

Discovery of a New Aphaenopsoid Trechine Beetle (Coleoptera, Trechinae) in Northeastern Jiangxi, East China

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Abstract A new aphaenopsoid trechine beetle has been discovered for the first time in the northeast of Jiangxi Province, East China, extending the eastern range of the known occurrence of cave-dwelling trechines in mainland China by more than 700 km. The new genus appears to be distantly related to *Cathaiaphaenops* and *Bore-aphaenops*, but is readily distinguished from them by several diagnostic characters. The new name given is *Jiangxiaphaenops longiceps* S. UÉNO et CLARKE.

Introduction

About sixty species of blind carabid beetles belonging to about two dozen genera have already been recorded from caves in mainland China. As summarised in CLARKE (2006), on the basis of published descriptions and speleological reports, the distribution of cave trechines in China appears to be restricted to the more elevated karst regions centering on Guizhou and its surrounding provinces, that is, central and southern Sichuan, eastern Yunnan, northern and northwestern Guangxi, southern and eastern Chongqing, northwestern Hunan, and southwestern and western Hubei. The cave dwelling trechine sites in these provinces are situated within the sub-tropical or warm temperate climatic zones of China. No cave adapted trechines have been recorded from the more distant northern, eastern, southern and western provinces, though biospeleological investigations have also been undertaken in the karst and caves of Shaanxi, Hebei, Liaoning, Shandong, Jiangsu, Zhejiang, Guangdong and Xinjiang (CLARKE, 2002). Needless to say, this does not mean that cave trechines do not occur in those provinces; in similarity with all biological studies, our knowledge of the beetle fauna in karst areas of China may simply reflect the intensity of cave biology studies in these



Fig. 1. Looking out the efflux entrance of Bianfu Dong. (Photo by A. K. CLARKE)

provinces.

There are an immense number of caves in China; many have large active or fossil passage sections, sometimes connecting to significantly long subterranean systems. To date, only a very small percentage of these caves have been visited by biospeleologists. Some of the known cave systems, including those with large dimensions, contain quite small and relatively undisturbed or sometimes pristine side branch passages or chambers and “difficult-to-access” recesses that may be climatically different from the main passages, particularly in regard to humidity levels. In common with other hygrophilous hypogean species, trechine beetles are sometimes restricted to these obscure or confined high humidity sanctuaries, especially when the caves concerned are largely dry. Cave

Figs. 2–3. Habitat of *Jiangxiaphaenops longiceps* in the upper level passage of Bianfu Dong. — 2. Gravel and shingle stone passage floor in bed of ephemeral stream channel. — 3. A live specimen of a platynine carabid beetle, *Metacolpodes* cf. *superlita* at rest beside streambed shingles in the upper level passage, indicated by the biro pen (used for scale). (Photo by A. K. CLARKE).



dwelling trechines are also readily camouflaged and like many hypogean species, they are “cryptic” due to their minute size, scarcity in numbers (small or limited populations), colour-likeness to cave sediments and rapid mobility (to avoid predators) (CLARKE, 2006). It is therefore often necessary to make painstaking and time-consuming investigations to clarify the presence or absence of trechine faunas and it is not always possible to undertake such intensive studies.

In late autumn 2006, the second author of this paper had an opportunity to visit the Xianrendong and Shennong Gong karst areas of Wannian Xian in northeastern Jiangxi, as a member of a speleological research party organised by the Institute of Karst Geology in Guilin. This exploration was aimed at obtaining basic information for promoting the nomination of Shennong Gong and its surrounding karst for national geopark status. Aside from a brief inspection of the fauna in Shennong Gong (recently developed as a show cave), he was able to undertake a more detailed examination of the biology of Bianfu Dong (Bats Cave), located about 5 km northwest of Shennong Gong. During exploration and mapping of Bianfu Dong, a diverse hypogean fauna was discovered with several cave adapted species, mostly associated with bat guano. In a narrow and confined upper level ephemeral stream passage in the far reaches of this small cave, located approximately 220–230 m from the entrance, he found four individuals of an aphaenopsoid trechine beetle (*F. Carabidae*).

