

One new species in the genus *Macromotettix* (Orthoptera: Tetrigidae: Metrodorinae) from China

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Abstract: One new species, *Macromotettix yunlongensis* sp. nov. from Yunnan, is described and illustrated with photographs. *Macromotettix yunlongensis* sp. nov. is similar to *M. undulatifemura* Deng, 2018, but differs from the latter in: pronotum with disc tectiform, entirely roof-shaped; median carina of pronotum slowly depressed behind shoulders; tegminal sinus on lateral lobes shallow; humeral angle obtusely rounded. An updated key to all species in the genus *Macromotettix* is provided.

Key words: Caelifera; pygmy locust; taxonomy; key

中国大磨蚱属一新种记述（直翅目：蚱科：短翼蚱亚科）

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摘要：记述中国云南大磨蚱属 1 新种：云龙大磨蚱 *Macromotettix yunlongensis* sp. nov.，提供了新种的形态特征照片图。云龙大磨蚱 *Macromotettix yunlongensis* sp. nov. 与波股大磨蚱 *M. undulatifemura* Deng, 2018 相似，但与后者的不同之处在于：前胸背板背面两侧倾斜，整体呈屋脊形；前胸背板中隆线在肩后缓慢下降；侧片后缘翅凹不明显；肩角钝圆形。文中还更新了大磨蚱属分种检索表。

关键词：蝗亚目；蚱；分类；检索表

Introduction

The genus *Macromotettix* was erected by Günther in 1939 with *Macromotettix quadricarinatus* (Bol'var, 1898) (= *Mazarredia quadricarinata* Bol'var, 1898) as its type species. Günther (1939) described *Macromotettix tonkinensis* Günther, 1939 and transferred *Mazarredia quadricarinata* Bol'var, 1898 and *Acrydium sokutsuensis* Karny, 1915 to *Macromotettix*. Afterwards, Günther (1972) transferred one species to this genus. Thereafter, a total of 23 new species were introduced (Günther 1972; Zheng 1998, 2005; Zheng & Fu 2000; Zheng & Jiang 2000, 2003, 2006; Zheng & Ou 2003, 2010; Liang & Jiang 2004; Deng *et al.* 2007a, b, 2010, 2018; Zheng *et al.* 2009; Lu & Deng 2021). So far, 27 species in

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this genus are known in the world.

In this study, we describe one new species, *Macromotettix yunlongensis* **sp. nov.**, collected from Yunnan, China. An updated key to all species of the genus *Macromotettix* is provided.

Material and methods

Specimens were photographed using a stereomicroscope (Keyence VHX-S550E) equipped with a digital microscopic system. Plates were processed with Adobe Photoshop® 2020 software. Morphological terminology and measurement landmarks follow Tumbrinck (2014). Measurements are given in millimeters (mm). Type specimens are deposited in the Biological Science Museum, Dali University, Yunnan (BMDU).

Taxonomy

Genus *Macromotettix* Günther, 1939

Type species: *Macromotettix quadricarinatus* (Bolívar, 1898) = *Mazarredia quadricarinata* Bolívar, 1898, by subsequent designation.

The genus *Macromotettix* can be identified as a member of the subfamily Metrodorinae based on the posterior angles of pronotal lateral lobes turning outwards with apex truncated. Within Metrodorinae, it is similar to *Macromotettixoides* Zheng, Wei & Jiang, 2005, but differs in having two concavities (ventral sinus and tegminal sinus) on the hind margin of the lateral lobe of pronotum instead of one concavity (ventral sinus) as in *Macromotettixoides*, and tegmina being visible instead of vestigial, covered by pronotum in *Macromotettixoides*. It is also similar to *Bolivaritettix* Günther, 1939 and *Mazarredia* Bolívar, 1887, but differs from the latter two in humeral apex ridge and lower margin of pronotum connected in the middle or behind middle of lower margin of pronotum instead of before middle of lower margin of pronotum (*Macromotettix* Günther, 1939; Blackith 1992; Jiang & Zheng 1998; Zheng & Jiang 2002; Zheng 2005; Deng *et al.* 2007a, b, 2018; Deng 2016; Lu & Deng 2021. Also see: <http://orthoptera.speciesfile.org/Common/basic/Taxa.aspx?TaxonNameID=1101096>).

