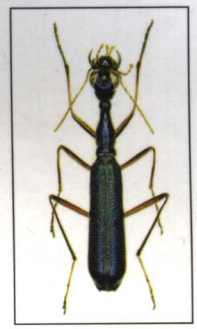
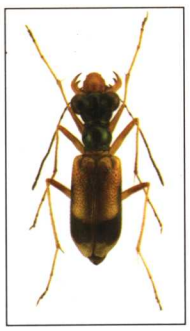
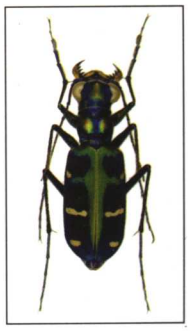
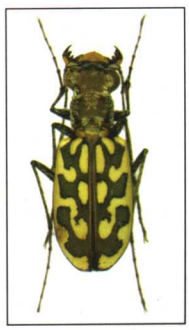
Tiger Beetles of Yunnan

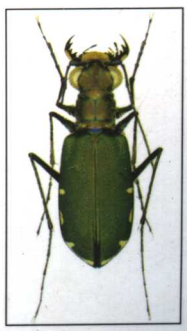
Gary Shook and Wu Xiao-Qiang











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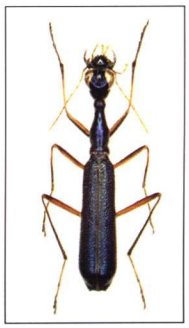

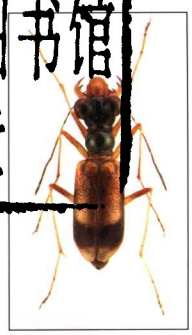

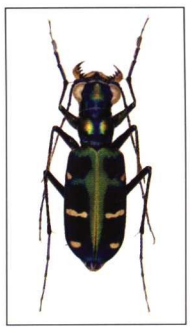

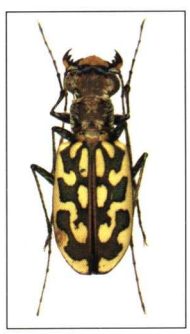

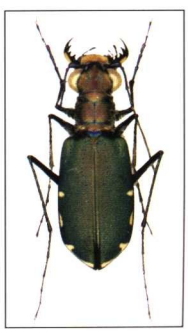

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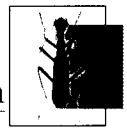

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Preface

For insects and many other taxa, there is a rising interest in global biodiversity. At the core of this concern is a growing appreciation of the importance of species distributions and their abundance. One result is that standardized use of species names (taxonomy) becomes essential for reliable identification and communication among lab and field workers. Early in the study of most groups, the data appear in the form of monographs and taxonomic revisions. If these books can be presented in an attractive and readable manner, they often become instrumental in expanding the interest in the subject taxon to researchers and areas of interest far beyond the museum and taxonomy. With a user-friendly publication in hand, professionals and enthusiastic amateurs can gather reliable distribution and biological information, quickly expanding the data set to the point that the current publication becomes obsolete and a new one is needed to replace it.

This publication on the tiger beetles of Yunnan is poised to not only increase our knowledge of tiger beetle biology in Asia but also to make tiger beetles a useful organism for general studies of biology, physiology, biogeography and conservation biology in southern China. Too often a barrier to advances in these fields is the lack of a reliable and well-known study organism. Gary Shook and Wu Xiao-Qiang have assembled a beautiful and useful monograph that will serve as both a basic text for lab researchers, a field guide for professionals and a catalyst for amateurs captivated by these beetles as a life long hobby. Whoever the users of this book will be, the potential for advancing basic biology and conservation efforts in southern China can only be enhanced by this comprehensive tome. It is written and illustrated to encourage a broad spectrum of readers. I hope that it will also serve as a template for similar publications from elsewhere in China, Asia and the world. These are the kind of efforts that will have a direct impact on understanding, enjoying and sustaining the world's biodiversity for generations to come.

David L. Pearson, Research Professor
Co-author of *Tiger Beetles: The Evolution, Ecology and Diversity of the Cicindelids*
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June 2007

Acknowledgments

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The inspiration for this book is the *Tiger Beetles of Thailand* by Roger Naviaux and Brother Amnuay Pinratana (2004). To both of them we extend our thanks for offering an excellent format from which to develop this current volume.

