



**Taxonomic structure of the subtribe *Chrysochroina* CAST.
with review of the genus *Chrysochroa* Dej.**

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book published only in English

- Warszawa 2009
- 1st edition
- 422 pages, 173 colour photographs of beetles, 124 maps, 14 phylogenetical trees
- softcover
- ISBN 978-83-928264-2-2
- price: Europe 80 EUR plus 10 EUR shipping and handling costs. Rest of the world US\$ 100 plus shipping and handling costs: North America & Africa US\$ 15, South America & Asia US\$ 20, Australia US\$ 25. ALL SHIPMENTS BY REGISTERED AIR MAIL
- payment ONLY by bank swift (NO POSSIBILITY TO ACCEPT CREDIT CARDS PAYMENTS) for GONDWANA SP. Z O.O., ADOLFA PAWINSKIEGO 5A/6A, 02-106 WARSZAWA, POLAND account PL 81 1440 1299 0000 0000 0289 9884 S.W.I.F.T. (BIC): NDEAPLP2
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The **Chrysochroina** CAST. is a large [*ca.* 400 known species – some 3% of the World buprestid fauna – in 13 genera] subtribe inhabiting almost all tropical and subtropical areas of the Old World. The taxon comprises big or at least medium-sized, often splendidly colourful species, many of which are rather common; moreover, larvae develop in wood of living forest- or orchard-trees including those of considerable economic importance, while size and attractive appearance of adults attract the interest of not only buprestid specialists but also “general nature lovers” and even provoke mass collecting for commercial (jewellery, “souvenirs”) purposes. And none the less they have never been subject of comprehensive phylogenetic or zoogeographic study, and even the last revision (KERREMANS 1908) and catalogue (OBENBERGER 1926) have been despairingly outdated; as the result, taxonomic structure remains poorly understood, available distributional data inexact and frequently erroneous, while knowledge about bionomy and phylogenetic relationships are almost totally lacking.

The present book – taxonomic, biogeographic and evolutionary revision of the subtribe at the genus-subgenus level and of its “central” genus, *Chrysochroa* DEJ. (*sensu novo*), at that of species and subspecies – is an attempt to fill some of these gaps in our knowledge. The main part [→**Contents**] is devoted to clarify the relationships between the included taxa: based on the detailed phylogenetic analyses (performed with the newly developed program, MICSEQ; the results shown on 14 trees and detailly described as well for the subtribe as a whole, as for each supraspecific taxon within *Chrysochroa* DEJ. and for each genus otherwise) a largely refined and emended classification (with keys, full synonymy, morphological descriptions, geographical distribution and taxonomic, nomenclatural, distributional &c. remarks [→**example page 135**]) is proposed on the one hand, and the ways of evolutionary (with tentative descriptive “reconstructions” of ancestors) and biogeographic (illustrated with “geocladograms” [→**example page 91**]) development hypothesized on the other. Altogether 64 subgenera in 16 genera of the **Chrysochroina** CAST., including 137 subspecies in 75 species, 20 circles and 13 subgenera of *Chrysochroa* DEJ. [1 genus, 14 subgenera, 2 species and 4 subspecies are described as new, while for 3 species and 2 subspecies new names are proposed due to homonymy] are treated, their distribution mapped [→**example page 129**], and most of them shown on 173 colour photographs [→**example tab. 4**].

The introductory part (pp. 12-29) discusses the basic approaches, assumptions and conventions accepted in the book, while the concluding chapters (pp. 311-330) evaluate to what degree these approaches and conventions proved correct and appropriate, and what general taxonomic, biogeographic and evolutionary conclusions can be drawn from the results presented in the systematic part (some new or disputable methods, concepts and hypotheses are critically commented upon [→**example page 314**]). List of quoted literature includes 386 publications.

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Chrysochroa (Chrysoxantha) rugicollis fruhstorferi WATH.