Key to the species of *Macromotettix* Günther, 1939

1. Pronotum elongate, extending far beyond the apex of hind femur2
- . Pronotum short, not surpassing or slightly surpassing the apex of hind femur5
2. Head distinctly exerted above pronotal surface3
- . Head not exerted above pronotal surface. China (Yunnan)*M. longipennis* Zheng
3. Upper margin of pronotum straight in profile; lower margins of middle femur slightly undulate; hind wings not reaching the caudal end of pronotum. Vietnam (Tonkin)*M. tonkinennis* Günther
- . Upper margin of pronotum undulate in profile; lower margins of middle femur slightly straight; hind wings reaching the caudal end of pronotum4
4. Width of vertex slightly narrower than the width of an eye (15 : 18); width of middle femur slightly narrower than the width of visible part of tegmina; hind wings reaching the apex of pronotum. China (Taiwan)*M. sokutsuensis* (Karny)
- . Width of vertex distinctly narrower than the width of an eye (10 : 18); width of middle femur wider than the

- width of visible part of tegmina; hind wings extending beyond the apex of pronotum. Indonesia (Sumatra)*M. quadricarinatus* (Bol'vář)
5. Frontal costa before eyes invisible in profile6
 -. Frontal costa before eyes visible in profile, vertex and frontal costa forming a round or obtuse shape12
6. Hind wings strongly reduced and just reaching the base of hind femur7
 -. Hind wings elongated and reaching to or beyond the middle of hind femur9
7. Tegmina degenerate and very small; ventral margins of middle femur with two teeth. China (Sichuan)*M. microptera* Deng
 -. Tegmina normal; ventral margins of middle femur without teeth8
8. Width of vertex wider than the width of an eye; disc of pronotum relatively smooth, convex between shoulders, interhumeral carinae absent. China (Guangxi)*M. xinganensis* Zheng, Zhang & Dang
 -. Width of vertex equal to or slightly narrower than the width of an eye; disc of pronotum coarse, concave between shoulders, interhumeral carinae present. China (Sichuan)*M. sichuanensis* Deng
9. Width of vertex narrower than the width of an eye10
 -. Width of vertex wider than or equal to the width of an eye11
10. Hind wings reaching the apex of pronotal process. Papua New Guinea (Solomon Islands)*M. solomonensis* Günther
 -. Hind wings reaching the middle of pronotal process. China (Guizhou, Chongqing)*M. brachyptera* Lu & Deng
11. Antennae inserted between lower margin of eyes; disc of pronotum relatively smooth; ventral margins of middle femur straight. Samoan Islands*M. compactus* (Chopard)
 -. Upper margin of antennal grooves at the level of lower margin of eyes; disc of pronotum coarse; ventral margins of middle femur undulate. China (Hunan, Guangxi)*M. luoxiaoshanensis* Zheng & Fu
12. Antennal grooves inserted below inferior margins of eyes13
 -. Antennal grooves inserted between inferior margins of eyes17
13. Width of vertex narrower than or slightly wider than the width of an eye14
 -. Width of vertex 1.5 times or more of the width of an eye15
14. Width of vertex narrower than the width of an eye; pronotum with a pair of interhumeral carinae between shoulders; hind wings reaching the apex of pronotum; width of middle femur narrower than the width of visible part of tegmina. China (Hunan)*M. nigritibis* Zheng & Fu
 -. Width of vertex 1.1 times the width of an eye; pronotum without a pair of interhumeral carinae between shoulders; hind wings reaching the middle of pronotum; width of middle femur 1.4 times width of visible part of tegmina. China (Guangxi)*M. tianlinensis* Liang & Jiang
15. Width of vertex 2 times the width of an eye; lateral carinae of prozona constricted backwards; median carina of pronotum slightly arcuate before shoulders and straight behind shoulders in profile; width of middle femur narrower than the width of visible part of tegmina. China (Shaanxi)*M. qinlingensis* Zheng, Wei & Li
 -. Width of vertex 1.5–1.7 times the width of an eye; lateral carinae of prozona parallel; median carina of pronotum strongly uplifted before shoulders in profile and depressed behind shoulders; width of middle femur wider than the width of visible part of tegmina16
16. Disc of pronotum tectiform; tegminal sinus on lateral lobes shallow; tegmina vestigial. China (Yunnan)*M. yunlongensis* **sp. nov.**
 -. Disc of front half of pronotum with middle area convex while both lateral areas flat or even concave; tegminal sinus on lateral lobes deep; tegmina slightly small. China (Sichuan)*M. undulatifemura* Deng
17. Head distinctly exserted above pronotal surface18
 -. Head not or only slightly exserted above pronotal surface22