Bianfu Dong and its Fauna

Bianfu Dong is located in the vicinity of Xiaohe Mountain, about 5 km east of Xianren Dong and 5 km northwest of Shennong Gong in the Huaiyu Shan hills region of Wannian Xian in the Shangrao Shi Prefecture, approximately 16 km east-northeast of Wannian Xian (county) town, directly east of Nanchang. The cave itself is situated near the small Gang Dao Yuan irrigation reservoir beside Wanli village. Bianfu Dong is a significant outflow cave containing a large population of bats and many associated guano-eating invertebrates. The cave has essentially three levels of sand and gravel floored stream passage, separated by two vertical waterfall sections; the lower one with deep top and bottom plunge pools is perennially active and the upper waterfall over a gour pool flowstone wall is ephemeral. A small colony of bats frequents the lower (outer) section of Bianfu Dong which extends approximately 70 m into the cave, where the range of guanophiles includes epigeal species. The majority of bats (*Megachiroptera*) occupy the second (middle) level above and beyond a 6–7 m high waterfall; this passage extends 130–140 metres into the dark zone, where much of the guano is deposited directly into the 1–2 m wide streambed. Beyond the main roosting area, the stream passage is wider, but has a low flat roof, eventually terminating at an upstream sump containing atyid shrimps. Beyond the sump, a dry bypass over gour pool flowstone (a small waterfall in the wet season), leads to a more confined upper level ephemeral stream passage in a narrow solution modified fissure where decaying guano mixes with the sand and gravel substrate in a high humidity environment. In addition to trechine

carabids on the moist cave walls and sandy floor of this 35–40 m long passage (terminating at another sump), the cavernicolous species include spiders, springtails, millipedes and the iridescent greenish-black platynine carabids, the latter being tentatively identified as *Metacolpodes superlita* (H. W. BATES, 1888, p. 383).

An examination of collection records and published manuscripts (CLARKE, 2002, 2006; UÉNO, 2002, 2005) indicates that the four specimens being described in this paper represent the first records of troglobitic cave-dwelling trechines in East China. Also representing the easternmost record for mainland China, Bianfu Dong is located more than 700 km east of the previously known eastern range extension for the cave-dwelling trechines. Subsequent study of the four specimens collected by the second author reveals that the troglobitic trechine beetle belongs to a new species of a new genus, distantly related to two cave genera from central China. It will be described in the present paper under the name *Jiangxiaphaenops longiceps*.

The abbreviations employed in this paper are the same as those in previous papers of the first author; e.g., see UÉNO, 2002; 2005.

Acknowledgements

Before going into further details, the second author wishes to express his indebtedness to the following persons who have assisted in making the collection of these specimens possible. Firstly, to Ged CAMPION and Bruce BENSLEY from Yorkshire Ramblers Club in North England for their invitation to partake in the October–November 2006 China Caves Project expedition to western Hubei and northeast Jiangxi. Secondly, to Prof. YAN Zhiwu, Vice director of Tourism Development, China University of Geosciences, Wuhan (Hubei) for his friendship and provision of logistic support. Thirdly, to staff at the Institute of Karst Geology, in Guilin, including CHEN Weihai (Director of cave studies), ZHANG Yuan Hai (expedition organiser and facilitator, who assisted in providing location data) and Prof. HUANG Baojian for invitation to survey the Bianfu Dong passages. Also special thanks to ZHENG Hong Yun from Nanchang University, in Nanchang, Jiangxi. WANG Shuijin, hotel manager from Chaoxi village is thanked for providing accommodation, along with CHI Zhaowen, General Manager of Shennong Gong show cave and Xianrendong archaeological site kindly acted as host, giving permission to access the caves and collect limited numbers of specimens. A special thank you to Mr. WANG from Wanli village, who guided us to Bianfu Dong and assisted inside the cave. CHEN Lixin from Guangxi TV in Nanning is especially thanked for putting aside his cinematography of the cave in order to assist the survey and mapping of Bianfu Dong, plus waiting patiently while the second author searched for and collected specimens.

Description of the New Trechine Beetle

Genus *Jiangxiaphaenops* S. UÉNO et CLARKE, gen. nov.

Type species: *Jiangxiaphaenops longiceps* S. UÉNO et CLARKE, sp. nov.

