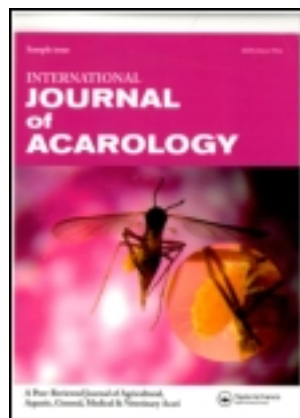




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Description of *Sinaxonopsis unicurus* sp. nov. et gen. nov. (Acari: Hydrachnidia: Aturidae) from Anhui Province, China

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A new genus *Sinaxonopsis* **gen. nov.** with a new species *Sinaxonopsis unicurus* **sp. nov.** from China is described. Adults of the new genus are autapomorphic among Aturidae in having a large posterior dorsal plate and a pair of anterior plates, numerous cetabula scattered on their surfaces from both sides of the gonopore to posterolateral area, CxIV extending far laterally with a ridge, the third and fourth legs of male exhibiting sexual dimorphism with various modified setae, claws of male III-L-6 heteromorphic and modified, male IV-L-6 with thicker distal ends, and a pair of well-developed dorsal projections. The systematic status of the new genus is discussed. The new genus is tentatively assigned to Axonopsinae but it certainly is not closely related to any previously described genus.

Keywords: Aturidae; Axonopsinae; new genus; new species; China

Introduction

Aturidae Thor, 1900 is a large, highly diverse family with well-sclerotized and typically dorsoventrally flattened bodies and is divided into four subfamilies (Krantz and Walter 2009). In the world catalogue of water mites published by Viets (1987), 54 genera were listed. A further 20 genera were described after 1987 (data from European Water Mite Research n.d.) and the species have been described regularly in the last 10 years (Pesic 2003, 2004; Pesic and Gerecke 2003; Tuzovskij 2003, 2004; Pesic et al. 2005, 2010; Smit 2007, 2010; Pesic and Ranga Reddy 2009; Semenchenko 2010; Esen et al. 2011; Semenchenko and Tuzovskij 2011). In China, three species were previously reported: *Albia* (*Spinalbia*) *rectifrons* Viets, 1935 and *Axonopsis* (*Hexaxonopsis*) *paxillata* Uchida & Imamura, 1951 from Hubei Province; and *Aturus* (*Aturus*) *hexgonus* Jin, 2001 from the Nei Mongol Autonomous Region (Jin 1997, 2001). The new genus, *Sinaxonopsis*, described here was collected from Anhui Province, near the northern margin of the Holarctic realm in China.

Materials and methods

Specimens examined in this study were collected by Tian-Ci Yi from a pool with substrate varying from bedrock to gravel of a small stream in Fuxi Nature Reserve, Anhui Province, China. Water mites were collected by hand netting, extracted from the collected material at the field site and preserved in Koenike's fluid. Specimens were dissected as described elsewhere (Jin 1997) under a stereomicroscope (Motic SMZ-168 series, Motic China Group Co. Ltd., Shenzhen City, Guangdong Province, China) and illustrations were made with LEICA-DALB (second edition in 1997 by Leica Mikroskopie und Systeme GmbH, Wetzlar, Germany). The dissected holotype and paratypes were slide

