

Revision of the new world species of *Hylurgops* LeConte, 1876 with the description of a new genus in the Hylastini (Coleoptera: Scolytinae) and comments on some Palearctic species

JAVIER E. MERCADO-VÉLEZ^{1,2,3} & JOSÉ F. NEGRÓN²

¹Colorado State University, Fort Collins, Colorado

²USDA/FS/Rocky Mountain Research Station, 240 West Prospect, Fort Collins, CO 80526

³Corresponding author. E-mail: jmercado01@fs.fed.us

Table of contents

Abstract	301
Resumen	302
Introduction	302
Biology	304
Material and methods	306
Key to the genera in the Hylastini (including the world fauna)	308
<i>Pachysquamus</i> , new genus	308
<i>Pachysquamus subcostulatus</i> (Mannerheim, 1853) comb. n.	311
Genus <i>Hylurgops</i> LeConte, 1876	314
Key to the New World <i>Hylurgops</i>	315
<i>Hylurgops palliatus</i> (Gyllenhal, 1813)	316
<i>Hylurgops planirostris</i> (Chapuis, 1869)	319
<i>Hylurgops rugipennis</i> (Mannerheim, 1843)	321
<i>Hylurgops pinifex</i> (Fitch, 1858)	324
<i>Hylurgops incomptus</i> (Blandford, 1897)	326
<i>Hylurgops longipennis</i> (Blandford, 1896)	329
<i>Hylurgops knausi</i> Swaine, 1917	330
<i>Hylurgops reticulatus</i> Wood, 1971	331
<i>Hylurgops porosus</i> (LeConte, 1868)	333
Concluding remarks	335
Comments on some Palearctic species of <i>Hylurgops</i>	337
Acknowledgements	338
References	338

Abstract

The New World species of the genus *Hylurgops* LeConte are revised and *Hylurgops subcostulatus* Mannerheim is transferred to the new genus *Pachysquamus*. A revised key to the tribe Hylastini which can be used for the world fauna is presented to include *Pachysquamus*. Our studies suggest that the Nearctic species *H. knausi* Swaine is a valid taxon, distinguishable from the Mesoamerican *H. planirostris* Chapuis. The subspecies *H. rugipennis rugipennis* Mannerheim and *H. r. pinifex* Fitch are considered distinct species. A key to *Hylurgops* species of the New World is provided to accommodate the restituted species. Due to their broadly separated procoxae the Palearctic species *H. bomvouloiri* and *H. inouyei* do not agree with the genus *Hylurgops*.

Key words: bark beetles, morphology, Hylastini, *Hylurgops*, *Pachysquamus*, key, aedeagus

Resumen

Las especies pertenecientes al género *Hylurgops* LeConte del nuevo mundo se han revisado. *Hylurgops subcostulatus* Mannerheim es transferido al nuevo género *Pachysquamus*. Se presenta una nueva clave para la tribu Hylastini y es aplicable a la fauna mundial incluyendo el género *Pachysquamus*. Nuestros estudios sugieren que la especie Neártica *H. knausi* Swaine es un taxón válido, distinguible de la especie Mesoamericana *H. planirostris* Chapuis. Las subespecies *H. r. rugipennis* Mannerheim y *H. r. pinifex* Fitch son también consideradas como especies válidas. Proveemos una clave para determinar las especies del género *Hylurgops* del nuevo mundo que acomoda las especies que han sido restituidas. Debido a la gran separación de procoxa de las especies Paleárticas *H. bonvouloiri* (Chapuis) y *H. inouyei* Nobuchi estas no se ajustan a la definición del género *Hylurgops*.

Introduction

With more than 6,000 described species worldwide (Wood 1982), bark beetles (Scolytinae) represent a large and diverse taxon within the Curculionidae. A few Scolytinae genera are particularly well known due to their economic and ecological importance. These are considered by entomologists and foresters as primary bark beetles, species that can overwhelm natural defenses of a healthy tree and reproduce within it successfully (Peirson 1923). Among these are certain species in the genera *Dendroctonus* Erichson, *Ips* DeGeer, and *Scolytus* Geoffroy. In contrast to primary bark beetles, those considered secondary (Peirson 1923) such as species of *Hylurgops* LeConte, are usually unable to kill a healthy tree, and thus are usually less studied.

The tribe Hylastini was erected by LeConte (1876), who selected *Hylastes* Erichson, 1836 as the type genus; it is considered a tribe of the Scolytinae (Wood 1982, Zarazaga & Lyal 2009). It was considered by Wood (1978, 1982, 1986) to represent a primitive group within the subfamily. Genera in the Hylastini are characterized by having a seven-segmented antennal funicle and an acutely raised precoxal ridge or costa. LeConte (1876) included in this group the genus *Hylurgops*, where he placed the species in Erichson's (1836) second division of the genus *Hylastes*, which had broad and bilobed third tarsal segments (Fig. 1a) and anteriorly protuberant mesoventrite (Fig. 2a). He also included the genus *Scierus*, where he placed a single species with widely separated procoxae, differing from both *Hylastes* and *Hylurgops*, in which the procoxae are subcontiguous.

The origins of the genus *Hylurgops* have been suggested to be Holarctic (Wood 1982), from which the earliest representatives were described from Baltic amber (Schedl 1947) dating back to the late Eocene, around 38 million years ago. Presently, 22 species are included in the genus (see Wood & Bright 1992, Alonso-Zarazaga & Lyal 2009), distributed throughout the Holarctic region where the conifer hosts occur. Nine species have a Nearctic to high montane Neotropical distribution, including the established exotic *H. palliatus* Gyllenhal (see Haack 2001, Hoebeke & Acciavatti 2006). The remaining 14 species are distributed throughout the Palearctic.

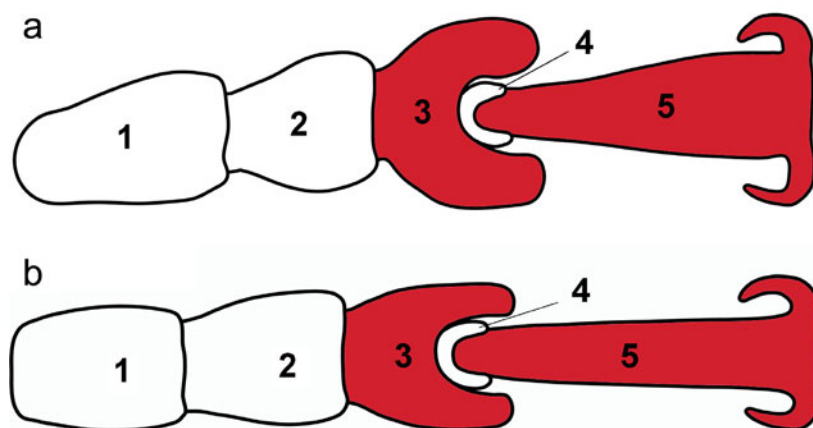


FIGURE 1. Tarsal characters distinguishing *Hylurgops* from *Hylastes*: a) third tarsal segment broader than the second, the fifth tarsal segment broadening apically (*Hylurgops longipennis*), b) second and third tarsal segments equally broad, fifth not broadening apically (*Hylastes mexicanus*).

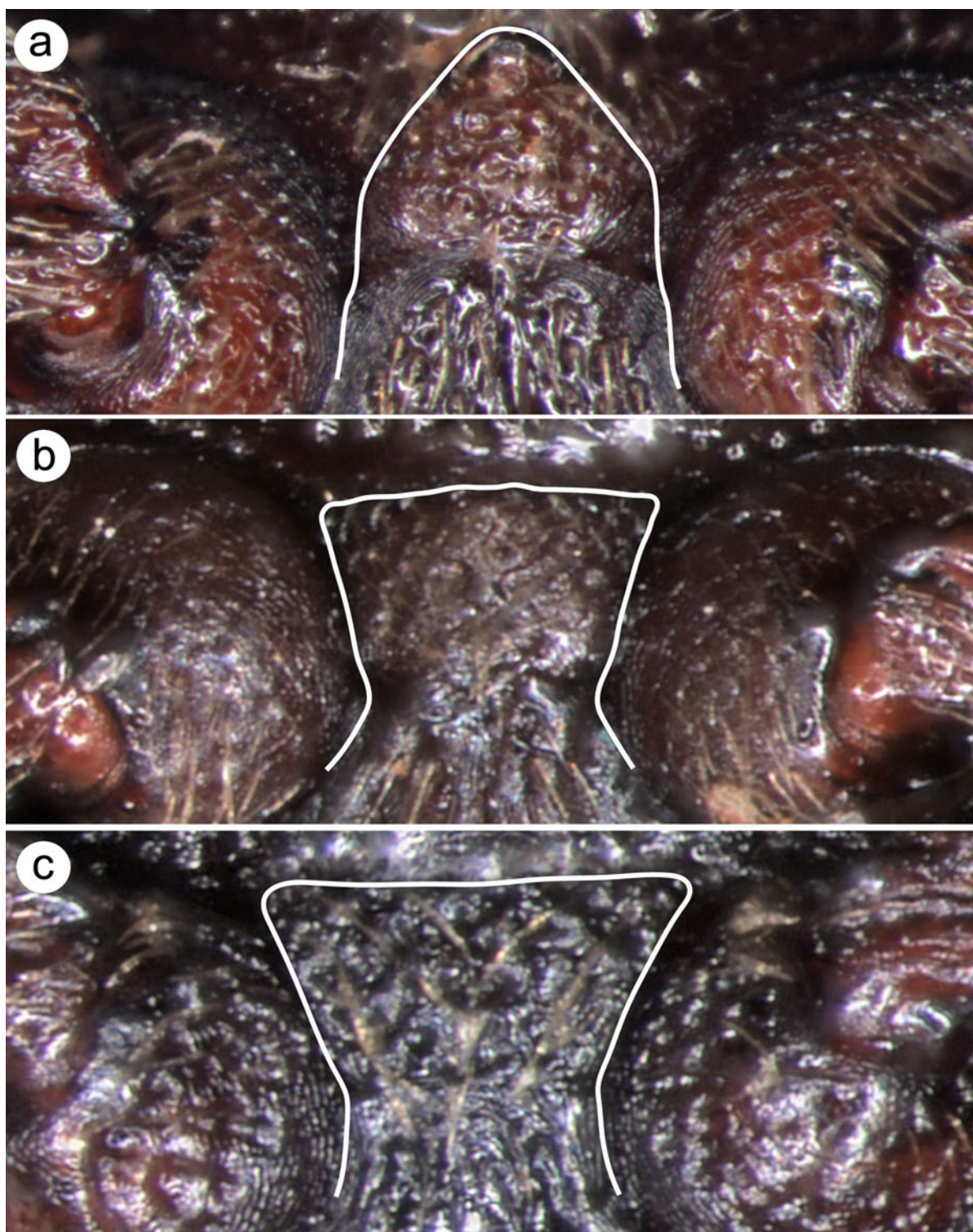


FIGURE 2. Anterior margin of mesoventrite in the Hylastini: a) distinctly pointed (*Pachysquamus subcostulatus*), b) slightly rounded and sub-inflated (*Hylurgops planirostris*), c) truncate, margin straight (*Hylastes salebrosus*).

Various species of *Hylurgops* have been reviewed previously. These reviews have been based on both external and internal morphologies (Munro 1917, Tsai & Huang 1964, Yin *et al.* 1984) including the genitalia (Nüsslin 1912), and the larval morphology (Thomas 1957). Descriptions for the Holarctic species including diagnostic keys are available (Reitter 1913, Pfeffer 1944). Also, diagnostic treatments are present for species of smaller regions or countries such as Europe and neighboring countries (Pfeffer 1995), eastern Russia (Krivolutskaya 1996), China (Tsai & Huang 1964, Yin *et al.* 1984), Japan (Murayama 1963), Canada and Alaska (Bright 1976), and North and Central America (Wood 1978, 1982). All the New World species were described between 1843 and 1971 (Table 1).

In his North and Central American bark beetle monograph, Wood (1982) treated *Hylurgops* and included a key and descriptions to the species of the New World. This revision reevaluates Wood's conclusions, as well as that of other workers and presents a treatment of the New World species in *Hylurgops* and a description of a new related genus.

TABLE 1. New World *Hylurgops* (including *Pachysquamus* new genus) previous designations and changes in this revision, listed in order of species description date.

Original designation	Wood (1982)	This study
<i>Hylesinus rugipennis</i> Mann., 1843	<i>H. r. rugipennis</i>	<i>H. rugipennis</i>
<i>Hylastes subcostulatus</i> Mann., 1953	<i>H. s. subcostulatus</i>	<i>P. subcostulatus</i>
<i>Hylastes pinifex</i> Fitch, 1858	<i>H. r. pinifex</i>	<i>H. pinifex</i>
<i>Hylastes porosus</i> LeConte, 1868	<i>H. porosus</i>	<i>H. porosus</i>
<i>Hylastes planirostris</i> Chapuis, 1869	<i>H. planirostris</i>	<i>H. planirostris</i>
<i>Hylastes alternans</i> Chapuis, 1869	<i>H. s. alternans</i>	<i>P. subcostulatus</i>
<i>Hylastes longipennis</i> Bland., 1896	<i>H. longipennis</i>	<i>H. longipennis</i>
<i>Hylastes incomptus</i> Bland., 1897	<i>H. incomptus</i>	<i>H. incomptus</i>
<i>Hylurgops knausi</i> Swaine, 1917	<i>H. planirostris</i>	<i>H. knausi</i>
<i>Hylurgops reticulatus</i> Wood, 1971	<i>H. reticulatus</i>	<i>H. reticulatus</i>

Biology

Adult *Hylurgops* are attracted by mixtures of alcohols and terpenes in the host's resin such as ethanol, α -pinene and β -pinene that are commonly released by dying or stressed conifers (Byers 1992, Volz 1988, Kelsey & Joseph 2003). Phloeophagous *Hylurgops* have been found in conifers of the genera *Abies*, *Larix*, *Picea*, *Pinus*, *Pseudotsuga*, and *Tsuga* where they feed and breed from the lower bole to the root crown of the tree (Furniss & Carolin 1977). They can also live in the fallen trunks and branches of their hosts where they prefer the damp undersides especially in cool and moist locations (Graham 1922, Oester *et al.* 1978, Wood 1982, Grünwald 1986). The preference for hosts in cool and moist areas can be further inferred from studies showing higher densities of the species *H. palliatus* and *H. glabratus* Zetterstedt occurring in bolts located in the forest's interior or at the edge, and lower densities in bolts located in adjacent drier and warmer clear-cuts (Fossestøl & Sverdrup-Thygeson 2009, Peltonen & Heliövaara 1999).

Hylurgops reproduction is barely known; however, its mating system has been described as monogamous in *H. palliatus*, *H. pinifex*, and *H. rugipennis* (Blackman 1919, Oester *et al.* 1978, Benz *et al.* 1986). Adult beetles search for a new tree that has been recently killed or is dying in response to biotic or abiotic disturbances, such as severe drought, fire, or the attack of a primary beetle or a fungal pathogen, among other factors. In these susceptible hosts, the female initiates a new brood gallery (Blackman 1919, Kirkendall 1983).

It is possible that *Hylurgops* respond only to host volatiles or stress indicators such as ethanol, since the use of pheromones has not been identified in this genus. Males court the mining female by stridulating, using the plectral tubercle's setae located on the seventh abdominal tergite (Barr 1969, Lyal & King 1996, Oester *et al.* 1978). Mating occurs in a chamber built by the female close to the entrance hole (Blackman 1919). Interestingly, unmated males probably attempt to mate previously paired females opportunistically, since they have been observed to be pushed out by the pair's male after entering their gallery (Oester *et al.* 1978).

Females deposit their eggs into niches along the sides of the simple longitudinal and slightly sinuate gallery (Fig. 3b) (Bright 1976). The emerging larvae tunnel perpendicularly to both sides of the longitudinal gallery (Blackman 1919). As the larvae feed, they mine the phloem in random patterns, eventually making their galleries as well as the brood gallery patterns indistinguishable (Swaine 1918, Blackman 1919). Four instars have been documented for *H. rugipennis* and *H. palliatus* (Lekander 1968, Bright & Stark 1973, Davis *et al.* 2008). After completing the last instar, the pupae of *H. pinifex* develops in a chamber for a week before emerging as adults (Blackman 1919).

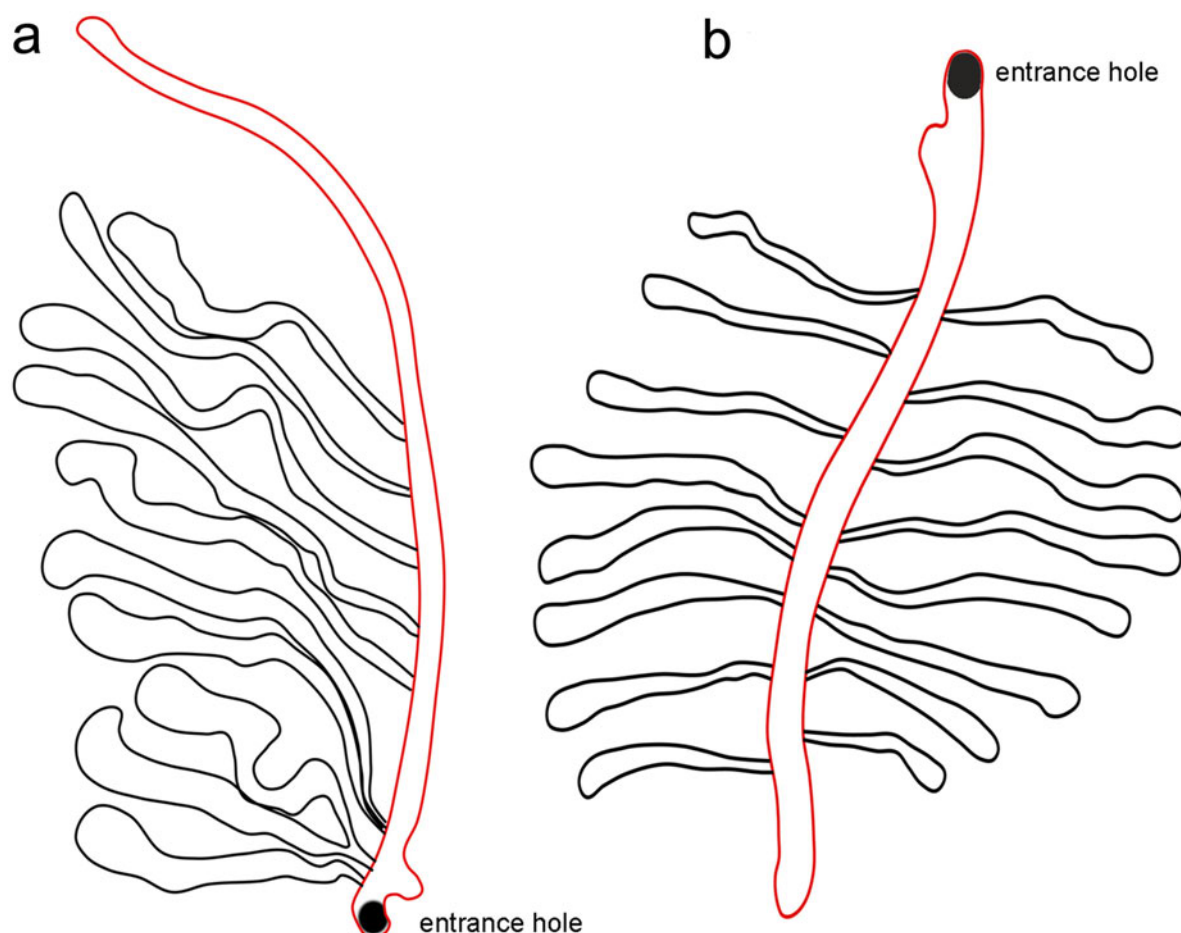


FIGURE 3. Detail of Hylastini galleries: a) *Pachysquamus subcostulatus*, maternal (red) and larval gallery (adapted from Cibrián-Tovar *et al.* 1995), b) *Hylurgops pinifex* (eastern form), maternal (red) and larval gallery (adapted from Blackman 1919).

As described for *H. pinifex* (Blackman 1919), *H. palliatus* (Gillanders 1908, Davis *et al.* 2008), and *H. rugipennis* (Bright & Stark 1973), *Hylurgops* overwinter both as fourth instar larvae and adults. The life cycle varies, depending on the temperature in the subcortical region of its host (Reid 1955). This has been described as univoltine in *H. palliatus* (Peltonen & Heliövaara 1999) and bivoltine in *H. rugipennis* and *H. pinifex* (Keen 1929, Chamberlin 1939, Reid 1955).

Hylurgops species have been associated with many species of fungi. Thirty-eight species of fungi that were inoculated into logs by *H. palliatus* were collected from *Pinus sylvestris* in Poland, including *Leptographium lundbergii* Lagerb. & Melin, which is a blue stain-causing fungus (Jankowiak 2006). Several ophiostomatoid fungi were isolated from roots of *Pinus ponderosa* in New Mexico after an attack by *H. planirostris* (Livingston *et al.* 1983). *Hylurgops planirostris* has been found in live *P. ponderosa* and could likely serve as a vector of pathogenic fungi into healthy trees (Livingston *et al.* 1983).

Fungal inoculations by *H. porosus* have been reported to be extensive (Otrosina & Ferrel 1995). In northern California, this was the most common bark beetle species found in experiments detecting *L. wagneri* Kendrick, and the third most likely species to inoculate this pathogen into *P. ponderosa* in 2002 (Schweigkofler *et al.* 2005). It is possible that suppressed seedling mortality in *P. contorta*, *P. monticola*, and *P. ponderosa* (Keen 1938) was in response to a combination of the girdling caused by *H. porosus* larvae and the inoculation of the pathogenic fungi it carries.

Material and methods

The taxonomic treatment used in this review follows that of Crowson (1967) and Kuschel (1995). Tribe designations follows the system by Wood (1982). Type specimens were examined and included the World fauna of *Hylurgops* with the exception of *Hylurgops junnanicus* Sokanovskii, a species known only from the type specimen. We also examined the Nearctic *Hylastes* fauna, including some Palearctic taxa. Species descriptions from the taxa in the tribe Hylastini were revised for diagnostic characters. Loan of specimens were obtained from the following museums, institutions, and personal collections (Codes follow Arnett *et al.* 1993):

CNCI	Canadian National Collection of Insects, Ottawa, Ontario, Canada
CUIC	Cornell University Insect Collection, Ithaca, New York, USA
CSUC	C.P. Gillette Museum of Arthropod Diversity, Fort Collins, Colorado, USA
DEBC	Donald E. Bright Collection, Fort Collins, Colorado, USA
ISNB	Royal Belgian Institute of Natural Sciences, Brussels, Belgium
NHMW	Museum of Natural History of Vienna, Vienna, Austria
UAIC	University of Arizona Insect Collection, Tucson, Arizona, USA
RMRSC	USDAFS Rocky Mountain Research Station Collection, Fort Collins, Colorado, USA
USNM	National Museum of Natural History, Washington, DC, USA

Below is a list of additional abbreviations of institutions cited:

BMNH	Natural History Museum, London, England
MCZC	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA
MZHF	Zoological Museum, University of Helsinki, Helsinki, Finland
UZI	Uppsala University, Museum of Evolution, Uppsala, Sweden

Locality information of examined specimens with reliable reference information was estimated using Google Earth 6.0 (<http://www.google.com/earth>) and logged into a spreadsheet. Locations were imported into ArcGIS 10 with a UTM projection adjusted to the center of their distributions to produce distribution maps. Only the most commonly reported or widely distributed hosts from each species are depicted in the distribution maps. Although *Hylurgops* species have been suggested to occur in all available pine species within their distributions (Wood 1982) only hosts from examined specimen labels or published records are reported here.

To observe the morphological characters, specimens were examined with a Wild M5 stereomicroscope at 20–100× and a Leica MZ16 stereomicroscope at 10–115× magnifications. The imagery was taken with Leica MZ16 microphotography equipment and the multiple layers combined with Leica's Application Suite v. 2.8 or with Helicon Focus v. 4.80 (<http://www.heliconsoft.com/>) for increased depth of field. Images were post-processed with Adobe® Photoshop CS4® to highlight diagnostic characters.

Specimens were measured with the electronic caliper of Leica's Application Suite by positioning the desired region perpendicular to the instrument's field of view. This instrument measures to the nearest hundredth of a millimeter; all measurements were rounded to the nearest tenth of a millimeter. The prothoracic length was measured from the anterior margin to the basal margin following the prothorax middle line. This was added to the elytral length which was measured from the anterior margin of the scutellum through the suture until the apex of the elytra. Width was measured at the widest part of the pronotum. Proportions are the ratio of the length to the width. A total of 25 specimens from across their distributions were measured per species, their averages and standard deviations are given in the description sections.

Sclerite designations follow Leschen *et al.* (2010). The term interstria refers to the space between two contiguous rows of sunken and punctured striae. Striae adjacent to the suture are referred to as sutural striae, versus “striae one” as in Wood (1982). Aedeagi were examined in several specimens per species. The procedure involved removing dried specimens from points with a solvent and soaking them in warm water for 20 minutes or until the specimen relaxed. Ventrites were removed from behind the metacoxae and cleared in a warm 7–10% potassium hydroxide solution for 20 minutes. The cleared male genitalia was carefully pulled from the abdomen and transferred to a watch glass where it was rinsed with distilled water for 10 minutes and subsequently mounted on slides with Euparal mounting medium. The corresponding ventrites were also photographed to identify secondary sexual characters.

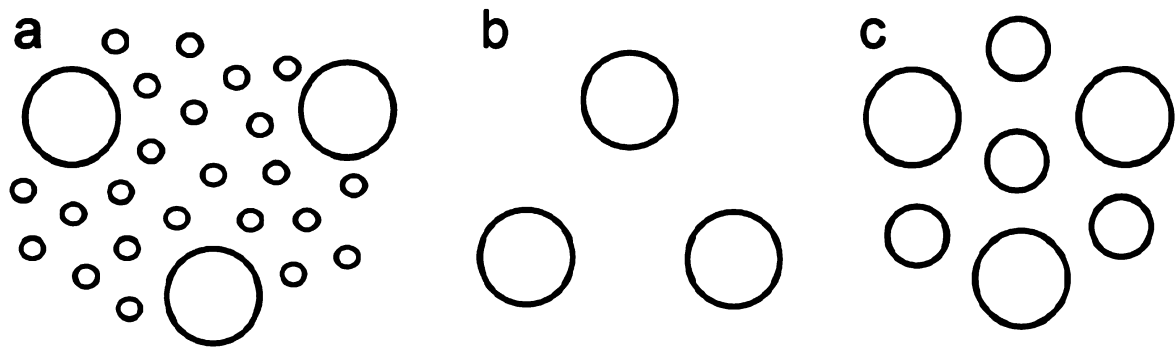


FIGURE 4. Surfaces between larger punctures in the pronotum: a) densely, minutely punctate (*Pachysquamus subcostulatus*), b) not punctate (*Scierus* and *Hylastes*), c) with smaller punctures about half the size of larger (*Hylurgops*).

