

A SYNOPSIS OF HAWAIIAN XYLEBORINI (COLEOPTERA: SCOLYTIDAE)¹

By G. A. Samuelson²

Abstract. The first post *Fauna Hawaiiensis* synopsis of Hawaiian Xyleborini is presented, with all of the species of the tribe known from the islands keyed and treated in text. Most species are illustrated. Twenty-four species of *Xyleborus* are recognized and of these, 18 species are thought to be endemic to Hawaiian islands and 6 species adventive. Not counted are 3 names applied to male-described endemics which are likely to be associated with known females later. Five species of *Xyleborus* are described as new and lectotypes are designated for 11 additional species. Males are described for 7 species of *Xyleborus* hitherto known only from females. One adventive species of *Xyleborinus* and 3 adventive species of *Xylosandrus* are known to the islands, but 1 of the latter may not have established.

The Xyleborini make up a large and interesting part of the Hawaiian scolytid fauna. This tribe contains both endemic and recently adventive species in the Hawaiian Is, with 3 genera represented. The endemic xyleborines all belong to *Xyleborus* Eichhoff and they seem to be the only members of the Scolytidae to have evolved to any extent in the islands, though not a great number of species has been produced. Presently treated are 18 species, of which most are certainly endemic, and 6 adventive species. *Xyleborinus* Reitter is represented by 1 adventive species in the Hawaiian Is. *Xylosandrus* Reitter is represented by 3 adventive species, but 1 appears not to have established in Hawaii.

Type material in the British Museum (Natural History) (BMNH) was examined during my stay in London in 1974, with occasional specimens borrowed for further study more recently. This important collection contains types of *Xyleborus* stemming from Blackburn & Sharp's (1885) studies and from R. C. L. Perkins' (1900) treatment in *Fauna Hawaiiensis*.

Material was studied from the following collections in Honolulu: Bishop Museum (BISHOP), Hawaii State Department of Agriculture (HSDA), Institute of Pacific Islands Forestry (IPIF), and University of Hawaii (UH). Specimens, including some paratypes, are deposited in 5 additional collections: California Academy of Sciences, San Francisco (CASC); Canadian National Collection, Biosystematics Research Institute, Ottawa (CNCI); Naturhistorisches Museum Wien (NMW); National Museum of Natural History, Washington (NMNH); and S. L. Wood Collection, Brigham Young University, Provo (SLWC).

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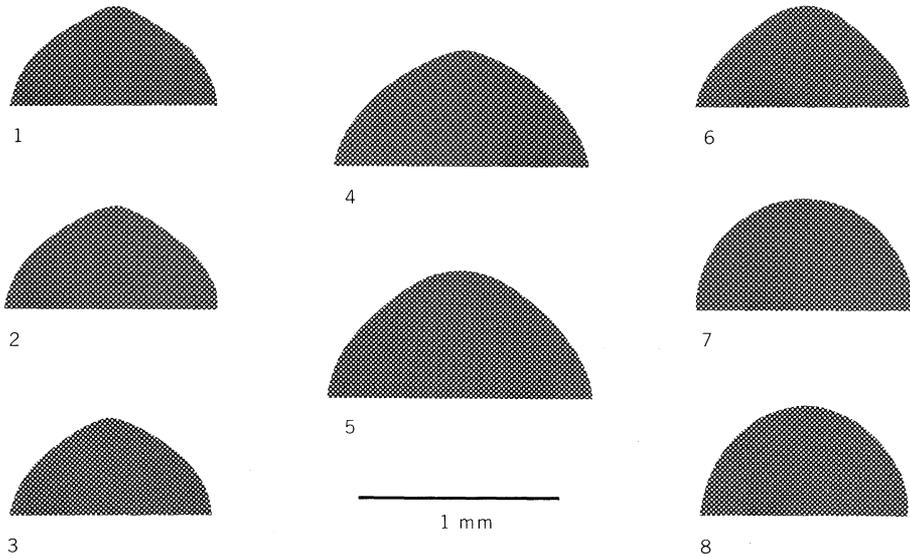


FIG. 1-8. Transverse profile of pronotum, showing discal summit (profile of the summit region is classed as angulate or subangulate in FIG. 1-4 and convex in FIG. 5-8): 1, *Xyleborus dubiosus*; 2, *nubilus*; 3, *rugatus*; 4, *tantalus*; 5, *hiiaaka*; 6, *hawaiiensis*; 7, *lanaiensis*; 8, *vulcanus*.