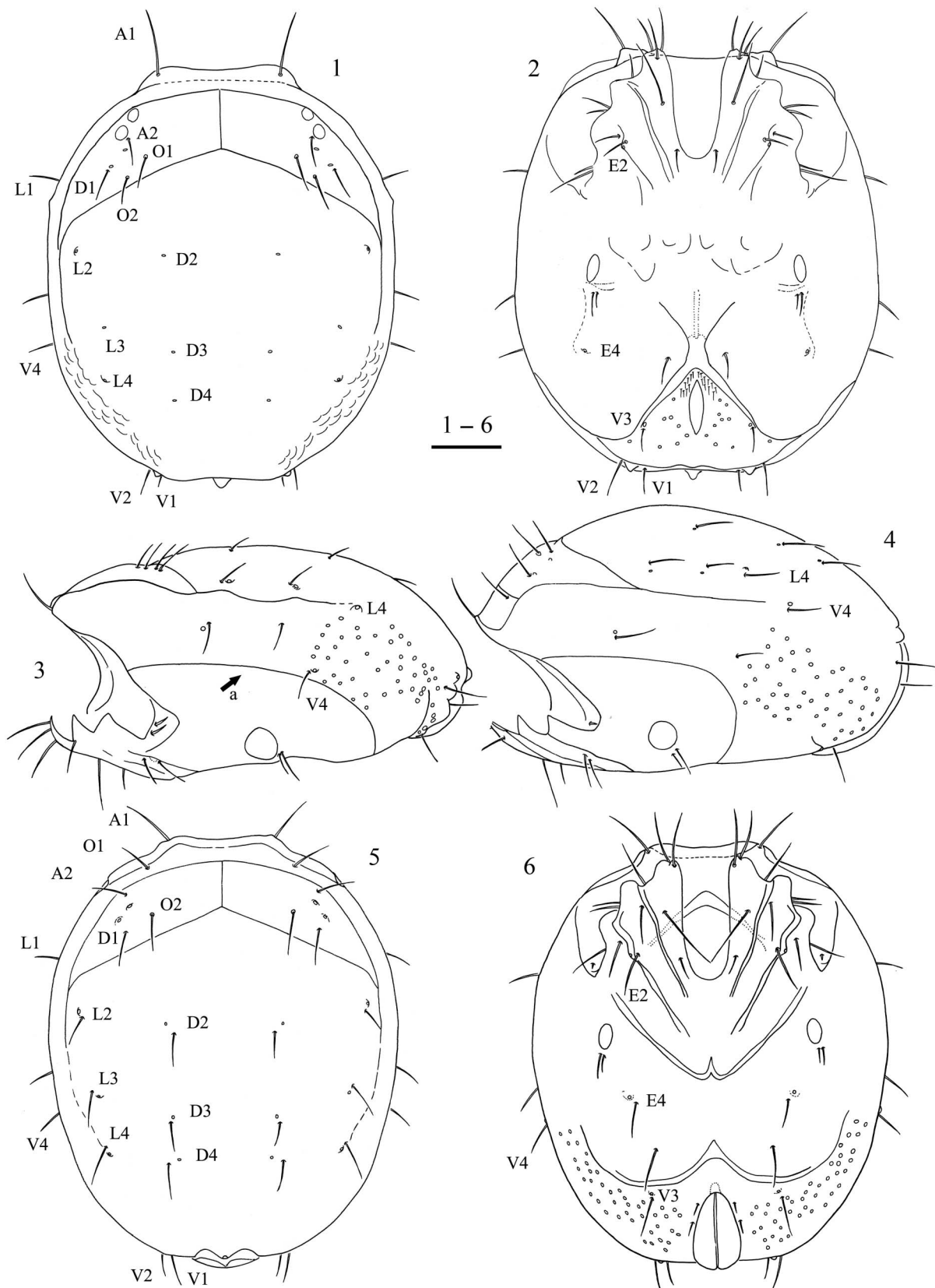
mounted in glycerine jelly and deposited in the Institute of Entomology, Guizhou University (GUGC), China.

Specimens selected for scanning electron microscopy were prepared step by step as follows: specimens were cleared in phosphate buffer (pH 7.2) for 15 min, 1500 rpm, thrice, then fixed in 2.5% glutaraldehyde in a phosphate buffer (pH 7.2) for 12 hours first and then in 4% osmic acid for 12 hours. Specimens were dehydrated in a graded series of ethanolic *tert*-butyl alcohol, once per grade (50–95%), and thrice in absolute alcohol before being freeze-dried with LGJ-10D in 0–10°C, 30 min. They were then sputter-coated with gold in Hitachi E-1010, 15 mA, 10 Pa, for 90 s and examined under a Hitachi S-3400N (Hitachi Science Systems, Ltd., Minato-ku, Tokyo, Japan) scanning electron microscope at 25 kV.

