A checklist and key to species of the genus *Sophonia* (Insecta: Auchenorrhyncha: Cicadellidae: Nirvaninae) in China with descriptions of two new species

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Abstract
This paper provides a checklist and a key to the 22 Chinese species of the nirvanine leafhopper genus *Sophonia* Walker. Two new species, *Sophonia transvittata* sp. nov. and *S. yunnanensis* sp. nov., are described and illustrated. The type specimens of the new species are deposited in the Institute of Entomology, Guizhou University, Guiyang, China (IEGUC).

Keywords: *Insecta*, *Hemiptera*, leafhoppers, Cicadellidae, Nirvaninae, *Sophonia*, China

Introduction
Many species of leafhopper (Homoptera: Cicadellidae) are important agricultural pests, either directly damaging crops or as vectors of crop diseases. Thirty-seven species of *Sophonia* Walker have been reported worldwide and 20 of these are from China. The present paper describes and illustrates two more new species from China and provides a checklist and key to all the Chinese species.

The specimens of the two new species are deposited in the Institute of Entomology, Guizhou University, Guiyang, China (IEGUC).

Systematics

Order HEMIPTERA
Family CICADELLIDAE
Subfamily NIRVANINAE
Genus *Sophonia* Walker

*Sophonia* Walker, 1870: 327. Type species: *Sophonia rufitelm* Walker, 1870.
*Pseudonirvana* Baker, 1923: 386. Type species: *Pseudonirvana sandakanensis* Baker, 1923.
Synonymized by Evans, 1947: 178.
*Quercinirvana* Ahmed and Mahmood, 1969: 260. Type species: *Quercinirvana longicephala*, Ahmed and Mahmood, 1969. Synonymized by Viraktamath and Wesley, 1988: 198.
Description

Head with crown flat or slightly convex, produced anteriorly, crown longer medially than width between eyes, anterolateral margin with marginal ridge; ocelli located laterally on crown, close to anterior corner of eyes; frontoclypeus elongate, basal area evenly convex, with one distinct longitudinal ridge medially, sides obliquely wrinkled, apex flat. Pronotum wider than head. Scutellum with transverse suture extending to lateral margins. Fore wings in repose extending beyond apex of abdomen, venation obscure at base, without pre-apical cells, with four apical cells, appendix narrow and short. Hind wing with three closed cells.

Male genitalia with lateral lobe of pygofer with long macrosetae, often with a variably shaped process; subgenital plate long and broad, median area with a row of long macrosetae and apical part with short fine setae; aedeagus with a complicated arrangement of processes laterally on the basal apodeme; connective Y-shaped; style twisted basally, apex acute.

Remarks

The genus Sophonia is closely related to Kana Distant and Nirvana Kirkaldy, but can be differentiated from these two genera mainly by its shorter male plates and complex aedeagus that has processes on the dorsal apodeme and usually apex of the shaft.

