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# A taxonomic monograph of subfamily Scolytinae (Coleoptera: Curculionidae) in the Western Himalaya

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## Table of Contents


Abstract . . . 5
Introduction . . . 5
Materials and methods . . . 5
PCR and Sequencing . . . 7
Data analysis . . . 7
Results and discussion . . . 8
Tribe Corthylini LeConte, 1876 . . . 8
Subtribe Pityophthorina Eichhoff, 1878 . . . 8
Genus ***Pityophthorus*** Eichhoff, 1864 . . . 8
Key to the Western Himalayan species of ***Pityophthorus*** Eichhoff, 1864 . . . 8
1. ***Pityophthorus cedri*** Wood, 1989 . . . 8
2. ***Pityophthorus chilgoza*** Wood, 1989 . . . 9
3. ***Pityophthorus deodara*** (Stebbing, 1903) . . . 10
Tribe Cryphalini Lindemann, 1877 . . . 11
Genus ***Cryphalus*** Erichson, 1836 . . . 11
Key to the Western Himalayan species of ***Cryphalus*** Erichson, 1836 . . . 11
4. ***Cryphalus fulmineus*** Wood, 1989 . . . 11
5. ***Cryphalus himalayensis*** **sp. nov.** . . . 12
6. ***Cryphalus major*** Stebbing, 1903 . . . 13
7. ***Cryphalus mangiferae*** Stebbing, 1914 . . . 14
8. ***Cryphalus strohmeyeri*** Stebbing, 1914 . . . 15
Tribe Crypturgini LeConte, 1876 . . . 16
Genus ***Crypturgus*** Erichson, 1836 . . . 16
Key to the Himalayan species of ***Crypturgus*** Erichson, 1836 . . . 16
9. ***Crypturgus beesoni*** Eggers, 1936 . . . 16
10. ***Crypturgus pusillus*** (Gyllenhal, 1813) . . . 17
Tribe Diamerini Hagedorn, 1909 . . . 18
Genus ***Sphaerotrypes*** Blandford, 1894 . . . 18
Key to the Western Himalayan species of ***Sphaerotrypes*** Blandford, 1894 (reproduced after Buhroo & Knížek, 2020) . . . 18
11. ***Sphaerotrypes montanus*** Buhroo & Knížek, 2020 . . . 18
12. ***Sphaerotrypes querci*** Stebbing, 1908 . . . 19
Tribe Dryocoetini Lindemann, 1877 . . . 20
Genus ***Coccotrypes*** Eichhoff, 1878a . . . 20
Key to the Western Himalayan species of ***Coccotrypes*** Eichhoff, 1878a . . . 21
13. ***Coccotrypes cinnamomi*** (Eggers, 1936) . . . 21
14. ***Coccotrypes papuanus*** (Eggers, 1923) . . . 22
Genus ***Dryocoetes*** Eichhoff, 1864 . . . 23
Key to the Himalayan species of ***Dryocoetes*** Eichhoff, 1864 . . . 23
15. ***Dryocoetes asperatus*** **sp. nov.** . . . 23
16. ***Dryocoetes brownei*** Mandelshtam & Petrov, 2010b . . . 25
17. ***Dryocoetes himalayensis*** Strohmeyer, 1908a . . . 25
18. ***Dryocoetes indicus*** Stebbing, 1914 . . . 26
19. ***Dryocoetes quadrisulcatus*** Strohmeyer, 1908c . . . 27
Genus ***Taphrorychus*** Eichoff, 1878b . . . 28
Key to the Himalayan species of ***Taphrorychus*** Eichoff, 1878b . . . 28
20. ***Taphrorychus betulae*** Schedl, 1974 . . . 29
21. ***Taphrorychus hewetti*** (Stebbing, 1908) . . . 29
Tribe Ernoporini Nüsslin, 1911 . . . 31
Genus ***Eidophelus*** Eichhoff, 1876 . . . 31
22. ***Eidophelus indicus*** (Wood, 1989) . . . 31
Genus ***Ernoporus*** Thomson, 1859 . . . 31
23. ***Ernoporus squamosus*** **sp. nov.** . . . 32
Tribe Hylesinini Erichson, 1836 . . . 33
Genus ***Hylesinus*** Fabricius, 1801 . . . 33
24. ***Hylesinus macmahoni*** (Stebbing, 1909) . . . 33
Tribe Hylurgini Gistel, 1848 . . . 35
Genus ***Hylurgus*** Latreille, 1806 . . . 35
25. ***Hylurgus indicus*** Wood, 1985 . . . 35
Genus ***Xylechinus*** Chapuis, 1869 . . . 36
26. ***Xylechinus padus*** Wood, 1988a . . . 36
Tribe Ipini Bedel, 1888 . . . 37
Genus ***Ips*** DeGeer, 1775 . . . 37

Key to the Western Himalayan species of ***Ips*** DeGeer, 1775 (reproduced after Buhroo & Lakatos, 2011). . . . . 37
27. ***Ips longifolia*** (Stebbing, 1909). . . . . 37
28. ***Ips stebbingi*** Strohmeyer, 1908b . . . . . 38
Genus ***Pityogenes*** Bedel, 1888 . . . . . 39
Key to the Himalayan species of ***Pityogenes*** Bedel, 1888 . . . . . 39
29. ***Pityogenes scitus*** Blandford, 1893a . . . . . 39
30. ***Pityogenes spessivtsevi*** Lebedev, 1926. . . . . 40
Tribe Micracidini LeConte, 1876 . . . . . 41
Genus ***Pseudothysanoes*** Blackman, 1920 . . . . . 41
31. ***Pseudothysanoes kashmirica*** Buhroo and Knížek, 2020. . . . . 42
Tribe Polygraphini Chapuis, 1869 . . . . . 43
Genus ***Carphoborus*** Eichhoff, 1864. . . . . 43
Key to the Himalayan species of ***Carphoborus*** Eichhoff, 1864. . . . . 43
32. ***Carphoborus costatus*** Wichmann, 1915 . . . . . 44
33. ***Carphoborus zhobi*** (Stebbing, 1909). . . . . 44
Genus ***Polygraphus*** Erichson, 1836 . . . . . 45
Key to the species of Himalayan ***Polygraphus*** Erichson, 1836 . . . . . 46
34. ***Polygraphus aterrimus*** Strohmeyer, 1908b. . . . . 46
35. ***Polygraphus difficilis*** Wood, 1988b. . . . . 47
36. ***Polygraphus longifolia*** Stebbing, 1903 . . . . . 48
37. ***Polygraphus major*** Stebbing, 1903 . . . . . 49
38. ***Polygraphus pini*** Stebbing, 1914 . . . . . 49
39. ***Polygraphus setosus*** Schedl, 1979. . . . . 50
40. ***Polygraphus trenchi*** Stebbing, 1905 . . . . . 51
Tribe Scolytini Latreille, 1804 . . . . . 53
Genus ***Scolytus*** Geoffroy, 1762 . . . . . 53
41. ***Scolytus kashmirensis*** Schedl, 1958 . . . . . 53
42. ***Scolytus major*** Stebbing, 1903. . . . . 54
43. ***Scolytus nitidus*** Schedl, 1936a. . . . . 55
44. ***Scolytus stepheni*** Mandelstam and Petrov, 2010a . . . . . 56
Tribe Scolytoplatypodini Blandford, 1893 . . . . . 57
Genus ***Scolytoplatypus*** Schaufuss, 1891 . . . . . 57
45. ***Scolytoplatypus daimio*** Blandford, 1893b . . . . . 58
46. ***Scolytoplatypus darjeelingi*** Stebbing, 1914. . . . . 59
47. ***Scolytoplatypus denticauda*** **sp. nov.** . . . . . 59
48. ***Scolytoplatypus kunala*** Strohmeyer, 1908a. . . . . 61
49. ***Scolytoplatypus minimus*** Hagedorn, 1904. . . . . 62
50. ***Scolytoplatypus raja*** Blandford, 1893b (Figure 63). . . . . 63
Tribe Trypophloeini Nüsslin, 1911 . . . . . 64
Genus ***Hypothenemus*** Westwood, 1834. . . . . 64
Key to the Western Himalayan species of ***Hypothenemus*** Westwood, 1834. . . . . 64
51. ***Hypothenemus birmanus*** (Eichhoff, 1878a) . . . . . 64
52. ***Hypothenemus ficivorus*** **sp. nov.** . . . . . 65
Tribe Xyleborini LeConte, 1876 . . . . . 66
Genus ***Cyclorhipidion*** Hagedorn, 1912 . . . . . 67
53. ***Cyclorhipidion inarmatum*** (Eggers, 1923) . . . . . 67
Genus ***Diuncus*** Hulcr & Cognato, 2009. . . . . 68
54. ***Diuncus corpulentus*** (Eggers, 1930). . . . . 68
Genus ***Xyleborinus*** Reitter, 1913 . . . . . 69
55. ***Xyleborinus saxesenii*** (Ratzeburg, 1837) . . . . . 69
Genus ***Xyleborus*** Eichhoff, 1864 . . . . . 70
56. ***Xyleborus perforans*** (Wollaston, 1857). . . . . 71
Genus ***Xylosandrus*** Reitter, 1913. . . . . 72
57. ***Xylosandrus crassiusculus*** (Motschulsky, 1866). . . . . 72
The endemism and distribution of scolytine fauna in the Western Himalaya. . . . . 75
Acknowledgement . . . . . 76
References. . . . . 76

## Abstract

We investigated the scolytine fauna of the West Himalayan region of India. The present study combines field samples, museum specimens, and published data to catalog the scolytine diversity. We recognize 57 scolytine species from 15 tribes and 25 genera. Five new species *Cryphalus himalayensis* **sp. nov.**, *Dryocoetes asperatus* **sp. nov**., *Ernoporus squamosus* **sp. nov.**, *Scolytoplatypus denticauda* **sp. nov.**, and *Hypothenemus ficivorus* **sp. nov.** are described from the region. Previously reported and inadequately characterized species are imaged and redescribed. Two new Indian records, seven new regional records, and fifteen new host records are reported. Keys to genera and photographs of each species are provided to facilitate identification. Mitochondrial COX-1 sequences were generated from some Himalayan species and sequences from GenBank were utilized for comparison with other related species. The current monographic study includes an overview of each species' taxonomic diagnosis, range, and host plants. Furthermore, an updated list of 165 scolytine species, distributed in the Himalaya but excluding its eastern part of Arunachal Pradesh, is also provided.

**Key words:** Western Himalaya, Scolytinae, taxonomy, new species, cytochrome oxidase 1 gene, phylogeny

## Introduction

Bark and ambrosia beetles (Coleoptera: Curculionidae: Scolytinae) are a diverse weevil subfamily that live most of their lives inside of plants. They occur throughout the forested regions of the world, in almost every part of the host plant. This subfamily has more than 6000 different species that are distributed in 258 genera and 29 tribes globally (Hulcr *et al.* 2015; Smith 2017; Sittichaya & Smith 2020; Johnson *et al.* 2020; Smith *et al.* 2020; Knížek & Tshering 2024). While certain species can kill a significant number of their host species, most are ecologically important decomposers and aid in the breakdown of dead plants. True bark beetles only consume the phloem and cambium of healthy, ailing, or dead trees, and some species have evolved to feed on specific plant parts, from the root to the fruit (Wood 1982). Ambrosia beetles are wood-borers which are more closely associated with symbiotic fungi supplying food for adults and larvae in gallery systems constructed in the xylem (Kirkendall *et al.* 2015). Most ambrosia beetles have special cuticular pockets called mycangia that transport the ambrosia fungi to the next breeding site. Beetle feeding on phloem and xylem accelerates the decomposition of trees and the introduction of other xylophagous organisms (Stokland *et al.* 2012). The act of boring into live trees by some beetle species introduces fungi into tree tissues which often results in the death of the trees. Scolytines display astounding complexity and diversity in their ecology, population dynamics, and behavior. Sometimes just one tree in a stand is impacted, but other times, indications of bark beetle infestation can be seen in a group of nearby trees of the same species, including fine, reddish-brown boring dust in bark cracks and around the bases of the trees. Since scolytines have been studied extensively elsewhere in the world, their taxonomy is fairly-well understood (Wood 1989; Wood & Bright 1992; Alonso-Zarazaga & Lyal 2009; Knížek 2011; Smith *et al.* 2020; Bright 2021). While working at the Forest Research Institute in Dehradun, Stebbing (1914) and Beeson (1915–1941) laid the groundwork for taxonomic and biological studies in India. Schedl (1936a,b, 1974) and later Maiti & Saha (2009), Buhroo & Lakatos (2007, 2011) and Buhroo & Knížek (2020) also made significant contributions. However, scolytines have received far less attention in the Western Himalaya's forested regions. The present study provides an overview of the fauna's taxonomic classification, geographic range, and host plants.

## Materials and methods

A survey was conducted by collecting bark beetles from conifer and broad-leaved trees in the Western Himalaya between 2016 to 2022. The specimens were collected from the bark and wood of the trap logs and infested branches of the standing trees. The smaller infested host plant logs gathered during the survey from various places were stored in the rearing chambers to encourage the appearance of beetle pests. All of the scolytine species kept in the National Forest Insect Collection at the Forest Research Institute in Dehradun were examined, together with specimens gathered from various locations in Jammu & Kashmir, Himachal Pradesh, and Uttarakhand. The information provided for each species was collected from the original hand-written labels (holotype labels/paratype labels), and it was cross-referenced with data from published studies or original descriptions (Stebbing 1914; Wood & Bright 1992; Maiti & Saha 2009 etc.). The specimens that had emerged from infested logs were stored in 95%

ethanol and then card mounted for taxonomic studies. The samples were then examined using a Leica M205A Stereozoom microscope (Leica Microsystems GmbH, Wetzlar, Hesse, Germany). Images of the specimens were captured using a Leica DFC295 camera with LAS Montage Multifocus Software (version 4.10) that was mounted to the microscope. Spatial information about the sample site was recorded as latitude and longitude using GPSmap 76CSx (Garmin). The applications of the program package ArcGIS 10.2 (ESRI©, Redlands, CA, USA) were used to map the distribution of different bark beetle fauna in the North-western Himalaya (Fig. 1).

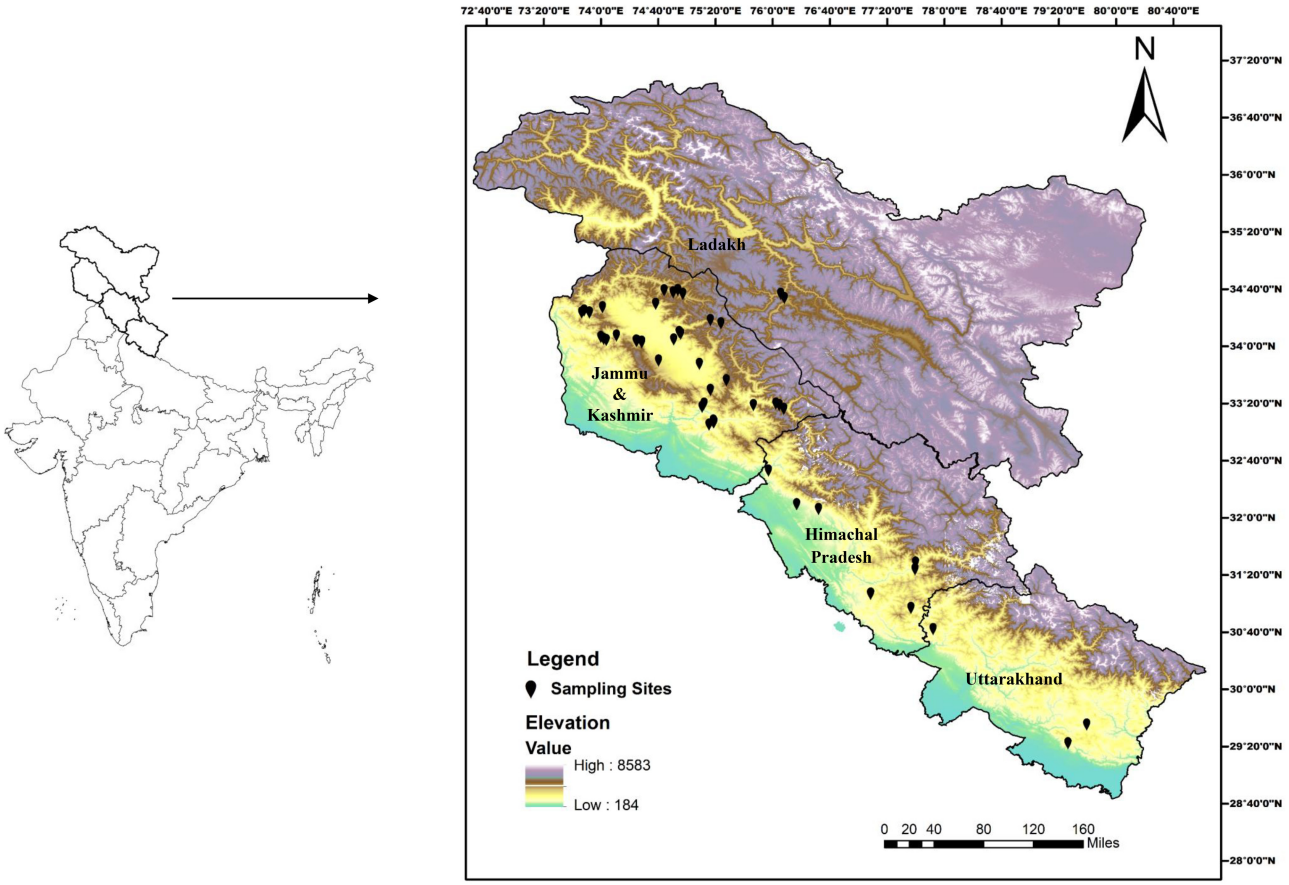


**FIGURE 1.** Map displaying sampling locations (shown in black) in the Western Himalaya. (ArcGIS 10.2; http:// resources. arcgis.com/en/help/ main/10.2/ index.html).

Specimens were identified and assigned to genus and species based on combinations of morphologically diagnostic characteristics, similarity of external morphology to that of identified specimens, by direct comparison to types at FRI Dehradun, available taxonomic literature, various keys, Electronic Image Depositories, and their gallery pattern characteristics. Host plants were identified using local herbarium data (Centre of Biodiversity and Plant Taxonomy, University of Kashmir) as well as information from various national and international identification manuals. The morphological species concept was used to characterize species using a distinct set of morphological characters as the basis for the species identification. Taxa are arranged alphabetically by tribe, genus, and then the species that belong to each genus. The taxonomy of Wood & Bright (1992) was followed, as well as further taxonomic and systematic modifications (Maiti & Saha 2009; Knížek 2011; Mandelshtam & Petrov 2010a, 2010b; Hulcr *et al.* 2015; Smith *et al.* 2020; Johnson *et al.* 2020). The terminology (Fig. 2) used for describing morphological features was adopted from Hulcr *et al.* (2015) and Smith *et al.* (2020). The specimens are deposited in the Kashmir University Insect Collection (KUIC) of the Department of Zoology, FRI Dehradun, some specimens of new species in the Milos Knížek Collection, Prague, Czechia and in the Naturhistorisches Museum Wien, Austria (NHMW).

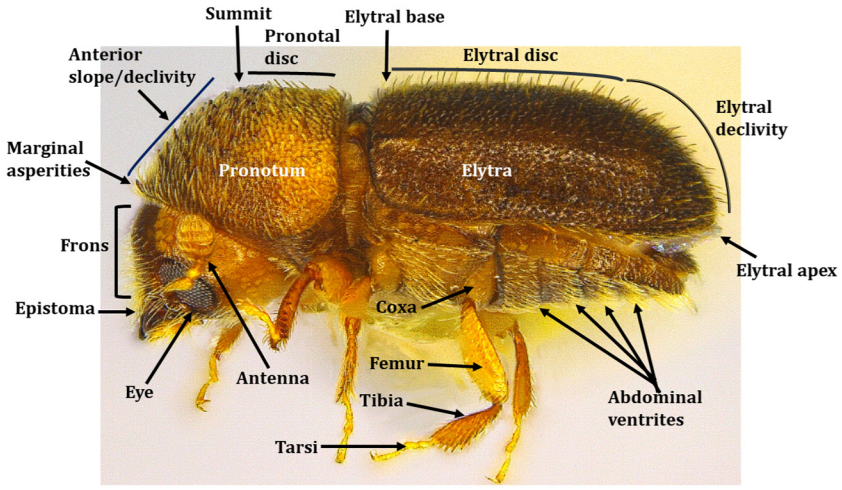


**FIGURE 2.** Morphological terminology illustrated on lateral habitus of *Cryphalus himalayensis* **sp. nov.**

## PCR and Sequencing

Scolytine DNA was extracted using GenEluteTM Mammalian Genomic DNA Miniprep Kit (Sigma-Aldrich, USA) following the manufacturer's protocol. The whole specimen was crushed and sampled during the extraction process. The extracted DNA was stored at 4 °C for up to 3 weeks, but for long term storage DNA was kept at −20 °C. The amplification of the DNA was carried out in 25µl reactions containing 3.75 mM $MgCl_2$ 125 µM dNTPs (Sigma-Aldrich, USA), 0.5 mM of the primers "LCO" and "HCO" (mentioned below) and 1U of Promega Taq. The amplifications were carried out with an initial denaturation step of 3 min at 94 °C, followed by 35 cycles of 94 °C (30 sec), 48 °C (60 sec) and 68 °C (90 sec) and a final extension step at 68 °C (10 min). PCR was performed in an Eppendorf Mastercycler in 200 µl tubes. Amplification of the respective genes was confirmed on a 2% agarose gel. PCR products were purified and the sequence reactions performed in both directions on a sequencer. The sequences derived from this study were deposited in the GenBank.

| Primer name | Primer sequence |
|---|---|
| LCO1490 | 5'-GGTCAACAAATCATAAAGATATTGG-3' |
| HCO2198 | 5'-TAAACTTCAGGGTGACCAAAAAATCA-3' |

## Data analysis

The DNA sequence alignment (for COX-1 genes) was performed by ClustalX (Thompson *et al*. 1997) using default settings. Distance analysis and reconstruction of trees was performed by the Neighbor-Joining (NJ) algorithm (Saitu & Nei 1987) as it is implemented in the MEGA-11 (Tamura *et al.* 2021). The evolutionary distances were computed using the Maximum Composite Likelihood method (Tamura *et al*. 2004), while the robustness of the topology was tested by bootstrapping with 1000 repetitions (Felsenstein 1985). For comparison, the GenBank entries of desired scolytine species, including outgroups, were also added in the analyses.

Abbreviations used in the present study project:

COX-1 Cytochrome Oxidase Subunit 1 gene;
DNA Deoxyribonucleic Acid;
FRI Forest Research Institute, Dehradun, India;
KUIC Kashmir University Insect Collection;
NHMUK Natural History Museum, London, UK;
NHMW Naturhistorisches Museum Wien, Austria;

NJ Neighbor-Joining Tree;
NMNH National Museum of Natural History, Smithsonian Institution, Washington, D.C. USA;
PCR Polymerase Chain Reaction.

## Results and discussion

We recognized 57 scolytine species belonging to 15 tribes and 25 genera of the subfamily in the Western Himalaya as legitimate species. In the subsequent taxonomic account, a comprehensive overview is given for each species which covers identification, occurrence, hosts and geographic distribution of the fauna. Keys are presented for each genus and phylogenetic analyses are presented for some species.

### Tribe Corthylini LeConte, 1876

### Subtribe Pityophthorina Eichhoff, 1878

### Genus *Pityophthorus* Eichhoff, 1864

*Pityophthorus* species are diagnosed by the following morphological characters: body length: 1.0–2.5 mm; body cylindrical; antennal funicle five-segmented, 1st segment alone as long as all the others; club flattened, broadly oval to circular, 1.5× as long as wide, with two to three straight to procurved sutures, suture 1 and 2 septate laterally; eyes anteriorly slightly emarginate; pronotum longer than wide, anteriorly with concentric tubercles, posteriorly punctate, with fine raised line at the base and also on sides of pronotum; declivity steep, convex to strongly bisulcate with interstriae 1 and 3 variously elevated and granulate; metepisternum is nearly completely covered with elytra; host: conifers.

### Key to the Western Himalayan species of *Pityophthorus* Eichhoff, 1864

1 Pronotal asperities arranged in concentric rows on anterior pronotum, anterior margin broadly rounded with six serrations; frons with short sparse setae and median carina in both sexes . . . . . *P. cedri* Wood
- Pronotal asperities rather irregularly arranged; frons in females with long setae . . . . . 2
2 Absence of distinct carina on the female frons but with longer setae rather forming tufts, anterior margin of pronotum armed with four serrations. . . . . *P. chilgoza* Wood
- Presence of distinct carina on the female frons and with uniformly distributed moderate hairs, anterior margin of pronotum scarcely serrate . . . . . *P. deodara* (Stebbing)

### 1. *Pityophthorus cedri* Wood, 1989

(Figure 3)

This species is diagnosed by the following morphological characters: ♀ frons convex, shining, coarsely and closely punctured, subglabrous, with conspicuous, acute median carina; epistomal margin fringed with long, pale erect hairs, short sparse setae on frontal surface; the anterior margin of compound eye emarginate; pronotum as long as wide, widest slightly above base, narrowing anteriorly and sinuate before apex; anterior margin broadly rounded with six serrations; anterior half with a number of asperities arranged in concentric rows; pronotal disc shiny, closely and deeply punctured with a median impunctate area; pronotal surface with short, recumbent, blunt setae prominent laterally; scutellum shiny black, wider and broadly rounded; elytra slightly narrower at base than pronotum, wider apically, 1.51× as long as pronotum; sides straight on basal three-fourth, then constricted towards broadly rounded apex; the basal area with transverse rugosities, rest glabrous, punctate; strial punctures deeply round, 1st striae distinctly impressed than others; punctures somewhat irregular on discal striae; interstriae glabrous, impunctate, nearly twice as wide as striae; elytral declivity distinctly shallowly sulcate from elevated sutural interstriae to interstriae 3; interstriae impunctate, 1–4 armed by small granules with filamentous setae over each granule; strial punctures minute; vestiture of fine, sparse setae, more prominent on sides and declivity, setae on interstriae 3 rather long; body length: 1.61–1.64 mm, 2.51× as long as wide.


**FIGURE 3.** *Pityophthorus cedri*. Female: dorsal view **A**; lateral view **B**; male: dorsolateral view **C**.

Males are similar to females except serrations on anterior margin of pronotum and granules on elytral declivity distinctly larger; body length: 1.70–1.74 mm, 2.58× as long as wide.

Remarks: This species differs from other Indian species of this genus by the moderately impressed elytral declivity, a conspicuous median carina present on frons of both sexes, and the more nearly concentric pronotal asperities (Wood 1989).

**Material examined:** New record: India: 2 ♀′s, 2 ♂′s. Jammu, Kishtwar, Kijaye Padder (33° 16.144′ N, 076° 07.680 E, 6145 ft.), A.A. Buhroo, 09.09.2017 (KUIC).

**Distribution:** India: Jammu (new record), Kashmir, Himachal Pradesh

**Hosts:** *Cedrus deodara*, *Pinus gerardiana* (Pinaceae)

### 2. *Pityophthorus chilgoza* Wood, 1989

(Figure 4)

This species is diagnosed by the following morphological characters: ♀ frons flat from eye to eye, finely, rather closely punctured near margins, ornamented by a marginal fringe of long hairs, setae in central area sparse to obsolete and much shorter; the anterior margin of compound eye emarginate; pronotum almost as long as wide; sides on basal half sub-straight, rather narrowly rounded anteriorly, anterior margin armed by four serrations, median pair much longer; anterior half asperate, asperities smaller and more confused than in other Indian species; posterior areas smooth, shining, rather finely, not closely punctured; glabrous except for sparse setae near margins; scutellum somewhat sub-triangular, elytra 1.8× as long as wide; sides almost straight and parallel on basal two-thirds, rather narrowly rounded posteriorly; striae not impressed, punctures moderately large, deep; interstriae nearly one and a half times as wide as striae, smooth, shining, impunctate; declivity rather steep, weakly bisulcate; strial punctures minute, interstriae 2 widened, smooth, shining, impunctate, 3 unarmed, a few small punctures evident; vestiture of minute strial hair and, on declivity, a few short, erect, interstrial setae; body length: 1.4 mm, 2.70× as long as wide.

Male similar to female except frons somewhat convex, its surface irregularly rugose punctate, shining with a short, acute median carina; body length: 1.45 mm.

Remarks: Although this species resembles *P. deodara* in appearance, they are not closely related. It may be distinguished by the long pubescence on the female frons, the absence of a carina on the female frons, the less strongly (shallowly) impressed declivital sulcus, and the much more confused arrangement of smaller pronotal asperities.

**Material examined:** Holotype ♀ and Allotype in Smithsonian NMNH, USA (images). Type locality: Kilba (7000 ft.), U. Bashahr Div., Punjab, India

**Distribution:** India: Himachal Pradesh

**Hosts:** *Pinus gerardiana* (Pinaceae)

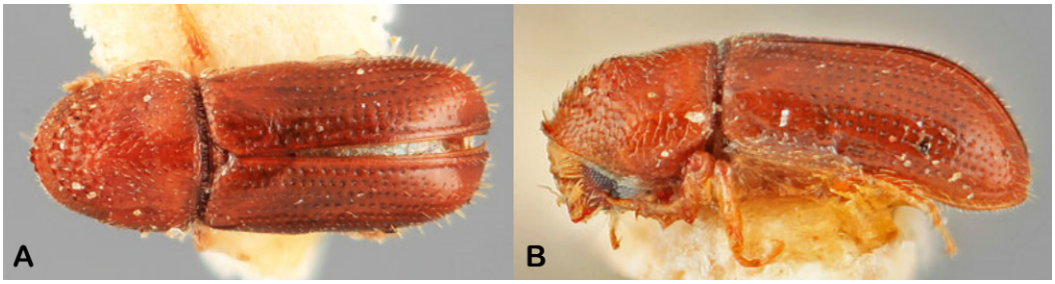


**FIGURE 4.** *Pityophthorus chilgoza.* Holotype female: dorsal view **A**, lateral view **B**. (Courtesy: Dr. Sarah M. Smith).

### 3. *Pityophthorus deodara* (Stebbing, 1903)

(Figure 5)

= *Cryphalus deodara* Stebbing, 1903
= *himalayensis* Stebbing, 1914 (*Cryphalus*)
= *sampsoni* Stebbing, 1914 (*Cryphalus*)

This species is diagnosed by the following morphological characters: frons convex, finely punctate and reticulate, subglabrous, with conspicuous, acute median carina; the anterior margin of compound eye emarginate; pronotum slightly wider than long; basal margin fine, truncate, sides behind very slightly oblique, rounded in front and sinuate before apex; apical margin obtusely rounded and scarcely serrate; anterior half with a number of asperities arranged concentrically, most prominent anteriorly; the posterior half rugose punctate , disc shiny, closely and deeply punctured with a median impunctate area; pronotal surface with short, recumbent, setae prominent laterally; scutellum shiny, wide; elytra 1.60× as long as wide, slightly narrower at base than pronotum, wider apically, twice as long as pronotum; sides almost straight up to apical fourth, then constricted towards broadly rounded apex; the basal area with transverse rugosities in between the strial punctures, rest glabrous; strial punctures moderately large, deep becoming minute on declivity; interstriae glabrous, impunctate twice as wide as striae, sutural interstriae somewhat raised; declivity rather steep, sulci weaker than other two species; declivital surface moderately shining, with a few weak tubercles apically, the outer margin raised; vestiture of minute strial hairs on elytra, and a few short, erect, interstrial setae on declivity; body length: 1.7 mm.

**Material examined:** Lectotype (here designated). Label information: *Pityophthorus deodara*, Konain, Jaunsar, N.W. Himalaya, E.P. Stebbing, 26.05.1902 (FRI)

**Distribution:** India: Himachal Pradesh, Kashmir, Uttarakhand

**Hosts:** *Abies pindrow*, *Cedrus deodara*, *Pinus gerardiana*, *P. roxburghii*, *P. wallichiana* (Pinaceae)

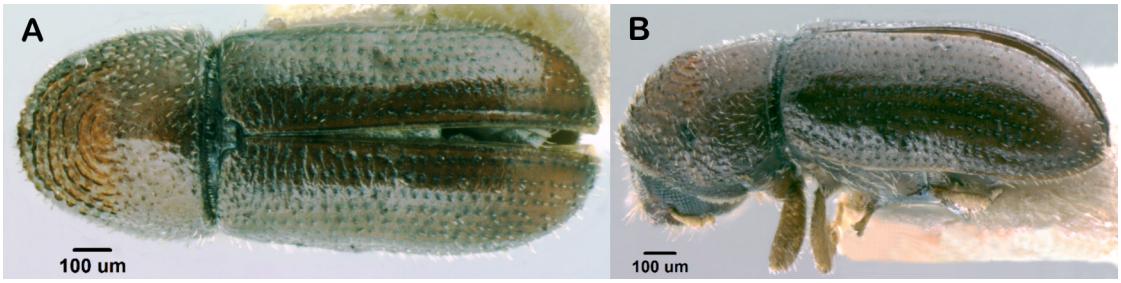


**FIGURE 5.** *Pityophthorus deodara.* Lectotype dorsal view **A**, lateral view **B**.

**Phylogenetic assessment:**

A phylogenetic analysis of Himalayan species *Pityophthorus cedri* along with other closely related species in the genus was carried out using the COX-1 gene (Fig. 6). The NJ tree revealed that *Pityophthorus cedri* formed a distinct clade from the other species, including *Pityophthorus pulchellus* Eichhoff, 1869, *Pityophthorus* sp., and *Pityophthorus carmeli* Swaine, 1918. It varied from *P. pulchellus* of North America by an interspecific nucleotide

difference that ranged from 14.83 to 15.02%. The clades of *Pityophthorus* sp. and *Pityophthorus carmeli* were monophyletic in this analysis.

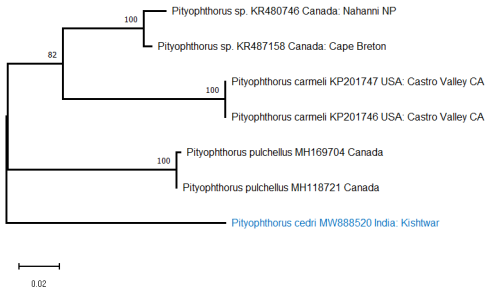


**FIGURE 6.** A phylogenetic tree obtained from the NJ for the COX-1 genes of *P. cedri* (in blue) and related species. Numbers at the branches represent bootstrap values.

## Tribe Cryphalini Lindemann, 1877

## Genus *Cryphalus* Erichson, 1836

*Cryphalus* species are diagnosed by the following combination of morphological characters: body length: 1.1–2 mm; eyes slightly anteriorly emarginate, antennal funicle with three to five segments, club strongly flattened, sutures clearly visible but without a septum; pronotum arched, anterior pronotal margin with serrations; posterior pronotal margin with fine, ridged border; declivity rounded; host: conifers and deciduous trees.

## Key to the Western Himalayan species of *Cryphalus* Erichson, 1836

1 Pronotal summit distinctly raised, placed on basal forth and asperities arranged in distinct concentric rows gradually spreading anteriorly. . . . . 2
- Pronotal summit not so raised, placed below the middle and with rather confused asperities not arranged in well-defined concentric rows. . . . . 3
2 Summit slightly behind the middle; median pair of asperities on anterior margin of pronotum much larger . . . . . *C. fulmineus* Wood
- Summit placed closer to the base; anterior pronotal margin with asperities nearly of same size . . . . . *C. strohmeyeri* Stebbing
3 Female frons with fine, weakly converging aciculations; anterior margin armed with 4–6 serrations . . *C. mangiferae* Stebbing
- Female frons with median transverse carina; anterior pronotal margin with four asperities . . . . . 4
4 Pronotal anterior two-third with more than 50 asperities; asperities distinctly sharp and longer, moderately spaced . . . . . *C. himalayensis* sp. n.
- Pronotal anterior two-third with distinct and longer asperities, but less numerous and less dense (30–35) . . . . . *C. major* Stebbing

### 4. *Cryphalus fulmineus* Wood, 1989

(Figure 7)

This species is diagnosed by the following morphological characters: ♀ frons very broadly convex, a slight, almost flat impression in median area just above epistoma; vertex without a transverse carina; surface rather strongly reticulate; punctures moderately coarse, indistinct; antennal club rather broad, sutures distinctly procurved; pronotum slightly wider than long; sides sub-parallel and feebly arcuate on basal half, gradually narrowing anteriorly; anterior margin armed by six serrations, median pair usually much larger; summit slightly behind middle, asperities on anterior half rather coarse, moderately abundant; posterior areas with fine granules and few obscure punctures in lateral areas; vestiture hair-like, erect, not abundant, longer near anterior and lateral margins; elytra 1.3× as long as wide and 1.7× longer than pronotum; sides almost straight and parallel on more than basal two-thirds, rather broadly rounded towards apex; striae not impressed, with shallow, distinct, punctures not closely placed; interstriae somewhat smooth and more than three times wider than striae, with very fine, numerous punctures; declivity steep,

convex; elytral vestiture consisting of a ground cover of abundant, short scales, each scale slightly longer than wide; rows of erect setae extend almost to base, each moderately slender and placed in rows on interstriae; body length: 2.0 mm, 2.26× as long as wide.

Male similar to female but somewhat smaller in size, with slightly smaller pronotal asperities; body length: 1.8 mm.