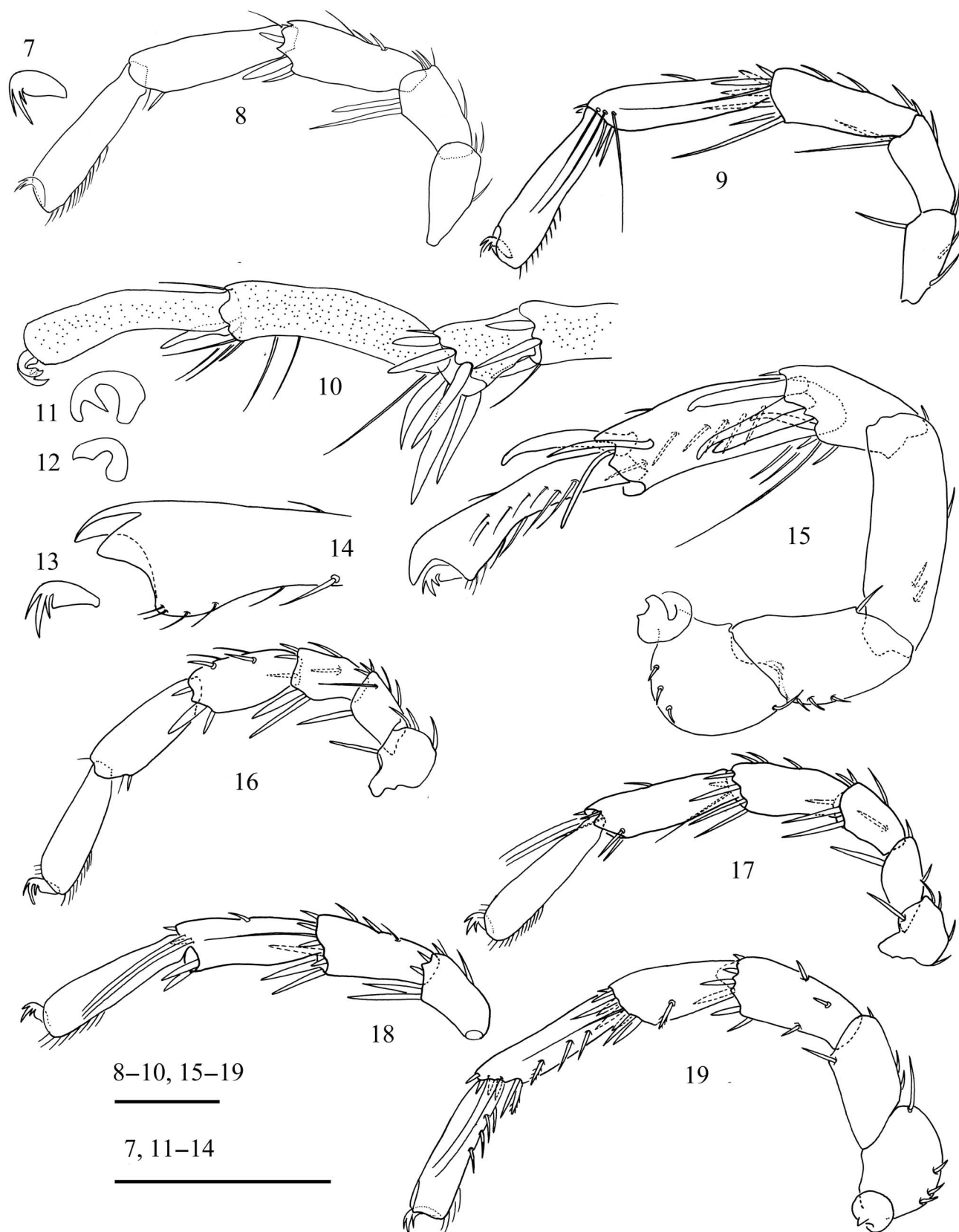
Measurements are given in micrometres. Measurements of paired structures were made on only one member of the pair, haphazardly selected as to left or right. Measurements are provided for $n = 5$ for both males and females followed by the measurement of the holotype. Terms follow Jin (1997). The following abbreviations are used: A1, A2, antennal glandularia 1 and 2; CxI–CxIV, coxae I–IV; D1–D4, dorsoglandularia 1–4; E1–E4, epimeroglandularia 1–4; L1–L4, lateroglandularia 1–4; O1, O2, ocularia I and 2; P-I to P-V, palpal segments 1–5; V1–V4, venteroglandularia 1–4; I-L-1 to I-L-6, the first leg segments 1–6; IV-L-1 to IV-L-6, the fourth leg segments 1–6.