General notes. Keys are designed for use with a dissecting microscope of moderate power (50 \times) fitted with an ocular micrometer; an ocular micrometer is necessary, as some couplets rely on careful measurements for body proportions. Measurements are made with the beetle on a horizontal plane; in keys and descriptions, *body length* and *body breadth* are rounded to the nearest 0.05 mm. In citations of type material, δ φ symbols are used for designating sexes; in citations of nontype material, numbers without symbols represent females and numbers with δ symbols represent males—the frequency of males is so low in collections as to make this format practical. Full collection data are reported for primary types and other members of type-series examined; nontype material may have collection data slightly to greatly abbreviated, depending on the species. Synonymies for the adventive species are not necessarily complete, but all synonyms and combinations relating to Hawaiian records are included. Genera are treated in text as ordered in the key, with respective species then treated alphabetically. An annotated checklist of Hawaiian Xyleborini concludes the text.

The Xyleborini may be separated from other members of the Scolytinae (Hylesininae not yet represented in Hawaii) by the following combination of characters (cf. Wood 1978): metepisternum visible throughout length, with slightly more than its dorsal $\frac{1}{2}$ covered by elytron (with elytra in locked position); antennal club obliquely truncate, distinctly thickened basally and with surface densely pubescent only on 1 side; meso- and metatibia dilated to beyond middle before narrowing to apex, each with outer margin armed by a row of numerous small teeth mostly of equal size.

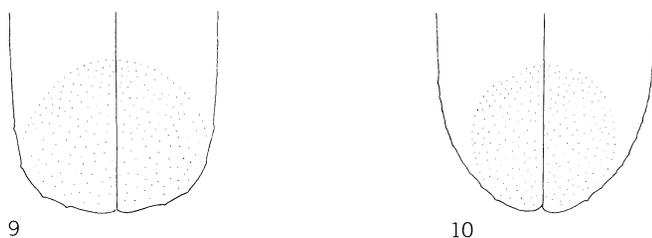


FIG. 9-10. Elytral apices of *Xyleborus* in dorsal view (semidiagrammatic): **9**, *dubiosus*, showing relatively abrupt curvature of elytral apex, with greatest curvature well behind declivital summit (declivital face stippled); **10**, *tantalus*, showing relatively gradual curvature of elytral apex, with curvature commencing near point of declivital summit.

These are mycophagous, woodboring scolytines, which may exhibit pronounced sexual dimorphism (see *Xyleborus* key). In the Hawaiian Is, only the Xyleborini and represented Dryocoetini [*Coccotrypes* Eichhoff (sensu Wood 1978) with several adventive species] have the antennal club obliquely truncate; however, in the latter, the habits are not woodboring and the meso- and metatibia are gradually broadened to the preapex, each with outer margin armed by fewer, coarser teeth.

KEY TO GENERA OF HAWAIIAN XYLEBORINI

1. Procoxae well separated: either with distance separating procoxae greater than [*compactus*, *morigerus*] or distinctly less than [*crassiusculus*] distance separating mesocoxae; body form robust, commonly 0.44–0.52× as broad as long; elytral declivital slope relatively gradual and commencing before middle of elytron **Xylosandrus**
- Procoxae contiguous or if distinctly separated, then body form more slender, ca. 0.37–0.40× as broad as long [*Xyleborus ignobilis*]; body form otherwise very slender to robust; elytral declivital slope usually relatively abrupt and commencing well behind middle of elytron, but rather gradual in some *Xyleborus* [*fornicatus*, *interjectus*, *spinulosus*] 2
2. Scutellum conical, not as distinct as a flattened plate [1 widespread species, *saxeseni*, adventive to the Hawaiian Is: ♀: body form moderately slender, about 0.34× as broad as long; elytral apex briefly truncate at extremity, bordered by small tubercles slightly exceeding curvature of margin; dorsum orange-testaceous to fuscous; length 1.95–2.35 mm; ♂: pronotum with anterior margin entire, convex; pronotal surface convex; length 1.55–1.7 mm] **Xyleborinus**
- Scutellum flattened, distinct as a ± triangular plate **Xyleborus**

Genus *Xylosandrus* Reitter

Three species are recorded for the Hawaiian Is; all are adventive. Males are not keyed; they are distinctly smaller and less cylindrical than females.