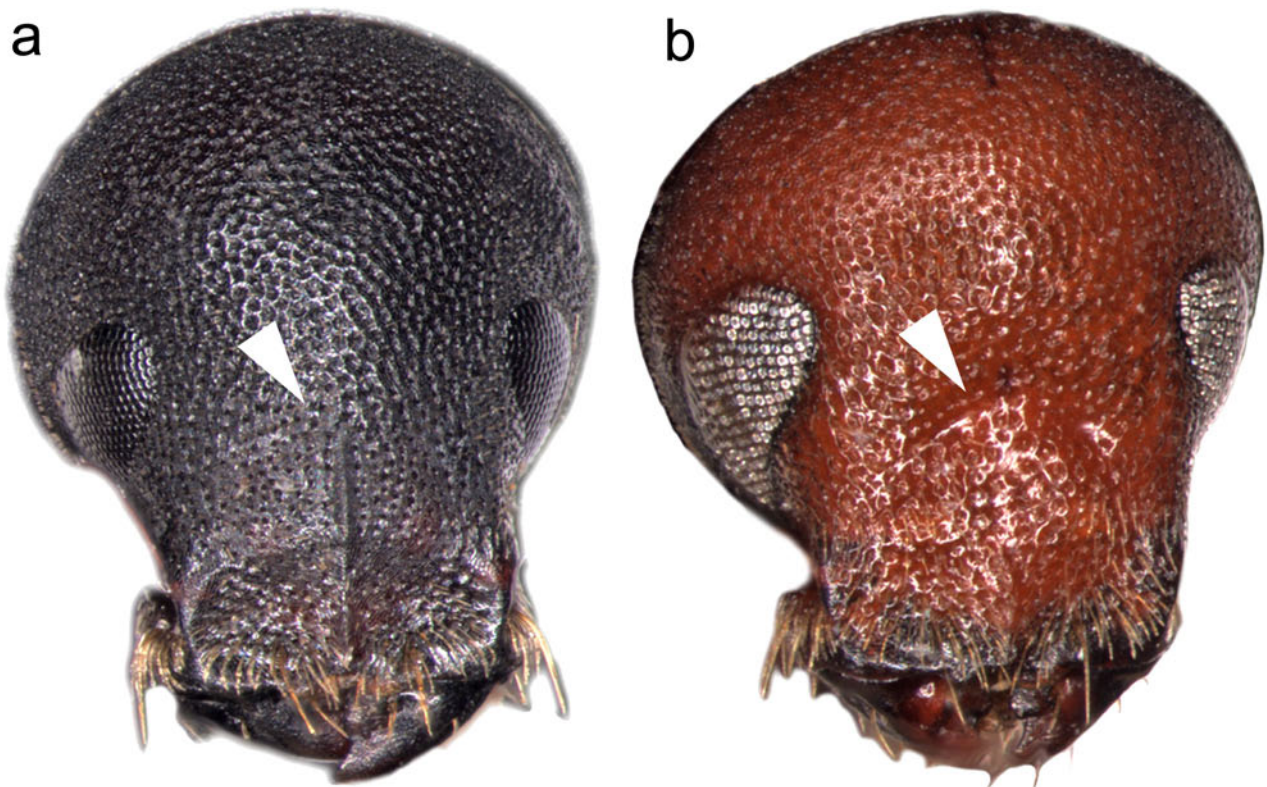


FIGURE 5. Depth of the mid-frontal impression of *Hylurgops* and *Hylastes*: a) deep and distinct (*Hylurgops rugipennis*), b) indistinct or absent (*Hylastes mexicanus*).

Key to the world genera in the Hylastini

- 1 Procoxae widely separated; elytral scale-like setae absent; elytral sides broadening posteriorly. *Scierus* LeConte, 1876
- Procoxae subcontiguous; elytral scale-like setae present; elytral sides nearly parallel 2
- 2 Surface of elytral disc densely covered by cup-shaped setae; odd numbered interstriae distinctly costate, especially at declivity; pronotal disc surface between large punctures abundantly, minutely punctate (Fig. 4a); anterior margin of mesoventrite pointed, distinctly extending anteriorly (Fig. 2a) *Pachysquamus* new genus
- Surface of elytral disc sparsely or densely covered by recumbent, hair-like setae; odd numbered interstriae evenly convex; pronotal disc surface between large punctures impunctate or with medium-sized punctures; anterior margin of mesoventrite slightly rounded or straight, extending anteriorly slightly or not (Figs. 2b, c) 3
- 3 Third tarsal segment 1.3–1.7× width of second, fifth broadening apically (Fig. 1a); pronotal disc with equal or greater number of smaller than larger punctures (Fig. 4c); prothorax averaging as long as wide (0.9–1.1); mid-frontal transverse impression usually distinct, without inflated area below (Fig. 5a) *Hylurgops* LeConte, 1876
- Third tarsal segment 1.0–1.1× width of second, fifth not broadening apically (Fig. 1b); pronotal disc lacking or with lesser number of smaller than larger punctures (Fig. 4b); prothorax averaging 1.2× longer than wide [1.0 (in *H. salebrosus*) to 1.3×]; mid-frontal transverse impression absent or indistinct, if present, inflated area below (Fig. 5b). *Hylastes* Erichson, 1836

Pachysquamus, new genus

Diagnosis. Diagnosed by the typical characters of the Hylastini (Wood 1982) and the following: **Size.** Length 3.1–4.7 (avg. 4.0 ± 0.4) mm long, 2.7× longer than wide. **Color.** Reddish-brown to medium dark-brown. **Frons.** Transverse impression between compound eyes down arching, carina extending from epistoma to frontal impression. **Eyes.** Elongate-oval, 2.6–2.8× longer than wide. **Pronotum.** Broad, 0.9× wider than long, strongly constricted anteriorly; discal surface with large punctures 3–5× the size of the abundant, minute punctures; interspaces narrower than diameter of small punctures, glossy; pronotal longitudinal midline indistinct; dorsal vestiture consisting of abundant cup-shaped setae and scattered thick bristles. **Elytra.** Length/width ratio 1.7–1.9 (avg. 1.8 ± 0.1); odd numbered interstriae raised, vestiture consisting of cup-shaped setae and erect thick bristles sparse on elevated interstriae. **Declivity.** As elytra but usually with shorter interstitial bristles. **Ventral sclerites.** Procoxae subcontiguous, precoxal region bluntly raised; margin of mesoventrite anteriorly extended and pointed (Fig. 2a); abdominal sclerites one and five longer than others, fifth more elongate in females than males. **Legs.** Third tarsal segment broader than second, fifth 2× broader at apex than at base. **Aedeagus** (Fig. 6, 7). Monotypic, see type species description.

Etymology: From the Greek “*pachy*,” meaning thick and “*squamus*,” meaning scale; for its distinct character of being thickly covered by scale-like setae in the shape of cups.

Type species: *Hylastes subcostulatus* Mannerheim 1853, present designation.

Discussion. The genus *Pachysquamus* exhibits several exclusive characters that distinguish it from all other genera in the Hylastini. A character separating it from *Hylurgops*, and previously mentioned (Chamberlin 1939, Swaine 1918, Wood 1982), is the raised, odd numbered elytral interstriae. The only other occurrence of raised interstriae in the Hylastini was described from the fossil of *H. piger* (Wickham 1913). This fossil questionably placed in the genus *Hylurgops* from a Miocene shale impression at Colorado’s Florissant Fossil Beds (Fig. 8).

The dorsal vestiture of the pronotum of the monotypic *P. subcostulatus* consists of a dense cover of cup-shaped setae and a few sparse and erect bristles. In the remaining species in the Hylastini, the pronotal vestiture cover is either absent or consists of hair-like setae of varying lengths. As in the pronotum, the entire discal surface of the elytral in *P. subcostulatus* is covered by an abundant vestiture of recumbent, cup-shaped setae; in the other species of the Hylastini, this vestiture consists of recumbent to semi-erect hair-like setae. The interstitial vestiture of *Pachysquamus* and *Scierus* consists of sparse and erect thick bristles while it consists of thinner and usually recumbent hairs in all *Hylurgops* and some *Hylastes* species, or of a midline of short and arcuate, semi-recumbent hairs in most species of *Hylastes*.

As in *Hylurgops* and *Hylastes*, the female’s fifth ventrite of *P. subcostulatus* is longer than the combined length of ventrites three and four and is also longer than in males. Relative to *Hylastes* and *Hylurgops*, the aedeagus of *P. subcostulatus* is more elongate, 3.8× longer than wide compared with an average of 3.3× for *Hylurgops* examined ($N=3$ per species). Although *Hylastes* aedeagi were not measured, these were visibly stockier, with the apodemes proportionally shorter than their length, 0.59 vs. 0.70 for examined *Hylurgops* ($N=3$ per species) (Figs. 6a, 7a).

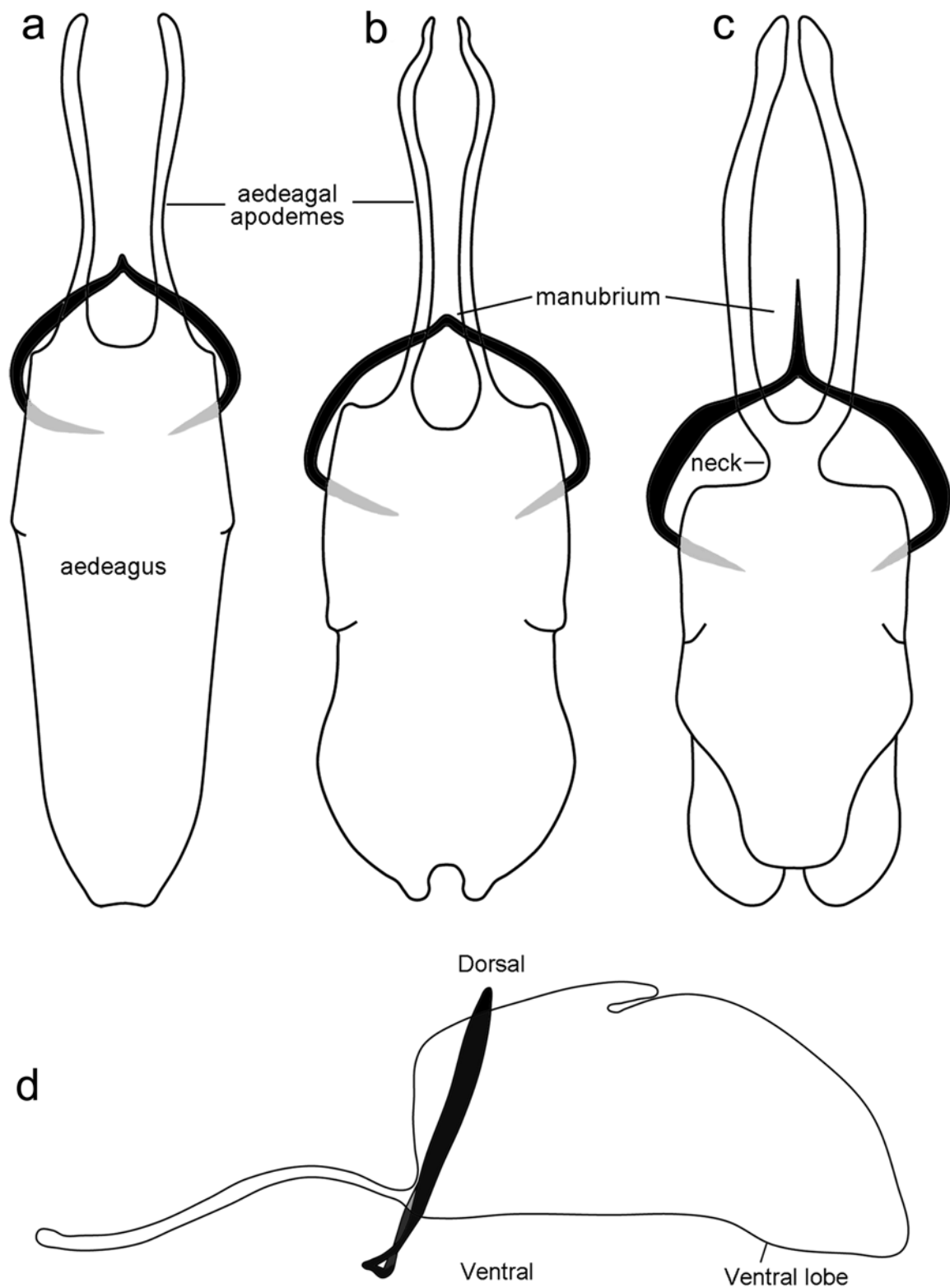


FIGURE 6. Aedeagus and spiculum gastrale: a) *Pachysquamus subcostulatus*, b) *Hylargops reticulatus*, c) *Hylastes ater* (modified from Grocholski *et al.* 1976), d) *Hylargops rugipennis*.

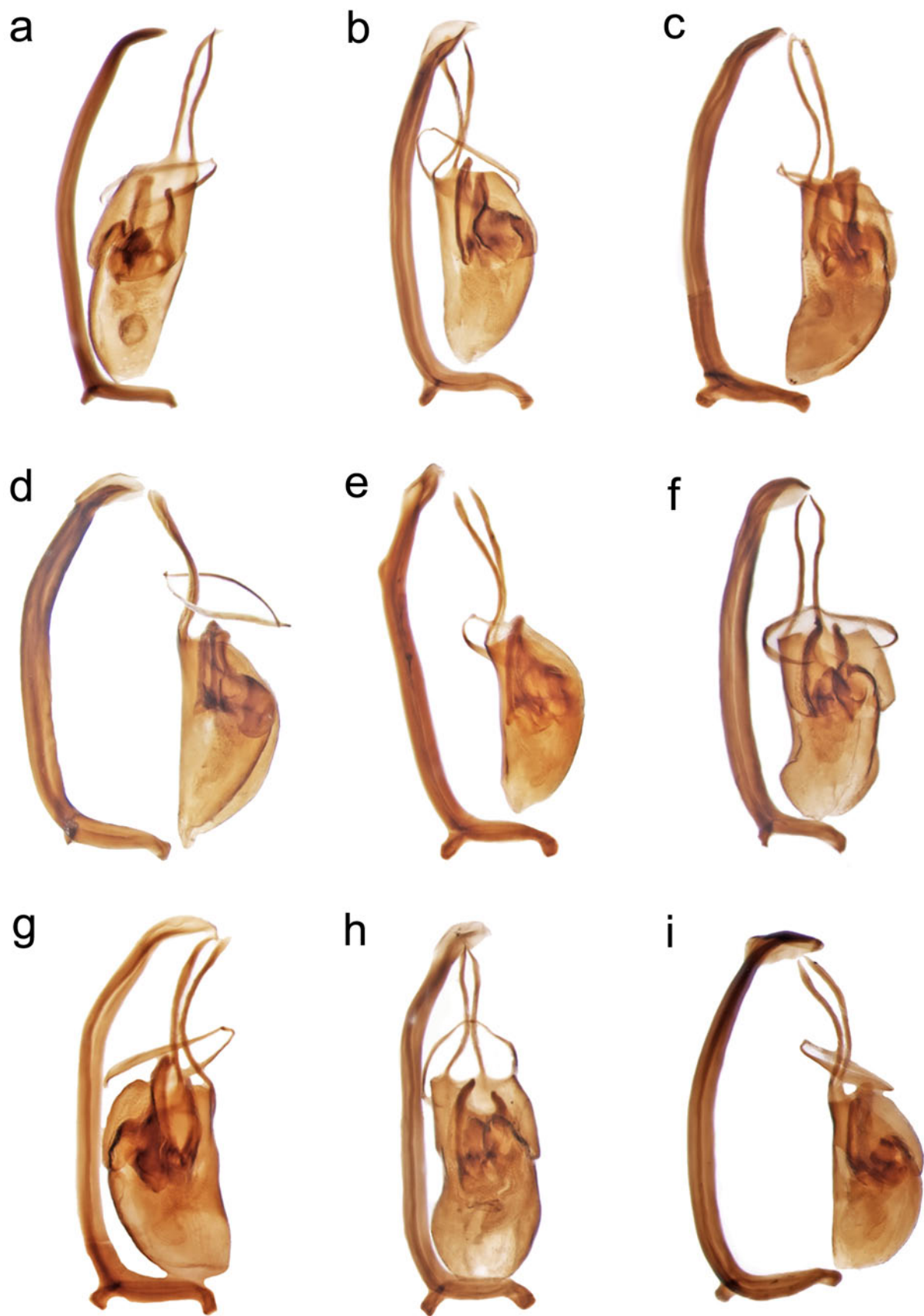


FIGURE 7. Aedeagus of the New World *Hylurgops* and *Pachysquamus*: a) *Pachysquamus subcostulatus*, b) *Hylurgops planirostris*, c) *H. rugipennis*, d) *H. pinifex*, e) *H. incomptus*, f) *H. longipennis*, g) *H. knausi*, h) *H. reticulatus*, and i) *H. porosus*.

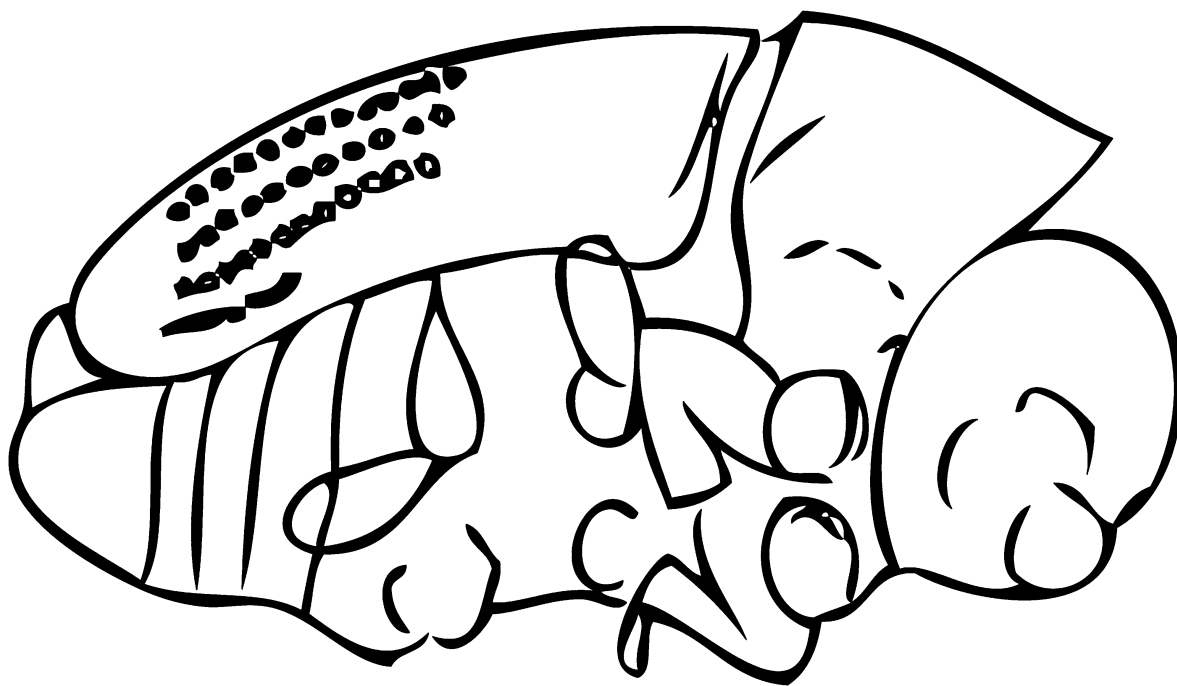


FIGURE 8. *Hylurgops piger*, drawing of a shale impression from Florissant, Colorado (modified from Wickham 1913).

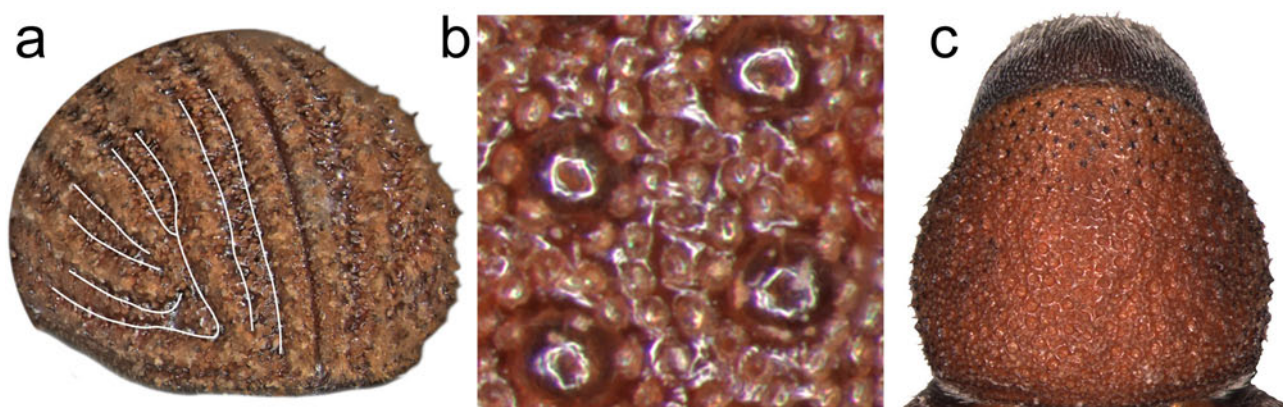


FIGURE 9. External characters of *Pachysquamus subcostulatus*: a) declivity showing elevated interstriae, b) cup-shaped setae (elytral disc shown), c) deep anterior constriction of prothorax.

Due to the uniqueness of its elevated odd numbered interstriae (Fig. 9a), the cup-shaped setae dorsal vestiture (Fig. 9b), and the strongly pointed anterior margin of the mesoventrite (Fig. 2a), *Hylurgops subcostulatus* is distinct from the other species in the Hylastini and is assigned to a new genus. The subspecies previously treated by Wood (1982) are not recognized.

***Pachysquamus subcostulatus* (Mannerheim, 1853) comb. n.**

(Figures 2a, 3a, 4a, 6a, 7a, 9a–b, 10)

Hylastes subcostulatus Mannerheim, 1853:239. (Kenai Peninsula, Alaska, USA, lost)

H. cristatus Mannerheim, 1853:239 (Kenai Peninsula, Alaska, USA, lost)

H. alternans Chapuis, 1869:22 (unspecified locality, Mexico)

Hylurgops subcostulatus, LeConte, 1876:389

H. cristatus, LeConte, 1876:389

H. alternans, Swaine, 1909:116
Hylastes (Hylastes) cristatus, Hagedorn, 1910:45
H. (Hylurgops) subcostulatus, Hagedorn, 1910:46
H. subcostulatus subcostulatus, Wood, 1982:91
H. subcostulatus alternans, Wood, 1982:91

Diagnosis. Distinguished from all other species in the Hylastini by the strongly elevated odd numbered elytral interstriae (Fig. 9a), by the dense dorsal cover of cup-shaped setae (Fig. 9b), the strongly pointed anterior margin of the mesoventrite, and by the more elongate aedeagus.

Description. Size. Length 3.1–4.7 (avg. 4.0 ± 0.4) mm long, $2.7\times$ longer than wide. **Color.** Mature adult dorsal color brownish red, ventral sclerites dark reddish-brown. **Frons.** Mid-frontal impression deep, becoming deeper from convex area below eyes towards epistoma, surface evenly punctate, inter-puncture spaces half the width of a puncture, shiny; carina elevated, short, shiny if present, extending from below the vertical impression to epistoma; epistomal lobe narrow; vestiture consists of hair-like setae, longer below middle, length of $2\text{--}7\times$ the diameter of a puncture. **Pronotum.** Broad, $0.9\text{--}1.0$ (avg. 0.9 ± 0.3) $\times$ as long as wide, distinctly constricted anteriorly (Fig. 9c), widest near basal fourth, sides of basal fifth slightly elevated forming a narrow margin, sides rounded at middle, constricted on anterior fifth; dorsal median line sometimes present, if so extending anteriorly from base to four-fifths of pronotum, surface shiny, slightly raised, usually concealed by cup-shaped setae; interspaces evenly, minutely punctate, punctures separated by distance equal to $\frac{1}{3}$ diameter of large punctures, margin smooth, shiny, and usually concealed by cup-shaped setae; additional vestiture consisting of sparse, erect bristles, $3\times$ length of large discal punctures, longer at marginal areas. **Elytra.** Length/width ratio $1.7\text{--}1.9$ (avg. 1.8 ± 0.1); anterior margin distinctly procurved, crenulate marginal line distinct and elevated; striae shallowly impressed, increasing from narrower than interstriae near base to wider at declivity, with deep, round punctures with shiny surfaces, less than their diameter apart; discal interstriae smooth, shiny, minutely punctate (seen at $100\times$ or more), concealed by cup-shaped setae, single midline of erect bristles separated by distance of two striae punctures, rising behind interstitial granules, as long as a discal puncture diameter. **Declivity.** Convex, alternate interstriae strongly elevated (Fig. 9a), with large tubercles as wide or wider than rest of interstitial costa; vestiture consisting of a bristle rising behind each granule, $1\text{--}3\times$ as long as striae puncture and a ground surface cover of dense, recumbent, cup-shaped setae. **Ventral sclerites.** Glossy, punctured. **Legs.** Tarsi dark reddish-brown; protibiae with two large socketed teeth before apical angle; meso- and metatibiae with one or two large socketed teeth before apical angle; third tarsal segment slightly broader than second. **Aedeagus.** Apodemes proportionally shorter than aedeagus in contrast to those in New World species of *Hylurgops* (Figs. 7b–i). Aedeagus elongate cylindrical, ventrally straight (Fig. 6a), barely arcuate dorsally. Without neck-like extension (Fig. 6c) of apodemes base (Fig. 6a) (Grocholski *et al.* 1976). Tegmen with a short manubrium.

Gallery: The maternal gallery is longitudinal, uniramous (Hopkins 1902), slightly sinuate (Fig. 3a). Eggs are laid in only one side of the gallery from which larval galleries run perpendicular to that side only (Cibrián-Tovar *et al.* 1995).

Material examined. 850 specimens from the CNCI, CSUC and the USNM collections were examined. CANADA. **British Columbia:** Coldwater (CNCI), Midday Valley, Merritt (CNCI), Peachland (CNCI), Summerland (CNCI), Vancouver (CNCI). MEXICO. **Chiapas:** 5 mi. E San Cristobal (CNCI), 6 mi. SE San Cristobal (CNCI), San Cristobal (CNCI). **Chihuahua:** Mesa del Huracan (CNCI). **Durango:** 3 mi. E El Salto (CNCI), 7 mi. W El Salto (CNCI), 10 mi. SW El Salto (CNCI), 10 mi. W El Salto (CNCI), 11 mi. W El Salto (CNCI), 11 mi. SW El Salto (CNCI), Buenos Aires, 10 mi. W La Ciudad (CNCI). **Mexico City** (CNCI, DEBC). **Nuevo Leon:** Cerro Potosi (CNCI), NE slope Cerro Potosi, Mpio. Galaena (CNCI). **Puebla:** 14 mi. W Texmelucan (DEBC), km 60 Rd Mexico-Puebla (CNCI), Zoquiapan NF (CNCI). USA. **Arizona:** Apache Co.: Brady Springs, SE Vernon, Sitgreaves NF (UAIC); Cochise Co.: Barfoot Grds. (DEBC), Barfoot picnic Grds., Chiricahua Mountains (CNCI, DEBC); Coconino Co.: 10 mi. SW Flagstaff (CNCI); Graham Co.: Mount Graham (CNCI), Pinaleno Mountains (CNCI); Greenlee Co.: Hannagan Camp (CNCI), 15 mi. S Alpine (CNCI); Pima Co.: Mount Lemmon, Sta. Catalina Mountains (CNCI), Sta. Catalina Mountains (CNCI), Bear Canyon, Chiricahua Mountains (CNCI); Yavapai Co.: Prescott NF, Prescott (CNCI). **California:** El Dorado Co.: 10 mi. E Georgetown, Blodgett Forest, UC (CNCI), 3 mi. E Kyburz (CNCI), Fallen Leaf Lake (CNCI, DEBC), Placerville (CNCI, DEBC), El Dorado NF (CNCI); Madera Co.: Chiquito Basin (CNCI); Modoc Co.: Hackamore (DEBC), Modoc NF (CNCI); Placer Co.: Big Bend Ranger Sta. (DEBC); San Bernardino Co.: Big Bear Lake (CNCI); San Diego Co. (CNCI).

