Review of American Xyleborina (Coleoptera: Curculionidae: Scolytinae) Occurring North of Mexico, with an Illustrated Key

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ABSTRACT Ambrosia-feeding scolytids in the Xyleborina are the most abundant exotic bark beetles in North America. Many new species discoveries and taxonomic changes have occurred since their last review in 1982. The need for a worldwide revision of this tribe hampers the ability to identify species. To remedy this situation, an illustrated key is constructed and *Xyleborus glabratus* Eichhoff, *Xyleborus similis* Ferrari, and *Euwallacea fornicatus* (Eichhoff), which are new to North America, are reported and diagnosed. In addition the key is presented in electronic format with additional illustration (http://scolytid.msu.edu) to increase worldwide availability and accommodate future taxonomic revision.

KEY WORDS exotic species, invasive pests, Scolytidae, ambrosia beetles, Xyleborini

Bark and ambrosia beetles are capable of causing significant economic destruction to forests (Wood 1982). This problem stems mostly from native species; however, the introduction of exotic species also threatens the forest economy and ecology. In the United States and Canada, exotic species are often intercepted at ports-of-entry (Haack 2003); however, some escape this vigilance and establish resident populations (Wood 1977, Atkinson et al. 1990; Mudge et al. 2001). Sometimes, identification of introduced species can be difficult given poor taxonomic knowledge. Thus, the ability to detect and control both native and exotic species relies on a solid understanding of the systematics and identity of species.

Ambrosia beetles are often undetected in port inspections compared with bark-feeding scolytids (Haack 2003), and they often successfully establish populations in new environments (Atkinson et al. 1990). Among the ambrosia-feeding scolytids, Xyleborina are the most numerous and widely distributed tribe. Their cryptic nature; polygamous, sib-mating system; and wide host range foster their distribution through commerce and establishment in new areas.

Since the last major reviews of North America Xyleborina (Bright 1968, Wood 1982), many non-native species have been discovered, several new species have been described, numerous nomenclatural changes have been made, and generic limits have been revised (Wood 1986; Wood and Bright 1992; Bright and Skidmore 1997, 2002; Rabaglia 2002). Atkinson et al. (1990) and Vandenberg et al. (2000) discuss exotic *Xyleborus* species discovered in the eastern United States, but there has not been a recent review of all 39 species of Xyleborina in America north of Mexico. Since review of the group by Wood (1982), nine new exotic xyleborine species (three reported herein) have been discovered in North America (Atkinson et al. 1990, Hoebeke 1991, Vandenberg et al. 2000, Mudge et al. 2001, Schiefer and Bright 2004). It is likely that in the future other species of xyleborines will become established in North America. It is also possible that some species are present in this region but have not yet been detected. Several species of *Euwallacea*, *Xylosandrus*, *Xyleborinus*, and *Xyleborus* have been widely distributed though commerce, but they are not yet recorded from North America.

The absence of an inclusive illustrated identification key for species hampers the identification of potential new introductions from foreign lands. The purpose of this article is to review the current diversity of Xyleborina in America north of Mexico, diagnose three new exotic species, and provide illustrated keys to the genera and species in the region. Also, the key is presented in electronic format with additional illustrations at http://scolytid.msu.edu to accommodate potential taxonomic revisions and future discoveries of Xyleborina species in North America.

Materials and Methods

As Bright (1968) and Wood (1982) indicated, this tribe is in need of a worldwide revision. With few exceptions, we follow the generic and species concepts of Wood (1986) and Wood and Bright (1992). No attempt is made to revise generic limits or species synonymies. Synonyms listed for each genus and spe-

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cies are as reported by Wood and Bright (1992) and Bright and Skidmore (1997, 2002). References to original descriptions and synonymies are cited as they are in Wood and Bright (1987, 1992) and Wood (1987). Abbreviations for location of type material are as follows: BMNH, British Museum of Natural History, London; CAS, California Academy of Sciences, San Francisco; CNCI, Canadian National Collection of Insects, Ottawa; IRSNB, Institut Royal des Sciences Naturelles de Belgique, Brussels; IZM, Institute of Zoology at Moscow, Moscow; MCZ, Museum of Comparative Zoology, Cambridge, MA; NHMW, Naturhistorisches Museum Wien, Wien; USNM, United States National Museum, Washington, DC; UZMC, Universitets Zoologisk Museum, Copenhagen; and Wood, S. L. Wood Collection, Provo, UT.

Specimens examined for this study were collected by R.J.R. during various state, regional, and national surveys, or they were sent to R.J.R. by state and federal forestry and agriculture workers (Rabaglia 2003). These specimens were compared with identified specimens at USNM, CNCI, MCZ, Cornell University, Texas A&M University, and the S. L Wood Collection. Specimens for new North American and state records are deposited at the USNM. Other specimens are deposited in the R.J.R. private collection (Annapolis, MD) or the Texas A&M University Collection (College Station, TX).

Distribution records are as reported in Wood and Bright (1992), Bright and Skidmore (1997, 2002), and recent publications. Many of the records for locations in the southeastern United States are from R.J.R. (unpublished data).

Characters used in keys presented are for species occurring in North America and may not reflect characters in non-North American species.

Scanning electron micrographs (SEMs) were produced using a JOEL 6400 instrument (Joel, Tokyo, Japan) at 15 kV. Specimens were sputter-coated with gold-palladium. SEMs were captured on Polaroid film and then digitized at 600 dpi. The resultant images were cleaned, and, in some cases, the background was converted to black in Photoshop (Adobe Systems, Mountain View, CA). Specimens used were deposited in the Texas A&M University Entomology Collection.

Further iterations of the electronic version of the key and the original key will be posted at the same Web site. Changes to the latest version will be summarized. Each iteration will be archived on compact discs and retained by each author. It is possible that the location of the electronic key will change. In that event, old and new Web sites will be linked, so as to redirect users to the key.

Species New to North America

Xyleborus glabratus Eichhoff
(Figs. 13, 23, 37)

Diagnosis. This species is easily distinguished from other North American *Xyleborus* by the slender shape; the noticeably convex declivity; the deep, numerous punctures on the declivity; and the nearly subquadrate, costate, posterolateral margin of the declivity.

Description. *Female.* Length 2.1–2.4 mm, 3.0 times as long as wide; color dark brown to black.

Frons convex, surface reticulate, sparsely punctured; vestiture inconspicuous except along epistoma.

Pronotum longer than wide, sides nearly straight, broadly rounded in front; anterior margin unarmed, anterior slope not steep, finely asperate, summit rounded, in front of middle; posterior area smooth, shining, minutely punctured on disc, somewhat reticulate on sides; vestiture very sparse, limited to asperate area.

Elytra 1.7 times as long as wide, 1.9 times as long as pronotum; sides almost straight, posterior margin subangulately rounded, striae not impressed, punctures very shallow, small; interstriae smooth and shining, wider than striae, punctures small, numerous. Declivity steep, noticeably convex, shining, posterolateral margin subacutely pointed, with carina from apex to interstriae 7; strial punctures much deeper, larger than on disc; interstriae one widest near middle, with small tubercles near middle, interstrial punctures looking similar in size and number to those on striae; small granules on other interstriae. Vestiture very sparse, short, length less than width of interstriae.

Male. Very similar to female but smaller, 1.8 mm in length, 2.5 times as long as wide. Frons similar to female. Pronotum 2.0 times as long as wide, reddish, asperities obsolete, anterior third concavely excavated, lateral margins of concavity broadly rounded, anterior margin with two, short, flattened median spines. Elytra just slightly longer than pronotum, color dark brown, essentially same as female.

Distribution. This species is native to Asia and has been recorded from India, Bangladesh, Japan, Myanmar, and Taiwan.

Hosts. *Lindera latifolia* Hook. f., *Litsaea elongata* (Nees) Benth. et Hook. f., and *Shorea robusta* C. F. Gaertn, are reported in Wood and Bright (1992). Maiti and Saha (2004) reference *Phoebe lanceolata* (Wall. ex Nees) Nees, as a host in India, and in Japan Murayama (1936) lists *Lithocarpus edulis* (Makino) Nakai, and Nobuchi and Ono (1973) list *Leucaena glauca* (L.) Benth. *Persea borbonia* (L.) Spreng were found infested in South Carolina, Georgia, and Florida.

Specimens Examined. Georgia: Chatham County, Port Wentworth, 22-IV-2002, W. L. Wells coll., ex: ethanol-baited funnel trap; Georgia: Chatham County, Port Wentworth, 7-VIII-2002, W. L. Wells coll., ex: ethanol-baited funnel trap. Georgia: Chatham County, Port Wentworth, 7-VIII-2002, W. L.Wells coll., ex: Ipslure-baited funnel trap.

South Carolina: Beaufort County, Hilton Head, 30-XI-2004 (laboratory emerged), S. Fraedrich coll., ex: *Persea borbonia.*

Xyleborus similis Ferrari
(Fig. 25)

Diagnosis. This rather small, slender species is readily distinguished from members of the genus in North America by the sloping, dull declivity with a pair of small tubercles near the middle of declivital inter-

striae 1, which widens as striae one diverges around the median tubercle.

Description. *Female.* Length 2.3–2.5 mm, 2.7 times as long as wide; color reddish brown.

Frons convex, surface reticulate, sparsely punctured; vestiture inconspicuous except along epistoma.

Pronotum slightly longer than wide, sides nearly straight, broadly rounded in front; anterior margin unarmed, anterior slope finely asperate, summit at middle; posterior area smooth, shining, minutely punctured on disc, somewhat reticulate on sides; vestiture sparse, limited to asperate area.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight, broadly rounded at posterior, striae not impressed, punctures relatively large, almost touching along row; interstriae smooth and shining, slightly wider than striae, punctures, small, regularly spaced. Declivity slightly sloping, flattened, dull, posterolateral margin rounded, weakly carinate from interstriae 3 to 7; interstriae 1 widest at middle, with a pair of small, but conspicuous tubercles near middle, an additional tubercle near base and one near apex; interstriae 2–5 with one to three smaller tubercles near upper half of declivity; striae one diverging around tubercles at middle of declivity, striae two and three also slightly divergent. Vestiture consisting of rows of fine, sparse interstrial setae.

Male. Not seen.

Distribution. This species is found in Africa, Southeast Asia, and a few Pacific Islands. It has been recorded from Cameroon, Kenya, Madagascar, Mauritania, Mauritius Island, Seychelles Islands, Tanzania, China, India, Japan, Jordan, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Taiwan, Thailand, Vietnam, Australia, Christmas Island, Fiji, Indonesia, Micronesia, New Caledonia, Papua New Guinea, Philippine Islands, Samoan Islands, Solomon Islands, and Tahiti. Wood and Bright (1992) record it from Hawaii, but Samuelson (1981) contends that previous accounts from Hawaii were the result of misidentifications and confusions with synonyms.

Hosts. *Alphitonia, Elaeocarpus,* and *Hevea brasiliensis* (Willd. ex A. Juss.) Müll. Arg. (Wood and Bright 1992). *Pinus caribaea hondurensis* (Seneclauze) W.H.G. Barrett & Golfari (plantation pines in Fiji (Beaver 1989). Browne (1961a) listed 19 hosts in 14 families in Malaysia, most notably, *Shorea, Hevea, Albizzia, Styrax,* and *Ficus. Cocos* is a host in Sri Lanka, and Ohno (1991) and Schedl (1962) list many additional hosts.

Specimens Examined. Texas, Harris County, Houston, 8-IV-2002, J. Pitts coll., ex: ethanol-baited funnel trap; Texas, Harris County, Houston, 23-V-2002, J. Pitts coll., ex: Chalcoprax-baited funnel trap; Texas, Harris County, Houston, 2-X-2002, J. Pase coll., ex: Chalcoprax-baited funnel trap.

Redescription of Species New to Eastern North America

Euwallacea fornicatus (Eichhoff)

Diagnosis. This species and *Euwallacea validus* (Eichhoff) are distinguished from other Xyleborina by the presence of one suture on the posterior face of the antennal club, the nearly quadrate pronotum, and the smooth posterior of the pronotum. It is distinguished from *E. validus* by the smaller size and the more arcuate elytra.

Description. Modified from Wood (1982). *Female.* Length 1.9–2.5 mm, 2.3 times as long as wide; color dark brown to almost black.

Frons convex, with a slight transverse impression above the epistoma; surface shining and sparsely punctured, reticulate and punctuate above level of eyes; vestiture sparse except along epistoma.

Pronotum about equal in length and width, sides weakly arcuate on basal half, broadly rounded in front; anterior margin armed by eight serrations, anterior area finely asperate; summit near middle, posterior half finely reticulate and minutely, sparsely punctured. Vestiture sparse, limited to sides and asperate area.

Elytra1 1.3 times as long as wide, 1.4 times as long as pronotum; sides nearly straight, broadly rounded at posterior; striae not impressed, punctures fine but distinct; interstriae about 3 times as wide as striae, smooth and shining, punctures fine, uniseriate. Declivity broadly, evenly arched, beginning just beyond middle of elytra; posterolateral margin narrowly carinate from apex to interstriae 7; striae slightly impressed, sculpture about as on disc except interstrial granules slightly larger. Vestiture of rows of moderately long interstrial setae.

Male. Length 1.5–1.6 mm. Frons similar to female, except shining area narrower. Pronotum less declivious, serration on margin and asperities on anterior slope reduced in size and number. Elytral declivity occupying two-thirds of elytral length, somewhat bisulcate, interstriae two impressed along length of declivity.