Systematics

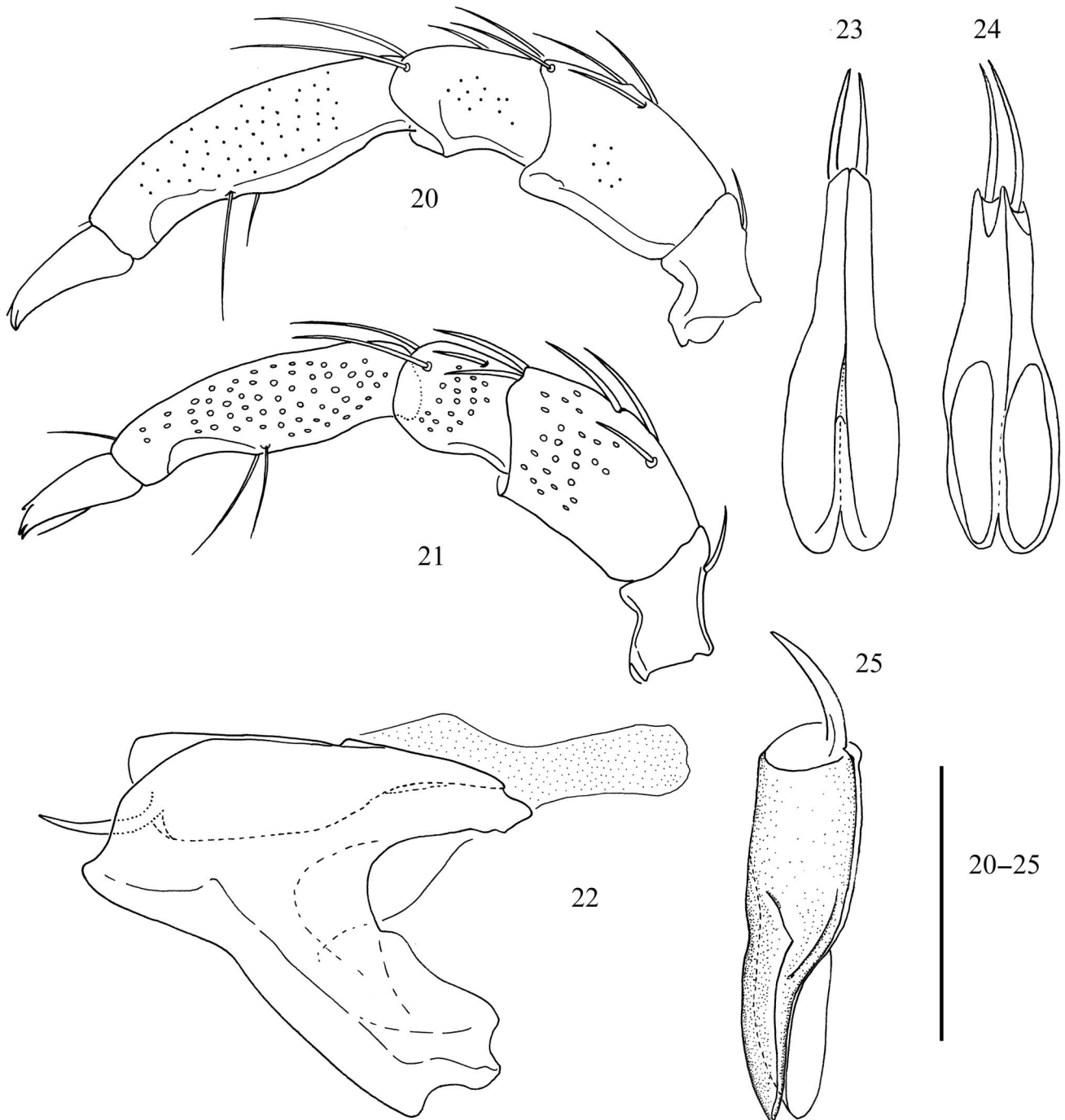
Family **Aturidae** Thor, 1900
Subfamily **Axonopsinae** Viets, 1929
***Sinaxonopsis* gen. nov.**
(Figures 1–41)