KEY TO SPECIES OF HAWAIIAN *Xylosandrus*

♀

1. Body length commonly <2.0 mm [range 1.55–1.9 mm in spms examined]; elytral striae evident apically; elytral declivity with interstices shining to subshining, smooth to alutaceous 2
 Body length commonly >2.0 mm [2.2–2.75 mm]; elytral striae not evident apically; elytral declivity dull with sculpture of numerous small granules; dorsum orange-fuscous with elytral declivity reddish ... (paleotropical, reaching Australia, Pacific, and N America; common in Hawaiian Is) **crassiusculus**
2. Elytron in lateral profile rather evenly and gently convex along middle with declivital slope gradually commencing before middle and then continuing to apical 0.25 where curvature becomes slightly steeper to apex; body slightly narrower, about 0.48× as broad as long; dorsum orange-fuscous to dark fuscous; length 1.55–1.8 mm ... (paleotropical, reaching Japan, Pacific, and N America; common in Hawaiian Is) **compactus**
 Elytron in lateral profile abruptly arched postbasally with declivital slope rather suddenly commencing before middle and thence rather evenly convex to apex; body slightly stouter, about 0.52× as broad as long; dorsum orange-testaceous to red-fuscous; length 1.6–1.9 mm ... (Madagascar, S Asia, Australia, Pacific, and Central to S America; doubtfully established in Hawaiian Is) **morigerus**

Xylosandrus compactus (Eichhoff)

FIG. 11

- Xyleborus compactus* Eichhoff, 1875, Ann. Soc. Entomol. Belg. **18**: 201 (Japan; type in BMNH); 1878, Mém. Soc. R. Sci. Liège ser. 2, **8**: 328 (Japonia Asiatica).—Blandford, 1894, Trans. Entomol. Soc. London **1894**: 107 (further description).—Kajiwara, 1964, Proc. Hawaii. Entomol. Soc. **18**(3): 331 (Oahu, *Persea americana*).—Murayama & Kalshoven, 1962, Entomol. Ber. Nederland **22**: 247 (*morstatti* synonymized).
Xylosandrus compactus: Browne, 1963, Entomol. Ber. Nederland **23**: 55; 1974, Commonw. For. Rev. **53**: 65 (Fiji, + general distribution).—Krauss, 1965, Proc. Hawaii. Entomol. Soc. **19**(1): 6 (Oahu, Isabella grape).—Kim, 1965, *ibid.* **19**(1): 12 (Oahu, *Dendrobium* hybrids, *Epidendrum*, *Vanda joaquim*, and *Asparagus myriocladus*), 24 (Oahu, *Cattleya*).—Davis & Krauss, 1965, *ibid.* **19**(1): 88, table (braconid parasite released on Oahu and Hawaii to control this borer).—Mitchell & Davis, 1966, *ibid.* **19**(2): 125 (Oahu, *Prosopis*).—Davis, 1968, *ibid.* **20**(1): 3 (Hawaii, 20 hosts listed), 7 (Oahu, further hosts including *Coffea arabica*).—Funasaki & Yoshioka, 1968, *ibid.* **20**(1): 7 (Hawaii, *Coffea arabica* and various orchids listed).—Davis, 1969, *ibid.* **20**(2): 262 (Kauai, orchids and other hosts listed), 277 (Oahu, *Clidemia*), 279 (Oahu: Mt Kaala, 8 hosts listed including 5 endemic species).—Funasaki, 1969, *ibid.* **20**(2): 282 (Maui, coffee).—Mitchell, 1970, *ibid.* **20**(3): 479 (Oahu, *Annona diversifolia* seeds).—Gagné, 1971, *ibid.* **21**(1): 19 (Oahu, *Drypetes phyllanthoides*); 1972, *ibid.* **21**(2): 161 (Oahu, *Ilex anomala*); 1976, *ibid.* **22**(2): 169 (Oahu, *Cryptocaria oahuensis*).—Mau, 1976, *ibid.* **22**(2): 171 (Molokai, kiawe).—Beaver, 1976, Bull. Entomol. Res. **65**: 543 (Samoa, hosts).—Wood, 1977, Great Basin Nat. **37**(1): 68, 74 (probable origin, introductions).—Fujii, 1978, Proc. Hawaii. Entomol. Soc. **22**(3): 394 (Oahu, *Clidemia hirta*, *Wikstroemia*, *Eugenia cumini*), 398 (Oahu, *Santalum freycinetianum*), 406 (Oahu, *Clidemia hirta*).—Mau, 1978, *ibid.* **22**(3): 401 (Lanai, kiawe).—Beaver & Browne, 1978, Orient. Insects **12**(4): 614 (Penang, + general distribution).
Xyleborus morstatti Hagedorn, 1912, Entomol. Bl. **8**: 37, Fig. 3a–c (Deutsch-Ostafrika).—Beeson, 1930, Indian For. Rec. **14**(10): 249 (India, hosts).—Paine, 1934, Agric. J. Fiji **7**: 39 (Fiji, host).—Beeson, 1938, J. Fed. Malay States Mus. **18**(2): 293 (list).—Schedl, 1942, Mitt. Münchner Entomol. Ges. **32**: 163 (Fiji);

