

## A New Cavernicolous Elmid (Coleoptera, Elmidae) Discovered in South China

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**Abstract** A new species belonging to a new genus of the elmid beetle is described from South China under the name of *Sinelmis uenoi*. This is the first record of cavernicolous elmid not only from China but also from whole Asia. It dwells in small rimstone pools fed by trickling water from the ceiling.

It is important and interesting from the viewpoints of zoogeography and systematics that a cavernicolous elmid beetle was found during the biospeological survey made in southeastern Guizhou, South China, in the autumn 2000. Although our team has made many faunal surveys in China for last ten years, we have been unable to collect any stygobiontic water beetles. However, collaborating with Dr. S.-I. UENO, KISHIMOTO, the second author of this paper, fortunately came across an elmid species, both adult and larva, in the limestone cave called Mochang Dong, southeastern Guizhou. This is the first finding of a stygobiontic elmid in China. Besides, only one stygobiontic species of Dytiscidae has hitherto been known from China (SPANGLER, 1996, pp. 243–245). It is extremely difficult to find out stygobiontic water beetles and less than 40 species belonging to 5 families have so far been recorded in the world.

Up to the present, one species of stygobiontic elmid has been described from Central Africa (Zaire) and four species from Central and South America (Haiti and Ecuador). One more elmid species was described from Japan (Ryukyus), but it is not a true stygobiontic species. Therefore, the one reported in this paper is the first record of cavernicolous elmid for the Asian fauna.

The adult of this elmid looks like an *Ordobrevia*, because the first punctate stria of each elytron is short, but it is utterly different from the latter in many respects as will be delineated on later pages. We are going to describe it as a new genus and new

species without hesitation and to give it a new name, *Sinelmis uenoi*.

We wish to express our hearty thanks to Dr. Shun-Ichi UENO of the National Science Museum (Nat. Hist.), Tokyo, for kindly reading the manuscript of this paper and for supporting the series of faunal surveys in China as our leader. We are also deeply grateful to Mr. FAN Ting for his kind arrangement of our continuous researches and to Messrs. Itsuro KAWASHIMA and Hiroyuki YOSHITOMI for their drawing fine illustrations used in this paper.

Genus *Sinelmis* M. SATÔ et KISHIMOTO, nov.

Type species: *Sinelmis uenoi* M. SATÔ et KISHIMOTO, sp. nov.

Body somewhat stout, elongate, but slightly dilated posteriad; dorsum moderately convex; surface provided with sparse granules and pubescence.