A fairly large-sized trechine of aphaenopsoid facies, with long and narrow fore body, strongly convex elytra widest much before the middle, and long slender appendages. Probably related, though distantly, to *Cathaiaphaenops* DEUVE (1996, pp. 42, 47), but readily distinguished from it by the more advanced aphaenopsoid facies with long head and narrow prothorax, the latter of which is finely bordered at the sides and has distinct front angles and ante-basal situation of lateral margins, stoutly bidentate right mandible, different arrangement of marginal umbilicate pores of elytra, and differently shaped male genitalia. Also resembles *Boreaphaenops* S. UÉNO (2002, p. 412), in particular *B. hirundinis* S. UÉNO (2005, p. 12, figs. 1–3), but the mentum is completely fused with submentum and widely concave, the pronotum bears distinct front and hind angles and is evidently sinuate at the sides before hind angles, the elytra bear obviously serrate humeral margins, only two setiferous dorsal pores, and anteriorly translocated pores of the middle set of marginal umbilicate series, and the male genitalia are differently shaped.

Concolourously reddish-brown, shiny lustre. Body seemingly glabrous on dorsal surface though sparsely covered with extremely minute hairs, particularly at the lateral parts. Microsculpture more or less degenerated on head and pronotum, not sharply impressed though mostly consisting of fine transverse lines; that of elytra coarse but irregular, forming neither reticulation nor transverse lines. Hind wings absent.

Head elongate, much longer than wide, widest at the level of antennal articulation, and gradually narrowed posteriad towards neck constriction, which is shallow but distinctly marked; neck wide, slightly dilated posteriad; frons and supraorbital areas moderately convex, separated from each other by deeply impressed frontal furrows, which are feebly curved and interrupted posteriorly behind the level of anterior supraorbital pores; two pair of supraorbital pores present, both widely distant from each other, and the posterior one approaching to neck constriction; eyes completely absent; genae either straight or very slightly arcuate, with several hairs in apical parts. Labrum transverse and narrow, widely emarginate at the apex. Mandibles slender, falcate though straight in proximal parts; right mandible stoutly bidentate, left mandible devoid of distinct teeth. Mentum transverse, completely fused with submentum, and deeply concave along the long axis, with correct mental tooth which is either simple or slightly truncated at the tip; submentum provided with a transverse row of four to seven setae, three median ones of which are usually located between a pair of longer ones; ligula rounded at the apex, octosetose as usual, paraglossae very thin and slightly arcuate, extending much beyond ligula. Palpi slender; penultimate palpomeres longer than apical ones, usually bisetose or trisetose in labial palpus, practically glabrous though bearing a few, extremely minute hairs in maxillary palpus; apical palpomeres subulate though