Figures 1–6. *Sinaxonopsis unicucrus* sp. nov. male, 1–3; female, 4–6 – 1. idiosoma, dorsal view; 2. idiosoma, ventral view; 3. idiosoma, lateral view; 4. idiosoma, lateral view; 5. idiosoma, dorsal view; 6. idiosoma, ventral view. Bar = 100 μm.



Figures 7–19. *Sinaxonopsis unicucrus* sp. nov. male – 7–15; female, 15–19 – 7. claw of I-L-6; 8. I-L; 9. II-L; 10. III-L (terminal segments); 11. claw of III-L-6; 12. claw of III-L-6; 13. IV-L-6; 14. claw of IV-L-6; 15. IV-L; 16. I-L; 17. II-L; 18. III-L (terminal segments); 19. IV-L. Bar = 100 μ m.



Figures 20–25. *Sinaxonopsis unicucrus* sp. nov. male – 20, 22; female 21, 23–25 – 20. palp, lateral view; 21. palp, lateral view; 22. infracapitulum, lateral view; 23. chelicera, ventral view; 24. chelicera, dorsal view; 25. chelicera, lateral view. Bar = 100 μ m.

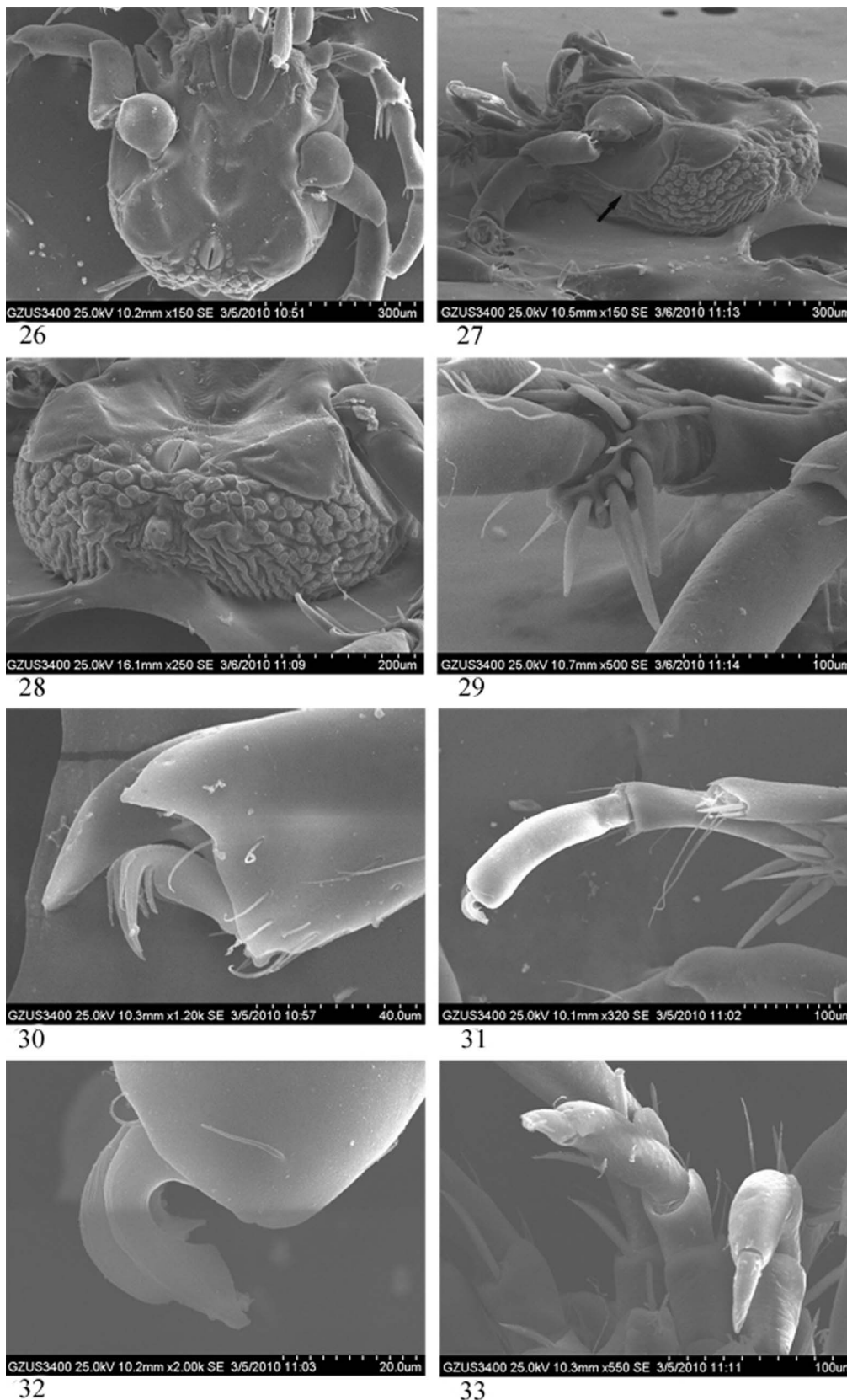
Diagnosis