18. Upper margin of pronotum undulated before shoulders and straight behind shoulders in profile19
 -. Upper margin of pronotum slightly convex before shoulders and straight behind shoulders in profile ...20
19. Lateral carinae of prozona parallel; ventral margins of fore and middle femur undulate. China (Yunnan) ...
*M. wuliangshana* Zheng & Ou
 -. Lateral carinae of prozona constricted backwards; ventral margins of fore and middle femur straight.
 China (Guangxi)*M. convexa* Deng, Zheng & Zhan
20. Width of vertex narrower than the width of an eye, ventral margins of middle femur undulate. China
 (Guangxi)*M. longtanensis* Zheng & Jiang
 -. Width of vertex equal to the width of an eye, ventral margins of middle femur straight21
21. Anterior margin of vertex straight; width of longitudinal furrow of frontal ridge wider than antennal
 groove diameter; width of middle femur narrower than the width of visible part of tegmina. China
 (Yunnan)*M. wangxiangtaiensis* Zheng & Ou
 -. Anterior margin of vertex round; width of longitudinal furrow of frontal ridge narrower than antennal
 groove diameter; width of middle femur wider than the width of visible part of tegmina. China (Guangxi)
*M. serrifemoralis* Zheng & Jiang
22. Upper margin of pronotum straight23
 -. Upper margin of pronotum undulate25
23. Tegmina very small; hind wings are shortened, reaching about the middle of hind femur. China (Guangxi)
*M. zhengi* Deng
 -. Tegmina normal; hind wings reaching about the apex of hind femur24
24. Head slightly exserted above pronotal surface; width of longitudinal furrow of frontal ridge wider than
 antennal groove diameter; lateral carinae of prozona constricted backwards. China (Guangxi)
*M. napoensis* Deng
 -. Head not exserted above pronotal surface; width of longitudinal furrow of frontal ridge equal to antennal
 groove diameter; lateral carinae of prozona parallel. China (Guangxi)*M. yaoshanensis* Zheng & Jiang
25. Width of vertex narrower than or equal to the width of an eye; ventral margins of middle femur straight 26
 -. Width of vertex wider than the width of an eye; ventral margins of middle femur undulate27
26. Upper margin of pronotum undulate, hind wings reaching the apex of pronotum. China (Guangxi)
*M. guangxiensis* Deng, Zheng & Wei
 -. Upper margin of pronotum only slightly convex between shoulders and straight behind shoulders; hind
 wings reaching the 5/6 of pronotum. Distributed in China (Yunnan)*M. brachynota* Zheng
27. Upper margin of pronotum arcuately bulging between shoulders and straight behind shoulders; lateral
 carinae of prozona parallel; pronotum without interhumeral carinae between shoulders; width of middle
 femur equal to the width of visible part of tegmina. China (Guangxi) ..*M. nigrítuberculus* Zheng & Jiang
 -. Upper margin of pronotum straight between shoulders and undulate behind shoulders; lateral carinae of
 prozona constricted backwards; pronotum with interhumeral carinae between shoulders; width of middle
 femur wider than the width of visible part of tegmina. China (Yunnan, Guangxi) ...*M. torulisinota* Zheng

***Macromotettix yunlongensis* sp. nov.** (Fig. 1)

Female. Body size small, surface densely covered with numerous small granules (Fig. 1A).

Head. Head not exserted above the level of anterior margin of pronotum. In dorsal view, vertex broad, 1.6–1.7 times as wide as one eye, with paired fossulae; anterior margin straight and slightly protruding before anterior margin of eyes; lateral carinae folded upward and slightly surpassing upper margin of eye, retrad reaching supraocular lobes; median carina conspicuous, erected in anterior half and slightly surpassing upper margin of eye (Fig. 1A). In

lateral view, vertex finely not exerted above the level of upper margin of eyes; frontal costa visible before eyes and together with medial carina of vertex nearly rounded; fascial carina concave between lateral ocelli and protruding arcuately between antennal grooves (Fig. 1B). In frontal view, frontal costa bifurcated above lateral ocelli, longitudinal furrow downwards expanded; width of longitudinal furrow of frontal ridge narrower than antennal groove diameter; lateral ocelli placed below middle part of eyes (Fig. 1E). Antennae filiform, inserted below lower margin of eyes, 15 segments, 7th–8th segments longest and 3–4 times as long as wide. Eyes globose, nearly at the level of top of vertex and anterior margin of the pronotum.