Distribution. This species is native to Asia and has been found in Bangladesh, China, India, Indonesia, Malaysia, Myanmar, Sri Lanka, Taiwan, Thailand, Vietnam, New Guinea, Philippine Islands, Fiji, HI,

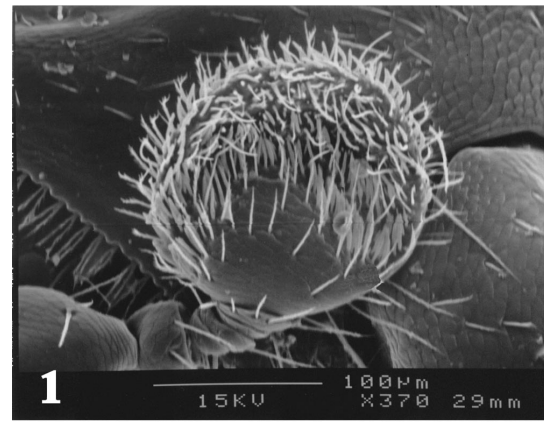

Fig. 1. *Premnobius cavipennis* Eichhoff, anterior face antennal club.

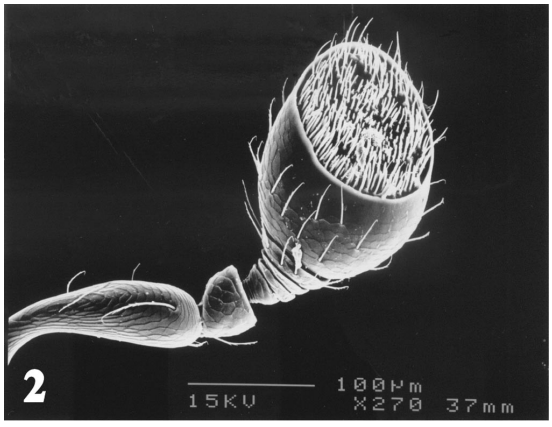

Fig. 2. *Xyleborus sayi* (Hopkins), anterior face antennal club.

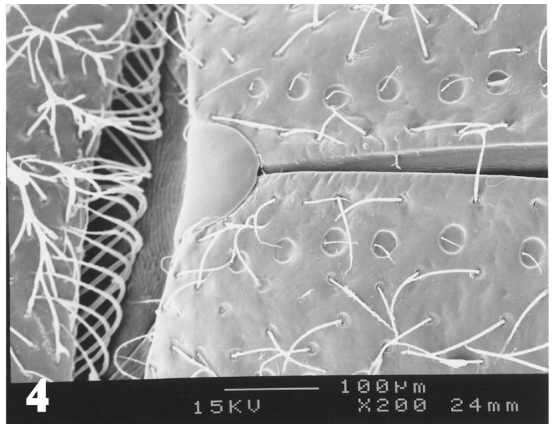

Fig. 4. *Xyleborus sayi* (Hopkins), scutellum.

Samoa, Reunion Island, Micronesia, and Australia and was introduced into Panama. R. L. Penrose et al. (unpublished data) recently reported this species from California as the first record in North America.

Hosts. Approximately 40 species are listed in Wood and Bright (1992), including *Albizzia* spp, *Camellia sinensis* (L.) Kuntze, *Hevea brasiliensis*, *Populus* sp., *Robinia pseudoacacia* L., *Shorea robusta*, and *Theobroma cacao* L. Bright and Skidmore (1997) also list avocado, citrus, and pomegranate. In India, it is a pest of cultivated tea (*Camellia sinensis*). It is known to attack nearly 100 species in 36 families in the Asian tropics (Browne 1961a).

Specimens Examined. Florida, Broward County, Ft. Lauderdale, University of Florida Research and Education Center, 6-V-2004, ex: *Delonix regia* (Bojer ex Hook.) Raf.

California, Los Angeles County, Whittier Narrows, 6-XII-2003 (laboratory emerged), ex: black locust, Dick Penrose (deposited at Oregon Department of Agriculture Collection, Salem, OR).

Key to Genera of Female American Xyleborina North of Mexico

1. Antennal club strongly flattened, basal corneous area small, its margin procurved (Fig. 1); pregula expanded and flush with ventral surface of head . . . . . *Premnobius*
   – Antennal club obliquely truncate, not strongly flattened, basal corneous portion larger, margin recurved (Fig. 2); pregula impressed . . 2
2 (1). Scutellum conical, base of elytra at suture notched, with abundant setae (Fig. 3) . . . . . *Xyleborinus*
   – Scutellum moderately large, its surface flush with adjacent elytra, glabrous (Fig. 4) . . . 3
3 (2). Procoxae moderately to widely separated, intercoxal piece continuous, not longitudinally emarginate (Fig. 5) . . . . . *Xylosandrus*
   – Procoxae contiguous, intercoxal piece longitudinally emarginate (Fig. 6) 4
4 (3). Posterior face of antennal club marked by two sutures on apical third, anterior face with

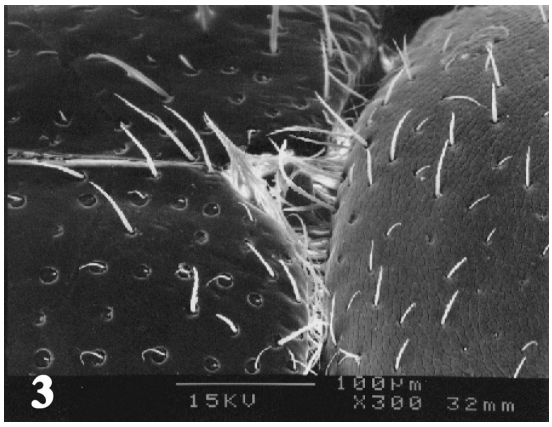

Fig. 3. *Xyleborinus saxesenii* (Ratzeburg), conical scutellum.

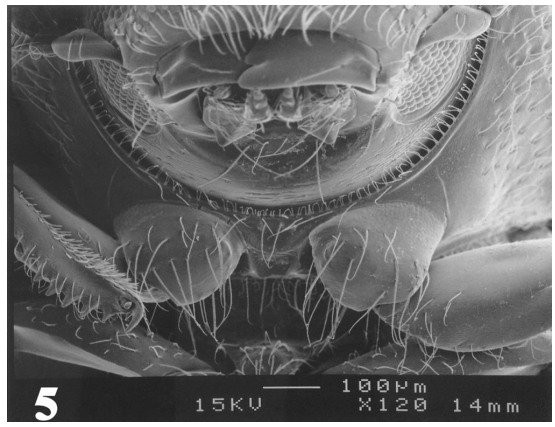

Fig. 5. *Xylosandrus germanus* (Blandford), widely separated procoxae.

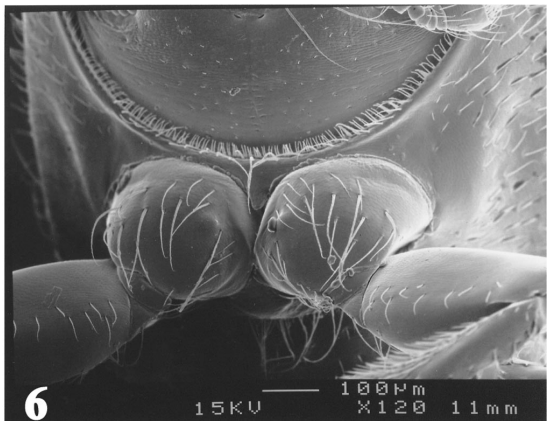

Fig. 6. *Xyleborus sayi* (Hopkins), contiguous procoxae.

Fig. 8. *Xyleborus sayi* (Hopkins), posterior face antennal club.

segment two comparatively large, sclerotized, slightly recurved (Fig. 7) . . . . . *Theoborus*

– Posterior face of antennal club with no >1 suture visible at or near apex, anterior face with segment 2, if visible, not sclerotized, strongly recurved (Fig. 8) 5

5 (4). Antennal club distinctly obliquely truncate, with segment 1 corneous, its distal margin forming a complete circle extending from anterior face to apex, suture on apical area of posterior face not visible, segment 2 on anterior face not visible (Fig. 2) . . . . . *Xyleborus* (in part)

– Antennal club with segment 1 on both faces rounded, extending to subapical area of posterior face, segment 2 on anterior face conspicuous (Fig. 9) 6

6 (5). Pronotal asperities extending from anterior to base, asperities on disc and posterior half almost as coarse as those on anterior half (Fig. 10) . . . . . *Ambrosiodmus*

– Pronotal asperities confined to anterior half, posterior half of pronotum often punctate (Fig. 11) 7

7 (6). Pronotum nearly quadrate, anterior margin straight; posterolateral margin of declivity subacutely elevated from sutural apex to interstriae 7; strial and interstrial punctures in rows, elytral vestiture sparse, confined to strial and interstrial rows (Fig. 12) . . . . *Euwallacea*

– Pronotum not quadrate, its anterior margin procurved; posterolateral margin of declivity rounded; elytral punctures confused, vestiture abundant and confused (Fig. 13). . . . . *Xyleborus* (in part)

Ambrosiodmus Hopkins 1915b

Type species; *Xyleborus tachygraphus* Zimmermann. *Phloeotrogus* Motschulsky 1863. Synonymy Wood 1966. *Brownia* Nunberg 1963b. Synonymy Wood 1980c.

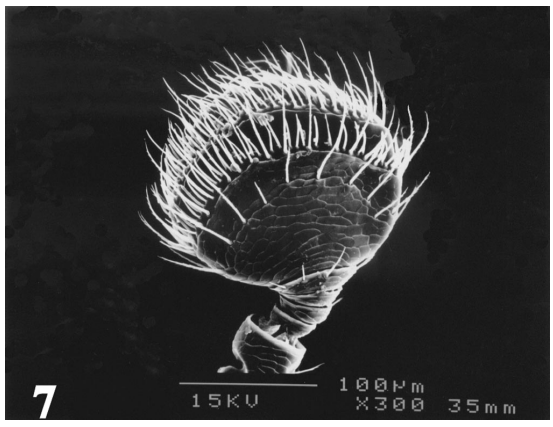

Fig. 7. *Theoborus ricini* (Eggers), posterior face antennal club.

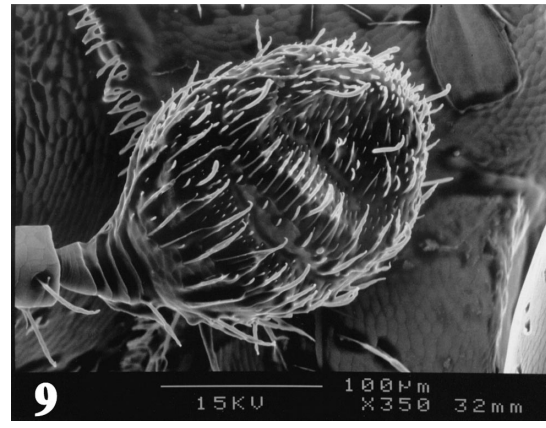

Fig. 9. *Ambrosiodmus obliquus* (LeConte), anterior face antennal club.

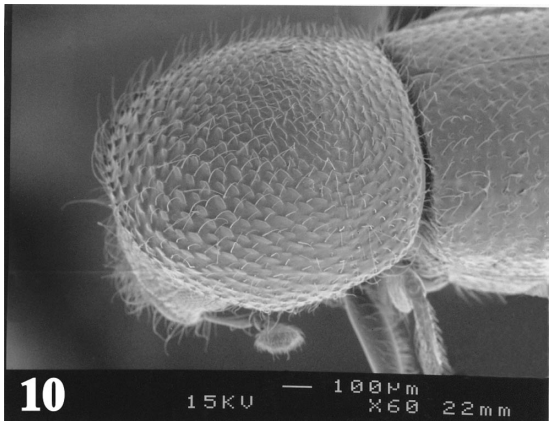

Fig. 10. *Ambrosiodmus rubricollis* (Eichhoff), pronotum.

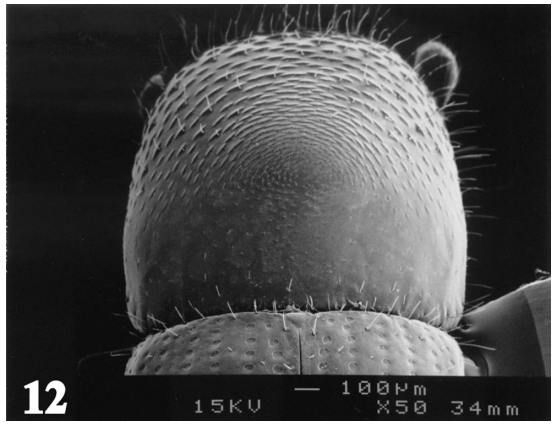

Fig. 12. *Euwallacea validus* (Eichhoff), dorsal view pronotum.

There are seven species of *Ambrosiodmus* in North America, save Mexico, two of which are not native to North America. Wood (1982) included the species in this genus as part of *Xyleborus,* and in the 1986 key (Wood 1986) recognized the genus as distinct from *Xyleborus.* Members of *Ambrosiodmus* are distinguished from other members of the tribe by the asperities covering the entire surface of the pronotum. There are 92 species currently recognized worldwide, with most species occurring in tropical Asia, Africa, and South America.