Head concealed under pronotum, so that only the front part including mouth parts

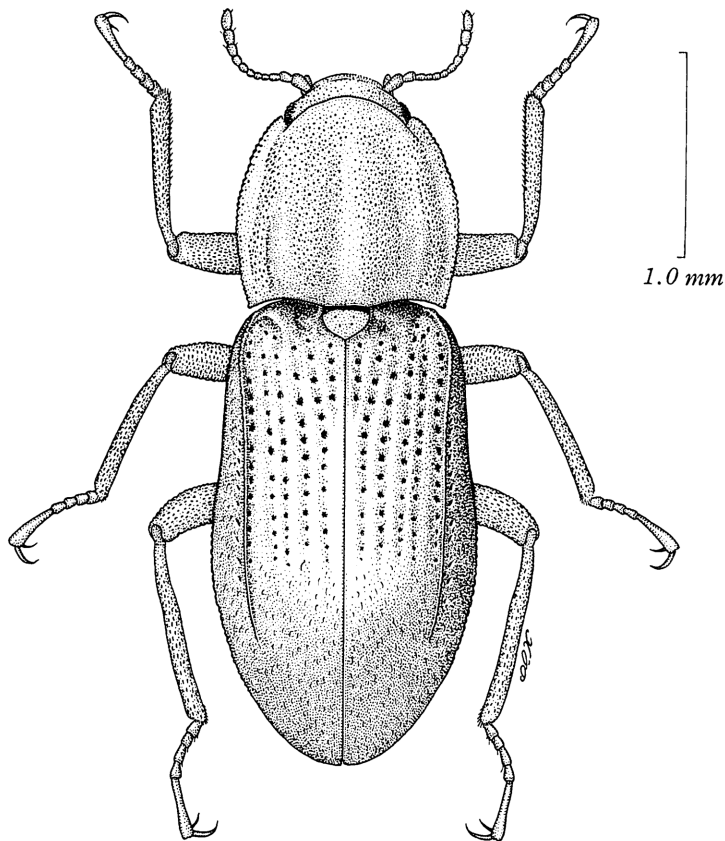


Fig. 1. *Sinelmis uenoi* M. SATÔ et KISHIMOTO, gen. et sp. nov., from Mochang Dong Cave at Laomaochong in Sandu Xian, SE. Guizhou; habitus.

is visible; clypeus narrowly transverse, straight across anterior margin and rounded antero-lateral corners; labrum arcuately rounded anteriorly and closely pubescent; mentum subtrapezoidal; submentum transverse; eyes reduced; mandibles provided with three apical teeth; antennae filiform, 11-segmented; maxillary palpi 4-segmented; labial palpi 3-segmented;

Pronotum a little broader than long, with the lateral sides arcuate; medial sulcus broad but shallow; sublateral carinae extending over the entire length of pronotum. Prosternal process rather broad, subparallel-sided with rounded apex. Metasternum wide, coarsely tuberculate. Metendosternite typical for elmid; stalk short; lateral arms short and stout.

Legs moderate in length, femora somewhat stout; 5th segment of tarsi the longest, a little shorter than 1st to 4th taken together and with middle ventral apex distinctly and broadly produced; claws simple and slender.

Elytra 2.1 times as long as pronotum, each furnished with 8 rows and 1 short accessory row of distinct punctures and with a sublateral carina. Hind wings obliterated.

Abdomen composed of 5 visible sternites; apex of the 5th gently rounded.

Male genitalia of trilobate type, slender; median lobe furnished with ventral sac. Female ovipositor typical for elmid; stylus and upper coxite rather long; baculus short.

*Notes.* The present new genus is somewhat related to *Ordobrevia*, *Stenelmis* and their allies, but can be easily distinguished from them by the reduced eyes and the obsolete hind wings which are adaptive features of stygobionts. Besides, the form of pronotum and the punctate striae of the elytra are characteristic.

The generic name, *Sinelmis* is a combination of *Sino-* meaning “Chinese” in Latin, and the nominotypical genus *Elmis*.