Thorax. Pronotum tectiform, roof-shaped especially in front half. In dorsal view, disc very coarse and uneven, covered with granules and tubercula; slightly rugged before and after shoulder; anterior margin straight; lateral carinae of prozona parallel and erect; mid-keel entire and thick; humeral angle obtusely rounded; interhumeral carinae between shoulders indistinct, represented by some irregular tubercula; hind process of pronotum short cone-shaped, apex sharply rounded, approaching the knee of hind femur (Fig. 1A). In lateral view, median carina of pronotum high, arched and lamellar at first half and slowly depressed at second half; lateral lobe of pronotum with posterior angle turning downwards, apex truncated, posterior margins of lateral lobes of pronotum with two concavities, tegminal sinus shallow. Tegmina with visible part long oval, apex narrowly rounded; hind wings degenerate and only reaching to 1/6 of hind femur (Fig. 1B). Fore and middle femora with margins finely serrated, upper margins straight, lower margins undulated with 2 large teeth each in base and middle, middle femur 2 times as wide as visible part of tegmina (Figs 1F–G). Hind femur stout, 2.6–2.7 times as long as wide, with carinae and margins finely serrated, antegenicular acute and genicular denticles nearly right-angled. Hind tibia with 6 spines on outer side, 5–6 spines on inner side; first tarsal segment 1.5 times as long as the third one, three pulvilli larger in sequence, apices of the first and the second pulvilli sharp, and apex of the third pulvillus rectangular (Figs 1H, 1I).

Abdomen. Ovipositor narrow and long, upper valve 4.5 times as long as wide, upper margin of upper valvula and lower margin of lower valvula armed with strong and sparse saw-like teeth. Length of subgenital plate longer than its width, hind margin with a strongly triangular protection in the middle, apex acute, deeply concave on both sides (Figs 1J, 1K).

Coloration. Body brown. Hind wings black. Hind femur brown, the outside of lower side black; hind tibia black, with two yellowish-white rings.

Male. Slightly smaller than female. Vertex 1.7–1.8 times as wide as one eye. Hind femur 2.5–2.7 times as long as wide. Subgenital plate short, cone-shaped, apex bifurcate. Other characters same as female.

Measurements. Length of body ♀ 9.5–10.5 mm, ♂ 7.0–7.5 mm; length of pronotum ♀ 7.3–7.5 mm, ♂ 6.0–6.5 mm; length of hind femur ♀ 5.5–5.8 mm, ♂ 4.5–5.0 mm.

Holotype. ♀, **China**, Yunnan, Dali, Yunlong, 25°52' N, 99°18' E, alt. 2417 m, 28-VII-2021, leg. Miao LI. **Paratypes.** 11 ♀6 ♂, leg. Benyong MAO, Guohui YANG, Yao DENG & Mengqi WANG, other data same as holotype.

Etymology. The specific epithet indicates the type locality in Yunlong County, Yunnan.