Key to Females of the Species of *Ambrosiodmus*, North of Mexico

1. Declivital interstriae 2 either unarmed or granules smaller than on 1 or 3 (Fig. 14) 2
– Declivital interstriae 2 with tubercles as large or larger than those on 1 or 3 (Fig. 15) . . . 3

2 (1). Declivital interstriae 1 feebly elevated, usually as high as 3, 2 feebly sulcate, its granules as large as those on 1; discal interstriae ≈3–4 times as wide as striae; color reddish brown to black; slightly larger, 2.0–2.4 mm . . . . . 1. *obliquus* (LeConte)
– Declivital interstriae one not elevated, declivital granules absent; elytral punctures larger, deeper; discal interstriae twice as wide as striae; color very dark brown; smaller, 1.8–2.1 mm. . . . . 2. *devexulus* (Wood)

3 (1). Interstrial punctures on elytral disc weakly confused to uniseriate, finely granulate 4
– Interstrial punctures on elytral disc irregularly biseriate, smooth to weakly granulate; 3.6–4.0 mm . . . . . 3. *lewisi* (Blandford)

4 (3). Declivital interstria all equally granulate, granules somewhat irregular in size, but those on two not distinctly larger than other interstria (Fig. 16) . . . . . 4. *rubricollis* (Eichhoff)
– Declivital interstriae one unarmed or bearing very small granules, two strongly granulate or tuberculate (Fig. 15) 5

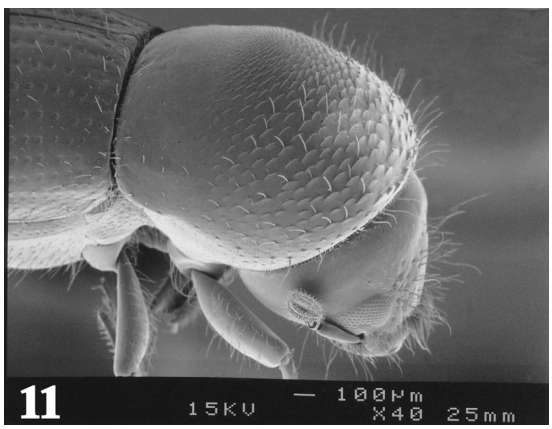

Fig. 11. *Euwallacea validus* (Eichhoff), pronotum.

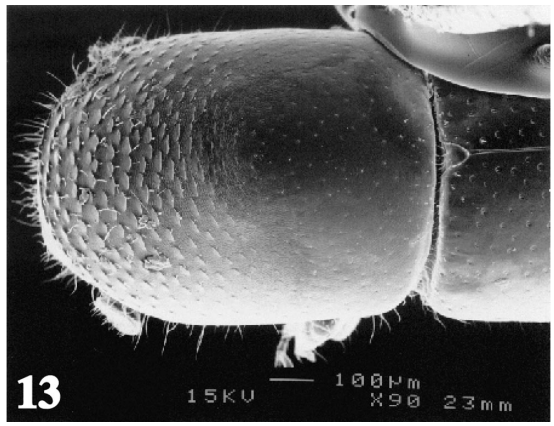

Fig. 13. *Xyleborus glabratus* Eichhoff, dorsal view pronotum.

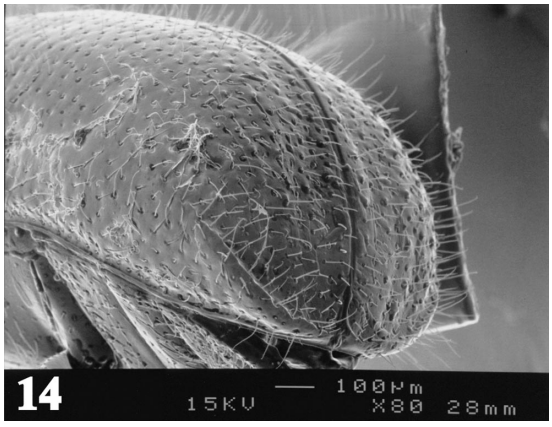

Fig. 14. *Ambrosiodmus obliquus* (LeConte), elytral declivity.

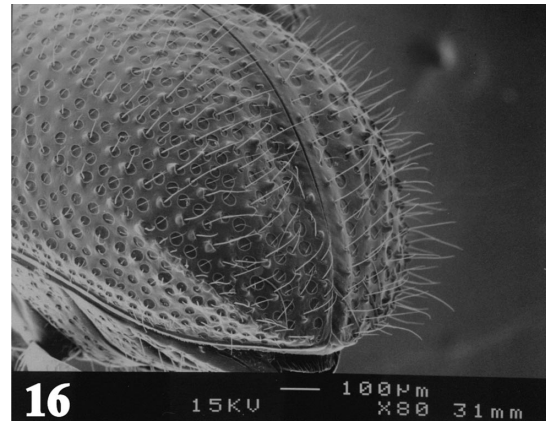

Fig. 16. *Ambrosiodmus rubricollis* (Eichhoff), elytral declivity.

5 (4). Sutural area of declivity feebly impressed, armed by several fine granules; 2.4 mm. . . . . 5. *opimus* (Wood)
– Sutural area of declivity moderately to strongly impressed, interstriae 1 unarmed; larger than 2.4 mm 6
6 (5). Strial punctures on disc coarse, deep interstriae <1.5 times as wide as striae (Fig. 17); smaller, 2.5–3.0 mm . . . . . 6. *lecontei* Hopkins
– Strial punctures on disc rather small, very shallow, interstriae >2 times as wide as striae (Fig. 18); larger, 3.4–3.8 mm. . . . . 7. *tachygraphus* (Zimmermann)

Ambrosiodmus obliquus (LeConte) 1878a (*Pityophthorus*)

(Figs. 9, 14)

Holotype female; Enterprise, FL; MCZ, Cambridge, MA.
gilvipes Blandford 1896. Synonymy Wood 1975b.
linderae Hopkins 1915. Synonymy Bright 1968b.
brasiliensis Eggers 1928c. Synonymy Wood 1975b.
mexicanus Eggers 1931a. Synonymy Wood 1972e.
pseudobrasiliensis Eggers 1941a. Synonymy Bright 1985c.
illepidus Schedl 1941d. Synonymy Wood 1975b.
melanarius Schedl 1978c. Synonymy Wood 1989.

Distribution. Africa, South America, North America: Antilles Islands, Guatemala, Mexico, United States: Alabama, Washington, D.C., Delaware, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia.

Notes. Wood (1977) states that this species is probably of South American origin, where it and similar species occur. It is also now found in Africa.

Ambrosiodmus devexulus (Wood) 1978b (*Xyleborus*)

Holotype female; Homestead, FL; Wood Collection, Utah.
devexus Wood 1977b. Preoccupied by Schedl 1977.
woodi Schedl 1979j. Replacement name, no status.

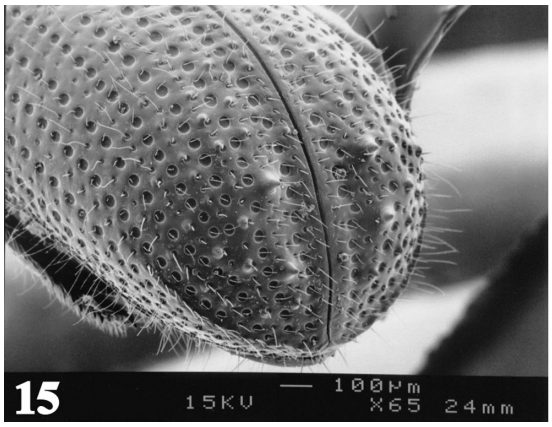

Fig. 15. *Ambrosiodmus lecontei* Hopkins, elytral declivity.

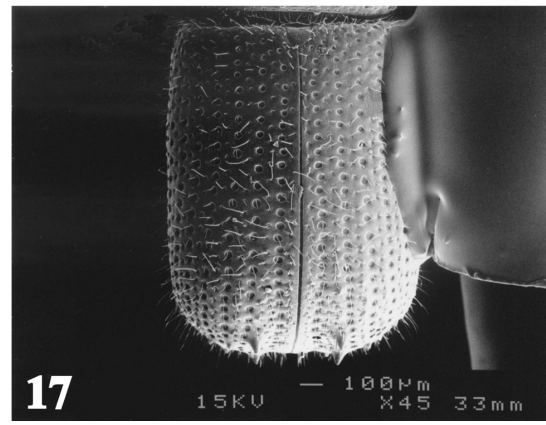

Fig. 17. *Ambrosiodmus lecontei* Hopkins, elytral disc.

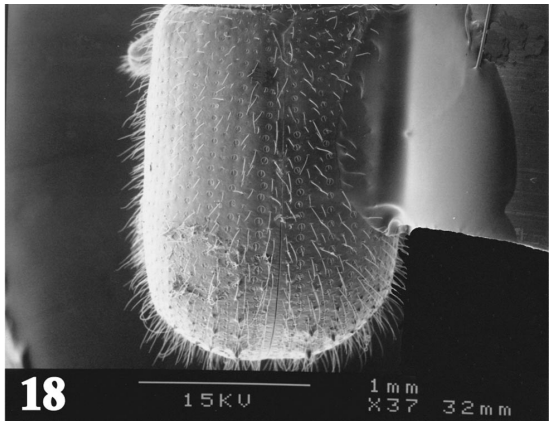

Fig. 18. *Ambrosiodmus tachygraphus* (Zimmermann), elytral disc.

Distribution. North America: Antilles, United States: Florida.

Notes. This species is very similar to *A. obliquus*, but it is distinguished by its smaller size and lack of tubercles on declivital interstriae 1. It is only known from southern Florida, Puerto Rico, and Dominican Republic.

Ambrosiodmus lewisi (Blandford) 1894d (*Xyleborus*)

Syntypes female; Japan; BMNH, London.
tegalensis Eggers 1923a. Synonymy Schedl 1950g.
lewekianus Eggers 1923a. Synonymy Wood 1989.

Distribution. Asia, North America (introduced): United States: Pennsylvania.

Notes. The only report of this Asian species in North America is by Hoebeke (1991) in southeastern Pennsylvania. It can be distinguished from other members of the genus in North America by the irregularly biseriate interstrial punctures on the elytral disc. The size is similar to *A. tachygraphus*, but the tubercles on the declivity are more uniform in size.

Ambrosiodmus rubricollis (Eichhoff) 1875 (*Xyleborus*)
(Figs. 10, 16)

Holotype Female; Japan; IRSNB, Brussels.
taboensis Schedl 1952c. Synonymy Wood 1989.
strohmeyeri Schedl 1975e. Synonymy Wood 1989.

Distribution. Asia, Australia (introduced), North America (introduced): United States: Alabama, Connecticut, Delaware, Florida, Louisiana, Maryland, Mississippi, Pennsylvania, South Carolina, Tennessee, Virginia.

Notes. This Asian species was first found in Maryland (Bright 1968) and is now commonly found in the mid-Atlantic and southeastern states.

Ambrosiodmus opimus (Wood) 1974a (*Xyleborus*)

Holotype female; Sebring, FL; Wood Collection, Utah.

Distribution. North America: United States: Florida.

Notes. This species was described from the holotype collected at light in 1951 and has not been collected since then. Wood and Bright (1992) state that it is probably introduced from another continent. It is likely that it never became established. Among North American species, its appearance is most similar to *A. lecontei.*

Ambrosiodmus lecontei Hopkins 1915b
(Figs. 15, 17)

Holotype female; Keene, FL; USNM, Washington.
gundlachi 1931a. Synonymy Wood 1972e.

Distribution. North America: Antilles Islands, United States: Alabama, Florida, Louisiana.

Notes. In North America, this species is similar to *A. tachygraphus*, but it can be distinguished from that species by the smaller size and the coarse, deep punctures on the elytral disc.

Ambrosiodmus tachygraphus (Zimmermann) 1868 (*Xyleborus*)
(Fig. 18)

Holotype female; North Carolina; MCZ, Cambridge, MA.

Distribution. North America: United States: Alabama, Arkansas, Washington, D.C., Delaware, Florida, Georgia, Illinois, Kentucky, Louisiana, Maryland, Mississippi, New Jersey, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia.

Notes. This species is common and widely distributed in the eastern United States. It is among the larger species in the tribe in North America.

Euwallacea Hopkins 1915b

Type species; *Xyleborus wallacei* Blandford.

There are two species of this predominately Asian genus now established in North America. On a worldwide basis, the characters and limits of the genus are in question, but the two species in North America are easily distinguished from other Xyleborina.

Key to Females of the Species of *Euwallacea*, North of Mexico

1. Small, body length 1.9–2.3 mm; stout, elytra 1.2 times as long as wide; pronotum more nearly subcircular, anterior margin procurved, coarsely serrate; declivity more strongly convex . . . . 1. *fornicatus* (Eichhoff)
– Larger, body length 3.4–3.8 mm; more slender, elytra 1.5 times as long as wide; pronotum

subquadrate, anterior margin weekly procurved, serrations weak to absent; declivity weakly convex . . . . . 2. *validus* (Eichhoff)

Euwallacea fornicatus (Eichhoff) 1868c (*Xyleborus*)

Syntypes; Ceylon; Hamburg Museum, lost.
fornicator Eggers 1923a. Synonymy Beeson 1930.
whitfordiodendrus Schedl 1942a. Synonymy Wood 1989.
perbrevis Schedl 1951i. Synonymy Wood 1989.
schultzei Schedl 1951i. Synonymy Beaver 1991.
tapatapaoensis Schedl 1951k. Synonymy Wood 1989.

Distribution. Asia, Australia (introduced), Pacific Islands (introduced) Hawaii, North America (introduced): Panama, United States: California, Florida.

Notes. In size and shape, this species superficially resembles *Xyleborus sayi* and *Xylosandrus germanus*, but it is easily distinguished by the generic characters in the key. It can be distinguished from *E. validus* by the much smaller size, the less quadrate pronotum, and the greater number of serrations and the anterior margin of the pronotum.

