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A New Species and Two New Records of Podocinum (Berlese, 1882) from Taiwan (Podocinidae: Mesostigmata)【Research report】

臺灣足角蟎屬一新種和二新記錄種 (蜱蟎亞綱：中氣門目：足角蟎科)【研究報告】

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Abstract

This article reports Podocinum (Berlese, 1882) from Taiwan, with one new species, Podocinum pintungense sp. nov., and two new records, Podocinum pacificum Berlese, 1886 and Podocinum changchunensis Liang, 1993. Podocinidae is recorded from Taiwan for the first time. A checklist and a key to the world species of Podocinidae based on the original description are provided.

摘要

記述臺灣足角蟎屬(Podocinum (Berlese, 1882)) 一新種：屏東足角蟎(Podocinum pintungense sp. n.) 和二新記錄種：太平洋足角蟎 (Podocinum pacificum Berlese, 1886) 和長春足角蟎 (Podocinum changchunense Liang, 1993)。足角蟎科首度被報導存在於台灣。

Key words: Podocinidae, Podocinum, new species, new record, Taiwan
關鍵詞: 足角蟎科、足角蟎屬、新種、新記錄種、臺灣。

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A New Species and Two New Records of *Podocinum* (Berlese, 1882) from Taiwan (Podocinidae: Mesostigmata)

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ABSTRACT

This article reports *Podocinum* (Berlese, 1882) from Taiwan, with one new species, *Podocinum pintungense* sp. nov., and two new records, *Podocinum pacificum* Berlese, 1886 and *Podocinum changchunensis* Liang, 1993. Podocinidae is recorded from Taiwan for the first time. A checklist and a key to the world species of Podocinidae based on the original description are provided.

Key words: Podocinidae, *Podocinum*, new species, new record, Taiwan

To find out which mites there are in the soil in Taiwan, soil samples with litter were taken from various agricultural lands and montane areas in Taiwan. Mites belonging to the Podocinidae family were isolated from these samples. Slide specimens of these Podocinidae mites were sent to the second author for identification of species. Three species, one new to science and two new to Taiwan, from the genus *Podocinum* (Berlese, 1882) were identified and are reported in this article. Podocinidae are reported from Taiwan for the first time.

The views regarding Podocinidae differ among the various publications and websites. Those that follow the view of Westerboer (1963) and Karg (1986) include some genera that are usually placed in the Ascidae and the Phytoseiidae. The genus *Derrickia* Womersley, 1956 was described from immature stages only and is considered by Halliday (1998) to probably belong to Trigynaspides. In the present study we follow the concept of Evans and Hyatt (1958) and Halliday (1998) and include only two genera, *Podocinum* and *Podocinella*, to this family.

***Podocinum pintungense* sp. n. 屏東足角蠕**

Female (Figs. 1-6)

Idiosoma dark yellow, elliptic, length 570-591 (581) μm, width 462-484 (473) μm.

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Dorsal shield covers entire dorsal side and extends to ventral side with reticulation formed by dense elliptic and conical protuberances, inside network with punctuations. Dorsal shield with 17 pairs of setae, two pairs in ventral position, second pair of podosomal dorsal setae and six pairs of opisthosomal setae stout, long, smooth or with loose, short hairs, and with longitudinal striae on setal stem, rest podosomal dorsal setae short and smooth. With pores on the shield. Sternal shield length 81-86 (84) μm, width at narrowest part 108-118 (115) μm, both anterior and posterior margin concave, sternal shield with three pairs of setae. Metasternal shields small, elliptic, metasternal setae on shield. Genital shield ax shape, length 108 μm, posterior width 140 μm, genital setae one pair. Ventro-anal shield small, length 161-172 (165) μm, anterior width 161-172 (165) μm, anterior with transverse suture parallel to anterior margin. Four pairs of setae in front of anus, three perianal setae, adanal setae slightly behind mid level of anus, length of adanal and postanal setae approximately equal to length of anus. Peritremal shield elongated posteriorly. Tectum with three prongs, all branched at tip, lateral prongs with a few serrations on outer margin. Movable digit of chelicerae with two large teeth, fixed digit with two large basal teeth and apically with a series of 4-5 small teeth lined beside 3 large teeth. Pilus dentilis very small. Palpal apotele 3-tined. Hypostomal setae smooth. Tarsus I distal setae length 398-484 (444) μm and 376-484 (430) μm, sub-distal setae length 215-269 (251) μm and 215-247 (226) μm, far beyond distal end of tarsus I. Length of leg I 1539 (coxa 65, trochanter 65, femur 376, genu 323, tibia 269, tarsus 441) μm, leg II 753 μm, leg III 645 μm, leg IV 806 μm.