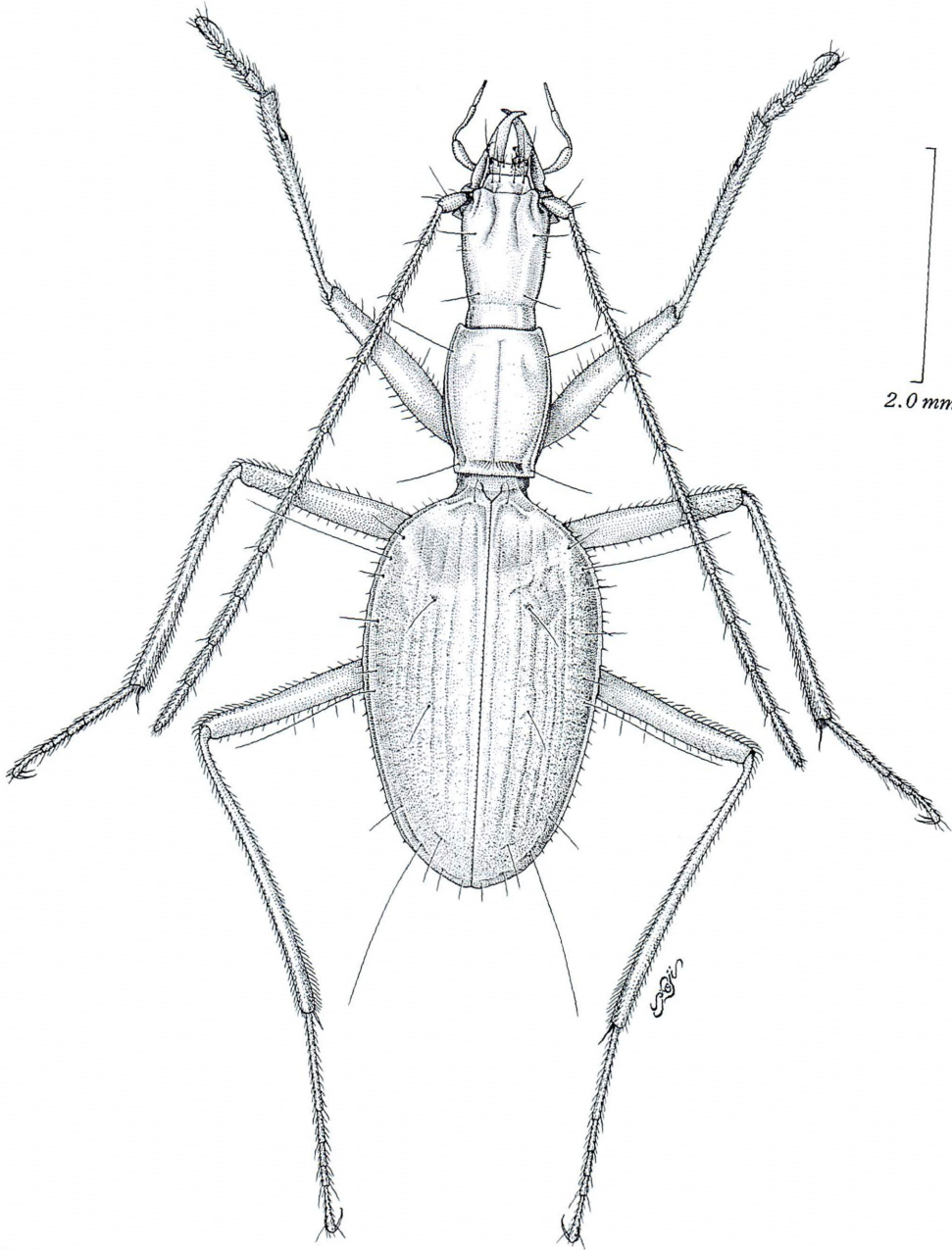


Fig. 4. *Jiangxiaphaenops longiceps* S. UENO et CLARKE, gen. et sp. nov., ♂, from Bianfu Dong, a limestone cave in Wannian Xian of northeastern Jiangxi, East China.

blunt at the tips. Antennae long and slender though individually variable in length to some extent, usually extending to near elytral apices but exceptionally only reaching apical fourth of elytra; scape as long as pedicel and the shortest though thickest, antennomere 5 the longest, 6–10 decreasing in length towards terminal antennomere, which is as long as antennomere 9.

Pronotum elongated barrel-shaped, usually somewhat shorter and a little wider than head, widest a little before the middle, and almost equally narrowed in front and behind; apex about as wide as base, slightly but widely emarginate between sharp front angles; lateral margins very feebly arcuate and finely bordered throughout, shallowly but distinctly sinuate just before hind angles which are nearly rectangular but narrowly rounded at the corners; two pair of marginal setae present, the anterior one at about apical fifth and the posterior one just in front of hind angles; dorsum convex, with fine median line almost reaching both apex and base; apical transverse impression evanescent; basal transverse impression continuous, laterally merging into small basal foveae, which are externally enclosed by reflexed postangular lamellae; basal area narrow, longitudinally strigose. Propleura narrowly visible from above in front of antebasal situation of lateral margins.