Euwallacea validus (Eichhoff) 1875 (*Xyleborus*) (Figs. 11, 12)

Syntypes female; Japan; IRSNB, Brussels.

Distribution. Asia, North America (introduced): United States: Delaware, Louisiana, Maryland, New Jersey, New York, Pennsylvania, South Carolina, Virginia, West Virginia.

New State Records. New Jersey, Union Co., Westfield, 1996, D.C. Booth, coll., ex: *Fagus.*

West Virginia, Monongalia Co, 12 miles northeast of Morgantown, 28-V-1991, USFS coll., ex funnel trap.

Notes. This Asian species was first reported from Nassau County, NY in 1976. It is now common throughout the Mid-Atlantic states and as far south as Louisiana. It is easily distinguished from other North American Xyleborina, but is very similar to *Euwallacea interjectus* (Blandford), a widely distributed Asian species. Ohno (1991) distinguishes *E. validus* from *E. interjectus* based on the dull surface of the declivity, and the lack of granules on the lower half of declivital interstriae 2. Specimens in North America have been seen with varying degrees of these characters. S. Wood (personal communication) stated that *E. interjectus* also may be established in the United States. Further study is needed on the populations in North America and the validity of these characters.

Theoborus Hopkins 1915b

Type species; *Theoborus theobromae* Hopkins.

There are eight species in this genus, all native to tropical Central and South America. One species, *T. ricini*, has been introduced into Africa, and also can be found in southern Florida. The genus is distinguished from other Xyleborina by the two sutures on the anterior face of the antennal club which extend to the posterior face.

Theoborus ricini (Eggers) 1932d (*Xyleborus*) Fig. 7

Holotype female; "Congostaat"; USNM, Washington.
Solitariceps Schedl 1954b. Synonymy Wood 1989.

Distribution. Africa (introduced), South America, North America: Costa Rica, Mexico, United States: Florida.

Notes. Until recently this species was only known from a single collection in Dade County, FL (Atkinson and Peck 1994). In 2003, specimens were collected in ethanol-baited funnel traps in several locations in Dade County (Florida Department of Agriculture and Consumer Services, unpublished report no. 2003-07-EBBS-01). In 2004, a series was collected in Broward County, FL: Ft. Lauderdale, University of Florida Research and Education Center, 6-V-2004, S. Ortiz, reared from *Delonix regia.* Atkinson et al. (1991) considered this species native to South Florida based on its continuous distribution in South and Central America.

Premnobius Eichhoff 1878b

Type species; *Premnobius cavipennis* Eichhoff.
Premnophilus Browne 1962g. Synonymy Schedl 1964j.

Only one species (*Premnobius cavipennis* Eichhoff) of this African genus occurs in North America. [*Premnobius ambitiosus* (Schaufuss) also has been introduced into South America.] The taxonomic placement of the genus has been the subject of controversy. Schedl (1957) considered it a synonym of *Xyleborus*, but Browne (1961b) disagreed and placed it in a separate tribe, Premnobini. Nobuchi (1969), using characters in the proventriculus, also placed the genus in the tribe Premnobini. In a review of North American Xyleborini, Bright (1968) considered *P. cavipennis* a species of *Xyleborus* but stated that it is unique among the tribe. Most obvious morphological differences are the strongly flatten antennal club and the pregula flush with the ventral surface of the head. DNA data, also suggests its independent origin from Xyleborina and its closer affinity to the Ipini (Normark et al. 1999, Farrell et al. 2001); however, characters that support the latter relationship are few (Farrell et al. 2001). Additional DNA data will likely clarify its phylogenetic placement. Wood and Bright (1992) list the genus and its 25 species in the Xyleborina, and it is included in this review for that reason.

Premnobius cavipennis Eichhoff 1878b (Fig. 1)

Syntypes female; "Africa meridionalis" and "America meridionalis"; Hamburg Museum (lost), one in IRSNB, Brussels

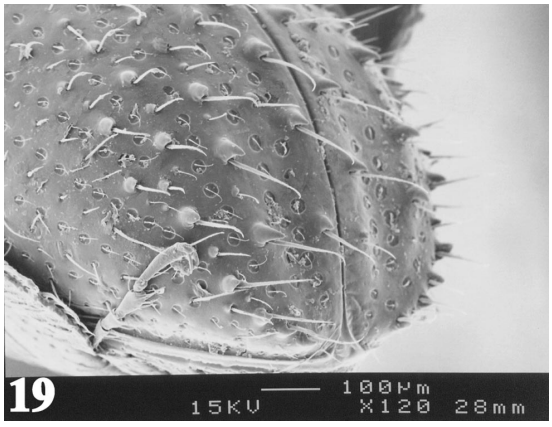

Fig. 19. *Xyleborinus alni* (Niisima), elytral declivity.

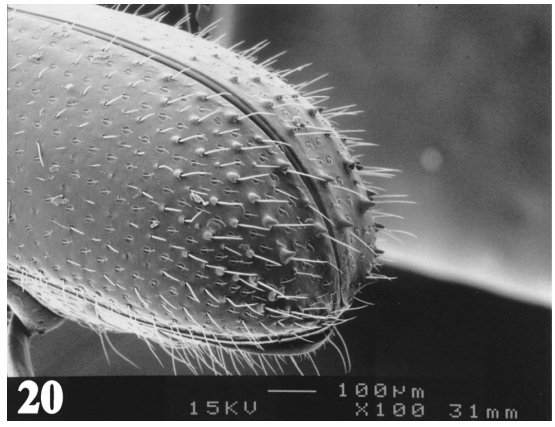

Fig. 20. *Xyleborinus saxesenii* (Ratzeburg), elytral declivity.

industrius Sampson 1912. Synonymy Schedl 1962j. *xylocranellus* Schedl 1931c. Synonymy Browne 1961d. *bituberculatus* Eggers 1932c. Synonymy Schedl 1962j. *latior* Eggers 1933b. Synonymy Wood 1977b.

Distribution. Africa, South America (introduced), North America (introduced): Antilles, Costa Rica, Honduras, Mexico, United States: Florida.

Notes: In North America, this African species has been found only in southern Florida (Atkinson and Peck 1994).

Xyleborinus Reitter 1913a

Type species; *Bostrichus saxsesenii* Ratzeburg.

There are three species of this genus in North America, save Mexico, two of which are native to Asia. Most species in the genus are found in Africa and Asia, with about a dozen additional species in South and Central America. The species are distinguished from other Xyleborina by the distinctly conical scutellum and the posterior margin of the declivity bearing a series of pointed tubercles.

Key to Females of the Species of *Xyleborinus*, North of Mexico

1. Declivital interstriae 1, 3, and 4 with small granules, 1 and 3 equally, weakly elevated; slightly larger, 2.0–2.8 mm 2
   – Declivital interstriae 1 without granules and not elevated; smaller 1.6–1.9 mm . . . . . 1. *gracilis* (Eichhoff)
2 (1). Punctures on declivital striae one and two obscure, but evident; granules on declivital interstriae 1 and 3 larger, those on 3 pointed (Fig. 19); granules on ventrolateral area larger, more pointed; declivital interstriae 2 flattened; larger, 2.5–2.8 mm . . . . . 2. *alni* (Niisima)
   – Punctures on declivital striae obsolete; granules on declivital interstriae 1 and 3 smaller, not pointed (Fig. 20); granules on ventrolateral areas smaller, less pointed; declivital interstriae two slightly impressed; smaller, 2.0–2.4 mm . . . . . 3. *saxesenii* (Ratzeburg)

Xyleborinus gracilis (Eichhoff) 1868c (*Xyleborus*)

Lectotypes female; Brasilia; USNM, Washington. *aspericauda* Eggers 1941a. Synonymy Bright 1985c. *neogracilis* Schedl 1954b. Synonymy Wood 1989.

Distribution. Azores, South America, North America: Antilles, Mexico, United States: Florida, Louisiana, North Carolina, South Carolina.

Notes. This species is easily distinguished from other members of the genus in North America by the absence of denticles on declivital interstriae 1.

Xyleborinus alni (Niisima) 1909 (*Xyleborus*) (Fig. 19)

Holotype female; Japan; Nobuchi Collection, Ibaraki, Japan.

Distribution. Asia, Europe (introduced), North America (introduced): Canada: British Columbia: United States: Maine, Maryland, New York, Oregon, Pennsylvania, Washington.

Notes. This species has a limited native distribution of Japan and eastern Russia, but it has recently been introduced into several European countries and North America. It was first detected in western North America in the late 1990s (Mudge et al. 2001) and recently reported in several eastern states (Hoebeke and Rabaglia 2006). It is similar in appearance to *X. saxesenii*, but can be distinguished by the larger size, and the larger, more pointed and hooked tubercles on the declivity (Holzschuh 1994).

Xyleborinus saxesenii (Ratzeburg) 1837 (*Bostrichus*) (Figs. 3, 20)

Syntypes female; "Sudlichen Deutschland"; not located.

dohrni Wollaston 1854. Synonymy Ferrari 1867a.
decolor Boieldieu 1859. Synonymy Ferrari 1867a.
angustatus Eichhoff 1866. Synonymy Schedl 1964m.
aesculi Ferrari 1867. Synonymy Ecihhoff 1878b.
sobrinus Eichhoff 1875. Synonymy Schedl 1964m.
subdepressus Rey 1883. Synonymy Bedel 1888b.
frigidus Blackburn 1885. Synonymy Samuelson 1981.
floridensis Hopkins 1915b. Synonymy Wood 1962.
pecanus Hopkins 1915b. Synonymy Wood 1962.
quercus Hopkins 1915b. Synonymy Wood 1962.
arbuti Hopkins 1915b. Synonymy Wood 1957c.
subspinosus Eggers 1930d. Synonymy Wood 1989.
tsugae Swaine 1934. Synonymy Wood 1957c.
librocedri Swaine 1934. Synonymy Wood 1957c.
pseudogracilis Schedl 1937h. Synonymy Wood 1989.
retrusus Schedl 1940c. Synonymy Wood 1989.
peregrinus Eggers 1944c. Synonymy Schedl 1980d.
pseudoangustatus Schedl 1948g. Synonymy Schedl 1964m.
paraguayensis Schedl 1948f. Synonymy Wood 1989.

Distribution. Africa (introduced), Asia, Australia (introduced), Europe (introduced), Hawaii (introduced), New Zealand (introduced), South America (introduced), North America (introduced): Mexico, Canada: British Columbia, Ontario, United States: Alabama, Arizona, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, Washington, West Virginia.

Notes. As evidenced by the distribution and numerous synonyms, this is a common, widely distributed and somewhat variable species. Now found on six continents, *X. saxesenii* is most likely native to Asia. It was among the first non-native scolytids introduced into North America (>100 yr ago probably from Europe), and is now found from coast to coast. It is one of the most damaging and occasionally aggressive species in the tribe in North America.

Nomenclature. Wood and Bright (1992) and most other authors list this species as *X. saxeseni*, but Holzschuh (1994) points out that Ratzeburg's original description was *saxesenii*, with the –ii ending.

Xyleborus Eichhoff 1864

Type species; *Bostichus monographus* F.
Anisandrus Ferrari 1867a. Synonymy Hagedorn 1910d.
Anacretus Duges 1887. Synonymy Hagedorn 1910d.
Progenius Blandford 1896a. Synonymy Hagedorn 1910d.
Heteroborips Reitter 1913a. Synonymy Schedl 1934f.
Xyleborips Reitter 1913a. Synonymy Schedl 1934f.
Boroxylon Hopkins 1915b. Synonymy Schedl 1952j.
Notoxyleborus Schedl 1934. Synonymy Wood 1986a.

This is the largest genus in the tribe, with >500 currently recognized species. Some previous authors have included genera currently recognized as valid, such as *Ambrosiodmus*, *Premnobius*, *Euwallacea*, and *Xyleborinus* (among others), as members of this genus. In the key to genera, above, specimens may key to *Xyleborus* in two different places in the key. Specimens with one suture visible on the posterior face of the antennal club and confused punctures and setae on the elytra are considered herein as *Xyleborus*, following Wood and Bright (1992). The two species in North America with this character are both native to eastern Asia and now established in North America, *Xyleborus californicus* and *X. pelliculosus.* In Wood's 1986 key, however, these species will key to *Terminalinus* Hopkins. Wood and Bright (1992) list *Terminalinus* as a synonym of *Cyclorhipidion* Hagedorn, but a formal synonymy with a description of characters for *Terminalinus* or *Cyclorhipidion* has never been published. Therefore, these two species are herein considered as part of *Xyleborus*, but in the future may be placed in *Cyclorhipidion.*

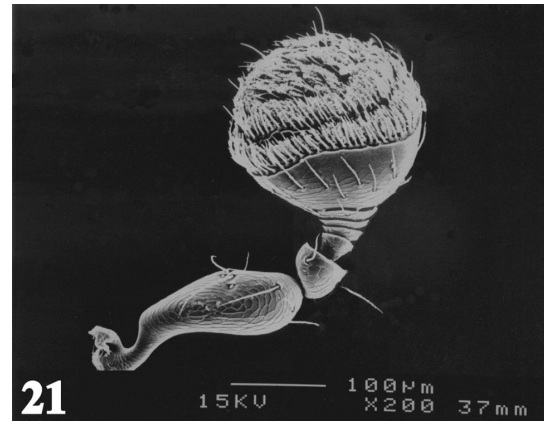

Fig. 21. *Xyleborus pelliculosus* Eichhoff, anterior face antennal club.