Colorado: Bent Co.: Las Animas Co. (CSUC); Chaffee Co.: CR-386 N Buena Vista (CSUC), Droney Gulch, Salida (CSUC); Douglas Co.: Franktown (CSUC); El Paso Co.: Black Forest (CSUC); La Plata Co.: Electra Lake (CSUC); Larimer Co.: Buckhorn Canyon (DEBC), Poudre Canyon (DEBC); Montezuma Co.: Dolores FS Rd 527 (CSUC), Mancos (CSUC); Montrose Co.: Sanborn Pk. (CSUC). **Idaho:** Kootenai Co.: near Coeur d' Alene (CNCI); Latah Co.: Deary (CNCI). **Montana:** Lake Co.: Pablo (CNCI); Ravalli Co.: Hamilton (CNCI). **New Mexico:** Otero Co.: Cloudcroft (CNCI). **Oregon:** Josephine Co.: Oregon Caves Nat'l Monument (CNCI), Klamath Co.: Ft. Klamath (CNCI). **South Dakota:** Custer Co.: Bear Mountain area Black Hills NF (RMRS), Pennington Co.: Rushmore Mt. Black Hills (CNCI). **Utah:** Garfield Co.: Panquitch Lake, Dixie NF (CNCI, DEBC); Juab Co.: The Mammoth (CNCI); Ouray Co.: Long Hollow, Dixie NF (DEBC); Sevier Co.: Pin Hollow, Fish Lake (CNCI, DEBC). **Washington:** Walla Walla Co.: Kooskooskie (CNCI).

Hosts. *Picea engelmannii*, *P. pungens*, *Pinus arizonica* var. *cooperi*, *P. ayacahuite*, *P. contorta*, *P. duranguensis*, *P. engelmannii*, *P. hartwegii*, *P. jeffreyi*, *P. lambertiana*, *P. leiophylla*, *P. leiophylla* var. *chihuahuana*, *P. montezumae*, *P. ponderosa*, *P. pseudostrobus*, *P. strobiformis*, *P. teocote*, *Pseudotsuga menziesii*, and *Tsuga heterophylla*.

Distribution (Fig. 10). NORTH AMERICA: British Columbia, Canada to Chiapas, Mexico and the Black Hills of South Dakota. There is only one known record from the Kenai Peninsula of Alaska, the putative type locality (Mannerheim 1853).

Discussion. *Hylastes subcostulatus* was described by Mannerheim (1853) from a single specimen collected by Dr. Fredrick Frankenhaeuser from the Kenai Peninsula in Alaska as part of an early Russian expedition. Another specimen in the same collection was described as *Hylastes cristatus* by Mannerheim (1853) and later synonymized with *H. subcostulatus* by Wood (1982).

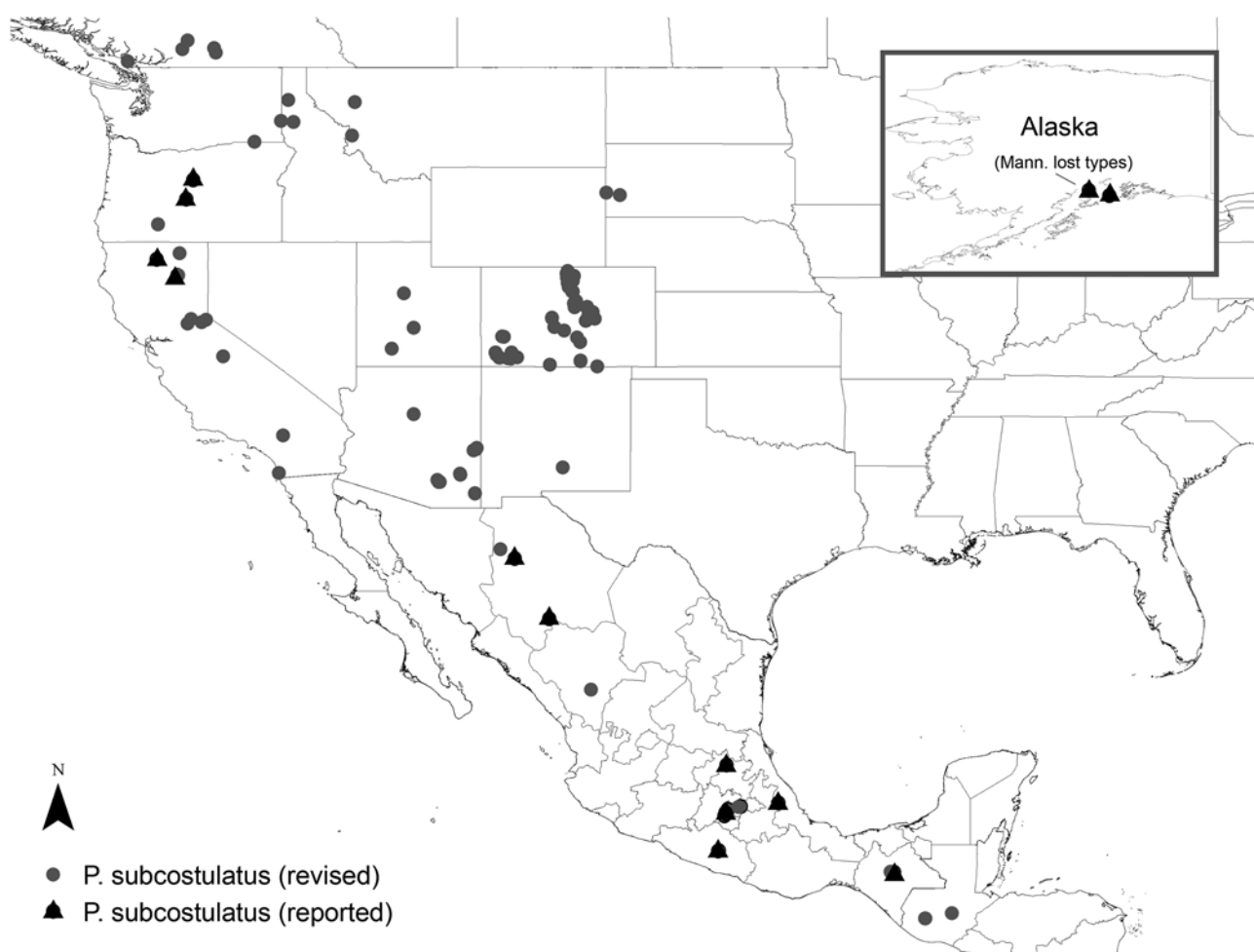


FIGURE 10. Distribution of *Pachysquamus subcostulatus* showing location of Mannerheim's lost types on the Kenai Peninsula, Alaska (insert).

The lack of collection records between British Columbia and the Mannerheim type from the Kenai Peninsula is intriguing. The type specimens of both *H. subcostulatus* and *H. cristatus* are considered lost (Wood 1969, 1982). Subsequent re-descriptions, including those of LeConte (1868) and Chapuis (*H. alternans*, 1869) were made from specimens collected from British Columbia and Mexico, respectively; however, the original description by Mannerheim is adequate to identify the species. The possibility that the type specimen was mislabeled should be considered.

Wood (1982) recognized *H. alternans* as a subspecies of *H. subcostulatus* based on what he considered to be a population with more elevated declivital interstriae and, in these, more inflated tubercles in specimens occurring south of central Arizona in contrast to specimens occurring north of that area. The subspecific concept has been questioned (D.E. Bright pers. comm.) based on the uninterrupted distribution of both geographical forms. Examination of specimens from throughout the species' range suggests that the size of the tubercles and the elevation of interstriae are variable and do not correlate with the arbitrary geographical distribution of the subspecies considered by Wood (1982).

Pachysquamus subcostulatus ranges from the Canadian Cascades in southern British Columbia to the Sierra de Chiapas in southern Mexico. The Black Hills of South Dakota represent the easternmost limit of the species. Ignoring the questionable Kenai specimens, the northern distribution of *P. subcostulatus* corresponds with that of *P. ponderosa*. The species occurs from altitudes of 60–700 m in Canada. In the continental United States, it occurs from elevations of 60–3,300 m. Although it primarily attacks *P. ponderosa*, it occurs in other conifers in the genera *Pinus*, *Picea*, *Pseudotsuga*, and *Tsuga*. In Mexico, examined specimens were collected from elevations ranging from 2,300–3,700 m.

As with other members in the Hylastini, *P. subcostulatus* selects and develops in conifers that have been weakened or killed by other bark beetles such as *Dendroctonus* or by other natural or anthropogenic agents such as severe drought and fires.

Genus *Hylurgops* LeConte, 1876

Type species: *Hylurgops pinifex* (Fitch, 1858)

Diagnosis. It is distinguished from the similar genus *Hylastes* in the Hylastini by the broader third tarsal segment, by the apically broadening fifth tarsal segment, by the pronotal interspaces with abundant punctures half the size as the larger punctures, by the pronotum being as long as its width, and by the distinct middle impression of the frons without an inflated region immediately below.

Description. By those characters of the Hylastini (Wood 1982) and the following: **Size.** ($N=200$). Length 2.2–5.9 (avg. 4.3 ± 0.6) mm long, 2.4–2.8 $\times$ longer than wide. **Color.** Mature adult from dark brown to black, some bicolored with pronota darker than elytra. **Frons.** Middle transverse impression arching down. **Eyes.** Elongate-oval, 2.2–2.5 $\times$ longer than wide. **Pronotum.** Broad, length/width ratio 0.9–1.1 (avg. 1.0 ± 0.1), apically constricted or smoothly tapering; surface smooth to reticulate, spaces between large punctures with medium-sized punctures (Fig. 3c); interspaces narrower than diameter of larger punctures (Fig. 3c); impunctate midline usually present, sometimes raised from base to anterior impression, sometimes reaching apex; vestiture hair-like, whitish to reddish, indistinct to distinctly long. **Elytra.** Length/width ratio 1.6–2.0 (avg. 1.7 ± 0.2); bases procurved to nearly straight (Figs. 11a–b), margin not strongly elevated, asperities indistinct to small, rounded (Fig. 12a) or keyhole-shaped (Figs. 12b–c), 9th striae indistinctly separated from 10th posterior to metacoxae; interstriae nearly as wide as striae, with three to five rows of short, recumbent, whitish to reddish-yellow, hair-like setae usually extending from middle of disc to its end, emerging from minute punctures or rugosities and a single line of long, semi-erect to erect, whitish to reddish hair-like setae, becoming longer after middle of disc, emerging behind a granule or rugosity. **Declivity.** Convex; striae narrower than interstriae, punctures as in elytra; 1st, 9th and 10th striae reaching apex (Fig. 13), 3rd and 8th meeting above interstriae 9 and 3 junction, 6th and 7th meeting anterior and between previous, and 4th and 5th meeting or ending singly over previous, further away from apex; interstriae convex, 2nd variably impressed, 3rd widest, intersecting 4th or not, with uniseriate row of granules followed by long, hair-like setae, ground vestiture of three to five rows of short, recumbent, whitish to reddish, scale-like or hair-like setae, emerging from a minute puncture. **Ventral sclerites.** Procoxae subcontiguous; precoxal region acutely raised, not blunt; anterior margin of mesoventrite slightly rounded to straight (Figs. 2b–c); abdominal sclerites one and five

longer than others, fifth more elongate in females than males; third tarsal segment distinctly ($1.3\text{--}1.7\times$) broader than second (Fig. 1a), fifth near $2\times$ broader at apex than at base. **Aedeagus.** Aedeagus cylindrical, proportionally shorter than in *Pachysquamus*. Ventrally straight with or without step-like lobe (Fig. 6d), dorsally arcuate. Neck-like extension (Fig. 6c) between aedeagus and aedeagal apodemes present in some *Hylastes* (Grocholski et al. 1976) is absent in New World *Hylurgops* (Figs. 6b, 7b–i). Spiculum gastrale slightly longer than aedeagus (Figs. 7b–i), rounded at tip, extending slightly arcuate posterior to aedeagus, and ending caudally in a fork. Tegmen with a short or completely absent manubrium (Fig. 6b).

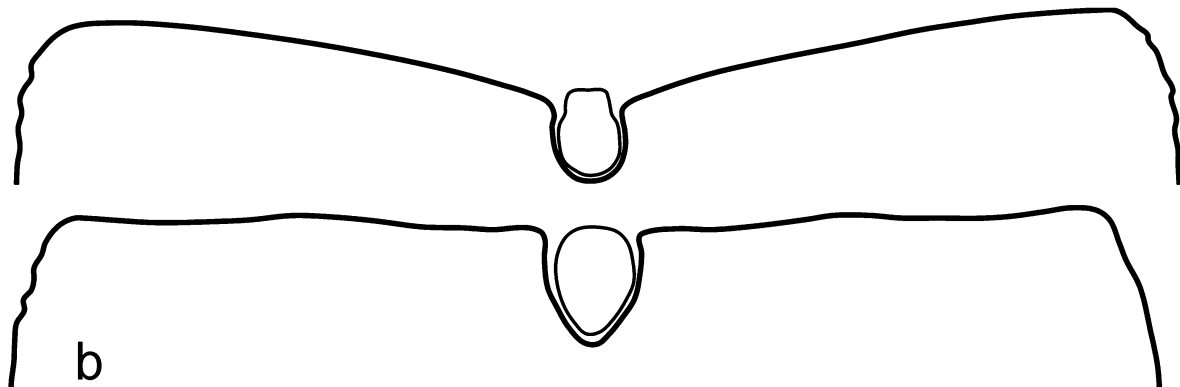


FIGURE 11. The anterior margin of elytra in the Hylastini. a) anteriorly procurved as in *Scierus* and some *Hylurgops* (*H. pinifex*), b) nearly straight as in most *Hylastes* (*H. mexicanus*).

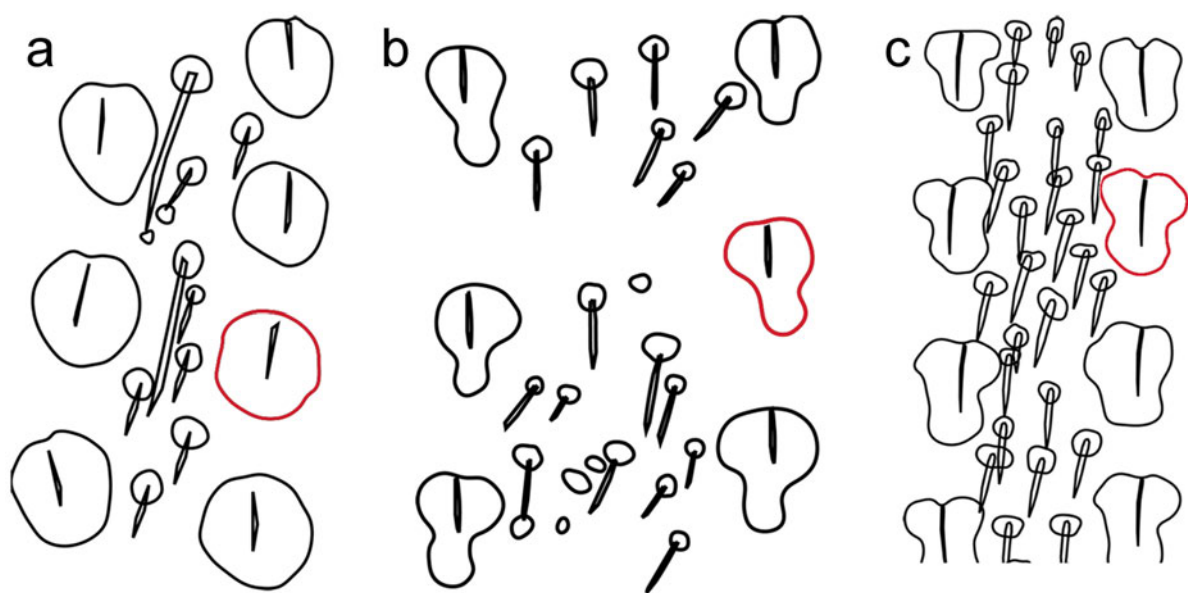


FIGURE 12. Shape of elytral disc striae punctures in *Hylurgops*: a) round (*H. longipennis*), b) keyhole-shaped (*H. pinifex*), and c) keyhole-shape variation (*H. planirostris*).

Key to the New World *Hylurgops*

- 1 Pronotum slightly wider than long (0.92 ± 0.4 , $N=109$), distinctly constricted anteriorly (Fig. 14a); mature color reddish-brown to dark brown, never black 2
- Pronotum slightly longer than wide (1.04 ± 0.4 , $N=118$), not constricted but smoothly tapering anteriorly (Fig. 14b); mature color dark reddish-brown to black 5
- 2(1) Smaller species (2.5–3.4 mm); declivital apex upturned (Fig. 15a); elytral striae more distinctly impressed; granules larger; mature color brown to reddish-brown *palliatu*s (Gyllenhal, 1813)

- Larger species (3.7–5.6 mm); declivital apex rounded, not upturned; elytral striae less distinctly impressed; declivital granules smaller; mature color brown to black 3
- 3(2) Dorsal surfaces dull; pronotal interspaces coarse, punctures deep; mature color brown, reddish brown to black; distribution Trans-Mexican Volcanic Belt to high mountains in southern Honduras *planirostris* (Chapuis, 1869)
- Dorsal surfaces lustrous to semi lustrous; pronotal interspaces smooth, punctures shallow; mature color reddish-brown to deep dark-reddish brown; distribution Alaska to New Mexico. 4
- 4(3) Pronotum interspaces distinctly reticulate (Fig. 16a), large punctures less than twice the diameter of small; declivital interstriae granules evenly separated, declivital granules vested with a long, hair-like setae; averaging shorter (4.2 mm); distribution coastal from Alaska to southern California. *rugipennis* (Mannerheim, 1843)
- Pronotum interspaces smooth to granulate (Fig. 16b), large punctures more than double the diameter of small; several declivital interstriae granules absent or very small, declivital granules vested with a short, hair-like setae; averaging longer (4.6 mm); distribution transcontinental, from northern British Columbia to Nova Scotia south to Arizona and North Carolina *pinifex* (Fitch, 1858)
- 5(1) Pronotum with distinct, long, erect, hair-like setae. 6
- Pronotum with indistinct, short, recumbent hair-like setae 7
- 6(5) Pronotum base nearly as wide as body, diameter of large punctures only twice diameter of smaller middle line not raised; hair-like setae yellow to reddish-yellow; distribution Arizona and New Mexico to northern Honduras and El Salvador *incomptus* (Blandford, 1897)
- Pronotum base distinctly narrower than body, diameter of large punctures more than twice diameter of smaller, middle line raised; hair-like setae whitish; distribution Central Mexico *longipennis* (Blandford, 1896)
- 7(5) Pronotum with abundant, similar sized punctures, large less than twice diameter of small punctures; ventral vestiture short *knausi* Swaine, 1917
- Pronotum with few, differently sized punctures, large twice diameter of small; ventral vestiture long. 8
- 8(7) Elytral surfaces dull, entirely, distinctly reticulate, visible at 30× magnification; pronotum longer (1.07 ± 0.03); body length averaging longer (4.5 mm) *reticulatus* Wood, 1971
- Elytral surfaces smooth and glossy, varying from granulate to reticulate on basal third of elytra; pronotum shorter (1.03 ± 0.04); body length averaging shorter (4.0 mm). *porosus* (LeConte, 1868)

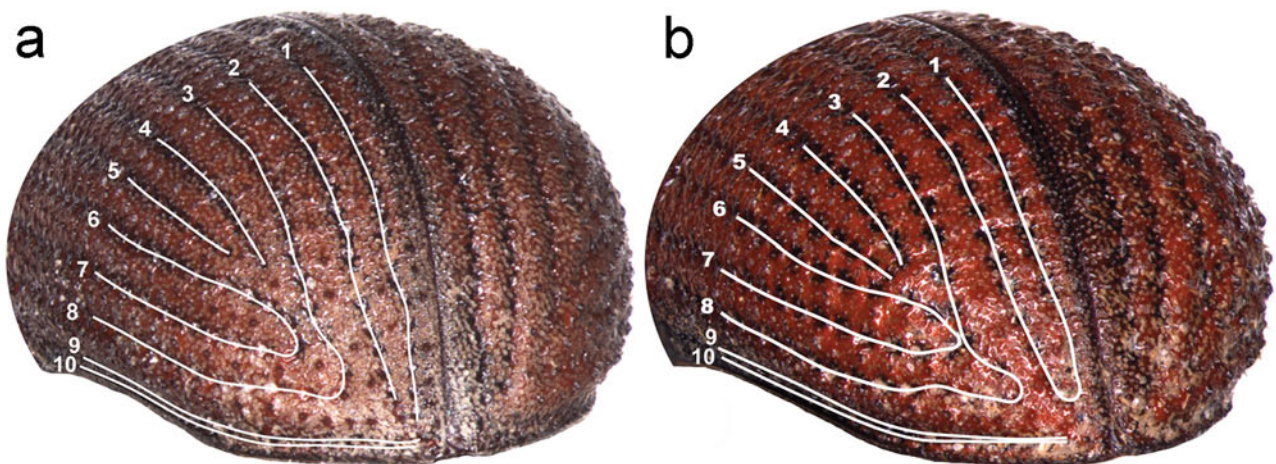


FIGURE 13. Declivity strial pattern of *Hylurgops*: a) third striae not touching the sixth (*H. pinifex* eastern form), b) third striae sometimes touching the sixth (*H. rugipennis*).

***Hylurgops palliatus* (Gyllenhal, 1813)**

(Figures 15a, 17a)

Hylesinus palliatus Gyllenhal, 1813:340 (Sweden)

Hylastes palliatus, Thomson, 1865: 349

Hylurgops palliatus, Reitter, 1913: 50

Diagnosis. *Hylurgops palliatus* is distinguished from all the New World species by its smaller size, by the upturned elytral apex (Fig. 15a), and by the more distinctly impressed discal striae.

Description. Size. Length 2.7–3.4 (avg. 3.1 ± 0.2) mm long, 2.5× longer than wide. **Color.** Mature adult brown to reddish brown, ventral sclerites dark reddish-brown to black. **Frons.** Transverse impression shallow; vestiture hair-like setae; longer below mid-impression, length 2–4× diameter of average frontal puncture. **Pronotum.** Broad

0.8–0.9 (0.9 ± 0), strongly constricted anteriorly (Fig. 17a), widest anterior to middle; lateral margin rounded, bulging from base to constriction near apical edge; dorsal middle line elevated, extending from base to anterior dorsal impression, surface smooth; discal punctures relatively few for genus, larger punctures twice diameter of smaller; inter-puncture area smooth, or with sparse reticulation; vestiture of short, recumbent, yellowish hair-like setae, long as size of large puncture. **Elytra.** Anterior margin procurved; striae distinctly impressed, as wide as interstriae except narrower than 2nd; punctures round, less than $\frac{1}{2}$ diameter apart; interstriae convex, surface rugose, minutely punctured (visible at $> 115\times$), each with a median row of erect bristles about $1.5\times$ longer than diameter of strial puncture, rising behind each interstitial granule, separated by distance of two strial punctures. **Declivity.** Second interstriae widest, indistinctly impressed, 3rd not intersecting 4th; vestiture consisting of three rows of semi-erect whitish to reddish, scale-like setae, close in length as diameter of strial puncture, a median row of erect, thicker, reddish-brown hair-like setae projecting behind each granule, $1.5\times$ the length of a declivital puncture; declivital apex ascending towards the suture. **Ventral sclerites.** Surfaces shiny, setose-punctate; mesoventrite anterior margin rounded. **Legs.** Tarsi dark reddish-brown, metatibiae with 2 large socketed teeth before apical angle. **Aedeagus.** Aedeagus shorter than in New World species, without a dorsal lobe, seminal opening appears more spread apart than in other species (see line drawing in Tsai & Huang 1964).

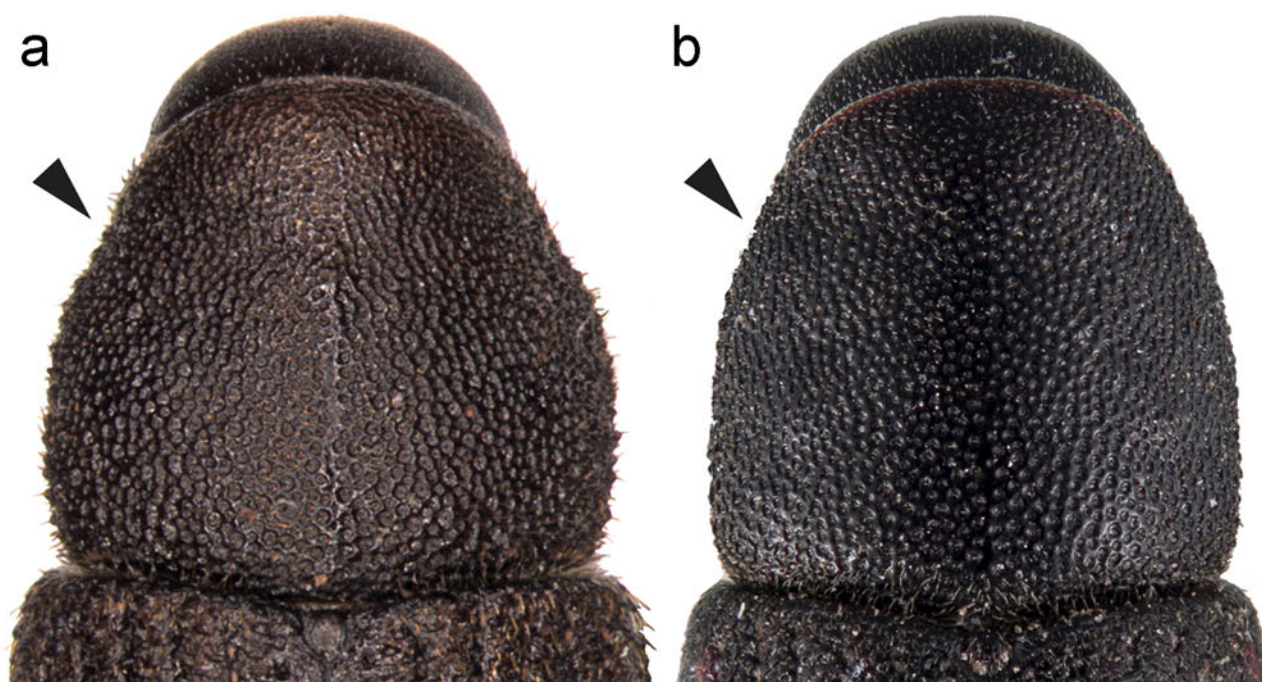


FIGURE 14. *Hylurgops*, prothorax proportion and shape: a) wider than long and constricted anteriorly (*H. planirostris*), b) longer than wide and smoothly tapering anteriorly (*H. knausi*).

Gallery. Longitudinal, biramous, slightly sinuate and about 30–50 mm, extending above and below the entrance hole (Davis *et al.* 2008). Eggs are laid on niches at both sides of the gallery, brood tunnels perpendicular from both sides of the gallery.

Material examined. 70 specimens. JAPAN. Mount Fuji (DEBC), Japan (CNCI). EUROPE. **Austria:** Amstetten (CNCI, DEBC), Mondseeberg (CNCI), St. Pölten (CNCI). **Bosnia and Herzegovina.** Zavidovići (CNCI). **England.** Blandford (DEBC). **Germany.** München (CNCI). **Poland:** Białowiezki NP (DEBC). **Russia** (CNCI). **Czech Republic.** Jeseník, Moravia (CNCI). **Sweden.** Sk. Vånga (CNCI). USA. **New York.** Nassau Co.: Oyster Bay, Planting field Arbor. (CUIC); Suffolk Co.: Smithown (CUIC). **Ohio.** Columbian Co.: 8 km SE Lisbon (CUIC); Geauga Co.: 1 km NW Thompson (CUIC), 3.5 km WSW Parkam (CUIC); Lake Co.: 2.2 km W Leroy Center (CUIC), 2 km NE North Madison (CUIC); Mahoning Co.: 5 km W Austintown (CUIC), 1 km W North Lima (CUIC); Portage Co.: 4 km NE Mantua Corners (CUIC), 2 km SSE Garrettsville (CUIC); Summit Co.: 1.6 km SW Peninsula (CUIC). **Pennsylvania.** Crawford Co.: Riceville, SGL-199 (CUIC), Shermanville (CUIC); Erie Co.: Asbury Nature Center (CUIC), Presque Isle State Park (CUIC); Richard Mennetti private land (CUIC), State game land 218 (CUIC).