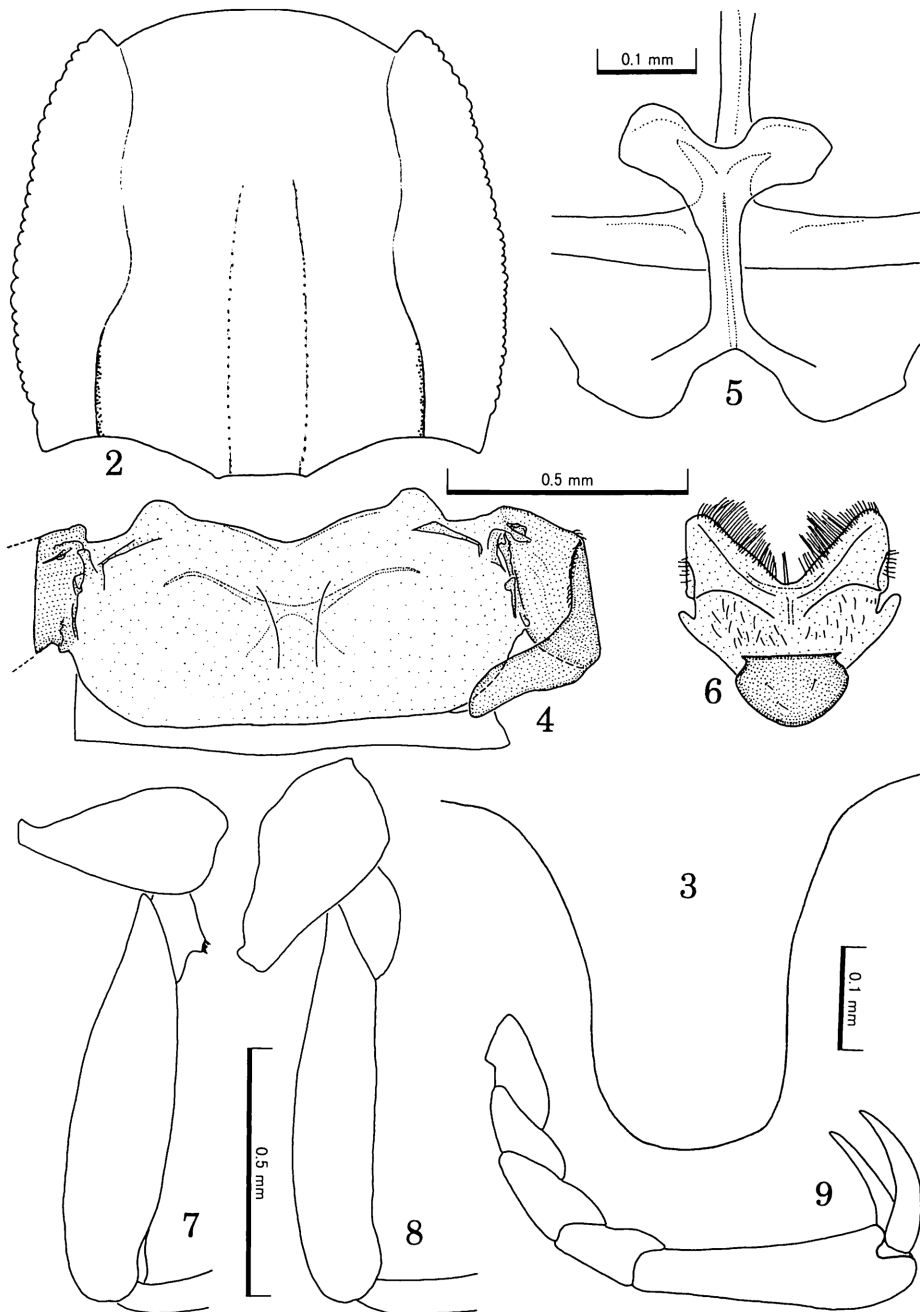
*Sinelmis uenoi* M. SATÔ et KISHIMOTO, sp. nov.

(Figs. 1–28)

**Male.** Coloration brown; pronotum and ventral surface somewhat darker. Body elongate, well convex above, moderately so below, subopaque but the elytra are faintly shining; surface sparsely covered with yellowish pubescence.

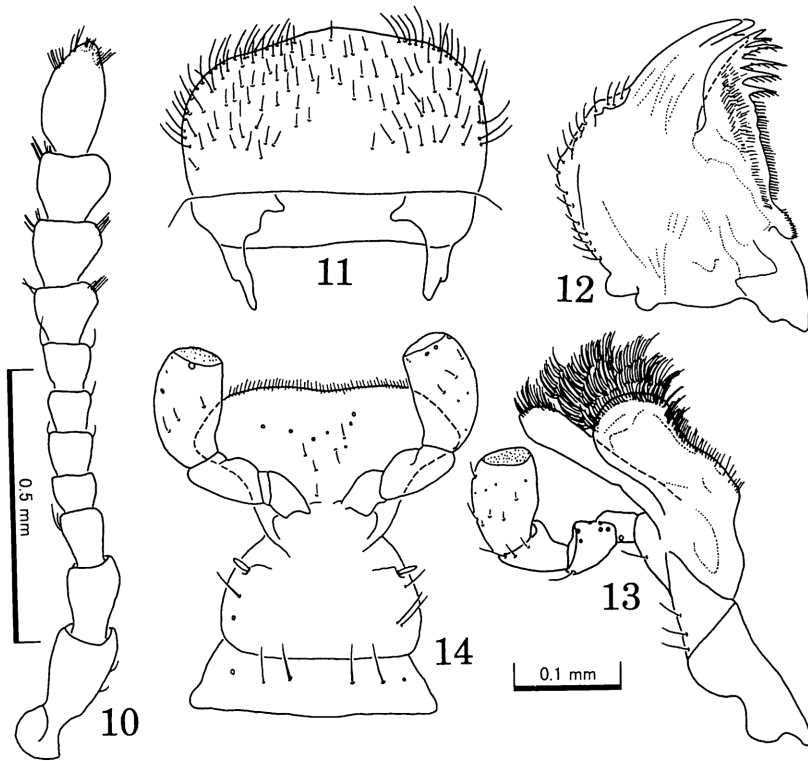
Head about 1.5 times as broad as long, slightly convex, rather strongly and sparsely granulate, very sparsely pubescent. Clypeus about 2.7 times as broad as long, sparsely granulate and reticulate in interspaces. Labrum about 1.9 times as broad as long, somewhat shining, microreticulate and closely pubescent. Eyes reduced, a small number of facets less than 20 remaining. Antennae slender, distal segment pointed at the apex. Maxillary palpus with suboval terminal segment which is the longest and truncate at the apex. Labial palpus with suboval terminal segment which is the longest and truncate at the apex.