Checklist of the species of Sophonia from China

1. Sophonia albula Cai and Shen
   Sophonia albula Cai and Shen, 1998: 46.
   Distribution: Henan.
2. Sophonia albuma Li and Wang
   Sophonia albuma Li and Wang, 1991: 127.
   Distribution: Guizhou.
3. Sophonia anushamata Chen and Li
   Sophonia anushamata Chen and Li, 1998: 65; Li and Chen, 1999: 46.
   Distribution: Guizhou, Sichuan, Hunan.
4. Sophonia arcuata Chen and Li
   Sophonia arcuata Chen and Li, 1998: 65.
   Distribution: Guizhou.
5. Sophonia bilineara Li and Chen
   Sophonia bilineara Li and Chen, 1999: 53.
   Distribution: Guangdong, Hainan.
6. Sophonia cyaetheana Li and Wang
   Sophonia cyaetheana Li and Wang, 1992: 141.
   Distribution: Guizhou, Guangxi, Hainan, Shaanxi.
7. Sophonia erythroleina (Kuoh and Kuoh)
   Pseudonirvana erythroleina Kuoh and Kuoh, 1983: 319.
   Sophonia erythroleina (Kuoh and Kuoh), Li and Chen, 1999: 50.
   Distribution: Yunnan.
8. Sophonia furcilinea (Kuoh and Kuoh)
   Pseudonirvana furcilinea Kuoh and Kuoh, 1983: 317.
   Sophonia furcilinea (Kuoh and Kuoh), Li and Chen, 1999: 39.
   Distribution: Fujian, Hunan, Guangdong, Yunnan.
9. *Sophonia fuscomarginata* Li and Wang
   *Sophonia fuscomarginata* Li and Wang, 1991: 125.
   Distribution: Guizhou.
10. *Sophonia lushana* (Kuoh)
    *Pseudonirvana lushana* Kuoh, 1973: 181.
    *Sophonia lushana* (Kuoh), Li and Chen, 1999: 49.
    Distribution: Jiangxi.
11. *Sophonia nigrifrons* (Kuoh)
    *Pseudonirvana nigrifrons* Kuoh, 1992: 292.
    *Sophonia nigrifrons* (Kuoh) Li and Chen, 1999: 41.
    Distribution: Tibet.
12. *Sophonia nigrilineata* Chen and Li
    *Sophonia nigrilineata* Chen and Li, 1998: 67.
    Distribution: Guizhou, Hunan, Henan.
13. *Sophonia nigromarginata* Cai and Shen
    *Sophonia nigromarginata* Cai and Shen, 1998: 46.
    Distribution: Henan.
14. *Sophonia orientalis* (Matsumura)
    *Nirvana orientalis* Matsumura, 1912: 282; Matsumura, 1931: 63.
    *Pseudonirvana orientalis* (Matsumura) Kuoh, 1966: 70.
    *Pseudonirvana rufofascia* Kuoh and Kuoh, 1983: 316. Synonymized by Huang, 1994: 85.
    *Sophonia rufofascia* (Kuoh and Kuoh) Huang, 1989: 64.
    *Quercinirvana longicephala* Ahmed and Mahmood, 1969: 260. Synonymized by Huang, 1994: 85.
    *Sophonia rufofascia* Huang, 1989: 64. Synonymized by Huang, 1994: 85.
    *Sophonia orientalis* (Matsumura) Li and Chen, 1999: 51.
    Distribution: Taiwan, Fujian, Guangdong, Guizhou, Pakistan, USA (Hawaii), Japan.
15. *Sophonia rosea* Li and Wang
    *Sophonia rosea* Li and Wang, 1991: 126; Li and Chen, 1999: 35.
    *Pseudonirvana alba* Kuoh, 1992: 293.
    Distribution: Guizhou, Yunnan, Shaanxi.
16. *Sophonia rufa* (Kuoh and Kuoh)
    *Pseudonirvana rufa* Kuoh and Kuoh, 1983: 321.
    *Sophonia rufa* (Kuoh and Kuoh) Li and Chen, 1999: 37.
    Distribution: Guizhou, Anhui.
17. *Sophonia spathulata* Chen and Li
    *Sophonia spathulata* Chen and Li, 2000: 75.
    Distribution: Guizhou.
18. *Sophonia transvittata* Li and Chen, sp. nov.
    *Sophonia transvittata* Li and Chen, sp. nov., this paper.
    Distribution: Yunnan.
19. *Sophonia unicolor* (Kuoh and Kuoh)
    *Pseudonirvana unicolor* Kuoh and Kuoh, 1983: 323.
    *Sophonia unicolor* (Kuoh and Kuoh) Li and Chen, 1999: 40.
    Distribution: Fujian.
20. *Sophonia unilineata* (Kuoh and Kuoh)
    *Pseudonirvana unilineata* Kuoh and Kuoh, 1983: 322.
    *Sophonia unilineata* (Kuoh and Kuoh) Li and Chen, 1999: 37.
    Distribution: Sichuan, Shaanxi, Hunan.
21. *Sophonia yunnanensis* Li and Chen, sp. nov.  
*Sophonia yunnanensis* Li and Chen, sp. nov., this paper.  
Distribution: Yunnan.

22. *Sophonia zhangi* Li and Chen  
*Sophonia zhangi* Li and Chen, 1999: 54.  
Distribution: Guangdong.

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**Key to the Chinese species of *Sophonia***

1. Crown, pronotum and scutellum with longitudinal bands medially .......... 2  
   – Crown, pronotum and scutellum without longitudinal bands medially .......... 14

2. Longitudinal bands at crown doubled or forked ............... 3  
   – Longitudinal bands at crown not doubled or forked .......... 11

3. Longitudinal bands orange, almost parallel at crown ............... 4  
   – Longitudinal bands black or blood-coloured, doubled or forked at crown ........ 4

4. Longitudinal bands blood-coloured, apex forked, forks short .......... 5  
   – Longitudinal bands black, double-line or single-line forked, if forked, fork long .......... 6

5. Crown with two light yellow lateral arc-shaped lines; posterior margin of clavus of forewing with three light brown stripes medially .......... *anushmata*  
   – Lateral sides of crown and clavus of forewing without any marks or stripes .......... *erythrolinea*

6. Longitudinal bands at median area of crown, pronotum and scutellum with red lines inlaid laterally .......... 7  
   – Longitudinal bands at median area of crown, pronotum and scutellum without any lines inlaid laterally .......... 8