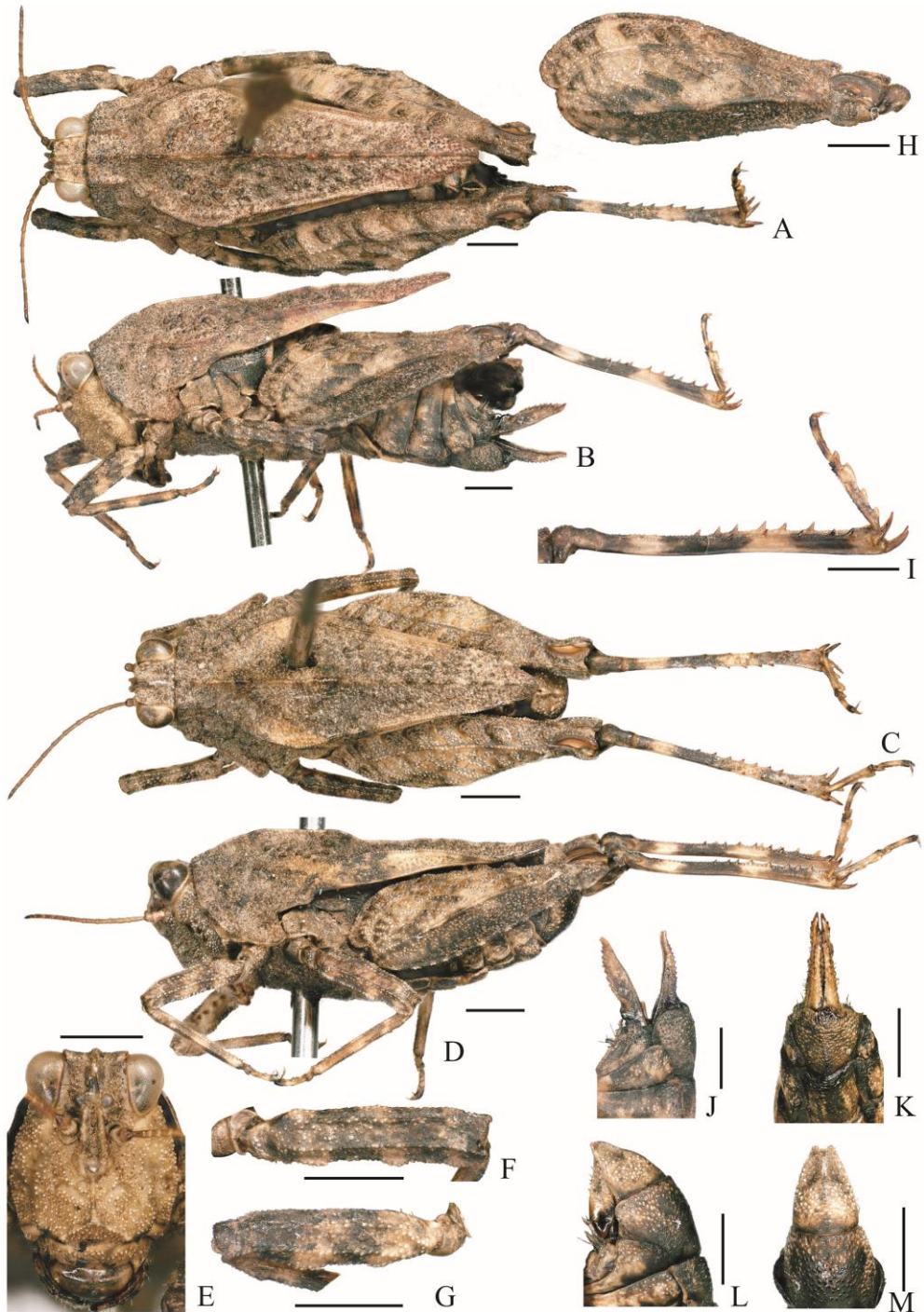


Figure 1. *Macromotettix yunlongensis* sp. nov. A, B. Female habitus, dorsal and lateral views; C, D. Male habitus, dorsal and lateral views; E. Head, frontal view; F, H. Left fore, middle and hind femora, lateral views; I. Left hind tibia, lateral view; J. Ovipositor of female, lateral view; K. Female subgenital plate, ventral view; L, M. Male subgenital plate, lateral and ventral views. Scale bars = 1 mm.

Diagnosis. This new species is similar to *M. undulatifemura* Deng, 2018, but differs from the latter by: 1) pronotum with disc tectiform, entirely roof-shaped (the front half of pronotum middle area bulging, later area flat in the latter); 2) median carina of pronotum slowly depressed behind shoulders (median carina of pronotum suddenly depressed behind shoulders in the latter); 3) tegminal sinus shallow (tegminal sinus deep in the latter); and 4) humeral angle obtusely rounded (obtuse in the latter).