Chrysochroa Fruhstorferi WATERHOUSE 1904: 266

Material examined:

Syntypes: “type” “China 1903-120” “Tonkin, Than-Moi, June-July, H. Fruhstorfer” “*Chrysochroa Fruhstorferi* (Type) Waterh” [1 ♂ (BMNH)]; “Tonkin, Than Moi, Juni-Juli, H.Fruhstorfer” “Coll.I.R.Sc.N.B., Tonkin, ex coll. Le Moul” “Le Moul vend., Wath. det., *Chrysochroa Fruhstorfi* [*sic!* – RBH] Wath.” “PARATYPES” “of Ann.Mag.Nat.Hist. 1904, 14,82:266” “Paratype” [1 ♀ (KBIN)]; “Tonkin, Than Moi, Juni-Juli, H.Fruhstorfer” “Coll.I.R.Sc.N.B., Tonkin, ex coll. Le Moul” “Le Moul vend., Wath. det., *Chrysochroa Fruhstorfi* [*sic!* – RBH] Wath.” “Paratype” [4 ♂ (KBIN)]; “Tonkin, Than Moi, Juni-Juli, H.Fruhstorfer” “Coll.I.R.Sc.N.B., Tonkin, ex coll. Le Moul” “Le Moul vend., Wath. det., *Chrysochroa Fruhstorferi* Wath.” “Paratype” [1 ♂, 1 ♀ (KBIN)]; “Tonkin, Than Moi, Juni-Juli, H.Fruhstorfer” “Coll.I.R.Sc.N.B., Tonkin” “Le Moul vend., Wath.det., *Chrysochroa Fruhstorferi* Wath.” “Paratype” [1 ♂ (KBIN)]

Additional material: 27 ♂, 17 ♀, 23 ♂

Characters: Males [2] 35.5×12–43×14.5, females [5] 40.5×13.5–50×17.5 mm. Head and pronotum dark purplish-violaceous; elytral apices (to posterior $\frac{2}{3}$), median patch (placed between basal fourth and midlength and reaching interspace between 1. and 2. costae), and margins (extending to or beyond 5. costa before median patch, but restricted to marginal costa behind it) blackish-blue; posterior angles of basal ivory band prolonged into linearly narrow strip separating anterior $\frac{2}{3}$ of median patch from dark elytral margin; hind angles of postmedian ivory band also acute-angled but broader and shorter; sternum dull purplish, abdomen and legs dark blue. F:V≈1.3, V:H≈0.27 (male). Vertex densely punctured. Elytral costae weakly developed, on basal fourth practically imperceptible, but 4. not appreciably weaker than others. Lateroapical denticle totally obliterated. Anal plate distinctly though shallowly sulcate along midline, rather narrowly but deeply emarginated at apex.

Geographical distribution (map 48):

This race is known only from northeasternmost Vietnam (Tonkin: Thanh Moi); labels “Annam Laos” “Annam” and “Cochinchina” do not seem reliable, and “Darjeeling” is evidently erroneous.

Remarks:

Somewhat enigmatic form. WATERHOUSE (1904) described it as a separate species, because “*in addition to the difference in colour it is distinguished by being less elongate, and the thorax shorter and broader*”; later authors found these additional characters not reliable and considered *C. fruhstorferi* WATH. a colour variety of *C. rugicollis* SND. However, apparently restricted peripheral (Thanh Moi lies close to Vietnamese-Chinese border, as the species’ northeasternmost known locality) distribution of this form suggested that it might be rather a subspecies, and this suggestion seems supported by remarkably uniform (as contrasted to bewildering variability of red-pronotal forms) elytral pattern. Moreover, purplish-violaceous colouration of head and pronotum seems correlated with some other chromatic (bluish – not distinctly violaceous – elytra and abdomen, linear yellow strip separating anterior $\frac{2}{3}$ of dark median patch from also dark elytral margin) and structural (somewhat wider and more densely punctured vertex, completely obliterated lateroapical denticle of elytra, trisinuately triangular apical emargination of anal sternite, narrower and deeper incision and more conspicuous median sulcus of anal plate) features rarely or never occurring in combination with red pronotum. Unfortunately most of these characters came to my attention too late to have been checked in the visited museums, and my collection on which the final description has been based contains only a single male, but even the available morphological and distributional data make the subspecific status most probable.