Pronotum about 1.2 times as broad as long, broadest at 1/3 from base; anterior margin arcuate at middle and strongly emarginate at the sides behind eyes; lateral margins gently rounded and wholly crenulate; posterior margin bisinuate; front angles



Figs. 2-9. *Sinelmis uenoi* M. SATÔ et KISHIMOTO, gen. et sp. nov. — 2, Pronotum; 3, prosternal process; 4, metanotum with obliterated hind wings; 5, metendosternite; 6, mesonotum and scutellum; 7, male hind trochanter and femur; 8, female hind trochanter and femur; 9, hind tarsus and claws.



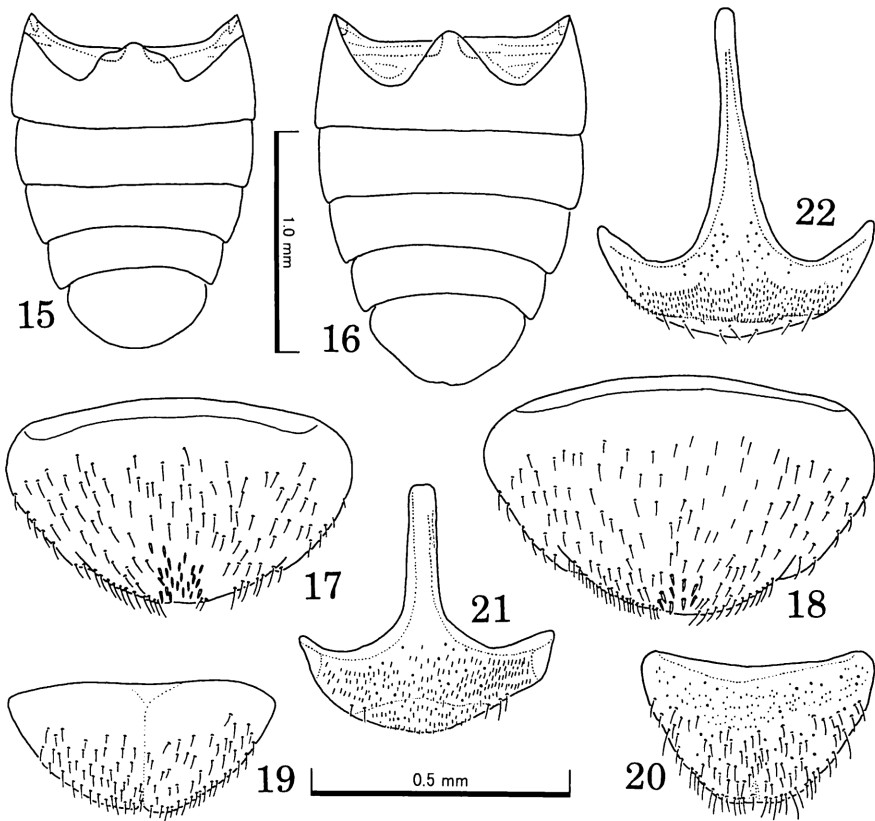


Figs. 10–14. *Sinelmis uenoi* M. SATŌ et KISHIMOTO, gen. et sp. nov. — 10, Antenna; 11, labrum; 12, right mandible; 13, maxillary palpus with galea; 14, labial palpus and mentum.

prominent along the external sides of eyes, with rounded apices, hind angles acute; surface sparsely granulate and pubescent, more sparsely at lateral portions and in posterior areas just inside sublateral sulci; medio-longitudinal sulcus broad and shallowly impressed, extending from base to apical third; sublateral carinae indistinct, bisinuate, extending over the full length of pronotum, though distinct in basal third. Scutellum cordate and shagreened.