Male (Figs. 7-8)

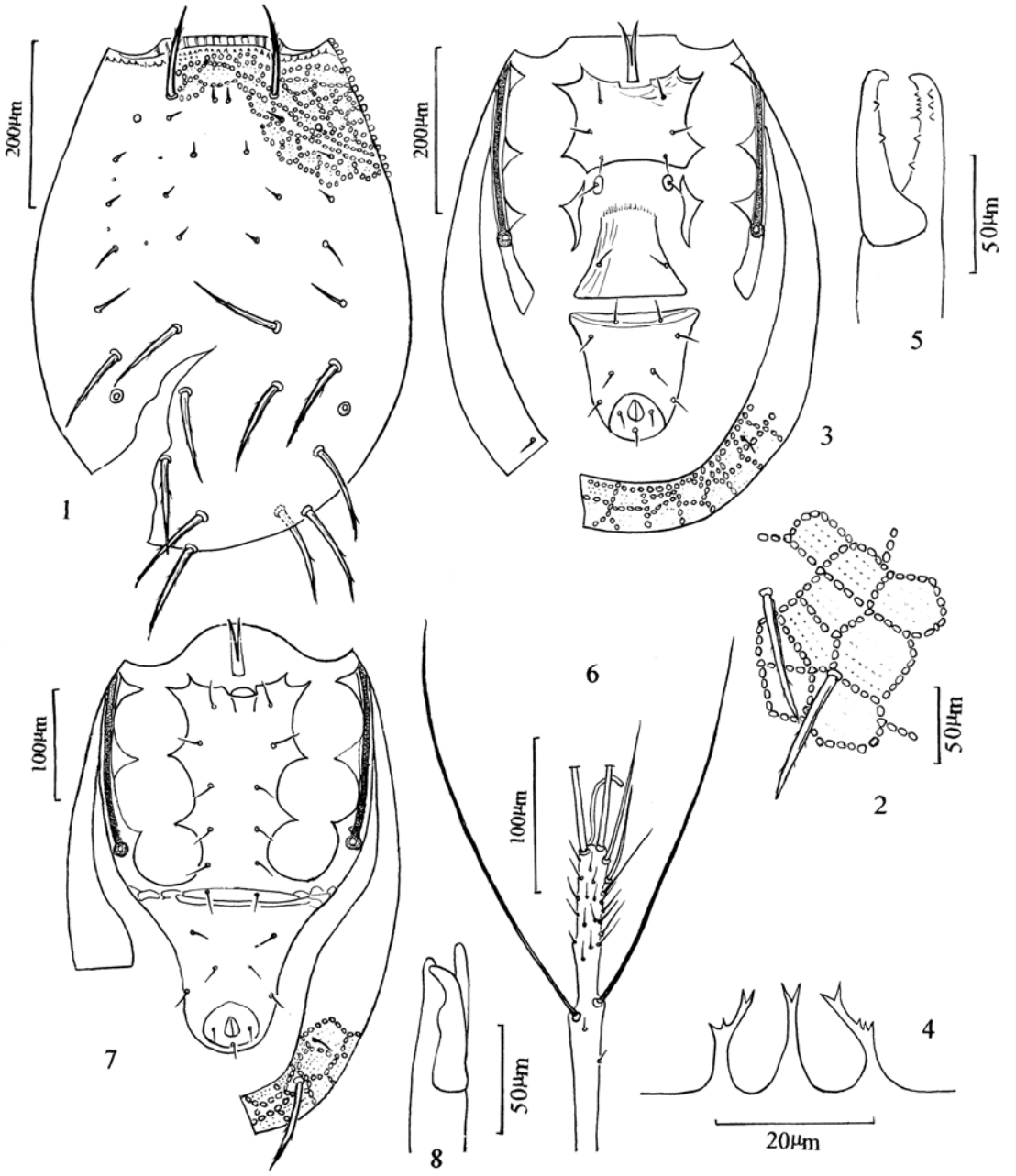
Idiosoma length 430-462 (446) μm, width 344-355 (349) μm. Dorsal shield as female. Holoventral shield length 312-344 (328) μm, width 108-118 (113) μm at level of coxae II and 97-108 (102) μm at level of the 4th pair of ventral setae, connected laterally to peritremal shield, with three transverse sutures between sterno-genital region and ventro-anal region, sterno-genital region with 5 pairs of setae, ventro-anal region with 4 pairs of preanal setae plus 3 peri-anal setae. Spermatodactyl of chela clavate like, extends beyond movable digit. Perianal setae, peritreme, tectum, hypostomal setae and palpal apotele as female. Leg I distal setae length 269-484 (376) μm and 215-376 (309) μm, subdistal setae length 161-215 (179) μm and 140-161 (154) μm, far beyond distal end of tarsus I. Length of leg I 1333 (coxa 65, trochanter 54, femur 333, genu 290, tibia 215, tarsus 376) μm, leg II 591 μm, leg III 538 μm, leg IV 645 μm.