Key to Females of the Species of *Xyleborus*, North of Mexico

1. Antennal club distinctly obliquely truncate, with segment 1 corneous, its distal margin forming a complete circle extending from anterior face to apex, suture on apical area of posterior face not visible, segment 2 on anterior face not visible (Fig. 2); strial and interstrial punctures in rows, elytral vestiture sparse, confined to strial and interstrial rows 2
– Antennal club with segment 1 on both faces rounded, extending to subapical area of posterior face, segment 2 on anterior face conspicuous (Fig. 21); elytral punctures confused, vestiture abundant and confused 19
2 (1). Anterior margin of pronotum distinctly armed by several coarse serrations (Fig. 22); body stout, <2.2 times as long as wide 3
– Anterior margin of pronotum unarmed by large serrations, if serrations present, smaller than asperities on anterior slope of pronotum

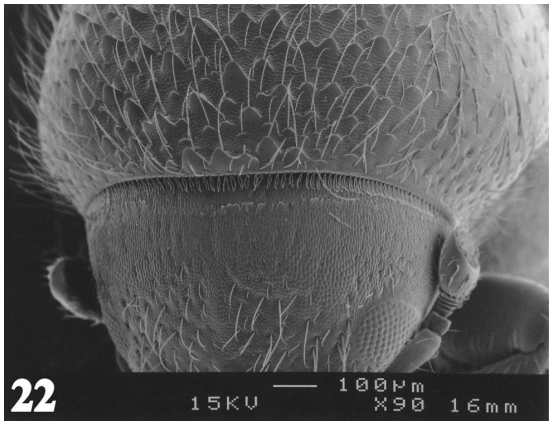

Fig. 22. *Xyleborus sayi* (Hopkins), anterior margin pronotum.

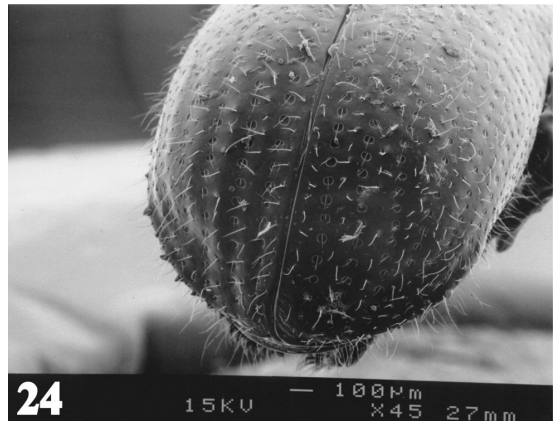

Fig. 24. *Xyleborus obesus* LeConte, elytral declivity.

(Fig. 23); body more slender >2.3 times as long as wide 5

3 (2). Posterolateral costa on declivity armed by three to five distinct tubercles (Fig. 24) . . . . . 1. *obesus* LeConte

– Posterolateral costa on declivity of uniform height, may seem undulating, but without serrations 4

4 (3). Anterior margin of pronotum armed by two to six serrations, median pair conspicuously larger than other; declivital interstriae at least twice as wide as striae . . . 2. *sayi* (Hopkins)

– Anterior margin of pronotum armed by six to eight subequal serrations; declivital interstriae <2 times as wide as striae . . . . . 3. *dispar* (Fabricius)

5 (2). Small serrations on anterior margin of pronotum present, but no larger than asperites on anterior slope of pronotum; body slightly more stout, 2.3–2.6 times as long as wide 6

– Anterior margin of pronotum without serrations; body slender, >2.6 times as long as 7

6 (5). Declivity slightly bisulcate, interstriae 2 impressed; small granules on all declivital interstriae uniform in size; body 3.0 mm in length, 2.6 times as long as wide, mature color black. . . . . 4. *atratus* Eichhoff

– Declivity strongly concave with obtusely elevated margins on posterolateral areas; sutural interstriae of declivity armed by two to four stout tubercles; body 3.8–4.2 mm in length, 2.3 times as long as wide, mature color reddish brown . . . . . 5. *horridus* Eichhoff

7 (5). Denticles on some declivital interstriae distinctly larger than on others (Figs. 25 and 26) . 8

– Denticles on all declivital interstriae, where present, more uniform in size (Figs. 30 and 31, 33, 35, 36) 13

8 (7). Declivital striae 1 curving away from suture, interstriae 1 wider than other interstriae, armed by denticles larger than those on other interstriae (Fig. 25) 9

– Declivital striae 1 not curving away from suture, interstriae one similar in size, or smaller than other interstriae, if denticles present on interstriae 1, smaller than those on other interstriae and only at base (Fig. 26) 11

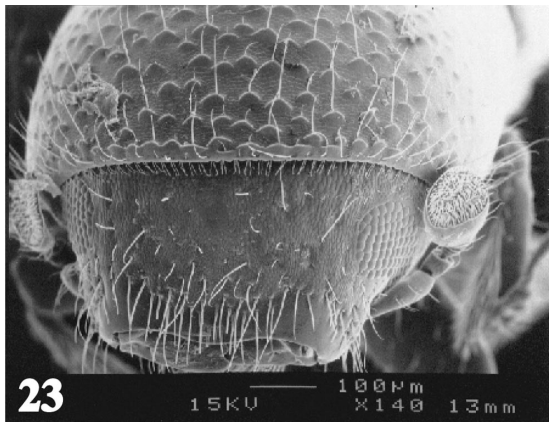

Fig. 23. *Xyleborus glabratus* Eichhoff, anterior margin pronotum.

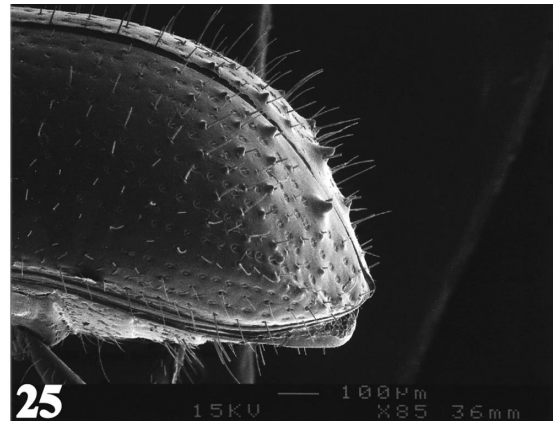

Fig. 25. *Xyleborus similis* Ferrari, elytral declivity.

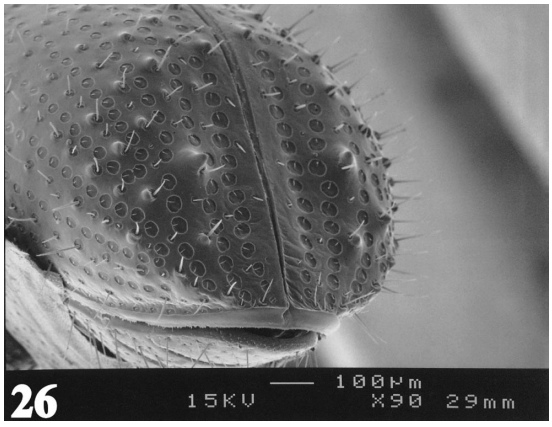

Fig. 26. *Xyleborus ferrugineus* (F.), elytral declivity.

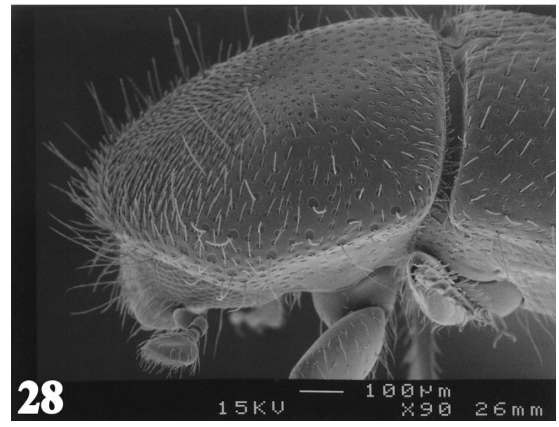

Fig. 28. *Xyleborus viduus* Eichhoff, pronotum.

9 (8). Declivity steep, flat, surface dull; striae 1 on declivity strongly curved away from suture, interstriae 1 covering half of declivital surface, with two large, pointed, widely spaced tubercles almost on striae; smaller granules on all interstriae only at base or lateral areas of declivity, not on face, forming a circumdeclivital ring; body 3.6–4.5 mm in length . . . . . 6. *celsus* Eichhoff

– Declivity less steep, convex; striae 1 less strongly curved away from suture, interstriae 1 making up 25% or less of declivital face, denticles smaller, more evenly spaced, granules on other interstriae not at base, nor forming a circumdeclivital ring; smaller 2.0–2.5 mm . 10

10 (9). Declivity noticeably convex, strial punctures deep, large, more than twice the width of interstriae; posterolateral area of declivity with a raised costa, extending to near middle of declivity (Fig. 27) . . 7. *glabratus* Eichhoff

– Declivity less convex, more sloping, strial punctures, shallow, small, interstriae wider than striae; posterolateral area rounded, without costa (Fig. 25) . . . 8. *similis* Ferrari

11 (8). Anterior portion of pronotum of female impressed, weakly sulcate (Fig. 28) . . . . . 9. *viduus* Eichhoff

– Anterior portion of pronotum of female convex, normal (impressed and sulcate in males) . 12

12 (11). Declivital interstriae 1 unarmed, interstriae 3 with three denticles: denticle near base subequal to larger middle denticle, small denticle near posterior margin; declivity distinctly sulcate, interstriae 2 impressed, strial punctures less distinct, declivity less shining (Fig. 29) . . . . . 10. *impressus* Eichhoff

– Declivital interstriae 1 armed by one small denticle at base, interstriae 3 with two or more denticles: denticle(s) near base small, denticle at middle of declivity distinctly larger than others; declivity flat, interstriae 2 not impressed, strial punctures distinct, declivity shining (Fig. 26) . . . . . 11. *ferrugineus* (Fabricius)

13 (7). Surface of declivity opaque, dull 14

– Surface of declivity shining 16

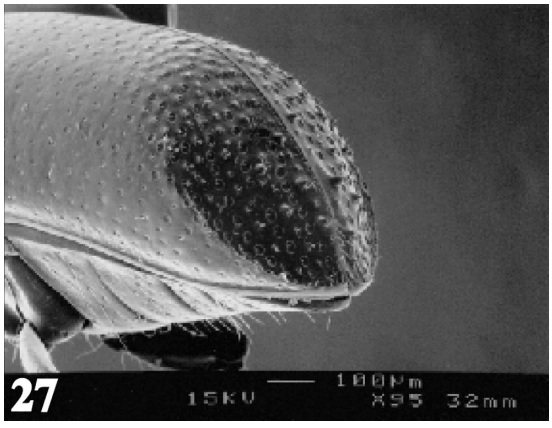

Fig. 27. *Xyleborus glabratus* Eichhoff, elytral declivity.

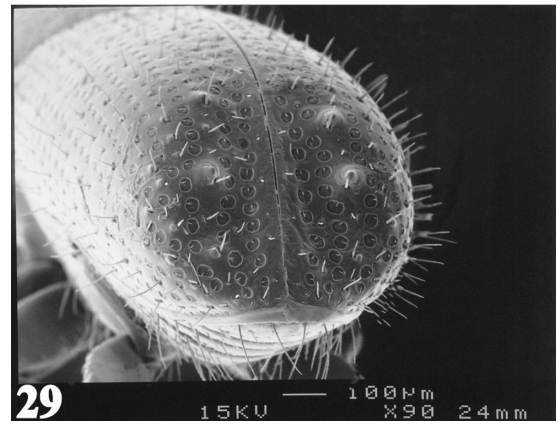

Fig. 29. *Xyleborus impressus* Eichhoff, elytral declivity.

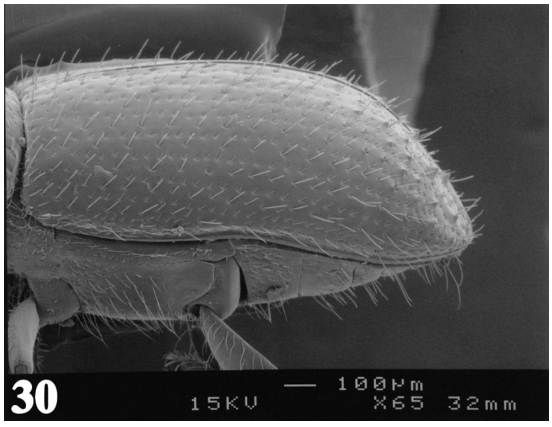

Fig. 30. *Xyleborus affinis* Eichhoff, lateral view elytra.

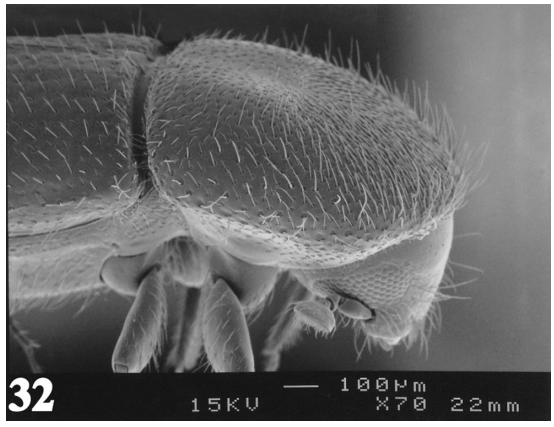

Fig. 32. *Xyleborus planicollis* Zimmermann, pronotum.