**Material examined:** Allotype ♀ in FRI Dehradun. Type localities: Tharali, Garwal, Uttarakhand (U.P.) and Jubal, Simla, Himachal Pradesh, India

**Distribution:** India: Himachal Pradesh, Uttarakhand

**Hosts:** *Alnus nitida* (Betulaceae)

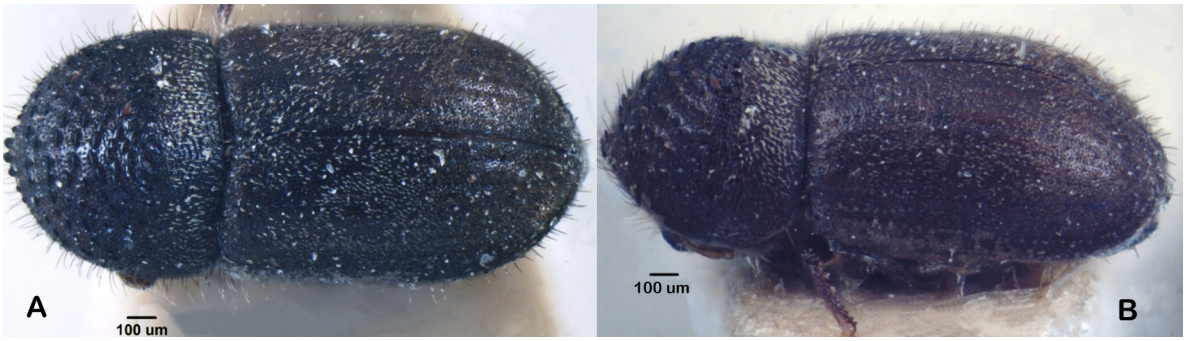


**FIGURE 7.** *Cryphalus fulmineus.* Allotype female: dorsal view **A**, lateral view **B**.

### 5. *Cryphalus himalayensis* sp. nov.

(Figure 8)

**Diagnosis:** This species can be distinguished from other *Cryphalus* species that are similar to it by its size (1.38–1.43 mm), proportions (2.15× as long as wide), the male frons with a transverse carina, the female frons with somewhat triangular elevation medially, many scale-like (feather-like) setae on the pronotal disc extending to the lateral margins, and darker elytra with barely apparent striae.

*C. himalayensis* **sp. nov.** is very similar *to C. morivorus* Johnson, 2020 and can be distinguished by the number of pronotal marginal asperities (four in *C. himalayensis* **sp. nov.** versus six in *C. morivorus*), the sculpture of female frons (rugose and with triangular, broad, medial elevation in *C. himalayensis* **sp. nov.** versus shining, smooth in *C. morivorus*), and the elytral bristles (rounded at apices in *C. himalayensis* **sp. nov.** versus pointed at apices in *C. morivorus*).

**Description:** The species description is based on the following morphological characters: ♀ frons broadly plano-convex; surface somewhat reticulate with minute granules; a black, shining tubercle-like elevation on medial area; vertex somewhat convex, finely reticulate punctate; epistomal margin with a fringe of long, pale hairs; sparse pale, hairs on entire frontal surface; eyes oval, slightly emarginate anteriorly; antennal scape long, funicle four-segmented, club oval with three straight to weakly procurved sutures; pronotum light brown, 1.14× wider than long; sides widest slightly above base, arcuately converging and rounded in front, lateral margins marked by a distinct carina, anterior margin armed by four distinctly spaced serrations, median pair large and longer; pronotum steeply arched, summit slightly behind middle; pronotal anterior two-third with more than fifty asperities, asperities distinctly sharp and longer, moderately spaced, areas between asperities glossy with obscure minute punctures and a mixture of pale, short, fine and moderately longer hair-like setae; posterior one-third with minute, rugose punctures, with dense pale, minute feathery scales (nearly 1.5× as long as wide) and sparse, longer hair-like setae with rounded apices; suture between pronotum and elytra almost straight; scutellum small, broadly triangular; elytra 1.18× as long as wide,1.47× as long as pronotum, usually darker than pronotum; sides parallel on more than basal two-thirds, rounded towards apex with no clear transition to the declivity; elytral texture rugose, striae weakly visible as rows of slightly larger punctures and fine, white, hair-like setae; interstriae irregularly rugose marked by somewhat smaller punctures; interstrial vestiture with rows of moderately longer, sparse whitish erect bristles, widened and rounded at tips, pointing posteriorly and ground cover of two to three rows of minute, tridentate scales, with a weak iridescence; procoxae with sparse, somewhat longer hair-like setae; protibiae and protarsi with short, hair-like setae; mesocoxae

moderately separated, more than distance between metacoxae; abdominal ventrites with pale, dense, moderately long hair-like setae; body length: 1.43 mm, 2.15× as long as wide.

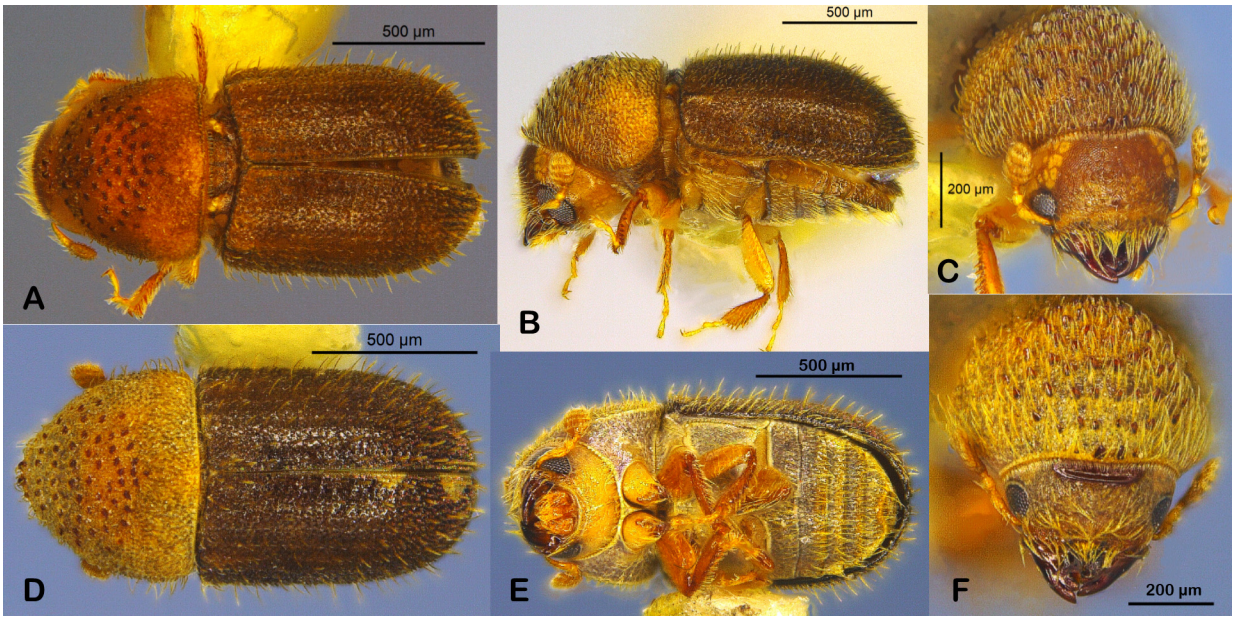


**FIGURE 8.** *Cryphalus himalayensis* **sp. nov.** Holotype female: dorsal view **A**, lateral view **B**, frons **C**; Allotype male: dorsal view **D**, ventral view **E**, frons **F**.

Male similar to female except: body length: 1.38 mm, 2.10× as long as wide; frons with a distinct, shining transverse carina above the level of eyes; pronotal asperities slightly less numerous; elytra slightly less rugose than female; protibiae and protarsi with only hair-like setae, almost same as in female; last abdominal ventrite clearly emarginated; pronotal profile rounded triangular, somewhat more protruding apically than in female.

**Material examined:** India: Holotype: ♀ Kashmir, Srinagar, Hazratbal (University Campus), (34° 07′51.10 ″ N, 074° 50′ 01.09″ E, 5220 ft.), A.A. Buhroo, 10.08.2019 (KUIC). Allotype, ♂: the same site and date as HT; HT and AT deposited at KUIC; 2 PTs NHMW.

**Type locality:** India: Kashmir: Hazratbal Srinagar (University Campus)

**Hosts:** *Ficus palmata* (Moraceae)

**Etymology:** The species epithet is in reference to the Himalayan distribution.

### 6. *Cryphalus major* Stebbing, 1903

(Figure 9)

= *morinda* Stebbing, 1903

This species is diagnosed by the following morphological characters: ♀ frons broadly convex, surface finely punctured, smooth and shining at middle, somewhat reticulate towards eyes; vertex convex, with a weak, shiny, transverse carina on median third, reticulate above carina; epistomal margin with a fringe of erect hairs medially; vestiture of fine, sparse hairs, restricted to area below carina; eyes anteriorly emarginate; antennal funicle with five segments, club flat oblong, with three slightly recurved sutures, marked by setae; pronotum 1.36× wider than long; sides sub-parallel and feebly arcuate on basal half, narrowing anteriorly; anterior margin armed by four serrations, median pair large and longer; pronotum steeply arched, summit slightly behind middle; asperities on anterior two-third distinct and longer, less numerous (30–35), areas between asperities shiny; posterior one-third with small, regular, close punctures, with dense minute feathery scales; sparse somewhat long setae on pronotal surface, more longer anteriorly and laterally; scutellum indistinctly visible; elytra 1.51× as long as wide and twice as long as pronotum; sides almost straight and parallel on more than basal two-thirds, rather broadly rounded towards apex; striae 1 slightly impressed, strial punctures shallow, distinct, close placed in rows becoming obscure towards declivity;

interstriae somewhat smooth and more than three times wider than striae, with very fine, numerous punctures; interstriae clothed with three to four rows of minute, light dense, trifid scales and sparse long, erect hair-like setae; declivity moderately steep, convex; strial punctures irregular on declivity, vestiture same as on disc; procoxae with sparse, longer hair-like setae; protibiae and protarsi with short intermixed with few long, hair-like setae; abdominal ventrites with fine, recumbent hair-like setae; body blackish; body length: 1.65 mm, 2.29× as long as wide.

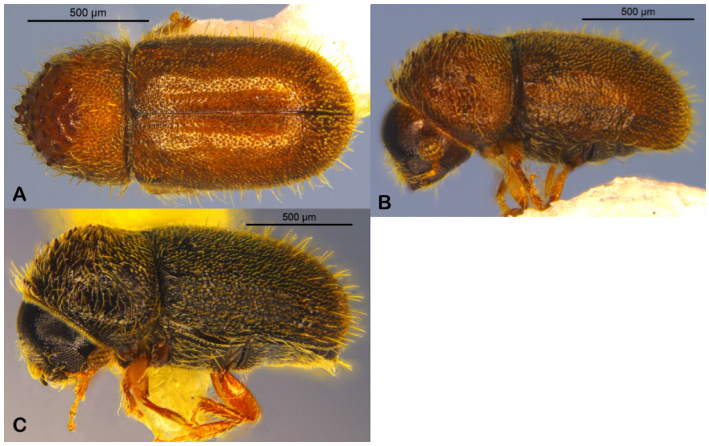


**FIGURE 9.** *Cryphalus major*. Male: dorsal view **A**, lateral view **B**; female: fronto-lateral view **C.**

Male similar to female except being somewhat smaller in size (1.40–1.46 mm long, 2.18× as long as wide) and yellowish brown in color.

**Material examined:** New records: India: 1 ♀, 3 ♂'s. Himachal Pradesh, Kandaghat Solan (30° 58.278 N, 077° 06.726′ E, 5110 ft.), A.A. Buhroo, 10.07.2011 (KUIC). Himachal Pradesh, Dalhousie, Banikhet (32° 32.939 N, 075° 57.027′ E, 5490 ft.), A.A. Buhroo, 27.09.2018 (KUIC).

**Distribution:** India: Himachal Pradesh, Uttarakhand

**Hosts:** *Picea smithiana*, *Pinus roxburghii*, *P. wallichiana* (Pinaceae)

### 7. *Cryphalus mangiferae* Stebbing, 1914

(Figure 10)

= *inops* Eichhoff, 1872 (*Cryphalus*)
= *griseus* Blackburn, 1885 (*Hypothenemus*)
= *mangiferae* Eggers, 1928
= *mimicus* Schedl, 1942 (*Cryphalus*)
= *opacus* Schedl, 1942
= *subcylindricus* Schedl, 1942 (*Cryphalus*)

This species is diagnosed by the following morphological characters: ♀ frons broadly convex with fine, weakly converging aciculations, obscure small punctures at sides and above; vestiture of sparse, fine hair, longer on epistoma; eyes oval, anterior margin moderately emarginate; antennal funicle with five segments, club sub-circular, rather strongly flattened, with three moderately procurved sutures, indicated by grooves and rows of setae; pronotum 1.15× wider than long; widest in line with summit, sides arcuately converging and broadly rounded in front; anterior margin armed by four to six widely spaced serrations, median pair larger; summit well behind middle, anterior slope coarsely asperate; areas between asperities and in lateral and discal areas densely, finely granulate; vestiture of abundant, fine, short, recumbent hairs, some sparse erect bristles also present; suture between pronotum and elytra weakly sinuate; scutellum distinct and somewhat triangular with sparse, pale, hair-like setae; elytra 1.44× as long as wide, 1.66× as long as pronotum; sides parallel up to middle, posteriorly very broadly rounded; striae somewhat obscure with minute, obsolete punctures on disc and somewhat deep on declivity; interstriae nearly three times wider than striae, covered by dense, fine, confused punctures on disc and declivity; declivity occupying more than posterior third of elytral length, moderately steep, convex; declivital interstriae comparatively narrower and somewhat arched; elytral vestiture of abundant small, somewhat triangular, dagger-like scales and interstrial rows

of erect bristles of moderate length; ventrites with mostly hair-like setae, last abdominal ventrite with margin of rounded tubercles; body yellowish-brown; body length: 1.96 mm, 2.25× as long as wide.

Male similar to female, except pronotal profile somewhat triangular and last abdominal ventrite weakly emarginated. 1.94–1.99 mm long, 2.20× as long as wide.

**Material examined:** New records: India: 1 ♀, 3 ♂'s. Himachal Pradesh, Pawarnoo (30° 83.875 N, 076° 99.451′ E, 810 m), A.A. Buhroo, 20.02.2018 (KUIC). Himachal Pradesh, Gaghar (32° 09.463′ N, 076° 16.697′ E, 2584 ft.), A.A. Buhroo, 26.09.2018 (KUIC).

**Distribution:** India: Himachal Pradesh (new record), Uttarakhand. Myanmar, Sri Lanka, Malaysia, Thailand, Indonesia, Hawaii, Micronesia, Africa, Australia, Madagascar, North America & South America

**Hosts:** *Mangifera indica* (Anacardiaceae).

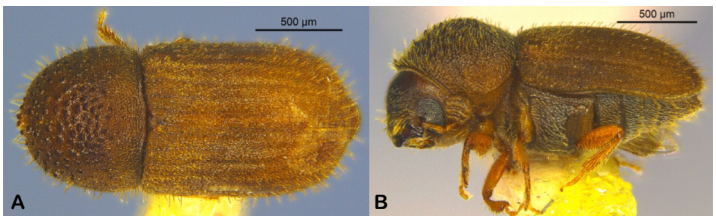


**FIGURE 10.** *Cryphalus mangiferae*. Female: dorsal view **A**, lateral view **B**.

### 8. *Cryphalus strohmeyeri* Stebbing, 1914

(Figure 11)

= *indicus* Stebbing, 1902

This species is diagnosed by the following morphological characters: ♀ frons plano-convex; surface coarsely reticulate with some sparse minute granules, a short median carina just above epistoma, feebly impressed on either sides; vertex finely reticulate; frontal surface with sparse fine hairs, longer and denser towards epistoma, epistomal margin with fringe of pale yellow hairs at middle; eyes oval, emarginated anteriorly on less than one-third of its width; antennal scape long, funicle with four segments; club flat, oval with three straight or slightly procurved sutures marked by pale, short hairs; pronotum 1.18× as wide as long, widest slightly above base; lateral sides rounded gently narrowing anteriorly towards rounded apex; anterior margin set with six to seven distinctly spaced asperities; pronotal summit distinctly humped and placed more towards base, anterior slope steeply declivous with approximately fifty distinct, irregularly placed asperities, denser towards summit; prontal disc less than one-fourth the length of pronotum, surface below summit and postero-laterally somewhat impressed and reticulate with fine granules; entire surface with erect, fine hairs longer anteriorly and laterally; scutellum small, triangular; elytra 1.80× as long as pronotum; elytral base wider than pronotum and the suture between pronotum and elytra sinuate; lateral sides widest at base converging posteriorly with rather broadly rounded apex; elytral disc somewhat convex; striae narrow marked by small, closely placed punctures, distinctly indicated almost up to declivity, each with a microhair; interstriae more than three times wider than striae; interstrial surface with dense coat of minute, feather-like scales and fine punctures; each interstria with a row of erect, hair-like bristles with pointed apices, denser and longer laterally; declivity rounded and sloping with uneven surface, interstriae relatively of variable width with same vestiture as on disc; procoxae with sparse, somewhat longer hair-like setae; protibiae and protarsi with short, hair-like setae; mesocoxae moderately separated, more than distance between metacoxae; abdominal ventrites with fine, short hair-like setae; head and pronotum dark-brown, elytral vestiture translucent yellow-brown with a weak iridescence; body length: 1.91–1.94 mm, 2.10× as long as wide.

Male similar to the female, except pronotal asperities slightly smaller; body length: 1.87–1.90 mm, 1.96× as long as wide.

**Material examined:** New records: India: 3 ♀'s, 4 ♂'s. Kashmir, Baramulla, Monkey Hill Gulmarg (34° 02′50.97″ N, 074° 22′53.63″ E, 8900 ft.), A.A. Buhroo, 13.08.2015 (KUIC). Kashmir, Baramulla, Check post Gulmarg (34° 03.797′ N, 074° 24.948′ E, 7552 ft.), A.A. Buhroo, 25.05.2017 (KUIC).

**Distribution:** India: Kashmir, Uttarakhund, West Bengal. China: Sichuan, Yunnan, Xizang

**Hosts:** *Abies densa*, *A. pindrow*, *Pinus wallichiana* (Pinaceae).

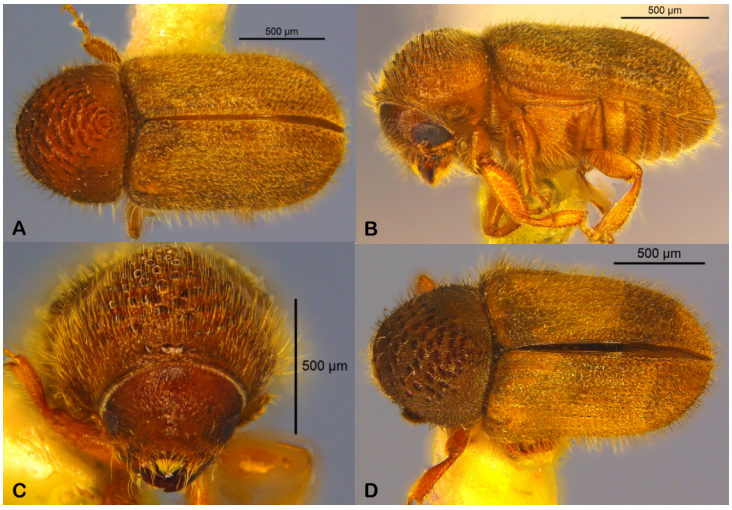


**FIGURE 11.** *Cryphalus strohmeyeri*. Female: dorsal view **A**, lateral view **B**, frons **C**; male: dorsal view **D**.

### Tribe Crypturgini LeConte, 1876

### Genus *Crypturgus* Erichson, 1836

*Crypturgus* species are diagnosed by the following morphological characters: body length 1.0–1.5 mm; scutellum small; unarmed simply punctate pronotum longer than wide, eyes emarginate anteriorly; scape longer than two-segmented funicle; club broad, irregularly oval with indistinct procurved suture at its apex; elytral declivity round with vestiture of recumbent long bristles, also in rest of the body; the procoxae contiguous; sexual dimorphism based on length and form of pronotum; host: conifers.

### Key to the Himalayan species of *Crypturgus* Erichson, 1836

1 Pronotal sides almost parallel, anterior margin broadly rounded, elytral disc somewhat convex with slightly impressed striae; strial punctures small, round, dense and shallow . . . . . *C. beesoni* Eggers

\- Pronotal sides moderately arcuate, converging equally anteriorly and posteriorly; strial punctures small, deep; striae 1 and 2 impressed on disc, others not impressed . . . . . *C. pusillus* (Gyllenhal)

### 9. *Crypturgus beesoni* Eggers, 1936

(Figure 12)

This species is diagnosed by the following morphological characters: ♂ frons slightly convex with fine, dense punctures; vestiture of short, fine hairs; pronotum 1.44× as long as wide, sides almost parallel, anterior margin broadly rounded, postero-lateral corners somewhat rounded; surface slightly convex, shiny, without a clear median line; punctures dense, clear, but not coarse; elytra 1.90× as long as pronotum and 1.66× as long as wide; basal margin clearly wider than pronotum, lateral sides parallel, narrowly rounded towards apex; disc somewhat convex with slightly impressed striae; strial punctures small, round , dense and shallow; interstriae slightly wider than striae, smooth, shiny with extremely fine, dense punctures; declivity convex, moderately steep; body vestiture consists of fine and short hairs, longer throughout the body margins; body dark brown; body length: 1.0 mm.

Female similar to male, except sides of pronotum somewhat bulging laterally, elytral apex almost rounded in a semicircle.

**Material examined:** Lectotype ♂ in NMNH (image), Smithsonian Institution, Washington, D.C. USA. Type locality: Kashmir

**Distribution:** India: Kashmir, Uttarakhand.

**Hosts:** *Cedrus deodara*, *Pinus roxburghii* (Pinaceae).

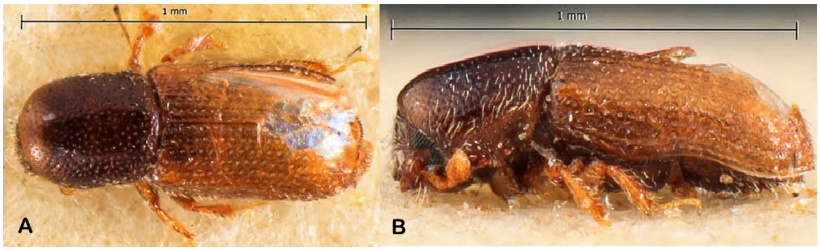


**FIGURE 12.** *Crypturgus beesoni*. Lectotype male: dorsal view **A**, lateral view **B**. (Courtesy: Dr. T. H. Atkinson, Smithsonian NMNH).

### 10. *Crypturgus pusillus* (Gyllenhal, 1813)

(Figure 13)

= *Bostrichus pusillus* Gyllenhal, 1813
= *aphodioides* Villa, 1833 (*Bostrichus*)
= *atomus* LeConte, 1868
= *minimus* Stebbing, 1903 (*Polygraphus*)
= *danicus* Eggers, 1932

This species is diagnosed by the following morphological characters: ♂ frons convex with reticulate surface and fine, obscure punctures; vestiture of short, fine hairs; pronotum 1.15× as long as wide, sides moderately arcuate, converging equally anteriorly and posteriorly; surface reticulate at margins, sub-reticulate and shining towards disc; punctures small and coarse; hair-like vestiture except on disc; elytra 1.33× as long as pronotum and 1.42× as long as wide; strial punctures small, deep; striae 1 and 2 impressed on disc, others not impressed; interstriae slightly wider than striae, smooth, shining with minute to obsolete punctures; declivity convex, moderately steep; strial punctures smaller than on elytra; vestiture inconspicuous on disc and consists of minute strial and slightly longer interstrial hairs, longer setae throughout the body margins; body black to dark-brown; body length: 1.09–1.12 mm, 2.61× as long as wide.

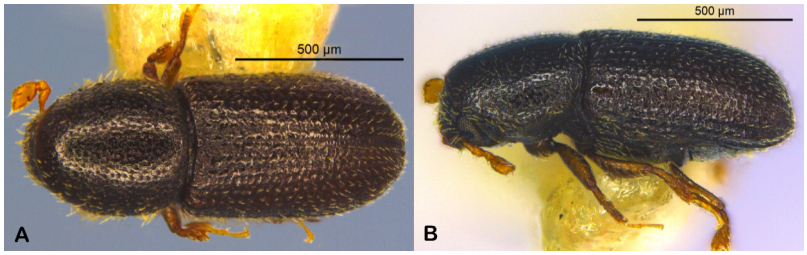


**FIGURE 13.** *Crypturgus pusillus*. Male: dorsal view **A**, lateral view **B**.

Sexes indistinct in the material studied.

**Material examined:** New records: India: 10 specimens. Kashmir, Anantnag, Achabal (33° 40′58.74″ N, 075° 13′22.89″ E, 5505 ft.), A.A. Buhroo, 09.08.2011 (KUIC). Jammu, Ramban, Batricheshma (33° 17.545′ N, 075° 10.597′ E, 3640 ft.), A.A. Buhroo, 20.05.2017 (KUIC). Jammu, Ramban, Dugalaid Batote (33° 07.053′ N, 075° 18.967′ E, 5420 ft.), A.A. Buhroo, 21.05.2017 (KUIC). Kashmir, Kupwara, Tangdhar (34° 23.527′ N, 073° 51.894′ E, 6525 ft.), A.A. Buhroo, 10.07.2017 (KUIC). Kashmir, Baramulla, Boniyar (34° 07.405′ N, 074° 10.717′ E, 5715 ft.), A.A. Buhroo, 30.09.2017 (KUIC). Himachal Pradesh, Sanwara Solan (30° 88.677′ N, 076° 99.854′ E, 4065 ft.), A.A. Buhroo, 20.02.2018 (KUIC).

**Distribution:** India: Himachal Pradesh, Jammu and Kashmir, Punjab, Uttarakhand. North America, North Africa, Europe, Northern Asia

**Hosts:** *Abies pindrow*, *Cedrus deodara*, *C. libani*, *Picea smithiana*, *Pinus roxburghii* (Pinaceae).

**Phylogenetic assessment:**
A phylogenetic analysis of the Himalayan *Crypturgus pusillus* and other similar species of the genus was carried out using the COX-1 genes to determine the evolutionary relationship between them and other related species. Himalayan *Crypturgus pusillus* formed a monophyletic cluster with *C. pusillus* distributed in Germany and Sweden (Fig. 14). It was observed that *Crypturgus pusillus* species were distantly separated from other species of *Crypturgus* examined in the present analysis. The Himalayan *C. pusillus*, however, differs from European *C. pusillus* species by a nucleotide difference of 14.57%.

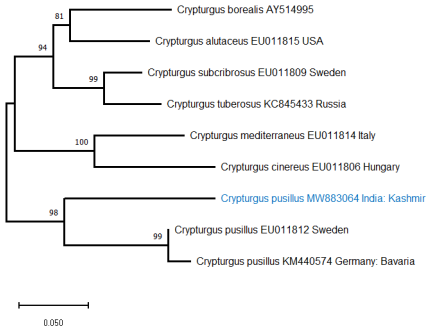


**FIGURE 14.** A phylogenetic tree obtained from the NJ for the COX-1 genes of the Himalayan *C. pusillus* (in blue) and related species. Numbers at the branches represent bootstrap values.

## Tribe Diamerini Hagedorn, 1909

## Genus *Sphaerotrypes* Blandford, 1894

*Sphaerotrypes* species are diagnosed by the following morphological characters: body length: 1.5–5 mm; body very stout, sub globular; eyes completely divided into two parts; antennal scape usually elongate, club flat, sutures variable, apparently five or more in number marked by constrictions and or rows of setae; pronotum without asperities, lateral margins costate; scutellum visible, longer than wide; elytral base procurved and armed by crenulations; host: deciduous trees.

## Key to the Western Himalayan species of *Sphaerotrypes* Blandford, 1894 (reproduced after Buhroo & Knížek, 2020)

1 Posterior margin of the elytra with somewhat distinct tubercles near apex; minute granules on anterior margin of pronotum; six or seven scattered transversely set erect setae on either side of median line close to base of pronotum. . . . . *S. querci* Stebbing
- Posterior margin of the elytra without distinct tubercles; no granules on anterior margin of pronotum; only three longer transversely set setae on either side nearer to median line close to base of pronotum. . . . . *S. montanus* Buhroo & Knížek

### 11. *Sphaerotrypes montanus* Buhroo & Knížek, 2020
(Figure 15)

This species is diagnosed by the following morphological characters: ♂ frons somewhat flat and impressed similarly as in other species of the genus, covered with dense greyish pubescence and sparse long setae pointing upwards to middle of vertex, roughened with longitudinal shining granules and a median shining longitudinal carina on the lower part of frons; epistomal margin substraight with a fringe of sparse, long golden setae; vertex distinctly convex with fine pubescence and minute punctures; eyes bipartite, the two parts separated by 1.2× the width of an upper part of the eye, united by a fine keel, each part plano-convex, sub-triangular; antennal funicle with seven segments; club oval, rounded, slightly flattened, with six distinct pseudo-sutures marked by micro setae; pronotum 1.72× as wide as long; widest at base, lateral margins and base bordered by a distinct ridge, anterior margin somewhat straight, median dorsal line distinct; base of pronotum produced backwards to form an obtuse angle, and slightly concave

on either side, sides rounded and strongly narrowed from base to apex; dorsum convex, impressed behind anterior margin, surface rugosely punctate with some granules, somewhat shining with a scanty covering of short pale scale-like setae and fine pubescence, mainly at apex, base and on sides, its anterior border fringed with longer erect setae; scutellum oblong with minute punctures; elytra somewhat globose, wider than pronotum, 1.1× as long as wide, 1.86× as long as pronotum; basal margin of each elytron procurved and ornamented with 14 crenulations, lateral margins gradually tapering posteriorly; declivity sloping gently from near the base of elytra; striae rather deep, shining, with obsolete punctures and reaching almost the elytral apex except striae 5 and 6 joining before reaching elytral apex; interstriae much wider than striae, flat except basal one-fifth slightly convex with distinct asperities, on apical four-fifth with irregular rows of rounded blunt granules; all interstriae gradually narrowing towards declivity, covered with very tiny scale-like setae and sparse longer obliquely erected scale-like setae, few whitish scales at the base of elytra; body length: 2.75–2.96 mm, 1.54× as long as wide.

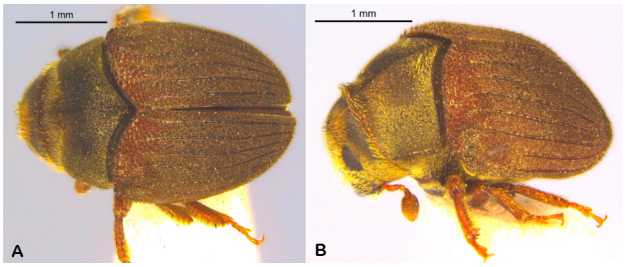


**FIGURE 15.** *Sphaerotrypes montanus*. Holotype male: dorsal view **A**, lateral view **B**.

Female similar to male except elytra longer, the frons is slightly more convex and the apex of the pronotum is less constricted; body length: 2.85 mm, 1.53× as long as wide.

Remarks: *Sphaerotrypes montanus* is related to *S. querci* (Stebbing, 1908) but can be distinguished by the strongly constricted anterior part of the pronotum, much more impressed behind the anterior margin compared to *S. querci*. The sculpture and vestiture on the frons and pronotum is much coarser and dense in *S. querci*. There are three longer hair-like and transversely set setae on either side of median line at base of pronotum in *S. montanus* as opposed to more numerous (6 or 7) on entire base of pronotum in *S. querci*, and missing in *S. pila* Blandford, 1894.

**Material examined:** Holotype ♂, Allotype ♀ in KUIC. Type locality: Jammu, Ramban, Batote, India

New record: India: 2 ♂'s. Jammu, Kishtwar (33° 18.787′ N, 075° 46.451′ E, 5610 ft.), A.A. Buhroo, 10.09.2017 (KUIC).

**Distribution:** India: Jammu and Kashmir (Batote, Kishtwar).

**Hosts:** *Prunus persica* (Rosaceae).

### 12. *Sphaerotrypes querci* Stebbing, 1908

(Figure 16)

= *tectus* Beeson, 1921

This species is diagnosed by the following morphological characters: ♂ frons somewhat flat and impressed, fringed with dense white pubescence, roughened with longitudinal granules and small median tubercules above the epistomal margin; epistomal margin substraight with a fringe of long pale setae; vertex distinctly convex with minute granules; antennal scape curved, funicle with seven segments and club with 8 or 9 distinct pseudo-sutures marked by rows of setae; pronotum wider, one and a half times as wide as long, widest at the base, converging anteriorly with weak convex lateral margins; anterior margin somewhat straight with some minute granules, median line distinct but not forming any ridge; dorsal surface minutely granulate punctuate, covered with dense scale-like setae, some scattered erect hairs on entire base of pronotum; posterior margin with distinct ridge forming somewhat V-shaped divergence, laterally; elytra somewhat globose slightly longer than broad and almost double the pronotum; basal margin of each elytron outcurved with 13 or 14 crenulations; lateral margins strongly outcurved, gradually narrowing posteriorly

and terminating into a angularly rounded apex; striae distinctly depressed marked with shallow punctures and reaching almost up to the elytral apex except striae 5 and 6; interstriae much wider, flat except basal one-fifth becoming somewhat convex with distinct regular asperities; discal interstriae with three to four rows of granules and covered with scale like minute setae throughout; declivity commencing on the posterior third, gradually slopping posteriorly with convex face; declivital interstriae with somewhat distinct minute tubercules becoming somewhat prominent towards apex; body length: 3.46 mm, 1.58× as long as wide.

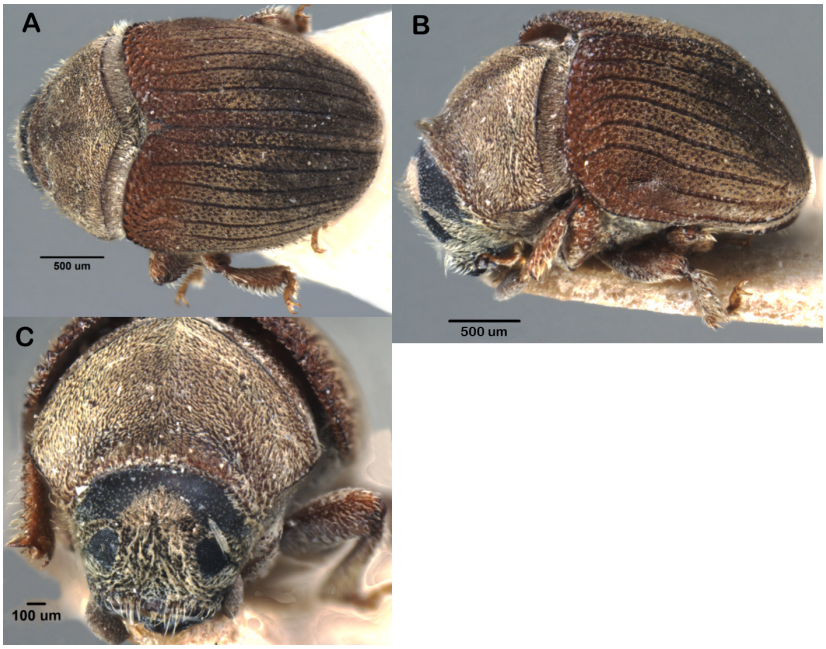


**FIGURE 16.** *Sphaerotrypes querci*. Lectotype: dorsal view **A**, lateral view **B**, frons **C**.

Females are similar to males, except the frons is plano-convex.

**Material examined:** Lectotype (here designated). Label information: *Sphaerotrypes querci*, Kumaon, N.W. Himalaya, E.P. Stebbing (FRI)

**Distribution:** India: Maharashtra, Punjab, Uttarakhand. China: Anhui, Haibei, Shanxi, Sichuan, Yunnan

**Hosts:** *Quercus floribunda*, *Q. leucotrichophora*, *Q. semecarpifolia* **(**Fagaceae)

**Phylogenetic assessment:**

The Himalayan *Sphaerotrypes montanus*, along with other closely related species of the genus (*S. hagedorni* Eggers, 1920) and other genera (*Hylesinus*, and *Dryocoetes*), were subjected to a phylogenetic study utilizing the COX-1 gene. Due to a lack of COX-1 sequences of *Sphaerotrypes* (except *S. hagedorni*) in GenBank, it was compared with species from other closely related genera. The phylogenetic tree, however, (Fig. 17), revealed that *Sphaerotrypes montanus* constituted a distinct group/clade from the others and had a nucleotide divergence of 19.43% from *S. hagedorni.* The populations of the other genera were monophyletic individually in the current study.

## Tribe Dryocoetini Lindemann, 1877

### Genus *Coccotrypes* Eichhoff, 1878a

*Coccotrypes* species are diagnosed by the following morphological characters: body length: 1.2–2.5 mm; frons convergently aciculate with sparse hair-like vestiture; eyes anteriorly emarginate; funicle five-segmented; club obliquely truncate with none to two recurved sutures on its posterior face; pronotum usually longer than wide with or without asperities; scutellum small; declivity convex and unarmed; vestiture consists of abundant and erect hair-like setae; procoxae contiguous; protibiae armed by four-socketed teeth; sexes hardly distinguishable; host: deciduous trees.

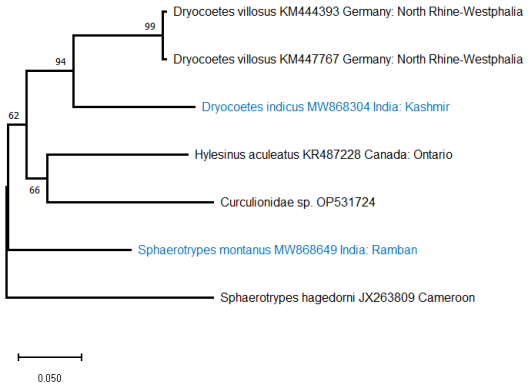


**FIGURE 17.** A phylogenetic tree obtained from the NJ for the COX-1 genes of *S. montanus* and related species (Himalayan in blue). Numbers at the branches represent bootstrap values.