Material examined

Holotype ♀, and paratypes 8 ♀ 2 ♂: PINTUNG: Manzhou 滿州, Nanren Shan 南仁山, 2002-I-19, C. C. Ho, leaf litter. Holotype, two female and one male paratypes will be deposited in the National Museum of Natural Science, Taichung, Taiwan. One female paratype will be deposited in the Acarology Laboratory of the Ohio State University. The rest types are deposited in the personal collection of the collector.

Diagnosis

The new species is close to *Podocinum sagax* (Berlese, 1882), but differs in having the outgrowths on dorsal shield lined up to form obvious reticulation, ventro-anal shield of female narrower, dorsal shield with 17 pairs of setae and with six pairs of stout setae in opisthosomal region; whereas in *P. sagax* the outgrowth on dorsal shield distributed evenly, not to form reticulation, the ventro-anal shield of female much broader than wide, dorsal shield with 18 pairs of setae and with only five pairs of stout setae in opisthosomal region, the setae D7 is not stout.



Figs. 1-8. 屏東足角蟎 *Podocinum pintungense* sp. n. Adult female (1-6): 1. dorsal view; 2. reticulation on dorsal shield; 3. ventral view; 4. tectum; 5. cheliceral digits; 6. tarsus I. Adult male (7-8): 7. ventral view; 8. chelicerus with spermatodactyl.

Etymology

The new species is named by collected locality of type specimens.

***Podocinum pacificum* Berlese, 1886** 太平洋足角蟎

Material examined

PINTUNG: Manzhou 滿州, Nanren Shan 南仁山, 1 ♀ 1 deutonymph, 2005-II-17, C. C. Ho, leaf litter.

Distribution

China (Jiangsu), Taiwan, Japan, Korea, India, Europe, Africa, North America, South America, Australia.

Remarks

This species is recorded from Taiwan for the first time.

***Podocinum changchunense* Liang, 1993 長春足角蟎**

Material examined

YUNLIN: Gukong 古坑, Huashan 華山, 1 ♀, 2004-XII-19, C. C. Ho, betel nut plantation soil. MIAOLI: Taian 泰安, Henlong Shan 橫龍山, 1 ♀, 2005-XII-25, C. C. Ho, bamboo plantation soil.

Distribution

China (Jilin), Taiwan.

Remarks

This species is recorded from Taiwan for the first time.

Checklist and key to world species of Podocinidae

At the time Evans and Hyatt (1958) reviewed the Podocinidae, there were only 12 podocinid species in the world, with nine species in the genus *Podocinum* and three species in the genus *Podocinella*. Twenty-one more podocinid species including the *P. pintungense* sp. n. in this article have been described since then. The total number of podocinid species increased to 33. A checklist and a key to the world species based on the original description are given below.

Information on type deposition is based mainly on the original description papers. However, the species described by De Leon (1964) were said to be deposited "in the author's collection". Prasad (2007) indicated that the mite collection of De Leon is deposited largely in the Museum of Comparative Zoology, Harvard University and that some specimens may have been sent to the U.S. National Mite Collection. We located *Podocinum catenulum* from the type specimens' list on the web site of the Museum of Comparative Zoology, but were unable to obtain information about *P. pugnorum* from the web site of the U.S. National Mite Collection nor from the web site of the Florida State Collection of Arthropods.