We acknowledge the assistance of many people: Professor Ye Hui and his graduate student Liu Xiao–Fei, Yunnan University (YNU), provided stereoscopic photography. Zhou Xue–Song and Liu Jia–Zhu of the Southwest Forestry College (SWFC) assisted in collecting and added significantly to distributional records of Yunnan. Professor Kuang Rong–Ping, as Director of the Specimen Museum at the SWFC, assured we had a place to work. Dr. Fabio Cassola (Italy), Ron Huber (USA), and Roger Naviaux (France) provided information and clarification where it was needed. Roger also gave us permission to use photos or provided photos, as did Dr. Andre Matalin (Russia). Dr. David Pearson (USA) edited the original manuscript and verified the accuracy of tiger beetle biology and ecology. Professor Zhou Hong–Zhang permitted access to specimens and their photography at the Institute of Zoology, China Academy of Sciences, Beijing.

A special thanks is extended to our mentor and teacher, Juergen Wiesner (Germany). It is through him how both authors have come to know the tiger beetles of Yunnan. Juergen kindly provided several specimens of photographic quality, photographs where needed, and an early review of each species account.

This guide is seen as a basic primer to the tiger beetle fauna of Yunnan. Because of the Province's uniqueness in blending at least three climatic zones, it is expected that more known species and new species alike will be found and added to the list we have provided here, requiring a second edition.

Introduction

The diverse climate and geography of Yunnan Province provides an equally rich and abundant diversity among the tiger beetles. Species of South and Southeast Asia mix with those of the Palearctic, offering a unique and exotic community of cicindelids. This book includes 82 species and subspecies of tiger beetles. Although Yunnan accounts for only 4.1% of China's total landmass (Yang et al), about half of all known Chinese tiger beetle species are found in the province. With 394,000 square kilometers (km^2), the province has a tiger beetle species density ratio of 4805 km^2/species.

Larval and adult tiger beetles are predators on small insects. In the life cycle of Yunnan tiger beetles, larvae may remain in their burrows for long periods of time, two or three years in some species. Adults, after emerging from the pupae, feed, breed and are usually short-lived. Some species are considered beneficial due to their appetite for insects harmful to crops.

In this book, the descriptions of each species is divided into two major taxonomic sections: the Subfamily Cicindelinae and the Subfamily Collyrinae. Although Pearson and Vogler (1991) confirm that, based on DNA sequencing, the collyrinids fall within the Subfamily Cicindelinae, the distinction of these two subfamilies is retained to make a convenient break between these two groups of tiger beetles that look so dissimilar. Cicindelinae have more quadrate bodies that are not as slender as those of the Collyrinae:

Subfamily Cicindelinae

Subfamily Collyrinae

Information regarding each known species and subspecies is presented and includes the known literature, with special emphasis on that related to China. The descriptive narratives for each species provides general comments that separate them from similar species.

Length is measured from the forehead (frons) to the anterior tip of the elytra. Although tiger beetles of Yunnan range in size from 6 to 28 millimeters, the body lengths in the photos have been kept constant in order to show necessary detail for species identification.

Where possible something about the ecology of the species is provided. For some species, little or nothing is known of their ecology, except where they were collected. Although a specific habitat type may be reported, tiger beetles may range far and wide and enter a wider variety of habitats during the rainy season.

The biodiversity rating is based on the ranking methodology used in the Natural Heritage system for the Western Hemisphere. It considers only the population densities in Yunnan and is, therefore, a subnational or "S" rating.

1–Extremely rare and critically impaired: Only occasional and single reports of occurrence. Extremely vulnerable to extinction.
2–Rare and imperiled: Infrequent populations or populations that may be endangered
3–Not rare but vulnerable: Locally small populations, which appear to have good fecundity and are secure.
4–Not frequent but not rare: Locally modest populations, which have good fecundity and are secure.
5–Frequent: Locally in large, fecund populations. Little danger of threat to reproductive security.

