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LETTER

The terrestrial isopod, *Cylisticus convexus* (de Geer, 1778), representing a new record family in China (Oniscidea)

Among the 11 suborders of Isopoda, Oniscidea is the only one that is completely adapted to land life. It is widely distributed in the world, with 38 families and 3,814 species (WoRMS, 2021). Thirteen accepted families and one *incertae sedis* genus of the suborder Oniscidea have been reported from China, namely Agnaridae Schmidt, 2003, Alloniscidae Schmidt, 2003, Armadillidae Brandt, 1831, Armadillidiidae Brandt, 1833, Detonidae Budde-Lund, 1904, Halophilosciidae Verhoeff, 1908, Ligiidae Leach, 1814, Philosciidae Kinahan, 1857, Platyarthridae Verhoeff, 1949, Porcellionidae Brandt, 1831, Styloniscidae Vandel, 1952, Trachelipodidae Strouhal, 1953, Tylidae Dana, 1852 and *Exalloniscus* Stebbing, 1911 (Chen, 2003; Schmalfuss, 2003a; WoRMS, 2021).

The family Cylisticidae was original erected by Verhoeff (1949) by a subfamily of the family Porcellionidae. But Strouhal (1953) disagreed the treatment and put all forms with five pairs of lungs under the subfamily Trachelipinae. However, Vandel (1962) consented Verhoeff's opinion and raised the Cylisticidae to family status. The subsequent works (Schmidt, 2003; Kashani, 2016) followed the treatment.

Until now, Cylisticidae consists of four genera, *Cylisticus* Schnitzler, 1853, *Lepinisticus* Manicastri & Taiti, 1983, *Parcylisticus* Verhoeff, 1943, *Troglocylisticus* Ferrara & Taiti, 1983, with 65 species (WoRMS, 2021). Species of the family Cylisticidae is mainly distributed in Europe, the Caucasus, and also in Turkey and Iran of Asia (Manicastri, 1983; Schmalfuss, 2003b; Kashani, 2016; Bakhshi, 2020), with the exception of *Cylisticus convexus* (de Geer, 1778) which was introduced to Northern Africa and North and South America (Schmalfuss, 2003a).

In present work, the species *Cylisticus convexus* (de Geer, 1778) is recorded in China for the first time, which is also the first record of the family in China.

Specimens were collected from Mountain Dongjiguan, Lvshunkou, Dalian, Liaoning, China and deposited in the Institute of Chinese Materia Medica, China Academy of Chinese Medical Sciences, China (CMMI). All the collected specimens were stored in 75% ethanol and the appendages (antenna, mouth parts, pereopods, pleopods) were preserved in a mixture of glycerin and water for identification. Multifocus images were captured using Olympus SZ16 stereomicroscope; montage images were generated using Helicon Focus V6.7.1® and edited with Adobe Photoshop CS3®.

Family Cylisticidae Verhoeff, 1949

Genus *Cylisticus* Schnitzler, 1853

***Cylisticus convexus* (de Geer, 1778)** (Figs 1–24)

Description. Maximum length 9.0 mm for male, 10.0 mm for female. Body elongated and convex, about 2 times as long as wide, exoantennal conglobation ability (when body rolls up, its antenna bend on back). Dorsal surface of head, pereon and pleon brown-gray with pale muscle spots (Fig. 1). Cephalon and pereonite 1 without any groove on dorsal surface (Fig. 3). Dorsal surface of tergites covered with gland pores.

Cephalon with nearly quadrangular lateral lobes obliquely directed outwards; medial lobe triangular, not surpassing lateral lobes in dorsal view; supra-antennal line absent (Figs 3, 5). Eyes with 22 ommatidia (Fig. 5). Antenna with fifth article of peduncle longer than flagellum; flagellum of two articles, distal and proximal articles nearly equal in length (Fig. 15). Mandible with molar penicil consisting of numerous setae arising from a common stem; several penicils between lacinia mobilis and molar process; incisor process and lacinia mobilis of right mandible smaller than left (Figs 19–20). Maxillule with exopod bearing 11 (4 simple + 7 cleft apically) teeth; outer margin of exopod with a row of dense setae with short setae on upper part and long setae on lower part (Fig. 18). Maxilla two-lobed, with both lobes bearing setules; inner lobe larger than outer lobe with scatter spines (Fig. 17). Maxilliped coxa bearing scales and scale-setae; endite with four