## Key to the Western Himalayan species of *Coccotrypes* Eichhoff, 1878a

1 Striae with small, shallow punctures, separated within the row by about half of the diameter of a puncture from each another; interstriae 2.5× wider than striae, marked by much smaller punctures, each with an erect bristle with knobbed apex. . . . . *C. cinnamomi* (Eggers)

- Strial punctures large, shallow, separated within the row by about the diameter of a puncture from each other; interstriae about 1.5× as wide as striae, marked by shallow, small punctures replaced by minute granules towards apices . . . . . *C. papuanus* (Eggers)

### 13. *Coccotrypes cinnamomi* (Eggers, 1936)

(Figure 18)

= *Thamnurgides cinnamomi* Eggers, 1936

This species is diagnosed by the following morphological characters: frons somewhat convex, sub-shining, surface with longitudinal aciculations denser towards eyes and a fine median longitudinal raised line extending from epistoma upto the upper level of eyes; surface with sparse, yellowish long setae and fringe of dense setae on epistomal margin; antennal funicle with five segments; club obliquely truncate with two recurved sutures marked by short, golden setae on posterior face; eyes shallowly anteriorly emarginate; pronotum as long as wide, sides weakly outcurved almost upto middle and then narrowing anteriorly towards broadly rounded apex, surface sub-convex with fine granulate asperities and small punctures on posterior third; vestiture of rather long erect hair-like setae, longer and semi-recumbent anterolaterally; scutellum shining, tongue shaped, longer than wide; elytra 1.52× longer than pronotum, basal margin sub-striaght, lateral sides sub-parallel upto basal two-thirds, converging posteriorly with rather narrowly rounded apex; surface shining, smooth, striate punctate, striae not impressed with small, shallow punctures separated by about half of their diameter from one another; interstriae 2.5× wider than striae, flat with much smaller punctures, each with an erect bristle with knobbed apex; declivity commencing on posterior third, somewhat convex rather steep, punctures and vestiture as on disc; procoxae narrowly separated; pro, meso and meta-tibiae broader towards apex; pro with four, meso and meta with five-socketed teeth; body pitchy brown; body length: 1.78–1.81 mm, 2.42× as long as wide.

Sexes indistinct in the material studied.

**Material examined:** New records: India: 2 specimens. Himachal Pradesh, Tanda Palampur (32° 06.141 N, 076° 32.036′ E, 4008 ft.), A.A. Buhroo, 25.09.2018 (KUIC)

**Distribution:** India: Himachal Pradesh (first country record). Sri Lanka, Indonesia, Malaysia, Seychelles, American Samoa

**Hosts:** Collected from an unknown host in the current study. Boring seeds of various hosts: *Carapa procera* (Meliaceae), *Cinnamomum verum* (Lauraceae), *Cola nitida* (Malvaceae), *Pentadesma butyracea* (Clusiaceae), *Planchonella garberi* (Sapotaceae).

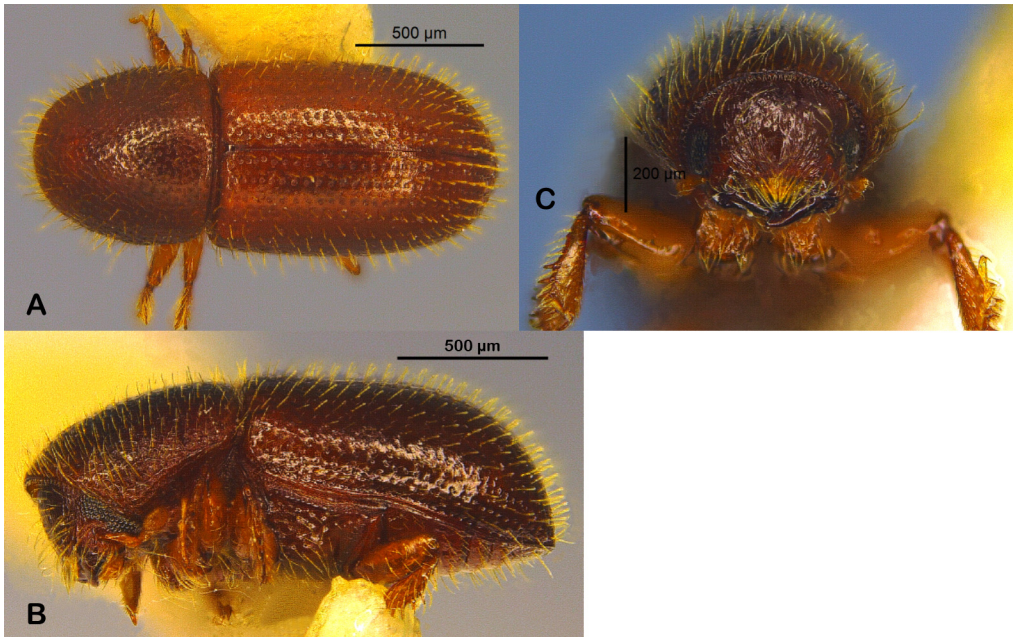


**FIGURE 18**. *Coccotrypes cinnamomi*. Dorsal view **A**, lateral view **B**, frons **C**.

### 14. *Coccotrypes papuanus* (Eggers, 1923)

(Figure 19)

= *Dendrurgus papuanus* Eggers, 1923
= *decipiens* Browne, 1972 (*Poecilips*)
= *glandis* Beeson, 1939 (*Thamnurgides*)
= *rubidus* Beeson, 1939 (*Thamnurgides*)

This species is diagnosed by the following morphological characters: ♀ frons plano-convex, weakly convergently acciculate on lower half with sparse, fine granulate punctures above, shining, subreticulate towards vertex; median line broadly, indistintctly elevated; vestiture of sparse, fine, long hairs; eyes anteriorly feebly emarginated; antennal club obliquely truncate, with two recurved sutures on its posterior face marked by short, pale hairs; pronotum slightly wider than long (1.04×),widest just behind the middle, lateral sides slightly out curved, strongly converging anteriorly towards rounded apex; surface plano-convex, shining and subreticulate with fine, moderately dense punctures each with granulate margin; vestiture of moderately dense, long erect and short recumbent hairs; scutellum somewhat raised, subtriangular; elytra 1.52× as long as pronotum; basal margin substraight; lateral sides subparallel, converging on posterior third into ovately rounded apex; strial punctures large, shallow without any microhair, separated within the row by distances nearly equal to diameter of a puncture; interstriae about 1.5× as wide as striae, marked by shallow, small punctures replaced by minute granules towards apices; vestiture of long and erect interstrial bristles with slightly flattened apices on apical third, each bristle slightly longer than distance between rows or between bristles within a row; declivity commencing slightly below the middle, face plano-convex, rather flattened in the area up to striae 3, striae 1 impressed, strial punctures as on disc; body color dark brown to pitchy black; body length: 2.26 mm, 2.30× as long as wide.

Male: Not seen in the material examined.

**Material examined:** New record: India: 1 ♀. Himachal Pradesh, Gaghar (32° 09.463′ N, 076° 16.697′ E, 2584 ft.), A.A. Buhroo, 26.09.2018 (KUIC).

**Distribution**: India: Himachal Pradesh (new record), Assam, Punjab, Uttarakhand, West Bengal. Malaysia, Vietnam, Indonesia, New Guinea, Philippines

**Hosts:** *Mangifera indica* (new host record). *Dipterocarpus gracilis* (Dipterocarpaceae), *Lithocarpus elegans* (Fagaceae), *Mesua ferrea* (Calophyllaceae), *Syzygium formosum* (Myrtaceae), *Terminalia myriocarpa* (Combretaceae).

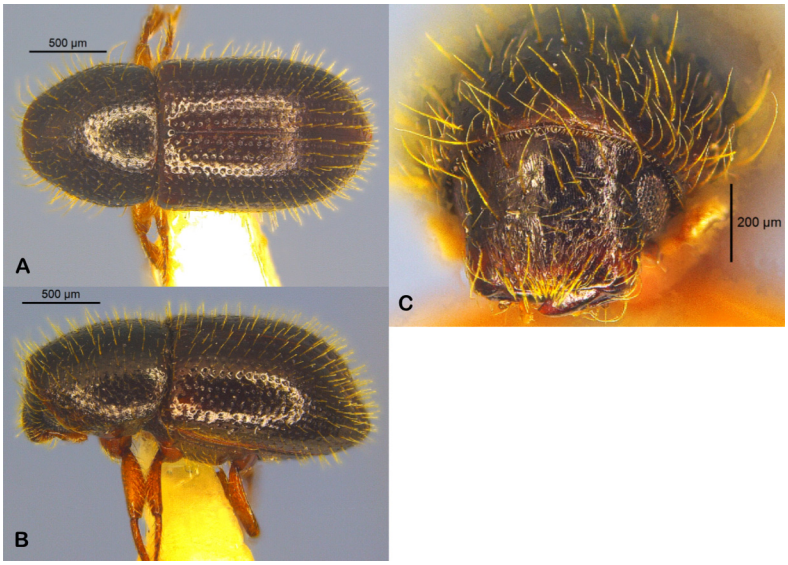


**FIGURE 19**. *Coccotrypes papuanus*. Dorsal view **A**, lateral view **B**, frons **C**.

## Genus *Dryocoetes* Eichhoff, 1864

*Dryocoetes* species are diagnosed by the following morphological characters: body length: 2–5.1 mm; eyes anteriorly emarginate; funicle five-segmented; club obliquely truncate with one to two recurved sutures on the posterior face; pronotum not arched (evenly convex), anterior half roughly sculptured with indistinct asperities, posterior half finely punctured; scutellum longer than wide; elytra with prominent striae; declivity rounded, unarmed, granulate; procoxae contiguous; protibia with five-socketed teeth on outer surface; host: both conifers and deciduous trees.

## Key to the Himalayan species of *Dryocoetes* Eichhoff, 1864

1 Body length equal to or more than 5mm . . . . . *D. brownei* Mandelshtam & Petrov
\- Body length less than 5mm . . . . . 2
2 Anterior pronotal margin asperate . . . . . *D. asperatus* sp. n.
\- Pronotum without marginal asperities . . . . . 3
3 Elytral strial punctures small; interstriae much wider than straie; striae 1 and 2 not so impressed on disc and declivity. . . . . *D. indicus* Stebbing
\- Elytral strial punctures large; interstriae narrower than or as wide as striae; striae 1 and 2 strongly impressed on disc and declivity . . . . . 4
4 Declivital striae 1 and 2 deeply sulcate/ grooved and both dilated away from sutural line towards apex; sutural interstriae slightly elevated; pronotal surface mostly granulate, coarser antero-laterally with rather irregular punctures around impunctate median line towards base . . . . . *D. quadrisulcatus* Strohmeyer
\- Declivital striae 1 and 2 not prominently sulcate, interstriae 4 and 5 terminated at the commencement of declivity; pronotum finely and closely asperate antero-laterally, basal half densely and coarsely punctured without impunctate area . . . . . *D. himalayensis* Strohmeyer

### 15. *Dryocoetes asperatus* sp. nov.

(Figure 20)

**Diagnosis:** This new species is exceptionally distinct and differs from other Indian species of the genus by its smaller size; covex, rugosely reticulate frons; serrate anterior pronotal margin; shining elytra with weakly impressed striae on disc; declivital interstriae with sparse, minute granules, more prominent apically; vestiture of sparse and short hairs on pronotum and elytra. The species also differs from *D. alni* (Georg, 1856) by having a wider declivital interstraie 2 and outwardly curved striae 2 on the middle of its declivity; and short vestitutre with a brown body color versus long, dense vestiture and black color in *D. alni*.

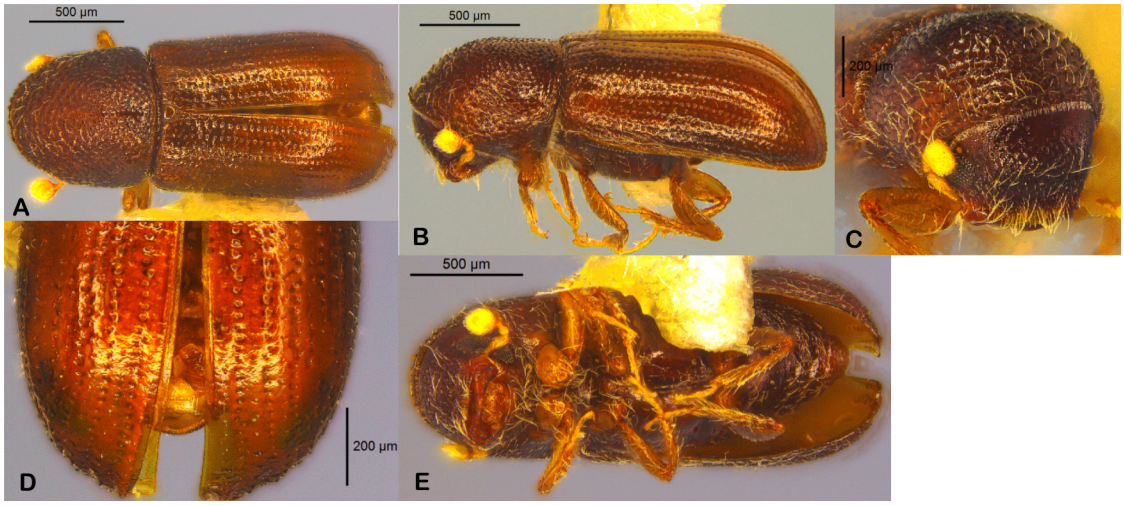


**FIGURE 20.** *Dryocoetes asperatus* **sp. nov.** Holotype: dorsal view **A**, lateral view **B**, frons **C**, elytral declivity **D**, ventral view **E**.

**Description:** The species is new in this genus by the following morphological characters: frons convex, sub-shining, impressed just above epistoma, surface rugose reticulate, longitudinal rugosities stronger towards eyes; surface sparsely finely punctured with sparse, moderately long setae and fringe of dense setae on epistomal margin; vertex shining, finely reticulate; antennal funicle with five segments; club obliquely truncate with recurved sutures on anterior face and one suture on posterior face; eyes of normal size, with upper part above emargination smaller than lower part, and not extending onto frons, finely faceted; pronotum slightly longer than wide (1.03×), widest close to base, posterior angles broadly rounded, sides sub-parallel in basal half, rather narrowly rounded anteriorly; anterior pronotal margin with serrations, summit at middle, anterior slope with numerous, densely placed asperities of variable size, arranged more or less concentrically, asperities somewhat triangular, larger and more elevated anteriorly; disc with a distinct, smooth median impunctate area, rest irregularly punctate upto base, becoming rugulose postero-laterally; vestiture of sparse, moderately long, setae on anterior slope and margin, shorter at sides; scutellum shining, broad, tongue shaped; elytra 1.51× as long as wide, 1.56× as long as pronotum, slightly wider than pronotum at base; sides parallel up to basal three-fourths, thence evenly rounded to apex; elytral surface shining; striae feebly impressed marked by distinct shallow, round punctures, separated by about half the width of one puncture, each with a microhair; interstriae 2–3× wider than striae, interstrial punctures uniseriate, much smaller and more widely separated, with short hairs visible laterally; declivity rather steep and convex, strongly impressed along stria 1 and 2; strial punctures somewhat smaller than those on disc; interstriae 1, 2 and 3 raised with minute, sparse granules more prominent towards apex, rest of interstriae also with few minute granules; declivital striae 2 rather outwardly curved on its middle; vestiture inconspicuous; protibia somewhat broader towards apex with five-socketed teeth on outer margin, meso and meta tibiae also with five spines on their outer margin; ventrites with short, rather recumbent and moderately dense setae; body color brownish; body length: 2.01–2.21 mm, 2.53× as long as wide.

Remark: Sex could not be determined and also confirmation of the species using molecular data was not possible as only two specimens were available for the study.

**Material examined:** India: Holotype: Kashmir, Ganderbal, Thajwas Sonamarg (34° 18.222′ N, 075° 16.388′ E, 9105 ft.), A.A. Buhroo, 03.09.2019 (KUIC); 1 PT NHMW.

**Type Locality:** Kashmir (Sonamarg)

**Hosts:** Unknown

**Etymology:** The species epithet asperatus refers to the presence of asperities on the anterior slope of pronotum.

**16. *Dryocoetes brownei* Mandelshtam & Petrov, 2010b**
(Figure 21)

This species is diagnosed by the following morphological characters: ♂ frons surface shiny with rather dense uniform punctures, and a small fovea in the center; vertex with smaller, less dense punctures and median longitudinal black line (sulcus); long, sparse, yellowish hair-like setae more longer at the lateral sides of frontal area; epistoma with long dense yellowish setae directed downwards; eyes rather large, emarginate anteriorly, funicle five-segmented, club obliquely truncate with recurved sutures on anterior face, and one suture on apical posterior face; pronotum slightly longer than wide; sides sub parallel in basal three fourth, rounded towards apex; pronotal surface mostly granulate, without reticulation, coarser anteriorly; punctures on small area on central portion of pronotal base around short impunctate median line; lateral and anterior margin of pronotum with long, curved, yellow hair-like setae; scutellum, tongue-shaped, flat, reddish- brown; elytra slightly wider than pronotum, slightly more so towards apex; elytra coarsely punctured on disc, especially on striae 1–3; juxtasutural stria not impressed on disc and declivity, punctures on striae 1st and 2nd deep, large up to the commencement of declivity; interstriae in central part of disc narrow, 1.6–2.0× narrower than striae, minute punctures in one irregular row on each interstria; rather convex and shining; declivity slightly flattened, convex, not steep, dull; ventro-lateral sides of declivity not armed and without minute tubercles on declivital surface; 1st and 2nd interstriae widened at declivity, punctures on 1st and 2nd striae larger than punctures on other striae on declivity; 1st and 2nd striae slightly divergent towards elytral apex; elytral interstriae with rather long yellow hair-like setae, longer laterally and on declivity; short recumbent hair-like setae on striae; body length: 5.1 mm.

**FIGURE 21**. *Dryocoetes brownei*. Holotype: dorsal view (Mandelshtam & Petrov, 2010b).

Female similar to male, except that the frons has a dense tuft of long yellow hair-like setae.

Remarks: This species differs from all other Indian species of the genus *Dryocoetes* by the exceptionally large punctures of the elytral discal striae and the large size of the body.

**Material examined:** Holotype ♂ in NHMUK (image). Type locality: Kashmir, Gulmarg, India.

**Distribution:** India: Kashmir, Afghanistan

**Hosts:** Unknown

**17. *Dryocoetes himalayensis* Strohmeyer, 1908a**
(Figure 22)

This species is diagnosed by the following morphological characters: ♂ head globose; frons plano-convex, transversely impressed above epistoma; surface glabrous with scattered minute granules and long hairs, granules denser towards epistomal margin; epistomal margin with a fringe of long, golden hairs; eyes elongate with a shallow, wide emargination anteriorly; antennal club with two recurved sutures on anterior face; pronotum 1.10× longer than broad; sides sub-parallel on basal half, then gradually narrowing anteriorly, anterior margin broadly rounded; apical half finely and closely asperate and extending laterally up to base; rest of the basal half densely and coarsely punctured; hairs distinct anteriorly and postero-laterally; scutellum pear shaped, smooth and black; elytra 1.32× as long as pronotum and 1.51× as long as wide, sides parallel upto the commencement of declivity; elytral disc shiny; striae distinct marked with fairly large, shallow punctures running almost to the elytral end; punctures devoid of

any distinct hairs; interstriae shiny, with widely spaced minute punctures and scattered long hairs, nearly as wide as striae; striae 1 and 2 rather impressed on elytra and within declivity, striae 1 to 3 running up to posterior margin; interstriae 1 to 3 also prominent up to the tip; interstriae 4 and 5 terminated at the commencement of declivity; declivity commencing on posterior fourth; declivital face stiff marked with interstrial setose granules, hairs longer on declivity and lateral sides of elytra; declivital margin not so demarcated but somewhat marked by slightly swollen interstriae 1 to 3; body dark redish-brown; body length: 2.70–2.81 mm, 2.61× as long as wide.

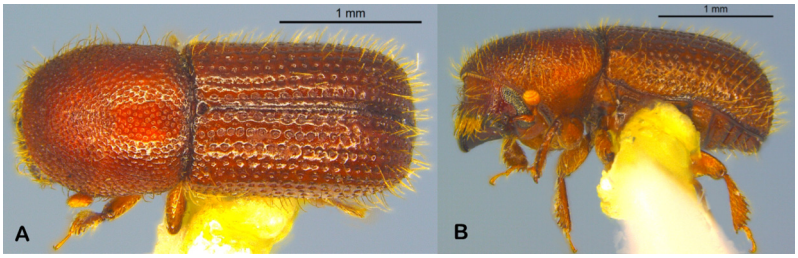


**FIGURE 22**. *Dryocoetes himalayensis*. Male: Dorsal view **A**, lateral view **B**.

The 1st stria is strongly deepened on the disc and declivity, more evident in males of this species, though it is also developed in the females.

Remarks: This species differs from *D. indicus* Stebbing, 1914 due to its much smaller body size and the strongly impressed first and second striae on the disc and declivity.

**Material examined:** New records: India: 4 ♂'s. Kashmir, Baramulla, Chandilora Tangmarg (34° 04′31.29″ N, 074° 26′59.74″ E, 6600 ft.), A.A. Buhroo, 23.09.2020 (KUIC). Kashmir, Anantnag, Larkipora (33° 38′42.96″ N, 075° 10′24.51″ E, 5482 ft.), A.A. Buhroo, 06.07.2012 (KUIC).

**Distribution:** India: Uttarakhand, Kashmir

**Hosts:** *Juglans regia* (Juglandaceae), *Sorbus lanata* (Rosaceae)

### 18. *Dryocoetes indicus* Stebbing, 1914

(Figure 23)

This species is diagnosed by the following morphological characters: ♂ frons rugose-punctate with dense minute punctures and sparse hairs, not forming tufts; epistomal margin with a brush of yellowish hairs; eyes emarginate anteriorly; funicle five-segmented and club obliquely truncate with two recurved sutures on anterior face, and one suture near apex on posterior face; pronotum almost as long as wide, disc convex, sides uniformly curved from base to apex; surface rugose with minute asperities, pubescence long and rather scattered, more prominent antero-laterally; scutellum large, heart-shaped, smooth, shining, dark brown; elytra 1.51× as long as pronotum and 1.42× as long as wide, broader apically than pronotum, apex rather sharply declivous, rounded; disc shining and strongly punctate, strial punctures placed in rows, large, shallow, each with a microhair; interstriae much wider than striae, set with a row of minute punctures; declivity shining, the sutural striae most strongly impressed in upper part, the punctures smaller, becoming very fine and scattered apically; vestiture of long, spiny interstrial hair-like setae, more longer laterally and on declivity; minute but evident tubercles on declivity; body dark brown; body length: 4.0–4.36 mm, 2.46× as long as wide.

Females have a bright yellow tuft of dense hair-like setae on frons, much longer towards the margins; body length: 3.0–4.0 mm.

**Material examined:** New records: India: 5 ♂'s, 3 ♀'s. Kashmir, Baramulla, Check post Gulmarg (34° 03.797′ N, 074° 24.948′ E, 7552 ft.), A.A. Buhroo, 25.05.2017 (KUIC). Kashmir, Bandipora, Chorwan Gurez (34° 39.242′ N, 074° 53.581′ E, 8275 ft.), A.A. Buhroo, 17.08.2018 (KUIC). Kashmir, Baramulla, Baba Reshi (34° 03.92′ N, 074° 24.54′ E, 7600 ft.), A.A. Buhroo, 10.07.2019 (KUIC). Kashmir, Kupwara, Tangdhar (34° 23.527′ N, 073° 51.894′ E, 6525 ft.), A.A. Buhroo, 10.07.2017 (KUIC).

**Distribution:** India: Himachal Pradesh, Kashmir, Uttarakhand. Nepal

**Hosts:** *Abies pindrow*, *Picea smithiana*, *Pinus wallichiana* (Pinaceae)

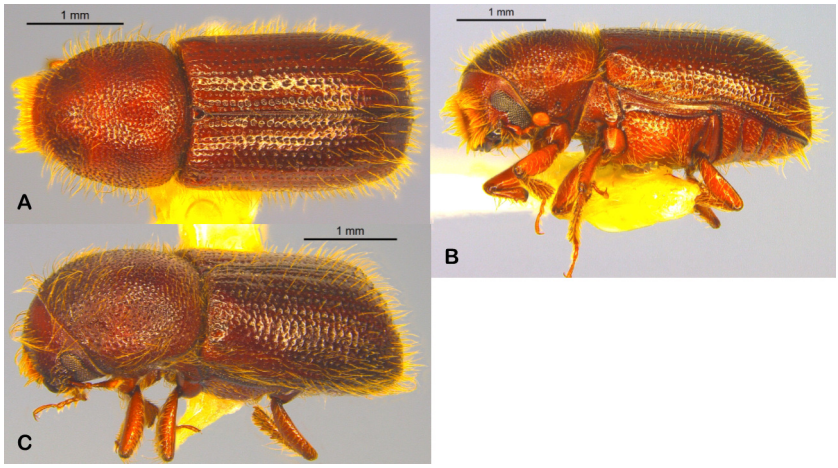


**FIGURE 23.** *Dryocoetes indicus*. Female: dorsal view **A**, lateral view **B**; male: fronto-lateral view **C**.

### 19. *Dryocoetes quadrisulcatus* Strohmeyer, 1908c

(Figure 24)

This species is diagnosed by the following morphological characters: ♂ frons subconvex, coarsely granulate-punctate, surface with few long sparse hairs; minute granules denser on flattened area above epistoma and on lateral sides; epistomal margin with fringe of dense, long yellow hairs; vertex shiny, smooth, irregularly punctured ; eyes elongate, anteriorly emarginate; antennal club sub-circular, slightly longer than wide, obliquely truncate with two recurved sutures on anterior face, and one suture on apical posterior face, basal corneous portion occupies about half the total length; pronotum slightly longer than wide (1.08×); evenly convex; basally truncate, sides sub-straight up to middle, narrowed and curved towards rounded apex; pronotal surface mostly granulate, coarser antero-laterally; somewhat irregular punctures around impunctate median line towards pronotal base; sparse, long yellow hairs on anterior and lateral portions; scutellum elongate, tongue-shaped, smooth, shiny-black; elytral base as wide as pronotum, 1.55× longer than pronotum and 1.67× as long as wide; basal margin truncate, sides parallel, posteriorly somewhat broadly rounded; elytra strongly striate punctate, strial punctures large, closely placed and especially deeply impressed on first two striae; interstriae as wide as striae, punctures much smaller, as numerous as on striae; declivity somewhat steep, striae 1 strongly and 2 less strongly sulcate and both dilated away from sutural line towards apex; sutural interstriae slightly elevated, with minute setose granules on declivital interstriae; elytral interstriae with long yellow hair-like setae, somewhat longer on lateral sides and on declivity; body dark brown; body length: 2.24–2.61 mm, 2.80× as long as wide.

Female body length: 2.25 mm. The strongly deepened, striae 1 on the disc and declivity is more evident in males of this species, though it is also developed in the females.

Remarks: This species is distinct from the rest of the Indian species due to its grooved (sulcate) striae 1 and 2 on its declivity.

**Material examined:** New records: India: 4 ♂'s, 4 ♀'s. Kashmir, Thajwas Sonamarg (34° 18.222′ N, 075° 16.388′ E, 9865 ft.), A.A. Buhroo, 12.07.2012 (KUIC). Kashmir, Bandipora, Tragbal Gurez (34° 29.647′ N, 074° 38.1652′ E, 9432 ft.), A.A. Buhroo, 18.08.2018 (KUIC).

**Distribution:** India: Kashmir, Uttarakhand

**Hosts:** *Abies pindrow* (Pinaceae)

**Phylogenetic assessment:**

The phylogenetic analysis based on COX-1 gene comparison was carried out between the Himalayan *Dryocoetes* species and other closely related species of the genus (Fig. 25). The NJ tree analysis revealed that *Dryocoetes quadrisulcatus* and *D. himalayensis* formed different clades and were monophyletic with a nucleotide difference of 11.52%. Along with North American *Dryocoetes affaber* (Mannerheim, 1852), Himalayan *D. indicus* likewise belonged to a distinct monophyletic group, although it differed from it by a nucleotide difference of 8.38–9.01%. The

European populations of *Dryocoetes* also formed distinct clades. The nucleotide divergence between *Dryocoetes quadrisulcatus* and *D. indicus* was 16%.

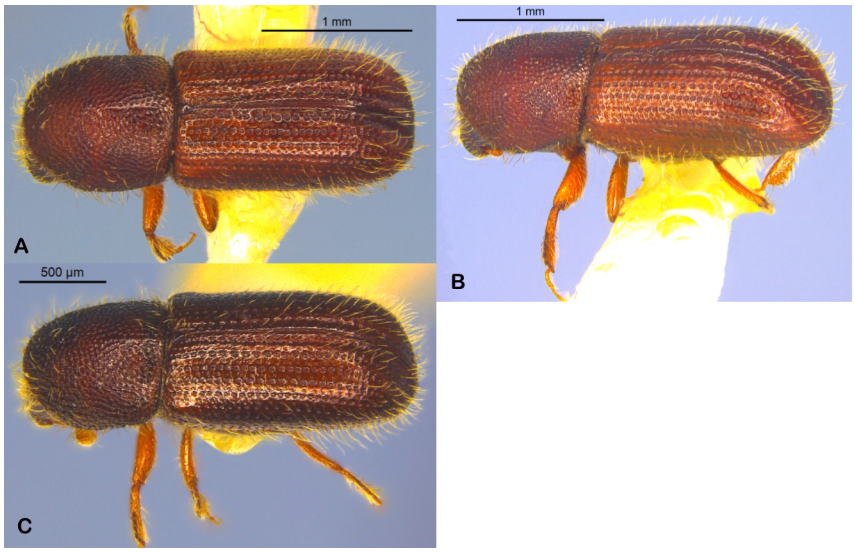


**FIGURE 24.** *Dryocoetes quadrisulcatus*. Male: dorsal view **A**, latero-declivital view **B**; female: dorso-lateral view **C**.

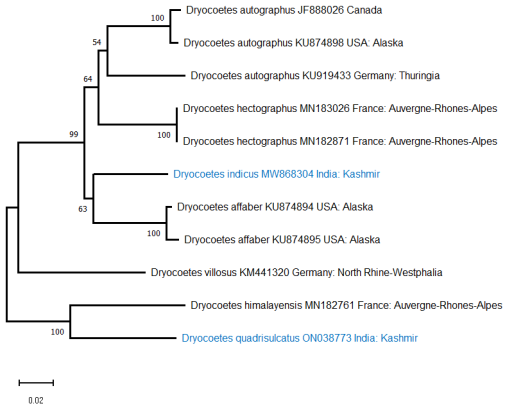


**FIGURE 25.** A phylogenetic tree obtained from the NJ for the COX-1 genes of *D. indicus*, *D. quadrisulcatus* (in blue) and related species. Numbers at the branches represent bootstrap values.

## Genus *Taphrorychus* Eichoff, 1878b

*Taphrorychus* species are diagnosed by the following morphological characters: body length: 1.5–2.7 mm; funicle with five segments; club flat, round with three slightly procurved sutures; pronotum as long as wide, anteriorly constricted, with rows of fine granules; elytra with striae; ♂ elytral declivity flat; female declivity rounded; ♂ frons granulate with sparse filliform setae; ♀ frons with crown of dense, short, filliform setae; body black to brown; antennae and legs light brown; hosts: deciduous trees and conifers.

## Key to the Himalayan species of *Taphrorychus* Eichoff, 1878b

1 Elytral disc very distinctly striate-punctate, the strial punctures of moderate size and closely placed; interstriae much wider, in places finely transversely wrinkled and each with median row of widely spaced rather large punctures as those on the main striae . . . . . *T. betulae* Schedl

\- Elytral disc with indistinctly marked striate and interstriae, striae 1 and 2, well-marked and impressed; punctures on both striae and interstriae of equal size and depth, declivital interstriae marked by long erect hairs and few minute granules . . . . . *T. hewetti* (Stebbing)

**20. *Taphrorychus betulae* Schedl, 1974**
(Figure 26)

This species is diagnosed by the following morphological characters: ♂ body pitchy black, frons densely granulate punctate, with long sparse yellow hairs; flattened above epistoma; epistomal margin with a fringe of yellow hairs; eyes elongate, anteriorly emarginate; antennal club sub-circular, basal corneous portion on less than half of length, rest pubescent non-corneous portion with two recurved sutures; pronotum 1.11× longer than wide, postero-lateral angles moderately rounded, sides parallel up to more than the middle, narrowed anteriorly with rounded apex; anterior pronotum obliquely convex and densely covered with small asperities, basal area densely rather coarsely punctate, median line impunctate and feebly raised, pubescence rather long and erect; scutellum of medium size, shining; elytra slightly wider than pronotal base, 1.53× longer than pronotum and 1.64× as long as wide; lateral sides parallel up to basal three-fourth, converging posteriorly to moderately rounded apex; disc shining, very distinctly striate-punctate, the striae deeper towards the declivity, the strial punctures of moderate size and closely placed; interstriae much wider, in places finely transversely wrinkled and each with median row of widely spaced small punctures with rather long erect pale hair-like setae, the size of these punctures not quite as large as those on the main striae; declivity commencing from behind middle and obliquely convex; sutural interstriae elevated, with a row of setose granules; striae 1 deeply impressed, interstriae 2 somewhat similar to sutural one, some of its punctures and on rest of the interstriae replaced by minute setose granules; body length: 2.70–2.74 mm, 2.78× as long as wide.

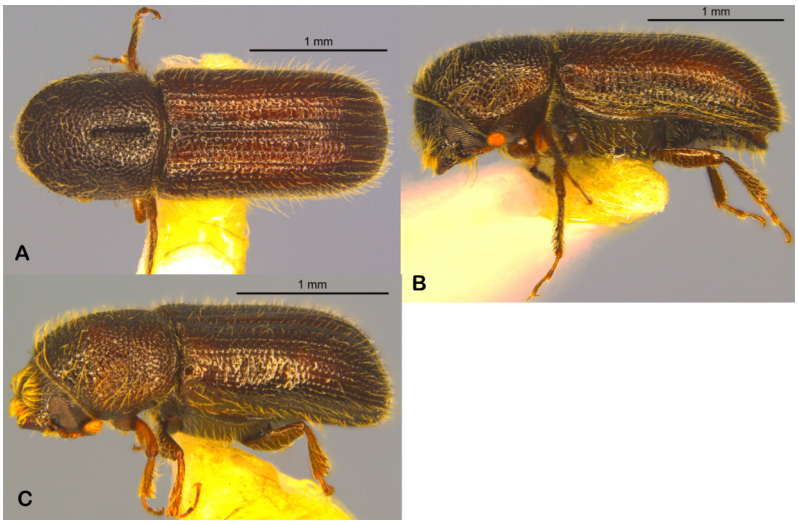


**FIGURE 26.** *Taphrorychus betulae*. Male: dorsal view **A**, lateral view **B**; female: fronto-lateral view **C**.

Females with finely and very densely punctured frons and with tufts of long incurved hairs along margins; body length: 2.48 mm.

**Material examined:** New records: India: 2 ♂'s, 4 ♀'s. Kashmir, Bandipora, Barnoi Gurez (34° 36.543′ N, 074° 57.182′ E, 8360 ft.), A.A. Buhroo, 17.08.2018 (KUIC). Kashmir, Ganderbal, Thajwas Sonamarg (34° 18.222′ N, 075° 16.388′ E, 9105 ft.), A.A. Buhroo, 03.09.2019 (KUIC).

**Distribution:** India: Kashmir (Barnoi, Sonamarg) (first country record). Pakistan

**Hosts:** *Betula utilis* (Betulaceae)

**21. *Taphrorychus hewetti* (Stebbing, 1908)**
(Figure 27)

= *Dryocoetes hewetti* Stebbing 1908

This species is diagnosed by the following morphological characters: ♂ frons plano-convex, surface rugose-punctate, with long scattered hairs and roughened with fine granules; epistomal margin with a fringe of long hairs; eyes

slightly emarginate at the antennal base; antennal funicle with five segments; club spatulate with procurved sutures; pronotum slightly longer than broad (1.04×), summit distinct, almost at the middle; basal margin substraight; lateral sides sub-parallel up to more than middle, narrowing anteriorly with rounded margin; coarser asperities on anterior half and much finer posteriorly; long sparse hairs on surface, especially anteriorly and laterally; scutellum rounded, convex and shiny; elytra 1.52× longer than pronotum and 1.6× as long as its width; basal margin substraight; lateral sides strictly parallel upto three fourth portion, afterwards narrowing posteriorly to a rounded posterior margin; disc shiny, punctures on both striae and interstriae of equal size and depth, striae and interstriae hardly demarcated, except striae 1 and 2, being impressed; declivity commencing on posterior fourth; declivital face somewhat steep, shiny; declivital margin marked by long erect hairs and few minute granules in respective interstriae; interstriae 1, 3 and 4 with few minute setose granules on upper half as well as towards posterior margin; body length: 2.7 mm, 2.68× as long as wide.

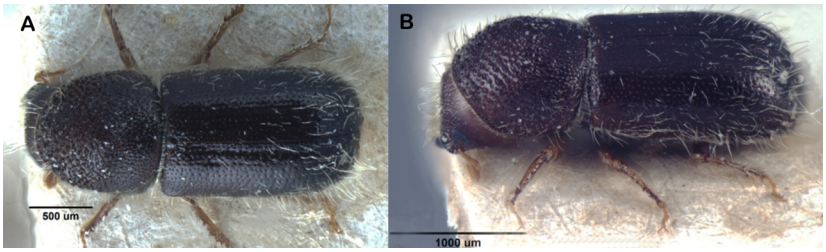


**FIGURE 27**. *Taphrorychus hewetti*. Lectotype male: dorsal view **A**, lateral view **B**.

Remarks: This species was formerly placed in *Dryocoetes* (*D. hewetti* Stebbing, 1908) but due to its spatulate antennal club, and extremely long declivital pubescence, it was transferred to *Taphrorychus* (Wood & Bright 1992).