Podocinella Evans *et* Hyatt, 1958
Podocinella Evans *et* Hyatt, 1958. Ann. Mag. Nat. Hist. 10: 926-27.
Type species: *Podocinella plumosa* Evans *et* Hyatt, 1958.

Podocinella alstoni Evans *et* Hyatt, 1958
Podocinella alstoni Evans *et* Hyatt, 1958. Ann. Mag. Nat. Hist. 10: 928, Figs. 45-49.
Type deposition: British Museum of Natural History.
Distribution: Indonesia (Celebes, Moluccas), Solomon Islands (Guadalcanal).

Podocinella meghalayaensis Bhattacharyya, 1994
Podocinella meghalayaensis Bhattacharyya, 1994. Rec. Zool. Surv. India 94: 55-56, Figs. 1-4.
Type deposition: Zoological Survey of India, Calcutta.
Distribution: India (Meghalaya)

Podocinella misella (Berlese, 1913)
Podocinella misellum Berlese, 1913. Redia 9: 83, Figs. ♀.
Podocinella misella Evans *et* Hyatt, 1958. Ann. Mag. Nat. Hist. 10: 929-930, Figs. 50-54.
Type deposition: Istituto Sperimentale per la Zoologia Agraria, Florence, Italy, missing.
Distribution: Indonesia (Celebes (Tomoho),

Java), Jamaica (St. Ann.)

Podocinella plumosa Evans *et* Hyatt, 1958
Podocinella plumosa Evans *et* Hyatt, 1958. Ann. Mag. Nat. Hist. 10: 927-928, Figs. 38-44.
Type deposition: British Museum of Natural History.
Distribution: Indonesia (Sumatra (Kubaljani)).

Podocinella poetica Ishikawa, 1976
Podocinella poetica Ishikawa, 1976. Nature and Life in Southeast Asia 7: 249-251, Figs. 48-52.
Type deposition: Biological Laboratory, Matsuyama Shinonome Junior College.
Distribution: Malaysia (Pasoh Forest.)

Podocinum Berlese, 1882
Podocinum Berlese, 1882. Bull. Entomol. Soc. Ital. 14: 340.
Type species: *Laelaps sagax* Berlese, 1882.

Podocinum aciculatum Evans *et* Hyatt, 1958.
Podocinum aciculatum Evans *et* Hyatt, 1958. Ann. Mag. Nat. Hist. 10: 918, 920, Figs. 5-10.
Type deposition: British Museum of Natural History.
Distribution: Nepal (Kalapani, Sikha).

Podocinum agilis Arutunyan, 1974
Podocinum agilis Arutunyan, E. S. 1974. Doklady Akad. Nauk Armyan. SSR 58(4): 254-256, Figs. 1-7.
Type deposition: National Academy of Sciences of the Republic of Armenia, Institute of Zoology, Yerevan, Armenia.
Distribution: Armenia.

Podocinum anhuense **Wen, 1965 安徽足角蟎**

Podocinum anhuense Wen, 1965. Acta Zootaxonomica Sinica 2: 353-356, Figs. 1-12.
Type deposition: Department of Parasitology, Shanghai First Medical College, Shanghai, China.
Distribution: China (Anhuei).

Podocinum aokii Ishikawa, 1970
Podocinum aokii Ishikawa, 1970. Annotationes Zoologicae Japonenses 44: 119-122, Figs. 21-29.
Type deposition: partly deposited in the National Science Museum, Tokyo, and the rest are owned by the Biological Laboratory, Matsuyama Shinonome Junior College.
Distribution: Japan (Hokkaido, Honshu, Kyushu, Shikoku), Russia (Primorye, Sakhalin).

Podocinum bengalensis Bhattacharyya, 1968
Podocinum bengalensis Bhattacharyya, 1968. Acarologia 10: 528-529, Figs. 3-5.
Type deposition: Zoological Survey of India, Calcutta, India.
Distribution: India (West Bengal).

Podocinum catenulum De Leon, 1964
Podocinum catenulum De Leon, 1964. Fla. Entomol. 47: 39-44, Figs. 1-7.
Type deposition: Museum of Comparative Zoology, Harvard University.
Distribution: USA (Tennessee).