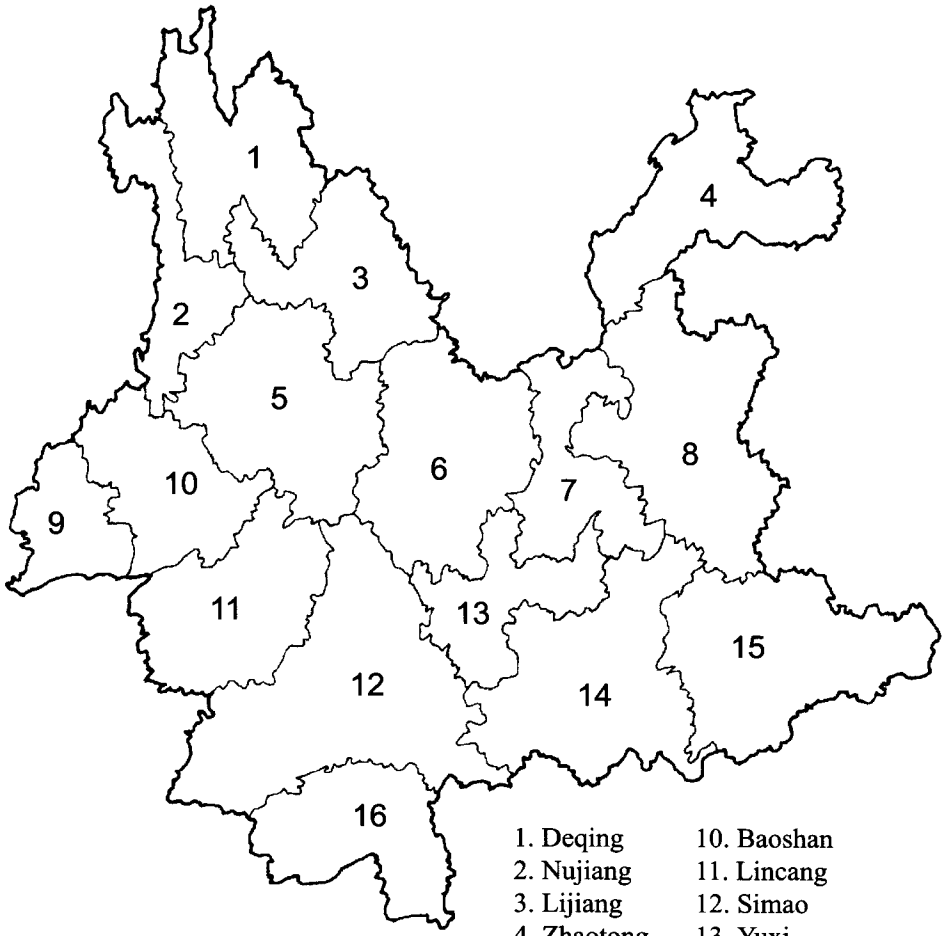
Location information has been taken from several sources. The following acronyms are used to identify them:

AM	Andre Matalin, Moscow, Russia
JW	Juergen Wiesner Collection, Wolfsburg, Germany
IOZ	Institute of Zoology, China Academy of Science, Beijing
KIZ	Kunming Institute of Zoology
SWC	Gary Shook and Wu Xiao–Qiang Collection, Kunming
SWFC	South West Forestry College, Kunming
SWFCST	South West Forestry College Student Collection
YTPHC	Yunnan Tropical Plant Horticulture College, Simao
YFDPD	Yunnan Forest Disease and Pest Prevention and Quarantine Department

Chinese personal names listed with location data use the currently accepted format of placing the family name in capital letters and hyphenating the given name (WU Xiao–Qiang, for example).

Notes may be added: the location of the species elsewhere within China or outside of China, holotype location and depository, special mention of taxonomic status and other relevant information for the species.

A map of the prefectures of Yunnan is shown in Figure 1 on page 10.