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References

- Blackith RE. 1992. The Tetrigidae (Insecta: Orthoptera) of South-East Asia. Japaga, 'Rockbottom', Ashford Co. Wicklow, Ireland, 248 pp.
- Bolívar I. 1898. Contributions à l'étude des Acridiens espèces de la Faune Indo et Austro-Malaisienne du Museo Civico di Storia Naturale di Genova. *Annali del Museo Civico di Storia Naturale di Genova*, Series 2, 19: 1–36.
- Cigliano MM, Braun H, Eades DC & Otte D. 2022. Orthoptera Species File. Version 5.0/5.0. Available from: <http://Orthoptera.SpeciesFile.org> (accessed 10 November 2022).
- Deng WA. 2016. *Taxonomic study of Tetrigoidea from China*. Dissertation, Huazhong Agricultural University, Wuhan, 341 pp.
- Deng WA, Xin L, Wei Q & Chen YZ. 2018. Two new species of the genus *Macromotettix* Günther, 1939 (Orthoptera: Tetrigidae, Metrodorinae) from China, with a key to the species of the genus. *Zootaxa*, 4370(4): 421–430.
- Deng WA, Zheng ZM & Wei SZ. 2007a. *Fauna of Tetrigoidea from Yunnan and Guangxi*. Science and Technology Press, Nanning, 458 pp.
- Deng WA, Zheng ZM & Wei SZ. 2007b. A taxonomic study of the genus *Macromotettix* Günther (Orthoptera: Tetrigoidea: Metrodoridae). *Zootaxa*, 1620: 63–68.
- Deng WA, Zheng ZM & Zhan SH. 2010. A new species of the genus *Macromotettix* Günther (Orthoptera: Tetrigoidea: Metrodoridae) from China. *Acta Zootaxonomica Sinica*, 35(2): 287–289.
- Günther K. 1939. Revision der Acrydiinae (Orthoptera), III. Sectio Amorphopi (Metrodorae Bol. 1887 auct.). *Abhandlungen und Berichte der Museum für Tierkunde und Volkerkunde zu Dresden*, (A), 20: 1–335.
- Günther K. 1972. Die Tetrigoidea (Orthoptera, Caelifera) von Süd-Melanesien. *Zoologische Beiträge*, 18(2): 251–292.
- Jiang GF & Zheng ZM. 1998. *Grasshoppers and Locusts from Guangxi*. Guangxi Normal University Press, Guilin, 363 pp.
- Liang GQ & Jiang GF. 2004. Four new species of Tetrigoidea from Tianlin County, Guangxi, South China (Orthoptera). *Acta Zootaxonomica Sinica*, 29(1): 115–120.
- Lu XY & Deng WA. 2021. New genus and new species of the subfamily *Metrodorinae* from China (Orthoptera: Tetrigidae). *Zootaxa*, 4964(2): 345–362.

- Tumbrinck J. 2014. Taxonomic revision of the Cladonotinae (Orthoptera: Tetrigidae) from the islands of South-East Asia and from Australia, with general remarks to the classification and morphology of the Tetrigidae and descriptions of new genera and species from New Guinea and New Caledonia. In: Telnov D (Ed.), *Biodiversity, Biogeography and Nature Conservation in Wallacea and New Guinea. Vol. II*. The Entomological Society of Latvia, Riga, pp. 345–396.
- Zheng ZM. 1998. A study of Tetrigoidea from Xishuangbanna (Orthoptera). *Acta Zootaxonomica Sinica*, 23(2): 161–180.
- Zheng ZM. 2005. *Fauna of the Tetrigoidea from Western China*. Science Press, Beijing, 501 pp.
- Zheng ZM & Fu P. 2000. A new species of *Macromotettix* Günther from Hunan Province (Orthoptera: Tetrigoidea: Metrodoridae). *Entomological Journal of East China*, 9(2): 17–19.
- Zheng ZM & Jiang GF. 2000. New genus and new species of *Metrodoridae* from Guangxi (Orthoptera: Tetrigoidea). *Acta Zootaxonomica Sinica*, 25(4): 402–405.
- Zheng ZM & Jiang GF. 2002. A study on the genus *Macromotettix* Günther (Orthoptera: Tetrigoidea: Metrodoridae) from China. *Entomotaxonomia*, 24(4): 235–238.
- Zheng ZM & Jiang GF. 2003. Three new species of *Metrodoridae* (Orthoptera: Tetrigoidea) from Longtan Natural Protectorate, Guangxi. *Entomotaxonomia*, 25(2): 79–85.
- Zheng ZM & Jiang GF. 2006. Four new species of Tetrigoidea from Zuojiang, Guangxi, (Orthoptera). *Acta Zootaxonomica Sinica*, 31(1): 141–145.
- Zheng ZM & Ou XH. 2003. Four new species of *Metrodoridae* (Orthoptera: Tetrigoidea) from Hengduan Mountain Region Western of Yunnan. *Entomotaxonomia*, 25(3): 159–167.
- Zheng ZM & Ou XH. 2010. A survey of Tetrigoidea from Yuanjiang Nature Reserve, Yunnan Province, China (Orthoptera). *Journal of Shaanxi Normal University*, 38(6): 60–70.
- Zheng ZM, Wei XJ & Li M. 2009. Five new species of Tetrigoidea from China (Orthoptera). *Journal of Huazhong Agricultural University*, 28(2): 141–147.
- Zheng ZM, Wei ZM & Jiang GF. 2005. A new genus and a new species of *Metrodoridae* (Orthoptera) from China. *Acta Zootaxonomica Sinica*, 30(2): 366–367.
- Zheng ZM, Zhang HH & Dang LH. 2009. Two new species of *Metrodoridae* (Orthoptera) from Hainan and Guangxi. *Entomotaxonomia*, 31(1): 1–5.