Elytra about 1.5 times as long as wide, about 1.2 times as broad as pronotum, broadest at apical third; lateral margins somewhat divergent posteriad and crenulate, with rounded apices; each elytron bearing 8 punctate striae and 1 short accessory one at the base between suture and 1st stria, punctures of each stria distinct and becoming finer posteriad; intervals slightly convex and scattered with minute granules, except for the 6th which is distinctly carinate; integument finely shagreened. Hind wings obliterated and only minutely remaining.

Ventral surface subopaque and microreticulate. Prosternum and episternum sparsely, but distinctly granulate. Prosternal process broad, subparallel-sided, with rounded apex. Mesosternum sparsely granulate, shallowly hollowed at middle.



Figs. 15–22. *Sinelmis uenoi* M. SATO et KISHIMOTO, gen. et sp. nov. — 15, Male abdominal segments; 16, female abdominal segments; 17, male 5th sternite; 18, female 5th sternite; 19, male 6th tergite; 20, female 6th tergite; 21, male 6th sternite; 22, female 6th sternite.

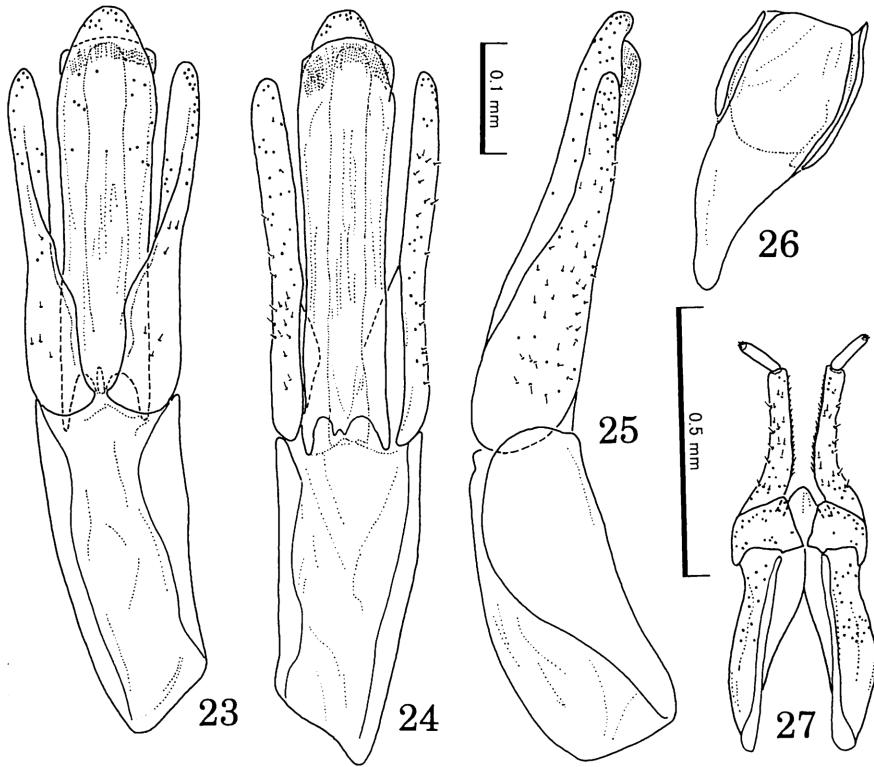
Metasternum wide, sparsely and distinctly granulate, with a medio-longitudinal groove. Abdominal sternite faintly scattered with minute granules; 1st segment shallowly rugoso-scrobiculate in anterior area and the pointed lobe more or less broadly and sinuately prominent anteriorly; 5th rather closely pubescent and with setae at the apical portion.