Elytra elongated obovate, much wider than prothorax, obviously longer than wide, widest well before the middle, and rather gradually narrowed towards pointed apices; basal parts ample; shoulders widely rounded; sides narrowly bordered throughout though diminishing at the prehumeral parts near basal peduncle, and obtusely but distinctly serrulate and ciliated at the humeral parts; dorsum strongly convex, especially before middle, obliquely depressed in basal parts inside the basal portion of interval 5, and forming a flat slanting area, steeply declivous at the lateral parts but rather gently slanting in apical area; surface somewhat coriaceous and subopaque due to coarse microsculpture; striae not sharply impressed but fairly deep and almost entire, with mal-defined punctation, stria 1 close to suture, stria 8 not deepened posteriorly; scutellar striole absent; apical striole evanescent; intervals mostly flat, sometimes slightly convex near suture, interval 1 very narrow, 2 concave at the basal portion behind basal pore; no apical carina; stria 3 with two setiferous dorsal pores, the anterior one of which is often foveolate; preapical pore located at the apical anastomosis of striae 2 and 3 or at the apical end of stria 2; two apical pores present as usual, but the posterior one is much smaller than the anterior one and is sometimes missing on one elytron; marginal umbilicate pores not aggregated, first three pores of the humeral set ranged equidistantly and either adjoining or almost adjoining marginal gutter, the 4th pore widely distant from the proximal three, lying halfway between the 3rd and 5th, and distant from marginal gutter, the two pores of the middle set closely lying to each other, and almost adjoining marginal gutter, the 6th pore being located just at the middle of elytra, the two pores of the apical set widely distant from the middle set mainly due to unusual approach of the 7th pore to the 8th, the latter lying behind the level of preapical pore.

Ventral surface sparsely pubescent from prosternum to anal ventrite, visible ventrites 3–5 each provided with a pair of paramedian setae; anal ventrite provided with a

pair of marginal setae in ♂. Legs long and slender; pro- and mesocoxae conically protrudent; protibiae straight, gradually dilated towards apices, wholly pubescent, and not externally grooved; metatibiae slightly outcurved at the apical parts; tarsi long and thin; in ♂, protarsomere 1 weakly dilated, twice or more as long as wide, stoutly produced inwards at the apex, and furnished beneath with adhesive appendages, protarsomere 2 slightly dilated, a little more than 1.5 times as long as wide, only angulate at the apico-internal corner, and furnished beneath with a few small adhesive appendages.

Male genital organ very small; aedeagus slender, tubular, lightly arcuate, abruptly bent ventrad behind basal part, and very slightly dilated towards apical orifice; viewed dorsally, aedeagus nearly symmetrical and subparallel-sided to near the rounded tip of apical lobe; basal orifice small, with the sides not emarginate but ventro-laterally arcuate; sagittal aileron large though hyaline; ventral surface minutely granulated behind middle; inner sac armed with an anisotopic copulatory piece but devoid of teeth-patches; styles short and broad, devoid of ventral apophyses, each bearing two or three apical setae.

Female unknown.

Range. Known only from a limestone cave near Xiaohe Mountain in the Huaiyu Shan hills of northeastern Jiangxi Province, East China.

Notes. In view of the narrow fore body, the bidentate right mandible, and the position of the first umbilicate pore of the marginal series, which is not translocated inwards, the present genus appears closer to *Boreaphaenops* than to *Cathaiaphaenops*, but is definitely different from it by the completely fused labium, small but sharply protrudent front angles of the pronotum, serrulate humeral margins of the elytra, each of which bears only two setiferous dorsal pores, anteriorly translocated middle set of marginal umbilicate pores, the fourth one of which is equally distant from the third and fifth, and the slender and tubular aedeagus not narrowed at the apical lobe in dorsal view. Most of these character states are also useful for discriminating *Jiangxiaphaenops* from *Cathaiaphaenops*, with the exception of the serrulate humeral margins and the number of setiferous dorsal pores of the elytra. The latter genus is also different from the former in the tridentate right mandible, inwardly translocated first pore of the marginal umbilicate series, and the barrel-shaped pronotum with the side borders widely explanate and reflexed in the postangular parts.

One of the most peculiar features of *Jiangxiaphaenops* is the mode of sexual modification of the male protarsi. Unless carefully examined from the ventral side, it may be considered to have only one modified segment, since only the first protarsomere is distinctly, though weakly, dilated and inwardly protrudent at the apex. The second protarsomere is only slightly dilated and devoid of apico-internal protrusion, so that it is not much different from the third protarsomere. However, there are a few small adhesive appendages on the ventral side of the second protarsomere, which can be detected only by close examination under high magnification. It is difficult to determine at present whether this is a degenerative condition or an underdeveloped state, but anyway

such a strange modification of the male protarsi is quite exceptional in the Trechinae and has never been reported until now so far as known to the present authors.

