU); Zhejiang, Taishun, Mt. Wuyanling, 30.VII.2005, Xu Peng leg., one male (SCAU).

Diagnosis

Male of *Embolemus* with 1SDC cell open, not fully enclosed by pigmented veins, with propodeum completely reticulate rugose, petiole short (less than 0.5 as long as metatrochanter), proximal membranous process of paramere with distal region provided of many short and slender sensorial filaments (Fig. 1C).

Description

HOLOTYPE male: Macropterous. Length 3.2 mm. Head brown-black, except clypeus, mandible, part of gena and part of ventral side testaceous; antenna brown-testaceous; mesosoma brown, except prothorax, axillae and lateral regions of scutellum testaceous; metasoma brown; legs testaceous. Antenna filiform, not geniculated, not thickened distally; antenna articulated to prominent contiguous processes; antennal segments in following proportions: 8:2.5:22:20:20:19:17:17:16:18. Head shiny, unsculptured, covered with short hairs, with dorsal side swollen; occipital carina complete; ocelli dis-

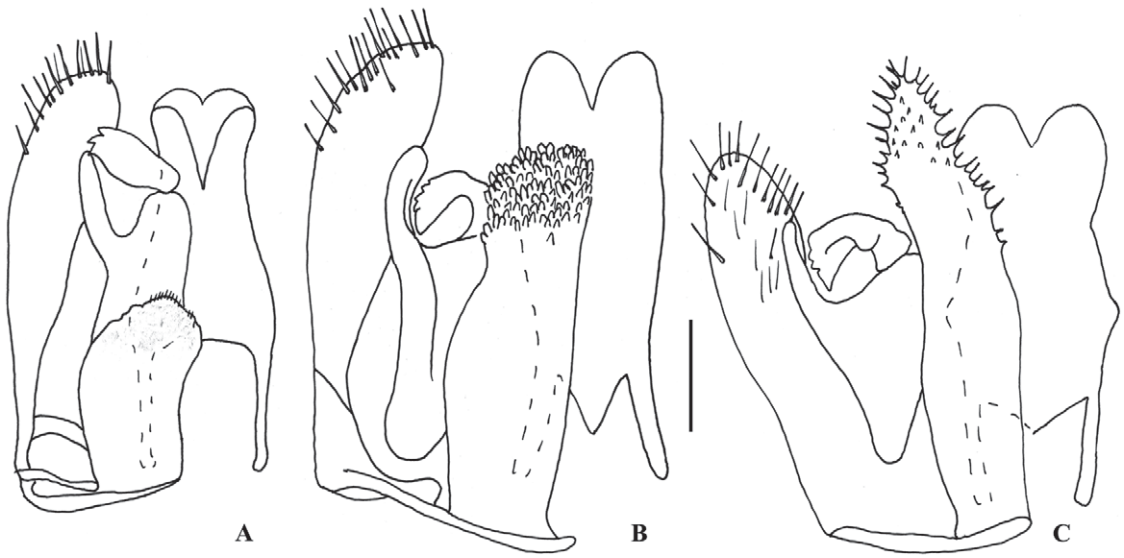


Fig. 1. Male genitalia of Oriental species of *Embolemus* (right half removed). A: *E. krombeini* Olmi from China, Mt. Gaoligongshan. B: *E. pecki* Olmi from China, Mt. Fengyang. C: *E. sensitivus* **sp. nov.**, holotype. Scale bar 0.08 mm.

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tinct; POL = 2; OL = 2; OOL = 6; OPL = 5; TL = 6; face without median furrow; eye small, approximately 0.5 as long as head (11:23); region of head from clypeus to antennal toruli with two longitudinal and median sutures very convergent. Palpal formula 6/3. Pronotum very short, with median longitudinal furrow. Scutum shiny, unsculptured. Notauli incomplete, reaching approximately 0,25 length of scutum. Scutellum shiny, unsculptured. Metanotum shiny, short, transverse, unsculptured. Propodeum dull, reticulate rugose; dorsal surface without median longitudinal keels from anterior margin to posterior surface. Mesopleuron and metapleuron shiny, smooth, unsculptured. Meso-metapleural suture distinct and complete. Forewing hyaline, completely slightly darkened; 1 SDC cell open. Hindwing hyaline, completely slightly darkened. Proximal membranous process of paramere with many sensorial filaments located on distal and subdistal region, without papillae (Fig. 1C). Tibial spurs 1, 2, 2.