**Material examined:** Lectotype (here designated). Label information: *Dryocoetes hewetti* n. sp., Type, Nainital, E.P. Stebbing, 1908 (FRI)

**Distribution:** India: Himachal Pradesh, Uttarakhand

**Hosts:** *Quercus floribunda*, *Q. leucotrichophora* (Fagaceae)

**Phylogenetic assessment:**

The Himalayan *Taphrorychus betulae* and other closely related species of the genus and other genera were compared phylogenetically using the COX-1 gene (Fig. 28). The phylogenetic analysis revealed that the populations of *T. betulae* found in the Himalayas belonged to a distinct monophyletic group and displayed a 2.21% intraspecific nucleotide divergence. It was also clear that the Himalayan *Taphrorychus* species is extremely different from the non-Himalayan *Taphrorychus* species, which formed a distinct monophyletic cluster in the analysis.

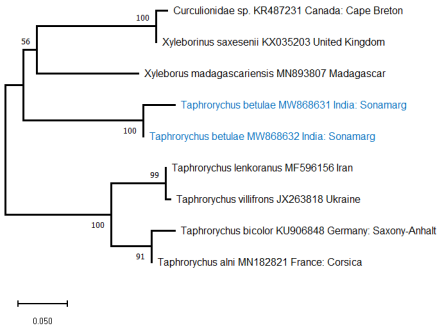


**FIGURE 28.** A phylogenetic tree obtained from the NJ for the COX-1 genes of *T. betulae* (in blue) and related species. Numbers at the branches represent bootstrap values.

**Tribe Ernoporini Nüsslin, 1911**

**Genus *Eidophelus* Eichhoff, 1876**

*Eidophelus* species are diagnosed by the following morphological characters: body length: 0.8–1.9 mm; eyes entire to rarely emarginate; scape usually longer than four-segmented funicle, club large and flat sometimes with sutures and septum; pronotum as long as wide, with a fine raised line on the lateral and basal margins, sometimes armed in the anterior half; scutellum small; declivity convex with or without granules; vestiture consists of short and light colored hair and scale-like setae; procoxae contiguous; host: deciduous trees.

**22. *Eidophelus indicus* (Wood, 1989)**
(Figure 29)

= *Scolytogenes indicus* Wood, 1989

This species is diagnosed by the following morphological characters: ♂ frons broadly convex, median line above eyes forming a transversely etched, indefinite summit; a transverse pair of widely spaced granules near middle, surface above finely rugose-reticulate, smooth and rough below; vestiture of fine, rather inconspicuous hair of moderate length; pronotum nearly as long as wide, widest on basal third, sides moderately arcuate, anterior margin rather broadly rounded; summit near middle, asperities on anterior slope rather coarse, finely closely punctured behind, punctures around summit slightly elevated to form granules; vestiture of rather short, recumbent hair; elytra 1.3× as long as pronotum and 1.2× as long as wide; striae not impressed, except weakly near declivity; strial punctures rather deep, small, in definite rows, somwhat confused near base on disc; interstriae almost twice as wide as striae, punctures near base resembling those on striae, punctures granulate towards declivity; declivity steep, broadly convex; sculpture about as on disc except interstriae 1 distinctly impressed, granules on all interstriae wider than on disc; vestiture consists of very minute strial hair and rows of erect, pointed bristles; each bristle as long as distance between rows, setae stout but not scale like, apical third of each tapered to a sharp point; a few short, scale-like setae also visible on declivity; body color dark brown, pronotum almost black; body length: 1.2 mm, 2.30× as long as wide.

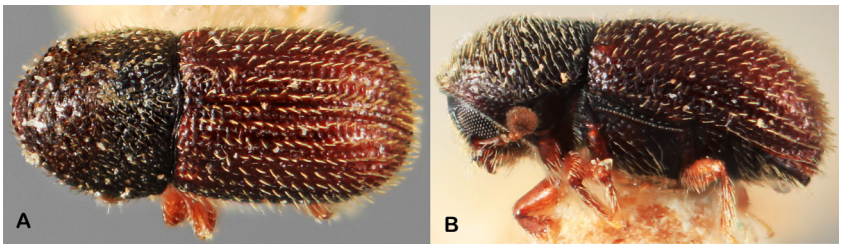


**FIGURE 29**. *Eidophelus indicus*. Holotype male: dorsal view **A**, lateral view **B**. (Courtesy: Smithsonian NMNH).

Female similar to male except area behind pronotal summit apparently more granulate; small scale-like setae on elytral declivity more numerous.

**Material examined:** Holotype in NMNH (image), Smithsonian Institution, Washington, D.C. USA. Type locality: Amarkantak, Rewah State, C. I. 3500 ft., FRI, Dehradun

**Distribution:** India: Kashmir, Uttarakhand. Oriental region

**Hosts:** *Hedera helix* (Araliaceae), *Moringa oleifera* (Moringaceae), *Wrightia tinctoria* (Apocynaceae)

**Genus *Ernoporus* Thomson, 1859**

*Ernoporus* species are diagnosed by the following morphological characters: body length: 1.4–2 mm; eyes entire; club oval, with three procurved sutures; pronotum arched; anterior pronotum with concentric rows of asperities,

forming a distinct summit, medial anterior pronotal margin with two or more protruding asperities; host: deciduous trees.

### 23. *Ernoporus squamosus* sp. nov.

(Figure 30)

**Diagnosis:** This new species is diagnosed by the reticulate frons and longitudinally aciculate vertex; by the pattern of asperities arranged in four concentric rows on the anterior slope of the pronotum. *Ernoporus squamosus* **sp. nov.** is very similar to *E. tillae* (Panzer,1793) but differs from it in the arrangement of asperities (in *E. tillae*, the anterior two rows have discontinuous asperities).

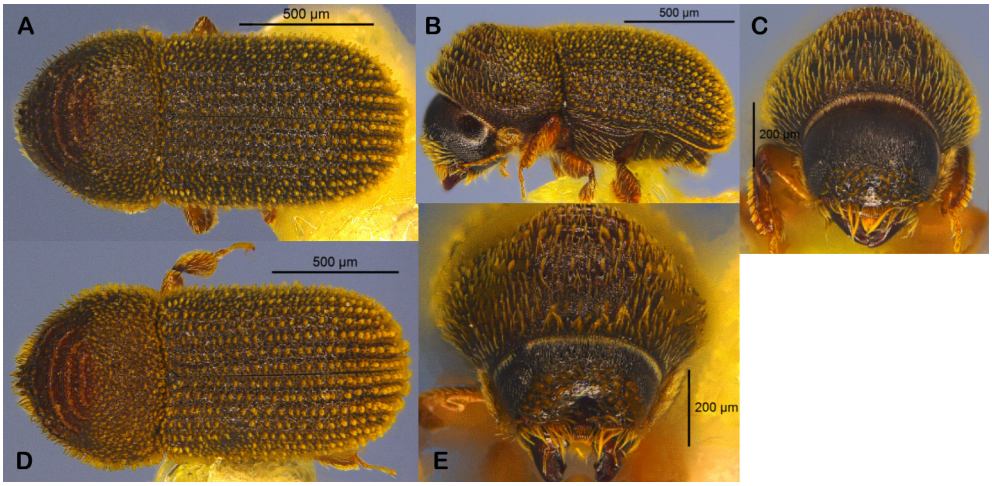


**FIGURE 30.** *Ernoporus squamosus* **sp. nov.** Holotype female: dorsal view **A**, lateral view **B**, frons **C**; Allotype male: dorsal view **D**, frons **E**.

**Description:** The species is new in *Ernoporus* by the following morphological characters: ♀ frons convex, weakly impressed just above epistoma, surface sub-shining, reticulate punctate, vertex with fine longitudinal aciculations; vestiture of erect, moderately dense hair-like setae on frontal surface, with a fringe of long hairs on epistomal margin; eyes oval, entire; antennal funicle with four segments, club flat, sub-round with three slightly procurved sutures indicated by rows of setae; pronotum 1.20× wider than long; sides widest slightly above base, arcuately converging; apical margin moderately produced anteriorly, set with four distinct closely placed asperities, median pair larger; summit situated at middle, anterior slope of summit concentrically asperate in four rows, of which posterior two rows fused to form two arcuate carinae, third row of fused asperities with rounded free apices, and fourth row with distinct triangular closely placed asperities; disc somewhat flat, sub-shinning, surface reticulate, rugose on postero-lateral sides; vestiture of moderately long, erect hair-like setae with some shorter, broad, dagger-like setae antero-laterally, posterior half with pale, short, dense, scales intermixed with some relatively longer, stout and blunt scales (nearly as long as wide); suture between pronotum and elytra somewhat straight; scutellum distinct, triangular; elytra 1.71× as long as pronotum, 1.42× as long as wide; sides parallel on more than basal two-thirds, rounded towards apex; elytral surface dark, iridescent; striae narrow, weakly impressed with small, oval, deep punctures separated from each other by about the diameter of a puncture; interstriae nearly 2.5× as wide as striae; interstrial surface with a row of medial pale, erect, flat and blunt scales, separated within the row by the length of a scale, and two rows of dense short scales (each on either side of medial row); declivity evenly convex with sculpture and vestiture as on rest of elytra; undersurface reticulate with moderately dense pubescence; body color dull, black; body length: 1.41–1.45 mm, 2.29× as long as wide.

Male similar to female, except for a slightly more produced apical margin of pronotum, and frons with a smooth, shining and impressed circular area above epistoma; body length: 1.42 –1.54 mm.

**Material examined:** Holotype: ♀: India: Kashmir, Srinagar, Theed Harwan (34° 09.858 N, 074° 54.590′ E, 5608 ft.), A.A. Buhroo, 02.10.2018 (KUIC). Allotype, ♂: the same site and date as HT; Paratypes: the same data

as HT (1 ♀, 3 ♂), except, Kupwara, Teetwal (34° 23.596′ N, 073° 46.458′ E, 3582 ft.), A.A. Buhroo, 17.07.2017; Dachigam National Park (34° 08.754′ N, 074° 55.604′ E, 5610 ft.), A.A. Buhroo, 02.10.2017; Jammu, Kishtwar, Shasho Padder (33° 19.855′ N, 076° 02.182′ E, 5260 ft.), A.A. Buhroo, 09.09.2017; Kishtwar (33° 18.787′ N, 075° 46.451′ E, 5610 ft.), A.A. Buhroo, 10.09.2017; HT, AT and PTs deposited at KUIC; 2 PTs NHMW.

**Type locality:** India: Kashmir: Srinagar, Harwan

**Hosts:** *Ficus palmata*, *Morus alba* (Moraceae)

**Etymology:** The species epithet *squamosus* refers to the presence of scale-like setae on the body.

## Tribe Hylesinini Erichson, 1836

## Genus *Hylesinus* Fabricius, 1801

*Hylesinus* species are diagnosed by the following diagnostic characters: body length: 2.2–6 mm; funicle seven-segmented; club long and ovate, with three sutures; anterior margin of eye weakly sinuate; pronotum wider than long often armed on anterolateral areas by coarse asperities; anterior margin of elytra armed by row of overlapping crenulations; lateral elytral margin with furrow; abdominal ventrites gradually rising posteriorly; procoxae subcontiguous; distinct pattern of coloration, due to vestiture of light and dark colored scale-like setae on the body surface; host: deciduous trees.

### 24. *Hylesinus macmahoni* (Stebbing, 1909)

(Figure 31)

= *Sphaerotrypes macmahoni* Stebbing, 1909
= *alternans* Schedl, 1959a
= *fraxinoides* Schedl, 1959b (*Leperisinus*)

This species is diagnosed by the following morphological characters: ♂ frons broadly impressed above epistomal margin; surface finely reticulate, with close punctures of irregular shape and size and dense stout setae, except on median smooth, impunctate area; vertex convex, finely reticulate and with minute punctures; eyes elongate and entire; antennal scape long, funicle with seven segments, club conical with three distinct sutures; pronotum 1.53× as wide as long, widest at base, lateral sides rounded and gradually incurved from the base, with distinct antero-lateral constriction; anterior margin sub rounded; surface rugosely punctate, punctures more prominent, shallow and irregular towards basal half; asperities of different sizes on lateral margins more prominent anteriorly; scale-like setae on pronotal surface, somewhat longer laterally and recumbent towards basal margin; elytra 1.94× as long as pronotum, slightly longer than broad (1.06×); lateral sides sub parallel on basal two-fifth gradually narrowing posteriorly with broadly rounded apex; basal margin each with 12–13 transverse crenulations; striae impressed and narrow with somewhat indistinct punctures; interstriae much wider than striae; interstrial vestiture with three to four rows of scale-like setae, scales blunt at apex; pale scales form a wide band from postero-lateral part of elytra to scutellum, with a further pale area on elytral declivity; rows of tuberculations visible on interstriae more prominent towards elytral base; declivity convex, moderately steep with 2nd interstriae somewhat depressed; body length: 2.74–2.77 mm, 1.74× as long as wide.

Females are distinct from males in having somewhat flat and feebly impressed frons.

Remarks: *Hylesinus macmahoni* is very similar to *H. tupolevi* Stark, 1936 in the elytral coloration, but the setae on the elytra in *H. tupolevi* are rather sharply pointed whereas, in *H. macmahoni* the setae are blunt. The species is also very similar to *H. cingulatus* Blandford, 1894 but differs from it mostly in the elytral setae, which are very short, somewhat rounded and blunt in *H. cingulatus*.

**Material examined:** New records: India: 3 ♂'s, 1 ♀. Kashmir, Uri, Salamabad (34° 05.186′ N, 074° 01.765′ E, 4415 ft.), A.A. Buhroo, 30.09.2017 (KUIC). Jammu, Ramban, Govindpora (33° 07.053′ N, 075° 18.967′ E, 5420 ft.), A.A. Buhroo, 10.05.2018 (KUIC).

**Distribution:** India: Jammu and Kashmir. Pakistan

**Hosts:** *Fraxinus excelsior*, *F. floribunda*, *Olea europaea* (Oleaceae).

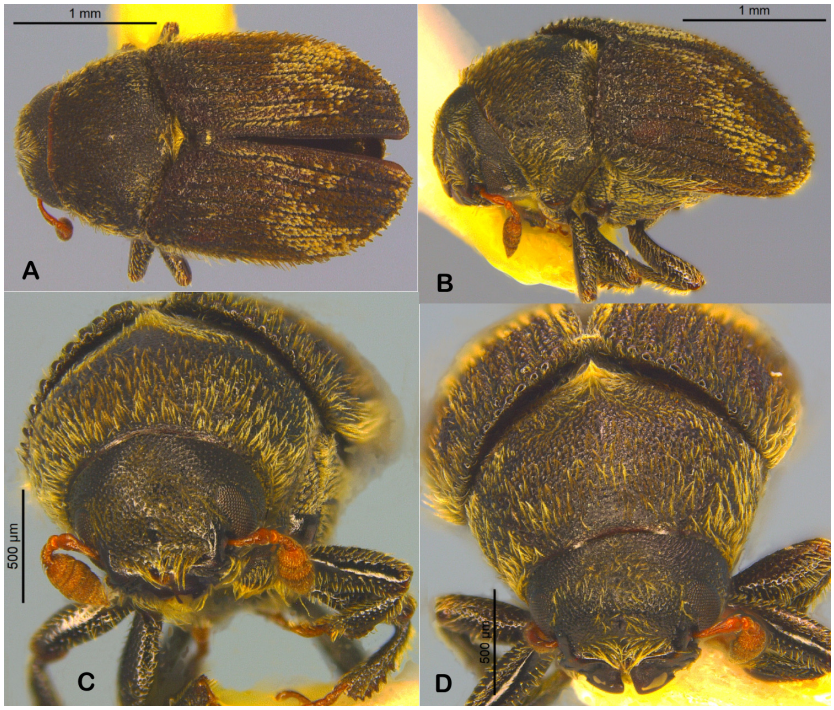


**FIGURE 31.** *Hylesinus macmahoni*. Male: dorsal view **A**, lateral view **B**, frons **C**; female: frons **D**.

**Phylogenetic assessment:**

A phylogenetic analysis of *Hylesinus macmahoni*, *H. varius* (Fabricius, 1775), *H. crenatus* (Fabricius, 1787), *H. fraxini* (Panzer, 1799) and *H. wachtli orni* Fuchs, 1906, together with the out-group *Hylurgus ligniperda* (Fabricius, 1787) resulted in the formation of clades with bootstrap values more than 90% (Fig. 32). *Hylesinus macmahoni* was separately monophyletic within the group with well-supported sister clades and its haplotypes were displayed in a single clade with a high bootstrap value. The haplotypes of *Hylesinus macmahoni* have a nucleotide difference of 2.2%. The interspecific nucleotide divergence ranged 14.71–14.90% between *Hylesinus macmahoni* and *H. varius*, 13.4–14% between *H. macmahoni* and *H. fraxini*, 12.3–14.6% between *H. macmahoni* and *H. wachtli* and 14.7–16% between *H. macmahoni* and *H. crenatus*. The consensus tree, however, demonstrated that *H. fraxini* and *H. varius* formed a single cluster with 98% bootstrap value, which also supports the synonymy of *H. fraxini* under *H. varius* being morphologically similar species.

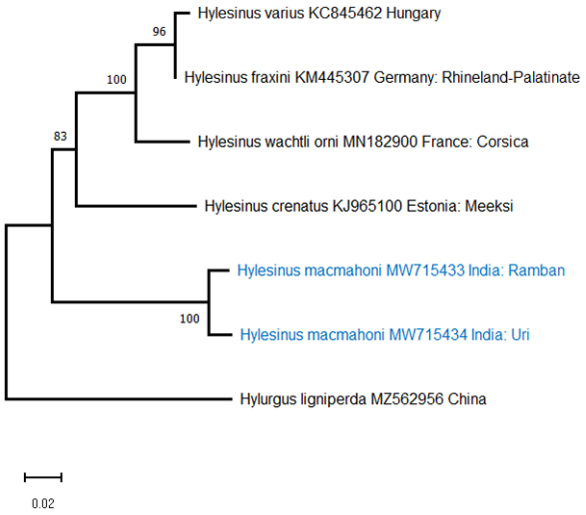


**FIGURE 32.** A phylogenetic tree obtained from the NJ for the COX-1 genes of *H. macmahoni* (in blue) and related species. Numbers at the branches represent bootstrap values.

**Tribe Hylurgini Gistel, 1848**

**Genus *Hylurgus* Latreille, 1806**

*Hylurgus* species are diagnosed by the following morphological features: body length: 2–5.7 mm; antennal funicle with six segments; club with three straight to recurved sutures; eyes entire; frons transversely impressed usually with median carina above the epistoma; pronotum usually longer than wide, unarmed; declivity convex, unarmed; vestiture consists of hair-like setae; procoxae are contiguous; host: conifers.

**25. *Hylurgus indicus* Wood, 1985**
(Figure 33)

This species is diagnosed by the following morphological characters: ♀ frons strongly convex, coarsely tuberculate and without transverse impression just below middle; epistoma with medium carina of uniform height; vestiture of long, abundant hairs, and a fringe of hairs on the epistomal margin; eyes entire, elongately oval; antennal funicle with six segments, club ovate with three recurved sutures; pronotum rather quadrate, 1.05× as long as wide; sides somewhat parallel, slightly narrowing anteriorly; surface dull, with small, close, deeper punctures and a median longitudinal raised line; vestiture of moderately abundant long hairs; elytra 1.7× as long as pronotum, 1.8× as long as wide; elytral base substraight equal in width to pronotal base, sides parallel up to basal three-fourths with evenly rounded apex, elytral surface dull rather transversely wrinkled; striae weakly impressed, strial punctures moderately large, distinct, set apart about a diameter of a puncture; interstriae slightly wider than striae, with very small, close, punctures; interstrial vestiture of erect setae mostly in rows both disc and declivity; body dull reddish brown; body length: 3.2 mm, 2.96× as long as wide.


**FIGURE 33.** *Hylurgus indicus*. Paratype female: dorsal view **A**, lateral view **B**, frons **C**.

Male: Not studied.

Remarks: This species strongly resembles *H. micklitzi* Watchl, 1881 but differs from it by smaller size and absence of a frontal tubercle. *Hylurgus indicus* also differs both from *H. ligniperda* and *H. micklitzi* by absence of tuft of hair-like setae on elytral declivity in female.

**Material examined:** Paratype ♀ in FRI Dehradun. Type locality: Kumaon Hills, W. Almora, Uttarakhand, India

**Distribution:** India: Kumaon Hills, W. Almora (Uttarakhand)
**Hosts:** *Pinus roxburghii* (Pinaceae)

## Genus *Xylechinus* Chapuis, 1869

*Xylechinus* species are diagnosed by the following morphological features: body length: 1.5–3.5 mm; antennal funicle with five segments; club with three sutures; anterior margin of eye slightly emarginate or sinuate; frons usually with median carina above the epistoma; pronotum usually wider than long, unarmed; pronotum with recumbent, filliform setae; scutellum small; metepisternal setae scale-like; elytral basal margin armed by a row of coarse crenulations; filliform setae of 1st interstria lighter, and more closely distributed than other interstriae; declivity convex, with small granules and vestiture of small scale-like setae and sparse long, light, semi-erect, thick bristles; host: deciduous trees.

### 26. *Xylechinus padus* Wood, 1988a

(Figure 34)

This species is diagnosed by the following morphological characters: ♀ frons broadly convex, a feeble median impression on lower half, pre-epistomal margin rather abrupt on median two-thirds; surface smooth and shining, feeble reticulation becoming slightly stronger laterally, much stronger towards vertex; punctures rather small, distinct, moderately coarse; vestiture of sparse, fine, rather short hairs; pronotum 1.24× wider than long; sides on basal half almost parallel, very weakly constricted on anterior half; surface smooth, shining, punctures moderately large, very close, rather deep; vestiture of moderately abundant, fine, rather short hairs; elytra 1.95× as long as pronotum, 1.6× as long as wide; striae slightly impressed, with moderately impressed close punctures, usually with small tubercles arising from interior; interstriae nearly 1.5× wider than striae, distinctly convex, 1st and 3rd interstriae slightly more strongly elevated on posterior half of disc and on declivity; 1st and 3rd interstriae each with a row of small, sub-crenulate tuberculations throughout, others usually with smaller tuberculations near base; declivity convex, steep; odd-numbered interstriae distinctly elevated, 3 and 9 elevations join and then continue almost to 1st interstria; odd-numbered interstriae each with a few to many small tubercules, others unarmed; vestiture of moderately abundant, short, almost hair-like setae throughout elytra; body length: 2.60–2.75 mm, 2.19× as long as wide.

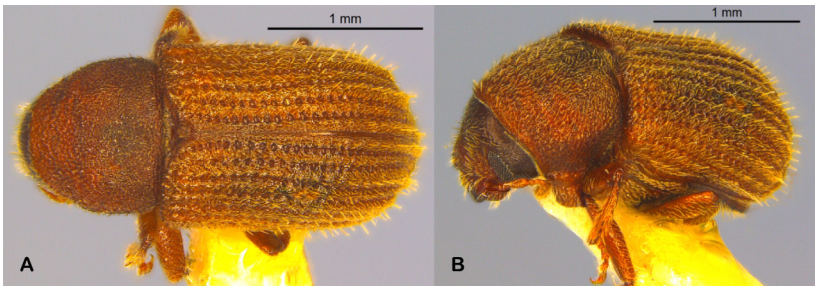


**FIGURE 34**. *Xylechinus padus*. Female: dorsal view **A**, fronto-lateral view **B**.

Male similar to female, except the frons is without median impression.

Remarks: This species is larger than other Indian *Xylechinus* species, it has a very different vestiture, and declivital interstriae 1 and 3 are distinctly elevated.

**Material examined:** New record: India: 2 ♀'s. Kashmir, Ganderbal, Thajwas Sonamarg (34° 18.222′ N, 075° 16.388′ E, 9105 ft.), A.A. Buhroo, 03.09.2019 (KUIC).

**Distribution:** India: Kashmir, Himachal Pradesh, Uttarakhand. China: Yunnan

**Hosts:** *Prunus cornuta* (Rosaceae)

## Tribe Ipini Bedel, 1888

## Genus *Ips* DeGeer, 1775

*Ips* species are diagnosed by the following morphological characters: body length ranges between 2.2–8.2 mm; funicle is five-segmented; pronotum as long as wide and asperate anteriorly; declivity steep concave, with lateral margins bearing spines, the third always being the largest and often capitate; 1st interstria before declivity with row of fine granules; spines of lateral declivital margin longer in male than in female; medial tubercles of frons larger in male than in female; filliform setae on medial posterior margin of 7th abdominal ventrite shorter in male than in female.

### Key to the Western Himalayan species of *Ips* DeGeer, 1775 (reproduced after Buhroo & Lakatos, 2011)

1 Spine 2 and 3 of elytral declivity connected by a tumescent base; 3 the largest but not elongated as in other species, its apex enlarged into a spade-like club with a constriction at its base; 4 smaller and always placed midway between 3 and the lower margin; frons and entire lateral margins of body with dense longish erect setae. . . . . *I. longifolia* (Stebbing)

\- Spine 3 on the elytral declivity largest and with a knobbed apex; in males the costa of apical margin of elytral declivity is more prominent and spine 4 closer to the lower margin than the 3; frons and entire lateral margins of body with fine and less prominent setae. . . . . *I. stebbingi* Strohmeyer

### 27. *Ips longifolia* (Stebbing, 1909)

(Figure 35)

= *Tomicus longifolia* Stebbing, 1909

This species is diagnosed by the following characters: ♂ frons feebly roughened with small granules intermixed fine erect hairs and with a small blunt tubercle placed at the middle of vertex; pronotum uniformly convex 1.2× as long as wide, lateral margins feebly outcurved, more prominent anteriorly; summit indistinct placed almost at middle, anterior slope of pronotum with concentric rows of asperities becoming smaller and indistinct postero-laterally, posterior-discal half shiny with small punctures; scutellum depressed and tongue-shaped; elytra 1.48× as long as pronotum, 1.41× as long as wide; elytral surface distinctly convex, basal margin, fairly concave; lateral sides subparallel upto posterior fourth converging posteriorly; striae distinct with shallow punctures devoid of any micro-hairs; interstriae 3–4× wider than striae with a few small widely spaced punctures; all striae and interstriae running almost upto commencement of declivity; declivity commencing almost on the middle of elytra, each margin of declivity with 4–5 spines, spine 2 and 3 connected by a tumescent base, 3 the largest but not elongated as in other species, its apex enlarged into a spade-like club with a constriction at its base, 4 smaller and always placed midway between 3 and the lower margin; frons and entire lateral margins of body with dense long erect setae; body length: 4.51–4.72 mm, 2.64× as long as wide.

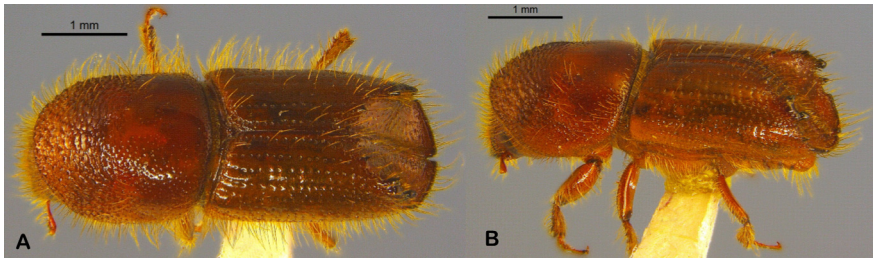


**FIGURE 35**. *Ips longifolia*. Male: dorsal view **A**, lateral view **B**.

**Material examined:** New records: India: 3 ♂'s. Jammu, Ramsu, Sarbagni (33° 19.806′ N, 075° 11.984′ E, 3880 ft.), A.A. Buhroo, 20.05.2017 (KUIC). Jammu, Ramban, Batricheshma (33° 17.545′ N, 075° 10.597′ E, 3640 ft.), A.A. Buhroo, 20.05.2017 (KUIC). Himachal Pradesh, Sanwara Solan (30° 88.677′ N, 076° 99.854′ E, 4065 ft.), A.A. Buhroo, 20.02.2018 (KUIC).

**Distribution:** India: Himachal Pradesh, Punjab, Jammu, Uttarakhand. Pakistan, Nepal, Bhutan, China
**Hosts:** *Pinus roxburghii* (Pinaceae)

### 28. *Ips stebbingi* Strohmeyer, 1908b

(Figure 36)

= *blandfordi* Stebbing, 1909 (*Tomicus*)
= *ribbentropi* Stebbing, 1909 (*Tomicus*)

This species is diagnosed by the following characters: ♂ frons roughly granulate-punctate with a short, narrow, longitudinal depression in the middle; granulate portion intermingled with some distinct setae; pronotum 1.2× longer than wide, lateral sides somewhat parallel converging anteriorly into a rounded apex, more than anterior one-third declivous, surface roughened with asperities gradually increasing in size towards anterior margin; basal portion of pronotum shining with distinct but small punctures; scutellum tongue-shaped; elytra slightly longer than pronotum (1.19×), 1.44× as long as wide; lateral sides subparallel converging posteriorly from the commencement of declivity; elytral disc convex, shiny, striae distinct with round shallow punctures without micro-hairs; interstriae nearly three times wider than striae, weakly convex marked with few small punctures, interstriae 1 and 2 slightly raised than others; elytral declivity concave; spine 3 largest with a knobbed apex; in males the costa of apical margin of elytral declivity more prominent; body stout, black and its entire lateral margins bear fairly dense spiny setae; long setae more or less along the whole declivity; body length: 4.47–5.50 mm, 2.65× as long as wide.

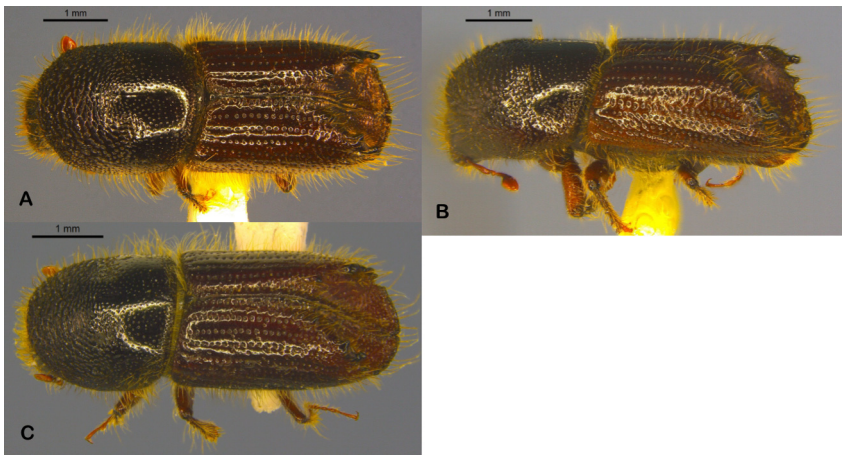


**FIGURE 36**. *Ips stebbingi*. Male: dorsal view **A**, lateral view **B**; female: dorsal view **C**.

The costa of apical margin of elytral declivity in female less prominent than male; body length: 5.25–5.30 mm.

**Material examined:** New records: India: 10 ♂'s, 6 ♀'s. Kashmir, Anantnag, Achabal (33° 40′58.74″ N, 075° 13′22.89″ E, 5505 ft.), A.A. Buhroo, 09.08.2011 (KUIC). Kashmir, Baramulla, Check post Gulmarg (34° 03.797′ N, 074° 24.948′ E, 7552 ft.), A.A. Buhroo, 25.05.2017 (KUIC). Kashmir, Kupwara, Tangdhar (34° 23.527′ N, 073° 51.894′ E, 6525 ft.), A.A. Buhroo, 10.07.2017 (KUIC). Kashmir, Anantnag, Daksum (33° 36.120′ N, 075° 27.595′ E, 8975 ft.), A.A. Buhroo, 08.09.2017 (KUIC). Kashmir, Baramulla, Boniyar (34° 07.405′ N, 074° 10.717′ E, 5715 ft.), A.A. Buhroo, 30.09.2017 (KUIC). Kashmir, Bandipora, Nail Gurez (34° 39.109′ N, 074° 44.028′ E, 7895 ft.), A.A. Buhroo, 18.08.2018 (KUIC). Kashmir, Bandipora, Chorwan Gurez (34° 39.242′ N, 074° 53.581′ E, 8275 ft.), A.A. Buhroo, 17.08.2018 (KUIC). Kashmir, Baltal Sonamarg (34° 16.018′ N, 075° 23.794′ E, 10080 ft.), A.A. Buhroo, 31.08.2018 (KUIC). Kashmir, Baramulla, Baba Reshi (34° 03.92′ N, 074° 24.54′ E, 7600 ft.), A.A. Buhroo, 10.07.2019 (KUIC).

**Distribution:** India: Himachal Pradesh, Kashmir, Punjab, Uttarakhand. Afghanistan, Bhutan, Nepal, Pakistan, China: Xizang

**Hosts:** *Abies pindrow*, *Picea smithiana*, *Pinus gerardiana*, *P. wallichiana* (Pinaceae)

**Phylogenetic assessment:**
A phylogenetic analysis of the Himalayan species *Ips stebbingi*, *I. longifolia* and *I. schmutzenhoferi* Holzschuh, 1988 was carried out using the COX-1 genes to determine the monophyly and sister groups of each species (Fig. 37). According to the NJ tree, *Ips stebbingi* and *I. longifolia* formed well-supported sister clades with strong bootstrap values (98%) and the interspecific nucleotide difference between the two clades was more than 8% which is significantly higher than the range of 6.1% observed for *Ips* sister species (Cognato & Sun 2007). The tree also revealed that the Himalayan *Ips* species were separately monophyletic, in contrast to sister groups that made up a different cluster in the analysis.

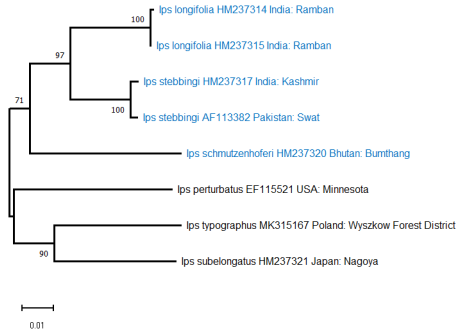


**FIGURE 37.** A phylogenetic tree obtained from the NJ for the COX-1 genes of Himalayan *Ips* (in blue) and related species. Numbers at the branches represent bootstrap values.

## Genus *Pityogenes* Bedel, 1888

*Pityogenes* species are diagnosed by the following morphological characters: body length: 1.5–3.5 mm; body stocky; funicle five-segmented; pronotum large relative to elytra, posterior pronotum punctate, with medial, longitudinal ridged band without punctures; elytral declivity rounded; lateral declivity with two to three declivital margin spines, with the first pair being the largest and down curved in males, female with tubercles; the frons sexually dimorphic, females usually having a central fossa.

## Key to the Himalayan species of *Pityogenes* Bedel, 1888

1 Elytral declivital margins with three almost equal sized, broad based tubercles more distinct in males; female frons with three cavities, larger one on vertex, and other two smaller ones below the vertex on lateral sides . . . . . *P. scitus* Blandford
- Elytral declivital margins with three tubercles of unequal size, more distinct in males; middle one biggest and hooked inwards, placed at the level of 3rd and 4th interstriae; female frons with single cavity with a central round operature . . . . . *P. spessivtsevi* Lebedev

### 29. *Pityogenes scitus* Blandford, 1893a
(Figure 38)

= *Pityophthorus coniferae* Stebbing, 1909

This species is easily diagnosed by the following morphological characters: ♂ frons broadly convex, surface shining, punctures rather small and dense, feebly granulate and with fine sparse hairs; epistomal margin convex with rows of minute hairs; pronotum slightly longer than wide (1.09×), anterior margin uniformly round with weak carina bearing small asperities in a row; lateral sides feebly convex; summit indistinct, placed almost at the middle; anterior slope of pronotum with crescentric rows of asperities, asperities gradually becoming smaller postero-laterally; a distinct shining median line running from summit to posterior margin; disc smooth, shining with small punctures; elytra elongate, 1.4× as long as pronotum and 1.7× as long as wide, anterior margin substraight, lateral sides subparallel, weakly converging posteriorly terminating into convex posterior margin; elytral disc convex, glabrous, striae feebly

marked with small shallow punctures in rows, sutural striae depressed, distinctly marked upto posterior margin, other striae running upto declivity; interstriae flat with scattered punctures; elytral declivity with three almost equal sized, broad based tubercles on both margins, more prominent than in females; head and pronotum blackish brown, elytra light brown; body length: 2.02–2.16 mm, 2.66× as long as wide.

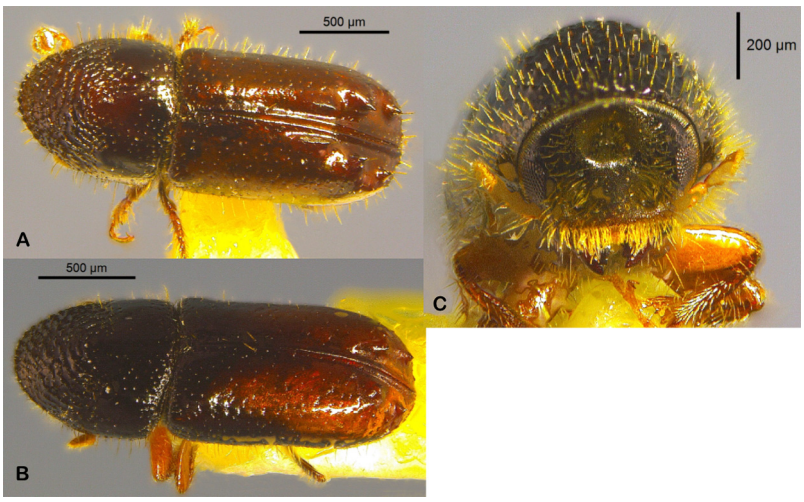


**FIGURE 38**. *Pityogenes scitus*. Male: dorsal view **A**; female: dorsal view **B**; frons **C**.

Females are somewhat smaller than males, frons with three deep cavities in triangular position larger one on vertex, other two are smaller on either side at lower level on the vertex; elytral declivity less broadly impressed, lateral tubercles smaller and almost of equal size; body length: 2.0–2.07 mm.