Prefectures of Yunnan Province, China

FIGURE 1

A Summary Check List of Tiger Beetles Known to Occur in Yunnan Province, China

Subfamily Cicindelinae

1. *Callytron andersonii* (Gestro, 1889)
2. *Calochroa anometallescens* (Horn, 1893)
3. *Calochroa elegantula* (Dokhtouroff, 1882)
4. *Calochroa flavomaculata* (Hope, 1831)
5. *Calochroa interruptofasciata* (Schmidt–Goebel, 1846)
6. *Calochroa octogramma* (Chaudoir, 1852)
7. *Calochroa pseudosiamensis* (Horn, 1913)
8. *Calochroa salvazai* (Fleutiaux, 1919)
9. *Calomera angulata* (Fabricius, 1798)
10. *Calomera funerea assimilis* (Hope, 1831)
11. *Calomera plumigera scoliographa* (Rivalier, 1953)
12. *Cephalota* (*Taenidia*) *chiloleuca* (Fischer, 1820)
13. *Cicindela* (*Cicindela*) *gemmata* Faldermann, 1835
14. *Cicindela* (*Sophiodela*) *chinensis* Geer, 1774
15. *Cosmodela aurulenta juxtata* (Acciavatti & Pearson, 1989)
16. *Cosmodela duponti* (Dejean, 1826)
17. *Cosmodela fleutiauxi rufosuturalis* (Mandl, 1954)
18. *Cosmodela separata* (Fleutiaux, 1893)
19. *Cosmodela setosomalaris* (Mandl, 1954)
20. *Cosmodela virgula* (Fleutiaux, 1893)
21. *Cylindera* (*Apterodela*) *lobipennis* (Bates, 1866)
22. *Cylindera* (*Cylindera*) *armandi* (Fairmaire, 1886)
23. *Cylindera* (*Cylindera*) *davidi* (Faimaire, 1887)
24. *Cylindera* (*Cylindera*) *delavayi* (Fairmaire, 1886)
25. *Cylindera* (*Cylindera*) *dromicoides* (Chaudoir, 1852)
26. *Cylindera* (*Eriodera*) *albopunctata* (Chaudoir, 1852)
27. *Cylindera* (*Eugrapha*) *biprolongata* (Horn, 1924)
28. *Cylindera* (*Eugrapha*) *elisae* (Motschulsky, 1859)
29. *Cylindera* (*Eugrapha*) *minuta* (Olivier, 1790)
30. *Cylindera* (*Eugrapha*) *mutata* (Fleutiaux, 1893)
31. *Cylindera* (*Ifasina*) *decolorata* (Horn, 1907)
32. *Cylindera* (*Ifasina*) *fallaciosa* (Horn, 1897)
33. *Cylindera* (*Ifasina*) *foveolata* (Schaum, 1863)
34. *Cylindera* (*Ifasina*) *holosericea* (Fabricius, 1801)
35. *Cylindera* (*Ifasina*) *kaleea* (Bates, 1863)
36. *Cylindera* (*Ifasina*) *spinolae* (Gestro, 1889)
37. *Cylindera* (*Ifasina*) *viduata* (Fabricius, 1801)
38. *Heptodonta eugenia* Chaudoir, 1865
39. *Heptodonta ferrarii* Gestro, 1893

40. *Heptodonta posticalis* White, 1844
41. *Heptodonta pulchella* (Hope, 1831)
42. *Heptodonta vermifera* Horn, 1908
43. *Lophyra* (*Lophyra*) *cancellata* (Dejean, 1825)
44. *Lophyra* (*Lophyra*) *fuliginosa* (Dejean, 1826)
45. *Lophyra* (*Spilodia*) *lineifrons* (Chaudoir, 1865)
46. *Lophyra* (*Spilodia*) *striolata striolata* (Illiger, 1800)
47. *Lophyra* (*Spilodia*) *striolata dorsolineolata* (Chevrolat, 1845)
48. *Myriochila* (*Myriochila*) *sinica* (Fleutiaux, 1889)
49. *Myriochila* (*Myriochila*) *speculifera* (Chevrolat, 1845)
50. *Naviauxella phongsalyensis* Sawada & Wiesner, 2004
51. *Pronyssa nodicollis* (Bates, 1874)
52. *Pronyssiformia excoffieri* (Fairmaire, 1897)
53. *Prothyma* (*Genoprothyma*) *birmanica* Rivalier, 1964
54. *Rhytidophaena feae* (Gestro, 1889)
55. *Ropaloteres desgodinsi* (Fairmaire, 1887)
56. *Therates fruhstorferi fruhstorferi* Horn, 1902
57. *Therates fruhstorferi vitalisi* Horn, 1913
58. *Therates pseudoconfluens* Sawada & Wiesner, 1999
59. *Therates pseudomandli* Probst & Wiesner, 1996
60. *Therates pseudorugifer pentalabiodentatus* Matalin, 2001