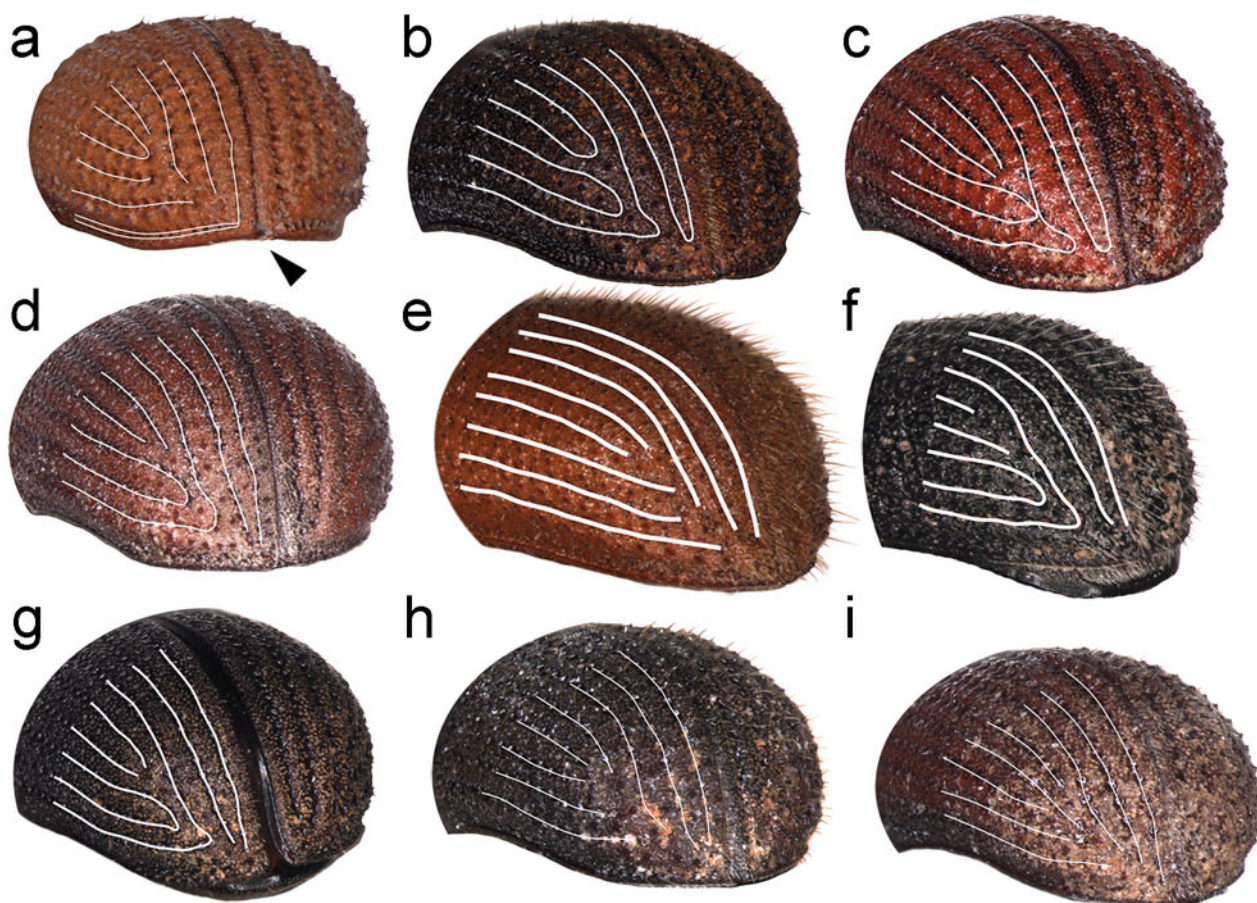


FIGURE 15. Elytral declivities of New World *Hylurgops*: a) *H. palliatus*, b) *H. planirostris*, c) *H. rugipennis*, d) *H. pinifex*, e) *H. incomptus*, f) *H. longipennis*, g) *H. knausi*, h) *H. reticulatus*, and i) *H. porosus*.

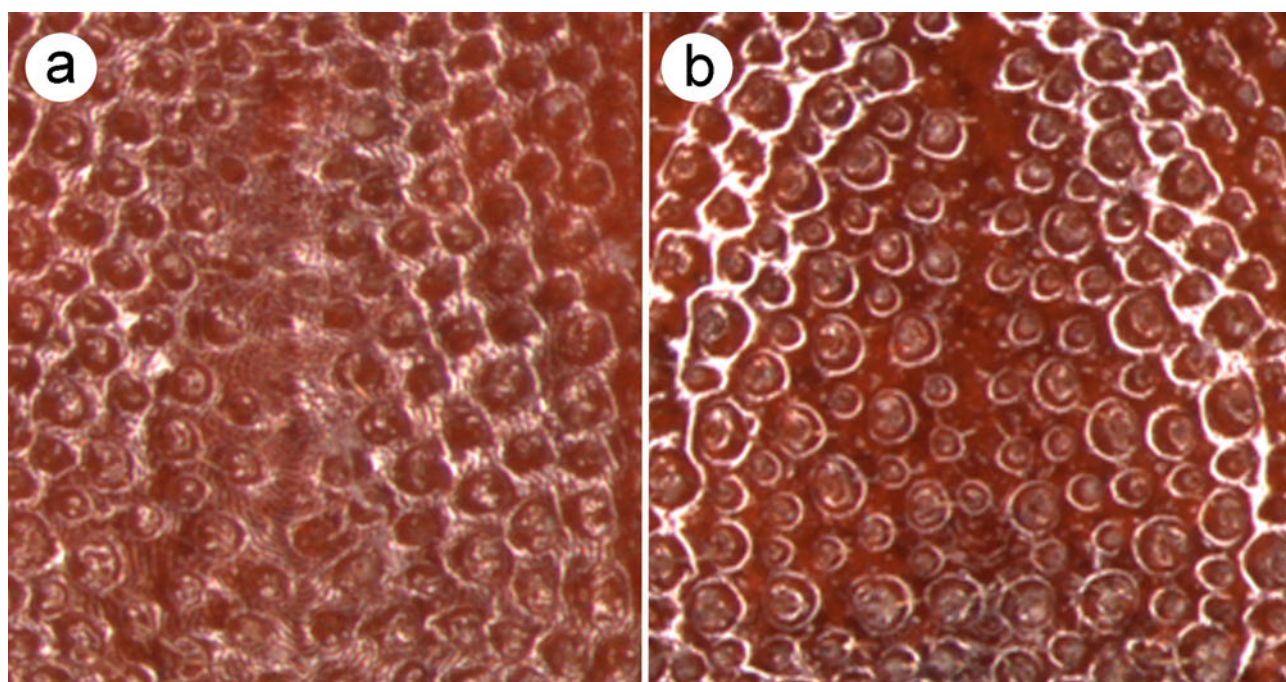


FIGURE 16. Prothoracic discal surfaces of *Hylurgops rugipennis* and the eastern form of *H. pinifex*: a) reticulate and dull, sometimes shiny with similarly-sized punctures (*H. rugipennis*), b) shiny (eastern form), subgranulate (western form) with distinct, differently-sized punctures (*H. pinifex*).

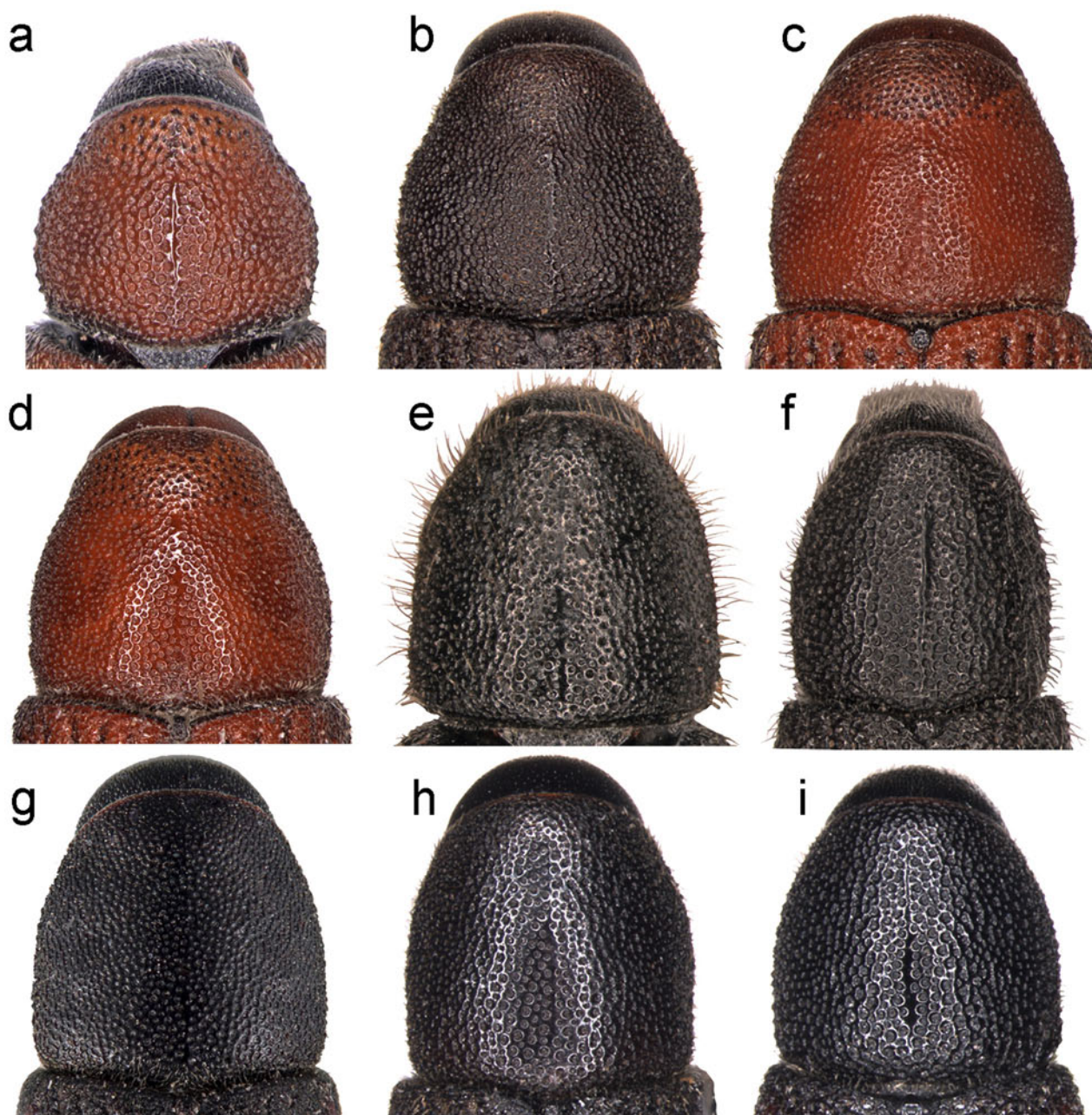


FIGURE 17. Prothoraces of the New World *Hylurgops*: a) *H. palliatus*, b) *H. planirostris*, c) *H. rugipennis*, d) *H. pinifex*, e) *H. incomptus*, f) *H. longipennis*, g) *H. knausi*, h) *H. reticulatus*, and i) *H. porosus*.

Nearctic host. *Pinus sylvestris*

Nearctic distribution. NORTH AMERICA: northeastern USA (established exotic).

***Hylurgops planirostris* (Chapuis, 1869)**

(Figures 2b, 7b, 12c, 14a, 15b, 17b, 18)

Hylastes planirostris Chapuis, 1869:21 (Rachos de Suapam, near Cordoba, Veracruz, Mexico)

Hylurgops planirostris, Hopkins, 1905:81

Diagnosis. *Hylurgops planirostris* is distinguished from the sympatric *H. incomptus* by the wider than long pronotum which is distinctly constricted anteriorly (Fig. 14a), by the larger and coarser pronotal punctures, and by

the procurved anterior margin of each elytron. It can be distinguished from *H. knausi* occurring north of the Trans-Mexican Volcanic Belt, by the distinct constriction of the anterior margin of the pronotum and. It differs from the Nearctic *H. rugipennis* and *H. pinifex* by the brown coloration and by the coarse and dull interpuncture surface of the pronotum.

Description. **Size** Length 3.8–5.2 (avg. 4.6 ± 0.4) mm long, $2.6\times$ longer than wide. **Color.** Mature adult black to brown, dark reddish-brown to black. **Frons.** Vertex convex or with shallow, short, vertical impression, if present with raised central rounded area below; shallow to moderately deep and slight procurved transverse mid-frontal impression, vestiture hair-like setae, longer below mid-impression $2\text{--}7\times$ length diameter of average frontal puncture; epistomal brush with reddish-brown setae. **Pronotum.** Broad 0.9–1.0 (0.93 ± 0.03), distinctly constricted anteriorly, widest anterior to middle; lateral margin rounded especially anterior to middle, constricting near apical edge; dorsal middle line distinctly elevated, extending from base up to anterior impression, surface granulate to reticulate, dull to semi glossy; small discal punctures abundant, large slightly less than twice diameter of small; inter-puncture area granulate or with minute reticulation; vestiture distinct, consisting of short, recumbent, reddish-brown hair-like setae, $2\times$ the diameter of a large puncture. **Elytra.** Anterior margin procurved; striae slightly concave, punctures keyhole-shaped (Fig. 12c), half their diameter apart; interstriae $1.5\times$ wider than striae, surface minutely punctured (visible at $> 100\times$), each with a short, recumbent hair-like setae and an uniseriate row of erect bristles rising from a central puncture, separated by 1.5 the width of a stria puncture, slightly longer than a discal stria puncture. **Declivity.** Second interstriae slightly impressed with conical granules, 3rd interstriae widest not intersecting 4th; vestiture of dense reddish-brown scale like setae and longer than declivital puncture, thick, erect reddish-brown hair-like setae rising from each granule. **Ventral sclerites.** Surfaces granulate to reticulate; mesoventrite anterior margin straight; tarsi dark reddish-brown, tibiae with 3 short socketed teeth before apical angle. **Aedeagus.** Lacking a ventral lobe (Fig. 7b).

Gallery: Longitudinal, biramous with irregular branches, extending downward from the entrance hole (Schwerdtfeger 1957).

Material examined. 124 specimens. GUATEMALA. **Baja Verapaz:** 39 mi. SE Coban (DEBC). **Totonicapan:** 7 mi. SE Totonicapan (DEBC), 8 mi. SE Totonicapan (DEBC). HONDURAS: **El Paraíso:** Cerro Montserrat, 7 km Yuscaran (USNM); **Francisco Morazan:** Cerro Uyuca Morazan 30 km E Tegucigalpa (DEBC). MEXICO. **Chiapas:** 5 mi. S San Carlos (DEBC), 5 mi. E San Cristobal (CNCI), 5 mi. NE San Cristobal (CNCI), 5 mi. SW San Cristobal (CNCI), 5 mi. SW El Bosque (CNCI), 8 mi. NE San Cristobal (CNCI), San Cristobal (CNCI). **Hidalgo:** km 181 Rd Mexico-Tuxpan (CNCI). **Mexico State:** Mexico City (CNCI), Izta-Popo (CNCI). **Michoacan:** 33 mi. E Morelia (DEBC). **Oaxaca:** 32 mi. S Valle Nacional (CNCI), 37 mi. S Valle Nacional (CNCI), 40 mi. S Valle Nacional (CNCI), 52 mi. N Valle Nacional (CNCI), 53 mi. S Valle Nacional (CNCI), Hwy 175, 3 mi. N Suchixtepec (CNCI), Juquila Mixes, Yautepec (DEBC). **Puebla:** 6 mi. W Teziutlan (CNCI), Iztacihuatl (CNCI). **Veracruz:** 7 mi. SE Las Vigas (DEBC).

Hosts: *Abies religiosa*, *Pinus ayacahuite*, *P. hartwegii*, *P. caribaea* var. *hondurensis*, *P. leiophylla*, *P. montezumae*, *P. tecunumanii*, *Pinus pseudostrobus* var. *apulcensis*, *P. chiapensis*.

Distribution (Fig. 18). NORTH AMERICA-CENTRAL AMERICA: From the Trans-Mexican Volcanic Belt in Mexico in the north to the Sierra Madre de Chiapas in southern Honduras.

Discussion. Chapuis (1869) described *Hylastes planirostris* as being from Mexico without specifying a locality. The determination of the type locality has remained unclear and has been suggested to be Choapan in Oaxaca, Mexico, by Dampf after the label “Suapam” (Schedl 1940) and later by Wood (1971c) as “Suapan” (State undetermined) Mexico. The collector of the type specimen was Auguste Sallé, who collected in Ranchos de Suapam, near Cordoba in Veracruz, Mexico; therefore, this is the most likely type locality for this species.

Both Chapuis (1873) and Blandford (1896) placed *H. planirostris* under Erichson’s (1836) second division for having the third tarsal segments bilobed. Blandford (1896) examined specimens from Alta Vera Paz in Guatemala that he thought were different from *H. planirostris* (*knausi*, present designation) specimens of Mexico. He considered the Guatemalan specimens to resemble *H. rugipennis*, differing from it by the closer and more rugose pronotal punctures. However, he could not define characters to separate the Guatemalan specimens from the Mexican. Hopkins (1905) agreed with Blandford’s (1896) observations and found similarities between a specimen of *H. planirostris* from Mexico City and *H. rugipennis*. Hopkins (1905) mentioned the specimen could be separated from the Nearctic *H. rugipennis* by the “obscure punctures” and “fine rugosities” of the pronotum, and placed *H. planirostris* under *Hylurgops* based on the characters of the bilobed third tarsal segments.

Wood (1971c) studied all Chapuis' syntypes and his homotypes of *H. knausi* Swaine and considered it identical to *H. planirostris*, placing them in his key (Wood 1982) under the species with longer than wide pronota and obscure anterior pronotal constrictions. The possibility that Wood did not study the forms with wider pronotum occurring from the Trans-Mexican Volcanic Belt to the south should be considered. Unlike specimens previously placed under *H. knausi* (Swaine 1917) occurring north of the Trans-Mexican Volcanic Belt, specimens of *H. planirostris* have a wider than long pronotum that is distinctly constricted on the anterior third, with deeper and closer punctures, and dull interpuncture spaces, in addition to a reddish-yellow vestiture.

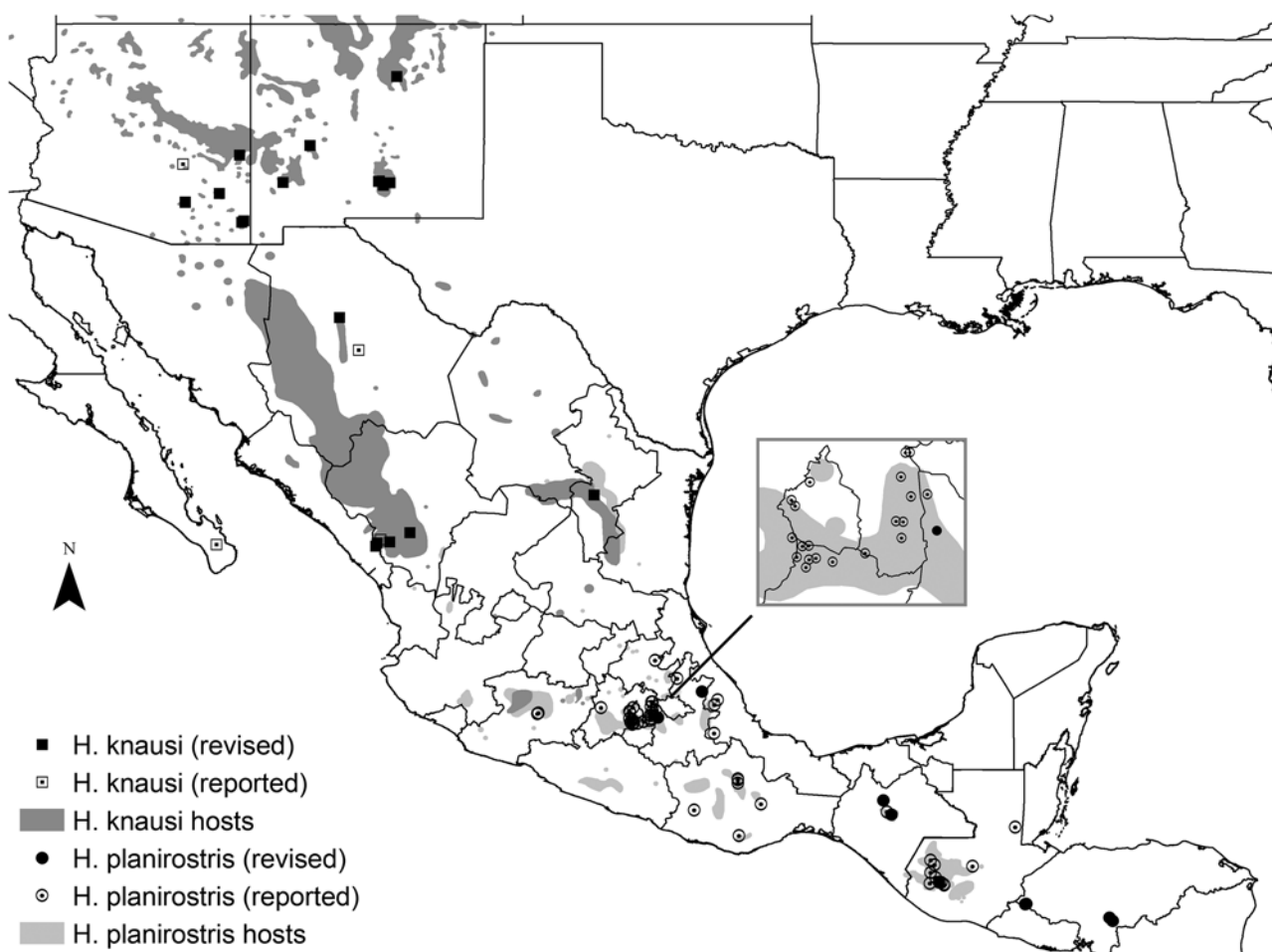


FIGURE 18. Species distribution of *Hylurgops knausi* (squares), including the main hosts: *Pinus ponderosae*, *P. arizonica*, and *P. durangeuensis* (dark grey); and the distribution of *H. planirostris* (circles), with its main hosts: *P. hartwegii* and *P. montezumae* (light gray). Insert shows detail of *H. planirostris*' distribution. Host polygons adapted from Little (1991).

***Hylurgops rugipennis* (Mannerheim, 1843)**

(Figures 5a, 6d, 7c, 13b, 15c, 16a, 17c, 19)

Hylurgus rugipennis Mannerheim, 1843:297 (Sitka Island, Alaska, USA, lost)

Hylastes rugipennis, Mannerheim, 1852:385 (not previously documented)

Hylurgops rugipennis, LeConte, 1876:390

H. rugipennis rugipennis, Wood, 1982:89

H. rugipennis pinifex, Wood, 1982:90

Diagnosis. *Hylurgops rugipennis* is reddish brown above, usually darker ventrally and its pronotum is broad and strongly constricted anteriorly (Fig. 17c). It is distinguished from *H. pinifex* at $> 50\times$ magnification by the distinct and complete pronotal reticulation (Fig. 16a), by the regularly-sized pronotal punctures (Fig. 16a), by the narrower metatibia, by the ventral lobe of the aedeagus (Fig. 7c), and by its more restricted distribution (Fig. 19).

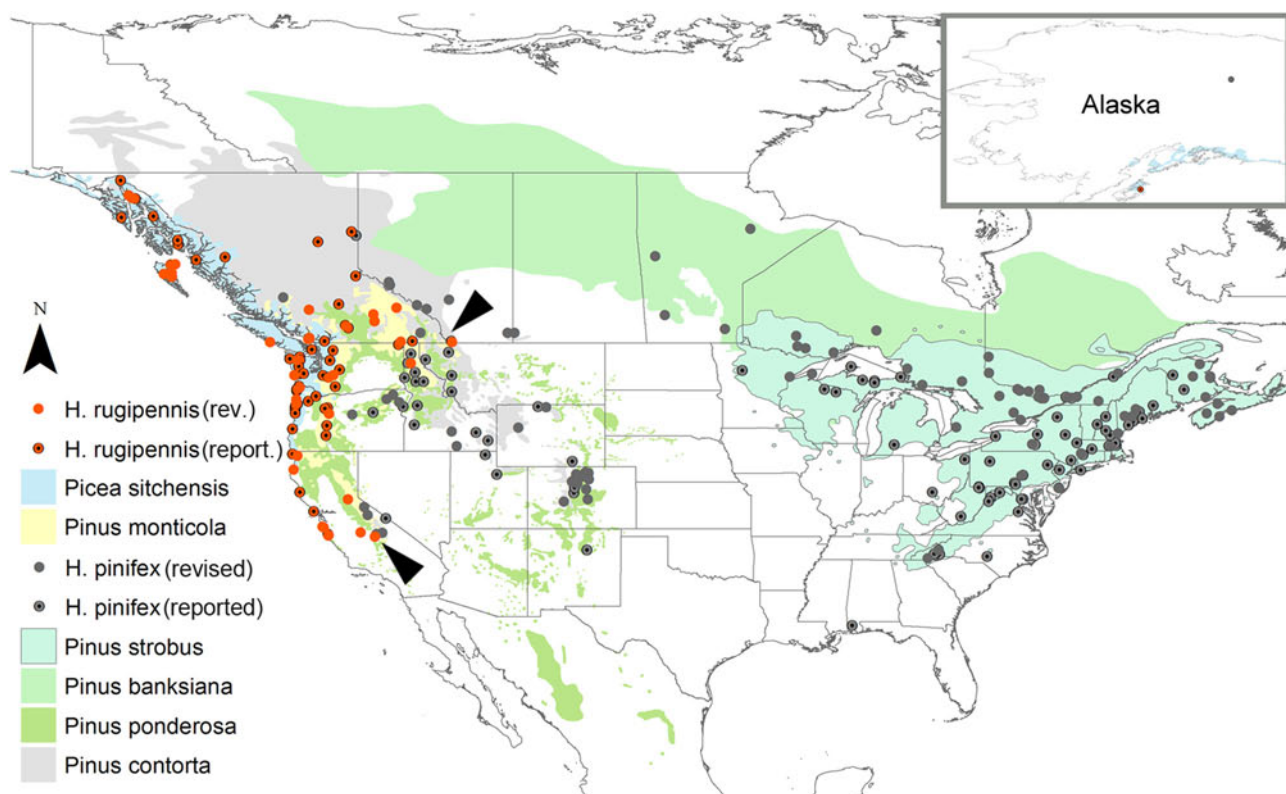


FIGURE 19. Species distribution with main hosts: *Hylurgops rugipennis* (orange) and *H. pinifex* (black-gray). Arrows indicate sympatric areas where the two species and their respective main hosts co-occur.

Description. **Size.** Length 3.7–4.7 (avg. 4.2 ± 0.3) mm long, 2.4× longer than wide. **Color.** Mature adult reddish to brownish-red with dark spots on anterior margin of pronotum, ventrally dark reddish-brown to nearly black, ventrites light reddish-brown. **Frons.** Transverse impression strong (Fig. 5a); inter-puncture areas reticulate, rarely shiny; carina broadly elevated, surface shiny; vestiture hair-like, longer on lower half, 2–7× the length of a puncture's diameter. **Pronotum.** Broad, 0.9–1.0 (0.93 ± 0.02), slightly narrower than elytral base, distinctly constricted on anterior third, widest anterior to middle; lateral margin narrowly rounded on basal fourth, becoming broadly rounded on central two fourths and broadly constricted on anterior fourth; middle line slightly raised, extends from base sometimes across entire pronotal length, discal surface reticulate (Fig. 16a), rarely glossy; discal punctures of two equally abundant sizes, small two-thirds the size of large, inner surface shiny, inter puncture area reticulate; vestiture short, recumbent, hair-like setae indistinct to the length of a large discal punctures on disc, 2× the length near margins. **Elytra.** Anterior margin moderately procurved, slightly raised dark margin; striae shallowly concave with round to keyhole-shaped, smooth, dark punctures, averaging half their diameter apart at disc; interstriae wide as first striae, wider than rest, smooth, shiny, minutely punctate (seen at $> 50\times$ magnification), each with a short, recumbent hair-like setae becoming scale-like on posterior half to declivity and a central punctate granule with a long, sub-erect hair-like setae as long as a stria puncture appearing as rugosities on disc, separated by length of 1.5 stria puncture diameter. **Declivity.** Striae slightly impressed, less than half as wide as interstriae, punctures oval and deep, some keyhole-shaped, smaller than at disc, separated by distance equal to their diameter, 2nd interstriae slightly impressed, wider than 1st, 3rd widest to equal than 2nd, usually intersecting 6th (Fig. 13b) all with regularly spaced pointed granules, 2 punctures width apart; vestiture scale-like, short, recumbent, confused and a central reddish, erect, hair-like setae as long as stria width. **Ventral sclerites.** Surface punctured, interspaces reticulate; recumbent setae hair-like, as long as size of three punctures or more; precoxal ridge acutely elevated. **Legs.** Tibia reddish, narrower than in other species; protibiae with 1 or 2 mid-sized socketed teeth before apical angle, mesotibiae with 2 mid-sized socketed teeth before apical angle, and metatibiae broad with 3 medium-sized socketed teeth before apical angle; third tarsal segments bilobed, broader than second. **Aedeagus.** Showing a distinct ventral lobe (Fig. 7d).