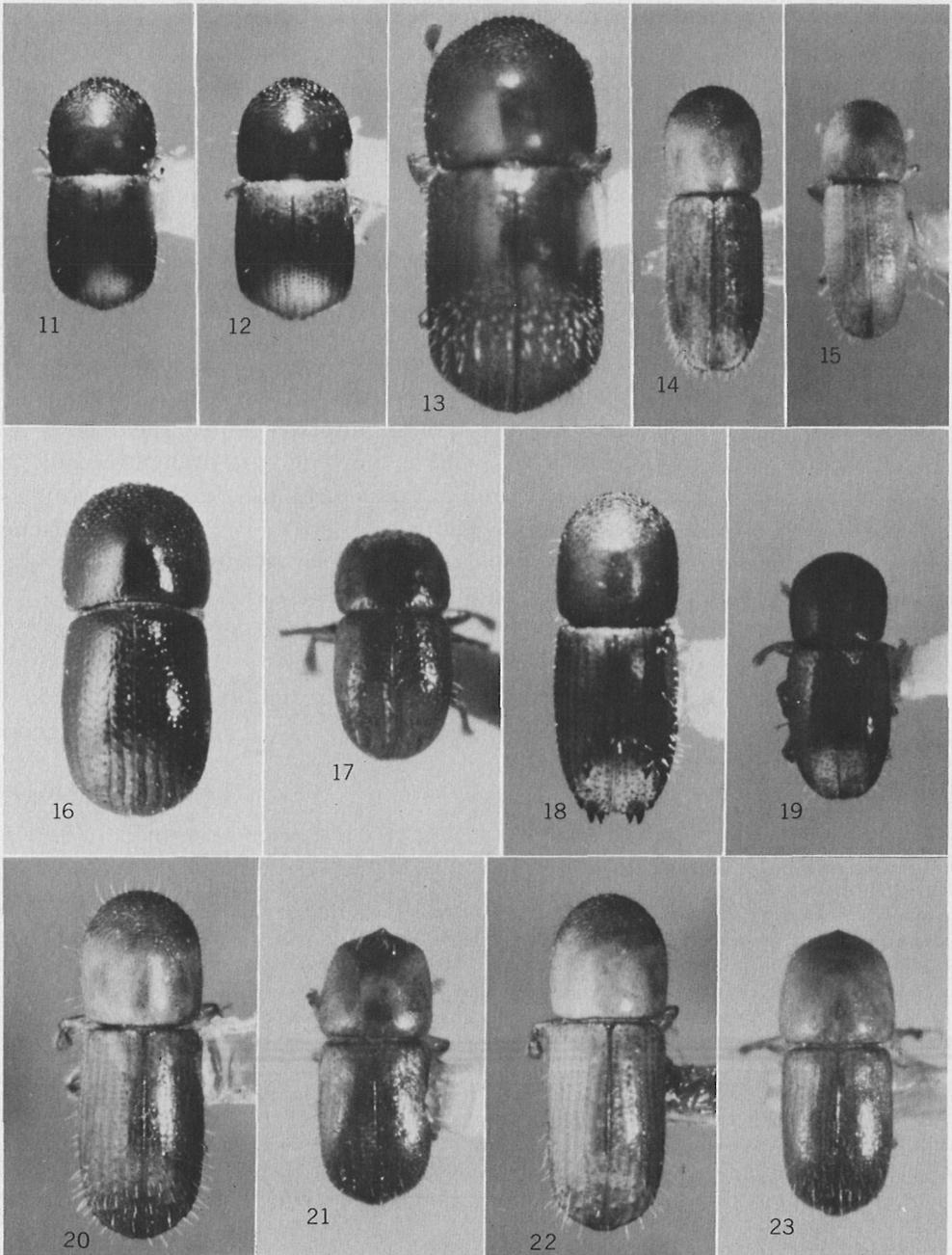


FIG. 11-23. Hawaiian Xyleborini, dorsal view. 11-13, *Xylosandrus*: 11, *compactus* ♀; 12, *morigerus* ♀; 13, *crassiusculus* ♀. 14-15, *Xyleborinus*: 14, *saxeseni* ♀; 15, *saxeseni* ♂. 16-23, *Xyleborus*: 16, *fornicatus* ♀; 17, *fornicatus* ♂; 18, *spinulosus* ♀; 19, *spinulosus* ♂; 20, *affinis* ♀; 21, *affinis* ♂; 22, *perforans* ♀; 23, *perforans* ♂. Figures to same scale.

1950, Bishop Mus. Occas. Pap. 20(3): 39 (Fiji, host).—Davis, 1963, Proc. Hawaii. Entomol. Soc. 18(2): 197 (Oahu, hosts), 323 (list).

Material examined. OAHU: 4, Honolulu, Nuuanu, 16.VI.1931, ex elderberry from Singapore, H.L. Lyon (HSDA); 23, Kailua, I.1962, *Vitex*, C.J. Davis (BISHOP); 4, Waianae Mts, nr Puu Pane, 425 m, VII.1970, in twigs of *Drypetes phyllanthoides*, W.C. Gagné (BISHOP); 18, Koolau Ra. [Kahaluu Vall], Ahuimanu Road, 100–120 m, ex twigs *Cestrum nocturnum*, G.A. Samuelson (BISHOP); 2, Kawaiolo Forest Res., Peahinaia Trail, 500 m, X.1974, in *Osmanthus sandwicensis* twigs, Gagné (BISHOP); many, Mokuleia, 620 m, X.1975 (emerged XI.1975), ex branches *Myrsine*, Samuelson (BISHOP); 5♂, same data (BISHOP). MOLOKAI: 2, Palaau, VI.1974, keawe twigs, R. Mau (HSDA). HAWAII: 9, Wahaula, Hawaii Volcanoes Natl Park, sea level, X.1975, ex twig *Diospyros*, H-75-17, Davis (BISHOP).

The remaining and extensive holdings of this species in the HSDA collection are not enumerated here. Much of the HSDA material had been cited elsewhere (see bibliographic citations above), but the host plant genera listed below are largely taken from that material.

Distribution. Paleotropical, reaching Japan, Pacific, and N America.