Subfamily Collyrinae

61. *Collyris gigas* Lesne, 1901
62. *Neocollyris* (*Leptocollyris*) *linearis* (Schmidt-Goebel, 1846)
63. *Neocollyris* (*Leptocollyris*) *rogeri* Shook & Wu, 2006
64. *Neocollyris* (*Leptocollyris*) *rosea* Naviaux, 1995
65. *Neocollyris* (*Leptocollyris*) *variicornis* (Chaudoir, 1864)
66. *Neocollyris* (*Leptocollyris*) *variitarsis* (Chaudoir, 1860)
67. *Neocollyris* (*Neocollyris*) *bonellii* (Guérin-Méneville, 1834)
68. *Neocollyris* (*Neocollyris*) *cruentata* (Schmidt-Goebel, 1846)
69. *Neocollyris* (*Neocollyris*) *fuscitarsis* (Schmidt-Goebel, 1846)
70. *Neocollyris* (*Neocollyris*) *jinpingi* Shook & Wu, 2006
71. *Neocollyris* (*Neocollyris*) *moesta* (Schmidt-Goebel, 1846)
72. *Neocollyris* (*Neocollyris*) *orichalcina orichalcina* (Horn, 1896)
73. *Neocollyris* (*Neocollyris*) *orichalcina yunnana* Naviaux, 1999
74. *Neocollyris* (*Neocollyris*) *rufipalpis* (Chaudoir, 1864)
75. *Neocollyris* (*Orthocollyris*) *crassicornis* (Dejean, 1825)
76. *Neocollyris* (*Pachycollyris*) *panfilovi* Naviaux & Matalin, 2002
77. *Neocollyris* (*Pachycollyris*) *tricolor* Naviaux, 1991
78. *Neocollyris* (*Stenocollyris*) *compressicollis* (Horn, 1909)
79. *Tricondyla gestroi scabra* Fleutiaux, 1920
80. *Tricondyla macrodera abruptesculpta* Horn, 1925
81. *Tricondyla mellyi* Chaudoir, 1850
82. *Tricondlya pulchripes* White, 1844

Subfamily Cicindelinae

There are two major habitat preferences for the Cicindelinae of Yunnan: riparian areas along the shores of rivers, streams, lakes and reservoirs, and upland areas, such as forests and scrublands. Some species survive after agriculture has replaced forests. *Calochroa flavomaculata*, for instance, has been found to prefer rice lands, where it can be an important predator on the rice sapper planthopper, and *Cylindera descendens* is known to live in tobacco fields. Other species, such as *Cylindera kaleea* and *Cylindera viduata*, are cosmopolitan and can be found even in large cities. During the rainy season some species may move out of a restricted habitat and be far-ranging. *Calomera plumigera scoliographa*, normally a riparian species, has been found in June high in the mountains many kilometers from the sandbars of streams where it breeds.

At the beginning of the life cycle, males court females and mate, holding the female by mandibles in the coupling sulcus on the sides of the female's pronotum. Even after the male's sex organ, the aedeagus, has retracted from the female following sperm transfer, the male may still continue to hold the female in a position known as "mate guarding". This activity presumably keeps other males away while the female goes about the business of egg laying.

With the exception of *Therates*, in which egg laying and larval burrow construction occurs in decaying vegetation and old logs, most genera of this subfamily lay their eggs in soil. The type of soil is often specific to the species: The riparian species of *Calomera* lay eggs in sand, many species of *Cylindera* prefer silt, and some of the *Calochroa* species lay eggs in clay.

The hatched larvae go through three instars, enlarging their burrows just prior to molting and enclosure as the pupae. Larvae pupate once a necessary biomass of food has been ingested. Forest species will remain as pupae from the late fall until the rains begin and soils become saturated during the following rainy season. Riparian species may remain as pupae for only a few weeks. Once emerged the imago, or fresh young adult whose cuticle has not yet hardened, begins actively feeding.

Males are easily separated from females by the brush-like setae on the protarsae of the male. *Heptodonta* and *Pronyssa* males also have such "brushes" on their mesotarsae.

Habitat of Cicindelinae

Habitat of riparian, or riverside–dwelling, species, such as *Calomera* species, *Cosmodela aurulenta* and *C. setosomalaris*, *Cylindera elisae*, *C. minuta*, *C. mutata* and *Lophyra cancellata*.

Many forest and field cicindelinae, such as *Calochroa* species, *Cosmodela virgula*, *Callytron andersoni*, and *Cylindera* species, occupy mountain habitats similar to these mountains in Honghe prefecture.

Callytron andersonii (Gestro, 1889)

Gestro, 1889:83; Fleutiaux 1892:60; Fowler 1912:437; Horn 1915:310, 1926b:192, 1938:T 58; Schilder 1953:551; Rivalier 1961:147; Mandl 1969:152b; Naviaux 1991:280; Wiesner 1992:221; Sawada & Wiesner 2002:97, 2004:273, 2006:456; Naviaux & Pinratana 2004:115; Shook & Wu 2007:37.