Male. Declivital hair-like setae longer.

Gallery: Maternal gallery longitudinal, slightly sinuate, extending up and down from entrance hole (Bright & Stark 1973), usually just over the root collar of a dead tree or stump. Larval galleries extend perpendicular to brood gallery becoming confused at later stages. These galleries can extend into the roots, often at considerable distance from the brood gallery (Bright & Stark 1973).

Material examined. 250 specimens. CANADA. **Alberta:** Red Rock Cny. Waterton Lakes NP (CNCI). **British Columbia:** Creston (CNCI), 8 mi. W Creston (CNCI), 21 mi. W Creston (CNCI), 2 mi. S Salmo River, Creston (CNCI), Glacier (CNCI), Inverness (CNCI), 12 mi. S Long Beach, Tofino (CNCI), Lorna (CNCI), Mainland (CNCI), Massett, Graham Is. QCI (CNCI), 4.7 km N Renell Sound Rd. Ghost Cr., Graham Is. (CNCI), Sicamous (CNCI), Skidegate, Graham Is. (CNCI), Stanley Park, Vancouver (CNCI), 1 mi. NW Tlell, Graham Is., QCI (CNCI), Tow Hill, Graham Is. (CNCI), Trinity Valley (CNCI, DEBC), Vancouver (CNCI), Laskeek Bay, Reef Island, QCI (CNCI). USA. **Alaska:** 15 km N Juneau, Chichagof Is. (DEBC), Douglas Is. (DEBC), N end Douglas Is (CNCI); 12 mi. N Juneau (DEBC), 41.5 km N Juneau (CNCI); Juneau (DEBC). **California:** Del Norte Co. (CNCI); El Dorado Co.: Blodgett Forest UC, 10 mi. E Georgetown (CNCI); Fresno Co. (CNCI); Humboldt Co.: Eureka (CNCI); Marin Co.: 1 mi. SE Inverness (CNCI); Mendocino Co.: Mendocino (DEBC); Monterey Co.: Carmel (CNCI), Monterey (CNCI); San Mateo Co.: Año Nuevo, 28 km NNE of Santa Cruz (CNCI); Santa Cruz Co.: Swanton (CNCI); Sonoma Co.: Salt Point St. Park (DEBC); Tulare Co.: Kaweah R., Mid Fork (CNCI). **Idaho:** Kootenai Co.: Coeur d'Alene NF (CSUC). **Oregon:** Clatsop Co.: app. 3 mi. SE of Olney (CNCI); Lincoln Co.: Otis, Cascade Head Exp. For. (CNCI); Linn Co.: Santiam Pass (CNCI, DEBC); Tillamook Co.: Kiwanda viewpoint on Cape Lookout, 2.5 mi. N 1.5 mi. W Sand Lake (CNCI); Wasco Co.: Wapinitia (DEBC). **Washington:** (no county) Mount Rainier NP (CNCI, CSUC), (no county) Nisqually R. Mt. Rainier NP (CNCI); Grays Harbor Co.: Westport (CSUC); Jefferson Co.: Hoh Ranger Station, Olympic NP (CNCI); Pierce Co.: West Side Mt Rainier (CSUC); West Side Rd. 1.6N Hwy 706 (CSUC).

Hosts: *Abies concolor*, *A. lasiocarpa*, *Callitropsis nootkatensis* (see Patterson & Hatch 1945), *Larix occidentalis*, *Picea engelmannii*, *P. sitchensis*, *Pinus attenuata*, *P. balfouriana*, *P. banksiana*, *P. contorta*, *P. lambertiana*, *P. monticola*, *P. muricata*, *P. ponderosa*, *P. radiata*, *Pseudotsuga menziesii*, *Tsuga heterophylla*.

Distribution (Fig. 19). NORTH AMERICA. CANADA and USA. Kodiak Island, Alaska to Monterey and Tulare in southern California; mostly east of the Rocky Mountains.

Discussion. Mannerheim (1843) described *Hylurgus rugipennis* from the Sitka Peninsula in Alaska, and placed it in the genus *Hylastes* in 1852. LeConte (1868) and Chapuis (1869, 1873) supported the placement under Erichson's (1836) second division of the genus *Hylastes*. LeConte (1876) placed *H. rugipennis* in his genus *Hylurgops*.

Wood (1971a) considered that *H. rugipennis* hybridized with *H. pinifex* in an area east of the Canadian Cascades to Vernon in British Columbia, later Bright (1976) considered this hybridization area to extend into Alberta. Wood (1982) reduced *H. rugipennis* to a subspecies because of the apparent intergrades in the above area, but the characters used to define the intergrades were not detailed by Wood (1971a, 1982). Bright (pers. comm.) mentioned that the character used by Wood to determine the hybrids of the two species was the distribution of the scale-like setae cover in the elytra. This suggests that in the "intergradation zone," *H. rugipennis* has scale-like setae extending anteriorly into the elytral disc as in *H. pinifex*, in contrast to the coastal forms of the species in which the scales are limited to the declivity.

While considering it a subspecies, Wood (1982) described the phenotypes of *H. r. rugipennis* occurring throughout the Pacific Northwest as morphologically and biologically distinct from *H. r. pinifex*. Also, the distribution of the scale-like setae used in his subspecies determination represents a variation occurring across the two species' distributions that was not observed by Wood (1982). Other characters such as the reticulate surface of the pronotal interspaces and the more regularly sized pronotal punctures of *H. rugipennis* are constant throughout the two species' distributions. The fact that *H. rugipennis* was found in areas where its host *Pinus monticola* and some of the known hosts of *H. pinifex* co-occur, but apparently not in areas where these conditions are not met explains the species' sympatry in areas in Alberta, British Columbia and the Sierra Nevada of California (see black arrows, Fig. 19). In this revision, *H. rugipennis* is treated as a distinct species from *H. pinifex* based on the characters specified in the key and other characters included in the description of the two species.

Hylurgops rugipennis, as defined herein, is restricted to the coastal forests of the Pacific Northwest from Kodiak Island in Alaska to Monterey in California and east to the Northern Rockies in Alberta, British Columbia; Idaho; Washington; and the Sierra Nevada of California (Fig. 19). In its coastal range from Alaska to extreme

northern California, the species occurs primarily in *Picea sitchensis*. South from there, the species' range seems determined by the occurrence of the coastal "closed cone pine" species, *Pinus attenuata*, *P. muricata*, and *P. radiata*. The distribution of *H. rugipennis* east of the Canadian Cascade Mountains into the Northern Rockies primarily follows the distribution of *P. monticola*, which extends up to the Waterton Lakes National Park in Alberta. In the Sierra Nevada, the southernmost distribution of the species into central California appears delimited by this conifer host as well.

***Hylurgops pinifex* (Fitch, 1858)**

(Figures 3b, 7d, 11a, 12b, 13a, 15d, 16b, 17d, 19)

Hylastes pinifex Fitch, 1858:729 (New York, USA)

Hylurgops pinifex, LeConte, 1876:389

Hylastes glabratus, Heyden, 1890:132

Hylurgops glabratus, Riley, 1891:92

Hylastes (Hylurgops) decumanus, Hagedorn, 1910:46

H. (Hylurgops) pinifex, Hagedorn, 1910:46

H. rugipennis pinifex, Wood, 1982:90

Diagnosis. *Hylurgops pinifex* is reddish-brown dorsally and darker ventrally, but occurs as entirely red forms; the pronotum is broad and strongly constricted anteriorly (Fig. 17d). It is distinguished from *H. rugipennis* at $> 50\times$ magnification by the absence of a complete and distinct pronotal disc reticulation (Fig. 16b), by the more distinctly different-sized pronotal punctures (Fig. 16b), by the narrower 2nd declivital interstriae, by the thicker, whitish yellow declivital erect setae, by the absent or smaller granules and erect setae on the 2nd declivital interstriae (eastern form only), by the usually larger metatarsal socketed teeth, by the lack of the ventral lobe of the aedeagus (Fig. 7d), and for the most part by the distribution (Fig. 19).

Description. **Size.** Length 4.1–5.3 (avg. 4.6 ± 0.3) mm long, $2.4\times$ longer than wide. **Color.** Mature adult nearly black to reddish-brown with black spots on anterior margin of pronotum with ventral sclerites dark-reddish to black. **Frons.** Transverse impression moderate to subtle; carina sharply elevated, surface shiny or granulate; vestiture hair-like, longer below middle, $2\text{--}7\times$ as long the diameter of a puncture. **Pronotum.** Broad, 0.9–1.0 (0.95 ± 0.03), slightly narrower than elytral base, distinctly constricted anteriorly (Fig. 17d), widest anterior to middle; lateral margin narrowly rounded on basal third, broadly rounded on middle third, constricted on anterior third; middle line slightly raised, extending from base up to entire pronotal length, its surface shiny (western) to subgranulate (eastern); discal punctures of three sizes, medium more abundant, larger $3\times$ diameter of smaller, inner surface shiny to granulate, inter puncture spaces smooth to granulate, reticulation if present limited to basal and apical margins; vestiture sparse to absent on disc, short, recumbent, hair-like, pronotal vestiture absent or sparse, hair-like, recumbent, short (as long as small discal puncture's diameter) on disc; approximately twice as long on margins. **Elytra.** Anterior margin procurved (Fig. 11a), slightly raised dark margin; striae shallowly concave, averaging half as wide as interstriae on disc, punctures deep, coarse, keyhole-shaped (Fig. 12b), half their diameter apart on disc; interstriae smooth, glossy, with confused small punctures (seen at $100\times$ or more) each with a short, recumbent, hair-like setae becoming scale-like on last third, uniseriate row of short, erect hair-like setae emerging from a central puncture, 1.5 discal striae diameter apart as long as diameter of a puncture on last third of disc. **Declivity.** Striae slightly impressed, a third width of interstriae, punctures elongate, deep, smaller than at disc separated by $0.75\times$ their diameter; 2nd interstriae slightly impressed, 3rd widest, not intersecting 6th (Fig. 13a), with pointed granules, separated by $1.5\text{--}2\times$ a puncture diameter, 2nd narrower, with reduced number of granules (eastern); ground vestiture consists of whitish-yellow abundant, recumbent scale-like setae and an uniseriate, erect hair-like setae as long as one striae. **Ventral sclerites.** Surface glossy, discretely reticulate; vestiture consists of short, recumbent hair. **Legs.** Tarsi dark reddish-brown; protibiae with two socketed teeth before apical angle; meso- and metatibiae with one or two large socketed teeth before apical angle. **Variation.** Western form differs from the eastern by the glossy pronotal surface, by the more regularly sized punctures, sometimes convergent, by the complete set of granules and setae on 2nd declivital interstriae, by the more distinctly setose elytral disc, by the darker coloration of specimens of Colorado and Wyoming. **Aedeagus.** Without a ventral lobe (Fig. 7d).

Male. Declivital hair-like setae longer.

Gallery: Egg gallery is longitudinal (Fig. 3b), slightly sinuate, and 50–85 mm long (Blackman 1919), extending up or down from entrance hole, usually bellow the first meter bellow the duff layer of a dead tree or stump. The larvae burrow at both sides of the maternal gallery, their tunnels becoming confused at later stages of development.

Material examined. 458 specimens. CANADA. **Alberta:** Banff (CNCI), Cypress Hills (CNCI), Jasper Park (CNCI), Laggan (CNCI), Lake Louise (CNCI), Olds (CNCI), Waterton Lakes NP (CNCI), Whirlpool River, Jasper (CNCI). **British Columbia.** Aspen Groove (CNCI), Glacier (CNCI), Golden (CNCI), Kleena kleene, “Tatler Lake” (CNCI), Lorna (CNCI), Marysville (CNCI), McBride (CNCI), Summit Lake, 392 mi. Alaska Hwy. (CNCI), Trinity Valley (CNCI). **Manitoba:** 30 mi. E Winnipeg (CNCI), Gillam (CNCI), Grass River Prov. Pk. (CNCI), South of Clear lake, “RD” Riding Mountains (CNCI). **New Brunswick:** Bathurst (CNCI), Kouchibouguac NP (CNCI), McGraw Brook (CNCI), Plaster Rock (CNCI), Saint Louis (CNCI), Salmon River (CNCI). **Nova Scotia:** Crescent Beach, Bridgewater (CNCI), Halifax (CNCI), Kejimikujik NP (CNCI), Kentville (CNCI). **Ontario:** Algonquin Pk. (CNCI), Atikokan (CNCI), Chalk River (CNCI), Constance (CNCI), Fort William (CNCI), Frater (CNCI), Ignace (CNCI), “King Mtn.” Mont King, Gatinau Pk. (CNCI), Kormak (CNCI), Longlac (CNCI), Marmora (CNCI), Ottawa (CNCI), Petawawa (CNCI), Petawawa Res. (CNCI), Prince Edward Co. (CNCI), Quetico Park (CNCI), Rainy River Dist. (CNCI), Lake Huron, Seaforth (CNCI), Sudbury (CNCI), Thessalon (CNCI), Toronto (CNCI). **Quebec:** Fort Coulogne (CNCI, DEBC), Hudson (CNCI), Hull (CNCI), Kazabazua (CNCI), PSP Sta., Lake Opasatika (CNCI), Laniel (CNCI), Lennox and Addington (CNCI), Lake Menphremagog (CNCI), Montreal (CNCI), “Sainte-Anne’s” de Beaupré (CNCI), Queens Park, Aylmer (CNCI). USA. **Alaska:** Ft. Yukon (CNCI). **California:** Mariposa Co.: Tuolumne Meadows (CNCI); Mono Co.: Blanco’s Corral, White Mts. (CNCI); Tulare Co.: Near Mt. Brewer (CNCI); Tuolumne Co.: Avalanche Meadows, Sequoia NP (CNCI). **Colorado:** Boulder Co.: Longmont (CSUC); Chaffe Co.: 17 km W Buena Vista, Cottonwood Pass Rd. (DEBC); Grand Co.: Elk Creek, Fraser (CNCI), Elk Creek, Fraser, Moffat Rd. (CSUC), Tabernash (CSUC), Williams Fork (CSUC); Gunnison Co.: 10 mi. E Almont (CSUC), Agate Cp. 6 mi. W Monarch Pass. (DEBC); Jackson Co.: Cameron Pass (CSUC); Jefferson Co.: (CSUC); Larimer Co.: 9.1 km W Bellvue, Rist Canyon (CSUC), Estes Park (CSUC), Fort Collins (CSUC); Teller Co.: Mueller State Park (CSUC). **Connecticut:** Litchfield Co.: Cornwall (CNCI). **Idaho:** Blaine Co.: Priest Rd. (CNCI); Cassia Co.: Minidoka NF (CSUC). **Maine:** Kennebec Co.: Monmouth (CNCI); Somerset Co.: Norridgewock (CNCI); Oxford Co.: Paris (CNCI); Penobscot Co.: Orono (UAIC, DEBC). **Massachusetts:** Middlesex Co.: Framingham (CNCI). **Minnesota:** Cook Co.: Grand Portage Natl. Mnmnt. 0.8 km N Cowboys Rd./Co. Rd 89 (DEBC, CSUC); Itasca Co. (DEBC); St. Louis Co.: Duluth (CNCI). **New Hampshire:** Strafford Co.: Durham (CNCI). **New Jersey:** (no county) DaCosta (CNCI); **New York:** St. Lawrence Co.: Cranberry Lake (DEBC); Tompkins Co.: Ithaca (CNCI). **North Carolina:** Buncombe Co.: Ashville (CSUC); Macon Co.: near Cliffside Lake Cpgd. NW Highlands (CNCI). **Oregon:** (no county) Blue Mountains (CNCI); (no county) Ochoco NF (CNCI), Wallowa Co.: Minam NF (CNCI), Whitman NF (CNCI). **Pennsylvania:** Allegheny Co.: N Bloomfield (CNCI); Hemmlock Island Co.: Cooksburg (DEBC). **Utah:** Wasatch Co.: Lost Lake (DEBC), Wolf Creek Pass. (DEBC). **Virginia:** Montgomery Co.: Christiansburg (CSUC). **Wisconsin:** Ashland Co.: Apostle Islands (CSUC). **Wyoming:** Big Horn Co.: 34 mi. E Lovell, Porcupine Camp. (CNCI); Riverton Co.: Dubois (CSUC).

Hosts: *Picea glauca*, *Pinus albicaulis*, *P. balfouriana*, *P. banksiana*, *P. contorta*, *P. resinosa*, *P. strobus*, *P. virginiana*, *Larix laricina*, *L. occidentalis*.

Distribution (Fig. 19). NORTH AMERICA, CANADA, and USA. Transcontinental from eastern

British Columbia to Nova Scotia, south to Central Colorado Rocky Mountains in the western populations. A record from western Arizona and one from north central New Mexico (Snow 1881) may be accidental. The eastern population occurs from Canada to the extreme north of Georgia and South Carolina in the Appalachian Mountains. The map point on Mobile, Alabama does not represent a naturalized population (Atkinson et al. 1991).

Discussion. Asa Fitch (1858) described *Hylastes pinifex* from specimens collected in New York. Later, LeConte (1868) supported the placement of *H. pinifex* in the genus *Hylastes* under Erichson’s (1836) second division. LeConte (1876) placed *H. pinifex* in his genus *Hylurgops*.

In the late 1800s Hamilton (1889, 1891), Heyden (1890), Hopkins (1893a, b), and Schwarz (1886) suggested that *H. pinifex* was the same species as the European *H. glabratus*, but that was not accepted by Blandford (1894, 1898). The Palearctic *H. glabratus* has more regularly sized pronotal punctures and shiny interspaces with some reticulation as does *H. rugipennis*, but it differs in that the first interstriae is wider than the second. *Hylurgops glabratus* differs from both *H. pinifex* and *H. rugipennis* in the complete lack of granules and the uniseriate row of

hair-like setae on the second declivital interstriae. Hagedorn (1910) considered *Hylurgops* to be a subgenus of *Hylastes*, where he placed *H. pinifex*. Thereafter, the species has been placed in the genus *Hylurgops*.

Wood (1982) reduced *H. pinifex* to a subspecies of *H. rugipennis* based on the apparent hybridization of the two (see Discussion section of *H. rugipennis* for details). The characters used by Wood are variable and occur outside the “hybridization zone.” However, those of the narrower second declivital interstriae missing granules [eastern population], whitish-yellow vestiture, distinctly different-sized pronotal punctures [eastern population], and glossy to granulate surface of the pronotal interspaces [western population] are constant along the species’ distribution and are not observed in *H. rugipennis*.

Hylurgops pinifex is the only Nearctic species in this genus occurring in eastern North America (north of Mexico), where the main hosts are *Pinus strobus* and *P. resinosa*. The occurrence in both eastern and western North America (north of Mexico) may have been possible by using *P. banksiana* and *Larix laricina* as a bridge across the North American boreal forest (see Fig. 19). The last two hosts extend to the Northern Rockies along Alberta’s and British Columbia’s southern border, where *H. pinifex* occurs in sympatry with *H. rugipennis*. The principal hosts in the west are *P. contorta* and *P. ponderosa*.

Hylurgops pinifex is considered a valid species supported by the consistent diagnostic features mentioned above in the species key and the diagnostic section. As several external morphological differences exist between the eastern and western forms of *H. pinifex*, a molecular approach may be useful to clarify the taxonomic status of these two forms.

***Hylurgops incomptus* (Blandford, 1897)**

(Figures 7e, 15e, 17e, 20, 21)

Hylastes incomptus Blandford, 1897:145 (Syntypes: Andres Chalchicomula, now Ciudad Serdan in Puebla, Mexico (1), Salazar (1), Chilpancingo in Guerrero (1))

H. (Hylurgops) incomptus, Hagedorn, 1910:45

Hylurgops incomptus, Kleine, 1912:166

H. grandicollis Swaine, 1917:17 (Cloudcroft and Santa Fe, New Mexico, USA)

Synonymy: Wood, 1957:397

Diagnosis. *Hylurgops incomptus* is distinguished from all other *Hylurgops* by the nearly complete acute margin of the sides of its pronotum (Fig. 20a). Is distinguished from the sympatric *H. longipennis* by its larger size, by having a pronotal base almost as broad as the elytral base, by the smaller and more abundant pronotal punctures, and by the long and yellowish hair-like vestiture.

Description. **Size.** Length 4.3–5.5 (avg. 4.9 ± 0.4) mm long, $2.7\times$ longer than wide. **Color.** Mature adult black. **Frons.** Transverse impression moderately strong; lower carina distinct, elevated from epistomal margin to convexity below frontal impression, where it bifurcates until reaching it; vestiture hair-like, longer below middle impression, $4\text{--}7\times$ the length of a puncture’s width. **Pronotum.** Slightly longer than wide $1.0\text{--}1.1$ (1.0 ± 0), widest at base smoothly tapering to basal $\frac{2}{3}$ (Fig. 20b), anterior $\frac{1}{3}$ strongly, roundly narrowing anteriorly; basal $\frac{3}{4}$ of lateral margin sharply elevated, anterior $\frac{1}{4}$ less sharply elevated, broadly rounded; middle line indistinct, not raised, indicated by lack of punctures from base to anterior edge, interpuncture surfaces smooth; discal punctures small, deeply impressed, abundant, of two different sizes, large $2\text{--}2.5\times$ size of small; vestiture distinct, length of erect discal setae $3\text{--}6\times$ the width of a large discal puncture, $5\text{--}9\times$ around margins. **Elytra.** Anterior margin almost straight, with scattered medium-sized crenulations; stria punctures, small, round; interstriae $2\text{--}3\times$ wider than striae, surface usually glossy but reticulate in some specimens; interstriae with two rows of punctate granules, each with a long, semi erect, hair-like setae from elytral disc to declivity, flanking an erect, thicker and longer ($4\text{--}6\times$ length discal puncture diameter) hair-like setae arising from uniseriate granules. Declivital vestiture more abundant than on disc, scale-like setae usually absent, in their place hair-like setae present. **Declivity.** 2^{nd} interstriae impressed, 3^{rd} not distinctly wider than 2^{nd} and not widened apically, all with pointed granules medially, height up to $\frac{1}{2}$ width of declivital puncture, separated by $1.5\times$ size of discal puncture; surface with four to five rows of minute oval punctures with acuminate serrations on their blunt apices; vestiture consisting of uniseriate row of long, erect, hair-like setae intercalated in two lateral rows of slightly shorter hair-like setae. **Ventral sclerites.** Finely reticulate. **Legs.** Protibiae with 1–2 large socketed teeth before the angle, meso- and metatibiae with two

large socketed teeth each, before the angle; third tarsal segments slightly broader than others. **Variation.** Specimens from southern Arizona and New Mexico. Pronotum smoothly broadening on basal $\frac{2}{3}$ (Fig. 20c), interpuncture surfaces reticulate. Elytral disc always reticulate, the long hair-like setae bearing granulate lateral rows on interstriae and declivity absent, bearing scale-like setae on declivity. Specimens from Durango, Mexico are intermediate (see discussion). **Aedeagus.** Lacking a ventral lobe (Fig. 7e).

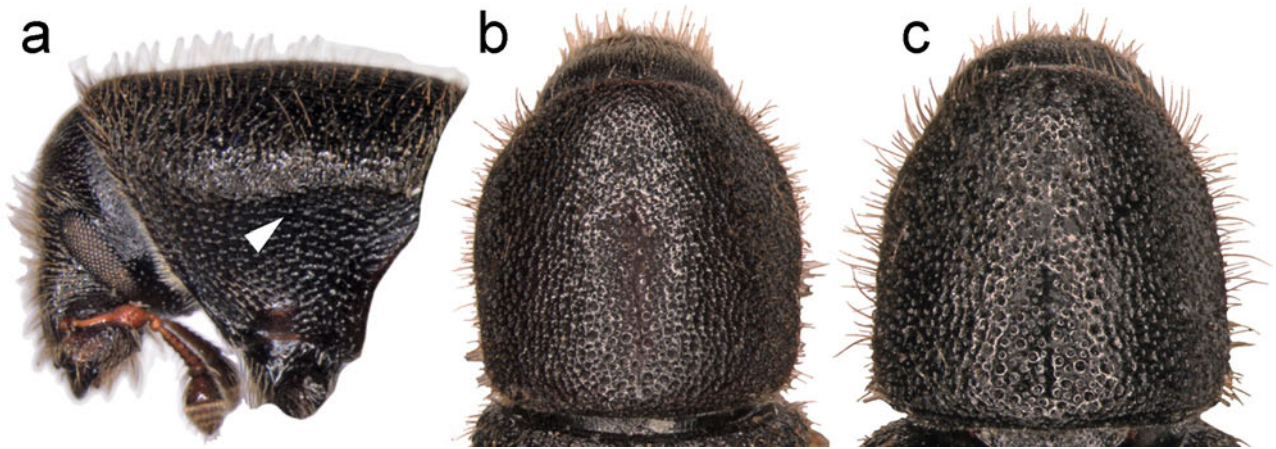


FIGURE 20. *Hylurgops incomptus* pronotum: a) prothoracic lateral margin, b) pronotum broadening from base (typical form), c) pronotum narrowing from base (Arizona and New Mexico variant).