Podocinum catenum Ishikawa, 1970
Podocinum catenum Ishikawa, 1970. Annotationes Zoologicae Japonenses 44: 116, 118-119, Figs. 14-20.
Type deposition: National Science Museum, Tokyo and Biological Laboratory, Matsuyama Shinonome Junior College.
Distribution: Japan (Hokkaido, Honshü, Kyushu, Shikoku), Russia (Khabarovsk, Primorye, Kunashir).

Podocinum changchunense **Liang, 1993 長春足角蟎**

Podocinum changchunense Liang, 1993. Acta Zootaxonomica Sinica 18: 58-59, Figs. 24-28.

Type deposition: Department of Environmental and Resources Biology, Fudan University.
Distribution: China (Jielin), Taiwan (Yunlin, Miaoli).

***Podocinum hainanensea* Liang, 1993 海南足角蠕**

Podocinum hainanensea Liang, 1993. Acta Zootaxonomica Sinica 18: 59-60, Figs. 29-33.
Type deposition: Department of Environmental and Resources Biology, Fudan University.
Distribution: China (Hainan).

Podocinum jamaicense Evans *et* Hyatt, 1958.
Podocinum jamaicense Evans *et* Hyatt, 1958. Ann. Mag. Nat. Hist. 10: 920-921, Figs. 11-13.
Type deposition: British Museum of Natural History.
Distribution: USA (Florida), Jamaica (Hanover, dolphin Head), Mexico (Oaxaca (San Luis Potosi)), Peru (intercepted in Miami, Florida from soil on bromeliad imported to USA).

***Podocinum jianfenglingense* Liang, 1993 尖峰嶺足角蠕**

Podocinum jianfenglingense Liang, 1993. Acta Zootaxonomica Sinica 18: 56-57, Figs. 13-19.
Type deposition: in the Department of Environmental and Resources Biology, Fudan University.
Distribution: China (Hainan (Mt. Jianfenling)).

Podocinum mediocre Berlese, 1913
Podocinum mediocre Berlese, 1913. Redia 9: 83, Figs. ♀.
Type deposition: Istituto Sperimentale per la Zoologia Agraria, Florence, Italy.
Distribution: Indonesia (Java).

Podocinum minus Berlese, 1913
Podocinum minus Berlese, 1913. Redia 9: 83, Figs. ♀.
Type deposition: Istituto Sperimentale per la Zoologia Agraria, Florence, Italy, missing.
Distribution: Indonesia (Java).

Podocinum monilicum Halliday, 1990
Podocinum monilicum Halliday, 1990, J. Aust. Entomol. Soc. 29: 277-278, Figs. 1-5.
Type deposition: Australian National Insect Collection, Canberra.
Distribution: Australia (New South Wales).

Podocinum nepalense Evans *et* Hyatt, 1958
Podocinum nepalense Evans *et* Hyatt, 1958. Ann. Mag. Nat. Hist. 10: 922, Figs. 14-18.
Type deposition: British Museum of Natural History.
Distribution: Nepal (Ulleri).

Podocinum orientale Evans *et* Hyatt, 1958
Podocinum orientale Evans *et* Hyatt, 1958. Ann. Mag. Nat. Hist. 10: 922, Figs. 19-23.
Type deposition: British Museum of Natural History.
Distribution: Malaya (Selangor, Pasoh Forest).

Podocinum pacificum Berlese
Podocinum pacificum Berlese, 1896. Atti Soc. Ven.-Trent. (2), 2: 319-320.
Type deposition: Istituto Sperimentale per la Zoologia Agraria, Florence, Italy.
Distribution: Canada (Ontario), USA (California, Florida, Illinois, Kansas, Maryland, New Jersey, North Carolina, Ohio, Oregon, Tenessee, Virginia), Mexico (Veracruz, Chiapas), Argentina (Tucuman), Australia (New South Wales), China (Jiangshu), Japan (Honshû, Shikoku), Korea, Taiwan (Pintung), India (Sikkim, Uttar Pradesh), Italy, Austria (Vienna), Algeria (Maison-Carrée, Boufarik, Béni-Messous).

Podocinum pintungense Ho, Ma *et* Wang
Podocinum pintungense Ho, Ma *et* Wang, 2009. Fromosan Entomol. 29: in this paper, Figs. 1-8.
Type deposition: National Museum of Natural Science, Taichung, Taiwan; Acarology Laboratory, Ohio State University, Columbia, Ohio; collector's collection.
Distribution: Taiwan (Pintung).