With the characteristics of the family and subfamily as described by Cook (1974); dorsum with a large posterior dorsal plate and a pair of anterior plates (Figures 1 and 5); coxae fused as single coxal group and suture lines recognizable, tips of anterior three pairs of coxae rounded and not beyond anterior end of body; acetabula numerous, scattered on surface from both sides of gonopore to posterolateral area (Figures 2–4, 6, 27, 28, 35 and 36); CxIV extending far laterally with a ridge (arrow in Figure. 27 for male

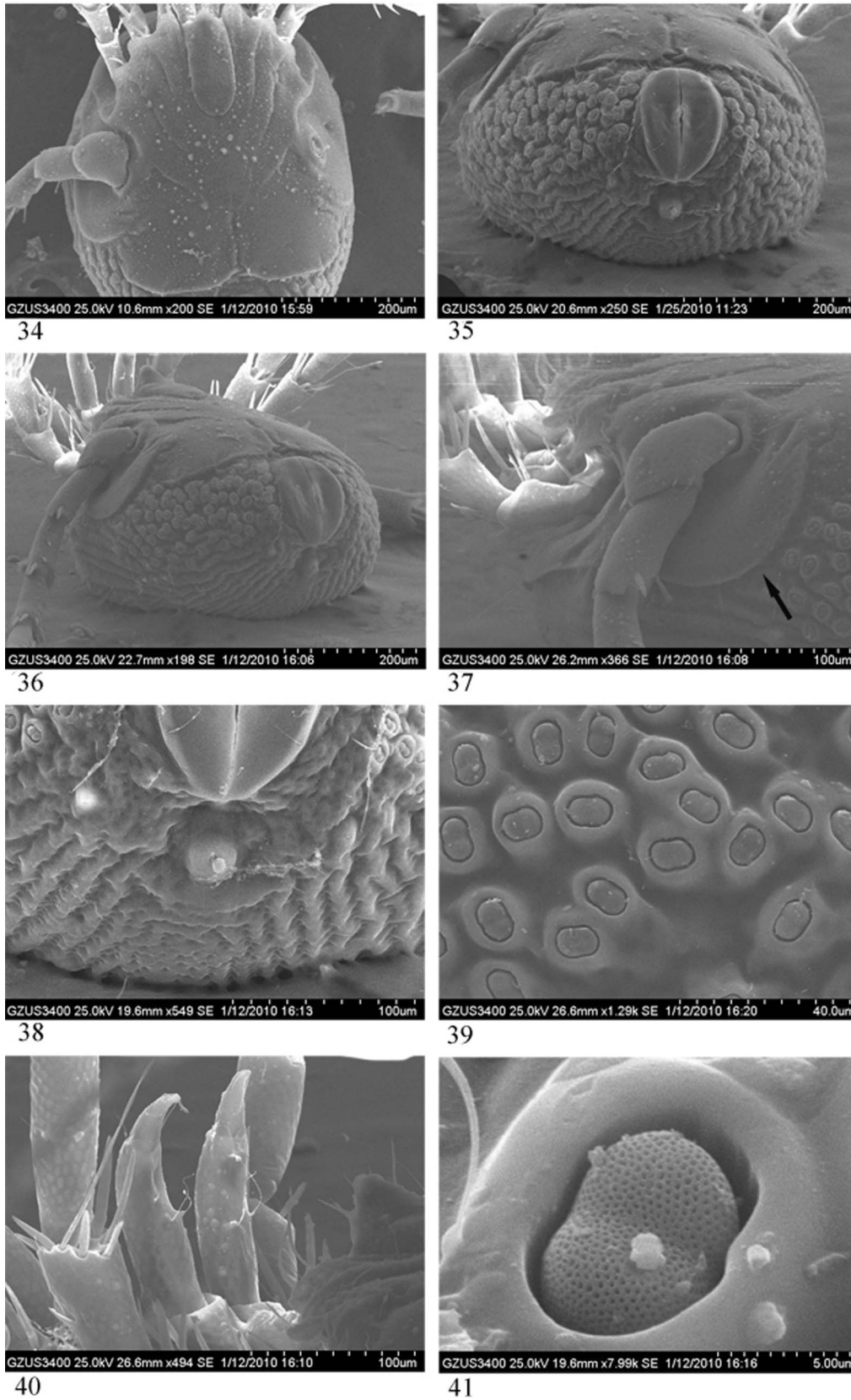
and in Figure 37 for female); the third and fourth legs of male exhibiting sexual dimorphism with various modified setae (Figures 10, 15, 29 and 30), claws of male III-L-6 heteromorphic and modified as shown in Figures 11, 12 and 32; male IV-L-6 with thicker distal ends and a pair of well-developed dorsal projection (Figure 14 and 30).