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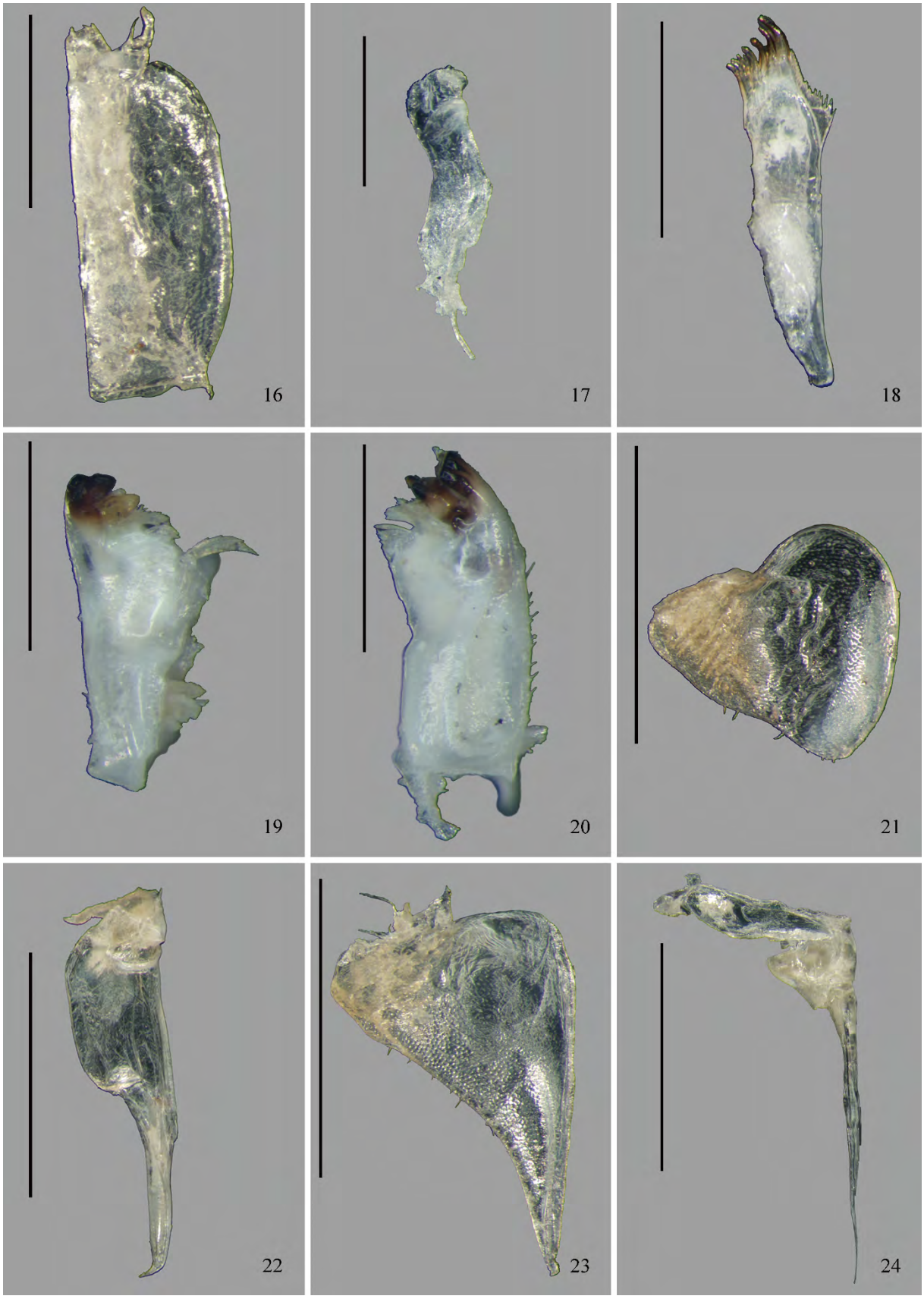
Figures 1–7. Male of *Cylisticus convexus*, CMMI 20201110002. 1. Dorsal view. 2. Ventral view. 3. Cephalon, dorsal view. 4. Telson and uropods, dorsal view. 5. Cephalon, frontal view. 6. Cephalon, ventral view. 7. Uropods, ventral view. Scale bars = 1.0 mm.

Figures 8–15. Male of *Cylisticus convexus*, CMMI 20201110002. 8. Pereopod 1. 9. Pereopod 2. 10. Pereopod 3. 11. Pereopod 4. 12. Pereopod 5. 13. Pereopod 6. 14. Pereopod 7. 15. Antenna. Scale bars = 1.0 mm.