**Material examined:** New records: India: 14 ♂'s, 6 ♀'s. Kashmir, Budgam, Yousmarg (33° 50.015′ N, 074° 40.131′ E, 7955 ft.), A.A. Buhroo, 29.06.2011 (KUIC). Himachal Pradesh, Shimla, Summer Hill (31° 06.720′ N, 077° 08.355′ E, 6877 ft.), A.A. Buhroo, 20.07.2011 (KUIC). Jammu, Batote, Shampa (33° 07.952′ N, 075° 18.453′ E, 4225 ft.), A.A. Buhroo, 21.05.2017 (KUIC). Kashmir, Kupwara, Marsary (34° 27.264′ N, 074° 00.987′ E, 6750 ft.), A.A. Buhroo, 09.07.2017 (KUIC). Kashmir, Kupwara, Tangdhar (34° 23.527′ N, 073° 51.894′ E, 6525 ft.), A.A. Buhroo, 10.07.2017 (KUIC). Kashmir, Anantnag, Daksum (33° 36.120′ N, 075° 27.595′ E, 8975 ft.), A.A. Buhroo, 08.09.2017 (KUIC). Jammu, Kishtwar, Padder (33° 18.820′ N, 076° 04.492′ E, 7000 ft.), A.A. Buhroo, 09.09.2017 (KUIC). Kashmir, Baramulla, Boniyar (34° 07.405′ N, 074° 10.717′ E, 5715 ft.), A.A. Buhroo, 30.09.2017 (KUIC). Kashmir, Bandipora, Mastan Gurez (34° 37.728′ N, 074° 50.378′ E, 8410 ft.), A.A. Buhroo, 17.08.2018 (KUIC). Kashmir, Srinagar, Hazratbal (University Campus), (34° 07′51.10 ″ N, 074° 50′ 01.09″ E, 5220 ft.), A.A. Buhroo, 30.06.2018 (KUIC). Kashmir, Ganderbal, Baltal Sonamarg (34° 16.018′ N, 075° 23.794′ E, 10080 ft.), A.A. Buhroo, 31.08.2018 (KUIC)

**Distribution:** India: Himachal Pradesh, Kashmir, Punjab, Uttarakhand. China, Nepal, Pakistan

**Hosts:** *Abies pindrow* and *Pinus halepensis* (Pinaceae) (new host records). *Cedrus deodara*, *Picea smithiana*, *Pinus bungeana*, *P. gerardiana*, *P. wallichiana* (Pinaceae)

### 30. *Pityogenes spessivtsevi* Lebedev, 1926

(Figure 39)

This species is diagnosed by the following characters: ♂ with flat frons, somewhat shiny at the middle with scattered minute granules and small hairs, vertex more densely granulate with micro hairs, hairs denser towards epistomal margin; pronotum slightly longer than wide (1.03×), anterior margin with distinct carina bearing few asperities prominent at the middle, lateral sides feebly outcurved, gradually narrowing into a rounded anterior margin; summit distinct placed almost at middle, anterior slope with 6 or 7 crescentric rows of asperities, asperities gradually becoming larger towards anterior margin; a shining median ridge running from summit to posterior margin; discal half of pronotum shining with fine granules and small punctures; elytra 1.5× as long as pronotum, 1.5× as long as wide, basal margin substraight and devoid of carina, discal surface glabrous, sutural line depressed; striae marked

with fine shallow punctures more prominent towards declivity; interstriae much wider than striae, flat with scattered fine punctures and some hairs prominent laterally; declivity commencing on posterior third with three prominent seteferous tubercles of unequal size on both margins, the 1st tubercle at the level of 2nd interstria, smallest in size, almost straight; 2nd one biggest, hooked inward, placed at the level of 3rd and 4th interstriae; 3rd one medium in size and placed at the postero-lateral margin of elytra; body chestnut brown; body length: 2.48–2.54 mm, 2.54× as long as wide.

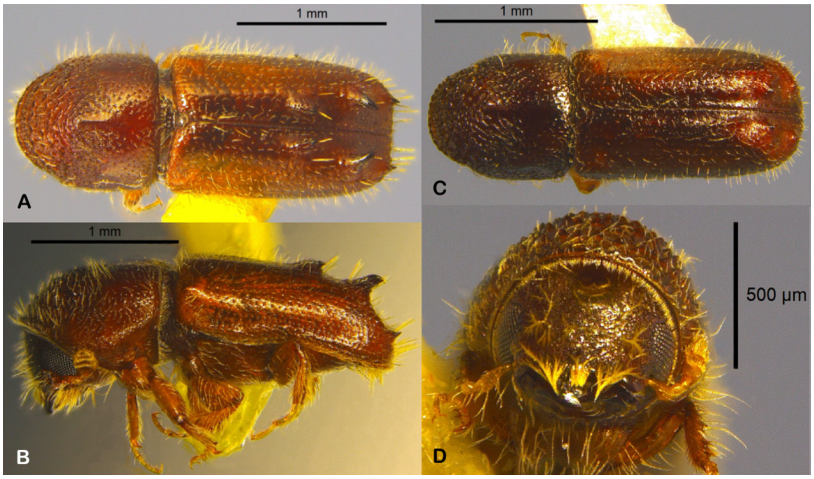


**FIGURE 39.** *Pityogenes spessivtsevi*. Male: dorsal view **A**, lateral view **B**; female: dorsal view **C**, frons **D**.

In females, frons bears a single cavity with a central round operature and declivital margin lined by smaller tubercles; body length: 2.31–2.40 mm.

**Material examined:** New records: India: 4 ♂'s, 2 ♀'s. Kashmir, Baramulla, Check post Gulmarg (34° 03.797′ N, 074° 24.948′ E, 7552 ft.), A.A. Buhroo, 25.05.2017 (KUIC). Kashmir, Thajwas Sonamarg (34° 18.222′ N, 075° 16.388′ E, 9105 ft.), A.A. Buhroo, 30.08.2018 (KUIC). Kashmir, Budgam, Tosamaidan (33° 54′09.89″ N, 074° 33′12.70″ E, 8746 ft.), A.A. Buhroo, 31.07.2019 (KUIC).

**Distribution:** India: Himachal Pradesh, Kashmir, Uttarakhand. China, Kazakhstan, Kyrgyzstan, Tajikistan

**Hosts:** *Picea schrenkiana*, *P. smithiana*, *Pinus gerardiana*, *P. roxburghii*, *P. wallichiana* (Pinaceae)

**Phylogenetic assessment:**

A phylogenetic analysis of the Himalayan species *Pityogenes scitus* and *P. spessivtsevi* was performed using the COX-1 genes to determine their evolutionary relationship with other similar species of the genus (Fig. 40). The NJ tree showed that the Himalayan species (*P. scitus* and *P. spessivtsevi*) formed distinct clades and there was a more than 16% interspecific nucleotide difference between the two species. *Pityogenes scitus*, *P. quadridens* (Hartig, 1834), *P. bistridentatus* (Eichhoff, 1878b), and *P. bidentatus* (Herbst, 1784) belonged to the same monophyletic group. However, *P. spessivtsevi*, was separately monophyletic in the present anylysis. *Pityogenes scitus* diverged from the European *P. quadridens* and *P. bistridentatus* by 12.5–13.5% in interspecific nucleotide divergence. Haplotypes of *P. spessivtsevi* displayed an intraspecific nucleotide divergence of 1.66%.

## Tribe Micracidini LeConte, 1876

### Genus *Pseudothysanoes* Blackman, 1920

*Pseudothysanoes* species are diagonosed by the following morphological characters: body length: 0.7–2.0 mm; eyes entire; antennal funicle with six segments, club oval to elongate without or with up to two procurved sutures; pronotum wider than long with well-developed summit and asperities on anterior half; elytra broadly rounded behind; elytral declivity not sulcate, protibia slender; host: deciduous trees.

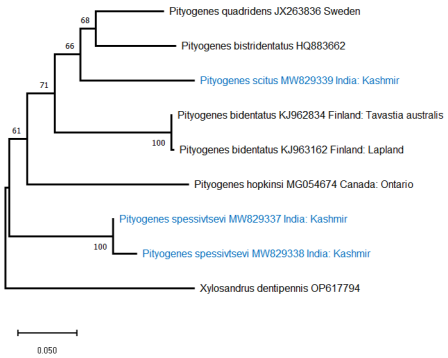


**FIGURE 40.** A phylogenetic tree obtained from the NJ for the COX-1 genes of Himalayan *Pityogenes* (in blue) and related species. Numbers at the branches represent bootstrap values.

### 31. *Pseudothysanoes kashmirica* Buhroo and Knížek, 2020

(Figure 41)

This species is diagnosed by the following morphological characters: ♂ frons flattened with dense erect golden hair-like setae, vertex finely granulated with minute punctures; eyes elongate-oval; antennal scape elongate with few pale hair like setae, funicle with six segments and few pale hair-like setae; antennal club elongate-oval, flattened, sutures 1 and 2 slightly procurved, marked by pale setae; few longish pale setae on its apex; pronotum 1.21× wider than long; widest at base, sides strongly arcuate, very strongly constricted on anterior half, anterior margin from dorsal view narrowly rounded and armed by four protruding serrations bent backwards; summit behind middle; stronger, wide tubercles on anterior slope; posterior part weakly shining, reticulate and punctate; surface of anterior half covered by flattened setae along with thin, erect hair-like setae, somewhat short pubescence in posterior half; scutellum large, rounded, with minute punctures and few setae; elytral surface finely punctured, 1.4× as long as wide, 1.7× as long as pronotum; lateral sides sub-parallel from base to posterior third of the elytra, posterior third evenly rounded to apex, elytral declivity rounded; striae with microscopic hair-like setae; interstriae with erect short flattened setae, on interstriae 1 and on declivital part of interstriae 3 and 9 setae biseriate, on even-numbered interstriae setae biseriate on elytral base, uniseriate on elytral disc and declivity; body length: 1.0–1.4 mm, 2.2× as long as wide.

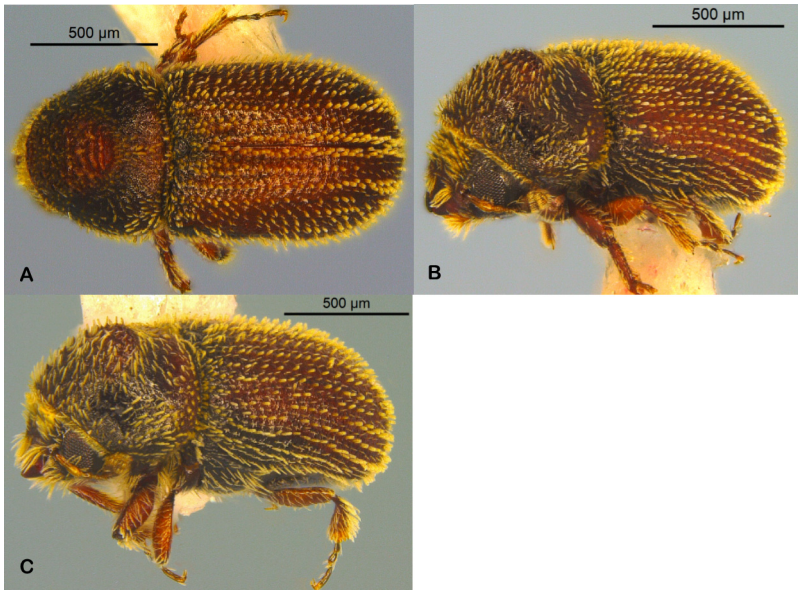


**FIGURE 41**. *Pseudothysanoes kashmirica*. Holotype male: dorsal view **A**, lateral view **B**; allotype: lateral view **C**.

Female similar to male except the apex of the pronotum is less constricted; pubescence on the pronotum and frons longer and relatively sparse compared to male, where it is short, stout and dense; body length: 1.0 mm.

Remarks: This species can be easily distinguished by the uniseriate scale-like setae in *P. modestus* (Murayama, 1940), which are biseriate on the whole length of interstriae 1 and on declivital part of interstriae 3 and 9 in *P. kashmirica.*

**Material examined:** Holotype ♂, Allotype ♀ in KUIC. Type locality: Kashmir, Srinagar, Dachigam National Park, India. Paratypes in KUIC: same data as HT

**Distribution:** India: Kashmir

**Hosts:** *Ulmus villosa* (Ulmaceae)

**Phylogenetic assessment**:

Using information from the COX-1 gene, a phylogenetic analysis of the Kashmir Himalayan species *Pseudothysanoes kashmirica* and other similar species was carried out (Fig. 42). The NJ tree revealed that *P. kashmirica* formed a monophyletic cluster of its haplotypes. The populations of *P. kashmirica* are monophyletic with populations of *P. yuccae* (Wood, 1956) and *P. cf. leechi* Wood, 1980 distributed in the United States. *Pseudothysanoes kashmirica* populations, however, vary from *P. yuccae* populations by an interspecific nucleotide divergence in the range of 20.64–21.77% and from *P. cf. leechi* populations by an interspecific nucleotide divergence in the range of 19.14–22.34%.

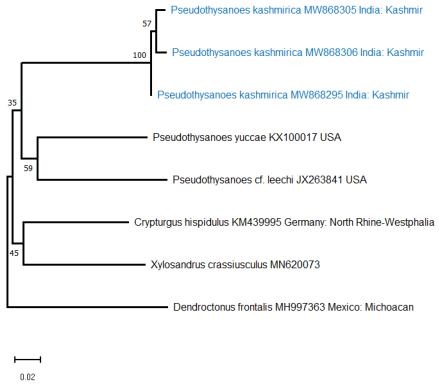


**FIGURE 42.** A phylogenetic tree obtained from the NJ for the COX-1 genes of Himalayan *Pseudothysanoes* (in blue) and related species. Numbers at the branches represent bootstrap values.

## Tribe Polygraphini Chapuis, 1869

## Genus *Carphoborus* Eichhoff, 1864

*Carphoborus* species are diagnosed by the following morphological characters: body length: 1.2–2.1 mm; eyes laterally emarginate; funicle five-segmented, club four-sutured and spatulate (rhomboid); pronotum wider than long; anterior elytral margin granulate; vestiture of short and thick scale-like setae; sexually dimorphic frons: ♀ frons punctured, with corona of short filamentous setae, ♂ frons with two small medial tubercles, and dense short filamentous setae; host: conifers.

This genus can be distinguished from similar *Polygraphus* by the presence of laterally emarginate compound eyes, and raised alternate declivital interstriae at the basal margin.

## Key to the Himalayan species of *Carphoborus* Eichhoff, 1864

1 Female frons with a corona of moderately long pale hairs around the margin; elytral striae marked with large, shallow, close, punctures each with a setose granule; interstriae nearly 1.5× as wide as striae, with much smaller punctures. . . . . *C. costatus* Wichmann

\- Female frons with a single large puncture visible at the middle and a corona of moderately short hairs around the margin; elytral striae deep with small, confused punctures each with a microhair; interstriae more than twice as wide as striae, with large punctures. . . . . *C. zhobi* (Stebbing)

**32. *Carphoborus costatus* Wichmann, 1915**
(Figure 43)

This species is diagnosed by the following morphological characters: ♀ frons plano-convex, surface granulo-reticulate with irregular small, dense punctures, a corona of moderately long pale hairs around the margin of frons, hairs somewhat longer towards epistoma, antero-median portion transversely weakly convex; anterior margin of eyes emarginate; antennal scape elongate, funicle with five segments; antennal club spatulate with three procurved sutures fringed with minute hairs on ventral surface; pronotum 1.42× wider than long, widest almost at middle and weakly converging posteriorly, strongly narrowing anteriorly towards rounded apex; a dorsal median short ridge visible; surface convex coarsely reticulate punctate, punctures shallow, small, closely placed and covered with short scale-like setae; elytra 1.34× as long as wide, 2.78× as long as pronotum, anterior margin convex with 10–11 crenulations, small granules on elytral base; striae well marked with large, shallow, close, punctures each with a setose granule becoming somewhat smaller on declivity; interstriae nearly 1.5× as wide as striae, surface convex with irregularly placed much smaller punctures; interstrial vestiture of short scales and erect bristles, more prominent on declivity; declivity short and steep marked with distinct tubercles on interstriae 1, 3, 5, 7 and 9; interstriae 3 and 9 much swollen and converge to meet before reaching apex; declivital margin roughened with denticles; body dark-brown, body length: 1.74–1.78 mm, 2.14× as long as wide.

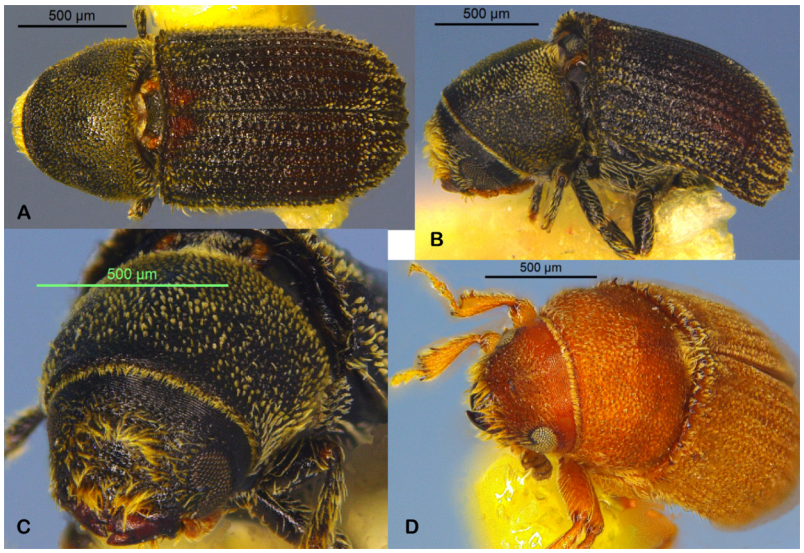


**FIGURE 43.** *Carphoborus costatus*. Female: dorsal view **A**, lateral view **B,** frons **C**; male: frons **D**.

Males slightly smaller than females, frons with sparse hairs not forming corona but a pair of minute, transversely placed, fused tubercles on the middle; body length: 1.49–1.70 mm.

**Material examined:** New records: India: 4 ♂'s, 6 ♀'s. Himachal Pradesh, Shimla, Summer Hill (31° 06.927′ N, 077° 08.503′ E, 6850 ft.), A.A. Buhroo, 15.07.2011 (KUIC). Jammu, Batote, Shampa (33° 07.952′ N, 075° 18.453′ E, 4225 ft.), A.A. Buhroo, 21.05.2017 (KUIC). Kashmir, Srinagar, Shankerachariya (34° 04.678′ N, 074° 50.789 E, 5875 ft.), A.A. Buhroo, 29.09.2017 (KUIC).

**Distribution:** India: Himachal Pradesh, Jammu and Kashmir, Uttarakhand

**Hosts:** *Pinus halepensis* (Pinaceae) (new host record). *Pinus greggii*, *P. ponderosa*, *P. roxburghii*, *P. wallichiana* (Pinaceae)

**33. *Carphoborus zhobi* (Stebbing, 1909)**
(Figure 44)

= *Phloeosinus zhobi* Stebbing, 1909

This species is diagnosed by the following morphological characters: ♀ frons plano-convex, surface reticulo-punctate with dense small punctures, a single large puncture visible at the middle of shining median area; a corona of moderately short hairs around the margin of frons, short erect bristles visible around the corona laterally; epistomal margin with a fringe of long, dense, pale hairs; eyes emarginate; antennae yellow, funicle five-segmented, club four-sutured; pronotum 1.47× as wide as long, widest at basal third, constricted anteriorly towards rounded apex; surface convex, reticulate punctate with small punctures, a median longitudinal raised line forming a distinct carina on basal half; surface with a mixture of short scales and erect bristles; elytra 1.49× as long as wide, 2.34× as long as pronotum, anterior margin convex with 10 or 11 crenulations, small granules on elytral base; striae deep with small, confused punctures each with a microhair; interstriae more than twice as wide as striae, surface convex, coarsely reticulate with irregular large punctures; interstrial surface with 2–3 irregular rows of short scales and some erect bristles, bristles more denser laterally and on declivity; declivity short and steep, interstriae 1, 3, 5, 7 and 9 raised and marked with distinct tubercles; interstriae 3 and 9 meet with each other before reaching apex; declivital margin roughened with denticles; body dark-brown, body length: 1.80–1.88 mm, 2.2× as long as wide.

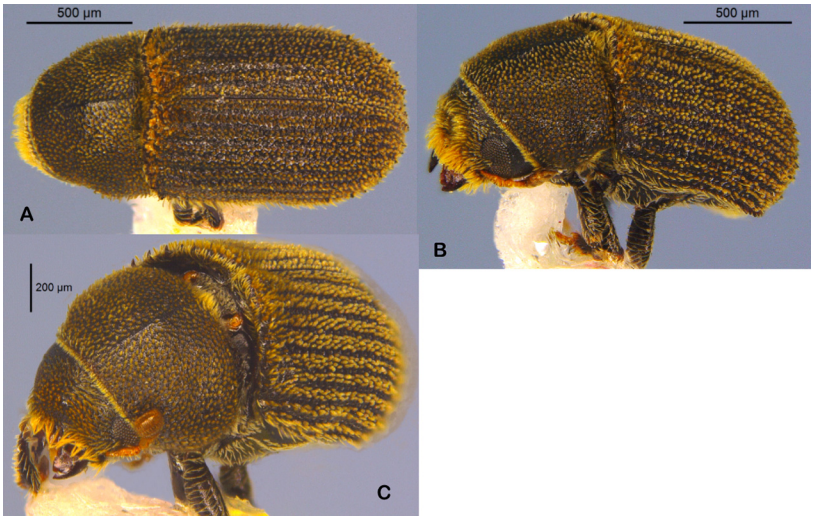


**FIGURE 44.** *Carphoborus zhobi*. Female: dorsal view **A**, lateral view **B**; male: fronto-lateral view **C**.

Males slightly larger than females, frons with moderately abundant scale-like setae not forming corona but with a pair of minute, transversely placed, fused tubercles on the middle; body length: 2.0–2.05 mm.

**Material examined:** New records: India: 2 ♂'s, 4 ♀'s. Jammu, Kishtwar, Kundhal Padder (33° 18.820′ N, 076° 04.492′ E, 7000 ft.), A.A. Buhroo, 09.09.2017 (KUIC). Jammu, Kishtwar, Kijaye Padder (33° 16.144′ N, 076° 07.680 E, 6145 ft.), A.A. Buhroo, 09.09.2017 (KUIC).

**Distribution:** India: Himachal Pradesh, Jammu (new record). Pakistan

**Hosts:** *Pinus gerardiana* (Pinaceae)

## Genus *Polygraphus* Erichson, 1836

*Polygraphus* species are diagnosed by the following morphological characters: body length: 1.2–3.5 mm; cylindrical body; bipartite eyes (completely divided into two); funicle five to six-segmented; club flat, leaf like and unsegmented (without sutures); pronotum wider than long, unarmed, smooth, finely, closely punctate; invisible scutellum; anterior elytral margin armed with coarse crenulations; 1st ventrite as long as terminal ventrite; 2nd, 3rd, and 4th ventrites small; presence of scaly short pubescence on elytra; frons sexually dimorphic: male frons rounded, with short, filliform setae and closely placed two medial tubercles at upper level of eyes; female frons with corona of short, filliform setae.

## Key to the species of Himalayan *Polygraphus* Erichson, 1836

1 Body length equal to or more than 3.00 mm . . . . . 2
- Body length less than 3.00 mm . . . . . 4
2 Elytra three times longer than pronotum; antennal club with broader apex. . . . . *P. aterrimus* Strohmeyer
- Elytra less than or two times longer than pronotum; antennal club with pointed apex . . . . . 3
3 Female frons with two tufts of long hairs around the upper margin of concavity almost touching each other at the middle of frons . . . . . *P. major* Stebbing
- Female frons with two prominent, reddish-golden brushes of long hairs around the upper and lateral margins of frons, curled inwards and downwards not joining medially . . . . . *P. trenchi* Stebbing
4 Female frons with a pair of transverse tubercles . . . . . 5
- Female frons without a pair of transverse tubercles; but with fringe of incurved, golden hairs along upper and lateral margins . . . . . *P. difficilis* Wood
5 Elytral interstriae with a row of widely spaced long, erect, scale-like setae and ground cover of very short blunt, feathery scales and fine hairs . . . . . *P. setosus* Schedl
- Elytral interstriae without a row of longer, erect setae; rather roughened with small granules; interstriae nearly 3× as wide as striae . . . . . 6
6 Male frons shallowly concave with thick, curled tuft of hairs, touching each other at the middle of frons, covering frontal two-third portion; elytra 2.1× as long as pronotum; discal striae 1 and 2 distinctly impressed up to the commencement of declivity; interstria 2 terminating at the commencement of declivity . . . . . *P. pini* Stebbing
- Male frons flattened with a distinct fringe of short curled golden yellowish hairs around the margin of vertex upto posterior margin of eyes; elytra 1.8× as long as pronotum; discal striae not impressed; declivity impressed along stria 1; declivital interstriae 1 and 3 elevated, marked by blunt scales . . . . . *P. longifolia* Stebbing

### 34. *Polygraphus aterrimus* Strohmeyer, 1908b

(Figure 45)

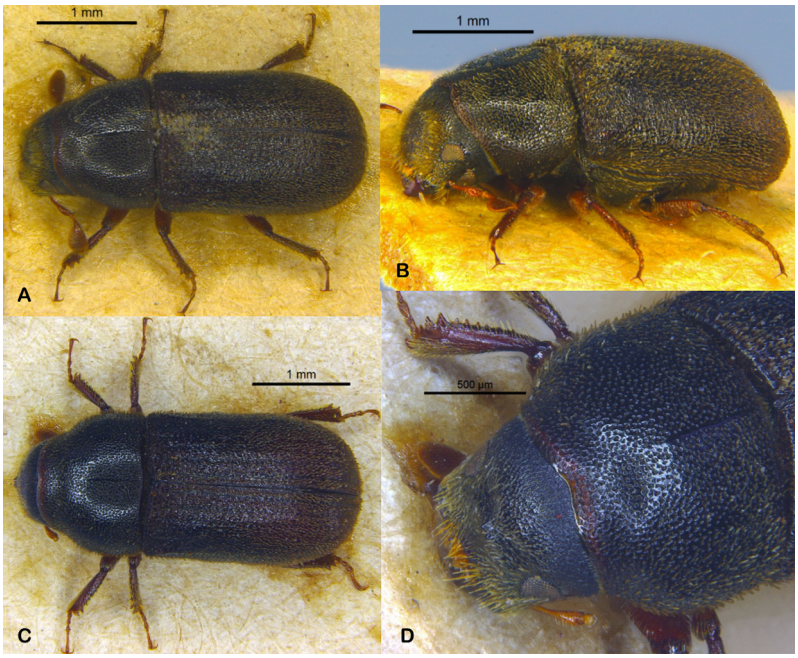


**FIGURE 45.** *Polygraphus aterrimus*. Male: dorsal view **A**, lateral view **B**; female: dorsal view **C**, frons **D**.

This species is diagnosed by the following morphological characters: ♂ frons plano-concave, entire surface with close dense punctures and erect hairs denser on margin forming a ring, hairs not touching each other at tips; eyes completely divided into two parts; antennal scape long; funicle with five segments; club obtuse with fine pubescence; pronotum 1.3× wider than long, median line distinct, basal margin substraight, lateral sides outcurved and suddenly narrowing before emarginate anterior margin; surface shining with distinct dense punctures and small scale-like setae; scutellum depressed; elytra 1.47× as long as its width, three times longer than pronotum, basal margin somewhat substraight with weak crenulations, lateral sides subparallel upto basal three fourth, thence broadly

rounded posteriorly; discal striae marked by punctures, each with a microhair; striae 1 and 2 more impressed than others; interstriae nearly three times wider than striae with small irregular punctures intermixed with short, blunt setae; interstriae toward basal margin more roughened and granulate; declivity commencing on posterior fourth, face convex and steep, stria 1 impressed; head pitchy black, pronotum and elytra dark brown; body length: 3.48 mm, 2.43× as long as wide.

Females are armed with a pair of frontal tubercles and slightly larger than males; body length: 3.52 mm.

**Material examined:** New record: India: 1 ♂, 1 ♀. Himachal Pradesh, Shimla, Tharoch (30° 56′53.67″ N, 77° 36′33.58″ E, 6338 ft.), A.A. Buhroo, 15.07.2011 (KUIC).

**Distribution:** India: Himachal Pradesh, Uttarakhand, Thailand

**Hosts:** *Abies pindrow*, *Cedrus deodara*, *Pinus roxburghii*, *P. wallichiana* (Pinaceae)

### 35. *Polygraphus difficilis* Wood, 1988b

(Figure 46)

This species is diagnosed by the following morphological characters: ♀ body not so elongated; frons moderately concave on central half, concave area with fringe of incurved, golden hairs along upper and lateral margins, longest setae on vertex could extend two-thirds of distance to epistoma; eyes rather large, two-thirds divided by deep emargination; antennal funicle six-segmented; club rather small, ovate, with acute apex; pronotum 1.3× as wide as long; widest on basal third, lateral sides arcuate with broadly rounded anterior margin and a strong constriction just in front of it; surface smooth, shining with dense, small punctures and covered with short, fine hairs; scutellum indistinct; elytra 1.45× as long as its width, 1.9× as long as pronotum, lateral sides almost parallel upto basal three fourth, broadly rounded posteriorly; striae not impressed, punctures in obscure rows; interstriae more than three times as wide as striae, punctures slightly smaller than those of striae, close, confused; declivity steep, convex except shallowly sulcate on interstria 2; striae not indicated; interstriae 1 weakly elevated, 1 and 3 each armed by a row of small tubercles; vestiture of small rather sparse, pale interstrial scales; body reddish-brown, body length: 2.04–2.18 mm, 2.36× as long as wide.

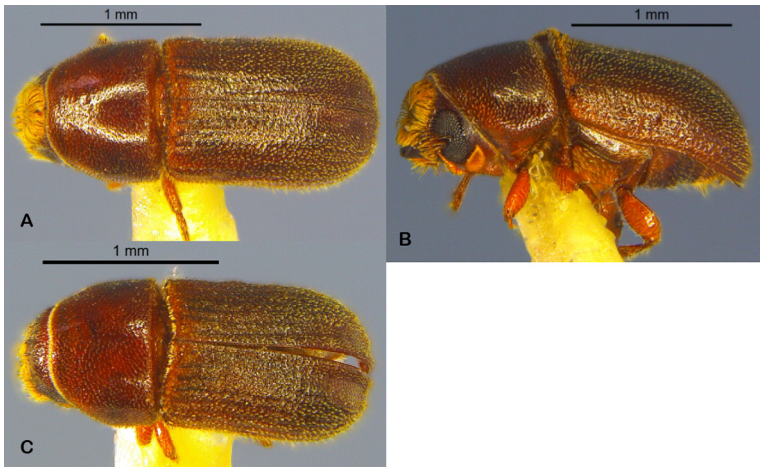


**FIGURE 46.** *Polygraphus difficilis*. Female: dorsal view **A**, lateral view **B**; male: dorsal view **C**.

Males differ from females in their frons being transversely impressed on lower third, convex above, armed by a transverse pair of rather widely spaced tubercles at upper level of eyes; body length: 1.76–1.93 mm.

**Material examined:** New Records: India: 2 ♂′s, 3 ♀′s. Jammu, Batote, Shampa (33° 07.952′ N, 075° 18.453′ E, 4225 ft.), A.A. Buhroo, 21.05.2017 (KUIC). Himachal Pradesh, Sanwara, Solan (30° 88.677′ N, 076° 99.854′ E, 4065 ft.), A.A. Buhroo, 20.02.2018 (KUIC).

**Distribution:** India: Himachal Pradesh, Jammu, Uttarakhand

**Hosts:** *Pinus roxburghii* (Pinaceae)

**36. *Polygraphus longifolia* Stebbing, 1903**
(Figure 47)

= *himalayensis* Stebbing, 1908

This species is diagnosed by the following morphological characters: ♂ body elongated and cylindrical; frons flattened, with minute round punctures each with a microhair, hairs moderately dense and longer towards epistomal margin; a distinct fringe of short curled golden yellowish hairs around the margin of vertex upto posterior margin of eyes; a distinct impunctate, broad area at the middle of the fringe extending as a longitudinal line on the vertex; antennal club ovate with rounded apex; pronotum 1.3× wider than long, widest at base, lateral sides rather constricted just before substraight anterior margin; pronotal surface smooth, shinning with small distinct punctures each with a microhair, a short longitudinal impunctate line at the middle of the pronotal disc; scutellum depressed; elytra 1.37× as long as its width, 1.8× as long as pronotum, basal margin weakly outcurved with weak crenulations extending upto interstria 7; elytral disc and declivity roughened; striae not impressed, punctures obscure; interstriae 2–3× as wide as striae, punctures close, confused, with some irregular granules; declivity gradually sloping, surface plano-convex, but impressed along stria 1; interstriae 1 and 3 elevated at declivital surface, marked by blunt scales; interstriae roughened with small granules; elytral surface covered with vestiture of small scales; body redish brown, body length: 2.33–2.71 mm, 2.40× as long as wide.

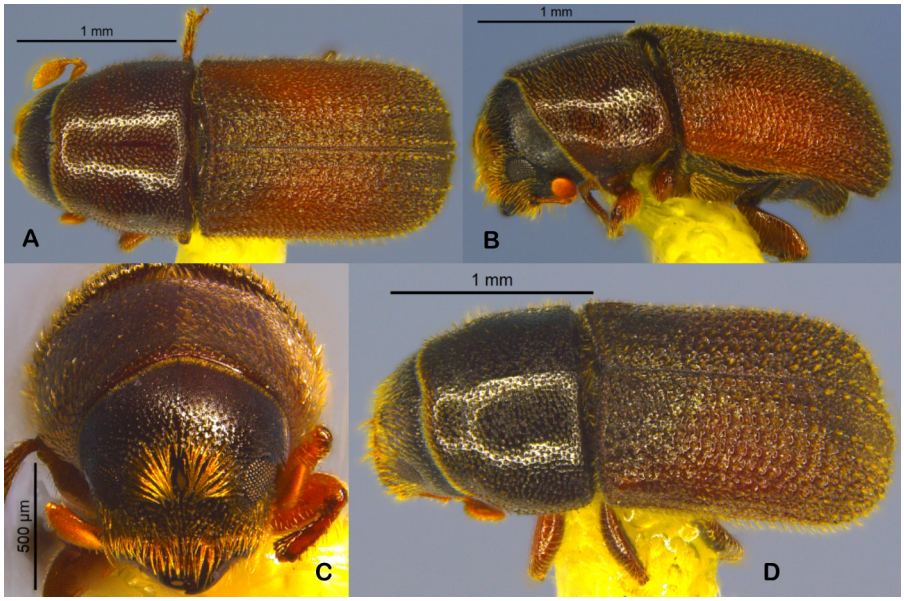


**FIGURE 47.** *Polygraphus longifolia*. Male: dorsal view **A**, lateral view **B**, frons **C**; female: dorso-lateral view **D**.

Females lack fringe of curled hairs on frons but have a pair of median tubercles; elytral interstriae with more distinct granules; body length: 2.53–2.60 mm.

**Material examined:** New records: India: 5 ♂'s, 3 ♀'s. Jammu, Ramsu, Sarbagni (33° 19.806′ N, 075° 11.984′ E, 3880 ft.), A.A. Buhroo, 20.05.2017 (KUIC). Jammu, Ramban, Batricheshma (33° 17.545′ N, 075° 10.597′ E, 3640 ft.), A.A. Buhroo, 20.05.2017 (KUIC). Jammu, Batote, Shampa (33° 07.952′ N, 075° 18.453′ E, 4225 ft.), A.A. Buhroo, 21.05.2017 (KUIC). Himachal Pradesh, Sanwara, Solan (30° 88.677′ N, 076° 99.854′ E, 4065 ft.), A.A. Buhroo, 20.02.2018 (KUIC). Himachal Pradesh, Dalhousie, Banikhet (32° 32.939 N, 075° 57.027′ E, 5490 ft.), A.A. Buhroo, 27.09.2018 (KUIC).

**Distribution:** India: Himachal Pradesh, Jammu, Uttarakhand

**Hosts:** *Pinus roxburghii* (Pinaceae)

**37. *Polygraphus major* Stebbing, 1903**
(Figure 48)

This species is diagnosed by the following morphological characters: ♀ frons plano-concave, with shiny surface and dense punctures throughout; tufts of long hairs around the upper margin of concavity almost touching each other at the middle of frons; eyes deeply emarginated; antennal club acute; pronotum 1.26× wider than long with distinct median line; basal margin substraight, lateral sides somewhat convex; surface shiny with dense punctures and scale-like setae; scutellum indistinct; elytra 1.52× as long as its width, 1.90× as long as pronotum, lateral sides subparallel upto basal three fourth, narrowing posteriorly with rounded apex; stria 1 distinctly impressed; other striae marked by minute shallow punctures, each with a microhair; interstriae with irregular minute punctures and granules, with vestiture of short scale-like setae; declivity convex and declivital interstriae 1 elevated, with uniseriate sparse granules intermixed with punctures; body dark-brown, body length: 3.33–3.40 mm, 2.46× as long as wide.


**FIGURE 48.** *Polygraphus major.* Female: dorsal view **A**, lateral view **B**; male: dorso-lateral view **C**.

In males, the frons is without tufts of hairs but has a pair of closely placed tubercles on the middle of the frons; body length: 3.10–3.17 mm.

Remarks: The species can be distinguished from *P. aterrimus* by its tuft of hairs on frons.