Legs rather stout, provided closely with elongate granules which look setiferous, and therefore sparsely covered with setae; internal face of front tibia furnished with a longitudinal series of setae; inner side of hind trochanter with a small tubercle bearing setae; claws large and slender, without tooth at each base.

Male genitalia slender; basal piece about 1.3 times as long as median lobe; lateral lobe tapered towards apex which is rounded; median lobe longer than lateral lobe, ventral sac well-developed.

Length: 2.75–3.70 mm; breadth: 1.15–1.50 mm.

Female. Inner side of hind trochanter without tubercle. Pointed lobe of 1st ab-



Figs. 23–27. *Sinelmis uenoi* M. SATŌ ET KISHIMOTO, gen. et sp. nov. — 23, Male genitalia in ventral aspect; 24, male genitalia in dorsal aspect; 25, male genitalia in lateral aspect; 26, male genital segment; 27, female ovipositor.

dominal sternite triangularly prominent anteriorly and apical setae of 5th not numerous. Ovipositor moderate; baculus short, shorter than stylus and coxite taken together; lower coxite rather stout; upper coxite slender and curved outwards; stylus long.

*Larva.* Body elongate and well convex above; ventral side less convex, head and thorax almost flat, strongly sclerotized. Light brown; head, thorax and tip of apical abdominal segment darker; surface rough, coarsely covered with minute rasp-like projections and devoid of distinct seta.

Head partially retracted into pronotum, subtrapezoidal in dorsal view, triangularly protrudent and transverse (width/length=0.64/0.40=1.60), with a projection at each antero-lateral corner; epicranial suture V-shaped, but its posterior half is indistinct; cranium without distinct seta; gular suture absent. Stemmata completely absent. Clypeus three times as wide as length, without seta. Mandibles tridentate, wedge-shaped; mesal surface slightly concave; middle tooth the longest; molar process absent. Maxilla and mentum clearly separated and devoid of seta. Maxilla with cardo, stipes, galea and lacinia distinctly separated; maxillary palpus 4-segmented, tapering towards apex.

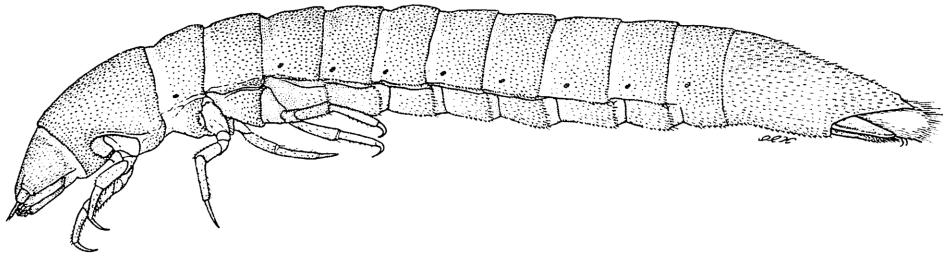


Fig. 28. Larva of *Sinelmis uenoi* M. SATŌ et KISHIMOTO, gen. et sp. nov., in lateral aspect.

Labial palpus 2-segmented. Antennae slender, inserted at antero-lateral corners, directed forwards; segment 1 about 1.6 times as wide as segment 2; segment 2 about 1.8 times as long as segment 1; segment 3 very thin and delicate, about 0.16 times as long as the preceding segment; antennal appendix also very thin and delicate, a little shorter than segment 3.

Prothorax slightly transverse (width/length=0.78/0.73=1.07), and longer than combined length of meso- and metathoraces along dorso-median line (prothorax/[mesothorax+metathorax]=0.73/[0.29+0.31]=1.22), with a triangular projection at anterior margin of sternum behind the level of procoxa. Propleuron divided into two parts. Mesothorax with a projected spiracle on each antero-lateral corner of pronotum, and without ventral ridge; posterior margin of sternite protrudent posteriad at middle. Mesosternum divided into two parts. Metathorax larger than mesothorax, devoid of spiracle, with conspicuous ventral ridge along median line of sternum, which bears a projection as in mesothorax.