7. Crown’s two black longitudinal bands strong, apex each connected with one elliptic black spot, the two spots partly overlapped .......... *spathulata*  
   – Crown’s two black longitudinal bands small, apex connected with only one rectangular black spot .......... *orientalis*

8. Vertex with only one black longitudinal line .......... *nigromarginata*  
   – Vertex with two black longitudinal lines or with a forked longitudinal line .......... 9

9. Vertex with a forked black longitudinal line, not connected to the black spot .......... 9  
   – Vertex with two black longitudinal lines, connected to the black spot .......... 10

10. Black spot at vertex with anterior and posterior margins concave medially; lateral lobe of male pygofer without process .......... *zhangi*  
    – Black spot at vertex with anterior and posterior margins not concave medially; lateral lobe of male pygofer with process .......... *bilineara*

11. Longitudinal bands at crown blood-coloured, apex connected to one blood-coloured blade-shaped mark .......... *arcuata*  
    – Longitudinal bands at crown black .......... 12
| 12. | Crown and pronotum dark brown laterally; median margin of clavus of forewing with one brown wedge-shaped mark | nigrilineata |
|   | Crown, pronotum and forewing without above marks |  |
| 13. | Basal area of face with one black spot | unilineata |
|   | Basal area of face without any spot. | lushana |
| 14. | Face black | nigrifrons |
|   | Face milk-white |  |
| 15. | Forewing with a black transverse band medially (Figures 2, 3) | transvittata |
|   | Forewing without black transverse mark medially, clavus with brown oblique mark (Figure 10) |  |
| 16. | Clavus of forewing with an oblique broad brown band (Figure 10) | yunnanensis |
|   | Clavus of forewing without mark |  |
| 17. | Posterior margin of forewing with brown oblique narrow mark | fuscomarginata |
|   | Posterior margin of forewing without brown oblique narrow mark |  |
| 18. | Anterolateral margin of crown with orange-yellow narrow mark | cyatheana |
|   | Anterolateral margin of crown without orange-yellow narrow mark |  |
| 19. | Body milk-white, lateral margin of crown and pronotum orange-yellow | albuna |
|   | Body light yellow-white, lateral margin of crown and pronotum not orange-yellow |  |
| 20. | Scutellum with one black spot at basal corner, anterior margin of forewing without black oblique mark | albula |
|   | Scutellum without black spot at basal corner, anterior margin of forewing with black oblique mark |  |
| 21. | Posterior margin of clavus with brown mark | unicolour |
|   | Posterior margin of clavus without brown mark | rosea |

**Sophonia transvittata** sp. n.

(Figures 1–9)

*Description*

Body length including wings: male 5.1–5.2 mm, female 5.8–6.0 mm.

External characters as in generic description with crown of head acutely produced anteriorly, surface slightly convex, part anterior to eye straight; ocellocular distance about 2.5 times diameter of ocellus; frontoclypeus longer than wide; anteclypeus rectangular, longitudinal convex medially. Pronotum convex, about the same length as crown, anterior and posterior margins almost parallel.

Male pygofer with lateral lobe slightly concave at apical margin, apical area with long macrosetae, apical-ventral corner produced as a long spine; subgenital plate slightly curved dorsally; aedeagus with shaft sinuate in lateral aspect with a pair of spine-like process at mid-length, basal apodeme with lateral arms lamellate; connective Y-shaped; style expanded medially, becoming narrower apically, apex with acutely produced outer process and triangular inner process.
Female seventh sternum longer medially than sixth segment, convex longitudinally and medially, posterior margin concave; ovipositor extending beyond apex of pygofer.

Crown yellowish white, laterally adjacent ocellus orange, eyes light yellow and light brown; face more or less whitish, without spots. Pronotum and scutellum light yellow, sides of pronotum with an orange line. Forewing light yellow, clavus with inner-lateral area, apical margin and median area irregularly marked with orange, medially with a black irregular band margined with orange-yellow, apical area with a black mark, large and irregular (male) or small and triangular (female). Thorax yellowish white, without spots, claws black.

**Holotype:** male. **Paratypes:** one male, three females, China: Yunnan, Pian-ma, (26°03’N, 98°24’E), altitude 1800 m, 15 August 2000 (Z. Z. Li and X. S. Chen) (IEGUC).

**Remarks**

*Sophonia transvittata* sp. nov. is similar to *S. rufa*, but lacks the orange-red lines on the dorsum and black oblique band anteriorly on the forewing.

**Sophonia yunnanensis** sp. n.

(Figures 10–15)

**Description**

Body length including wings: male 5.1 mm, female 5.1–5.2 mm.
External characters as in *S. transvittata* but ocellocular distance about three times diameter of ocellus and pronotum slightly shorter than crown with anterolateral margins straight and slightly oblique.