Hosts

Unknown.

Etymology

This specific name means that the proximal membranous process of the paramere has many sensorial filaments.

Remarks

The Oriental species of *Embolemus* are the following:

Embolemus walkeri Richards 1951. The holotype is a female specimen deposited in BMNH and collected in China (Zhejiang Province, near Ning-Po, Da-Laen-Saen, 500-2500 ft., 5-16.XI.1893, with ants, J.J. Walker leg.); a female paratype in ELKU has been collected in Japan (Honshu, Fukushima Prefecture, Akai, Minato-Muna, 29.IV.1950, in nest of *Myrmica* sp. (Formicidae), Y. Kurosawa leg.). Olmi (1996) considered erroneously this species a junior synonym of *Embolemus ruddii* Westwood 1833. However, van Achterberg & van Kats (2000) considered it a good species separated from *E. ruddii*, though the differences are inconspicuous, as in all females of *Embolemus*. We believe that the opinion of van Achterberg & van Kats is correct. *E. walkeri* is a good Oriental species, though present also in the central part of Japan (as it happens in many Oriental species of Dryinidae spreading to the central regions of Japan from the Ryukyu Islands). The above two females are the only known specimens of *E. walkeri*. The male is unknown.

Embolemus krombeini Olmi 1996. The holotype is a female specimen deposited in CAS and collected in India (Maharashtra, Poona, 16.I.1962, E.S. Ross & D. Cavagnaro leg.). The above is the only known female specimen. On the contrary many males are known, usually collected by Malaise traps or yellow pan traps. However, as the opposite sexes of the *Embolemus* species are very different, the attribution of the above males to *E. krombeini* is only tentative. Males of this species are known from many Oriental countries: Brunei, China, Indonesia, Laos, Malaysia, Philippines, Sri Lanka, Thailand, Viet Nam. In China the following localities are known:

Guangdong: Zhaoqing, Mt. Dinhushan, 11-12.VIII.2005, Zaifu Xu leg., one male (SCAU); Nanling National Nature Reserve, 22-24.VIII.2010, Xu Zaifu leg., one male (SCAU); same locality label, 8-17.VIII.2010, yellow pan trap, Chen Huayan leg., ten males (SCAU). **Hong Kong**: Northern Territories, Taipokau, 15.VI.1964, J.L. & M. Gressitt, one male (BPBM). **Taiwan**: Nantou, Sun Moon Lake, Tehuache, 800-900 m, 6.VI.1990, J. Heraty leg., one male (DETAM); Mt. Dahan, 7.VI.2011, Pu Tang leg., one male (SCAU). **Xizang Autonomous Region (= Tibet)**: Hanmi-Beibeng, 17.VI.2009, Jiangli Tan leg., one male (SCAU). **Yunnan**: Pingbian, Daweishan, 18.VII.2003, Hu Long leg., one male (ZJUC); Tengchong, Mt. Gaoligongshan, 28.V.2009, Jiangli Tan leg., one male (SCAU). **Zhejiang**: Jiande, 6.VIII.1986, X.X. Chen leg., one male (ZJUC); Taishun, Wuyanling, 31.VII.2005, Xu Peng leg., one male (SCAU); Linan, Qingliangfeng, 8-12.VIII.2005, Shi Min leg., one male (SCAU).

Embolemus pecki Olmi 1997. The holotype is a male specimen deposited in CNC and collected in Japan (Shikoku, Mt. Ishizuchi National Park, Omogo Valley, 700 m, 21.VIII.1980, S. Peck leg.). No female specimens are known. The males are known not only from the Oriental region (Brunei, China, Indonesia, Japan (Ryukyu Islands), Viet Nam) but also from few countries of the Palaearctic region (China (Jilin, Liaoning), Japan (Fukuoka, Hokkaido, Shikoku), Spain (Canary Islands)). In China the following localities are known:

Fujian: Mt. Wuyishan, 7.X.1991, Wu Hong leg., one male (ZJUC); same locality label, 31.VII.1983, Y. Ma leg., one male (ZJUC); same locality label, 3-5.VIII.1983, J.H. He leg., one male (ZJUC); same locality label, 20.VII.1985, N.Q. Lin leg., one male (ZJUC); same locality label, 16.VII.1994, S.F. Ye leg., one male (ZJUC); same locality label, 14. VII.1994, X.X. Chen leg., one male (ZJUC); same locality label, 22.VIII.1007, Zeng Jie leg., one male (SCAU); Mt. Meihuashan, 23-24.VII.1988, J.H. He & J.J. Fan leg., one male

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(ZJUC); Kengshang, 9.IX.1983, J.S. Wang leg., one male (ZJUC); Mt. Huangganshan, four males (ZJUC); Mt. Lonqishan, 1.VII.1991, 2. VII.1991, two males (ZJUC); Shui'an, Tianbaoyan, 21.VIII.2005, Pu Meihua leg., one male (SCAU); Mt. Meihuashan, 23-24. VII.1988, Junhua He leg., one male (SCAU). **Guangdong**: Fengkai, 18.V.1992, X.X. Chen & Y. Ma leg., one male (ZJUC); Shaoguan, 9.V.1992, Junhua He leg., one male (ZJUC); Shaoguan, Nanling National Natural Reserve, 23.VII.2003, 9-18.VII.2004, 4.VIII.2004, 4-6. VIII.2004, 1-6.X.2004, Zaifu Xu leg., 35 males (29 in ZJUC, one in MOLC); same locality label, 9-18.VII.2005, Cai Yali leg., one male (SCAU); same locality label, 22-24.VIII.2010, Zaifu Xu leg., four males (SCAU); same locality label, 8-17.VIII.2010, yellow pan trap, Chen Huayan leg., eight males (SCAU); Nanling National Natural Reserve, Conservation Area, 22.VIII.2010, Rui Guo leg., one male (SCAU); Shixing, Chebaling, 28.VII.2002, Zaifu Xu leg., one male (ZJUC); Shaoguan, Chebaling, 10-12.VII.2003, Zaifu Xu leg., one male (ZJUC); Longmen, Mt. Nankushan, 2-3. VII.2005, Zaifu Xu leg, two males (SCAU); same locality label, 23.V.2010, Zaifu Xu leg., one male (SCAU); same locality label, 4-6. VI.2011, Zaifu Xu leg., five males (SCAU); Mt. Dinghushan, 2-6.VIII.2010, yellow pan trap, Liu Jingxian leg., one male (SCAU). **Guangxi**: Longsheng, 24-26.VI.1982, J.H. He leg., one male (ZJUC); Tianlin, 30.V.1982, J.H. He leg., one male (ZJUC); Jiuwangdashan, Yuxi, 28.VII.2003, Wang Yiping leg., one male (ZJUC). **Guizhou**: Mt. Fanjingshan, 11-14. VII.1993, 3.VIII.2001, Z.F. Xu & X.X. Chen leg., two males (ZJUC); Mt. Fanjingshan, Jinding, 1800 m, 3.VIII.2001, Ma Yun leg., one male (ZJUC); Daozhen County, Dashabe, Xiannudong, 613 m, 26.VIII.2004, Wu Qiong leg., two males (ZJUC). **Hainan**: Jianfengling National Nature Reserve, 12-15.VII.2006, T.F. Chen leg., nine males (ZJUC); Jianfengling, 22-23.XI.2008, 25.XI.2008, Wang Manman leg., two males (SCAU); Diaoluoshan National Nature Reserve, 16-17.VII.2006, J.M. Liu leg., four males (ZJUC); Bawangling National Nature Reserve, 7-11.VII.2006, J.X. Liu leg., one male (ZJUC); Mt. Diaoluoshan, 17.VII.2006, Liu Jieming leg., one male (SCAU); Mt. Yinggeling, 16.XI.2008, Wang Manman leg., one male (SCAU); same locality label, 16-20. XI.2008, Huayan Chen leg., ten males (SCAU); same locality label, 