**Material examined:** New records: India: 9 ♂'s, 4 ♀'s. Kashmir, Budgam, Yousmarg (33° 50.015′ N, 074° 40.131′ E, 7955 ft.), A.A. Buhroo, 29.06.2011 (KUIC). Kashmir, Verinag, Halan (33° 29.365′ N, 075° 16.394′ E, 7132 ft.), A.A. Buhroo, 29.06.2011 (KUIC). Jammu, Ramban, Batote (33° 06.844′ N, 075° 18.512′ E, 5318 ft.), A.A. Buhroo, 21.05.2017 (KUIC). Kashmir, Baramulla, Tangmarg Dharhama (34° 03.121′ N, 074° 28.377′ E, 7955 ft.), A.A. Buhroo, 25.05.2017 (KUIC). Kashmir, Kupwara, Marsary (34° 27.264′ N, 074° 00.987′ E, 6750 ft.), A.A. Buhroo, 09.07.2017 (KUIC). Kashmir, Kupwara, Tangdhar (34° 23.527′ N, 073° 51.894′ E, 6525 ft.), A.A. Buhroo, 10.07.2017 (KUIC). Kashmir, Anantnag, Daksum (33° 36.120′ N, 075° 27.595′ E, 8975 ft.), A.A. Buhroo, 08.09.2017 (KUIC). Kashmir, Bandipora, Mastan Gurez (34° 37.728′ N, 074° 50.378′ E, 8410 ft.), A.A. Buhroo, 17.08.2018 (KUIC). Kashmir, Bandipora, Chorwan Gurez (34° 39.242′ N, 074° 53.581′ E, 8275 ft.), A.A. Buhroo, 17.08.2018 (KUIC).

**Distribution:** India: Himachal Pradesh, Punjab, Jammu and Kashmir, Uttarakhand. Bhutan, China, Nepal.

**Hosts:** *Abies pindrow*, *Cedrus deodara*, *Picea smithiana*, *Pinus gerardiana*, *P. wallichiana* (Pinaceae).

**38. *Polygraphus pini* Stebbing, 1914**
(Figure 49)

= *minor* Stebbing, 1903

This species is diagnosed by the following morphological characters: ♂ frons shallowly concave, surface shiny with

punctures, denser towards epistoma; thick, curled tuft of hairs, touching each other at the middle of frons, covering frontal two-third portion; pronotum 1.3× wider than long; surface shiny, median line inconspicuous, with distinct, dense punctures and moderately fine hairs; scutellum submerged; elytra 1.54× as long as its width, 2.1× as long as pronotum, basal margin weakly crenulate; discal striae 1 and 2 distinctly impressed up to the commencement of declivity; striae marked by shallow punctures; interstriae nearly three times as wide as striae, surface roughened, marked with small granules, becoming distinct towards declivity and covered with irregular rows of short scale-like setae; declivity strongly convex; striae 1 and 2 indistinct; interstria 1 marked by granules and scale-like setae; interstria 2 terminating at the commencement of declivity, others also well marked with small granules; body dark-brown, body length: 2.10–2.16 mm, 2.46× as long as wide.

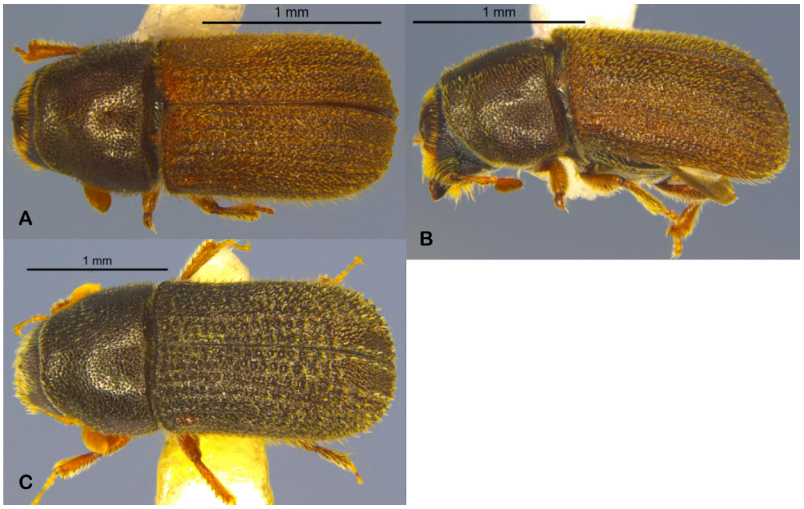


**FIGURE 49.** *Polygraphus pini*. Male: dorsal view **A**, lateral view **B**; female: dorsal view **C**.

Females are similar to males but the frons is devoid of any tuft of hairs but with a pair of tubercles at its middle; elytral interstriae are roughened with somewhat distinct granules; body length: 2.49–2.63 mm.

**Material examined:** New records: India: 5 ♂'s, 5 ♀'s. Kashmir, Anantnag, Achabal (33° 40′58.74′ N, 075° 13′22.89′ E, 5505 ft.), A.A. Buhroo, 09.08.2011 (KUIC). Jammu, Ramban, Batote (33° 06.844′ N, 075° 18.512′ E, 5318 ft.), A.A. Buhroo, 21.05.2017 (KUIC). Jammu, Ramban, Dugalaid Batote (33° 07.053′ N, 075° 18.967′ E, 5420 ft.), A.A. Buhroo, 21.05.2017 (KUIC). Kashmir, Kupwara, Tangdhar (34° 23.527′ N, 073° 51.894′ E, 6525 ft.), A.A. Buhroo, 10.07.2017 (KUIC). Kashmir, Anantnag, Daksum (33° 36.120′ N, 075° 27.595′ E, 8975 ft.), A.A. Buhroo, 08.09.2017 (KUIC). Kashmir, Baramulla, Boniyar (34° 07.405′ N, 074° 10.717′ E, 5715 ft.), A.A. Buhroo, 30.09.2017 (KUIC). Kashmir, Bandipora, Chorwan Gurez (34° 39.242′ N, 074° 53.581′ E, 8275 ft.), A.A. Buhroo, 17.08.2018 (KUIC). Kashmir, Thajwas Sonamarg (34° 18.222′ N, 075° 16.388′ E, 9105 ft.), A.A. Buhroo, 30.08.2018 (KUIC). Himachal Pradesh, Dalhousie, Banikhet (32° 32.939′ N, 075° 57.027′ E, 5490 ft.), A.A. Buhroo, 27.092018 (KUIC).

**Distribution:** India: Himachal Pradesh, Jammu and Kashmir, Punjab, Uttarakhand

**Hosts:** *Abies pindrow*, *Cedrus deodara*, *Picea smithiana*, *Pinus wallichiana* (Pinaceae)

### 39. *Polygraphus setosus* Schedl, 1979

(Figure 50)

This species is diagnosed by the following morphological characters: ♀ frons transversely depressed, with indistinct fine punctures and short fine hairs, longer and denser on epistomal margin, a pair of median transversely set tubercles at the upper level of eyes; pronotum 1.63× wider than long with a distinct, median, longitudinal, impunctate line upto basal two-third, anterior-third with a transverse coller-like depression; surface shiny, convex with fine punctures, each puncture with recumbent fine hair; basal margin with a sharp transverse ridge; scutellum indistinct; elytra 1.57× as long as its width, 2.56× as long as pronotum, lateral sides subparallel, converging into a rounded apex;

anterior margin distinctly asperate throughout, surface convex and roughened with some granules; discal striae 1, 2 and 3 with some granules and those on others indistinct but with roughened surface; interstria 1 distinctly marked up to apex, interstria 2 distinct upto declivity and rest feebly marked; interstrial surface with a row of widely spaced long, erect, scale-like setae and ground cover of very short blunt, feathery scales and fine hairs; declivity distinct on posterior third, surface weakly convex, but sharply declivous with distinct scale-like setae; interstriae 1, 2 and 3 with some granules; striae 1, 2 and 3 somehow prominent, rest indistinct; head and pronotum black, elytra dark-brown; body length: 2.28 mm, 2.32× as long as wide.

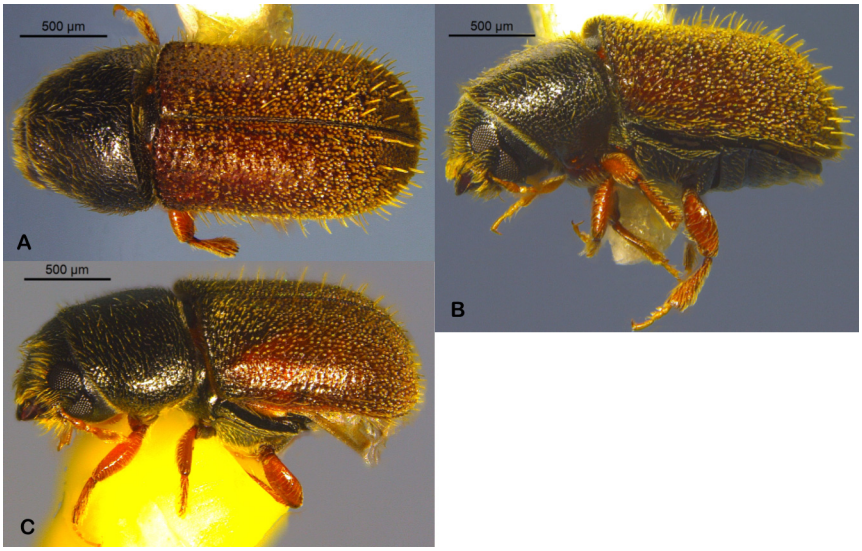


**FIGURE 50.** *Polygraphus setosus.* Female: dorsal view **A**, lateral view **B**; male: lateral view **C**.

Male frons shallowly concave with sparse, hairs becoming longer on upper, lateral and epistomal margins and without a pair of tubercles on frons; body lenth: 2.23–2.30 mm.

**Material examined:** New records: India: 2 ♂'s, 1 ♀. Himachal Pradesh, Dalhousie, Banikhet (32° 32.939 N, 075° 57.027′ E, 5490 ft.), A.A. Buhroo, 27.09.2018 (KUIC).

**Distribution:** India: Himachal Pradesh, Punjab, Uttarakhand

**Hosts:** *Pinus roxburghii* (Pinaceae)

### 40. *Polygraphus trenchi* Stebbing, 1905

(Figure 51)

This species is diagnosed by the following morphological characters: ♀ frons plano-concave, surface shiny; two prominent, reddish-golden brushes of long hairs around the upper and lateral margins of frons, curled inwards and downwards without intersecting medially to about halfway and then continue in two thin strands, a few separate hairs covering the inner surface of eyes also meet the thin strands; antennal club ovate with pointed apex; pronotum 1.38× wider than long; lateral sides somewhat rounded on the basal half, narrowly constricted towards anterior third; a median conspicuous longitudinal raised line on pronotum, surface shining with minute punctures each with a fine hair, lateral margins set with moderate scales; scutellum depressed; elytra 1.43× as long as its width, twice as long as pronotum; basal margin crenulate, lateral sides somewhat parallel on basal two third, converging posteriorly into a rounded apex; striae narrow, marked with small round punctures on basal half of disc becoming much smaller posteriorly, striae 1 more impressed upto declivity; interstriae nearly four times wider than striae with close, fine granulations becoming larger and wider apart in apical fourth, interstrial surface with dense short scale-like setae; declivity convex with rows of minute interstrial granules; body moderately shining, dark brown; body length: 3.08–3.15 mm, 2.44× as long as wide.

Males are smaller than females; frons has few sparse yellow hairs and two small, median tubercles, placed transversely; body length: 2.90–2.97 mm.

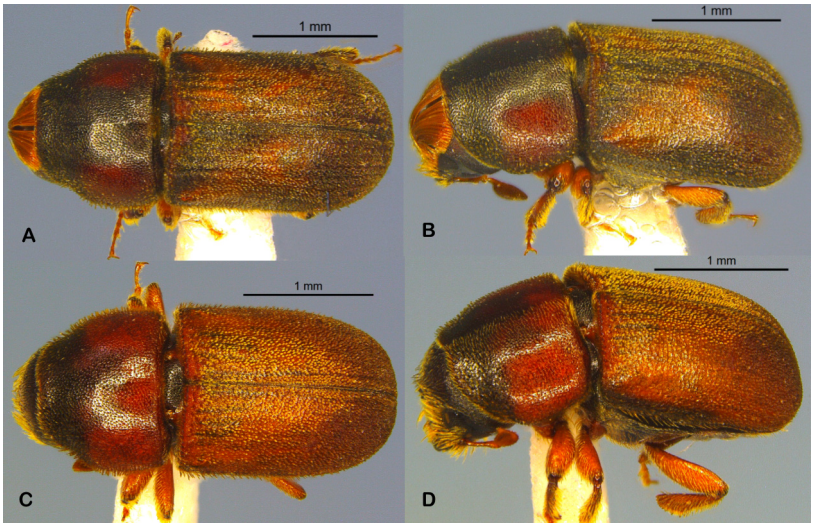


**FIGURE 51.** *Polygraphus trenchi*. Male: dorsal view **A**, lateral view **B**; female: dorsal view **C**, lateral view **D**.

Remarks: The position and configuration of frontal brushes in females serve as a diagnostic feature in the identification of this species.

**Material examined:** New records: India: 2 ♂'s, 2 ♀'s. Jammu, Kishtwar, Kundhal Padder (33° 18.820′ N, 076° 04.492′ E, 7000 ft.), A.A. Buhroo, 09.09.2017 (KUIC). Jammu, Kishtwar, Kijaye Padder (33° 16.144′ N, 076° 07.680 E, 6145 ft.), A.A. Buhroo, 09.09.2017 (KUIC).

**Distribution:** India: Jammu (new record), Punjab, Pakistan

**Hosts:** *Pinus gerardiana* (Pinaceae)

**Phylogenetic assessment**:

The phylogenetic treatment of the Himalayan *Polygraphus* along with other closely related species was carried out using the COX-1 genes to examine the monophyly and sister groups of each species (Fig. 52). The NJ tree showed that *P. trenchi* populations are monophyletic with *P. proximus* Blandford, 1894 populations distributed in Russia and that they differ from them by 14.73–14.89%, while *P. pini* populations formed a separate monophyletic cluster with well-supported bootstrap values and that their intraspecific nucleotide difference was between 0.5–1.92%. The research also revealed that *P. trenchi* and *P. major* differed by 14.07%, whilst *P. major* and *P. pini* were 15.37% dissimilar.

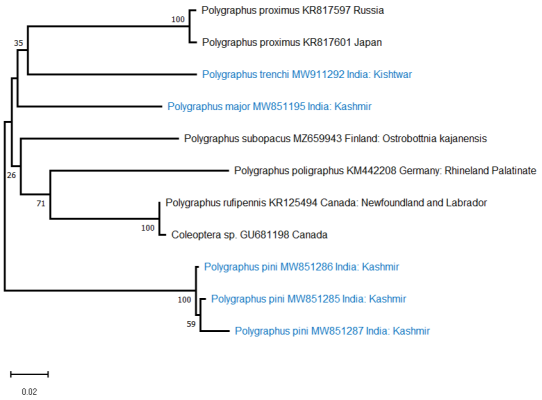


**FIGURE 52.** A phylogenetic tree obtained from the NJ for the COX-1 genes of Himalayan *Polygraphus* (in blue) and related species. Numbers at the branches represent bootstrap values.

**Tribe Scolytini Latreille, 1804**

**Genus *Scolytus* Geoffroy, 1762**

*Scolytus* species are distinguished by the following morphological characters: body length: 1.5–7 mm; anterior margin of compound eye sinuate to slightly emarginate; scape shorter than seven-segmented funicle, club large, oval usually pubescent, sutures medially bowed in acute angle; pronotum large, anteriorly constricted; posterior and lateral margins sharply bordered; scutellum large; declivity absent (elytra posteriorly flat); abdomen rising posteriorly from 2nd ventrite towards apex; procoxae contiguous; tibiae smooth produced distally into a long curved spine; sexual dimorphism based on shape of head and setae, abdominal process; host: deciduous trees, one species on conifer.

A key to the species of *Scolytus* Geoffroy, 1762 has been already provided by Mandelshtam & Petrov (2010a), which includes all the Indian species of the genus.

**41. *Scolytus kashmirensis* Schedl, 1958**
(Figure 53)

This species is diagnosed by the following morphological characters: ♂ frons plano-concave, surface rugose punctate except a median smooth area, a short median raised line above epistoma upto the smooth area; lateral margins of frons with two parallel rows of long, erect setae; eyes much elongated with a wide shallow emargination anteriorly; pronotum as wide as long (1.03×), constricted and impressed near the anterior margin; surface shiny with minute punctures on pronotal disc, denser towards apex; pronotum black on anterior 2/3, posterior 1/3 of pronotum and elytra light brown in color (with some black shade in the middle of each elytra); scutellum set deeply in scutellar impression, covered with elongated scale-like white setae; elytra 1.11× as long as its width, 1.20× as long as pronotum, strial and interstrial punctures somewhat large, round and shallow, nearly equal in size; the 2nd abdominal ventrite near its anterior border with a low blunt tooth-like structure, posterior margin armed with a lip-like extension in the middle, with a knobbed tooth on each side; lateral sides of pronotum, posterior portion of elytra, 1st, 2nd and 5th abdominal ventrites, and hind legs covered by long hair-like setae, setae much longer on posterior elytra and hind legs; body lenth: 3.72–4.30 mm, 2.38× as long as wide.

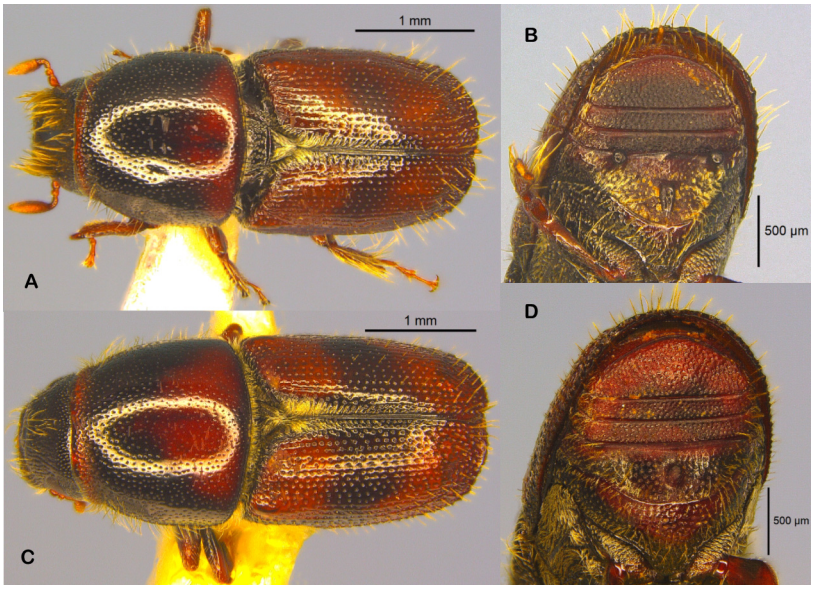


**FIGURE 53.** *Scolytus kashmirensis*. Male: dorsal view **A**, abdominal declivity **B**; female: dorsal view **C**, abdominal declivity **D**.

In females, the median tooth on the 2nd abdominal ventrite is much larger, the lip-like structure is strongly reduced, the lateral teeth on the posterior border much smaller and farther apart from each other; frons is covered by sparse hair-like setae throughout; body length: 4.24 mm.

**Material examined:** New records: India: 2 ♂'s, 1 ♀. Kashmir, Anantnag, Danter (33° 43′34.07″ N, 075° 09′13.58″ E, 5270 ft.), A.A. Buhroo, 01.08.2011 (KUIC). Kashmir, Anantnag, Halan Verinag (33° 29.365′ N, 075° 16.394′ E, 7132 ft.), A.A. Buhroo, 22.08.2012 (KUIC). Kashmir, Anantnag, Thajiwara Bijbehara (33° 47.59′ N, 075° 08.67′ E, 5420 ft.), A.A. Buhroo, 07.09.2017 (KUIC).

**Distribution:** India: Kashmir

**Hosts:** *Ulmus villosa*, *U. wallichiana* (Ulmaceae)

### 42. *Scolytus major* Stebbing, 1903

(Figure 54)

= *deodara* Stebbing, 1903
= *minor* Stebbing, 1903

This species is diagnosed by the following morphological characters: ♂ frons plano-convex roughened with minute tubercules and longitudinal aciculations, surface with scattered hairs and median frontal tubercle above epistoma; the epistomal margin feebly concave with a tuft of hairs at the middle directing forward; vertex with dense, minute punctures; eyes much elongated with a wide shallow emargination anteriorly; pronotum slightly wider than long (1.09×), constricted and impressed on anterior lateral margin; surface convex, shining and finely punctate, rather somewhat rugose towards antero-lateral margins with denser and larger punctures than on pronotal disc; a median narrow, longitudinal, smooth area on disc and a few longish scattered hairs laterally in anterior portion; scutellum rather small, triangular and submerged; elytra 1.33× as long as its width, 1.45× as long as pronotum; base of elytral disc rugose, elytral striae and interstriae with punctures of approximately the same size; rows of erect interstrial hair-like setae evident from the base of elytra up to their apex; elytra impressed medially at base and slightly narrowed behind, the outer margins of apical fourth finely serrate, apices separately rounded; abdomen ascending gradually, the anterior margin of 1st ventrite prominent and produced forwards and thickened, 2nd abdominal ventrite convex, 3rdand 4th with a small lateral tubercle on posterior margin, 5th ventrite flat; all ventrites with dense round punctures; body unicolored black; body length: 3.60–3.73 mm, 2.48× as long as wide.

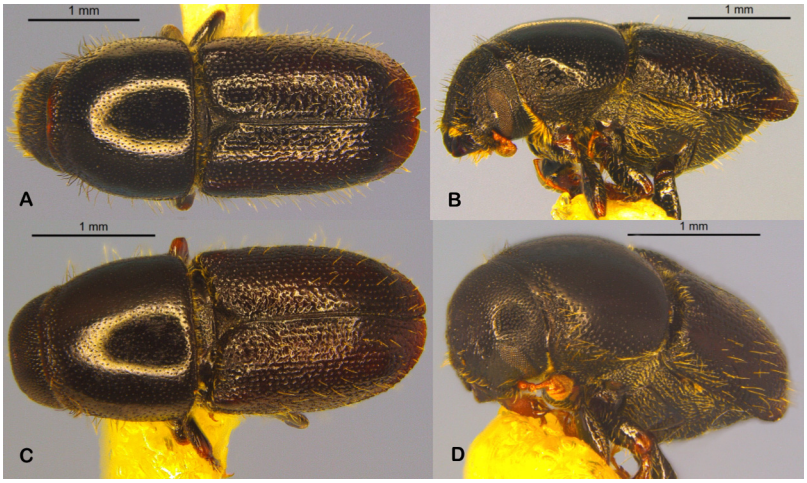


**FIGURE 54.** *Scolytus major*. Male: dorsal view **A**, lateral view **B**; female: dorsal view **C**, fronto-lateral view **D**.

In females, the epistomal margin is without a tuft of hairs at the middle but with a transverse, shallow impression just above the epistoma; frons is more convex with a few hairs on its surface; body length: 3.35 mm.

**Material examined:** New records: India: 2 ♂'s, 1 ♀. Kashmir, Baramulla, Darkash Tangmarg (34° 02.676′ N, 074° 28.360′ E, 6888 ft.), A.A. Buhroo, 25.5.2017 (KUIC). Kashmir, Kupwara, Semari Teetwal (34° 25.032′ N,

073° 48.148′ E, 3670 ft.), A.A. Buhroo, 11.07.2017 (KUIC). Kashmir, Srinagar, Hazratbal (University Campus), (34° 07′51.10 ″ N, 074° 50′ 01.09″ E, 5220 ft.), A.A. Buhroo, 10.08.2019 (KUIC).

**Distribution:** India: Himachal Pradesh, Kashmir, Uttarakhand. Afghanistan, Pakistan

**Hosts:** *Cedrus deodara* (Pinaceae)

### 43. *Scolytus nitidus* Schedl, 1936a

(Figure 55)

This species is diagnosed by the following morphological characters: ♂ frons flat, longitudinally aciculated, with a dense brush of yellowish hair-like setae on either sides sloping from vertex to epistoma; antennal club elliptical with acutely procurved suture, surface with minute, dense pubescence; pronotum slightly wider than long (1.05×), lateral sides somewhat parallel upto middle, moderately narrowing towards substraight anterior margin; anterior pronotum with a subapical coller-like constriction; surface shiny black,with minute and widely separated punctures; scutellum large, scutellar impression covered by white long hair-like setae; elytra dark red brown, 1.09× as long as its width, 1.16× as long as pronotum; elytral strial punctures moderately large, round and shallow, interstrial punctures slightly widely placed than strial punctures; a small subapical elytral constriction visible; 2nd abdominal ventrite ascending abruptly and perpendicularly with a minute pointed tubercle in the middle near its posterior border; body length: 3.08–3.34 mm, 2.40× as long as wide.

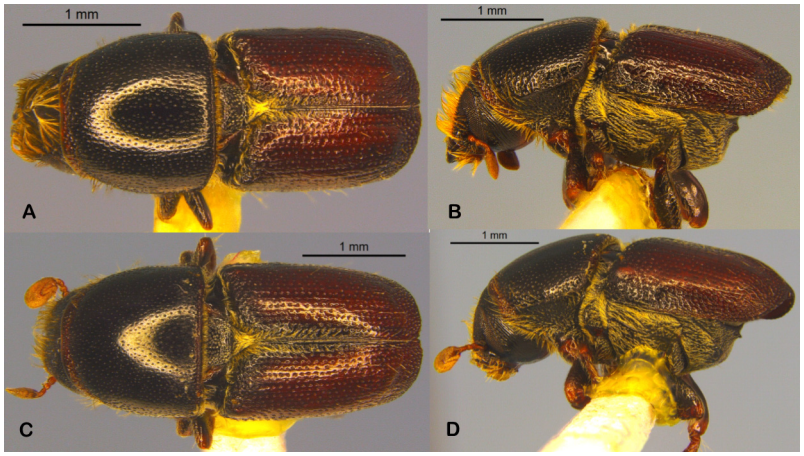


**FIGURE 55.** *Scolytus nitidus*. Male: dorsal view **A**, lateral view **B**; female: dorsal view **C**, fronto-lateral view **D**.

The female similar to male but can be distinguished by somewhat convex frons with sparse long hair-like setae on its surface; the abdominal tubercle is slightly larger in ♂ than in ♀; body length: 3.58–3.64 mm.

**Material examined:** New records: India: 7 ♂'s, 3 ♀'s. Kashmir, Srinagar, Zakura (34° 09′31.49″ N, 074° 50′01.04″ E, 5272 ft.), A.A. Buhroo, 24.09.2012 (KUIC). Kashmir, Baramulla, Darkash Tangmarg (34° 02.676′ N, 074° 28.360′ E, 6888 ft.), A.A. Buhroo, 25.5.2017 (KUIC). Kashmir, Kupwara, Tangdhar (34° 23.527′ N, 073° 51.894′ E, 6365 ft.), A.A. Buhroo, 10.07.2017 (KUIC). Kashmir, Kupwara, Semari Teetwal (34° 25.032′ N, 073° 48.148′ E, 3670 ft.), A.A. Buhroo, 11.07.2017 (KUIC). Kashmir, Ganderbal, Nuner (34° 12′56.26″ N, 074° 47′00.90″E, 5259 ft.), A.A. Buhroo, 18.09.2020 (KUIC). Kashmir, Baramulla, Salamabad Uri (34° 05.186′ N, 074° 01.765′ E, 4415 ft.), A.A. Buhroo, 30.09.2017 (KUIC). Kargil, Poyen (34° 33.692′ N, 076° 08.122′ E, 8710 ft.), A.A. Buhroo, 31.08.2018 (KUIC). Kargil, Hardass (34° 36.371′ N, 076° 05.507′ E, 8770 ft.), A.A. Buhroo, 31.08.2018 (KUIC).

**Distribution:** India: Himachal Pradesh, Kashmir, Ladakh, Uttarakhand. Nepal, Pakistan, China (Xizang)

**Hosts:** *Crataegus songarica* and *Cydonia oblonga* (Rosaceae) (new host records). *Betula utilis* (Betulaceae), *Cotoneaster microphyllus* (Rosaceae), *Juglans regia* (Juglandaceae), *Malus domestica*, *Prunus armeniaca*, *P. avium*, *Sorbus lanata* (Rosaceae)

**44. *Scolytus stepheni* Mandelstam and Petrov, 2010a**
(Figure 56)

This species is diagnosed by the following characters: ♂ frons flat, longitudinally aciculate, its surface with fine pale hair-like setae; lateral parts of frons near eyes covered by denser and longer hair-like setae; vertex deeply punctured; pronotum reddish-brown, wider than long; lateral sides parallel for most of their length, gently rounded towards apex; apical pronotum with a weakly developed constriction; pronotal surface shiny with small punctures, larger on anterior portion; scutellum triangular with weak scutellar impression; elytra reddish-brown, rather shining, as wide as pronotal base and 1.12× as long as its width, 1.5× as long as pronotum; elytral base slightly elevated; striae slightly impressed, strial punctures round, closely placed; interstriae flat with smaller punctures and less closely placed than striae; sub apical elytral constriction distinct; prior to apex, elytra with faint impression with irregularly set punctures; pale sparse erect hair-like setae near elytral apex; 5th abdominal ventrite laterally thickened on posterior margin with two strong adjacent conical projections, each with a bundle of golden hair-like setae; body length: 4.6 mm, 2.40× as long as wide.

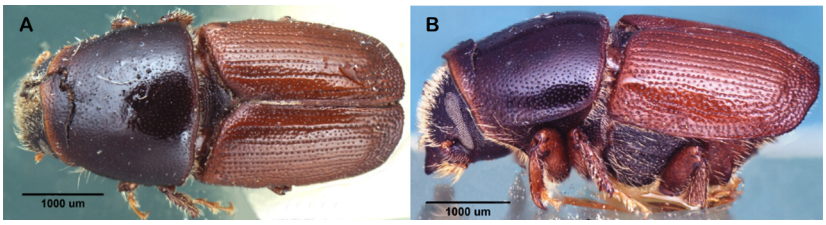


**FIGURE 56.** *Scolytus stepheni*. Female: dorsal view **A**, lateral view **B**.

The female similar to male except larger in size; the frons is more convex, uniformly punctured, and evenly covered with short and less dense hairs; the 5th abdominal ventrite has weakly developed callous-like elevations with short hair-like setae not forming bundles.

**Material examined:** Non-type specimens in FRI Dehradun. Locality: Pahalgam, 7000 ft, Lidar valley, Kashmir, C.F.C. Beeson, 07.06.1928

**Distribution:** India: Kashmir

**Hosts:** *Ulmus wallichiana* (Ulmaceae)

**Phylogenetic assessment:**

A phylogenetic analysis of *Scolytus nitidus*, *S. kashmirensis*, *S. rugulosus* (Müller, 1818), *S. amygdali* Guérin-Méneville, 1847 and other closely related species was performed using the COX-1 genes to determine the monophyly and sister groups of each species (Fig. 57). According to the NJ tree, *S. nitidus* and *S. amygdali* formed sister clades with well-supported bootstrap values, and the interspecific nucleotide difference between the two clades was greater than 10%. The two species came together to create a distinct monophyletic group. The tree also showed that *S. kashmirensis* and *S. obelus* Wood, 1962 formed distinct clades. Together, *Scolytus regulosus* and *S. intricatus* (Ratzeburg, 1837) formed a monophyletic cluster.

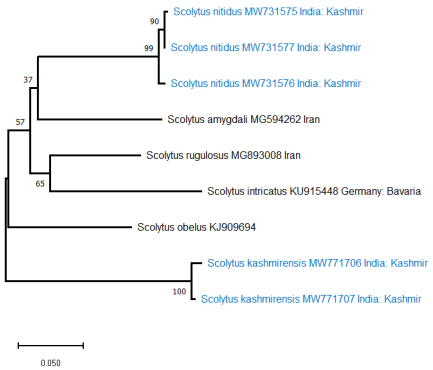


**FIGURE 57.** A phylogenetic tree obtained from the NJ for the COX-1genes of Himalayan *Scolytus* (in blue) and related species. Numbers at the branches represent bootstrap values.

**Tribe Scolytoplatypodini Blandford, 1893**

**Genus *Scolytoplatypus* Schaufuss, 1891**

*Scolytoplatypus* species are diagnosed by the following morphological characters: body length: 1.2–4.6 mm; head globose with convex frons in ♀, concave in ♂, sometimes with tufts of hairs; eyes elongate oval, entire; antennal scape clavate, funicle with six segments, club flattened, varying in shape from oval to elongate triangular, without sutures, covered by short setae, sometimes with a few longer hairs at base and at apex; pronotum usually as wide as long or wider than long, base bisinuate, sides usually constricted towards base to form femoral grooves, postero-lateral angles often right-angled or projecting, disc evenly curved without a summit; elytra slightly wider and clearly longer than the pronotum, base simply angled or carinate, cylindrical, sides parallel, apex broadly or angularly rounded, occasionally with a sutural emargination, discal punctures usually confused, less often seriate, interstriae often raised or carinate near top of declivity, sometimes with spines projecting over declivity; procoxae large, widely separated; pro-sternum often modified in males; abdomen horizontal or slightly rising posteriorly; host: deciduous trees.

Keys to both males and females of the Oriental species of *Scolytoplatypus* Schaufuss, 1891 have already been provided by Beaver & Gebhardt (2006). However, key to the Western Himalayan species of *Scolytoplatypus* is reproduced below to include the new species as well.

For males:

1 Body length less than 2 mm . . . . . *S. minimus* Hagedorn
- Body length more than 2 mm . . . . . 2
2 Frons with distinct brushes or sparse fringe of long incurved hairs around the margin of vertex upto or below the level of eyes . . . . . 3
- Frons without distinct brushes of long incurved hairs, rather with sparse hairs moderately longer towards the upper half or towards margins . . . . . 5
3 Longest setae on frons extend in a brush from the upper frontal parts extending beyond the middle of frons . . . . . 4
- Frons with a rather sparse fringe of hair-like setae on each side curving inwardly, but not extending to lower half of frons . . . . . *S. kunala* Strohmeyer
4 Elytral disc angularly/abruptly separated from declivity; declivital interstriae 1 and 3 with a row of distinct tubercles; elytral color yellowish, gradually becoming darker posteriorly, without a distinct darker band along suture . . . . . *S. daimio* Blandford
- Elytral disc evenly rounded into declivity; declivity with rather indistinct tubercles on interstriae 1 and 3; elytral color yellowish anteriorly, becoming darker towards declivity, with darker extensions along suture and sides of elytra to base . . . . . *S. darjeelingi* Stebbing
5 Basal angles of pronotum weakly produced; disc flat, with small punctures not arranged in distinct striae and interstriae, except lateral (last) two rows of strial punctures set in regular fashion; prosternum with two sub-rounded lobes on anterior margin, with asymmetrical, weakly sclerotised translucent process between them . . . . . *S. denticauda* sp. n.
- Basal angles of pronotum strongly produced; elytra distinctly striate-punctate, striae strongly impressed on disc; interstriae 1, 3, 5 and 7 gradually distinctly ridged posteriorly; prosternum with two tubercles anteriorly, anterior to them a pair of widely diverging processes, with sharply in-turned and hooked tips. . . . . *S. raja* Blandford

For females:

1 Pronotum without a mycangial pore. . . . . *S. denticauda* sp. n.
- Pronotum with a mycangial pore . . . . . 2
2 Basal angles of pronotum triangularly produced laterally, acute apically; elytral disc with narrow, strongly impressed striae, interstriae convex . . . . . *S. raja* Blandford
- Basal angles of pronotum not strongly produced laterally, nearly rectangular apically; elytral disc with flat to weakly impressed striae; interstriae flat to feebly raised on disc. . . . . 3
3 Elytral declivity with dense vestiture of long, yellowish hair-like setae . . . . . *S. darjeelingi* Stebbing
- Elytral declivity with vestiture of very short hair-like setae or glabrous elytra . . . . . 4
4 Elytra unicolored; smaller species, less than 2 mm long . . . . . *S. minimus* Hagedorn
- Elytra bicolored; larger species, more than 2 mm long . . . . . 5
5 Declivity granulate only on the unevenly numbered interstria; declivital surface with dense short hair-like setae . . . . . *S. daimio* Blandford
- Declivital interstriae with minute tubercles, distinct only on the first interstriae, obscure on other interstriae; declivital surface without short hair-like setae . . . . . *S. kunala* Strohmeyer

**45. *Scolytoplatypus daimio* Blandford, 1893b**
(Figure 58)

= *muticus* Hagedorn, 1904
= *siomio* Blandford, 1893b

This species is diagnosed by the following morphological characters: ♂ frons weakly concave, impunctate dull with uniform fine granules throughout; anterolateral edges with long golden hairs extending from upper frontal area almost up to epistoma, forming inwardly curled tufts on upper level of eyes; eyes entire; antennal club ovate, elongate, widest at base, 1.7× longer than wide, narrowly rounded at the apex, surface densely covered with setae, longer setae on base and apex; pronotum 1.22× wider than long, widest at anterior third, devoid of any distinct summit and asperities, surface finely reticulate with minute punctures, set 3–4 diameters apart from each other; dorsal surface somewhat smooth with sparse minute pubescence; prosternum with a pair of widely separated, divergent, straight processes on the anterior margin; scutellum triangular, flush with elytral surface; elytra 1.29× as long as wide, 2× as long as pronotum, clearly widened posteriorly; basal angles rectangular, sides parallel to abruptly declivous apex; elytral surface shining, with irregularly placed minute punctures; striae & interstriae indistinct; declivity commencing on posterior fourth, sub-convex; striae 1 and 2 somewhat visible, rest confused; interstriae shortly carinate at the commencement of declivity, 1 and 3 well- marked, lined with a row of distinct tubercles, interstriae 7 toothed forming a lateral tooth on elytron; elytral apex with distinct carina; surface with long, pale hairs; elytral color yellowish, gradually becoming darker posteriorly, without a distinct darker band along suture; body length: 2.97–3.22 mm, 2.16× as long as wide.