Podocinum protonotum Ishikawa *et* Saichuae, 1997
Podocinum protonotum Ishikawa *et* Saichuae, 1997. J. Acarol. Soc. Jpn. 6: 65-68, Fig. 1 A-E.
Type deposition: Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.
Distribution: Thailand (Khao Yai).

Podocinum pugnorum De Leon, 1964
Podocinum pugnorum De Leon, 1964. Fla. Entomol. 47: 41, Figs. 8-12.
Type deposition: in the author's collection.
Distribution: USA (Florida).

Podocinum ruwenzoriense Evans *et* Hyatt, 1958
Podocinum ruwenzoriense Evans *et* Hyatt, 1958. Ann. Mag. Nat. Hist. 10: 924-25, Figs. 29-33.
Type deposition: British Museum of Natural History.
Distribution: Uganda (Ruwenzori).

Podocinum sagax (Berlese, 1882)
Laelaps sagax Berlese, 1882a. Atti ist. Veneto (5), 8 (1): 638.
Podocinum sagax: Berlese, 1882b. Bull. Soc. Entomol. Ital. 14: 340.
Type deposition: Istituto Sperimentale per la Zoologia Agraria, Florence, Italy.
Distribution: Japan (Nagasaki city, Kyushu), China (Jiangshu, Hunan), Indonesia (Bogor), India (Camorta Island), Italy, British, Mexico (Orizaba), Jamaica (St. Ann), Puerto Rico (Quebradillas), Guatemala (intercept from debris with *Odontoglossum grande* imported to USA at San Francisco, California; intercept from orchid plants imported to USA at Browsville, Texas), Argentina (Tucumán).

Podocinum sibiricum Volonikhina, 1999
Podocinum sibiricum Volonikhina, 1999. Acarina 7: 63, 65, Figs. 1-4.
Type deposition: Zoological Museum of the Institute for Systematics and Ecology of Animals, Novosibirsk.
Distribution: Russia (Altai, Khabarovsk, Birobidzhan).

Podocinum stellatum **Ma *et* Wang, 1998 星狀足角蟎**

Podocinum stellatum Ma *et* Wang, 1998. Acta Arachnologica Sinica 7: 4-5, Figs. 12-17.
Type deposition: National Base of Plague and Brucellosis Control, Baicheng, Jilin Province, China.
Distribution: China (Sichuan).

Podocinum sumatrense Evans *et* Hyatt, 1958
Podocinum sumatrense Evans *et* Hyatt, 1958. Ann. Mag. Nat. Hist. 10: 918, Figs. 34-37.
Type deposition: British Museum of Natural History.
Distribution: Indonesia (Sumatra (Kubaljani)).

Podocinum taylori Halliday, 1990
Podocinum taylori Halliday, 1990. J. Aust. Entomol. Soc. 29: 279-280, Figs. 6-8.
Type deposition: Australian National Insect Collection, Canberra.
Distribution: Australia (Queensland).

Podocinum tianmuense **Liang, 1993 天目足角蟎**

Podocinum tianmuense Liang, 1993. Acta Zootaxonomica Sinica 18: 57-58, Figs. 20-23.

Type deposition: Department of Environmental and Resources Biology, Fudan University.
Distribution: China (Zhejian).

Podocinum tsushimanum Ishikawa, 1970
Podocinum tsushimanum Ishikawa, 1970. Annotationes Zoologicae Japonenses 44: 114-117, Figs. 7-13.
Type deposition: partly deposited in the National Science Museum, Tokyo, and the rest are in the possession of the Biological Laboratory, Matsuyama Shinonome Junior College.
Distribution: Japan (Tsushima Islands, Kyushu).