Etymology

Named after China, where the water mites occur, and the subfamily name.



Figures 26–33. *Sinaxonopsis unicucrus* sp. nov. male – 26. idiosoma, ventral view; 27. idiosoma, lateral view; 28. idiosoma, ventral-end view; 29. terminal seta of III-L-4; 30. end of IV-L-631. III-L-5, 6; 32. claw of III-L-6; 33. palp.



Figures 34–41. *Sinaxonopsis unicrucus* sp. nov. female – 34. coxale; 35. idiosoma, caudal view; 36. idiosoma, ventral-end view; 37. idiosoma, lateral view; 38. gonopore; 39. acetabula; 40. palp; 41. a single acetabulum.

Remarks

The subfamily Axonopsinae is the most diverse of the subfamilies in the family Aturidae and awaits a full revision for proper taxonomic placement of genera (Cook 1974; Valdecasas 2008). Some members of Axonopsinae have anterior coxae not projecting beyond the anterior end of the body and numerous acetabula, but their acetabular region does not extend as far post-laterally as in the new taxon. The new taxon is tentatively assigned to the Axonopsinae but it certainly is not closely related to any previously described genus.

***Sinaxonopsis unicucrus* sp. nov.**
(Figures 1–41)

Type series

Holotype: male, Fuxi Nature Reserve, Anhui Province, surface water of a stream, 30°04'17" N, 118°09'26" E, 22 October 2006, leg. Tian-Ci Yi. Paratypes: 10 males and 12 females, the same data as the holotype, one male and one female were prepared for scanning electron microscopy.