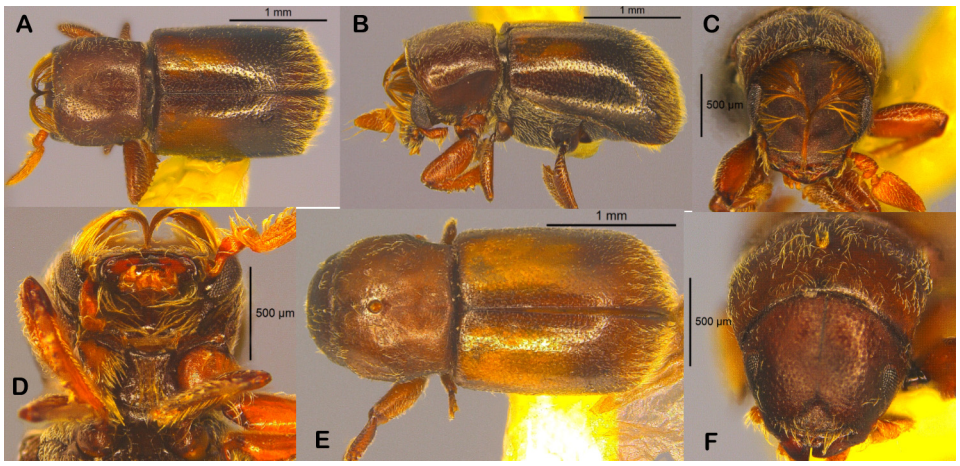


**FIGURE 58.** *Scolytoplatypus daimio*. Male: dorsal view **A**, lateral view **B**, frons **C**, prosternum **D**; female: dorsal view **E**, frons **F**.

Female is very similar to male except the frons being strongly convex with a feeble longitudinal median impression, either side of which is finely but distinctly punctate with sparse minute hairs; commencement of elytral declivity devoid of any distinct longitudinal ridges; odd numbered interstriae with few minute, scattered tubercles on the declivity; body length: 3.0–3.28 mm.

**Material examined:** New records: India: 3 ♂'s, 3 ♀'s. Kashmir, Thajwas Sonamarg (34° 18.222′ N, 075° 16.388′ E, 9105 ft.), A.A. Buhroo, 30.08.2018 (KUIC). Kashmir, Pahalgam (34° 05.15′ N, 075° 15.47′ E, 8000 ft.), A.A. Buhroo, 07.09.2019 (KUIC).

**Distribution:** India: Himachal Pradesh, Kashmir, Uttarakhand

**Hosts:** *Acer caesium* (Sapindaceae)

**46. *Scolytoplatypus darjeelingi* Stebbing, 1914**
(Figure 59)

This species is diagnosed by the following morphological characters: ♂ frons concave; surface reticulate on lower half, upper half smooth and shiny with sparse small hairs; presence of callosity below the eyes; fringe of long curled golden hairs around the margin of vertex up to posterior level of eyes, except on median portion; eyes elongate, weakly convex; antennal club elongately oval, with dense fine hairs along with sparse and moderately long erect hairs on anterior face; pronotum 1.2× as wide as long, widest at the middle; basal margin feebly bisinuate; lateral sides distinctly outcurved and feebly ridged; surface feebly convex and finely reticulate with minute punctures and dense pubescence; prosternum similar to that of *S. daimio* with a pair of widely separated, straight processes on the anterior margin diverging away laterally; scutellar tip only visible; elytra 1.2× as long as pronotum, much wider than pronotum and 1.2× as long as its width; basal margin substraight and weakly carinate up to stria 5, lateral sides sub parallel on basal three-fourths; postero-lateral margins carinate, weakly granulate towards interstria 9; apex broadly rounded; disc smooth and shiny; striae marked by minute punctures, becoming more distinct towards declivity; interstriae much wider than striae, with fine punctures; declivital face steep and convex; striae feebly impressed at declivital face with inconspicuous punctures; interstriae 1 and 2 with sparse and prominent granules, interstriae 1 with granules up to apices; entire declivital surface reticulate and roughened; surface with dense admixture of fine and a few erect hairs; elytral color yellowish anteriorly, becoming darker towards declivity, with darker extensions along suture and sides of elytra to base; body length: 2.65–2.80 mm, 2.14× as long as wide.

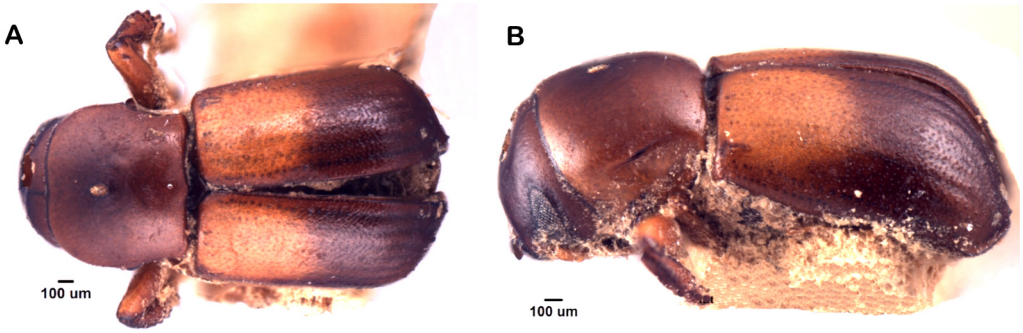


**FIGURE 59.** *Scolytoplatypus darjeelingi*. Lectotype female: dorsal view **A**, lateral view **B**.

Females are very similar to males but comparatively longer (3.10 mm); frons convex, devoid of tuft of hairs on margin of vertex; pronotum with a rounded mycangium; declivity less roughened with comparatively smaller granules.

Remarks: *S. darjeelingi* resembles *S. daimio* by its very similar male prosternum and the incurved brushes of hair-like setae extending beyond the middle of frons, usually reaching the epistomal margin but differs by its elytral disc becoming evenly rounded into declivity and the elytral color being yellowish anteriorly, becoming brown just before summit of declivity with darker extensions along suture and sides of elytra up to the base.

**Material examined:** Lectotype (here designated). Label information: *Scolytoplatypus darjeelingi* Steb., Type, Darjeeling, E.P. Stebbing, 24.02.1903 (FRI)

**Distribution:** India: Himachal Pradesh, Uttarakhand

**Hosts:** *Acer caesium* (Sapindaceae), *Alnus nepalensis* (Betulaceae), *Eucalyptus globulus* (Myrtaceae), *Grevillea robusta* (Proteaceae), *Prunus nepalensis* (Rosaceae), *Quercus lamellosa* (Fagaceae), *Symplocos theaefolia* (Symplocaceae)

**47. *Scolytoplatypus denticauda* sp. nov.**
(Figure 60)

**Diagnosis:** This new species is distinct from other species of the genus by its indistinct discal striae and interstriae, a transverse incised dark band on the pronotum, the distinct tubercles on the declivital interstriae 1 and 3, and the strongly concave propleura and pyriform fovea at the antero-ventral corners.

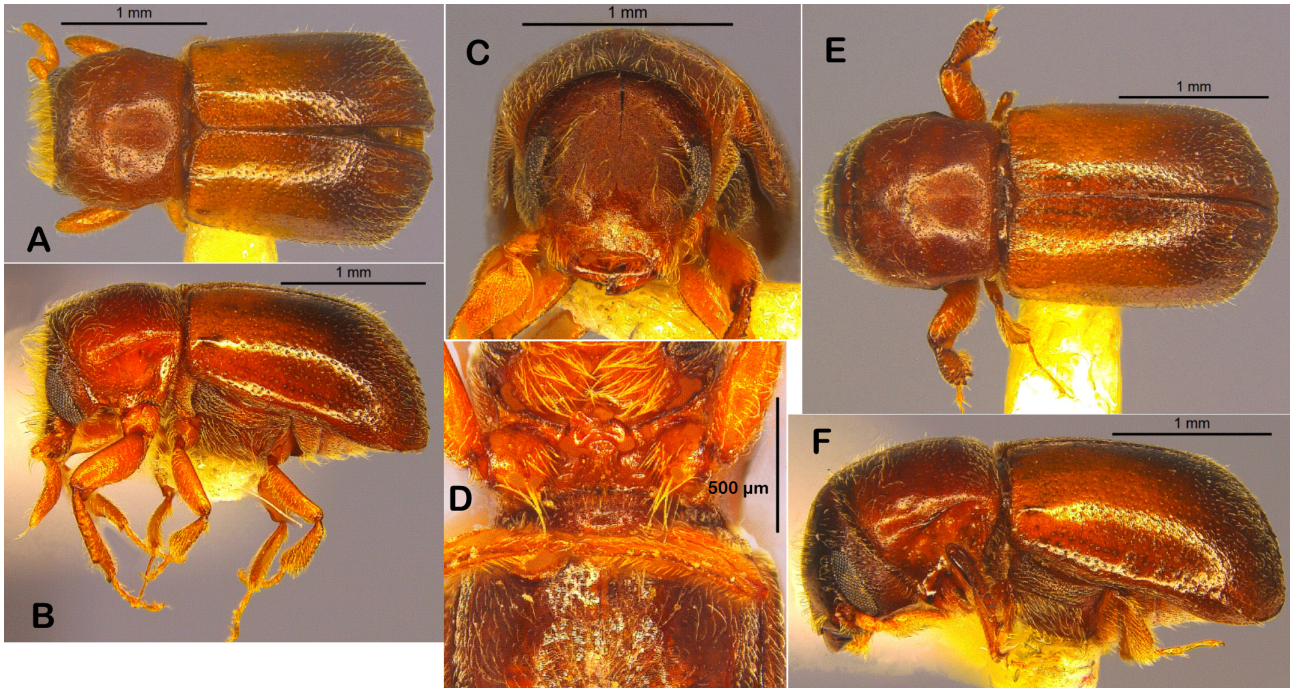


**FIGURE 60.** *Scolytoplatypus denticauda* **sp. nov.** Holotype male: dorsal view **A**, lateral view **B**, frons **C**, ventral view **D**; Allotype female: dorsal view **E**, lateral view **F**.

The new species closely resembles with *S. gardeneri* Maiti & Saha, 2009 but can be distinguished by: the indistinct discal striae and interstriae in *S. denticauda* **sp. nov.** versus distinct discal striae and interstriae in *S. gardeneri;* a transverse incised dark band on the pronotum of *S. denticauda* **sp. nov.** versus not seen in *S. gardeneri.* The new species also resembles with *S. ruficauda* Eggers, 1939 in its prosternum but differs in other features.

**Description:** The species is new by the following morphological characters: ♂ frons broadly, moderately concave, surface micro-reticulate, with evenly spaced fine punctures, a broad V-shaped shining area on lower one-third; a distinct incised line from vertex up to middle; vestiture on entire surface with sparse, moderately long hairs, somewhat longer on the margins; antennal funicle with six segments, club flattened, elongate widest at the base, 2.21× longer than wide, narrowly rounded at the apex, surface covered by short setae, and a few longer hairs on margins and apex; eyes elongate and weakly convex; pronotum 1.25× wider than long, widest in the middle, anterior margin with distinct median emargination, basal margin indistinctly bisinuate, not produced in the middle; postero-lateral corners sub-angular, lateral sides divergent up to middle; dorsal surface shining, finely reticulate, with small punctures, punctures shallow and set 2–3 diameters apart from each other, somewhat more denser towards anterior and basal margins; pronotum with a broad transverse dark band below anterior margin and a raised longitudinal median line; vestiture of short fine hairs prominent anteriorly; lateral margins of pronotum distinctly ridged and propleura strongly concave, antero-ventral angles of pronotum with a relatively deep, pyriform fovea separated from anterior margin by a narrow ridge; prosternum raised medially on posterior half with a distinct triangular elevation anteriorly between procoxae, its pointed apex oriented anteriorly; anterior margin projecting in two sub-rounded lobes, with asymmetrical, weakly sclerotised translucent process between them; procoxae somewhat flattened, with sparse, setae on the inner surface and a few long, erect setae posteriorly; scutellum small, triangular and sunken; elytra 1.18× longer than wide, 1.87× as long as pronotum, shining; elytral base carinate, sides slightly diverging posteriorly, widest on apical fourth, apex slightly angularly rounded and carinate, disc flat, shinning with small punctures not arranged in distinct striae and interstriae, except lateral (last) two rows of strial punctures set in regular fashion; declivity towards apical fourth, steeply convex with well-marked impressed striae up to middle of declivity, with somewhat larger punctures than on disc; interstriae convex, granulate, unevenly alternately raised; interstriae 1 with seven to eight distinct tubercles, 2 somewhat depressed, 3 with four distinct tubercles and a few tubercles on lateral interstriae, 9 toothed, confluent with carinate, raised apex; vestiture on declivity with fine covering of short hairs; ventrites with shallow, dense punctures and vestiture of short, fine yellowish setae directed backwards,

more longer medially and on last ventrite; body dark brown, anterior half of elytra yellowish brown; body length: 2.64–2.74 mm, 1.88× as long as wide.

Female is very similar to male except with convex frons, pronotum with somewhat projecting postero-lateral angles, pronotal surface without a transverse band; fovea on antero-ventral angles absent; declivity with less impressed striae and a few, less stronger tubercles on declivity. Mycangial pore on the pronotum absent. Body length: 3.03–3.07 mm.

**Material examined:** Holotype: ♂ India: Kashmir, Thajwas Sonamarg (34° 18.222′ N, 075° 16.388′ E, 9105 ft.), A.A. Buhroo, 30.08.2018. Allotype, ♀: the same site and date as HT; Paratypes: the same data as HT (1 ♀), except, Aru, Pahalgam (34° 05.15′ N, 075° 15.47′ E, 8000 ft.), A.A. Buhroo, 07.09.2019 (1 ♂, 1 ♀); HT, AT and 3 PT deposited at KUIC; 3 PTs NHMW.

**Type locality:** India: Kashmir (Sonamarg)

**Hosts:** *Acer caesium* (Sapindaceae)

**Etymology:** The species epithet refers to the presence of tubercles on the declivity.

### 48. *Scolytoplatypus kunala* Strohmeyer, 1908a

(Figure 61)

This species is diagnosed by the following morphological characters: ♂ frons concave, with uniform fine granules and minute punctures; vestiture on frontal surface with very fine erect and somewhat longer hair-like setae; upper and lateral edges of frons with long hair-like setae, those on upper part until middle of eyes somewhat curved towards center of frons; pronotum 1.30× wider than long, widest at anterior third, vestiture of fine and short hair-like setae denser at anterior margin; pronotal surface shining, minutely punctured, punctures very shallow and set 3–4 diameters apart from each other, surface between punctures minutely reticulate; lateral margins of pronotum sharply elevated and propleura strongly concave; prosternum weakly convex, with an obscure triangular elevation between procoxae, its indistinct pointed apex oriented backwards, anterior margin armed with two divergent translucent processes set far apart; scutellum small, triangular, flush with elytral surface; elytra 1.14× as long as wide, 1.71× as long as pronotum, sides almost parallel upto the commencement of declivity with abruptly declivous apex; elytral surface minutely punctured, shining, without signs of reticulation; elytral punctures not organized in rows and interstriae invisible; interstriae finely carinate at declivity, except interstriae 1 broadly elevated, not carinate bearing 9–10 tubercles of medium size, diverging towards elytral apex; carina on all other interstriae very low with a few tubercles; elytral declivity convex, not impressed; posterior dark carinate portion of elytra with yellowish and dense recumbent hair-like setae; color pale brown, elytra with only slightly darkened suture; each elytron with a large yellow area extending from anterior margin up to middle of elytral length; body length: 2.78 mm, 2.05× as long as wide.

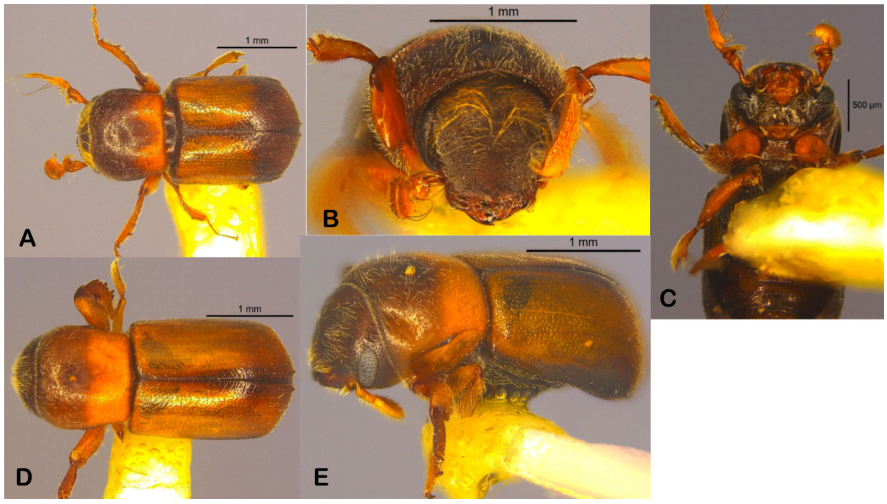


**FIGURE 61.** *Scolytoplatypus kunala*. Male: dorsal view **A**, frons **B**, ventral view **C**; female: dorsal view **D**, lateral view **E**.

Female similar to male, but frons is not impressed and long pubescence at lateral and upper edges of frons is not developed; pronotum has a median mycangial pore in its centre; body length: 3.26 mm.

Remarks: We agree with Mandelshtam & Petrov (2010b) that *S. kunala* is distinct from *S. daimio.* This species resembles *S. daimio*, but is smaller in size and has different color pattern on elytra. Short frontal vestiture easily distinguishes the male *S. kunala* from *S. daimio* and *S. darjeelingi* males in which the longest setae extend in a brush from the upper frontal parts up to the epistoma.

**Material examined:** New records: India: 1 ♂, 1 ♀. Kashmir, Thajwas Sonamarg (34° 18.222′ N, 075° 16.388′ E, 9105 ft.), A.A. Buhroo, 30.08.2018 (KUIC). Kashmir, Pahalgam (34° 05.15′ N, 075° 15.47′ E, 8000 ft.), A.A. Buhroo, 07.09.2019 (KUIC).

**Distribution:** India: Kashmir

**Hosts:** *Acer caecium* (Sapindaceae), *Prunus cornuta* (Rosaceae)

### 49. *Scolytoplatypus minimus* Hagedorn, 1904

(Figure 62)

This species is diagnosed by the following morphological characters: ♂ frons concave, surface dull, finely reticulate with minute punctures and sparse, micro-hairs; fringe of long dense incurved golden hairs around the margin of vertex up to lower side of eyes (except on upper half of eyes); eyes elongate and weakly convex; antennal club lanceolate, entirely pubescent, along with a few long hairs; pronotum sub-quadrate, 1.2× wider than long; basal margin bisinuate; lateral sides ridged on basal two-thirds, weakly so anteriorly; basal third narrowest; widest at anterior third; surface finely reticulate and dull, punctures and hairs inconspicuous; prosternum with a small triangular median projection anteriorly, posteriorly a pair of widely separated, weakly shining, flattened areas; scutellum submerged; elytra 1.21× as long as pronotum and slightly wider (1.08×) than its own length; basal margin somewhat bisinuate and carinate; lateral sides sub-parallel up to two-thirds; postero-lateral margins carinate, converging posteriorly and confluent with interstria 9; discal striae impressed marked by indistinct punctures; interstriae weakly convex gradually elevated posteriorly; interstriae 1 to 8 terminating into single spine at commencement of declivity, spines on interstriae 1–5 alternately longer and shorter, interstrial surface rough with somewhat indistinct granules; declivity abrupt, face sub-convex, entire surface roughened with minute granules; striae and interstriae indistinctly marked; color yellowish brown, postero-lateral margins of pronotum and anterior half of elytra much lighter; body length: 1.60 mm, 1.79× as long as wide.

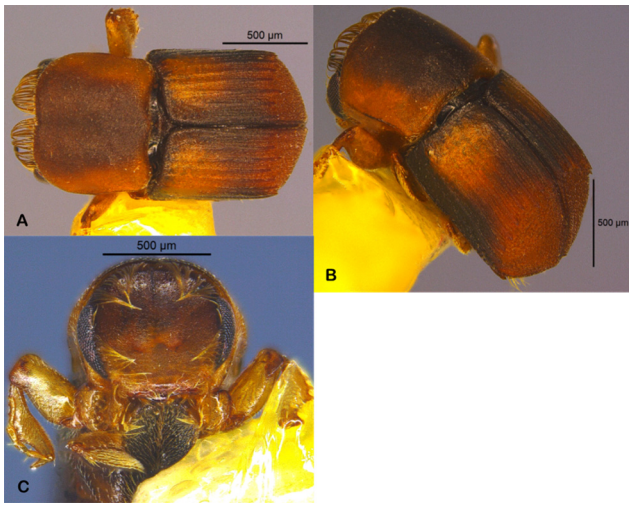


**FIGURE 62.** *Scolytoplatypus minimus*. Male: dorsal view **A**, latero-declivital view **B**, frons and prosternum **C**.

Females: pronotum about as long as wide with a mycangial pore, striae and interstriae obsolete on apical part of elytral declivity.

Remarks: This species is smallest among all representatives of the genus from India.

**Material examined:** New record: India: 1 ♂. Himachal Pradesh, Palampur, Tanda (32° 06.141′ N, 076° 32.036′ E, 4008 ft.), A.A. Buhroo, 25.09.2018 (KUIC).

**Distribution:** India: Uttarakhand, Himachal Pradesh, West Bengal. Thailand

**Hosts:** *Grevillea robusta* (Proteaceae) (new host record). *Acrocarpus fraxinifolius* (Fabaceae), *Alnus nitida* (Betulaceae), *Cornus macrophylla* (Cornaceae), *Prunus armeniaca* (Rosaceae), *Salix tetrasperma* (Salicaceae), *Wendlandia tinctoria* (Rubiaceae)

### 50. *Scolytoplatypus raja* Blandford, 1893b (Figure 63)

= *himalayensis* Stebbing, 1914

This species is diagnosed by the following morphological characters: ♂ frons strongly concave up to vertex; surface reticulate, roughened and with sparse bent hairs more distinct on upper half; the upper margin of frontal cavity with uniform curled hairs; eyes elongate and weakly convex; antennal club large and lanceolate, slightly longer than scape and funicle combined together; pronotum nearly as long as wide and widest at the middle; basal margin strongly bisinuate, lateral sides with basal emargination and ridged beyond middle; postero-lateral corners rather acute and projected outwards; surface opaque and reticulate with close large punctures, except longitudinal impunctate area; hairs inconspicuous; prosternum with two tubercles anteriorly, anterior to them a pair of widely diverging processes, with sharply in-turned and hooked tips; scutellum submerged, not distinctly visible; elytra 1.10× longer than pronotum and 0.97× as long as its own width; basal margins truncated and somewhat weakly carinate; lateral sides substraight, but very weakly diverging posteriorly; postero-lateral margins feebly carinate and confluent with interstria 9; striae strongly impressed on disc, with elongate confluent punctures; interstriae 1, 3, 5 and 7 gradually distinctly ridged posteriorly and each terminating into a spine with a few tufts of long hairs at commencement of declivity; interstrial surface reticulate with small irregular punctures; declivity rather abrupt with uneven face; striae impressed and obsolete at middle of declivity; striae 1 and 2 confluent, 4 and 5 forming loop, 3 and 6 running up to posterior half of declivity; interstriae 1 and 3 strongly ridged, terminating slightly above the posterior margin, forming a blunt projection; interstria 2 obsolete, 4 depressed and narrowed, 5 broad; interstrial surface with fine, irregular granules; color blackish brown; body length: 3.09 mm, 2.06× as long as wide.

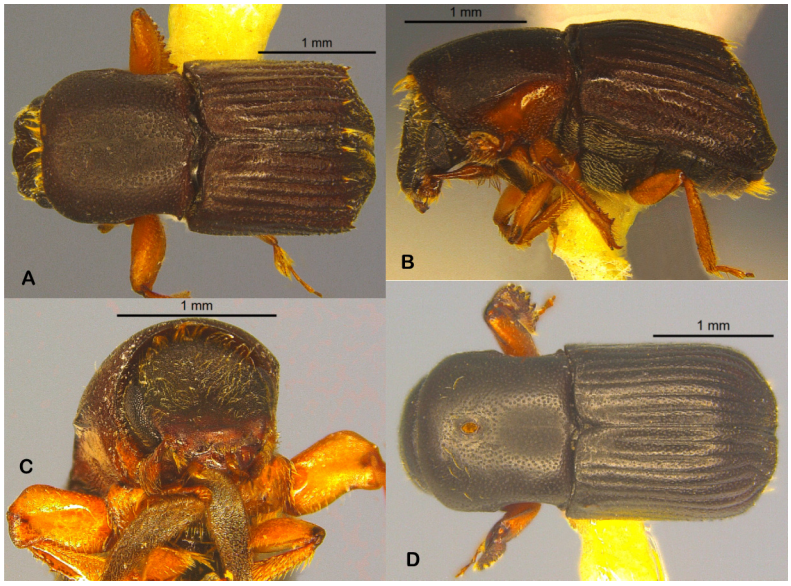


**FIGURE 63.** *Scolytoplatypus raja*. Male: dorsal view **A**, lateral view **B**, frons **C**; female: dorsal view **D**.

Females are very similar to males, but frons convex, pronotal surface finely reticulate with minute punctures and sparse bent hairs; mycangium at about anterior third of pronotum; interstriae convex, surface finely reticulate without any spine at commencement of declivity; body length: 3.15 mm.

**Material examined:** New record: India: 1 ♂, 1 ♀. Himachal Pradesh, Palampur, Tanda (32° 06.141′ N, 076° 32.036′ E, 4008 ft.), A.A. Buhroo, 25.09.2018 (KUIC).

**Distribution:** Himachal Pradesh, Kashmir, Uttar Pradesh, West Bengal, Assam. China, Nepal, Vietnam

**Hosts:** *Grevillea robusta* (Proteaceae) and *Albizia chinensis* (Fabaceae) (new host records) and many different hosts recorded by Beeson (1941)

### Tribe Trypophloeini Nüsslin, 1911

### Genus *Hypothenemus* Westwood, 1834

*Hypothenemus* species are distinguished by the following combination of characters: body length: 0.6–2.8 mm (male much smaller, flightless), eyes emarginated; antennal funicle three to five-segmented, club oval with three slightly indented sutures, suture 1 partly septate visible as a dark line, suture 2 procurved and marked by setae; anterior pronotum with asperities, basal and lateral margins of pronotum finely carinate; rather abundant vestiture of rows of interstrial scales (bristles) and rows of recumbent strial setae; host: deciduous trees.

### Key to the Western Himalayan species of *Hypothenemus* Westwood, 1834

1 Anterior pronotal margin with 4 closely placed serrations, median pair largest, anterior slope armed by 18–20 distinct asperities . . . . . *H. birmanus* (Eichhoff)

- Anterior pronotal margin armed by 6 serrations, median pair somewhat closely placed; anterior slope with approximately 30 large, chisel-like asperities . . . . . *H. ficivorus* **sp. nov.**

### 51. *Hypothenemus birmanus* (Eichhoff, 1878a)

(Figure 64)

= *Triarmocerus birmanus* Eichhoff, 1878a
= *birmanus* Eichhoff, 1878b
= *maculicollis* Sharp, 1879
= *peritus* Blandford, 1894
= *farinosus* Blandford, 1896a
= *valens* Sampson, 1914
= *perkinsi* Hopkins, 1915
= *psidii* Hopkins, 1915
= *sterculiae* Hopkins, 1915
= *alter* Eggers, 1923
= *uter* Eggers, 1923
= *nibarani* Beeson, 1933
= *ampliatus* Eggers, 1936
= *pacificus* Beeson, 1940
= *castaneus* Wood, 1954
= *dubius* Schedl, 1971

This species is diagnosed by the following morphological characters: ♀ frons moderately convex, feebly impressed above epistoma, with median longitudinal strip smooth and shiny, laterally finely reticulate; vertex strongly reticulate; surface with small, obscure, rather sparse punctures; vestiture of fine, sparse, rather short hair somewhat long and abundant on epistoma; eyes shallowly emarginate, finely faceted; antennal funicle with four segments; club flattened, suture 1 partly septate; other two sutures rather procurved; pronotum 1.14× wider than long, widest on basal third, sides rather strongly arcuate, converging towards narrowly rounded anterior margin; anterior margin with four closely placed serrations, median pair largest; summit at middle, anterior slope armed by 18–20 distinct asperities; posterior areas smooth, shining with small punctures; vestiture of ground cover of short semi-recumbent hair, intermixed with sparse, longer bristles anteriorly and laterally, sparse slender scales near base; elytra 1.49× as long as wide, 1.76× as long as pronotum; lateral sides subparallel upto basal two-thirds, narrowing posteriorly with rounded apex; striae weakly impressed on base and declivity, punctures moderately larger near base, small towards

declivity; interstriae more than twice as wide as striae, with irregular 2–3 rows of minute punctures; declivity convex, moderately steep; sculpture nearly same as on disc; vestiture of ground cover of short hairs on disc, more stout and denser on declivity; uniseriate erect interstrial scales (each scale 2–4× as long as wide); flattened interstrial scales stout and more denser on declivity than on disc; body color dark-brown to black; body length: 2.10–2.12 mm, 2.38× as long as wide.

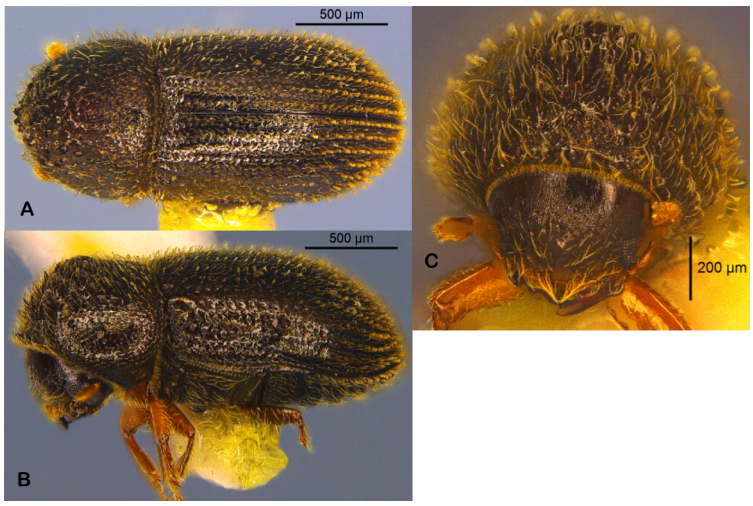


**FIGURE 64.** *Hypothenemus birmanus*. Female: dorsal view **A**, lateral view **B**, frons **C**.

Male similar to female except anterior margin of pronotum with only two serrations, eyes greatly reduced in size, antennal club smaller, more slender.

**Material examined:** New record: India: 3 ♀'s. Himachal Pradesh, Tanda Palampur (32° 06.141′ N, 076° 32.036′ E, 4008 ft.), A.A. Buhroo, 25.09.2018 (KUIC).

**Distribution:** India: Andaman Islands, Himachal Pradesh (new record), Madhya Pradesh, Uttarakhand. South East Asia, Australia, Micronesia, Hawaii, Africa and Central and North America

**Hosts:** Collected from unknown wood, and many other Leguminosae hosts as reported by Browne (1961)

### 52. *Hypothenemus ficivorus* sp. nov.

(Figure 65)

**Diagnosis:** The new species is distinct by sculpture of frons with longitudinal rugose reticulations from vertex to below the lower level of eyes, being stronger on sides of the short longitudinal carina between the eyes and by the transversely reticulate elytral surface with small strial punctures. The interstrial scales are about 2–3× as long as wide and nearly equal in length to the distance between the rows.

*Hypothenemus ficivorus* **sp. nov.** is closely related to *H. eruditus* (Westwood, 1834) and *H. crudiae* but can be distinguished by a short longitudinal carina between eyes in *H. ficivorus* **sp. nov.** versus a median tubercle between the eyes in *H. crudiae* (Panzer, 1791) and absence of median tubercle or longitudinal carina in *H. eruditus*. The new species also differs in having longitudinal rugose reticulations from vertex to below the lower level of eyes, stronger on the sides of short longitudinal carina versus surface rugose-reticulate from vertex to upper level of eyes, more finely rugose below the upper level of eyes in *H. eruditus* and surface rugose-reticulate above median tubercle with reticulate area below the tubercle in *H. crudiae.* The interstriae are more than twice as wide as striae in *H. ficivorus* **sp. nov.** versus twice as wide as striae in *H. eruditus* and as wide as striae in *H. crudiae*. The declivital interstrial scales are about 3× as long as wide in *H. ficivorus* **sp. nov.** versus scales varying from about 3–8× as long as wide in *H. eruditus* and scales about 4–5× as long as wide in *H. crudiae*.

**Description:** This species is new by the following morphological characters: ♀ frons broadly convex; surface with distinct longitudinal rugosities extending up to vertex; a weak, longitudinal short carina between eyes (visible on fronto-lateral view), with strong rugose-reticulations on either side of carina; narrow impunctate area below the carina up to epistoma; vestiture of rather short, sparse hair on frons, moderately abundant below eyes, longer and

more abundant on epistoma; eyes large with weak emargination; antennal funicle with four segments, club oval, somewhat flattened with three weakly procurved sutures marked by hair, suture 1 with an indistinct septum; pronotum 1.17× as wide as long, widest at middle, sides feebly arcuate on basal half, rather broadly rounded towards apex; anterior margin armed by six serrations, median pair somewhat closely placed; anterior slope with approximately thirty large, chisel-like asperities, areas between asperities smooth, shining; summit at middle, posterior and lateral areas shinning, reticulate punctate; vestiture of ground cover of short hair, intermixed with a few longer dagger like setae on anterior slope; sparse, short, flattened, blunt scales with micro hair posteriorly and on lateral sides; scutellum somewhat triangular; elytra 1.72× as long as wide and 1.98× as long as pronotum; lateral sides subparallel upto basal two-thirds, narrowing posteriorly with rounded apex; elytral surface weakly reticulate, strial punctures small on disc and declivity; interstriae more than twice as wide as striae, shining on disc and declivity, interstriae 1 and 2 somewhat narrowed towards apex; erect interstrial setae scale-like, blunt and wider apically, about 2–3× as long as wide and about equal in length to distance between rows, uniseriate but with a few out-of-line setae; strial setae small, semi-recumbent, hair-like; declivity evenly convex; sculpture as on disc; erect interstrial setae slightly longer than on disc; strial setae similar to those on disc; body color dark-brown to black; body length: 1.23–1.26 mm, 2.57× as long as wide.

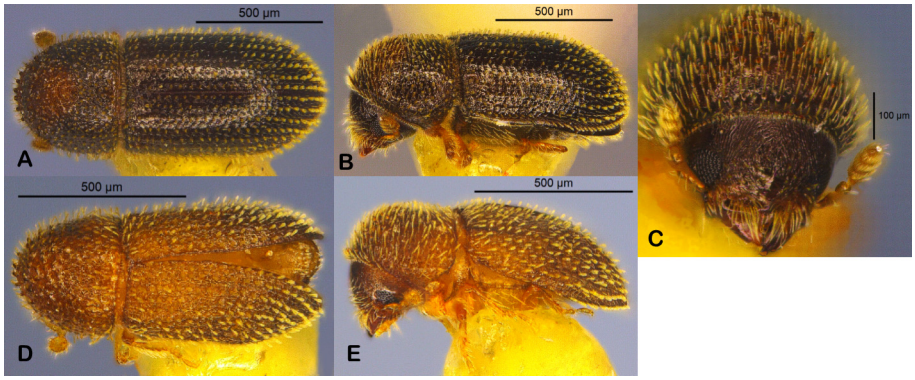


**FIGURE 65.** *Hypothenemus ficivorus* **sp. nov.** Holotype female: dorsal view **A**, lateral view **B**, frons **C**; Allotype male: dorsal view **D**, lateral view **E**.

Male similar to female but much smaller than female with smaller eyes; body length: 0.92 mm.

**Material examined:** Holotype: ♀ India: Kashmir, Srinagar, Hazratbal (University Campus), (34° 07′51.10 ″ N, 074° 50′ 01.09″ E, 5220 ft.), A.A. Buhroo, 10.08.2017 (KUIC); Allotype, ♂: the same site and date as HT; Paratypes: the same data as HT (1 ♀); HT, AT and 1 PT deposited at KUIC; 2 PTs NHMW.

**Type locality:** India: Kashmir: Hazratbal Srinagar (University Campus)

**Hosts:** *Ficus palmata* (Moraceae)

**Etymology:** The species epithet *ficivorus* refers to the *Ficus* eating.

**Phylogenetic assessment:**

A phylogenetic analysis of the temperate Himalayan *Hypothenemus* species and several similar species, most of which are found in the tropics and subtropics was performed using the COX-1 gene to detemine their monophyly and evolutionary relations (Fig. 66). The NJ tree showed that *Hypothenemus* sp. of Panama (MK769333) and Himalayan *H. ficivorus* **sp. nov.** were monophyletic with low-supported bootstrap values and with an interspecific nucleotide difference of 13.84% between the two clades. The tree further demonstrated the monophyly of *H. birmanus* and *H. hampei* (Ferrari, 1867), with an interspecific nucleotide difference of 16.53%. The interspecific nucleotide difference between *H. birmanus* and *H. eruditus* was 17.23%.

## Tribe Xyleborini LeConte, 1876

The anatomical terminology for antennal club types and pronotum types from dorsal and lateral views of Xyleborini species follows Hulcr *et al.* (2007).

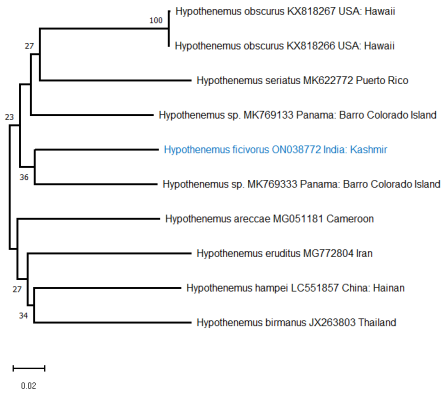


**FIGURE 66.** A phylogenetic tree obtained from the NJ for the COX-1 genes of Himalayan *Hypothenemus* (in blue) and related species. Numbers at the branches represent bootstrap values.