Hosts. Hawaiian records are considerable, covering many families of plants, and involve both introduced and native hosts. The bulk of the host-associated beetles is deposited in the HSDA collection. New records continue to be reported. Host genera so far recorded for the Hawaiian Is include *Acacia*, *Albizia*, *Abutilon*, *Aleurites*, *Anacardium*, *Andira*, *Annona*, *Anthurium*, *Antidesma*, *Araucaria*, *Asparagus*, *Buddleja*, *Byrsonima*, *Callicarpa*, *Casimiroa*, *Cassia*, *Cattleya*, *Cestrum*, *Citrus*, *Clidemia*, *Coffea*, *Coprosma*, *Cordia*, *Croton*, *Cryptocarya*, *Dendrobium*, *Diospyros*, *Drypetes*, *Epicattleya*, *Epidendrum*, *Eranthemum*, *Eucalyptus*, *Eugenia*, *Euphoria*, *Flacourtia*, *Flindersia*, *Fraxinus*, *Gouldia*, *Graptophyllum*, *Hibiscus*, *Ilex*, *Indigofera*, *Inga*, *Inocarpus*, *Jasminum*, *Lantana*, *Leucaena*, *Liquidambar*, *Litchi*, *Macadamia*, *Malvastrum*, *Melaleuca*, *Melastoma*, *Melia*, *Melicoccus*, *Melochia*, *Murraya*, *Myrsine*, *Olmediella*, *Osmanthus*, *Passiflora*, *Pelea*, *Perrottetia*, *Persea*, *Pipturus*, *Pithecellobium*, *Pittosporum*, *Prosopis*, *Rollinia*, *Rubus*, *Samanea*, *Sambucus*, *Santalum*, *Schinus*, *Solanum*, *Spondias*, *Stachytarpheta*, *Swietenia*, *Syncarpia*, *Tabebuia*, *Theobroma*, *Toona*, *Tristania*, *Vanda*, *Vinca*, *Vitex*, *Vitis*, and *Wikstroemia*.

Remarks. The first occurrence of *Xylosandrus compactus* in the Hawaiian Is appears to be VI.1931 when H. L. Lyon collected specimens in Nuuanu from elderberry imported from Singapore. No further signs of the borer were noted then and Lyon's specimens remained undetermined until the present study. Thirty years later, this species was again collected on Oahu when specimens were taken by C. J. Davis from a variety of hosts in Kailua. This time (XI.1961), the species was obviously established and spreading. In the following years, this borer reached neighboring islands, apparently in the following order: Kauai by VII.1962, Hawaii by XII.1966, Maui by X.1968, Molokai by VI.1974, and Lanai by IV–V.1975. This borer is known from a broad spectrum of hosts throughout the tropics and subtropics and has invaded the native Hawaiian forests, becoming common on numerous kinds of endemic plants. Agriculturally important plants grown in Hawaii or elsewhere, such as *Coffea arabica*, *Macadamia integrifolia*, *Persea americana*, and *Theobroma cacao*, are attacked by this