Jiangxiaphaenops longiceps S. UÉNO et CLARKE, gen. et sp. nov.

(Figs. 4-6)

Length: 5.40-6.25 mm (from apical margin of clypeus to apices of elytra); 5.85-6.75 mm (including mandibles).

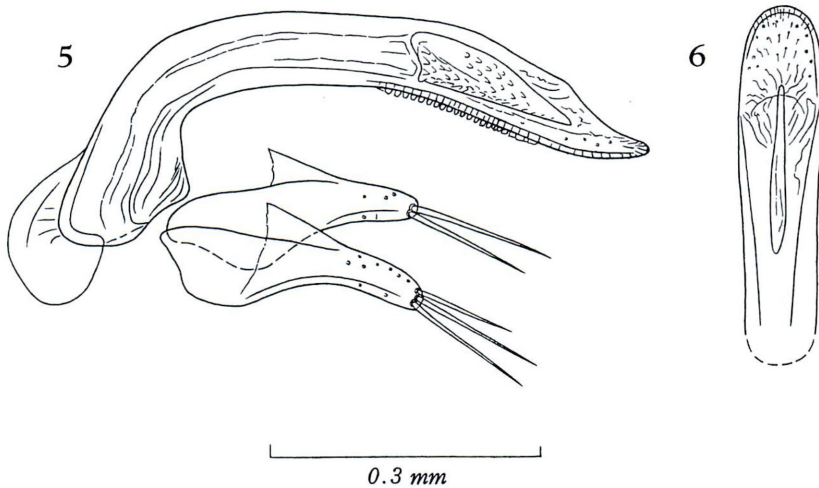
Fore body long and narrow, hind body elongated obovate with ample basal part and relatively narrow apical part, strongly convex on dorsum. Colour reddish-brown, shiny; elytra seemingly sub-opaque though the derm itself is shiny.

Head elongate though variable to some extent in length according to individuals; HL/HW 1.60-1.77 (M 1.68), HL/PL 1.01-1.11 (M 1.05); antennae long though individually variable in length, usually reaching apical tenth of elytra but sometimes reaching barely apical fourth, pedicel slightly more than a half as long as antennomere 3 or three-sevenths as long as antennomere 5, which is the longest, antennomeres 4-6 each six times or more as long as wide, antennomere 11 slightly longer than 10, about as long as 9, about two-thirds as long as 5, and about four times as long as wide.

Pronotum elongated barrel-shaped, nearly as long as or a little shorter than head, a little wider than the latter, widest at about four-sevenths from base; PW/HW 1.20-1.23 (M 1.22), PW/PL 0.73-0.75 (M 0.74) [PL/PW 1.33-1.36 (M 1.35)], PW/PA 1.32-1.38 (M 1.36), PW/PB 1.32-1.39 (M 1.36); sides nearly straight near front angles, feebly arcuate posteriad to ante-basal situation at about basal eighth, and then slightly divergent (rarely subparallel) towards hind angles; apex about as wide as base, PB/PA 0.94-1.04 (M 1.00), the latter slightly bisinuate and slightly oblique on each side inside hind angle; dorsum convex, with sculptures as described under the genus.

Elytra much larger than fore body, elongated obovate with ample basal part, widest at about basal third or a little behind that level, and more gradually narrowed towards apices than towards bases; EW/PW 2.11-2.22 (M 2.19), EL/PL 2.64-2.76 (M 2.71), EL/EW 1.66-1.70 (M 1.68); shoulders widely rounded and devoid of distinct humeral angles; prehumeral borders moderately oblique and nearly straight near basal peduncle; sides moderately arcuate at the humeral parts, very feebly so in apical two-thirds, and narrowly and conjointly rounded at apices without preapical emargination; striae moderately but not sharply impressed and indefinitely punctate on the disc, becoming shallower and superficial at the side, striae 1-4 more or less deepened in basal area, striae 4-7 irregular in apical area; stria 3 with two stout dorsal setae at 1/4-3/7 and 1/2-5/9 from base, respectively; preapical seta also stout, a little less than twice more distant from apex than from suture; anterior apical pore isolated due to obliteration of apical striole.