14 (13). Declivity broadly sloping, occupying posterior 30–40% of elytra; declivity slightly tapered posteriorly; declivital tubercles on interstriae 1 and 3 small but conspicuous (Fig. 30) . . . . . 12. *affinis* Eichhoff
– Declivity steep, occupying posterior 15% of elytra, apex blunt, not tapered; tubercles on declivital interstriae 1 and 3 very small (Fig. 31). 15
15 (14). Anterior portion of pronotum of female impressed, weakly sulcate (Fig. 32) . . . . . 13. *planicollis* Zimmermann
– Anterior portion of pronotum of female convex, normal (impressed and sulcate in males) . . . . . 14. *xylographus* (Say)
16 (13). Elytral declivity convex, posterolateral areas not subacutely elevated (Fig. 33) . . . 17
– Elytral declivity flatted, sloping, posterolateral areas subacutely margined (Fig. 34) 18
17 (16). Discal interstriae 2 times as wide as striae; some declivital tubercles with height and basal width greater than the diameter of strial punctures (Fig. 35) . . . . . 15. *intrusus* Blandford
– Discal interstriae <1.5 times as wide as striae; some declivital tubercles with height and basal width less than the diameter of strial punctures (Fig. 33) . . . . . 16. *pubescens* Zimmermann
18 (16). Smaller, body length 2.1–2.8 mm, color reddish brown; declivity flattened to slightly convex, interstriae 2 moderately impressed, interstriae 1 near posterior less elevated (Fig. 34); strial punctures on elytral disc larger, within a row nearly touching . . . . . 17. *volvulus* (F.)
– Larger, body length 3.0–3.6 mm, color usually black; declivity flattened, interstriae 2 impressed especially from middle of declivity, interstriae 1 near posterior distinctly elevated (Fig. 36); strial punctures on elytral disc smaller, within a row separated by 1–0.5 times the size of a puncture . . . . . 18. *pfeili* (Ratzeburg)
19 (1). Smaller, body length 2.0–2.2 mm, color yellowish brown; declivity may look dull due to number and closeness of granules. . . . . 19. *californicus* Wood

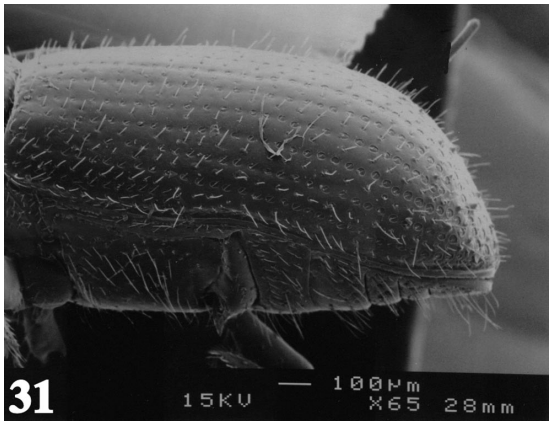

Fig. 31. *Xyleborus xylographus* (Say), lateral view elytra.

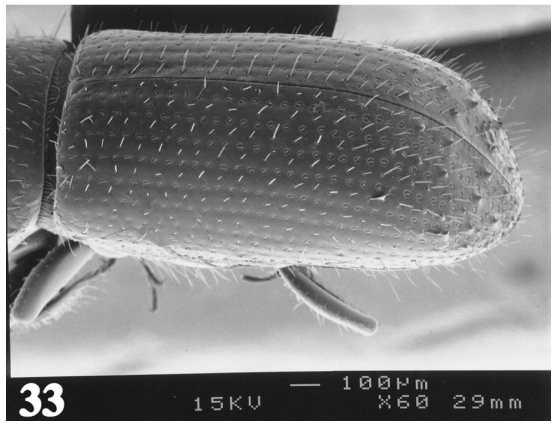

Fig. 33. *Xyleborus intrusus* Blandford, elytral disc.

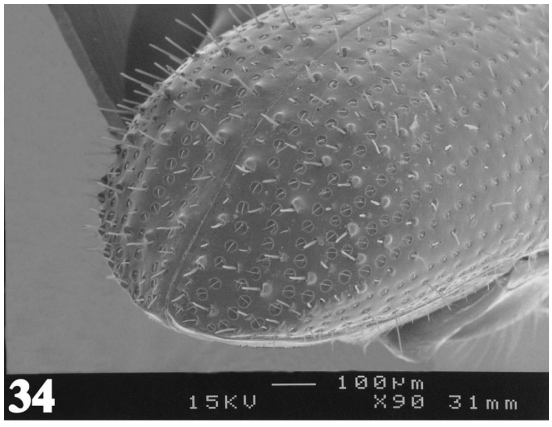

Fig. 34. *Xyleborus volvulus* (F.), elytral declivity.

– Larger, body length 3.2 mm, color dark brown; declivity shining. . . . . 20. *pelliculosus* Eichhoff

Xyleborus obesus LeConte 1868
(Fig. 24)

Lectotype Female; Virginia; MCZ, Cambridge, MA.
serratus Swaine 1910b. Synonymy Hopkins 1915b.
populi Swaine 1917. Synonymy Schedl 1964m.

Distribution. North America: Canada: Ontario, Quebec; United States: Connecticut, Kentucky, Massachusetts, Maine, Minnesota, New York, Ohio, Wisconsin, West Virginia.

Notes. This species is easily distinguished from other stout *Xyleborus* by the presence of a series of denticles on the posterolateral margin of the declivity.

New State Records. New York, St. Lawrence County, Pierrepont, 22-VII-1999, A. Stevenson coll., Ohio, Portage Co., Ravenna Arsenal, 31-V-2001, R. Williams coll., ex: Lindgren funnel trap. West Virginia, Monongalia Co., 12 miles west northeast of Morgantown, 28-V-1991, U.S. Forest Service coll.

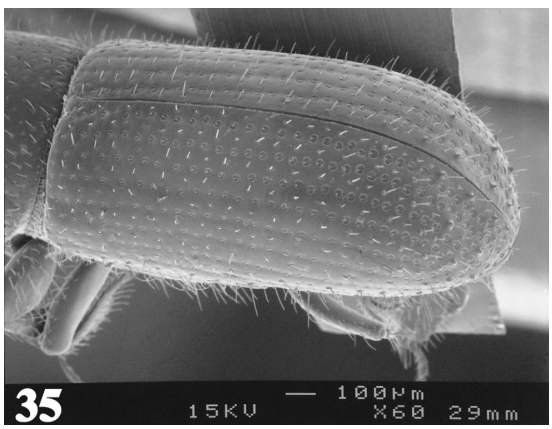

Fig. 35. *Xyleborus pubescens* Zimmermann, elytral disc.

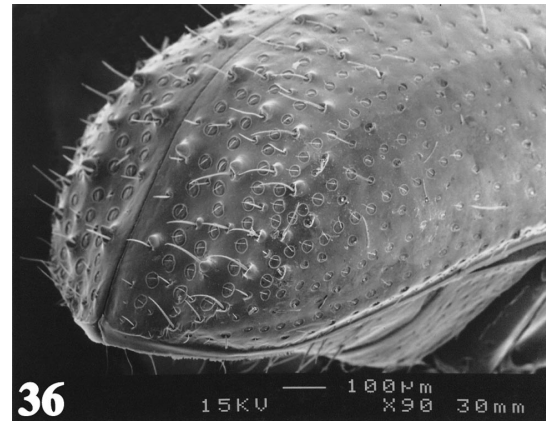

Fig. 36. *Xyleborus pfeili* (Ratzeburg), elytral declivity.

Xyleborus sayi (Hopkins) 1915b (Anisandrus)
(Figs. 2, 4, 8, 22)

Holotype female; Morgantown, WV; USNM, Washington.
obesus minor Swaine 1910b. Synonymy Wood 1957c.
neardus Schedl 1950c. Synonymy Wood 1957c.

Distribution. North America: Canada: Ontario, Quebec; United States: Alabama, Connecticut, Washington, D.C., Delaware, Illinois, Indiana, Kentucky, Maine, Maryland, Michigan, Missouri, Mississippi, New Jersey, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia.

Notes. This small, stout species is similar to the native *X. obesus*, and the exotic *X. dispar*, but it can be distinguished from them based on characters on the declivity (from *obesus*) and the anterior of the pronotum (from *dispar*).

Xyleborus dispar (F.) 1792 (*Apate*)

Syntypes female; Germaniae; UZMC, Copenhagen.
brevis Panzer 1793. Synonymy Eichhoff 1878b.
thoracicus Panzer 1793. Synonymy Hagedorn 1910d.
pyri Peck 1817. Synonymy Hubbard 1897.
tachygraphus Sahlberg 1834. Synonymy Eichhoff 1878b.
ratzburgi Kolentai 1846. Synonymy Ferrari 1867a.
swainei Drake 1921. Synonymy Wood 1957c.
dispar rugulosus Eggers 1922c.
cerasi Eggers 1937b. Synonymy Schedl 1964k.

Distribution. Asia, Europe, North America: Canada: British Columbia, Nova Scotia, Ontario; United States: California, Washington, D.C., Idaho, Illinois, Maine, Maryland, Massachusetts, Michigan, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, Utah, Virginia, Washington, D.C., West Virginia.

Notes. *X. dispar* is the first non-native scolytid reported in North America. It is native to Europe and

was likely introduced into North America before 1817 (Wood 1977). It is now found across North America from southern Canada through northern United States.

New State Records. California, Humboldt County, Arcata, 28-V-2004, ethanol-baited funnel trap, D. Penrose, coll.; Mendocino County, Branscomb, 19-V-2003, ethanol-baited funnel trap, D. Penrose, coll.; Nevada, County, Truckee, Donner Memorial State Park, 19-IV-2004, ethanol-baited funnel trap, D. Penrose, coll.; Solano County, Farifield, Rockville Hills Park, 22-V-2003, ethanol-baited funnel trap, D. Penrose, coll.; Trinity County, Weaverville, 27-IV-2004, ethanol-baited funnel trap, D. Penrose, coll.

Xyleborus atratus Eichhoff 1875

Holotype female; Japan. Hamburg Museum, lost.

Distribution. Asia, North America (introduced): United States: Alabama, Delaware, Florida, Georgia, Kansas, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Ohio, South Carolina, Tennessee, Texas, Virginia, West Virginia.

Notes. This Asian species was first reported in North America in 1990 (Atkinson et al. 1990) from Georgia, Maryland, Tennessee, Virginia, and West Virginia. Its wide distribution at that time indicates that it was likely introduced well before then. It has since been found as far west as Texas and Kansas and as far south as Florida. It seems to be related to *X. dispar,* but it can be distinguished by the smaller serrations on the anterior margin of the pronotum, and the weakly bisulcate elytral declivity with longer interstrial setae.

New State Records. Kansas, Crawford County, 2 miles west of Pittsburgh, 18-IV-2003, flight intercept trap, G. A. Salsbury, coll.; Wyandotte County, Kansas City, 5-XIII-2003, Lindgren funnel trap, T. Miller, coll.; Shawnee County, 5-V-2003, Lindgren funnel trap, B. Hilbert, coll. (all deposited in Kansas State University Collection, Manhattan, KS). Ohio, Portage Co., Ravenna Arsenal, 10-V-2001, R. Williams coll., ex: Lindgren funnel trap.

Xyleborus horridus Eichhoff 1869a

Lectotype female; Mexico. IRSNB, Brussels.
flohri Schedl 1972g. Synonymy Wood 1977b.

Distribution. North America: El Salvador, Guatemala, Mexico, United States: Texas.

Notes. This species is unique among *Xyleborus* north of Mexico. It is closely related to *X. horridatus* Wood, which occurs from Costa Rica to northern South America. Both species have a concave declivity with a series of denticles on interstriae 1.

Xyleborus celsus Eichhoff 1868a

Syntypes female; "America boreali". Hamburg Museum, lost.
biographus LeConte 1868. Synonymy Eichhoff 1878b.

Distribution. North America: United States: Arkansas, Connecticut, Washington, D.C., Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Vermont, Virginia, West Virginia.

Notes. This relatively large and slender species is distinguished from other North American *Xyleborus* by the steep, flat declivity with large tubercles and the very wide declivital interstriae 1. This species seems to be restricted to hickories (*Carya* spp.). It can attack weakened trees but usually causes damage to cut logs (Solomon 1995).

Xyleborus glabratus Eichhoff 1877a
(Figs. 13, 23, 27)

Syntype female; Japan. IRSNB, Brussels.

Distribution. Asia, North America (introduced): United States: Florida, Georgia, South Carolina.

Notes. Specimens of *X. glabratus* were first found in North America in a funnel trap outside of a warehouse in Port Wentworth, GA, in 2002. It was unclear at that time whether the species was established or the specimens were intercepted from the warehouse. In 2004, a large series of specimens were examined from red bay trees dying on Hilton Head, SC. It is clear that the species is now established in the area and may be aggressively attacking trees. Additional specimens also have been collected from dying red bay trees in several counties in Georgia and near Jacksonville, FL. The host list of this species suggests that it may be attracted to aromatic species especially in the Lauraceae. Most xyleborine species have a wide host range, but *X glabratus* seems to be restricted to Lauraceae in Asia and North America. (In Asia, *Shorea robusta*, a non-Lauraceae, is a host, but is also very aromatic.) Host odors from these aromatic species may be serving as primary attractants for this species. In addition, red bay trees attacked in Georgia, South Carolina, and Florida are quickly dying and are infested with an apparently aggressive wilt fungus possibly vectored by this species.