Geographical distribution (maps 36-39):

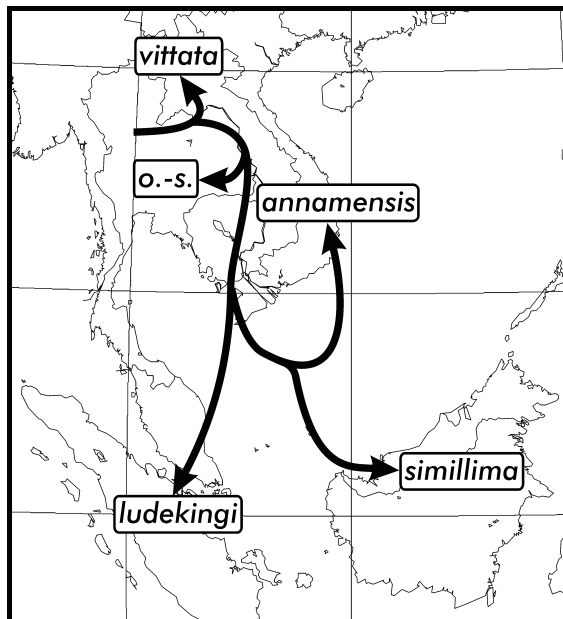
Species of this subgenus are distributed in South-East Asia from India, through Indochinese (incl. Malay) Peninsula, Andamanes, Sumatra and Borneo, to Celebes.

Evolutionary history:

On the 1. cladogram *Pyranthe GISTL* appears as the sister-group of *Chrysoxantha sg.n.* what, however, does not seem “intuitively” acceptable and is apparently an artifact induced by the latter subgenus having been represented in the analysis by an arbitrarily selected species [*C. buqueti* (Gy.)] instead of reconstructed ancestor. Indeed, cladograms 2 and 3, already with “proto-*Chrysoxantha*”, show it almost twice as distant (30 phenons) from *Pyranthe GISTL* as *Xanthodema sg.n.* (17), and this relation seems the best supported.

The “basalmost” branch of *Pyranthe GISTL* – *C. vittata* (F.) – occurs in Indochina; as *Xanthodema sg.n.* shows the basal disjunction to the both sides of that area (*C. sarasinorum* FL. in Ceylon and S-India, *C. [castelnaudi]-superspecies* in Sundaland), and the next-closest relative (*Chroodema sg.n.*) occupies its northern borderlands, it seems justified to assume that “proto-*Pyranthe*” probably inhabited the Indochinese Peninsula (map 34). The reconstruction shows it (1:X) as a relatively small, dorsally bright-green beetle with contrastingly cupreous front and laterobasal patches of pronotum, unicolorously cupreous ventral side, rather indistinct metallic pattern but conspicuous transverse ivory band on elytra, dense but rather short (somewhat longer in males) ventral pubescence, well developed femoral brushes, rather wide (V:H \approx 0.3–0.4) vertex, small pronotum with prominent laterobasal lobes but poorly marked “collar”, no discal depressions, undifferentiated median line, elytra widest at midlength, sides shallowly sinuate in basal half, apex bidenticulate, no subhumeral or epipleural angularities, distinct but not very prominent costae without intercostae, fine irregular punctulation distinctly sparser and finer on periscutellar area, densely punctured convex prosternal process anteriorly delimited with deep transverse groove, no prometasternal ledge, rather compact antennae with 3. joint longer than 4., markedly bent mesotibiae, 1. metatarsomere much longer than 2, female anal sternite apically incised, and nearly straight (in lateral aspect) cylindrical aedeagus.