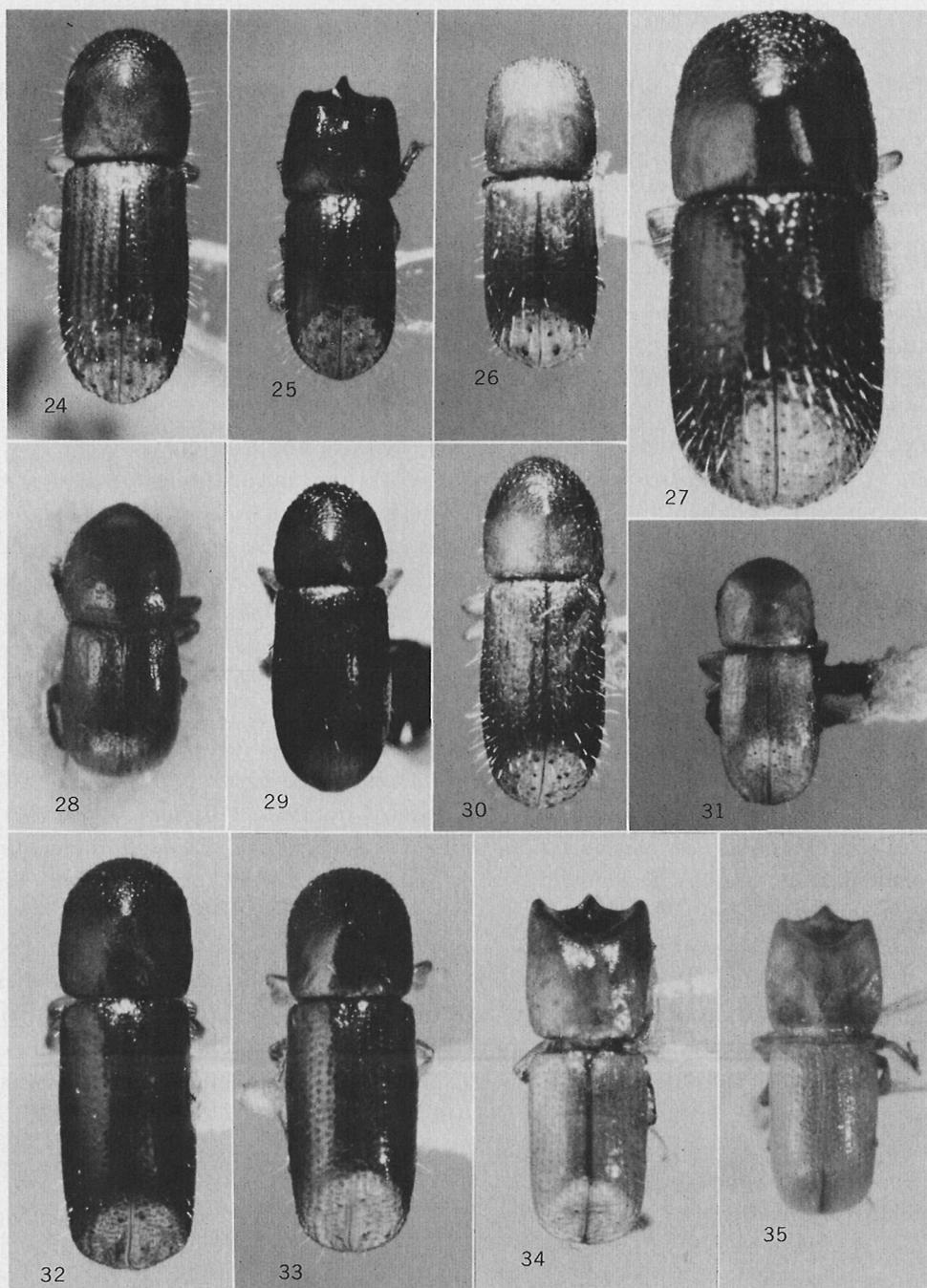


FIG. 24-35. Hawaiian *Xyleborus*, dorsal view. 24, *ferrugineus* ♀; 25, *ferrugineus* ♂; 26, *similis* ♀; 27, *interjectus* ♀; 28, *agamus* ♂; 29, *ignobilis* ♀; 30, *rugatus* ♀; 31, *rugatus* ♂; 32, *nubilis* ♀; 33, *dubiosus* ♀; 34, *dubiosus* ♂ (major); 35, *dubiosus* ♂ (minor). Figures to same scale.

borer. Many orchids and a great variety of other ornamentals are attacked as well and so are certain plant pests like *Clidemia hirta* and *Lantana camara*.

This species differs from *morigerus* (Blandford) by having the elytral disc flatter from the base to the apical 0.25 and the body slightly narrower.

Xylosandrus crassiusculus (Motschulsky)

FIG. 13

Phlaeotrogus crassiusculus Motschulsky, 1866, Bull. Soc. Imp. Nat. Moscou **2**: 403 (Ceylon: Montagnes de Nura-Ellia; *Phlaeotrogus*).

Phloeotrogus crassiusculus: Gemminger & Harold, 1872, Cat. Coleopt. **9**: 2692.—Wood, 1969, Great Basin Nat. **29**(3): 119 (*Xyleborus semiopacus* Eichhoff synonymized).

Xyleborus semiopacus Eichhoff, 1878, Mém. Soc. R. Sci. Liège ser. 2, **8**: 334 (Nipon).—Blandford, 1894, Trans. Entomol. Soc. London **1894**: 107 (Japan, Hong Kong).—Beeson, 1930, Indian For. Rec. **14**(10): 257.