Xyleborus similis Ferrari 1867
(Fig. 25)

Holotype female; "Insula Keeling". NHMW, Wien.
ferrugineus Boheman 1859. Preoccupied by Fabricius 1801 (synonymy Schedl 1960h).
parvulus Eichhoff 1868. Synonymy Schedl 1959a.
dilatus Eichhoff 1876b. Synonymy Schedl 1959a.
submarginatus Blandford 1896b. Synonymy Eggers 1929e.
bucco Schaufuss 1897a. Synonymy Schedl 1959a.
capito Schaufuss 1897a. Synonymy Schedl 1959a.
novaguineanus Schedl 1936g. Synonymy Wood 1989.
dilatatulus Schedl 1953b. Synonymy Wood 1989.

Distribution. Africa, Asia, Australia, Pacific Islands, North America: United States: Texas.

Notes. Five specimens of *X. similis* were collected in a funnel trap in the spring of 2002 in Houston, TX. The location of the trap in Memorial Park, away from the port or warehouses, indicates that this species is most likely established in the area. It has a wide distribution in the tropics and has been moved around through commerce. An unidentified specimen at the USNM intercepted from solid wood packing material from India coming into the port of Houston in 1999, was recently identified as *X. similis.*

Xyleborus viduus Eichhoff 1878b
(Fig. 28)

Syntypes female; uncertain: Brasilia or America septentrionali. Hamburg lost.

Distribution. North America: United States: Alabama, Florida, Kansas, Maryland, Missouri, Tennessee.

Notes. This species, along with *X. planicollis,* is unique among North American xyleborines. The anterior of the female pronotum is impressed as in males of several other species. This character, along with the rarity of the species, has led to confusion and misidentification. Several authors considered this a male of other *Xyleborus* spp., owing to the "male-like" pronotum, but dissection has proven them to be females. In Maryland (Rabaglia 2001) and Kansas (see record below), specimens of *X. viduus* were collected in funnel traps, indicating that they were indeed females, not flightless males.

New State Record. Kansas, Wyandotte Co., Kansas City, 5-VIII-2003, T. Miller coll., ex: Lindgren funnel trap.

Xyleborus impressus Eichhoff 1868a
(Fig. 29)

Lectotype female; "Amer. Bor."; USNM, Washington.

Distribution. North America: United States: Alabama, Arkansas, Florida, Georgia, Illinois, Louisiana, Missouri, New Jersey, North Carolina, Ohio, South Carolina, Tennessee, Texas, Virginia.

Notes. This species was considered a synonym of *X. ferrugineus* (Fabricius) by Schedl (1960), and is treated as such by Wood and Bright (1992). Rabaglia (2005) considered it a valid species. It is easily distinguished from *X. ferrugineus* by the impressed sutural interstriae, the smaller tubercles on interstriae three and the lack of denticles on interstriae 1.

Xyleborus ferrugineus (F.) 1801 (*Bostrichus*)
(Fig. 6, 26)

Lectotype female; "America meridionali"; UZMC, Copenhagen.
trypanaeoides Wollaston 1867. Synonymy Browne 1955.
fuscatus Eichhoff 1868a. Synonymy Schedl 1960h.
confusus Eichhoff 1868a. Synonymy Schedl 1957d.
retusicollis Zimmerman 1868. Synonymy Bright 1968b.
amplicollis Eichhoff 1869a. Synonymy Schedl 1960h.
insularis Sharp 1885. Synonymy Schedl 1941f.
tanganus Hagedorn 1910b. Synonymy Schedl 1960h
soltaui Hopkins 1915b. Synonymy Bright 1968b.
nyssae Hopkins 1915b. Synonymy Schedl 1960h.
hopkinsi Beeson 1929. Synonymy Schedl 1960h.
argentinensis Schedl 1931c. Synonymy Schedl 1960h.
rufopiceus Eggers 1932d. Synonymy Wood 1989.
schedli Eggers 1934a. Synonymy Schedl 1960h.
nesianus Beeson 1940. Synonymy Beaver 1991.
notatus Eggers 1941a. Synonymy Schedl 1960h.
subitus Schedl 1948f. Synonymy Schedl 1960h.

Distribution. Africa (introduced), Australia (introduced), Pacific Islands (introduced) (Hawaii), South America, North America: Antilles, Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, United States: Alabama, Arizona, Arkansas, Washington, D.C., Delaware, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia.

Notes. This is a widely distributed and variable species that is in need of a thorough review. Schedl (1960) considered several African and South American species as synonyms. Kirkendall and Jordal (unpublished data) consider *X. bispinatus* Eichhoff (considered a synonym of *X. ferrugineus* by Schedl 1960) as a distinct species, and suggest that in North America, what is currently considered *X. ferrugineus* may be *X. fuscatus* Eichhoff, which they consider as a distinct species. There is considerable variation in size, placement of the tubercle on declivital interstriae 3, punctures on the declivity and setation among the currently recognized synonyms. More detailed morphological and molecular studies on this species are needed.

New State Record. Kansas, Cherokee County, 1 mile south of Galena, 9 May 2002, flight intercept trap, G. A. Salsbury, coll., Bourbon County, 9 miles southwest of Ft Scott, 20 July 2004, canopy intercept trap, G. A. Salsbury, coll. (all specimens deposited in Kansas State University Collection, Manhattan, KS).

Xyleborus affinis Eichhoff 1868a
(Fig. 30)

Syntypes female; "America bor.", Cuba; Hamburg Mus., lost; 1 in USNM Washington.
affinis parvus Eichhoff 1878b. Synonym Wood 1960a.
affinis mascarensis 1878b. Synonym Wood 1960a.
affinis fuscobrunneus 1878b. Synonym Schedl 1959a.
sacchari Hopkins 1915b. Synonymy Schedl 1959a.
subaffinis Eggers 1933b. Synonymy Schedl 1959a.
societatis Beeson 1935a. Synonymy Beaver 1991.
proximus Eggers 1943c. Synonymy Schedl 1962j.

Distribution. Africa (introduced), Asia (introduced), Australia (introduced), Europe (introduced), Pacific Islands (introduced) Hawaii, South America, North America: Antilles, Belize, Costa Rica, El Salvador,

Guatemala, Honduras, Mexico, Nicaragua, Panama, United States: Alabama, Arkansas, Washington, D.C., Delaware, Florida, Georgia, Illinois, Indiana, Kansas, Lousiana, Massachusetts, Maryland, Michigan, Mississippi, North Carolina, New Jersey, New York, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia.

Notes. This widely distributed species, along with *X. ferrugineus*, is native to tropical America (Wood 1977, 1982). Atkinson and Peck (1994), however, consider both of these species native to North America, because their distribution is contiguous from South and Central America through the southeastern United States. As with *X. ferrugineus*, this species can cause economic damage in moist, lowland areas of the Neotropics.

New State Record. Kansas, Cherokee County, 1 mile south of Galena, 9-V-2002, flight intercept trap, G. A. Salsbury, coll. (deposited in Kansas State University Collection, Manhattan, KS).

Xyleborus planicollis Zimmermann 1868
(Fig. 32)

Holotype female; Pennsylvania; MCZ, Cambridge, MA.

Distribution. North America: United States: Illinois, Indiana, Maryland, Missouri, North Carolina, Pennsylvania.

Notes. The concave female pronotum is similar to *X. viduus*, but the declivity is most similar to *Xyleborus xylographus* (Say). It was thought that this species represented males of *X. xylographus* (Bright 1968), but once males of *X. xylographus* were examined and *X planicollis* dissected, it became apparent that this is a distinct, but rare species.

Xyleborus xylographus (Say) 1826 (*Bostrichus*)
(Fig. 31)

Neotype female; North Carolina; CNCI, Ottawa.
inermis Eichhoff 1868a. Synonymy Eichhoff 1878b.
canadensis Swaine 1917. Synonymy Wood 1957c.

Distribution. Asia (introduced), North America: Antilles, Canada: Bristish Columbia, Ontario, Quebec; United States: Arkansas, California, Washington, D.C., Florida, Georgia, Iowa, Illinois, Indiana, Kansas, Kentucky, Massachusetts, Maine, Michigan, Maryland, Minnesota, Missouri, Mississippi, North Carolina, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia, Wisconsin.

Notes. Many authors thought that *Xyleborinus saxesenii* was a male of *X. xylographus*, and many articles published before 1960 confused these two species. Bright (1968) clarified the taxonomic history of the species. It is native to eastern North America, but it also has been found in western Canada and the United States.

New State Record. Kansas, Crawford County, 2.5 miles west of Pittsburgh, 7-V-2003, flight intercept trap, G. A. Salsbury, coll. (all specimens deposited in Kansas State University Collection, Manhattan, KS).

Xyleborus intrusus Blandford 1898b
(Fig. 35)

Lectotype female; Guatemala; BMNH, London.
howardi Hopkins 1915b. Synonymy Wood 1972e.
fitchi Hopkins 1915b. Synonymy Wood 1962.
scopulorum Hopkins 1915b. Synonymy Wood 1972e.

Distribution. North America: Antilles, Guatemala, Honduras, Mexico, Canada: British Columbia; United States: Arizona, California, Colorado, Washington, D.C., Idaho, Maryland, Montana, New Mexico, North Carolina, Oregon, Pennsylvania, South Carolina, South Dakota, Utah, Washington.

Notes. As it is currently recognized, this species has the most westerly distribution of the native *Xyleborus.* Bright (1968) considered those occurring in the west as a distinct species, *Xyleborus scopulorum* Hopkins, distinguishable by the larger size and larger declivital tubercles. Wood (1982) and Wood and Bright (1992) now consider it a synonym of *X. intrusus.* It is also one of the few species of the genus restricted to conifers.

Xyleborus pubescens Zimmermann 1868
(Fig. 33)

Lectotype female; "southern states", USA; MCZ, Cambridge, MA.
propinquus Eichhoff 18869d. Synonymy Wood 1973c.

Distribution. North America: Antilles, Canada: Ontario; United States: Alabama, Arkansas, Washington, D.C., Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, New Jersey, New York, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia.

Notes. There was some nomenclatural confusion concerning this species owing to the misidentification of "*Xyleborus pini* Say" by Eichhoff. Wood (1982) and Wood and Bright (1992) clarify the issue, however, some papers before those that refer to *X. pini* concern *X. pubescens.* This species, as with *X. intrusus,* is common in pines. It can be distinguished from *X. intrusus* by the larger strial punctures and the smaller declivital tubercles.

Xyleborus volvulus (F.) 1775 (*Bostrichus*)
(Fig. 34)

Lectotype female; "America ligno Dom v. Rohr (Cuba?)"; UZMC, Copenhagen.
torquatus Eichhoff 1868c. Synonymy Wood 1960a.
alternans Eichhoff 1869. Synonymy Eggers 1929e.
badius Eichhoff 1869a. Synonymy Wood 1960a.
interstitialis Eichhoff 1878b. Synonymy Wood 1982b.
guanaguatensis Duges 1887. Synonymy Wood 1983a.
hubbardi Hopkins 1915b. Synonymy Schedl 1952k.

schwarzi Hopkins 1915b. Synonymy Bright 1968b.
rileyi Hopkins 1915b. Synonymy Bright 1968b.
grenadensis Hopkins 1915b.Synonymy Wood 1972e.
silvestris Beeson 1929. Synonymy Wood 1989.
vagabundus Schedl 1948f. Synonymy Wood 1972e.
granularis Schedl 1950g. Synonymy Wood 1989.

Distribution. Africa, Asia, Australia, Pacific Islands (Hawaii), South America, North America: Antilles, Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, United States: Florida.

Notes. This species, along with *Xyleborus perforans* (Wollaston), *Xyleborus pfeili* Ratzeburg, and to a lesser extent *X. pubescens* and *X. intrusus*, form a morphologically-similar and likely closely-related group. Wood and Bright (1992) state that *X. perforans* and *X. pfeili* are doubtfully distinct from *X. volvulus*, and some of the records of *X. volvulus* from southeast Asia and the Pacific, may refer to *X. perforans.* All the species in this group have widely spaced, pointed tubercles on declivital interstriae 1 and 3, and to varying degrees on the lateral interstriae. *Xyleborus pubescens* and *X. intrusus* are distinguished from others by the steeper declivity and the rounded posterolateral declivital margin. In the United States, *X. volvulus* has only been found in southern Florida. Recently, specimens fitting the description of *X. perforans* (slightly smaller and lighter in color), from southern Florida (Palm Beach Co., West Palm Beach, 20-IX-2003, S. Krantz, ex: ethanol-baited Lindgren funnel trap) were seen by R.J.R.; however, because the differences between these species, and their validity is in question, they are currently recognized as *X. volvulus.* More detailed work on the morphology and genetics of this complex is needed.

Xyleborus pfeili (Ratzeburg) 1837 (*Bostrichus*)
(Fig. 36)

Syntypes female; "Luneburgschen und in Bayern"; not located.
alni Mulsant and Rey 1856. Synonymy Hagedorn 1910d.
vicarious Eichhoff 1875. Synonymy Schedl 1963j.
adumbratus Blandford 1894d. Synonymy Schedl 1963j.

Distribution. Africa, Asia, Europe, North America (introduced): Canada: British Columbia; United States: Maryland, Oregon.

Notes. The first report of this Old World species in North America was in Maryland by Vandenberg et al. (2000). Mudge et al. (2001) also reported it from Oregon. It is very similar in appearance to *X. volvulus*, but is larger, much darker in color, and the posterior end of declivital interstriae 1 is distinctly elevated. As mentioned above, Wood and Bright (1992) suggest that this species may be a synonym of *X. volvulus.* Brockerhoff et al. (2003) state that previous records listing this species as established in New Zealand are incorrect.

Xyleborus californicus Wood 1975b

Holotype female; Palo Alto, CA; CAS, San Francisco.