## Genus *Cyclorhipidion* Hagedorn, 1912

*Cyclorhipidion* species are diagnosed by the following combination of characters: a morphologically variable genus, with body length: 1.7–5.0 mm; elytral apex entire and declivital forms variable; species can largely be distinguished by their distinctive appearance with most of body covered with dense pubescence and very abundant minute punctures; elytral disc with confused interstrial punctures, pronotum and elytra rounded, typically with no conspicuous edges or carinae; antennal club flattened, type 3 (types 4 and 5 rare); scutellum visible; protibiae semi-circular with evenly rounded outer edge (rarely obliquely triangular), procoxae contiguous and lack of mycangial tufts; several species have obliquely truncate or truncate declivities; host: deciduous plants.

### 53. *Cyclorhipidion inarmatum* (Eggers, 1923)

(Figure 67)

= *Xyleborus inarmatus* Eggers, 1923
= *Xyleborus vagans* Schedl, 1977

This species is diagnosed by the combination of following morphological characters: ♀ frons weakly convex and devoid of any median lines; surface finely reticulate, upper half with irregular deep punctures and lower half with minute granules and fine hairs; eyes elongately oval and nearly half of its width emarginated; antennal scape short; club flat (type 3); pronotum longer than wide, rounded (type 7) from dorsal view and from lateral view as well; anterior margin broadly rounded and unarmed; anterior two-thirds with small asperities; posterior portion finely reticulate with distinct punctures; scutellum large, shiny and tongue-shaped; type 3; pronotum scutellum visible; elytra 1.5× as long as pronotum and 1.6× as long as wide; basal margin substraight, lateral sides subparallel nearly upto two-thirds, converging posteriorly with rounded apex; discal striae feebly impressed, marked by shallow punctures, each with a microhair; interstriae flat somewhat wider than striae with irregular granules and fine hairs; declivity commencing on posterior third, face steeply rounded; striae distinctly impressed with distinct small punctures, each with a microhair; interstriae 1 and 3 feebly elevated armed with large tubercles; interstriae 2 always unarmed; postero-lateral margins rounded; setae on interstriae 1 in two confused rows, interstriae 2 with uniseriate setae; body color yellowish brown, elytra comparatively darker; body length: 2.8–3.0 mm, 2.8× as long as wide.

**Material examined:** Lectotype in NMNH (image), Smithsonian Institution, Washington, D.C. USA

**Distribution:** India: Himachal Pradesh, West Bengal. Bhutan, China: Yunnan, Indonesia: Sumatra, Laos, Myanmar, Thailand, Vietnam.

**Hosts:** Recorded from *Castanopsis* and *Quercus* (Fagaceae), and probably with a close association with Fagaceae (Beaver *et al.* 2014).

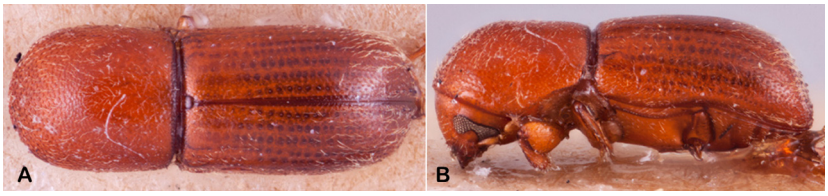


**FIGURE 67**. *Cyclorhipidion inarmatum*. Lectotype female: dorsal view **A**, lateral view **B**. (Smith *et al*. 2020).

## Genus *Diuncus* Hulcr & Cognato, 2009

*Diuncus* species are distinguished by the following combination of morphological characters: body length: 1.5–3.0 mm; antennal club truncate, segment 1 corneous and dominant on both sides; pronotum stout, with 4–6 serrations on anterior margin; pronotum from lateral view rounded, robust (type 5), from dorsal view rounded (type 1), rarely conical and angulate (type 6); declivity flat and broad, margins broadened and distinctly carinate, declivital base often armed with one or two pairs of denticles; protibiae obliquely triangular, with 3–5 large denticles, denticles distinctly longer than wide; scutellum visible and flush with the elytra; mycangial tufts absent; and procoxae contiguous; host: deciduous trees.

### 54. *Diuncus corpulentus* (Eggers, 1930)

(Figure 68)

= *Xyleborus corpulentus* Eggers, 1930

This species is diagnosed by the following morphological characters: ♀ frons plano-convex, surface finely reticulate with distinct shallow sparse punctures, vestiture of very sparse fine hairs distinct on lateral areas near eyes, longer and relatively denser on epistomal margin; antennal club obliquely truncate (type 1), segment 1 corneous and dominant on both sides; pronotum from lateral view rounded (type 5), dorsal view rounded (type 1); postero-lateral angles broadly rounded; sides bulging out and converging anteriorly terminating into an angular projection, anterior margin armed with six asperities, larger pair at middle; summit distinct almost at middle; anterior declivous portion armed with distinct triangular asperities in concentric rows, gradually increasing in size anteriorly; posterior half shiny, finely reticulate and punctate, vestiture of sparse hairs anteriorly and postero-laterally; scutellum triangular flushed with elytra; elytra 1.58× as long as pronotum,1.27× as long as wide; basal margin substraight; lateral sides sub-parallel up to basal two-thirds, converging posteriorly into an angular apex; postero-lateral margins of elytra strongly carinate and confluent with interstria 7; striae marked by close fine punctures; interstriae 4–5× as wide as striae, surface flat with irregular punctures and inconspicuous hairs; declivity commencing from slightly above the middle, interstriae 2 armed by three denticles at commencement of declivity; declivital interstriae 3, 5, and 6 with a uniseriate row of denticles along its length; vestiture of minute, confused, recumbent interstrial hairs and a few long hairs along lateral sides; elytra and pronotum dark colored, basal half of pronotum yellowish-brown; body length: 2.62 mm, 2.15× as long as wide.

Male is very similar to female except small in size; eyes feebly emarginate; anterior pronotal margin weakly produced but unarmed; hairs inconspicuous.

**Material examined:** Holotype ♀ in FRI Dehradun (*Xyleborus corpulentus* Eggers, 1930). Type locality: Upper Dihing Reserve, Lakhimpur, Assam, India

New record: India: 1 ♀. Himachal Pradesh, Palampur, Tanda (32° 06.141′ N, 076° 32.036′ E, 4008 ft.), A.A. Buhroo, 25.09.2018 (KUIC).

**Distribution:** India: Himachal Pradesh (Tanda Palampur) (new record), Assam, Andaman Islands, West Bengal. Nepal, China: Xizang

**Hosts:** *Grevillea robusta* (Proteaceae) (new host record). *Acrocarpus fraxinifollius* (Fabaceae), *Artocarpus chama* (Moraceae), *Cryptocarya wightiana* (Lauraceae), *Sterculia villosa* (Malvaceae), *Vatica lanceifolia* (Dipterocarpaceae).

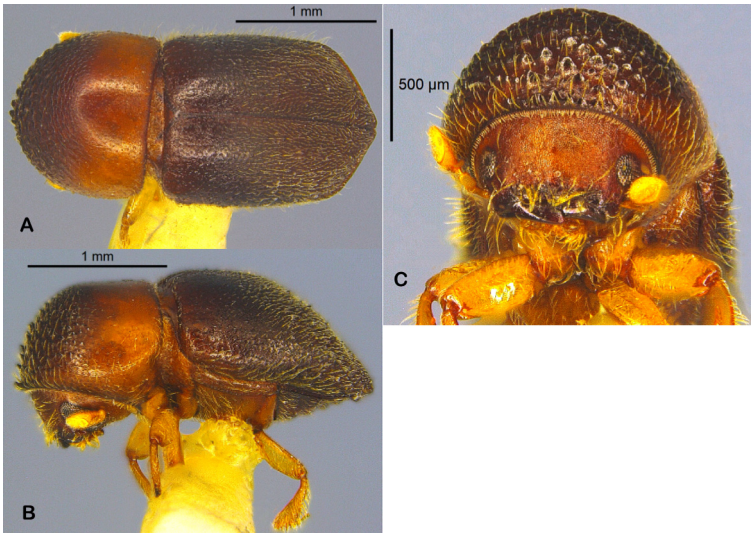


**FIGURE 68**. *Diuncus corpulentus*. Female: dorsal view **A**, lateral view **B**, frons **C**.

## Genus *Xyleborinus* Reitter, 1913

*Xyleborinus* species are diagnosed by the following combination of characters: body length: 1.4–3.5 mm (male dwarf, deformed and flightless); anterior margin of the compound eyes emarginated; antennal funicle five-segmented; the antennal club is obliquely truncate with segment 1 corneous and dominant on both sides of the club (type 1); pronotum longer than wide (type 8); anterior slope of pronotum convex, anterior margin armed by weak to moderate serrations; scutellum depressed, conical, not fitting in the scutellar notch, the cavity around the scutellum bears distinctive short tuft of hairs;elytra striate, punctures in rows; declivity usually armed by tubercles or spines; procoxae contiguous; host: deciduous trees.

### 55. *Xyleborinus saxesenii* (Ratzeburg, 1837)

(Figure 69)

= *Bostrichus saxesenii* Ratzeburg, 1837
= *dohrnii* Wollaston, 1854 (*Tomicus*)
= *decolor* Boieldieu, 1859 (*Tomicus*)
= *aesculi* Ferrari, 1867 (*Xyleborus*)
= *sobrinus* Eichhoff, 1876 (*Xyleborus*)
= *subdepressus* Rey, 1883 (*Xyleborus*)
= *frigidus* Blackburn, 1885 (*Xyleborus*)
= *arbuti* Hopkins, 1915 (*Xyleborus*)
= *floridensis* Hopkins, 1915 (*Xyleborus*)
= *pecanis* Hopkins, 1915 (*Xyleborus*)
= *quercus* Hopkins, 1915 (*Xyleborus*)
= *subspinosus* Eggers, 1930 (*Xyleborus*)
= *tsugae* Swaine, 1934
= *librocedri* Swaine, 1934
= *pseudogracilis* Schedl, 1937 (*Xyleborus*)
= *retrusus* Schedl, 1940 (*Xyleborus*)
= *peregrines* Eggers, 1944 (*Xyleborus*)
= *pseudoangustatus* Schedl, 1948 (*Xyleborus*)
= *paraguayensis* Schedl, 1949 (*Xyleborus*)
= *opimulus* Schedl, 1976 (*Xyleborus*)
= *cinctipennis* Schedl, 1980 (*Xyleborus*)

This species is diagnosed by the following morphological characters: ♀ frons broadly convex, surface shining, reticulate with rather coarse, shallow punctures; a distinct median line from epistoma up to upper level of eyes, epistomal margin with a few short hairs; anterior margin of compound eyes emarginate; antennal funicle with five segments; club slightly longer than wide, obliquely truncate, with segment 1 corneous encircling anterior face, segment 2 narrow, concave, corneous on anterior face only; sutures absent on posterior face; pronotum longer in lateral view (type 8), sides almost straight and parallel on more than basal half, broadly rounded in front (type 8 in dorsal aspect); anterior margin armed by ten or more low serrations; summit slightly in front of middle of pronotum length, anterior slope coarsely, closely asperate; posterior areas finely reticulate, punctures minute, rather numerous; vestiture hair-like, sparse, mostly on margins; elytra 1.58× as long as wide, 1.26× as long as pronotum; disc occupying basal one third of elytral length; striae not impressed, punctures small, somewhat larger on discal portion of striae 2, 3 and 4; interstriae more than twice as wide as striae, smooth, shining with rather minute punctures, some near declivity replaced by small tubercles; declivity steep, convex, weakly impressed; surface smooth, usually granulate; striae 1–3 clearly indicated with small punctures in rows; interstriae 1 feebly elevated, armed by a row of seven to eight small, pointed tubercles, 2 somewhat flat, unarmed except for three to four minute tubercles at declivital summit, 3 armed by a row of about eight small, pointed tubercles more stronger towards apex; apex of interstriae 4 confluent with elevated apex marked by few pointed tubercles; vestiture of short, fine strial hair, and long, erect, rather coarse interstrial setae, some setae on declivity more than twice as long as distance between rows; color dark reddish brown; body length: 2.10–2.24 mm, 2.90× as long as wide.

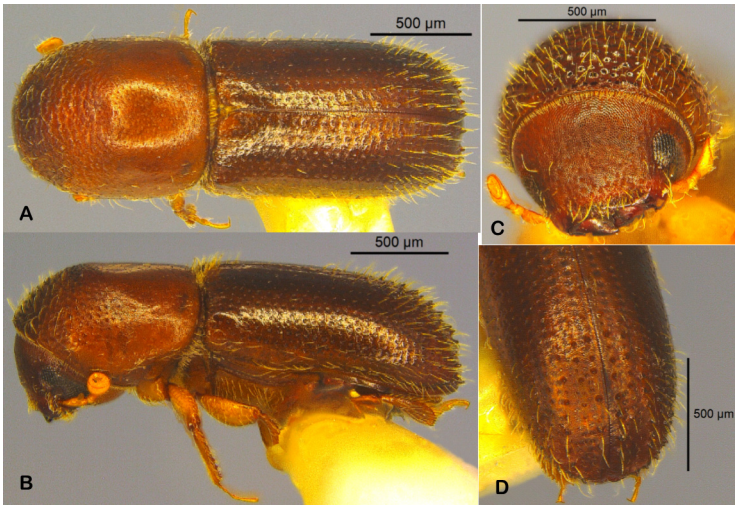


**FIGURE 69**. *Xyleborinus saxesenii*. Female: dorsal view **A**, lateral view **B**, frons **C**, elytral declivity **D**.

Male similar to female except eyes smaller; pronotum 1.1× as long as wide, summit indefinite, anterior slope more gradual, asperities minute, restricted to a much smaller area, anterior margin unarmed; declivity longer and not as steep as in female; strial and interstrial punctures poorly formed, declivital tubercles reduced in size and number.

**Material examined:** New record: India: 4 ♀'s. Kashmir, Srinagar, Hazratbal (University Campus), (34° 07′51.10 ″ N, 074° 50′ 01.09″ E, 5220 ft.), A.A. Buhroo, 20.08.2017 (KUIC).

**Distribution:** India: Assam, Kashmir, Uttarakhand, West Bengal. Asia, Europe, North and South America, Australia, Africa.

**Hosts:** *Aesculus indica* (Sapindaceae) and *Salix alba* (Salicaceae) (new host records). *Fraxinus excelsior* (Oleaceae), *Juglans regia* (Juglandaceae), *Prunus armeniaca*, *P. cornuta* (Rosaceae), *Symplocos theaefolia* (Symplocaceae)

## Genus *Xyleborus* Eichhoff, 1864

*Xyleborus* species are diagnosed by the following morphological characters: body length: 1.9–3.9 mm; scutellum flat, flush with elytra, mycangial tufts absent; lateral margin of pronotum obliquely costate; pronotum from dorsal

view rounded frontally (types 2, 7); elytral disc longer than declivity; elytral disc strial and interstrial punctures seriate; pronotal disc alutaceous; posterior face of the protibiae flat, unarmed; antennal club typically obliquely truncate with segment 1 nearly covering the entire posterior face (type 2); antennal funicle five-segmented; anterior pronotal margin unarmed; procoxae contiguous; host: deciduous trees.

### 56. *Xyleborus perforans* (Wollaston, 1857)

(Figure 70)

= *Tomicus perforans* Wollaston, 1857
= *testaceus* Walker, 1859 (*Bostrichus*)
= *duponti* Montrouzier, 1861 (*Bostrichus*)
= *tuberculatus* Motschulsky, 1863 (*Anodius*)
= *denticulus* Motschulsky, 1863 (*Anodius*)
= *kraatzii* Eichhoff, 1868
= *philippinensis* Eichhoff, 1878b
= *immaturus* Blackburn, 1885
= *hirsutus* Lea, 1894 (*Xylopertha*)
= *whitteni* Beeson, 1935a
= *apertus* Schedl, 1939
= *criticus* Schedl, 1950
= *shionomisakiensis* Murayama, 1951
= *cylindrus* Schedl, 1951
= *minimus* Schedl, 1955

This species is diagnosed by the following morphological characters: ♀ frons weakly convex; surface rugosely reticulate with sparse shallow punctures distinct towards eyes; eyes elongately oval with deep emargination; antennal club obliquely truncate on anterior face, basal corneous portion with recurved feebly costate apical margin forming a complete ring being sub-apical on posterior face, (type 2); pronotum 1.16× as long as wide; basal margin substraight, lateral sides feebly outcurved, anterior margin broadly rounded and unarmed; summit at middle; declivous portion with fine asperities; posterior half smooth and shiny with sparse fine punctures; mixture of short and long hairs visible on anterior and lateral portions; scutellum small, smooth and triangular; elytra 1.70× as long as wide and 1.43× as long as pronotum; basal margin substraight; lateral sides almost straight and sub-parallel on basal two-thirds, gradually narrowing posteriorly into broadly rounded apex; discal striae not so impressed, marked by small, deep punctures, each with a microhair; interstriae smooth and shiny, nearly 1.5× wider than striae with widely placed small punctures and long fine hairs; declivity commencing on apical third, face steep and weakly convex; declivital striae as on disc with somewhat larger punctures; interstriae 1 and 3 each armed with four small and strong tubercles; interstriae 2 with few granules at declivital summit, interstriae 4, 5 and 6 with one to three rather small tubercles on upper half of declivity; all interstriae with sparse, long erect hairs; body color light to reddish brown; body length: 2.42 mm, 2.95× as long as wide.

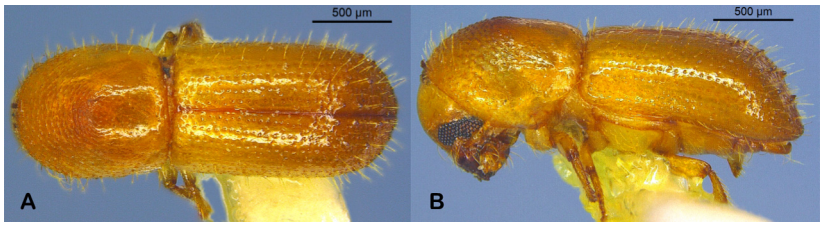


**FIGURE 70.** *Xyleborus perforans*. Female: dorsal view **A**, lateral view **B**.

Male dwarf; pronotum almost as long as wide, sub-squarish, basal margin substraight; lateral margins sub-parallel, anterior margin moderately round, angularly produced medially with weak asperities.

**Material examined:** New record: India: 1 ♀. Himachal Pradesh, Gaghar (32° 09.463′ N, 076° 16.697′ E, 2584 ft.), A.A. Buhroo, 26.09.2018 (KUIC).

**Distribution:** India: Himachal Pradesh (Gaghar, Kangra), West Bengal

**Hosts:** *Mangifera indica* (Anacardiaceae) (new host record). Climbers, seeds of Mangrove plants

## Genus *Xylosandrus* Reitter, 1913

*Xylosandrus* species are distinguished by the following combination of characters: body length: 1.3–3.9 mm; anterior margin of the compound eye shallowly to deeply emarginate; antennal funicle with five segments, club flat, obliquely truncate with segment 1 covering the posterior face (type 1); pronotum slightly wider than long, anterior margin armed by distinct serrations, basal pronotum with median mycangial tuft; lateral margins obliquely costate; scutellum flat, flushed with elytra; elytral declivity steep, unarmed and granulate-punctate; procoxae widely separated; host: deciduous trees.

### 57. *Xylosandrus crassiusculus* (Motschulsky, 1866)

(Figure 71)

= *Phloeotrogus crassiusculus* Motschulsky, 1866
= *semiopacus* Eichhoff, 1878b (*Xyleborus*)
= *semigranosus* Blandford, 1896b (*Xyleborus*)
= *bengalensis* Stebbing, 1908 (*Dryocoetes*)
= *mascarenus* Hagedorn, 1908 (*Xyleborus*)
= *ebriosus* Niisima, 1909 (*Xyleborus*)
= *okoumeensis* Schedl, 1935 (*Xyleborus*)

This species is diagnosed by the following morphological characters: ♀ frons weakly convex with a distinct median line, surface coarsely granulate, a few distinct carinulae on either side of median line converging towards epistomal margin; vertex finely reticulate punctate; vestiture of long, sparse hairs on frons, denser on epistomal margin; eyes elongately oval, rather deeply emarginate; antennal club obliquely truncate on anterior face (type 1); pronotum as long as wide, rounded (type 1) from dorsal view and basic (type 0) from lateral view; anterior margin narrowly rounded armed with ten asperities; summit feebly marked at middle; anterior two-thirds with small asperities; posterior portion finely reticulate with distinct punctures; vestiture of sparse, long hairs antero-laterally and dense mycangial tuft towards pronotal base; scutellum large, shiny and tongue-shaped; elytra 1.25× as long as pronotum, 1.30× as long as wide; basal margin substraight; lateral sides sub-parallel up to basal two-thirds, broadly rounded posteriorly; postero-lateral margins of elytra distinctly carinate and confluent with interstria 7; disc smooth and shiny; striae not so impressed and marked by small and shallow punctures, each with a microhair; interstriae more than three times as wide as striae with irregular two to three rows of punctures as in striae with fine, semi-recumbent hairs; declivity somewhat convex, gradually sloping, feebly elevated towards sutural apex; surface dull with obsolete strial punctures, rather with confused granules throughout; vestiture of small fine hairs and uniseriate rows of long stout setae; color dark-brown; body length: 2.53–2.55 mm, 2.16× as long as wide.

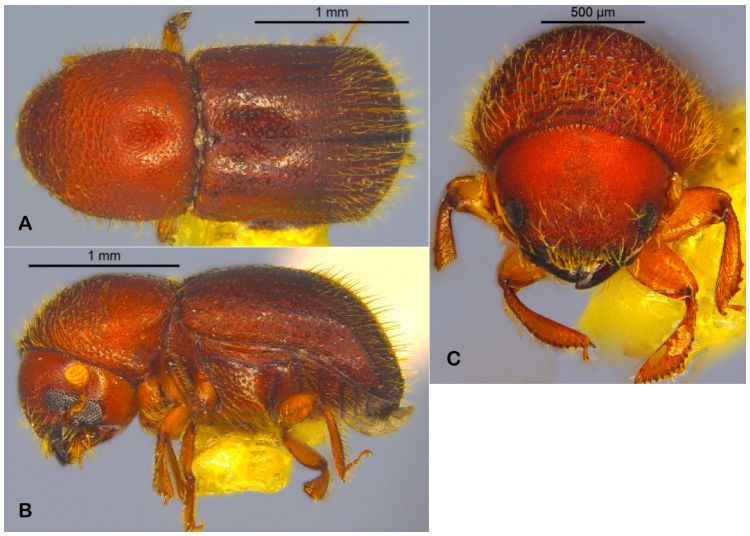


**FIGURE 71**. *Xylosandrus crassiusculus*. Female: dorsal view **A**, lateral view **B**, frons **C**.

Male deformed in shape and smaller in size; pronotum without asperities; elytra more gradually arched towards apex.

**Material examined:** New record: India: 3 ♀'s. Himachal Pradesh, Palampur, Tanda (32° 06.141′ N, 076° 32.036′ E, 4008 ft.), A.A. Buhroo, 25.09.2018 (KUIC).

**Distribution:** India: Himachal Pradesh (Palampur); wide distribution range from Oriental region to Japan, Pacific islands to Hawaii, tropical Africa and North America

**Hosts:** *Albizia chinensis* (Fabaceae) and *Grevillea robusta* (Proteaceae) (new host records). *Acrocarpus fraxinifolius* (Fabaceae), *Cryptocarya wightiana* (Lauraceae), *Toona hexandra* (Meliaceae)

**Remark:** Apart from the five species of Xyleborini mentioned above, there are 17 additional species of this tribe that are found in Uttarakhand, according to the recently released Monograph of Indochinese Xyleborini by Smith *et al.* (2020), which are given in the comparison Table 1.

**TABLE 1.** List of Scolytinae tribes, genera, and species known from the Western Himalaya in contrast to the Eastern Himalaya.

| Tribe | Western Himalaya | Eastern Himalaya |
|---|---|---|
| **Corthylini** | *Pityophthorus cedri* Wood, *P. chilgoza* Wood, *P. deodara* (Stebbing) | *Pityophthorus deodara* (Stebbing) |
| **Cryphalini** | *Cryphalus fulmineus* Wood, *C. himalayensis* **sp. n.**, *C. major* Stebbing, *C. mangiferae* Stebbing, *C. strohmeyeri* Stebbing | *Cryphalus* sp. aff. *major* Stebbing, *C. discretus* Eichhoff, *C. strohmeyeri* Stebbing |
| **Crypturgini** | *Crypturgus beesoni* Eggers, *C. pusillus* (Gyllenhal) | *Crypturgus pusillus* (Gyllenhal) |
| **Diamerini** | | *Diamerus curvifer* (Walker), *D. fici* Blandford, *D. nigrisetosus* Eggers, *D. striatus* Eggers |
| | *Sphaerotrypes montanus* Buhroo & Knížek, *S. querci* Stebbing | *Sphaerotrypes bengalensis* Wood, *S. siwalikensis* Stebbing |
| **Dryocoetini** | *Coccotrypes cinnamomi* (Eggers), *C. papuanus* (Eggers) | *Coccotrypes advena* Blandford, *C. cardamomi* Schaufuss, *C. carpophagus* (Hornung), *C. cyperi* (Beeson), *C. dactyliperda* (Fabricius), *C. impressus* Eggers, *C. longior* (Eggers), *C. nubilus* (Blandford), *C. papuanus* (Eggers), *C. salakensis* (Schedl), *C. vulgaris* (Eggers) |
| | *Dryocoetes asperatus* **sp. n.**, *D. brownie* Mandelshtam & Petrov, *D. himalayensis* Strohmeyer, *D. indicus* Stebbing, *D. quadrisulcatus* Strohmeyer | *Dryocoetes hectographus* Reitter, *D. indicus* Stebbing |
| | | *Dryocoetiops moestus* (Blandford), *D. coffeae* (Eggers) |
| | *Taphrorychus betulae* Schedl, *T. hewetti* (Stebbing) | *Taphrorychus hewetti* (Stebbing) |
| **Ernoporini** | *Eidophelus indicus* (Wood) | *Eidophelus aspericollis* (Eichhoff), *E.* sp. aff. *ater* (Eggers), *E. imitans* Eichhoff, *E. punctatus* (Schedl) |
| | *Ernoporus squamosus* **sp. n.** | |
| **Hylesinini** | | *Ficicis porcatus* (Chapuis) |
| | *Hylesinus macmahoni* (Stebbing) | *Hylesinus* sp. aff. *tupolevi* Stark |
| **Hylurgini** | *Hylurgus indicus* Wood | |
| | | *Pseudoxylechinus indicus* Wood, *P. setosus* (Eggers) |
| | *Xylechinus padus* Wood | *Xylechinus darjeelingensis* Schedl |

*.....continued on the next page*

**TABLE 1.** (Continued)

| Tribe | Western Himalaya | Eastern Himalaya |
|---|---|---|
| **Hyorrhynchini** | | *Hyorrhynchus kalimpongensis* Maiti & Saha, *H. sensarmai* Maiti & Saha, *H. shiva* Maiti & Saha |
| | | *Pseudohyorrhynchus blandfordi* (Sampson) |
| | | *Sueus niisimai* (Eggers) |
| **Ipini** | | *Acanthotomicus perexiguus* (Blandford) |
| | *Ips stebbingi* Strohmeyer, *I. longifolia* (Stebbing) | *Ips longifolia* (Stebbing), *I. schmutzenhoferi* Holzschuh |
| | *Pityogenes scitus* Blandford, *P. spessivtsevi* Lebedev | *Pityogenes scitus* Blandford |
| **Micracidini** | *Pseudothysanoes kashmirica* Buhroo & Knížek | |
| **Phloeosinini** | | *Phloeocranus bruchoides* Schedl |
| | | *Phloeosinus corneyanus* Knížek & Tshering, *P. jubatus* Sampson, *P.* sp. aff. *shensi* Tasi & Yin, *P.* sp. aff. *squamulatus* Chapuis |
| **Polygraphini** | *Carphoborus costatus* Wichmann, *C. zhobi* (Stebbing) | |
| | *Polygraphus aterrimus* Strohmeyer, *P. difficilis* Wood, *P. longifolia* Stebbing, *P. major* Stebbing, *P. pini* Stebbing, *P. setosus* Schedl, *P. trenchi* Stebbing | *Polygraphus longifolia* Stebbing, *P. major* Stebbing, *P. pini* Stebbing, *P. setosus* Schedl, *P. squamosus* (Schedl) |
| **Scolytini** | *Scolytus kashmirensis* Schedl, *S. major* Stebbing, *S. nitidus* Schedl, *S. stepheni* Mandelshtam & Petrov | *Scolytus nitidus* Schedl |
| **Scolytoplatypodini** | *Scolytoplatypus daimio* Blandford, *S. darjeelingi* Stebbing, *S. denticauda* **sp. n.**, *S. kunala* Strohmeyer, *S. minimus* Hagedorn, *S. raja* Blandford | *Scolytoplatypus brahma* Blandford, *S. darjeelingi* Stebbing, *S. gardneri* Maiti & Saha, *S. lopchuensis* Maiti & Saha, *S. minimus* Hagedorn, *S. nitidicollis* Eggers, *S. pubescens* Hagedorn, *S. raja* Blandford, *S. ruficauda* Eggers, *S. samsinghensis* Maiti & Saha |
| **Trypophloeini** | | *Cosmoderes monilicollis* (Eichhoff) |
| | *Hypothenemus birmanus* (Eichhoff), *H. ficivorus* **sp. n.** | *Hypothenemus crudiae* (Panzer), *H. eruditus* (Westwood) |
| **Xyleborini** | *Amasa eugeniae* (Eggers) | |
| | *Ambrosiodmus minor* (Stebbing) | *Ambrosiodmus asperatus* (Blandford), *A. minor* (Stebbing) |
| | | *Ambrosiophilus satoi* (Schedl), *A. sulcatus* (Eggers) |
| | *Anisandrus lineatus* (Eggers), *A. mussooriensis* (Eggers) | *Anisandrus cristatus* (Hagedorn), *A. eggersi* (Beeson), *A. geminatus* (Hagedorn), *A. hirtus* (Hagedorn), *A. lineatus* (Eggers), *A. mussooriensis* (Eggers), *A. niger* (Sampson) |
| | | *Arixyleborus moestus* (Eggers) |
| | | *Cnestus gravidus* (Blandford), *C. nitidipennis* (Schedl) |
| | | *Coptodryas mus* (Eggers) |
| | *Cyclorhipidion distinguendum* (Eggers), *C. inarmatum* (Eggers) | *Cyclorhipidion distinguendum* (Eggers), *C. druk* Smith & Beaver, *C. fukiense* (Eggers), *C. inarmatum* (Eggers) |
| | *Debus shoreae* (Stebbing) | *Debus amphicranoides* (Hagedorn), *D. fallax* (Eichhoff), *D. shoreae* (Stebbing) |

*.....continued on the next page*

**TABLE 1.** (Continued)

| Tribe | Western Himalaya | Eastern Himalaya |
|---|---|---|
| **Xyleborini** | *Diuncus corpulentus* (Eggers), *D. haberkorni* (Eggers) | *Diuncus corpulentus* (Eggers) |
| | | *Eccoptopterus spinosus* (Olivier) |
| | *Euwallacea interjectus* (Blandford), *E. malloti* (Eggers), *E. similis* (Ferrari) | *Euwallacea andamanensis* (Blandford), *E. fornicatus* (Eichhoff), *E. gravelyi* (Wichmann), *E. insolitus* Smith & Beaver, *E. interjectus* (Blandford), *E. neptis* Smith, Beaver & Cognato, *E. piceus* (Motschulsky), *E. sibsagaricus* (Eggers), *E. similis* (Ferrari), *E. velatus* (Sampson) |
| | | *Heteroborips indicus* Smith, Beaver & Cognato |
| | | *Leptoxyleborus sordicauda* (Motschulsky) |
| | | *Microperus undulatus* (Sampson) |
| | *Planiculus bicolor* (Blandford) | |
| | *Webbia pabo* Sampson | |
| | *Xyleborinus andrewesi* (Blandford), *X. artestriatus* (Eichhoff), *X. saxesenii* (Ratzeburg) | *Xyleborinus andrewesi* (Blandford), *X. artestriatus* (Eichhoff), *X. exiguus* (Walker), *X. speciosus* (Schedl) |
| | *Xyleborus cognatus* Blandford, *X. perforans* (Wollaston) | *Xyleborus affinis* Eichhoff, *X. conditus* Schedl, *X. perforans* (Wollaston) |
| | *Xylosandrus crassiusculus* (Motschulsky), *X. discolor* (Blandford), *X. mesuae* (Eggers) | *Xylosandrus brevis* (Eichhoff), *X. crassiusculus* (Motschulsky), *X. discolor* (Blandford), *X. formosae* (Wood), *X. geduensis* Smith & Beaver, *X. jaintianus* (Schedl) |
| **Xyloctonini** | | *Scolytomimus assamensis* Schedl |
| **Xyloterini** | | *Indocryphalus intermedius* (Sampson) |
| | | *Trypodendron dorjitenzingi* Schmutzenhofer |

## The endemism and distribution of scolytine fauna in the Western Himalaya

Bark and ambrosia beetles spread throughout the world's forests around 120 million years ago, when vast distances of ocean separated most of the continents (Kirejtshuk *et al.* 2009). Furthermore, as indicated by periodic radiation bursts, geographic isolation had a significant role in the diversification of species (Jordal & Cognato 2012). These beetle adults and larvae consume plant tissues such as twigs, branches, trunks, roots, xylem, piths, fruits, and cones. Bark beetles act as the primary decomposers of this plant tissue, which is typically dead or dying (Stokland *et al.* 2012). They also provide channels for other decomposers to enter the wood.

The previous studies on the diversity of bark beetles in the northwestern Himalayan region remain fragmentary (e.g., Schedl 1957; Buhroo & Lakatos 2007, 2011; Maiti & Saha 2009; Buhroo *et al.* 2020; Buhroo & Knížek 2020). To verify the accuracy of the identification and build taxonomic keys, the specimens in the current study were compared and verified with all known Palaearctic and Oriental species that were gathered from different locations throughout the region and at FRI Dehradun. There are 165 species of Scolytinae known to exist in the Himalaya, according to current research and reliable literature (Knížek 2011; Beaver & Liu 2018; Smith *et al.* 2020; Beaver & Smith 2022; Knížek & Tshering 2024). The Western Himalayan region yielded 74 scolytine species in the current study, including five new species (Table 1), while 122 species exist in the Eastern Himalaya (Nepal, Sikkim, Darjeeling and Bhutan) including 70 species from Nepal (Beaver & Liu 2018) and 35 species from Bhutan (Beaver & Smith 2022; Knížek & Tshering 2024). The following species are exclusive to the Western Himalaya: *Pityophthorus cedri*, *P. chilgoza*. *Cryphalus fulmineus*, *C. himalayensis* **sp. nov.**, *C. mangiferae*, *Crypturgus beesoni*, *Sphaerotrypes montanus*, *Coccotrypes cinnamomi*, *Dryocoetes asperatus* **sp. nov.**, *D. brownei*, *D. himalayensis*, *D. quadrisulcatus*, *Taphrorychus betulae*, *Eidophelus indicus*, *Ernoporus squamosus* **sp. nov.**, *Hylesinus macmahoni*, *Hylurgus indicus*, *Xylechinus padus*, *Ips stebbingi*, *Pityogenes spessivtsevi*, *Pseudothysanoes kashmirica*, *Carphoborus costatus*, *C.*

*zhobi*, *Polygraphus aterrimus*, *P. difficilis*, *P. trenchi*, *Scolytus kashmirensis*, *S. major*, *S. stepheni*, *Scolytoplatypus daimio*, *S. denticauda* **sp. nov.**, *S. kunala*, *S. minimus*, *Hypothenemus birmanus*, *H. ficivorus* **sp. nov.**, *Amasa eugeniae*, *Diuncus haberkorni*, *Euwallacea malloti*, *Planiculus bicolor*, *Webbia pabo*, *Xyleborinus saxesenii*, *Xyleborus cognatus* and *Xylosandrus mesuae*. The genera *Dryocoetiops*, *Pseudoxylechinus*, *Pseudohyorrhynchus*, *Phloeosinus*, *Ambrosiophilus*, *Arixyleborus*, *Cnestus*, *Leptoxyleborus*, *Microperus*, *Scolytomimus*, *Indocryphalus* and *Trypodendron* are found only in the Eastern Himalayan region.

Both Himalayan regions share the 31 scolytine species mentioned in Table 1. In fact, the newly discovered *Ernoporus squamosus* **sp. nov.** marks the first record of this genus on *Ficus palmata* and *Morus alba* from the Indian sub-continent. Along with *Pseudothysanoes modestus*, which has previously been recorded from the Far-Eastern Palaearctic subregion (Mandelshtam *et al.* 2007; Knížek 2011), *P. kashmirica* is just the second species of this genus to be reported from all of Eurasia. The species *Sphaerotrypes montanus* was only observed on its host in the hilly Pir Panjal range, which has a nearly semi-temperate climate, rather than in the main region of Kashmir. Therefore, it is suggested that its range can be the semi-temperate zone of Northwestern Himalaya including the Pir Panjal range until found from some other localities.

Based on the taxonomic comparison presented above and more recent research (Smith *et al.* 2020), it appears that the Eastern Himalayan fauna is similar to that of southern China and Southeast Asia, regions with tropical and subtropical climates. Distribution records also show that the majority of ambrosia beetles are found in the aforementioned Himalayan area. Many of those species are found in tropical forests, with just secondary adaptations to the subtropical, mountain, and temperate climates found in the drier western regions and at higher elevations. However, the fauna of the Western Himalaya is diverse and exhibits endemic nature because of altitudinal variations and different types of climatic circumstances. As a result, there is still much to learn about the biodiversity of Scolytinae from a variety of host plants, and this work offers a baseline for future research on the fauna of the Himalayas.

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