Key to the genera of Podocinidae (modified from Evans *et* Hyatt (1958))

1. Tarsus I with two whip-like setae apically; with adanal setae, ventrianal shield in the female with 11 setae; dorsal shield with 14-19 pairs of setae; setae j1 present ..... *Podocinum* Berlese
- Tarsus I with a single whip-like seta; with or without adanal setae, ventrianal shield of the female with 9 or 11 setae; dorsal shield with 12-23 pairs of setae; setae j1 present or absent...*Podocinella* Evans & Hyatt

Key to species of *Podocinella* based on female

1. Anterior half of dorsal shield with only one pair of stout setae, dorsal shield with 12 pairs of setae; ventrianal shield subtriangular, lateral margin slightly concave; two pairs of setae exterior to the concave margin..... *P. meghalayaensis*
- Anterior half of dorsal shield with three or more pairs of long, stout setae 2
2. Dorsal shield with 16 pairs of setae; ventrianal shield subtriangular, with concave lateral margin ..... *P. misella*
- Dorsal shield with more than 16 pairs of setae 3
3. Dorsal shield with 23 pairs of setae; Ventrianal shield with concave anterior margin, width almost two times the length ..... *P. plumosa*
- Dorsal shield with 18 pairs of setae.... 4
4. Width of ventrianal shield more than twice the length, with three pairs of preanal setae..... *P. alstoni*
- Ventrianal shield wider than long but not as wide as above, with four pairs of preanal setae..... *P. poetica*

Key to species of *Podocinum* based on female

1. Dorsal shield with a deep incision in posterior half..... 2
- Dorsal shield without a deep incision in posterior half 5
2. Dorsal shield with 19 pairs of setae..... ..... *P. ruwenjoriense*
- Dorsal shield with 14 pairs of setae.... 3
3. Dorsal shield with polygonal networks formed by nodules..... 4
- Dorsal shield without polygonal networks formed by nodules .... *P. jamaicense*
4. Polygonal networks on whole dorsal shield, hysterosoma with four pairs of stout dorsal setae, fixed digit of chelicera with four teeth .... *P. protonotum*
- Polygonal networks on opisthosoma only, hysterosoma with five pairs of stout dorsal setae, fixed digit of chelicera with six teeth ... *P. bengalense*
5. Subterminal setae on tarsus I very long, extending much beyond the distal end of tarsus I 6
- Subterminal setae on tarsus I not extending much beyond the distal end of tarsus I 9
6. Dorsal shield with polygonal networks 7
- Dorsal shield without polygonal networks 8
7. Dorsal shield with 17 pairs of setae,

hysterosoma with six pairs of stout setae, ventrianal shield longer than wide, fixed digit of chelicera with 9 teeth..... *P. pintungense*

- Dorsal shield with 16 pairs of setae, hysterosoma with seven pairs of stout setae, ventrianal shield wider than long, fixed digit of chelicera with 5 teeth..... *P. aciculatum*

8. Dorsal shield with 18 pairs of setae, hysterosoma with five pairs of stout setae, ventrianal shield wider than long ..... *P. sagax*
- Dorsal shield with 16 pairs of setae, hysterosoma with four pairs of stout setae..... *P. pugnorum*

9. Length of subterminal setae of tarsus I approximate the distance between the setal base and the distal end of tarsus I 10
- Length of subterminal setae of tarsus I less than the distance between the setal base and the distal end of tarsus I 14

10. With 19 pairs of dorsal setae 11
- With 16 or 17 pairs of dorsal setae.... 12

11. Length of subterminal setae on tarsus I does not reach the distal end of tarsus I; setae D3, D4, D5, D6, L2, L3 smooth, length of seta D7 longer than distance between D7-D8 ..... *P. sibirium*
- Length of subterminal setae on tarsus I reaches the distal end of tarsus I; setae D3, D4, D5, D6 pilose, L2 weakly pilose, length of seta D7 does not reach the base of D8..... *P. tsushimanum*

12. Anterior half of dorsal shield with four pairs of long, stout setae..... ..... *P. monilicum*
- Anterior half of dorsal shield with only one pairs of long, stout setae 13

13. Ventrianal shield subtriangular; hysterosoma with seven pairs of stout dorsal setae ..... *P. taylori*
- Ventrianal shield much wider than long, more or less pentagonal, anterior margin concave; hysterosoma with six pairs of stout dorsal setae..... ..... *P. sumatrense*

14. Length of subterminal setae of tarsus I approximate half the distance between setal base and the distal end of tarsus I 15
- Length of subterminal setae of tarsus I much less than half the distance between setal base and the distal end of tarsus I 20

15. With two subterminal setae on tarsus I approximate half the distance between setal base and the distal end of tarsus I ..... *P. jianfenglingense*
- With only one subterminal setae on tarsus I approximate half the distance between setal base and the distal end of tarsus I 16