Figures 16–24. Male of *Cylisticus convexus*. 16–18. CMMI 20201110001. 16. Maxilliped; 17. Maxilla; 18. Maxillule. 19–20. CMMI 20201110003. 19. Right mandible; 20. Left mandible. 21–24. CMMI 20201110002. 21. pleopod 1 exopod; 22. pleopod 1 endopod; 23. pleopod 2 exopod; 24. pleopod 2 endopod. Scale bars: 16–20 = 0.5 mm; 21–24 = 1.0 mm.

setae on distal margin; palp reduced, three-segmented with basal segment bearing 2 setae, distal margin of medial segment bearing 1 large seta on inner side and 1 seta on medial margin, distal process of apical segment bearing a tuft of small setae (Fig. 16).

Pereonite 1 with postero-lateral corners acute and postero-lateral margin concave; pereonites 2–4 with postero-lateral corners rounded; pereonites 5–7 with postero-lateral corners almost right-angled (Fig. 1). Noduli laterals on pereonite 4 2.5 times as far from lateral margin than those on pereonite 3. Pereopod 1 carpus with longitudinal slender scales on rostral surface, dactylus with one dactylar seta and brown-yellow claw curved ventrally (Fig. 8).

Side edge of pleon in line with side edge of pereon (Fig. 1). Pleopod 1–5 exopod with internal lungs. Telson triangular with concave sides and rounded apex; apex surpassing uropodal protopod (Figs 1, 4). Uropodal protopod grooved on outer margin; endopod as long as exopod ending with long setae (Figs 2, 7).

Male. Pereopods 1–7 merus and carpus with brush of setae on ventral surface. Distal two thirds of pereopods 6 basis with long and dense setae (Fig. 13). Ventral margin of pereopod 7 ischium slightly concave with hairy brush of small setae and six long setae (Fig. 14). Pleopod 1 exopod nearly heart-shaped with a raw of short setae on outer margin; endopod with proximal half wide, distal half narrow, and tip slightly curved outward (Figs 21–22). Pleopod 2 exopod triangular with a raw of short setae on outer margin; endopod styliform, longer than exopod (Figs 23–24).

Material examined. CMMI 20201110001–005, 4♀6♂, under stones, Mountain Dongjiguan, Lvshunkou, Dalian, Liaoning, China (38°48'23.6″N, 121°17'15.6″E, elev. 73 m), 10 November 2020, coll. W.H. Dai.

Distribution. China (Liaoning), Asia Minor, Europe, Northern Africa, North and South America.

Biology. The species was found in a tourist attraction with the vegetation type of deciduous forest (Fig. 25). Individuals often hide in humid environments during the day, such as soft soil, under stones and thick piles of dead leaves. When frightened by light, sound or vibration, it will roll its body into a ball or run away quickly (Fig. 26).

Remarks. The genus *Cylisticus* consists of an eastern group (Eastern Europe, Turkey, Caucasus region, northern and western Iran) and a western group (southern France, northern Italy, Corsica, Sardinia) (Schmalfuss, 2003b). There are two vague diagnostic characters of the genus: the exoantennal conglobation ability which may be liable to convergence, male pereopod 6 basis with sexual modification while this characteristic is deficient in smaller, endogenous life, unpigmented species of the western group. The discovery of *C. convexus* adds a family to the Chinese woodlouse species lists. Up to now, 14 families and one *incertae sedis* genus of the suborder Oniscidea in China. Woodlouse species such as *Armadillidium vulgare* (Latreille, 1804), *Porcellio laevis* Latreille, 1804, and *Porcellionides pruinosus* (Brandt, 1833) have spread to all parts of the world through human activities. Whether the source of Chinese *C. convexus* originated from the same path still needs to be further studied.

The suborder Oniscidea in China has been intermittently reported (Shen, 1949; Wei, 1992; Kwon & Taiti, 1993; Wang & Kwon, 1993; Gui *et al.*, 1994; Tang *et al.*, 1994a, b; Jeon & Kwon, 1995, 1996; Kwon & Wang, 1996; Gui & Tang, 1996; Dai & Cai, 1998; Tang & Gui, 2000; Chen, 2003; Li, 2015, 2017, 2018). Previous studies had been focused on the southern part of China, but more areas of China still need to be investigated by zoologists, such as the western, central and northern

Figures 25–26. *Cylisticus convexus*. 25. Habitat. 26. Living adult.

parts of China. It has a great potential that more species of the suborder Oniscidea occur in areas not explored or incompletely sampled.

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