Distribution. North America (introduced): United States: Alabama, Arkansas, California, Delaware, Florida, Kansas, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia, Washington.

Notes. When Wood (1975) described this species from California, he stated that it is not related to any North American species and is likely introduced from another area. It is now known to be native to northern Palearctic (Vandenberg et al. 2000). It has since been found in Oregon and Washington (Mudge et al. 2001), and several Mid-Atlantic and southeastern states (Vandenberg et al. 2000, Rabaglia 2001). M. Mandelshtam (personal communication) indicates that this species is very similar to, and may be a synonym of *X. bodoanus* Reitter (=*X. punctulatus* Kurenzov) from northeastern Russia.

New State Record. Kansas, Crawford, County, 2 miles west of Pittsburgh, 9-V-2003, Lindgren funnel trap, G. A. Salsbury, coll., Bourbon County, 9 miles southwest of Ft. Scott, 26-V-2004, flight intercept trap, G. A. Salsbury, coll. (all specimens deposited in Kansas State University Collection, Manhattan, KS).

Xyleborus pelliculosus Eichhoff 1878b
(Fig. 21)

Syntypes female; Japan; Hamburg Museum, lost.

Distribution. Asia, North America (introduced): United States: Delaware, Maryland, Pennsylvania, Rhode Island, Tennessee, Virginia.

Notes. This Asian species was first found in North America in Maryland and Pennsylvania (Atkinson et al. 1990), and has since been reported in several other eastern states (Rabaglia and Valenti 2003; R.J.R., unpublished data). It is similar to *X. starki* Nunberg from eastern Russia (M. Knizek, personal communication), and several specimens from the United States seem very similar to *X. starki.* As stated above, this species and *X. californicus* have an antennal club more like *Cyclorhipidion* than *Xyleborus*, but following Wood and Bright (1992) are herein placed in *Xyleborus.*

New State Record. Maine, York County, Sanford, 12-V-2004, exotic bark beetle funnel trap. Rhode Island, Washington Co., Richmond, 1 mile northwest Hillsdale, VIII-1995, C. J. Raithel coll.

Xylosandrus Reitter 1913a

Type species; *Xyleborus morigerus* Blandford.
Apoxyleborus Wood 1980c. Synonymy Wood 1984b.

There are ≈50 species in this predominately Asian genus as it is currently recognized. Four of the five species which now occur in North America are of Asian origin. An additional species, *X. morigerus* (Blandford) has been widely distributed through commerce, and Wood (1977) states that it was com-

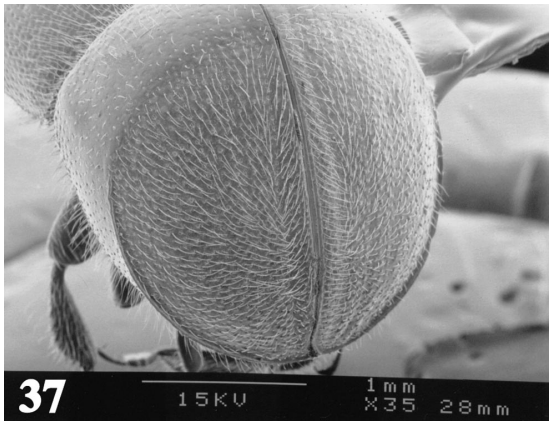

Fig. 37. *Xylosandrus mutilatus* (Blandford), elytral declivity.

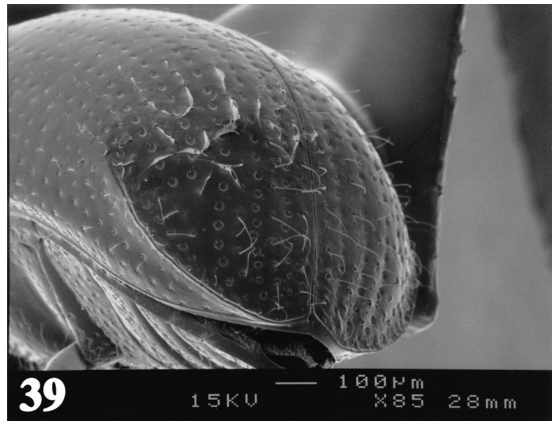

Fig. 39. *Xylosandrus germanus* (Blandford), elytral declivity.

monly intercepted at ports-of-entry in Arizona, California, and New Jersey. Although it is not currently known to be established in the United States (and not treated herein), it is now established in Central America.

The widely separated fore coxae are used to distinguish the genus from other Xyleborina, however, on a worldwide basis this character is somewhat variable.

The non-native species of *Xylosandrus* currently found in North America are among the most aggressive and damaging species in the tribe. In coastal, southeastern United States, *X. compactus* attacks healthy twigs of trees and shrubs (Solomon 1995). Both *X. germanus* and *X. crassiusculus* are capable of attacking healthy stems and trunks of trees and causing tree mortality.

Key to Females of the Species of *Xylosandrus*, North of Mexico

1. Declivity without punctures, surface granulate, dull; body length longer than 2.3 mm (Figs. 37 and 38) 2
   –Declivital striae with punctures clearly impressed, in rows; declivital surface shining, granules, if present, in sparse rows; body length <2.3 mm (Figs. 39 and 40) 3
2 (1). Body very stout, elytra shorter than pronotum; declivity steep, with a slightly raised carina around bottom three-fourths, declivital interstriae apparent as faint rows of granules; body length larger than 3 mm (Fig. 37) . . . . . 1. *mutilatus* (Blandford)
   – Body less stout, elytra longer than pronotum; declivity more sloping, without carina, declivital striae obsolete, declivital surface dull, with dense, confused, uniformly distributed granules; body length <3 mm (Fig. 38) . . . . . 2. *crassiusculus* (Motschulsky)
3 (1). Larger, 2.0–2.3 mm; strial setae on declivity entirely obsolete; declivital striae at least feebly impressed, interstriae very slightly convex (Fig. 39) . . . . . 3. *germanus* (Blandford)

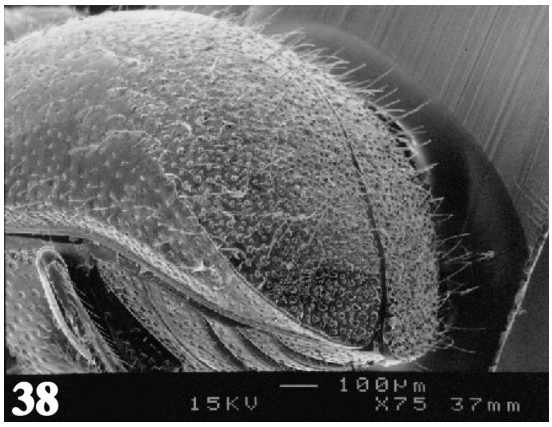

Fig. 38. *Xylosandrus crassiusculus* (Motschulsky), elytral declivity.

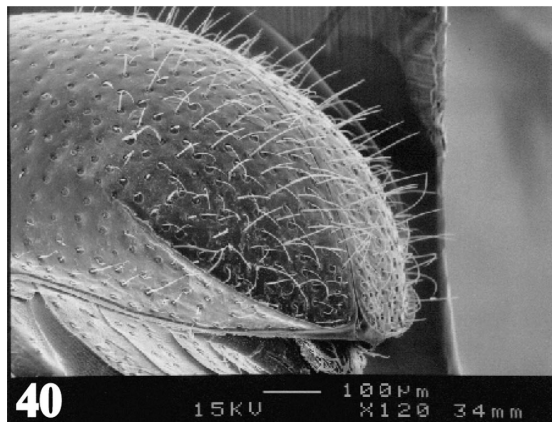

Fig. 40. *Xylosandrus compactus* (Eichhoff), elytral declivity.

– Smaller, 1.7 mm or less; strial setae on declivity present, at least one-third as long as those on interstriae; declivital striae not impressed, interstriae flat (Fig. 40) 4

4 (3). Elytra almost evenly arched from middle of disc to apex; setae on pronotal disc more generally distributed, slightly more abundant on a transverse row in median area at base; posterior portion of pronotum shining . . . . . 4. *compactus* (Eichhoff)

– Elytra more abruptly arched from base of declivity to middle of declivity; pronotal disc glabrous except for a dense, median tuft of setae extending from base about half distance to summit; posterior portion of pronotum reticulate . . . . . 5. *zimmermanni* (Hopkins)

Xylosandrus mutilatus (Blandford) 1894d (*Xyleborus*)
(Fig. 37)

Holotype female; Japan; BMNH, London.
sampsoni Eggers 1930d. Synonymy Wood 1989.
banjoewangi Schedl 1939f. Synonymy Kalshoven 1960d.

Distribution. Asia, North America (introduced): United States: Florida, Mississippi, Texas.

Notes. The first report of this Asian species in North America is by Schiefer and Bright (2004). It seems to be well established in Mississippi based on the thousands of specimens collected in traps there. Schiefer and Bright (2004) also state that two specimens were collected from a trap in Lake Placid, Highlands County, FL, in 2002. Specimens have been recently collected at several east Texas localities (Cognato et al. 2006). This is a relatively large, distinctive species that is easily distinguished from other xyleborines. Its habits and fungal associates have been well documented in Japan by Kajimura and Hijii (1992).

Xylosandrus crassiusculus (Motschulsky) 1866 (*Phloeotrogus*)
(Fig. 38)

Syntypes female; Ceylon; IZM, Moscow.
semiopacus Eichhoff 1878b. Synonymy Wood 1969c.
semigranosus Blandford 1896b. Synonymy Schedl 1959a.
ebriosus Niisima 1909. Synonymy Choo 1983.
bengalensis Stebbing 1908. Synonymy Beeson 1915.
mascarenus Hagedorn 1908. Synonymy Eggers 1923a.
okoumeensis Schedl 1935f. Synonymy Schedl 1959a.
declivigranulatus Schedl 1936f. Synonymy Schedl 1959a.

Distribution. Africa, Asia, Pacific Islands (introduced) (Hawaii), North America (introduced): United States: Alabama, Delaware, Florida, Georgia, Indiana, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oregon, South Carolina, Tennessee, Texas, Virginia.

Notes. This non-native species is easily distinguished from other xyleborines in North America by the lack of declivital striae and the numerous, confused declivital granules giving the declivity a dull appearance. It has been reported to attack healthy and newly transplanted trees and shrubs causing significant economic loss.

New State Record. Kansas, Anderson County, 28-IV-2003, Lindgren funnel trap, S. C. White, coll., Butler County, 2-V-2003, Lindgren funnel trap, K. O. Bell, coll., Bourbon County, 8-V-2003, Lindgren funnel trap, G. A. Salsbury, coll., Douglas County, 2.5 miles northwest of Baldwin, 9-VII-2003, Lindgren funnel trap, S. C. White, coll., Crawford County, 2.5 miles west of Pittsburgh, 1-8-IV-2004, flight intercept trap, Franklin County, 30-VI-2004, Lindgren funnel trap, S. C. White, coll. (all specimens deposited in Kansas State University Collection, Manhattan, KS).

Xylosandrus germanus (Blandford) 1894d (*Xyleborus*)
(Figs. 5, 39)

Syntypes; Japan; BMNH, London.
orbatus Blandford 1894d. Synonymy Choo 1983.

Distribution. Asia, Europe (introduced), North America (introduced): Canada: British Columbia, Ontario, Quebec; United States: Alabama, Connecticut, Delaware, Florida, Illinois, Indiana, Kentucky, Massachusetts, Maryland, Mississippi, North Carolina, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Islands, South Carolina, Tennessee, Virginia, West Virginia.

Notes. This Asian species has been in North America since at least 1930, and now occurs across the northern United States and southern Canada. It is occasionally as aggressive as *X. crassiusculus*, but usually attacks dying or recently cut material (Solomon 1995). It is readily distinguished from other *Xylosandrus* by its size, lack of strial setae and shining declivity.

New State Records. Maine, Cumberland County, Portland, 12-V-2004, exotic bark beetle survey funnel trap.

Massachusetts, Bristol Co., Dartmouth, 22-VI-1994, D. Fernandez coll.

Rhode Island, Providence Co., Lincoln Limerock Preserve, 1 mile NW Limerock Ctr., 25-V-1998, R. W. Enser coll.

Xylosandrus compactus (Eichhoff) 1875 (*Xyleborus*)
(Fig. 40)

Syntypes female; Japan; Hamburg Museum (lost). 1 syntype Schedl Collection NHMW, Wien.
morstatti Hagedorn 1912. Synonymy Murayama and Kalshoven 1962.

Distribution. Africa, Asia, Pacific Islands (introduced) (Hawaii), New Zealand (introduced), South America, North America (introduced) Antilles, United States: Alabama, Florida, Louisiana, Mississippi, North Carolina, Texas.

Notes. This non-native species is distinguished from *X. germanus* by the smaller size and the presence of strial setae on the declivity. Commonly known as the black twig borer, it aggressively attacks healthy twigs of living trees and shrubs in the southeastern United States, and causes significant economic impact.

New State Record: North Carolina, Currituck Co., 30-VIII-2000, Lyle Buss coll., ex: sweetgum twig.

Xylosandrus zimmermanni (Hopkins) 1915b (*Anisandrus*)

Holotype female; Biscayne, FL; USNM, Washington.

Distribution. South America, North America: Guatemala, Costa Rica, Mexico, United States: Florida.

Notes. In the United States, this species has been found only in tropical Florida. Wood and Bright (1992) suggest that it may be a junior synonym of *X. curtulus* (Eichhoff), which occurs in the Antilles, Central America, and South America.

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