16. With 19 pairs of dorsal setae..... 17
- With 16 or 17 pairs of dorsal setae ... 19

17. Hysterosoma with eight pairs of stout dorsal setae 18
- Hysterosoma with six pairs of stout dorsal setae ..... *P. catenulum*

18. Polygonal area of dorsal shield tuberculated, fixed digit of chelicera with four teeth ..... *P. changchunense*
- Polygonal area of dorsal shield not tuberculated, fixed digit of chelicera with seven teeth..... *P. anhuense*

19. Dorsal shield with 17 pairs of setae, hysterosoma with four pairs of stout dorsal setae, fixed digit of chelicera with five (four) teeth..... *P. orientale*
- Dorsal shield with 16 pairs of setae, hysterosoma with six pairs of stout dorsal setae, fixed digit of chelicera with seven teeth..... *P. aokii*

20. Dorsal shield with polygonal networks 21
- Dorsal shield without polygonal networks, subterminal setae on tarsus I minute, inconspicuous .... *P. mediocre* and *P. minus*

21. Dorsal shield with polygonal networks in center only ..... *P. stellatum*
- Dorsal shield with polygonal networks in whole area..... 22

22. Dorsal shield with 16 pairs of setae . 23
- Dorsal shield with more than 16 pairs of setae 24

23. Distance between j1 shorter than setal length of j1.....*P. pacificum*
- Distance between j1 longer than setal length of j1.....*P. agilis*

24. With 17 pairs of dorsal setae, two pairs of stout dorsal setae on hysterosoma ....*P. nepalense*
- With more than 17 pairs of dorsal setae.....25

25. With 19 pairs of dorsal setae, six pairs of stout dorsal setae on hysterosoma, distance between j1 setae longer than length of j1.....*P. catenum*
- With 18 pairs of dorsal setae.....26

26. Hysterosoma with six pairs of stout dorsal setae, distance between j1 setae shorter than length of j1, ventrianal shield more or less rectangular with rounded corners .....*P. hainanense*
- Hysterosoma with five pairs of stout dorsal setae, distance between j1 setae longer than length of j1, ventrianal shield triangular with rounded corners .....*P. tianmuense*

Ishikawa (1970), Liang (1993) and Volonikhina (1999) classified the setae of the dorsal shield into D and L series. This setae name system is followed in the present key.

Berlese described four *Podocinum* species, *P. sagax* Berlese, 1882, *P. pacificum* Berlese, 1895, *P. mediocre* Berlese, 1913, and *P. minus* Berlese, 1913. The former two species were each re-described by a few authors but not the latter two species. The only available information on the morphology of *P. mediocre* and *P. minus* is the original description of Berlese (1913). These two species differ in *P. minus* is smaller and the ventrianal shield of female is "obtrapzino- semicirculare" in *P. mediocre* and is "posterius bene rotundato" in *P. minus*. This is not sound enough for separating these two species to the present authors. We therefore follow Evans and Hyatt (1958) in keeping *P. mediocre* and *P. minus* in together in the identification key. Fortunately, these two species can be distinguished with other species by their short subterminal setae on tarsus I and the lack of polygonal networks on the dorsum.

Evans and Hyatt (1958), Athias-Henriot (1959), Ishikawa (1970), and Liang (1993) all described *Podocinum pacificum* using drawings. Athias-Henriot (1959) recorded 17 pairs of dorsal setae whereas the other authors recorded 16 pairs of dorsal setae. However, in the figures of Athias-Henirot (1959), all 17 pairs of setae were drawn in the figure of the dorsal view (Fig. 1A), while the other authors drew one pair of setae on the membrane posterolateral to the ventrianal shield. Therefore, the number of "dorsal" setae should be 17 pairs for *P. pacificum* with the setae L7 not on the dorsal shield but in the ventral position.

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臺灣足角蠕屬一新種和二新記錄種（蜱蠕亞綱：中氣門目：足角蠕科）

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摘　要

記述臺灣足角蠕屬(*Podocinum* (Berlese, 1882)) 一新種：屏東足角蠕(*Podocinum pintungense* sp. n.) 和二新記錄種：太平洋足角蠕 (*Podocinum pacificum* Berlese, 1886) 和長春足角蠕 (*Podocinum changchunense* Liang, 1993)。足角蠕科首度被報導存在於台灣。

關鍵詞：足角蠕科、足角蠕屬、新種、新記錄種、臺灣。

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