Length (without labrum): 7.0 to 9.5 mm.

Description: A small and non-descript dark beetle, rather dull-looking. The body is dull brownish, the head and pronotum have green reflections especially at the sides, and violet or copper reflections on top. Head rugose in the middle of frons and vertex, more striate at sides to gena. The labrum is short, brown at the anterior edge, light brown on the disc. It contains three teeth, faint in the male but distinct in the female, and six to ten setae. The gena is glabrous. Antennae are black, first four segments shiny with violet and/or green reflections, remaining segments finely pubescent. The pronotum is finely rugose on the disc, with the grooves shallow. It is subquadrate and noticeably wider than long in the female. The elytra are almost parallel-sided in the male, with a slight lateral expansion at the medial in the female. The female is quickly separated from the male as she has a shiny black spot ("mirror") at the center on the basal one-third of the elytra. The maculae consist of very faint medial and apical bands at the lateral edge. They are off-white in color. Trochanters are light brown. Legs black. Femora with green and copper reflections, apex light brown. Tibia base brown, remaining length may have green reflections. Underside with green and blue reflections, pilose at the sides, glabrous in the middle

Ecology: Adults are found in open forests, on dirt roadways and paths during the rainy season in association with *Cylindera viduata*, *C. spinolae*, *C. kaleea*, *Lophyra lineifrons* and *L. striolata*. Where found, it is a moderately common species.

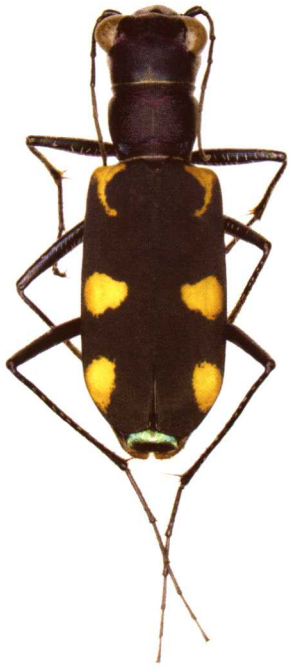
Biodiversity Rating: 4

Locations: Xishuangbanna: Menglun, 1-VI-2006, G. SHOOK & WU X.-Q. (SWC).

Note: The species has a broad distribution throughout Thailand, Cambodia, Laos, Vietnam, Myanmar and southwestern China to Hong Kong.

Calochroa anometallescens (Horn, 1893)

Horn 1893:140, 1915:302, 1926b:183, 1938:T54; Fleutiaux 1893:492; Fowler 1912:398; Rivalier 1961:127; Schilder 1953:555; Naviaux 1991:272; Li & Chen 1993:106; Sawada & Wiesner 2004:264, 273, 2006:456; Naviaux & Pinratana 2004:104; Shook & Wiesner 2006:8; Shook & Wu 2007:37.



Length (without labrum): 13.0 to 16.5 mm.

Description: An attractive, moderately-sized beetle. The body is black with green and violet reflections under illumination or in sunlight. The head is finely rugose and striate. Labrum black with a light brown band transversing the disc. Four setae occupy the apex. There is a central tooth. Behind it and in front of the medial carina is a small impression. The gena is glabrous. The pronotum is rectangular, wider than long in the female. Disc transversely rugose and striate, with anterior and posterior grooves distinct. The elytra are velvety black and microgranulate, parallel-sided and evenly rounded at the apex. The three maculae vary in color from yellow to orange. The humeral lunule is broad at the base but is reduced in width or may be absent on the disc. The other two spots are round and vary little from specimen to specimen. The trochanters are brown or black. Legs and underside black with blue and violet reflections. There may be light setae along the sides of the sternum and abdomen.

Ecology: Adults are found in open forests and on dirt paths during the rainy season.

Biodiversity Rating: 4

Locations: Simao: Jiangcheng County, Shimao City, Haiming, 20-29-VI-2005 (JW).

Note: The species occurs in Thailand, Myanmar and Laos. The Yunnan location cannot be confirmed, as the label data include an unknown location in Jiangcheng County. The species is known to occur at Phongsali, Laos, just across the border from the reported location. Therefore, species occurrence in Yunnan is likely.