Basal split seems to have occurred between north-eastern and southwestern populations. In the former, pronotal pattern became less distinct, cupreous-red vittae appeared on elytra simultaneously with disappearance of yellow band, ventral pubescence became longer, elytra basally parallelsided, costae prominent throughout, mesotibiae straight – the result is known as *C. vittata* (F.). On the Southwest changes were less pronounced – ventral pubescence became inconspicuous, vertex still broader (V:H>0.4), pronotum distinctly



Map 34. Distributional history of *Chrysochroa vittata* (F.) and *C. [simillima]-superspecies*; o.-s. – [*ocellata*]- and [*similis*]-superspecies

Sg. *Chrysoxantha* sg.n.

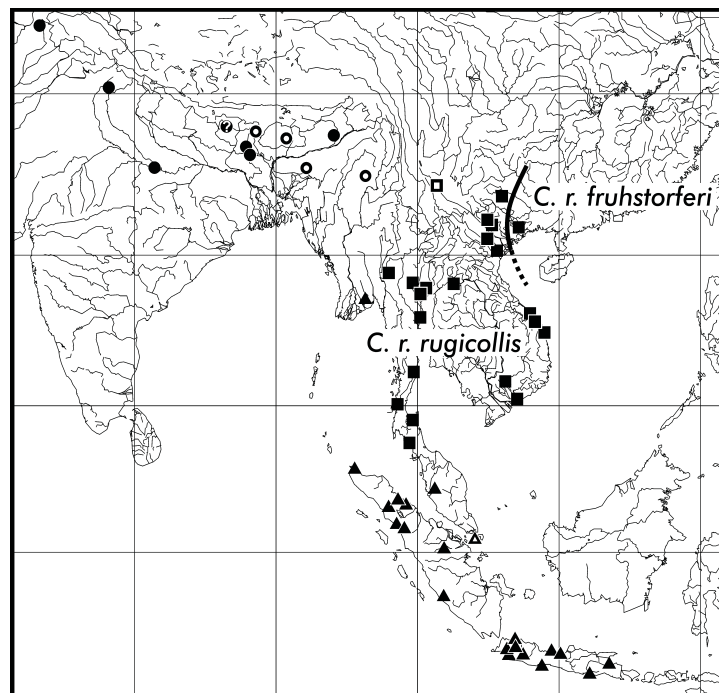
Type-species: *Buprestis buqueti* GORY 1833

General characteristics:

Very distinctive, small (single circle with three species) group of multicoloured beetles. System of elytral (violaceous-blue with typically two – basal and postmedian – broad ivory bands interconnected along suture) and ventral (carmin-red sternum sharply contrasting with violaceous-blue abdomen) colouration is unique within the **Chrysochroina** **CAST.**; frontal depression and pronotal sides usually bright red, rarely green, median portion of pronotum dark blue or sometimes green, or concolorous with lateral parts. Laterobasal lobes of pronotum inconspicuous, pronotal sides before them strongly convergent along straight or but inconspicuously sinuate lines. Elytra very slightly widened to midlength, then roundly tapering to apices; lateral margin smooth; costae (without intercostae) slightly elevated. Metacoxae slightly expanded mediad, only *ca.* 1½× longer at proximal end than at metepisternal suture. Apex of anal sternite in male broadly arcuately emarginated with more or less distinct triangular “deepening” at middle; anal plate elongately trapezoidal, apex shallowly emarginated. 2. antennal joint globular, 3. subequal in length to 4.

Geographical distribution (map 48):

Distribution-area of this subgenus includes subhimalayan countries, Indochinese and Malay Peninsulæ, Sumatra and Java.



Map 48. Geographical distribution of the subgenus *Chrysoxantha* **HOL.**

● – *Chrysochroa mirabilis* **THS.**; ■ – *C. r. rugicollis* **SND.**; ▲ – *C. buqueti* (**Gy.**)

Tab. 4



27.



28.



29.



30.



31.



32.



33.



34.