Foreleg large and robust; coxa large and oval; trochanter longer on posterior face than on anterior face; femur longer and thicker than tibiotarsus which is curved inwards and slightly tapered apicad, with some spines along inner margin; pretarsus slender and curved. Middle and posterior legs slender; mesocoxa smaller than procoxa; metacoxa slender and flexible; femur without spine along inner margin except one at the tip; tibiotarsus and pretarsus slender and longer than those of anterior leg.

Abdominal segment covered with minute whitish scale-like pubescence, more conspicuous on the undersurface. Segments 1–6 each with remarkable pleurite, 7 with small pleurite; 2–7 tergites without tergal suture; 8–9 tergites, pleurites and sternites fused together, forming a continuous ring. Spiracles present near the lower margins of abdominal tergites 2–8. Segment 9 gradually narrowed posteriad in lateral view, deeply emarginate at apical margin, with a conspicuous projection on each side of emargination in dorsal view. Operculum covering cloacal chamber, with abdominal hooks, and without distinct seta. Anal gills well developed.

Length: 5.0–5.6 mm; width: 0.7–0.8 mm.

*Distribution.* China (Guizhou).

Holotype: ♂, Mochang Dong, 430 m alt., Laomaochong, Machang Cun, Fengle Xiang, Sandu Xian, SE. Guizhou, China, 28-X-2000, T. KISHIMOTO leg. Allotype: ♀,

same data as for the holotype. Paratypes: 53 exs., same data as for the holotype.

*Larval specimens examined.* 10 exs., collected together with the adults.

The holotype, allotype, most paratypes and all the larval specimens are preserved in the collection of the National Science Museum (Nat. Hist), Tokyo. Some paratypes will be distributed to the following institutions: Entomological Laboratory, Ehime University; Laboratory of Insect Resources, Tokyo University of Agriculture; Nagoya Women's University; Naturhistorisches Museum, Wien; Smithsonian Institution; and so on.

The larva is somewhat allied to those of *Stenelmis* and its related genera in general appearance and in having the same structure of propleuron and mesopleuron. However, this larva may be allied to that of *Ordobrevia*, due to the lack of tergal suture on the abdominal sternites 2–7.

The specific name is given after Dr. S.-I. UENO who has greatly contributed to the progress of the biospeology and also has shown powerful leadership in our surveys and studies.

*Biological Notes.* It is doubtless that the new species described in the present paper is truly stygobiontic. Most specimens obtained were found in two small rim-pools, 7×32 cm and 16×19 cm, respectively, and about 5 cm in depth, located at the



Fig. 29. Habitat of *Sinelmis uenoi* M. SATÔ et KISHIMOTO, gen. et sp. nov. on a large flat stalagmite in the cave Mochang Dong, SE. Guizhou, China.

top of a large flat stalagmite about 2 m in diameter and 0.4 m in height. The stalagmite is isolated in a wide passage of the type cave and is less than 100 m removed from the entrance, which is wide and rather low, opening on a gentle slope well above the water of the surface stream.

Since the stalagmite in question is flat and always fed by trickling water from the ceiling, many small rim-pools are formed in a concentric way and those developed near the skirts are usually larger than those lying near the top. However, the elmid gathered in the two pools mentioned above, into which trickled, sometimes showered, the water from the ceiling. The same aggregation can be said also for a bidessine dytiscid beetle coexisting with the present species. Many adults and variously sized larvae of the elmid were observed, some resting or copulating on the inner walls of the rim both above and below the water surface, others slowly crawling on the slime at the bottom. Pupae were not found in any part of the pools, nor in nearby places outside the rim, so that pupation may not take place at the site. A few individuals of *Sinelmis* were found in the pools lying at lower spots of the slope, but they may not be the natural habitats of the beetle. Incidentally, the water temperature of the pools at the top was 17°C on October 28, and the air temperature at the side of the stalagmite was 19°C on the same day.

Several isolated individuals of the adults were also found in larger and deeper gours located at a deeper part of the cave, more than 150 m removed from the entrance. Since no larvae were observed in those gours, this place may not be an original habitat of *Sinelmis uenoi*. It is possible that the beetle is washed from here to there in the cave in rainy seasons and remains even in such pools as are not particularly favourable for its existence.