17-20.VII.2010, Huayan Chen leg., one male (SCAU); same locality label, 16.XI.2008, Huayan Chen leg., one male (SCAU); same locality label, 28.V.2007, Liqiong Weng, three males (SCAU). **Henan**: no localities, 14.VII.1998, one male (ZJUC). **Hubei**: Shennongjia, 26.VIII.1982, J.H. He leg., one male (ZJUC). **Hunan**: Mt. Mangshan, 13.VIII.2010, Huayan Chen leg., nine males (SCAU). **Shaanxi**: Liping Experiment Farm, 1344 m, 23.VII.2004, Xuexin Chen leg., one male (ZJUC); Liping National Forest Park, 1742 m, Wu Qiong leg., two males (ZJUC); Liuba, Ziboshan, 1632 m, 4.VIII.2004, Wu Qiong leg., four males (ZJUC). **Sichuan**: Pingwu, Baimazhai, 25.VII.2006, H.Y. Zhang leg., one male (ZJUC). **Taiwan**: Tainan, Kwantzeling, 250 m, 6-7.IV.1965, C.M. Yoshimoto leg., one male paratype (BPBM); Chiayi, Arisan, 2130 m, 17.VIII.1964, J.L. Gressitt leg., two male paratypes (BPBM, AMNH); Nantou, Wushe, 1150 m, 13.IV.1983, H. Townes leg., one male paratype (CNC); same locality label, IX.1983, one male paratype (CNC); same locality label, 26.IV.1983; 29.V.1983; 23.III.1983; 10.V.1983; 22.V.1983, H. Townes leg., five males (identified as *Embolemus ruddii* Westwood by Olmi, 1996, p. 117)(AEIC); Nantou, Tungpu, 1200 m, X.1985, two males (AMNH, TARI); Nantou, Sungkang, 2100 m, X.1985, two males (AMNH, TARI); Nantou, Lienhuachih, 650 m, VII.1984, one male (TARI); Nantou, Tsuifeng, 2300 m, IX.1985, two males (AMNH, TARI); Nantou, Meifeng, 2150 m, 29.V.1983, two males (AEIC, TARI); Nantou, Mt. Lushan, 1000 m, 27-31.V.1980, one male (TARI); Nantou, Mt. Lushan, 19.VI.2011, Pu Tang leg., one male (SCAU); Nantou, Riyue Lake, 18.VI.2011, Pu Tang leg., one male (SCAU); Taipei, Hsintien, VI.1964, one male (TARI); Taipei, IV.1964, one male (TARI); Taichung, Sheng Kuang, 1850 m, 20.IX.1968, one male (TARI); Taichung, Chiapaotai, 750 m, 14-18.X.1980, one male (TARI); Taichung, Wanfeng Hill, VIII.1984, one male (TARI); Taichung, Anmashan, 2275 m, 6-9.VII.1979, one male (TARI); Taichung, Wuling, 1900 m, 27-29.VI.1979, one male (TARI); Taichung, Lishan, 1900 m, 26.VI.1979, one male (TARI); Taichung, Chingsan, 1100 m, V.1989, J. Heppner & H. Wang leg., one male (identified as *Embolemus ruddii* Westwood by Olmi, 1996, p. 117)(AEIC); Pingtung, Heng Chung, Kwei-tzu-chio, 29.V.1965, one male (TARI); Pingtung, Ouluanpi, Coast forest, 23-25.III.1982, one male (TARI); Pingtung, Kenting, 5-9.XII.1982, one male (TARI); Pingtung, Chihshan, 25.III.1982 (TARI); Pingtung, Mt. Dahan, 1600-1900 m, 9.VI.2010, Xuexin Chen leg., one male (SCAU); Pingtung, Shuangliu National Forest Recreation Area, 30.VI.2011, Pu Tang leg., one male (SCAU); Hualien, Tayuling, 2560 m, 10-15.IX.1980, one male (TARI); Hualien, Fuli, 9-11.XI.1981, one male (TARI); Hualien, Antung, 14-17.II.1984, one male (TARI); Taoyuan, Up-Palin-Lalashan, 1110-2130 m, 9.VII.1986, one male (TARI); Taoyuan, Paling, 800 m, 3-5.V.1983, one male (TARI); Taoyuan, Palin, 8-9.VII.1986, one