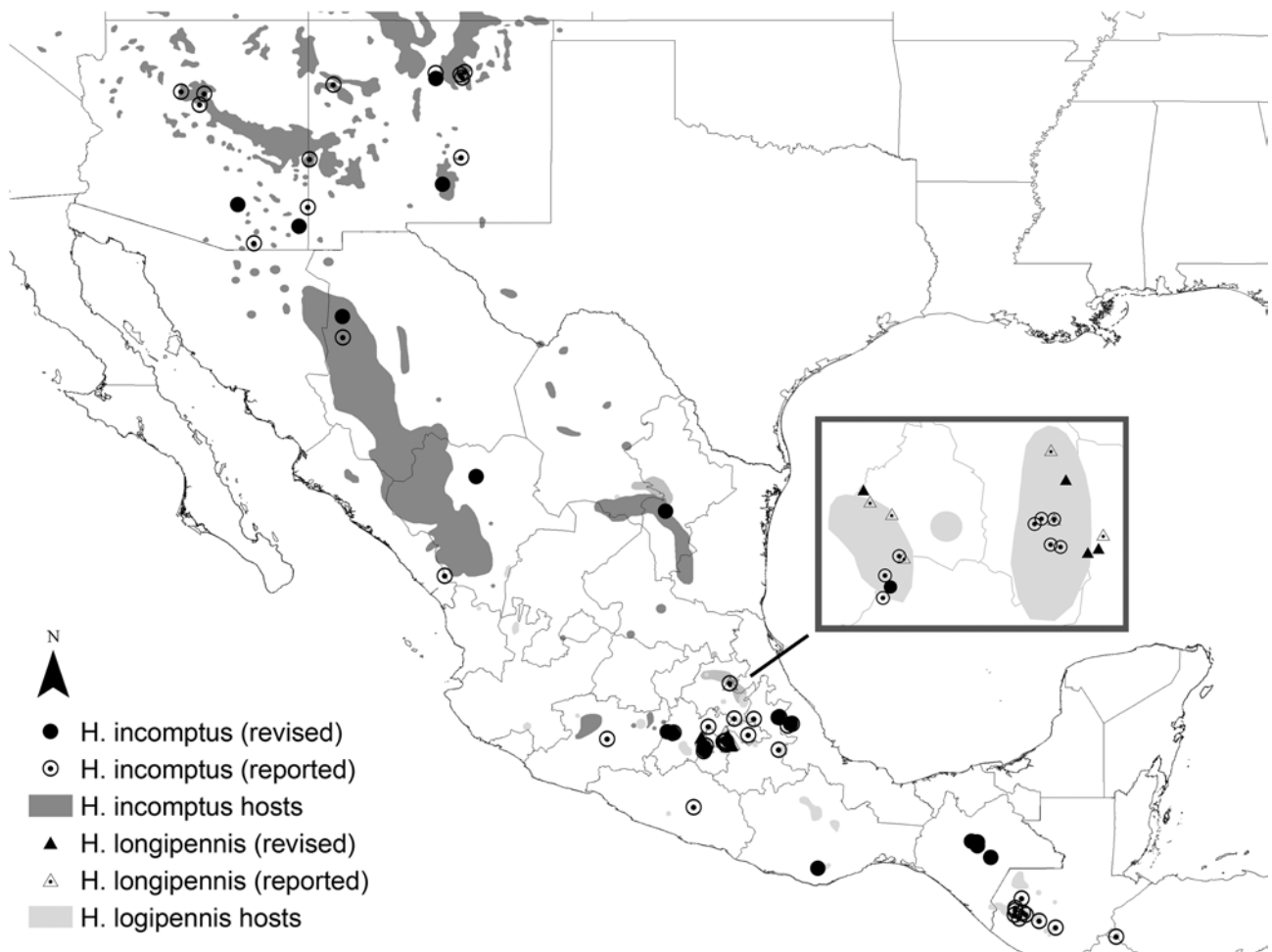


FIGURE 21. *Hylurgops incomptus* distribution (circles) with main hosts: *Pinus arizonica*, *P. duranguensis*, and *P. ponderosae* (central, AZ and NM). *H. longipennis* distribution (triangles) with main hosts: *P. hartwegii* and *P. patula*. Insert shows sympatric zone near Mexico City.

Gallery: The maternal gallery is constructed near or below the root collar, upward from the entrance hole, longitudinal and slightly sinuate from 60–120 mm long (Schwerdtfeger 1957). The larval tunnels extend from both sides of the maternal gallery (Wood 1982).

Material examined. 108 specimens. MEXICO. **Chiapas:** 5 mi. E San Cristobal (CNCI), 6 mi. NE San Cristobal (CNCI), 7 mi. E San Cristobal (CNCI), 8 mi. E San Cristobal (CNCI), 8 mi. SE San Cristobal (CNCI), 25 mi. SE Teopisca (CNCI), San Cristobal (CNCI). **Chihuahua:** Mesa del Huracan (CNCI). **Durango:** 9 mi. E El Palmito (CNCI), 10 mi. SW El Salto (CNCI), 10 mi. SW El Salto (CNCI). **Mexico DF:** 15 mi. S El Guarda (CNCI). **Mexico State:** 40 mi. W (DEBC); Vivero San Cayetano (DEBC). **Nuevo Leon:** Cerro Potosi (CNCI). **Oaxaca:** 17.9 km E Teotitlan (DEBC), Hwy. 175, 3.5 mi. S Suchixtepec (CNCI). **Puebla:** 6 mi. W Teziutlan (CNCI). **Veracruz:** 3.6 mi. W Las Vigas (CNCI). USA. **Arizona:** Cochise Co.: Rustler Pk., Chiricagua Mountains (CNCI); Pima Co.: Sta. Catalina Mountains (CNCI); Sedona Co.: Oak Creek Canyon (CNCI). **New Mexico:** Otero Co.: Cloudcroft (RMRS), Cloudcroft Paratype 9241 (CNCI); Santa Fe Co.: Santa Fe Canyon Paratype 9241 (CNCI).

Hosts: *Pinus arizonica*, *P. duranguensis*, *P. engelmannii*, *P. hartwegii*, *P. leiophylla*, *P. montezumae*, *P. tecumanianii*, *P. patula*, *P. ponderosae* (included without revised information due to beetle records north of Mogollon Rim (the northern limit of *P. arizonica*), *P. pseudostrabus*).

Distribution (Fig. 21). CENTRAL AMERICA: Honduras, Guatemala and El Salvador; NORTH AMERICA: Arizona and New Mexico to southern Mexico.

Discussion. Blandford (1897) described this species as *Hylastes incomptus* under Erichson's second division, and Hagedorn (1910) included *H. incomptus* under the subgenus *Hylurgops*. Kleine (1912) considered Hagedorn's species concept of *Hylastes* to be too broad and did not follow his subgeneric concept, placing *H. incomptus* as a member of *Hylurgops*.

When Swaine (1917) described *H. grandicollis* from three specimens collected in New Mexico, he did not make any reference to Blandford's (1897) species. Swaine (1917) mentioned having examined specimens from California but gave no specific locality. No specimens from California were examined during this study, and Bright & Stark (1973) did not include *H. grandicollis* from that state. In 1955, Schedl reported *H. incomptus* from Guatemala, its southernmost distribution. Wood (1957) synonymized *H. grandicollis* Swaine with *H. incomptus* Blandford after comparing Swaine's *grandicollis* type with several of his and Eggers' specimens from unspecified locations. Wood (1982) based his description on a homotype from Cerro Calel, Guatemala and examined the types of *H. incomptus* and *H. grandicollis* among 151 others.

Specimens from Arizona and New Mexico, including the Swaine *H. grandicollis* types, have a pronotum that gradually broadens from the base to the middle or to slightly anterior of the middle (Fig. 20b). These specimens also have a reticulate surface of the elytra. On the declivity, the hair-like setae are shorter, reddish-yellow, and less abundant due to the presence of a single row of medially arranged granules on the interstriae and the scale-like setae are more abundant. The pronotum of Mexican specimens from Chiapas gradually narrow from the base toward the apex (Fig. 20c). The elytral surface varies from reticulate to smooth and glossy, and the declivital vestiture is light-yellowish with abundant, medium length, hair-like setae due to the presence of a pair of lateral granules in addition to the central interstitial row and less abundant scale-like setae.

The occurrence of the species between the populations of southern Arizona and New Mexico is fragmented possibly due to the host patchiness in the few mountains across the Sonoran and Chihuahuan deserts. The northernmost Mexican record reported by Wood (1982) is from Mesa del Huracan in Chihuahua, about 300 km southeast of the southernmost record in Arizona in the isolated Huachuca Mountains. Specimens from these two disjunct regions are indistinguishable. Specimens from the Sierra Madre del Sur in the Mexican state of Oaxaca also closely resemble the northern specimens, except that some are smaller. The greatest differences are found between specimens occurring north of Durango, Mexico and specimens from Chiapas in southern Mexico. However, individuals from extremes of the range share some characters, suggesting that the species probably exhibit clinal variation. Collecting other material for additional morphometric and molecular analysis would help determine if specimens from these populations represent different species.

***Hylurgops longipennis* (Blandford, 1896)**

(Figures 1a, 7f, 12a, 15f, 17f, 21, 25)

Hylastes longipennis Blandford, 1896:143 (Rancho de Popocatepetl, Mexico)

H. (Hylastes) longipennis, Hagedorn, 1910:45

Hylurgops longipennis, Wood, 1982:87

Diagnosis. *Hylurgops longipennis* is distinguished from the sympatric *H. incomptus* by the larger and fewer prothoracic punctures of two distinctly different sizes (Fig. 17f), by the larger and coarser elytral punctures, and by the long, whitish versus yellowish setae.

Description. Size. Length 3.8–4.8 (avg. 4.3 ± 0.3) mm long, 3× longer than wide. **Color.** Mature adult black, posterior face of abdominal ventrites reddish; remaining ventral sclerites black. **Frons.** Transverse impression indistinct, shallow; middle carina from epistomal margin to transverse impression, surface granulate, dull; vestiture whitish, hair-like setae, longer below middle impression, 3–6× frontal puncture diameter. **Pronotum.** Elongate 1.0–1.1 (1.09 ± 0.03), smoothly tapering anteriorly (Fig. 17f), widest at middle; basal ¼ of lateral margin roundly elevated, anterior fifth broadly constricted; middle line raised from base to ½ its length, its surface granulate, dull; discal punctures of two equally abundant sizes, larger twice diameter of smaller, punctures' inner surface granulate, dull; interpuncture surface smooth to granulate; vestiture whitish, erect, long, length 1.5× width of a large discal puncture on disc, 2.5–5× on pronotal margins. **Elytra.** Bases slightly procurved, stria punctures deep, round (Fig. 12a), half their diameter apart; interstriae as wide or slightly narrower than interstriae at disc, surface glossy, smooth to finely granulate, minutely punctured; vestiture consists of hair-like setae arising from punctures on posterior half of disc that become scale-like towards declivity and a single middle row of longer (1–5× width of discal puncture) hair-like setae. **Declivity.** The 1st and 2nd interstriae impressed (Fig. 15f), with pointed granules, some ⅓ as high as declivital puncture diameter; stria punctures round, large, deep, diameter half of interstitial width; vestiture of scale-like setae on 3 to 4 rows, uniseriate setae, long, erect, slightly longer than interstitial width. **Ventral sclerites.** Sclerites finely reticulate. **Legs.** Third tarsal segment distinctly broader than 2nd (Fig. 1a). **Aedeagus.** Presenting a distinct ventral lobe (Fig. 7f).

Gallery: On the stem collar and roots of its host (Atkinson & Equihua-Martínez 1985a). The pattern has not been described.

Material examined. 17 specimens. MEXICO. **Mexico City:** Cruz Blanca, Parque Nal. Desierto los Leones (USNM). **Nuevo Leon:** Cerro Potosi nr. Galeana (DEBC), Mpio. Galeana NE slope Cerro Potosi (CNCI). **Puebla:** 11 mi. E Amecameca (USNM), Parque Nacional Iztaccihuatl-Popocatepetl, Popocatepetl (USNM), Parque Nacional Zoquiapan (USNM).

Hosts: *Pinus hartwegii*, *P. leiophylla*, *P. patula*, *P. pseudostrobus*.

Distribution (Fig. 21). NORTH AMERICA: MEXICO. From two disjunct localities in the Sierra Madre Oriental, one northern in Nuevo León and a southern from Hidalgo, to the Trans-Mexican Volcanic Belt.

Discussion. Blandford (1896) described *Hylastes longipennis* from five specimens collected at Rancho Popocatepetl, Mexico. Hagedorn (1910) and Schedl (1940) treated *H. longipennis* as a species of *Hylastes*. Wood (1982) designated a female in Blandford's series as the lectotype and placed the species in the genus *Hylurgops* based on its bilobed third tarsal segments and the intermixed large and small punctures on the pronotum.

The species distribution appears limited to that of the primary hosts, *P. hartwegii* and *P. montezumae*, but this could be a result of insufficient collections. These pines occur discontinuously at high elevations in the Trans-Mexican Volcanic Belt, the Sierra Madre de Oaxaca, the Sierra Madre de Chiapas, and in other smaller patches. The previously known distribution of the species showed it was restricted to the Trans-Mexican Volcanic Belt (Atkinson & Equihua-Martínez 1985a, b). New records from the USNM collection expand the known distribution of this species, which seems to match that of *P. hartwegii*, as exemplified by its occurrence in a small population of *P. hartwegii* in the Cerro Potosí, Nuevo León, in the Sierra Madre Oriental in Mexico.

***Hylurgops knausi* Swaine, 1917**

(Figures 7g, 14b, 15g, 17g, 18)

Hylurgops knausi Swaine, 1917:17 (Cloudcroft, New Mexico, USA)

= *Hylurgops planirostris* Wood, 1971c:146

Diagnosis. This species is distinguished from the similar and sympatric *H. reticulatus* by the short, recumbent, hair-like ventral setae and by the overall smaller sized (thus more numerous) pronotal punctures (Fig. 17g–i). The presence of short pronotal setae distinguishes it from *H. longipennis* and *H. incomptus* in northern Mexico. The absence of a distinct anterior pronotal constriction, the straighter anterior margin of the elytra, the more elongated habitus, reduced elytral disc vestiture, more regularly sized small and large pronotal disc punctures, and the aedeagus with a moderate ventral lobe separate it from *H. planirostris* of southern Mexico to Honduras.

Description. **Size.** Length 4.2–5.6 (avg. 4.7 ± 0.3) mm long, $2.7\times$ longer than wide. **Color.** Mature adult dark brown to black, ventral sclerites dark brown to black with tarsi dark reddish. **Frons.** Transverse impression moderately strong; median carina extends from above epistomal margin to middle of convex area below frontal impression; vestiture short, recumbent, hair-like, $2\times$ as long as the diameter of a one frontal puncture, $3\times$ as long immediately above epistoma. **Pronotum.** As long as wide 1.0–1.1 (1.0 ± 0.0) narrower than elytral margin at base, evenly or slowly widening to or slightly anterior to middle, where appears wider than elytral margin, then smoothly tapering anteriorly (Fig. 14b); basal $\frac{1}{4}$ – $\frac{1}{3}$ of lateral margin narrowly constricted, slightly rounded at middle; middle line low, sometimes indicated only by a lack of punctures; discal punctures small, numerous, appearing regularly sized at low magnification, small $\frac{2}{3}$ the size of large at magnifications $> 100\times$, discal interpuncture surface shiny, with scattered reticulation; vestiture short, nearly indistinct, recumbent, hair-like setae the length of a puncture's diameter on pronotal sides. **Elytra.** Interstriae glossy, $1.5\times$ wider than striae on disc, surface rugose, with two to three rows of confused punctures, each with a short, recumbent, whitish hair-like seta, becoming semiplumose towards discal end; striae punctures small, keyhole-shaped (Figs. 12 b–c), moderately impressed. **Declivity.** 3^{rd} interstriae widest (Fig. 15g), slightly impressed, all with a single row of granules as tall as half as half size of a puncture; vestiture semi-erect, whitish hair-like setae as long as one (females) to four times (males) a discal puncture's diameter, ground vestiture of four to five rows of short, recumbent, scale-like setae. **Ventral sclerites.** Finely reticulate; vestiture short, recumbent hair-like setae. **Legs.** Third tarsal segment slightly broader than second, bilobed. **Aedeagus.** Presenting a moderate ventral lobe (Fig. 7g).

Male. Declivital hair-like setae longer than in female.

Gallery: On stem collar and roots (Livingstone 1980).

Material examined. 235 specimens. MEXICO. **Chihuahua:** Arroyo Mesteno, Sierra del Nido (DEBC). **Durango:** 3 mi. E El Salto (CNCI), 7 mi. W El Salto (CNCI), 9 mi E El Palmito (CNCI), 10 mi. SW El Salto (CNCI), 10 mi. W El Salto (CNCI, DEBC), 11 mi. SW El Salto (CNCI), Buenos Aires 10 mi. W La Ciudad (CNCI), Buenos Aires 10 mi. W El Salto (CNCI, DEBC), Buenos Aires 37 mi. W La Ciudad (CNCI), 24 mi. E El Salto (CNCI), 24 mi. W La Ciudad (CNCI), Ciudad (CNCI). **Nuevo Leon:** Cerro Potosi (CNCI, DEBC), NE slope Cerro Potosi, Mpio. Galeana (CNCI). USA. **Arizona:** (no county) S. Arizona (CNCI); Apache Co.: Alpine (CNCI), Big Bonito Creek, White Mts. (UAIC); Cochise Co.: Carr Canyon (CNCI), Onion Saddle, Chiricagua Mountains (CNCI), Paradise (CNCI), Rustler "Park" Camp., Chiricagua Mountains (CNCI); Graham Co.: Pinaleno Mountains (CNCI, UAIC), Pinaleno Mountains, Soldier Creek (UAIC); Gila Co.: Globe (CNCI); Greenlee Co.: Buffalo Crossing, East Fork Black R., White Mts. (UAIC), Hannagan Camp. (CNCI); Pima Co.: Bear Wallow, Santa Catalina Mountains (CNCI, DEBC), Carr Canyon, Huachuca Mountains (CNCI), Florida Cny. Sta. Rita Range Res. (UAIC), Green Spg., Mt. Lemmon (UAIC), Mt. Bigelow (UAIC), Santa Rita Mountains (CNCI), Sierra Vista, Huachuca Mountains (CNCI), Sta. Catalina Mts. (DEBC), Sta. Catalina Mts. near Summerhaven (UAIC); Santa Catalina Mountains (CNCI), Santa Cruz Co.: Carr Canyon, Huachuca Mountains (CNCI), Santa Rita Mountains (CNCI). **New Mexico:** Grant Co.: McMillan Camp. 13 mi. N Silver City (CNCI), McMillan Camp., 14 mi. N Silver City (CNCI); Otero Co.: Cloudcroft (CNCI, DEBC), Cloudcroft, Lycoparatypes 9243 (CNCI), Lincoln NF 1 mi. SE Cloudcroft (CNCI), Pine Camp., 2 mi. NE Cloudcroft (CNCI); San Miguel Co.: near hot springs, Las Vegas (CNCI); Socorro Co.: Bear Trap Camp., 28 mi. SW Magdalena (CNCI).

Hosts. *Picea engelmannii*, *Pinus arizonica*, *P. arizonica* var. *cooperi*, *P. duranguensis*, *P. hartwegii* (new host, Cerro Potosi, Nuevo Leon, MX, Seybold 1993), *P. leiophylla*, *P. ponderosa*, *P. pseudostrobus*, *P. strobiformis*.

Distribution (Fig. 18). NORTH AMERICA: MEXICO and USA. Arizona and New Mexico to Durango and Nuevo Leon, Mexico.

Discussion. Swaine (1917) described *H. knausi* from specimens collected in Cloudcroft, Otero County in New Mexico, and in 1918 placed the species under *Hylurgops* based on tarsal characters. Wood (1971c) compared Chapuis' syntypes of *H. planirostris* with his homotypes of *H. knausi* and found them to be identical, and so treated them as synonymous. In his monograph's key to *Hylurgops*, Wood (1982) placed the synonymized species under those lacking a distinct anterior constriction of the pronotum. Wood (1982) suggested that a slight intergrade of "characters" of this species with *H. porosus* occurred north of central Arizona and central New Mexico where the northern distribution limit of *H. knausi* and the southern of *H. porosus* (as suggested by Wood) meet. Although, no specimens of *H. porosus* from central AZ and none from any part of NM were examined, and Wood does not mention which were these characters, we can only speculate that confusion may have arisen when he examined males of *H. knausi* with long declivital setae or that he might have confused specimens of the sympatric *H. reticulatus*. Nevertheless, the two specimens upon which he based his comments may represent aberrant specimens. The full species designation given by Swaine (1917) is considered valid by the characters discussed in the specific key, diagnosis, and description.

***Hylurgops reticulatus* Wood, 1971**

(Figures 6b, 7h, 15h, 17h, 22a, 23)

Hylurgops reticulatus Wood, 1971b:71 (Summit Lake, Shasta County, California, USA)

Diagnosis. *Hylurgops reticulatus* is distinguished from the sympatric *H. porosus* at high ($> 50\times$) magnification by the completely reticulate elytral surfaces (Fig. 22a), also by the ventral lobe of the aedeagus (Fig. 7h). It is distinguished from *H. knausi* by a greater size difference between the large and small pronotal punctures, by the long, hair-like setae on the ventral surfaces and from dark brown specimens of *H. pinifex* occurring in Colorado by the longer than wide pronotum (Fig. 17h), which tapers smoothly anteriorly.

Description. **Size.** Length 3.9–5.3 (avg. 4.5 ± 0.4) mm long, $2.8\times$ longer than wide. **Color.** Mature adult black to dark brownish-red, if bicolored (rarely) it presents a black pronotum and a reddish-brown to brown elytra, ventral sclerites dark brownish-red to black with dark femur and tibiae and lighter tarsi. **Frons.** Middle impression moderately deep; carina elevated, extends from middle impression to epistoma, surface smooth to reticulate; vestiture hair-like setae, longer below middle, $2\text{--}7\times$ the size of a puncture diameter. **Pronotum.** Elongate 1.0–1.1 (1.1 ± 0), base narrower than elytral anterior margin; smoothly tapering anteriorly (Fig. 17h), widest near middle; median line present lengthwise, slightly raised, its surface reticulate; discal punctures of two sizes, the smaller more abundant (2:1), the larger $3\times$ diameter of the smaller, inner surface shiny or dull, inter-puncture area reticulate, some with scattered smooth areas; discal setae sparse to absent, short, recumbent, whitish, hair-like, averaging length of small punctures at disc, $2\times$ longer at marginal areas; basal $\frac{2}{3}$ of lateral margin narrowly rounded, becoming broadly rounded anteriorly to a slight apical constriction. **Elytra.** Anterior margin almost straight; striae straight, shallowly concave, punctures round, shiny, separated by half their diameter on disc; interstriae slightly wider than striae, evenly reticulate (visible at $> 50\times$, Fig. 22a), punctures minute, confused, a middle row of erect, whitish hair-like setae arising from behind each granule, setae as long as a discal stria puncture width, becoming longer posteriorly, separated by $1.5\times$ stria puncture width. **Declivity.** Striae slightly impressed, as wide as most interstriae except the third (Fig. 15h), punctures round and deep, smaller than at disc, separated by half their diameter's length, second interstriae slightly impressed, all with pointed granules separated by $1.5\times$ a puncture diameter, with ground vestiture of small, round, scale-like setae, 3–4 rows across interstriae, uniseriate midline of erect, whitish hair-like setae as long or slightly longer than interstitial width. **Ventral sclerites.** Surface punctured, reticulate; vestiture distinctly long, hair-like; precoxal ridge acutely elevated. **Legs.** Protibiae with two large socketed teeth before apical angle; meso- and metatibiae with one or two large socketed teeth before apical angle; third tarsal segment slightly broader than second. **Aedeagus.** Of typical *Hylurgops* type, with a distinct ventral lobe in the aedeagus (Fig. 7h).

Gallery: As in *H. porosus* (Wood 1982): uniramous, longitudinal, with broods mining perpendicular to the brood gallery.

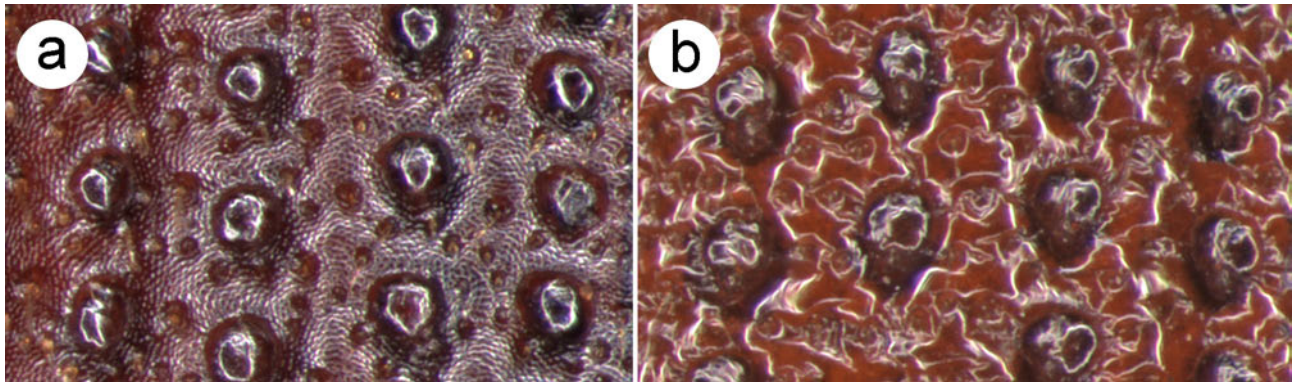


FIGURE 22. Elytral disc surfaces of New World *Hylurgops*: a) surface reticulate (*Hylurgops reticulatus*), b) surface smooth and glossy (*Hylurgops porosus*).

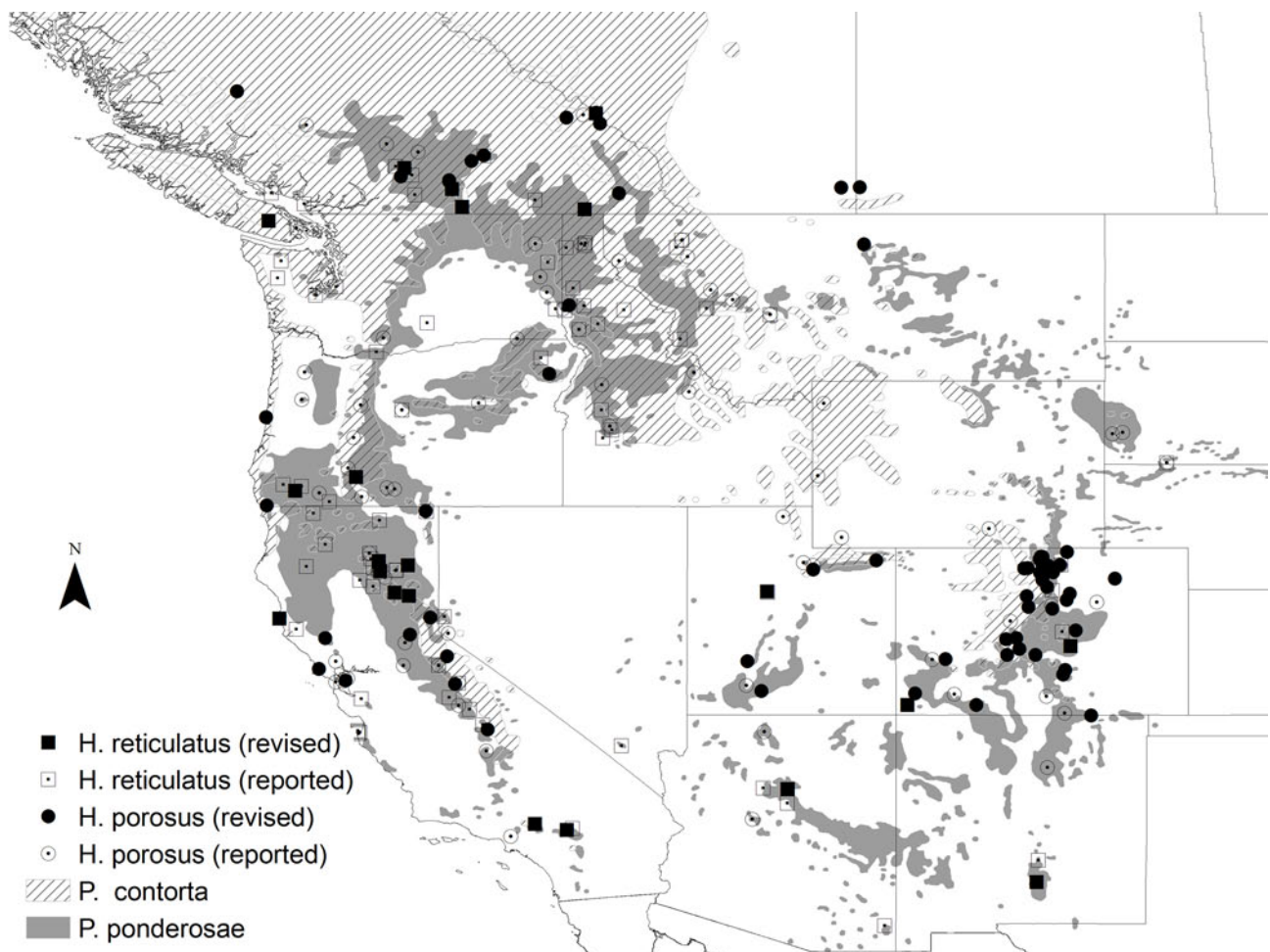


FIGURE 23. Species distribution with two shared and widespread conifer hosts of *Hylurgops reticulatus* (squares) and *H. porosus* (circles).