Male pygofer with lateral lobe broadly produced, apical area with long macrosetae, apical margin with three spine-like processes; aedeagal shaft sinuate in antero-posterior aspect with a pair of elongate apical processes directed ventrally, basal apodeme with a long lamellate process from each basal arm extending beyond apex of aedeagal shaft; connective Y-shaped; style pincer-shaped apically with subapical lobe very long, tapered apically and apical process strongly curved laterally.

Female terminalia as in *S. transvittata* but posterior margin of seventh sternum almost straight.

Body and forewing milky-white, ocellus light yellow, eyes light brown, face without spots. Scutellum with dark spots at basal corners. Forewing with three fine oblique bands subapically on anterior margin, a blackish brown spot at base of second apical cell, apex of clavus and at middle of posterior margin and apical area of wing and a wide band at median area of clavus, light brown. Thorax with venter yellowish white, without spots, claws black.

**Holotype:** male. **Paratypes:** five females, China: Yunnan, Pian-ma (26°03’N, 98°24’E), altitude 1800 m, 17 August 2000 (Z. Z. Li and X. S. Chen) (IEGUC).

**Remarks**

*Sophonia yunnanensis* is similar to *S. albuma* but has the forewing with a black spot apically on the clavus and an oblique wide band on the medial area. The two species also clearly differ in the structure of the male genitalia.

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References

Ahmed M, Mahmood SH. 1969. A new genus and two new species of Nirvanina (Cicadellidae-Homoptera) from Pakistan. Pakistan Journal of Science and Industry Research 12(3):260–264.

Baker CF. 1923. The Jassoidea related to the Stenocotidae with special reference to Malayan species. Philippine Journal of Science 23(4):345–401, 5 pls.

Cai P, Shen XC. 1998. New species of family Cicadellidae from Mt. Funiu in Henan (Homoptera: Cicadelloidea). Insects of the Funiu Mountains Region 1:37–52.

Chen XS, Li ZZ. 1998. Three new species of the genus Sophonia from China. Zoological Research 19(1):65–70.

Chen XS, Li ZZ. 2000. A new species of the genus Sophonia (Homoptera: Cicadellidae: Nirvaninae). Acta Entomological Sinica 43(1):75–77.

Evans JW. 1947. A natural classification of leafhoppers (Jassoidea, Homoptera). Part 3: Jassidae. Entomological Society of London Transactions 98:105–271.

Huang KW. 1989. Nirvanini of Taiwan (Homoptera: Cicadellidae: Nirvaninae). Bulletin of the Society of Entomology (NCHU) 21:61–67.

Huang KW. 1994. Supplement of Nirvanini of Taiwan (Homoptera: Cicadellidae: Nirvaninae). Chinese Journal of Entomology 14(1):83–88.

Kuoh CL. 1966. Homoptera: Cicadellidae. Economic Insect Fauna of China. Fasc. 10. Beijing: Science Press. p 66–72.

Kuoh CL. 1973. Two new species of Pseudonirvana (Homoptera: Nirvanidae). Acta Entomological Sinica 16(2):180–184.

Kuoh CL. 1992. Homoptera: Cicadellidae. Insects of Hengduan Mountains Region. Vol. 1, (Beijing: Science Press), p 243–316.

Kuoh CL, Kuoh JL. 1983. New species of Pseudonirvana (Homoptera: Nirvanidae). Acta Entomological Sinica 26(3):316–325.

Li ZZ, Chen XS. 1999. Nirvaninae from China (Homoptera: Cicadellidae). Guiyang: Guizhou Science and Technology Publishing House. p 29–55.

Li ZZ, Wang LM. 1991. Five new species of the genus Sophonia from Guizhou, China (Homoptera Nirvaninae). Zoological Research 12(2):125–132.

Li ZZ, Wang LM. 1992. Agriculture and Forestry Insect Fauna of Guizhou. Vol. 4, Guiyang: Guizhou Science and Technology Publishing House. p 133–143.

Matsumura S. 1912. Die Acocephalinen und Bythoscopinen Japans. Japan Journal of College of Agriculture, Tokoku Lmp. University 4:282–283.

Viraktamath CA, Wesley CS. 1988. Revision of the Nirvaninae (Homoptera: Cicadellidae) of the Indian subcontinent. Great Basin Naturalist Memoirs 12:182–223.

Walker F. 1870. Catalogue of the Homopterous insects collected in the Indian Archipelago by Mr. A. R. Wallace, with descriptions of new species. Linnaeus Society of London, Journal of Zoology 10:276–330.