Description

Male ($n = 5$). Idiosoma (547–588) 588 in length and (506–513) 513 in width; dorsal and ventral shields present; dorsal integument lined (Figures 28, 35 and 38); anterior margin of dorsum projected dorsally and bearing a pair of A1; dorsal shield comprising a large posterior dorsal plate and a pair of anterior plates (Figure 1) with suture lines easily recognizable; anterior plate bearing two pairs of lateral eyes, O1, O2, A2 and D1; posterior plate bearing D2, D3, D4, L2, L3, L4; excretory pore on a marked projection locating on terminal end of body (Figure 28); tips of anterior three pairs of coxae rounded and not beyond anterior end of body; tips of CxI with three long setae; infracapitulum bay 198 in depth; all coxae fused as single coxal group and suture lines recognizable; E2 located on posterior margin of CxII where suture line of CxII/III is convex lateroposteriorly; CxIV well extended posteriorly with round posterior margin and laterally with a ridge; E4 on projections in middle of CxIV (Figure 28); genital field triangular and slightly depressed and gonopore somewhat protruding; gonopore (75–77) 77 in length and (21–25) 25 in width; several pairs of genital setae on anterior part of gonopore; acetabula numerous, distributed from both sides of gonopore to the post-lateral area of idiosoma (Figures 3, 4, 28 and 35); integument of palps raised, proportions and chaetotaxy of palp as shown in Figure 20; mid-ventral side of P-II concave; ventral side of P-IV with two heteromorphic setae, concave from anterior ventral setae; dorsal lengths of P-I to P-V: (40–44) 44, (79–88) 86, (52–57) 55, (128–131) 131, (45–51) 49; characters of infracapitulum as shown in Figure 22, (170–175) 173 in length, chelicera (173–181) 180 in length; ventral surface of I-L-6 and II-L-6 with dense small setae (Figures 8 and 9), claws of I-L-6 and II-L-6 with a dorsal clawlet and a ventral clawlet (Figure 7); the third and the fourth legs exhibiting

sexual dimorphism, III-L-4 sturdy with six terminal heavy setae, III-L-5 with a terminal heavy seta; III-L-6 curved ventrally with round tips, claws of III-L-6 modified and heteromorphic, as shown in Figures 11, 12 and 32; IV-L-4 sturdy with four heavy setae and well-developed distal projection covering the insertions of heavy setae and proximal of IV-L-5; IV-L-5 with a wide, long heavy seta, a slender heavy seta and ventrally curved uniform thickness seta; IV-L-6 gradually thicker from mid to distal and with a pair of well-developed dorsal projections (Figures 14, 15 and 30), claws of IV-L-6 with a dorsal clawlet and a ventral clawlet; dorsal lengths of I-L-4 to 6: (121–125) 125, (143–150) 150, (131–141) 140; dorsal lengths of IV-L-3 to 6: (128–136) 135, (219–223) 223, (193–208) 205; II-L-5 with four, III-L-4 with one and IV-L-4 with one swimming hair.

Female ($n = 5$). Idiosoma 564–594 in length and 468–479 in width; the shape of dorsal shield and palp similar to male; anterior plate bearing two pairs of lateral eyes, O1, O2, A2 and D1; excretory pore on dorsal posterior end; infracapitulum bay 163 in depth; coxae smooth without projection and concave as that of the male, suture lines of coxae as shown in Figures 6 and 24; gonopore large and located terminally, 126–135 in length and 52–67 in width; infracapitulum 151–163 in length; chelicera 173–178 in length (Figures 23–25); dorsal lengths of P-I to P-V: 48–54, 86–93, 50–55, 119–125, 41–46; legs as shown in Figure 2J–M, the third and the fourth legs without modified setae and claws of III-L-6 homomorphic; dorsal lengths of I-L-4 to 6: 101–108, 121–130, 131–135; dorsal lengths of IV-L-3 to 6: 115–128, 135–148, 118–127; II-L-4 with one, II-L-5 with three, III-L-2 with one, III-L-5 with three, IV-L-4 with one and IV-L-5 with two swimming hairs.

Etymology

Named after the strongly modified male legs, *unicus* Latin meaning unique, *crus*, Latin meaning leg.

Remarks

Except for the sexual dimorphism of the legs and the shape and position of the gonopore, the position of O1 and V4 is different between male and female. O1 is on the anterior plate in the male but on the “forehead” anterior to the anterior plate in the female. V4 is close to the margin of CxIV (lateral view; Figure 3) in male, but close to the margin of the dorsal shield (lateral view; Figure 4) in the female.

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