27. *Chrysochroa (Demoxantha) gratiosa indica* (Cs.) – ♀ [RBH: BPibq], INDIA: Darjeeling
 28. *Chrysochroa (Demoxantha) gratiosa* (DEYR.) s.str. – ♀ [RBH: BPihc], MALAYA: PERAK: Kwala Kangsar
 29. *Chrysochroa (Demoxantha) gratiosa curticollis* (THY.) – ♀ [RBH: BPibh], SUMATRA
 30. *Chrysochroa (Pyranthe) vittata* (F.) – ♀ [RBH: BPiig], CHINA: Hankou
 31. *Chrysochroa (Pyranthe) ocellata* (F.) – ♂ [RBH: BPhrm], INDIA
 32. *Chrysochroa (Pyranthe) fulgens ephippigera* WH. – ♂ [UN], SIAM: LAMPHUN
 33. *Chrysochroa (Pyranthe) fulgens toulgoeti* DESC. – ♂ [RBH: BPCig], MALAYA: CAMERON HL
 34. *Chrysochroa (Pyranthe) pseudoludekingi* LD. – ♂ [RBH: BPicp], MALAYA

division of *Chrysochroa* DEJ. s.l. altogether – the predictive power of the resulting classifications would (in both cases) be obviously rather negligible... Similar relations are well known to occur not infrequently already at the species-level, also – if my interpretation of the available data is correct – in *Chrysochroa* DEJ.: *C. semperi* SND. has apparently evolved “from within” *C. fulminans* (F.), *C. eburnea* (Js.) cladistically belongs to *C. opulenta* (Gx), but their inclusion (as subspecies? varieties?) into the respective “mother-species” would be an evidently wrong solution.

Indo-Pacific Region

“As a biogeographic feature Wallace’s Line is only of modest significance to plants and insects. ... In these groups, the really profound separation is of Australian elements from those of New Guinea and Malesia”.

J.A. KEAST

Although the term has been consistently used by me since several years (e.g. HOŁYŃSKI 1994c, 1999, 2000a), its definition and justification has been published only recently (HOŁYŃSKI 2001e). This concept differs principally from that of the traditional Oriental Region in its south-eastern border, running through Torres Strait, Coral Sea and western Pacific rather than along the WALLACE’S, WEBER’S or LYDEKKER’S Line; in other words, New Guinea and Oceania **do** belong to Indo-Pacific but **do not** make a part of Oriental. As can be seen from the maps the distribution of the Chrysochroina CAST. supports the warranty of such distinction, conforming to the pattern predicted for the Indo-Pacific: of its 58 subgenera (with several hundred species) occurring from Africa to Marquesas only *Chalcophorotaenia* OBB. (**map 103**) with some 15 species and monotypic *Leptomroczkowskia* HOL. (**map 90**) and *Platymroczkowskia* HOL. (**map 91**) – none of them extending beyond Torres Strait – inhabit Australia (besides, two or three recent invaders reached northernmost Queensland and Arnhemland), whereas New Guinea is dominated by large, speciose genera like *Paracupta* DEYR. (**map 82**), *Metataenia* THY. (**map 94**), *Cyphogastra* DEYR. (**map 110**), or *Iridotaenia* DEYR. (**map 116**) widely distributed to the Southeast, Northwest or both but – except *Metataenia* (*Chalcophorotaenia* OBB.) – not (or at most marginally) to the South. On the other hand, the northwestern part of the Indo-Pacific Region coincides with the “classic” Orientalis, and the **Chrysochroina** CAST. (**map 1**) might serve as a handbookish illustration of the traditionally accepted borderline separating it from Palaearctis: limits of its distribution almost exactly follow the Desert of Thar, Himalayas and Yang-tse-kiang Valley.

THE METHODS

“A methodology that generally avoids all ad hoc hypotheses may be most parsimonious, but certainly will have to be regarded as senseless”.

G. BECHLY

The most important methodical innovation introduced in my recent papers is certainly the procedure (MICSEQ) of phylogenetic reconstructions, but at least one other particularity of my approach to taxonomic/phylogenetic work seems to deserve mention here as differing from currently most popular practice.