Material examined. 110 specimens. CANADA. **Alberta:** Lake Louise (CNCI). **British Columbia:** Creston (CNCI), Enderby (CNCI), Indian Meadows, Manning Provincial Park (CNCI), Midday Creek (CNCI), Midday Valley, Merritt (CNCI), Midday Valley, Merritt Paratypes No. 12578 (CNCI), Lake Cowichan (CNCI), Oliver (CNCI), Robson (CNCI), Spious Creek (CNCI), Summerland (CNCI), Trinity Valley (CNCI), Vancouver, Mesachie Lake (CNCI), Voght Valley (CNCI). MEXICO. **Durango:** 10 mi. SW El Salto (CNCI). USA. **Arizona:** Coconino Co.: Flagstaff (DEBC). **California:** Lassen Co.: Black Mountain (DEBC); Lassen NF (CNCI); Los Angeles Co.: Big Pines (CNCI, DEBC); Mendocino Co.: Mendocino (DEBC); Plumas Co.: Jackson Ck. (DEBC),

Meadow Valley (CNCI); San Bernardino Co.: Baldwin Lake (CNCI), Big Bear Lake (CNCI); Shasta Co.: Old Station (DEBC). **Colorado:** El Paso Co.: 15 mi. S. Colorado Springs (CNCI); Montezuma Co. (CSUC). **New Mexico:** Otero Co.: Cloudcroft (CNCI). **Oregon:** Josephine Co. (DEBC); Klamath Co.: 7 mi. SW Fort Klamath (CNCI); **Utah:** Juab Co.: Eureka (CNCI), The Mammoth (CNCI).

Hosts: *Picea engelmannii*, *P. sitchensis*, *Pinus arizonica* var. *cooperi* (new host, El Salto, Durango, MX, Coll. J.B. Thomas 1964), *P. attenuata*, *P. contorta*, *P. jeffreyi*, *P. monticola*, *P. muricata*, *P. ponderosa*, *P. radiata*, *Pseudotsuga menziesii*, *Tsuga heterophylla*.

Distribution (Fig. 23). NORTH AMERICA: From southern Alaska to Durango, Mexico.

Discussion. Wood (1971b) described *H. reticulatus* from specimens he collected in 1946 at Summit in Shasta County, California. He mentioned that *H. reticulatus* was previously confused with *H. porosus* and *Hylastes macer* LeConte, the latter also having a reticulate elytral surface.

The third tarsal segments of *H. reticulatus* are not as broad as in other *Hylurgops*; however, they are not narrow as in *Hylastes*. The pronotal punctures are of two distinct sizes that are intermixed (Fig. 17h). The species resembles *H. porosus* and occurs in sympatry with it throughout most of its distribution.

***Hylurgops porosus* (LeConte, 1868)**

(Figures 7i, 15i, 17i, 22b, 23, 24b)

Hylastes porosus LeConte, 1868:175 (Cayo de los Reyes, CA, USA)

H. (Hylastes) porosus, Hagedorn, 1910:46

Hylurgops lecontei Swaine, 1917:16 (Colorado, USA)

Synonymy: Wood, 1971c:147

Diagnosis. *Hylurgops porosus* is distinguished from the similar and sympatric *H. reticulatus* at high ($> 50\times$) magnification by the incomplete reticulate surface of the elytra (Fig. 22b) and by lacking the ventral lobe of the aedeagus (Fig. 7i). It can be distinguished from *H. knausi* in the extreme southern limit of its distribution by the by the marked difference between the small and large pronotal punctures clearly distinct different-sized pronotal punctures (Fig. 17i) and the long ventral hair-like setae. It can be distinguished from dark specimens of *H. pinifex* by its narrower body and the indistinct pronotal constriction (Fig. 17i).

Description. Size. Length 3.5–4.5 (avg. 4.0 ± 0.3) mm long, $2.7\times$ longer than wide. **Color.** Mature adult black or brownish red to bicolored with black pronotum or reddish-brown and reddish-brown or brownish elytra, ventral sclerites brown to black with tarsi dark reddish-brown. **Frons.** Transverse impression moderately impressed; a shiny carina extends from lower convex area on lower frons to epistoma; vestiture consisting of hair-like setae, longer below middle, $2\text{--}7\times$ a frontal puncture diameter's length. **Pronotum.** Slightly elongate $0.9\text{--}1.1$ (1.0 ± 0) (Fig. 17i), its base narrower than elytra, smoothly tapering anteriorly, widest near middle; slightly raised middle line extends across the entire length, surface shiny to variably reticulate; discal punctures of two sizes, smaller more abundant, larger $3\times$ diameter of smaller, inner surface shiny or reticulate, margin smooth to reticulate; vestiture sparse to absent on disc, short, recumbent hair-like setae, averaging the length of larger punctures on disc, $2\times$ longer on marginal areas; basal $\frac{1}{3}$ of lateral margin narrowly rounded becoming broadly rounded anteriorly to slight anterior constriction. **Elytra.** Anterior margin near straight; stria punctures vary from round to keyhole-shaped (Fig. 12), shallowly concave, surface smooth (Fig. 22b), separated by half their diameter at disc; interstriae smooth, slightly wider than discal striae, minutely punctured ($>100\times$ or more), each with a short, recumbent hair-like setae on anterior two thirds of disc, with a single row of erect hair-like setae from behind a punctate granule, as long as discal puncture width on last third, $1.5\times$ stria puncture diameter apart. **Declivity.** Striae slightly impressed, half as wide as interstriae, punctures round, deep, smaller than on disc, $0.75\times$ diameter apart, second interstriae slightly impressed, all with granules separated by $1.5\times$ puncture length, each with an erect, yellowish hair-like seta as long to slightly longer than interstriae width. **Ventral sclerites.** Surface reticulate; ground vestiture of distinct long hair-like setae. **Legs.** Protibiae with two large socketed teeth before apical angle; meso- and metatibiae with one or two large socketed teeth before apical angle; third tarsal segment slightly broader than second. **Aedeagus.** Lacking a ventral lobe (Fig. 7i).

Male. Fifth ventrite with a small dense patch of setae medially on posterior margin.

Gallery: A uniramous, longitudinal gallery (Hopkins 1902) in the lower bole and roots.

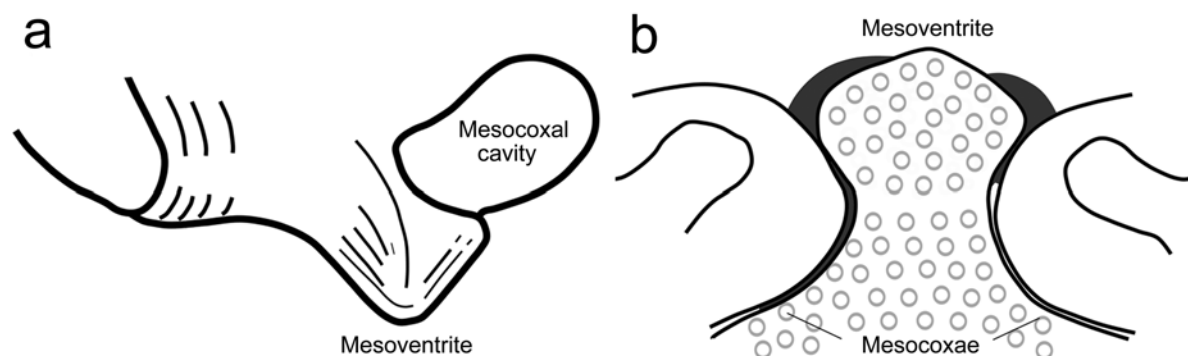


FIGURE 24. Different interpretations of the mesoventrite in *Hylurgops* species: a) sub-inflated (modified from Swaine 1918), b) anteriorly protuberant (*Hylurgops porosus*, modified from Bruck 1936).

Material examined. 93 specimens. CANADA. **Alberta:** Banff (CNCI), Cypress Hills (CNCI), Laggan (CNCI), Lake Louise (CNCI). **British Columbia:** Atlin (CNCI), Cawston (CNCI), Chicoltin (CNCI), Creston (CNCI), Creston, Summit Creek (CNCI), Enderby (CNCI), Golden (CNCI), Kingsvale (CNCI), Kleena kleene, “Tatler lake” (CNCI), Lorna (CNCI), Manning Provincial Park (CNCI), Merritt: Cranbrook (CNCI), Middy Valley (CNCI), Newgate (CNCI), Peachland (CNCI), Summerland (CNCI), Trepanier Creek (CNCI), Trinity Valley (CNCI), Vermillion “Summit” Pass, Banff Rd. (CNCI), Vernon (CNCI). **Saskatchewan:** Cypress Hills (CNCI). USA. **Arizona:** Apache Co.: Chuska Mountains (CNCI). **California:** Alameda Co.: Berkely (CNCI), Piedmont (CSUC); Alpine Co.: Sand Flat (CSUC); El Dorado Co.: Grass Lake, Tahoe (CNCI); Lake Co.: Cobb (DEBC); Lassen Co.: Lassen NF (CNCI, DEBC); Madera Co.: Northfork (CNCI); Mariposa Co.: Yosemite (CSUC); Marin Co.: Inverness (DEBC); Modoc Co.: Willow Ranch (DEBC); Nevada Co.: Truckee (CNCI); Plumas Co.: Chester (CNCI); Tuolumne Co.: Avalanche Meadows at Sequoia NP (CNCI). **Colorado:** Adams Co.: JCK Corp. Henderson (CSUC); Archuleta Co.: Fairfield (CSUC); Boulder Co.: Gold Hill (CSUC), Meeker Park (DEBC); Chaffee Co.: 17 km W Buena Vista (CSUC), Custer Rd 306 2 mi. S Rd 307, Droney Gulch (CSUC); Denver Co.: Denver (CSUC); El Paso Co.: Black Forest (CSUC); Fremont Co.: 5 mi. N Cotopaxi (CSUC), US 285 W Aspen Park (CSUC); Grand Co.: Fraser Exp. For. (CSUC); Gunnison Co.: Agate Camp. 6 mi. W Monarch Pass. (DEBC); Jackson Co.: Cameron Pass (CSUC), CO St. Forest (CSUC); Larimer Co.: Buckhorn Cny. (DEBC); Estes Park (CSUC), Estes Park, Timber Creek Camp. (CNCI), Fort Collins (CSUC), Glen Haven (CSUC), Manhattan (CSUC), Mt. Margaret trail near Parvin Lake (CSUC), Rd. to Pingree Pk. (CSUC), Red Feather Lakes (CSUC), Round Mt. trail Big Thompson Canyon (CSUC); Las Animas Co.: Sugarite Canyon at Dorothy Lake (CSUC); Montezuma Co.: Montezuma (CSUC), W shore McPhee Res. (CSUC); Montrose Co.: Government Springs (DEBC); Morgan Co.: Ft. Morgan (CSUC); Pueblo Co.: 2 mi. S San Isabel (CSUC), Beulah (CSUC); Weld Co.: Meadow Springs (CSUC). **Idaho:** Latah Co.: Moscow Mountain (DEBC). **Montana:** Hill Co.: Rocky Boy Indian Reserve (CNCI). **Oregon:** Curry Co.: Little redwood campground (CSUC); Lane Co.: Devil’s Elbow (DEBC); Wallowa Co.: Whitman NF (CNCI). **South Dakota:** Custer Co.: Custer (CNCI). **Utah:** Beaver Co. (DEBC); Daggett Co.: Elk Park, Ashley NF (DEBC); Ouray Co.: Long Hollow, Dixie NF (DEBC); Wasatch Co.: Wolf Creek Pass. (DEBC).

Hosts. *Picea engelmannii*, *Pinus attenuata*, *P. banksiana*, *P. contorta*, *P. flexilis*, *P. jeffreyi*, *P. ponderosa*, *P. radiata*.

Distribution (Fig. 23). NORTH AMERICA: USA. Alaska to New Mexico west of South Dakota.

Discussion. LeConte (1868) described *Hylastes porosus* from two specimens collected in California. He placed the species under Erichson’s first division of *Hylastes* based on tarsal and the mesoventrite characters as those of the second division (*Hylurgops sensu* LeConte 1876). LeConte (1876) placed *H. porosus* in the genus *Hylastes* even after he erected the genus *Hylurgops*.

After examining a specimen originally designated by LeConte from Colorado, Swaine (1917) moved *H. porosus* to the genus *Hylurgops* describing it as a different species, *Hylurgops lecontei*. He made his determination based on differences in the degree of impression of the elytral striae (a character not currently used) as well as by differences in the size of pronotal punctures of the specimens he studied. Examined material throughout the range

indicates that *H. porosus* can vary in size, degrees of elytral striae impression, and coloration, among other characters. However, these characters vary in series from the same area.

Swaine (1918) placed *Hylastes porosus* in the genus *Hylurgops* under the species with broad and bilobed third tarsal segments and anteriorly protuberant mesoventrite. Wood (1971c) synonymized *H. lecontei* with *H. porosus* after he examined the types of both species and considered them to be identical. Based on the characters followed in this review, *H. porosus* is considered to fit the generic concept of *Hylurgops*. To address the suggested hybridization between *H. porosus* and *H. knausi* made by Wood (1982) see *H. knausi* discussion section.

Concluding remarks

Placing *Pachysquamus* in a separate genus facilitates a cleaner presentation of the characters in both *Hylastes* and *Hylurgops*. Erecting a monotypic genus is not a simple act to decide, especially when the molecular characters of the whole tribe are not entirely understood. We consider that the characters in *Pachysquamus* are as distinct as those distinguishing *Scierus* from the other Hylastini genera and are stronger than those used to determine *Hylastes* from *Hylurgops*. These characters are useful on identifying *Pachysquamus* from the world fauna in the Hylastini. *Hylurgops* is a valid genus within the Hylastini and is defined by the characters of the third tarsal segments, which are distinctly wider than the second and the fifth that broadens apically (Fig. 1a); the presence of small- to medium-sized punctures between the large pronotal punctures on the disc (Fig. 4c); the pronotum nearly as long as wide; and the presence of a well-defined frontal impression without an inflated area below (Fig. 5a). The reinterpretation of several traditionally used characters and incorporation of new characters were needed for an effective and simpler way of differentiating the genera *Hylurgops* and *Hylastes*.

The original character of a bilobed versus emarginate third tarsal segment (Erichson 1836) is difficult to interpret. This character has been redefined, making reference to the fact that the third tarsal segments of *Hylurgops* species are 1.3–1.7× (Fig. 1a) wider than the second, while those of *Hylastes* species are 1–1.1× (Fig. 1b) wider than the second.

The second morphological character used to define the genus is also difficult to interpret. LeConte (1876) described the mesoventrite as being protuberant in *Hylurgops* (Fig. 2a) versus truncate in *Hylastes* species (Fig. 2b), based on Erichson's (1836) subdivisions. Later, Chapuis (1869, 1873) defined the character as anteriorly protuberant in *Hylurgops* species versus straight or emarginate in *Hylastes* species. The confusion of the term is evident in Swaine's (1918) key, where he describes it as protuberant in the front but illustrates it as ventrally sub-inflated (Fig. 24a). Bruck (1936) provided an illustration (Fig. 24b) that is faithful to the original description of this character in his revision of the tribe Hylesinini.

When LeConte (1876) erected the genus *Hylurgops* he based his designation on the species *H. pinifex*, *H. rugipennis*, and *H. subcostulatus* from which only *H. subcostulatus* has a clearly distinct anteriorly protuberant mesoventrite (Fig. 2a) but he carried the use of Erichson's term for describing the three species. In some *Hylastes* and in *Hylurgops* species this anterior expansion is reduced to just a slightly procurved margin (Fig. 2b), which makes separating both genera difficult. Therefore, the character is not useful to separate *Hylurgops* from *Hylastes* species and it was found not to be mutually exclusive of either genus. However, this character is useful to distinguish *P. subcostulatus* from both *Hylastes* and *Hylurgops* species across the world as in *Pachysquamus* this character is more evident.

The anterior margin of each elytron has been described as procurved (Fig. 11a) for *Hylurgops* species versus nearly straight for *Hylastes* species (Fig. 11b) (Eichhoff 1881). Although species of *Hylurgops* usually can be separated from those in *Hylastes* by this character, its variability, even among individuals of the same species, results of poor utility. The anterior curvature of the elytral margin of *H. incomptus*, *H. longipennis*, *H. porosus*, *H. knausi*, and *H. reticulatus* is not pronounced, even appearing straight in some specimens. The opposite can be observed in some specimens of *Hylastes macer* LeConte that show considerable curvature of this margin. Therefore, this character is not reliable for separating the two genera.

Eichhoff (1881) and later others (Swaine 1909, Reitter 1913, Pfeffer 1944, 1989, 1995) grouped species with wider than long pronotum under *Hylurgops* and species with the opposite proportion under *Hylastes*. Morphometrics of specimens from various geographical areas and descriptions of species in *Hylastes* have validated the use of this character for identifying the New World fauna with the modifications shown in the generic key provided in this review.

The intermixed small and large pronotal punctures are frequently used for separating *Hylurgops* from *Hylastes* species. Wood (1961) defined this character as the small punctures being equally abundant as the large in *Hylurgops* species versus the small punctures being absent or less abundant than the large in *Hylastes* species. Although some species of *Hylastes* can have smaller punctures among the larger-sized punctures, the smaller punctures neither are as small nor their presence as evenly distributed in that genus as in *Hylurgops* species. The presence of the small punctures evenly intermixed between the large (Fig. 4c) makes the density of pronotal punctures in *Hylurgops* greater than those in *Hylastes* (Fig. 4b).

In terms of separating the sexes, previous studies have found both sexes in *Hylurgops* to be morphologically similar (Krivolutskaya 1996, Yin *et al.* 1984), whereas most species of *Hylastes* are sexually dimorphic (Grocholski *et al.* 1976, Yin *et al.* 1984, Pfeffer 1995). The characters of the frons impression and its carina were suggested as distinguishing between the sexes of *H. pinifex* (Hopkins 1894), but these could not be used to distinguish the sexes of *Hylurgops* species in this study. Swaine (1917) indicated that the shorter hair-like setae on the declivity of some *H. knausi* specimens could represent the male of the species. We found the opposite in this revision, males of *H. knausi*, *H. pinifex*, and *H. rugipennis* have distinctly longer uniseriate, hair-like setae on the declivity than females.

Male and female sexual characters in *Hylastes* are indicated by a longitudinal impression on the male's fifth ventrite, which is usually vested with recumbent setae pointing apically. Two exceptions to this are the American species *H. tenuis* and *H. exilis*, for which the fifth ventrite is not longitudinally impressed. As opposed to *Hylastes*, the fifth ventrite on males of *Hylurgops* species is not grooved and does not have the distinctive vestiture as do most *Hylastes* species, except for slightly so in *H. porosus*. A valid way to determine the sex in *Hylurgops* species is by examining the shape and size of the fifth ventrites; females have a longer, more apically tapered fifth ventrite. This ventrite is distinctly longer than the third and fourth combined (Fig. 25a) in females, but it is equal or indistinctly longer than those in males (Fig. 25b).

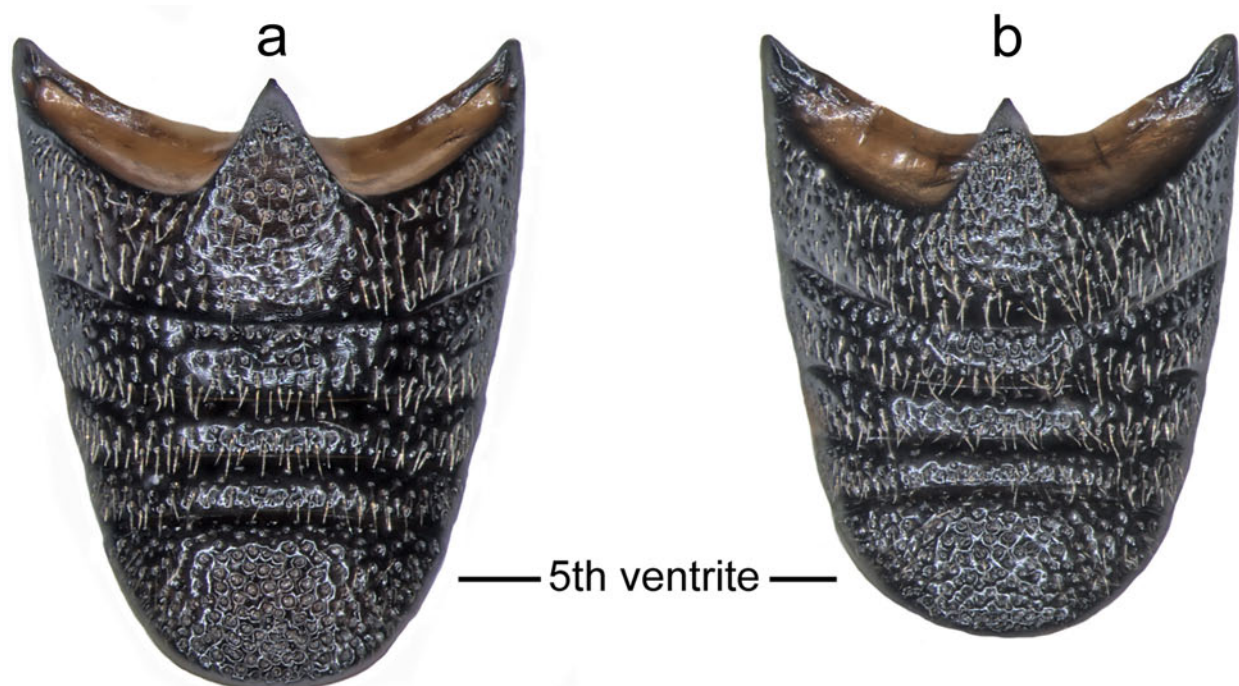


FIGURE 25. *Hylurgops* ventrites showing sexual dimorphism: a) female, fifth ventrite distinctly longer than the third and fourth combined, b) male, fifth ventrite not distinctly longer than length of the third and fourth combined (*H. longipennis*).

Few have studied the genitalia of members of the tribe Hylastini. Nüsslin (1912) described differences among *Hylastes* and *Hylurgops*; however, he only compared *Hylurgops palliatus* and *Hylastes ater*. Also, he based his observations on figures by Lindemann (1875) who drew extruded genitalia, which changes the aspect desired in genitalia descriptions. Grocholski *et al.* (1976) described the differences of the male genitalia of six *Hylastes* species from the Palearctic, emphasizing the slight differences of the median lobe and the tegmen. In their line drawings, five of the six *Hylastes* species they studied showed an elongated and pointed tegmenal manubrium.

Dissections of all American species revealed a greatly reduced to absent manubrium (Figs. 6a–b, d). A character not mentioned by Grocholski *et al.* (1976) was an extension of the aedeagus at the base of the aedeagal apodemes that forms a neck-like extension (Fig. 6c) in four of their treated *Hylastes* species. This character is not present in any New World *Hylurgops* species; however, some New World species of *Hylastes* examined during this study also lacked the elongated manubrium and/or the “neck.”

Comments on some Palearctic species of *Hylurgops*

Though the goal of this revision was not to treat the world fauna of the genus *Hylurgops*, the examination of all species within the genus was required to determine characters useful in the construction of generic keys. During our revision we studied the type specimens of all but one Palearctic species. Several of the observed specimens were in too poor condition to confirm their generic designations while two species were found to have characters of another genus in the Hylastini.

The type specimen of *H. sulactus* Eggers was in a poor state of preservation, missing both antennal clubs and part of both funicles. Since the descriptions of these structures are missing from Sokanovskii’s original description and the rest of the literature, its generic designation should be taken with great care until further material is secured and identified. The species, *H. bovoulouiri* (Chapuis) from Algeria, Africa and *H. inouyei* Nobuchi from Japan differed from all other *Hylurgops* species in having all dorsal surfaces very coarse and an elytral vestiture consisting of a single row of short and thick setae reminiscent of those in the Hylastini genus *Scierus* (Fig. 26), completely lacking the scale-like setae of the rest of the species. More importantly, as in that genus, the procoxae are widely separated (Fig. 27), which is the primary character used to designate the genus *Scierus*. Analysis of additional material should provide a clearer notion of the best taxonomic placement for these two species.

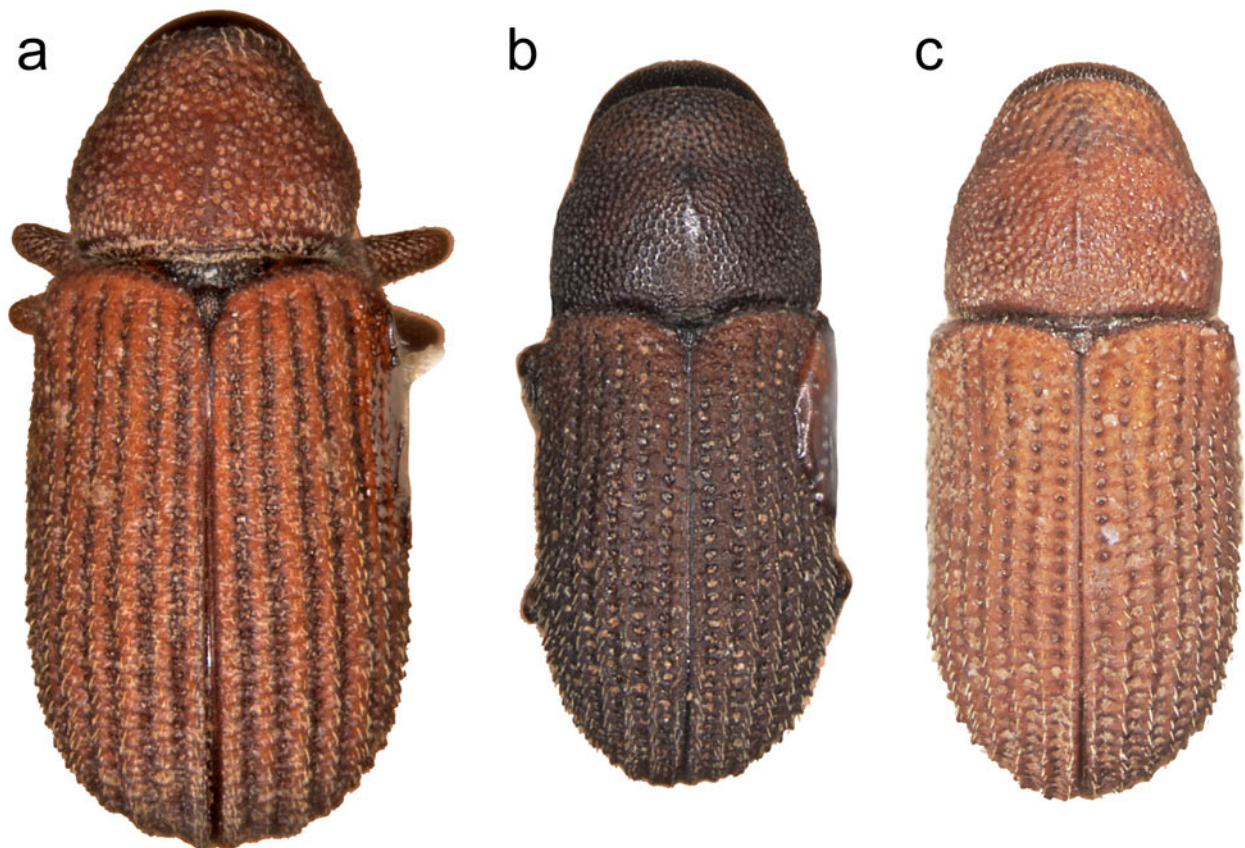


FIGURE 26. Dorsal habitus of *Scierus* and two Palearctic *Hylurgops* species: a) *S. annectens*, b) *H. bovoulouiri*, c) *H. inouyei*.