#### A Check List of Stygobiontic Elmidae

1. *Anommatelmis botosaneanui* SPANGLER, 1981, 377.  
Haiti, eyeless.
2. *Lemalelmis fontana* SPANGLER, 1981, 383.  
Haiti, reduced eyes.
3. *Lemalelmis minyops* SPANGLER, 1981, 381.  
Haiti, reduced eyes.
4. *Neoelmis sketi* SPANGLER, 1996, 246.  
Ecuador, reduced eyes.
5. *Sinelmis uenoi* M. SATÔ et KISHIMOTO, 2001, 77.  
China, reduced eyes.
6. *Troglelmis leleupi* JEANNEL, 1950, 171.  
Zaire, reduced eyes.

## 要 約

佐藤正孝・岸本年郎：中国における洞窟性ヒメドロムシ科甲虫の発見。—— これまでほぼ10年にわたって中国の洞窟生物相を調査してきたが、水生甲虫類をどうしても見つけることができなかった。それが、2000年の調査の折り、幸いにも著者の一人、岸本が貴州省三都県の抹岩洞で、ヒメドロムシ科の1種を、それも幼虫とともに採集することができた。

これまで地下性のヒメドロムシ科は、アフリカから1種、中央・南アメリカから4種が知られていただけである。アジアからはじめての発見であり、複眼と後翅が退化傾向にあることとあわせて、前胸背板や上翅の点刻列の形態から明らかに新属を形成するものと考えられるので、ここに新種とあわせてキシウドウクツヒメドロムシと命名し、幼・成虫ともに記載した。

## References

- BERTRAND, H. P. I., 1972. Larves et nymphes des Coléoptères aquatiques du Globe. 804 pp. F. Paillart, Paris.
- JEANNEL, R., 1950. Un Elmide cavernicole du Congo Belge (Coleoptera, Dryopidae). *Rev. fr. Ent.*, **17**: 169–172.
- 1953. Note sur le *Trogelmis leleupi* JEANNEL. *Notes biospéol.*, **8**: 131–132.
- MUSGRAVE, P. N., 1935. Two new Elmidae from Puelto Rico with descriptions of a new genus (Coleoptera). *Proc. ent. Soc. Wash.*, **17**: 32–35.
- NOMURA, Si., 1961. Elmidae found in subterranean waters of Japan. *Akitu, Kyoto*, **10**: 1–3.
- SANDERSON, M. W., 1953. A revision of the Nearctic genera of Elmidae (Coleoptera). *J. Kansas ent. Soc.*, **26**: 148–163.
- 1954. A revision of the Nearctic genera of Elmidae (Coleoptera). *Ibid.*, **27**: 1–13.
- SATŌ, M., 1965. Dryopoidea of the Ryukyu Archipelago, I (Coleoptera). *J. Nagoya Wom. Coll.*, (11): 76–94.
- 1997. Aquatic Coleoptera of the Ryukyu Archipelago, II. *Coleopt. News, Tokyo*, (117): 1–4. (In Japanese.)
- SPANGLER, P. J., 1981. Two new genera of phreatic elmids from Haiti; one eyeless and one with reduced eyes (Coleoptera, Elmidae). *Bijdr. Dierkunde*, **51**: 375–387.
- 1986. Insecta: Coleoptera. In BOTOSANEANU, L. (ed.), *Stygofauna Mundi*. A Faunistic, Distributional and Ecological Synthesis of the World Fauna Inhabiting Subterranean Waters (including the Marine Interstitial). Pp. 622–631. E. J. Brill/Dr. W. Backhuys, Leiden.
- 1996. Four new stygobiontic beetles (Coleoptera: Dytiscidae; Noteridae; Elmidae). *Ins. Mundi*, **10**: 241–259.
- & V. DECU, 1998. Coleoptera Aquatica. In JUBERTHIE, C., & V. DECU (eds.), *Encyclopaedia Biospeologica*, [2]: 1031–1046. Société de Biospéologie, Moulis/Bucarest.