Legs long; mesotibia about three-fifths as long as elytra, metatibia about three-fourths as long as elytra; tarsi long and thin, mesotarsus about five-eighths as long as mesotibia, metatarsus about seven-tenths as long as metatibia; tarsomere 1 obviously



Figs. 5–6. Male genitalia of *Jiangxiaphaenops longiceps* S. UÉNO et CLARKE, gen. et sp. nov., from Bianfu Dong in Wannian Xian; left lateral view (5), and apical part of aedeagus, dorso-apical view (6).

longer than (about 1.3 times as long as) tarsomeres 2–4 combined in both meso- and meta-tarsi; protarsomeres in ♂ as described under the genus.

Male genital organ very small though moderately sclerotized. Aedeagus only one-fifth as long as elytra, with short apical lobe and relatively small basal part; viewed laterally, apical lobe gently reflexed and rapidly tapered to blunt extremity; viewed dorsally, apical lobe widely rounded at the tip; ventral margin widely emarginate at middle in profile. Copulatory piece elongated subtriangular, about three-tenths as long as aedeagus, widest near the base and gradually tapered towards acute apex; surface largely covered with minute scales. Styles as described under the genus.

Female unknown.

Type series. Holotype: ♂, paratypes: 3 ♂♂ (incl. 1 teneral ex.), 7–XI–2006, A. K. CLARKE leg. [CLARKE's collection number 1106–26 (ex 40B).] Deposited in the Department of Zoology collection, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Limestone cave called Bianfu Dong at approximately 135 m elevation, in Wannian Xian (county) in the Shangrao Shi Prefecture (municipality) east of Nanchang, in northeastern Jiangxi Province, East China. Latitude: 28° 44' 49.7" N; Longitude: 117° 13' 23.3" E.

Notes. *Jiangxiaphaenops longiceps* is restricted to an upper level ephemeral stream passage in the far reaches of Bianfu Dong. Three of the four specimens collected were found on moist sandy streambed floor, where there was a mix of decaying guano, gravel and sand in a narrow stream passage. One specimen was taken from moist cave wall of narrow upper level stream passage, approximately 20–25 cm above moist stream gravel bed.

Etymology for Jiangxiaphaenops longiceps. Genus name derived from a combination of two words: “*Jiangxi*” (in honour of Jiangxi Province), being the first trechine beetle to be discovered in this province and representing the most easterly occurrence for a cave adapted trechine from mainland China and “*aphaenops*” (invisible eyes) particularly to relate the aphaenopsoid characters of this troglobitic trechine: depigmentation, blind, slender pronotum, ovoid hind body and exceedingly elongated appendages. The specific name “*longiceps*” derives from Latin elements (root words) “*longi*” and “*ceps*” combined here to describe the “long-headed” nature of this particular troglobitic trechine carabid beetle.

要 約

上野俊一・A. K. CLARKE: 中国東部におけるアシナガメクラチビゴミムシの発見。—— 中国大陸では、25属 60種ほどのメクラチビゴミムシ類が、これまでに洞窟から記録されているが、その生息地は貴州省を中心とする四川、云南、广西、重庆、湖南、湖北の各省または特別市か自治区の範囲内に限られ、地理的に日本と関係の深い東部の諸省からは、まったく知られていなかった。ところが2006年の晩秋に、中国中東部の江西省で洞窟生物の調査を行った本論文の第二著者によって、浙江省との省境に近い万年县湾里の洞窟から、アシナガメクラチビゴミムシの一種が発見された。この洞窟は、メクラチビゴミムシ類の既知の分布域の東縁から700 km以上、東方に離れ、東シナ海沿岸からそれほど遠くない位置にある。一見、湖南省や湖北省の洞窟種に似た形態をもつこの種は、詳しい検討の結果、これまでに知られているどの属とも異なる孤立した特徴をもっていることがわかったので、新属新種のチビゴミムシとして *Jiangxiaphaenops longiceps* S. UÉNO et CLARKE という新名のもとに本論文で記載した。

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