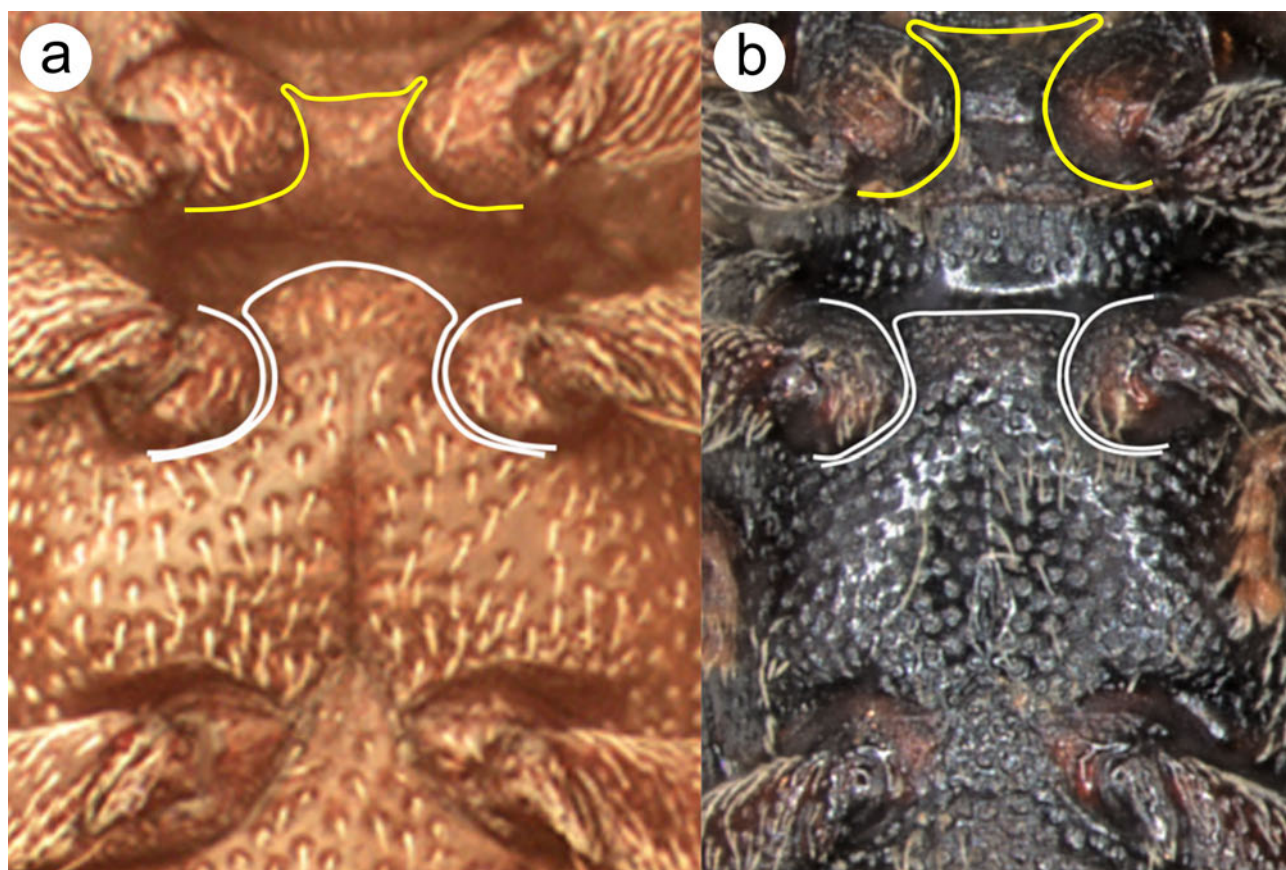


FIGURE 27. Procoxae separation (yellow lines, mesocoxae in white) by proventrite in *Scierus* and a Palearctic *Hylurgops* species: a) *S. annectens* (Photo by Dr. Richard J. Buss), b) *H. bonvouloiri*

Acknowledgements

The following institutions provided instrumental funding for this revision: The USDA/FS Rocky Mountain Research Station, Fort Collins, Colorado; APHIS/PPQ Center for Plant Health Science and Technology, Fort Collins, Colorado, special thanks to Dr. Terrence Walters; the National Science Foundation's Alliance for Graduate Education and the Professoriate.

The following museums and their collection managers provided specimens for this revision: Canadian National Collection of Insects, Arachnids and Nematodes (CNCI): Dr. Pat Bouchard; Colorado State University Insect Collection: Dr. Boris C. Kondratieff; Cornell University Insect Collection: E. Richard Hoebeke; Museum of Natural History, Vienna: Dr. Heiner Schönmann; United States National Museum (USNM): Dr. David Furth and Dr. Natalia J. Vandenberg; and Dr. Donald E. Bright, for the use of his personal collection.

The following reviewers contributed their valuable comments for this manuscript: Dr. Donald E. Bright, Dr. Boris C. Kondratieff, Dr. Thomas H. Atkinson, Dr. Bjarte H. Jordal, and Dr. Lawrence R. Kirkendall (editor).

References

- Alonso-Zarazaga, M.A. & Lyal, C.H.C. (2009) A catalogue of family and genus group names in Scolytinae and Platypodinae with nomenclatural remarks (Coleoptera: Curculionidae). *Zootaxa*, 2258, 1–134.
- Arnett, R.H., Samuelson, G.A. & Nishida, G.M. (1993) *The Insect and Spider Collections of the World*. Sandhill Crane Press, Gainesville, Florida, 310 pp.
- Atkinson, T.H. & Equihua-Martínez, A. (1985a) Lista comentada de los coleópteros Scolytidae y Platypodidae del Valle de México. *Folia Entomológica Mexicana*, 65, 63–108.
- Atkinson, T.H. & Equihua-Martínez, A. (1985b) Notes on biology and distribution of Mexican and Central American

- Scolytidae (Coleoptera). I. Hylesininae, Scolytinae except Cryphalini and Corthylini. *The Coleopterists Bulletin*, 39 (3), 227–238.
- Atkinson, T.H., Rabaglia, R.J., Peck, S.B. & Foltz, J.L. (1991) New records of Scolytidae and Platypodidae (Coleoptera) from the United States and the Bahamas. *The Coleopterists Bulletin*, 45 (2), 152–164.
- Barr, B.A. (1969) Sound production in Scolytidae (Coleoptera) with emphasis on the genus *Ips*. *The Canadian Entomologist*, 101, 636–672.
<http://dx.doi.org/10.4039/ent101636-6>
- Benz, G., Bovey, P. & Junod, P. (1986) On the specific attraction of the males of the six-toothed spruce bark beetle, *Pityogenes chalcographus* (L.) to a mixture of synthetic pheromones of the eight-toothed spruce bark beetle, *Ips typographus* (L.) (Coleoptera, Scolytidae). *Experientia*, 42 (3), 325–326.
<http://dx.doi.org/10.1007/bf01942523>
- Blackman, M.W. (1919) Notes on forest insects I: On two bark-beetles attacking the trunks of white pine trees. *Psyche*, 26 (4), 85–96.
<http://dx.doi.org/10.1155/1919/30961>
- Blandford, W.F.H. (1894) The Rhynchophorus Coleoptera of Japan, Part III Scolytidae. *Transactions of the Entomological Society of London*, 53–141.
- Blandford, W.F.H. (1896) Scolytidae. In: Godman, F.D. & Salvin, O. (Eds.), *Biologia Centrali-Americana. Insecta, Coleoptera*, 4 (6), pp. 81–144.
- Blandford, W.F.H. (1897) Scolytidae. In: Godman, F.D. & Salvin, O. (Eds.), *Biologia Centrali-Americana. Insecta, Coleoptera*, 4 (6), pp. 145–184.
- Blandford, W.F.H. (1898) The identity of *Xyleborus affinis*, with some synonymical notes. *Entomological News and Proceedings of the Entomological Section*, 9 (1), 3–6.
- Bright, D.E. (1967) Catalogue of the Swaine types of Scolytidae (Coleoptera) with designations of lectotypes. *The Canadian Entomologist*, 99 (7), 673–681.
- Bright, D.E. (1976) *The Insects and Arachnids of Canada, Part 2: The Bark Beetles of Canada and Alaska (Coleoptera: Scolytidae)*. Canada Department of Agriculture, Ottawa, Ontario, 241 pp.
- Bright, D.E. & Stark, R.W. (1973) *The Bark and Ambrosia Beetles of California: Coleoptera: Scolytidae and Platypodidae*. University of California Press, Berkeley, California, 169 pp.
- Bruck, C.R. (1936) A synoptic revision of the subfamily Hylesininae of western North America North of Mexico. *Bulletin of the southern California Academy of Sciences*, 35 (1), 38–51.
- Byers, J.A. (1992) Attraction of bark beetles, *Tomicus piniperda*, *Hylurgops palliatus*, and *Trypodendron domesticum* and other insects to short chain alcohols and monoterpenes. *Journal of Chemical Ecology*, 18, 2385–2402.
<http://dx.doi.org/10.1007/bf00984957>
- Chamberlin, W.J. (1939) *The Bark and Timber Beetles of North America North of Mexico*. Oregon State University, Corvallis, Oregon, 513 pp.
- Chapuis, F. (1869) *Synopsis des Scolytides (Prodrome d'un travail monographique)*. Société Royale des Sciences de Liège, Liège, Belgium, 61 pp.
- Chapuis, F. (1873) Synopsis des Scolytides. *Mémoires de la Société Royale des Sciences de Liège*, 2 (3), 213–269.
- Cibrián-Tovar, D., Méndez-Montiel, J.T., Campos-Bolaños, R., Yates, H.O. III & Flores-Lara, J. (1995) *Forest Insects of Mexico*. Universidad Autónoma Chapingo, Chapingo, Estado de Mexico, 453 pp.
- Crowson, R.A. (1967, reprint from 1955) *The Natural Classification of the Families of Coleoptera*. E.W. Classey Ltd., Middlesex, England, 214 pp.
- Davis, E.E., Albrecht, E.M. & Venette, R.C. (2008) *Hylurgops palliatus*. In: Venette, R.C. (Ed.), *Pine Commodity-Based Survey, Cooperative Agricultural Pest Survey*. USDA, Northern Research Station, St. Paul, pp. 43–54.
- Eichhoff, W. (1881) *Die Europäischen Borkenkäfer: Für forstleute, Baumzüchter und Entomologen*. Julius Springer Press, Berlin, Germany, 315 pp.
- Erichson, W.F. (1836) Systematische auseinandersetzung der familie der borkenkäfer (Botrischidae). *Archiv Für Naturgeschichte*, 2, 45–65.
- Fitch, A. (1858) Fourth report on the noxious, beneficial and other insects of the state of New York. *Transaction of the New York State Agriculture Society*, 17, 687–814.
- Fossestøl, K.O. & Sverdrup-Thygeson, A. (2009) Saproxylic beetles in high stumps and residual downed wood on clear-cuts and in forest edges. *Scandinavian Journal of Forest Research*, 24, 403–416.
<http://dx.doi.org/10.1080/02827580903143871>
- Furniss, R.L. & Carolin, V.M. (1977) *Western Forest Insects*. Miscellaneous Publication No. 1339, United States Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Washington, D.C., 654 pp.
- Gillanders, A.T. (1908) *Forest Entomology*. William Blackwood & Sons, Edinburgh, England, 422 pp.
- Graham, S.A. (1922) Effect of Physical Factors in the Ecology of Certain Insects in Logs. In: Ruggles, A.G. (Ed.), *Nineteenth Report of the State Entomologist of Minnesota*. Agricultural Experiment Station University Farm, St. Paul, pp. 22–40.
- Grocholski, J., Michalski, J. & Nowak, W. (1976) Notes on intraspecific variation and sexual dimorphism of some Palearctic species in the genus *Hylastes* Er. (Col., Scolytidae). *Acta Zoologica Cracoviensia*, 21, 553–584.
- Grünwald, M. (1986) Ecological segregation of bark beetles (Coleoptera, Scolytidae) of Spruce. *Journal of Applied Entomology*, 101, 176–187.

- Gyllenhal, L. (1813) *Insecta Svecica Descripta. Clasis I, Coleoptera sive, Scolytidae*. F. J. Leverentz, Scaris, 730 pp.
- Haack, R.A. (2001) Intercepted Scolytidae (Coleoptera) at U.S. ports of entry: 1985–2000. *Integrated Pest Management Reviews*, 6, 253–282.
- Haack, R.A. (2006) Exotic bark- and wood-boring Coleoptera in the United States: recent establishments and interceptions. *Canadian Journal of Forest Research*, 36, 269–288.
- Haack, R.A. & Petrice, T.R. (2009) Bark-and wood-borer colonization of logs and lumber after heat treatment to ISPM 15 specifications: the role of residual bark. *Journal of Economic Entomology*, 102 (3), 1075–1084.
- Hagedorn, M. (1910) Coleoptera Fam. Ipidae. In: Wytsman, P. (Ed.), *Genera Insectorum, Fasc. III*. Brussels, pp. 1–178 + XIV pls.
- Hamilton, J. (1889) Catalogue of the Coleoptera common to North America, northern Asia and Europe, with the distribution and bibliography. *Transactions of the American Entomological Society and Proceedings of the Entomological Section of the Academy of Natural Sciences*, 16 (2), 88–162.
- Hamilton, J. (1891) Comments on the fifth report of the U.S. Entomological Division. *Insect Life*, 4 (3–4), 129–132.
- Heyden, L. (1890) Europäisch-Nordamerikanische Coleopteren - Synonyma. *Wiener Entomologische Zeittung*, 9 (5), 131–132.
- Hoebeker, E.R. & Acciavatti, R.E. (2006) *Hylurgops palliatus* (Gyllenhal) (Coleoptera: Curculionidae: Scolytinae), an Eurasian bark beetle new to North America. *Proceedings of the Entomological Society of Washington*, 108 (2), 267–273.
- Hopkins, A.D. (1893a) Catalogue of the West Virginia Scolytidae and their enemies. *West Virginia Agricultural Experiment Station, Bulletin No. 31*, 3 (7), 121–168.
- Hopkins, A.D. (1893b) Catalogue of the West Virginia forest and shade tree insects. *West Virginia Agricultural Experiment Station, Bulletin No. 32*, 3 (8), 171–251.
- Hopkins, A.D. (1894) Sexual characters in Scolytidae. *The Canadian Entomologist*, 26, 274–280.
- Hopkins, A.D. (1902) Insect enemies of the pine in the Black Hills Forest Reserve. *United States Department of Agriculture Division of Entomology, New Series, Bulletin No. 32*, 1–24.
- Hopkins, A.D. 1904) Catalogue of exhibits of insect enemies of forests and forest products at the Louisiana purchase exposition, St. Louis, Missouri. *United States Department of Agriculture Division of Entomology, Bulletin No. 48*, 1–56 + XXII pls.
- Hopkins, A.D. (1905) Notes on some Mexican Scolytidae, with descriptions of some new species. *Proceedings of the Entomological Society of Washington*, 7 (2–3), 71–82.
- Jankowiak, R. (2006). Mycobiota associated with *Hylurgops palliatus* (Gyll.) on *Pinus sylvestris* L. in Poland. *Acta Societatis Botanicorum Poloniae*, 75 (4), 333–338.
<http://dx.doi.org/10.5586/asbp.2006.040>
- Keen, F.P. (1929) *Bark Beetles of the Superfamily Scolytoidea (Ipoidea): Infesting Forest Trees of Western North America, with Keys to the Genera Based on Adult Characters and Work*. United States Department of Agriculture, Bureau of Entomology, Stanford University Press, Palo Alto, California, 129 pp.
- Keen, F.P. (1938) *Insect Enemies of Western Forests*. Miscellaneous Publication No. 273, United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, Washington, D.C., 209 pp.
- Kelsey, R.G. & Joseph, G. (2003) Ethanol in ponderosa pine as an indicator of physiological injury from fire and its relationship to secondary beetles. *Canadian Journal Forest of Research*, 33, 870–884.
- Kirkendall, L.R. (1983) The evolution of mating systems in bark and ambrosia beetles (Coleoptera: Scolytidae and Platypodidae). *Zoological Journal of the Linnean Society*, 77, 293–352.
- Kleine, R. (1912) Die geographische verbreitung der Ipiden-Genera orbis terrarum. (Col.). *Berliner Entomologische Zeitschrift*, 57, 155–192.
- Krivolutskaya, G.O. (1996) *Scolytidae*. In: Lehr, P.A. (Ed.), *Key to the Insects of the Russian Far East. Vol. III. Part 3 Coleoptera*. Dal'nauka Press, Vladivostok, pp. 312–377. [in Russian]
- Kuschel, G. (1995) A phylogenetic classification of Curculionoidea to families and subfamilies. *Memoirs of the Entomological Society of Washington*, 14, 5–33.
- LeConte, J.L. (1868) Synopsis of the Scolytidae of America North of Mexico, Appendix. *Transactions of the American Entomological Society*, 2 (1), pp. 150–178.
- LeConte, J.L. (1876) Family IX, Scolytidae. In: LeConte, J.L. & Horn, G.H. (Eds.), *The Rhynchophora of America North of Mexico. Proceedings of the American Philosophical Society*, 15 (96), pp. 341–391.
- Lekander, B. (1968) The number of larval instars in some bark beetle species. *Entomologisk Tidskrift*, 89, 25–34.
- Lawrence, J.F., Beutel, R.G., Leschen, R.A.B. & Ślipiński, A. (2010) *Vol. 2. Morphology and Systematics (Elateroidea, Bostrichiformia, Cucujiformia Partim)*. Walter de Gruyter, Berlin, New York, 768 pp.
- Lindeman, K. (1875) Vergleichend-anatomische untersuchung über das männliche begattungsglied der borkenkäfer. *Bulletin de la Société Impériale des naturalistes de Moscou*, 49 (1), 197–252.
- Little, E.L. Jr. (1971) *Atlas of United States Trees, Volume 1, Conifers and important Hardwoods*. U.S. Government Printing Office, Washington, DC, 9 pp. + 200 maps.
- Livingstone, W.H. (1980) *Bark Beetle-Root Relationships, Workshop*. Proceedings Thirty First Annual Western Forest Insect Work Conference, El Paso, Texas, 29 pp.
- Livingstone, W.H., Mangini, A.C., Kinzer, H.G. & Mielke, M.E. (1983) Association of root diseases and bark beetles (Coleoptera: Scolytidae) with *Pinus ponderosa* in New Mexico. *Plant Disease*, 67, 674–676.

<http://dx.doi.org/10.1094/pd-67-674>

- Lyal, C.H.C. & King, T. (1996) Elytro-tergal stridulation in weevils (Insecta: Coleoptera: Curculionoidea). *Journal of Natural History*, 30, 703–773.
<http://dx.doi.org/10.1080/00222939600770391>
- Mannerheim, C.G. (1843) Beitrag zur kaefer-fauna der Aleutischen Inseln, der Insel Sitkha und Neu-Californiens. *Bulletin de la Société Impériale des Naturalistes de Moscou*, 16, 3–142.
<http://dx.doi.org/10.5962/bhl.title.37833>
- Mannerheim, C.G. (1852) Zweiter Nachtrag zur Kaefer-fauna der Nord-Amerikanischen Laender des Russischen Reiches. *Bulletin de la Société Impériale des Naturalistes de Moscou*, 25, 284–387.
- Mannerheim, C.G. (1853) Dritter nachtrag zur kaefer-fauna der Nord-Amerikanischen laender des Russien reiches. *Bulletin de la Société Impériale des Naturalistes de Moscou*, 26, 95–273.
- Munro, J.W. (1917) The genus *Hylastes* and its importance in forestry. *Proceedings of the Royal Physical Society of Edinburgh*, 20, 123–158.
- Murayama, J.J. (1963) *Studies in the Scolytid Fauna of the Northern Half of the Far East, V: Hylesininae*. Shukosha Press, Fukuoka, Japan, 72 pp.
- Nüsslin, O. (1912) Zur phylogenie und systematik der einheimischen Hylesinen. *Naturwissenschaftlichen Zeitschrift für Forst- und Landwirtschaft*, 32, 267–290.
- Oester, P.T., Ryker, L.C. & Rudinsky, J.A. (1978) Complex male premating stridulation of the bark beetle *Hylurgops rugipennis* (Mann.). *The Coleopterists Bulletin*, 32 (2), 93–98.
- Otrosina, W.J. & Ferrell, G.T. (1995) Root diseases: Primary Agents and Secondary Consequences of Disturbance. In: Eskew, L., (Compiler), *Forest Health through Silviculture, Workshop*, Mescalero, NM. General Technical Report RM-GTR-267, Fort Collins, pp. 87–92.
- Patterson, G.K. & Hatch, M.H. (1945) An annotated list of the Scolytoidea of Washington. *University of Washington Publications in Biology*, 10 (4), 145–154.
- Peirson, H.B. (1923) *Insects Attacking Forest and Shade Trees*. Bulletin of the Maine Forest Commissioner Maine Forest Service, Augusta, Maine, 56 pp.
- Peltonen, M. & Heliövaara, K. (1999) Attack density and breeding success of bark beetles (Coleoptera, Scolytidae) at different distances from forest-clearcut edges. *Agricultural and Forest Entomology*, 1 (4), 237–242.
<http://dx.doi.org/10.1046/j.1461-9563.1999.00033.x>
- Pfeffer, A. (1944) Příspěvek k poznání rodu *Hylastes* Erichs. a *Hylurgops* LeC. *Entomologické Listy*, 7 (4), 97–105.
- Pfeffer, A. (1989) *Kůrovcovití Scolytidae a Jádrolodovití Platypodidae*. Československá Akademie Věd, Nakladatelství ČSAV, Praha, 137 pp.
- Pfeffer, A. (1995) *Zentral-und Westpaläarktische Borken-und Kernkäfer*. Basel: Pro Entomologia, c/o Naturhistorisches Museum Basel, Basel, Switzerland, 310 pp.
- Reid, R.W. (1955) The bark beetle complex associated with lodgepole pine slash in Alberta. Part I. Notes on the biologies of some Scolytidae attacking lodgepole pine slash. *The Canadian Entomologist*, 87 (7), 311–323.
<http://dx.doi.org/10.4039/ent87311-7>
- Reitter, E. (1913) Bestimmungstabelle der borkenkäfer (Scolytidae) aus Europa und den angrenzenden ländern. *Wiener Entomologische Zeitung*, 32, 1–116.
- Riley, C.V. (1891) Corrections to Packard's report on forest tree insects. *Insect Life*, 4 (3–4), 92–94.
- Schedl, K.E. (1940) Fauna Mexicana, 1. Insecta Coleoptera, superfamilia Scolytoidea: Scolytidae, Coptonotidae y Platypodidae Mexicanos. *Anales de la Escuela Nacional de Ciencias Biológicas*, 1 (3–4), 317–377.
- Schedl, K.E. (1947) Die borkenkäfer des balstischen Bernsteins. *Zentralblatt für das Gesamtgebiet der Entomologie*, 2 (1), 12–45.
- Schedl, K.E. (1955) Die kiefern-borkenkäfer Guatemalas. 145. Beitrag zur Morphologic und Systematik der Scolytoidea. *Zeitschrift für Angewandte Entomologie*, 38, 1–48.
- Schedl K.E. (1977) Scolytoidea aus El Salvador. 327. Beitrag zur Morphologie und Systematik der Scolytoidea. *Zeitschrift der Scolytoidea. Arbeitsgemeinschaft Österreichischer Entomologen*, 29(1–2), 41–48.
- Schwarz, E.A. (1886) Remarks on North American scolytids. *Entomologica Americana*, 2 (3), 54–56.
- Schweigkofler, W., Otrosina, W.J., Smith, S.L., Cluck, D.R., Maeda, K., Peay, K.G. & Garbelotto, M. (2005) Detection and quantification of *Leptographium wageneri*, the cause of black-stain root disease, from bark beetles (Coleoptera: Scolytidae) in Northern California using regular and real-time PCR. *Canadian Journal of Forest Research*, 35, 1798–1808.
- Schwerdtfeger, F. (1957) Scolytidae (Col.) an *Pinus*-Arten in Mittelamerika III. Die Gattungen *Hylastes* Erichson und *Hylurgops* Leconte: (6. Beitrag zur Forstentomologie Mittelamerikas). *Deutsche Gesellschaft für Angewandte Entomologie*, 41 (2–3), 363–367.
<http://dx.doi.org/10.1111/j.1439-0418.1957.tb01300.x>
- Snow, F.H. (1881) List of Coleoptera collected in Santa Fe Canon, New Mexico. *Transactions of the Kansas Academy of Science* (1872–1880), 7, 67–71.
- Swaine, J.M. (1909) Catalog of the Described Scolytidae of North America North of Mexico, Appendix B, In: Felt (Ed.), 24th Report of the State Entomologist, 1909. New York Education Department Bulletin. New York State University, Albany,

New York, pp. 76–159 + XIV pls.

- Swaine, J.M. (1917) Canadian bark beetles, Part 1. Description of new species. *Canada Department of Agriculture, Entomological Branch, Bulletin*, 14 (1), 1–32.
- Swaine, J.M. (1918) Canadian bark beetles, Part 2. A preliminary classification, with an account of the habits and means of control. *Canada Department of Agriculture, Entomological Branch, Bulletin*, 14 (2), 1–143 pp + XXXI pls.
- Thomas, J.B. (1957) The use of larval anatomy in the study of bark beetles (Coleoptera: Scolytidae). *The Canadian Entomologist*, 89 (Suppl. 5) 3–45 pp.
- Thomas, J.B. (1967) A comparative study of gastric caeca in adult and larval stages of bark beetles. *Proceedings of the Entomological Society of Ontario*, 97, 71–90.
- Thomson, C.G. (1865) *Skandinaviens Coleoptera, Synoptiskt Bearbetade, Tom. VII*. Tryckt uti Lundbergska boktryckeriet, Lund, Sweden, 394 pp.
- Tsai, P. & Huang, F. (1964) Notes on Chinese bark beetles of the genus *Hylurgops* LeConte. *Acta Zootaxonomica Sinica*, 1 (2), 235–246.
- Volz, H.-A. (1988) Monoterpenes governing host selection in the bark beetles *Hylurgops palliatus* and *Tomicus piniperda*. *Entomologia Experimentalis et Applicata*, 47, 31–35.
<http://dx.doi.org/10.1111/j.1570-7458.1988.tb02278.x>
- Wickham, H.F. (1913) Fossil Coleoptera from the Wilson Ranch near Florissant, Colorado. *State University of Iowa, Laboratories of Natural History, Bulletin* 6 (4), 29 pp.+ VII pls.
- Wood, S.L. (1957) Distributional Notes on and Synonymies of Some North American Scolytidae (Coleoptera). *The Canadian Entomologist*, 89 (9), 396–403.
<http://dx.doi.org/10.4039/ent89396-9>
- Wood, S.L. (1961) A key to the North American genera of Scolytidae. *The Coleopterists Bulletin*, 15(2), 41–48.
- Wood, S.L. (1969) New synonymy and records of Platypodidae and Scolytidae (Coleoptera). *The Great Basin Naturalist*, 29 (3), 113–128.
- Wood, S.L. (1971a) Family Scolytidae (Ipidae). In: Hatch (Ed.), *The Beetles of the Pacific Northwest: Part V: Rhipiceroidea, Sternoxi, Phytophaga, Rhynchophora, and Lamellicornia*. University of Washington Press, Seattle, pp. 395–428.
- Wood, S.L. (1971b) New species of bark beetles (Coleoptera: Scolytidae) from western North America. *The Great Basin Naturalist*, 31 (2), 69–76.
- Wood, S.L. (1971c) New synonymy in American bark beetles (Scolytidae: Coleoptera). *The Great Basin Naturalist*, 31 (3), 140–152.
- Wood, S.L. (1978) A reclassification of the subfamilies and tribes of Scolytidae (Coleoptera). *Annales de la Société Entomologique de France, nouvelle série*, 14, 95–122.
- Wood, S.L. (1982) The bark and ambrosia beetles of North and Central America (Coleoptera: Scolytidae), a taxonomic monograph. *Great Basin Naturalist Memoirs*, 6, 1–1359.
- Wood, S.L. (1986) A reclassification of the genera of Scolytidae (Coleoptera). *Great Basin Naturalist Memoirs*, 10, 1–126.
- Wood, S.L. & Bright, D.E. (1992) A catalog of Scolytidae and Platypodidae (Coleoptera), part 2: taxonomic index. *Great Basin Naturalist Memoirs*, 13, 1–1553.
- Yin, H.-F, Huang, F.-S. & Li, C.-L. (1984) *Economic Insect Fauna of China. Fasc. 29, Coleoptera: Scolytidae*. Science Press, Beijing, 205 pp + XIX pls.