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male (TARI); Taoyuan, E of Bailing, 800 m, 25.V.1990, cloud forest. J. Heraty leg., one male (DETAM)); Ilan, Tapinshan, 1950 m, 26-28.VII.1983, one male (TARI); Ilan, Mt. Fushan, Arboretum, 10-12.VI.2011, Pu Tang leg., one male (SCAU); Kaohsiung, Duona Forest Road, 3.VI.2011, Pu Tang leg., one male (SCAU); Kanko, 18.IX.1924, one male (TARI); Tseuy Feng, 200 m, VIII.1979, I. Gauld leg., one male (identified as *Embolemus ruddii* Westwood by Olmi, 1996, p. 117))(BMNH). **Zhejiang**: Mt. Tianmushan, 2.IX.1987, X.X. Chen & J.J. Fan leg., one male (ZJUC); same locality label, 17-19.VI.1983, J.H. He & Y. Ma leg., one male (ZJUC); same locality label, 10-12.IX.1983, J.F. Wang leg., one male (ZJUC); 9.VI.1992, X.X. Chen leg., one male (ZJUC); same locality label, 21.VII.1987, X.X. Chen leg., one male (ZJUC); same locality label, 25-29.VII.2011, Huayan Chen leg., three males (SCAU); Mt. Tianmushan West, Xianrending, 27.VII.2003, 29.VII.2003, 30.VII.2003, Yu Xiaoxia leg., seven males (ZJUC); Hangzhou, 1. VII.1983, Y. Ma leg., one male (ZJUC); Qingyuan, 29.X.1993, H. Wu leg., one male (ZJUC); Mt. Longwangshan, 21.VII.1995, 24.X.1995, H. Wu leg., two males (ZJUC); same locality label, 31.VIII.1993, X.X. Chen leg., one male (ZJUC); Mt. Longwangshan, Anji, 31.VIII.2003, 22.IX.2004, Shi Min leg., 13 males (ZJUC); Mt. Longwangshan, Longquan, 7.VIII.2003, 10.VIII.2003, Jingxian Liu leg., two males (ZJUC); Mt. Fengyangshan, 7.VIII.2003, Jingxian Liu leg., four males (ZJUC); same locality label, 26-29. VII.2007, 29.VII.2007, Yiping Wang leg., two males (SCAU); Mt. Fengyangshan, Huangmaojian, 1933 m, 8.VIII.2003, Shi Min leg., one male (ZJUC); same locality label, 2. VIII.2008, Jingxian Liu leg., one male (SCAU); same locality label, 2.VIII.2008, Jingxian Liu leg., six males (SCAU); Mt. Fengyangshan, Fengyangmiao, 9.VIII.2003, Yu Xiao Xia leg., one male (ZJUC); Mt. Fengyangshan, Datianping, 4.VIII.2008, Jingxian Liu leg., one male (SCAU); Mt. Jitianshan, Kaihua, 845 m, 18.VIII.2003, Shi Min leg., one male (ZJUC); Qingyuan, Baishanzu, 1856 m, 13.VIII.2003, 14.VIII.2003, Ma Yun leg., three males (ZJUC); Taishun County, Mt. Wuyanling, 7.VII-5. VIII.2005, nine males (ZJUC); same locality label, 28.VII-5.VIII.2005, Jingxian Liu leg., six males (SCAU); same locality label, 29. VII.2005, 31.VII.2005, 2.VIII.2005, 3. VIII.2005, 4.VIII.2005, Xu Peng leg., 11 males (SCAU); same locality label, 3.VIII.2005, 4. VIII.2005, Wei Shujun leg., two males (SCAU).

The records of *E. ruddii* Westwood 1833 from the Oriental region (Olmi 1996; Xu & Olmi 2001) have to be attributed respectively to *E. krombeini* (Taiwan) and *E. walkeri* (Zhejiang).

While we are waiting for the correct attribution to the females of the above males (possibly by DNA analysis), we present the following key to the males of the Oriental species of *Embolemus*:

1. Proximal membranous process of paramere without papillae or sensorial filaments, at most with short hairs (Fig. 1A). . . . . *krombeini* Olmi

— Proximal membranous process of paramere with papillae (Fig. 1B) or sensorial filaments (Fig. 1c) 2

2. Proximal membranous process of paramere with papillae (Fig. 1B). . . . . *pecki* Olmi

— Proximal membranous process of paramere with sensorial filaments, without papillae (Fig. 1C) . . . . . *sensitivus* **sp. nov.**

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