Xyleborus semigranosus Blandford, 1896, Trans. Entomol. Soc. London **1896**: 211 (Sumatra, from tobacco).—Beeson, 1929, Insects Samoa **4**(4): 236 (Samoa); 1930, Indian For. Rec. **14**(10): 255 (India, Burma, Andamans, hosts); 1938, J. Fed. Malay States Mus. **18**(2): 293 (list).—Van Zwaluwenburg, 1956, Proc. Hawaii. Entomol. Soc. **16**(1): 9 (Hawaii: Hilo, ex monkeypod wood).—Wood, 1960, Insects Micronesia **18**(1): 52 (key), 57, fig. 10d (Palau).

Xyleborus crassiusculus: Beaver, 1976, Bull. Entomol. Res. **65**: 539 (Samoa, hosts).—Beaver & Browne, 1978, Orient. Insects **12**(4): 607 (Penang, hosts, general distribution).

Xylosandrus crassiusculus: Wood, 1977, Great Basin Nat. **37**(1): 68, 74 (probable origin, introductions).

Material examined. KAUAI: 2, Wailua, XII.1956, light trap, C.A. Isenberg (BISHOP); 5, same loc., VIII.1966, ex *Eucalyptus robusta*, S. Au (HSDA). OAHU: 2, Haleauau Val, VII.1954; 3, Halona Val, V.1955, XI.1957, *Sapindus*; 2, nr Punaluu, XII.1955, *Acacia koa*; 1, Puu Kaneoha, II.1960; 3, Puu Pane, Waianae Mts, 2000 ft [610 m], III.1957, *Sapindus*; 9, Wahiawa, XI.1954, II.1955, V.1955, XII.1955; 1, same loc., X.1957, kukui; 2, same loc., VII.1958, light trap; 2, same loc., IV.1960, *Acacia koa*; 2, Waianae Mts, VII.1954, *Sapindus* fruit; 2, same loc., I.1955, *Cordyline*, Christmas berry; 7, same loc., II.1955 (all by E.J. Ford Jr, BISHOP); 1, Ekahanui Gulch, SE of Puu Kaua, 670 m, X.1971, in *Ilex anomala*, W.C. Gagné (BISHOP); 15, Kahaluu, VIII.1963, ex litchi twigs, G. Funasaki (HSDA); 2, Koolau Ra. [Kahaluu Val], 100–120 m, VII.1976, ex *Acacia koa*, G.A. Samuelson (BISHOP); 16, Manoa Val, VII.1962, ex diseased litchi limb, J.W. Beardsley (HSDA); 31, same loc., VII.1962, ex dead litchi, W. Sa Ning (BISHOP, CNCI); 10, Poamoho Shelter, VI.1976, J.K. Fujii, N. Pekelo, R. Saito (BISHOP, IPIF); 2, Waianae Mts, II.1955, Ford (HSDA). MAUI: 3, Kaupakulua, VII.1970, ex litchi tree, N. Miyahira (HSDA); 10, Puakea, X.1968, ex *Acacia koa*, Miyahira (HSDA). HAWAII: 5, Captain Cook, XII.1964, ex *Poinciana*, C. Hammond (HSDA); 2, Hilo, V.1950, ex cut monkeypod, Davis (HSDA); 2, same loc., V.1953, in cut wood, monkeypod, Davis (HSDA); 4, same loc., X.1962, ex *Eucalyptus robusta*, R.E. Nelson (HSDA); 18, same loc., I.1965, ex *Litchi chinensis*, old branches, H. Yamayoshi & M. Oshiro (HSDA); 4, same loc., I.1967, ex litchi, Yamayoshi (HSDA); 1, Hilo Forest Res., Saddle area, nr Saddle Road, 670 m, VIII.1972, dead *Metrosideros*, GAS.1972. 37D, Samuelson (BISHOP); 9, same loc., Saddle area, IX, X.1972, ex BR.72.45 tree, BR.72.56A, -80, W.E. Ruffin (BISHOP); 11, same loc., 1–2 km S of Saddle Road, ca. 1200 m, X.1972, ex *Myrsine*, BR.1972.69, Ruffin (BISHOP); 3, same loc., nr Saddle Road, 610 m, XII.1976, *Metrosideros* acetone-heartwood extract on tanglefoot trap, R.P. Papp (BISHOP); 59, same loc., nr Saddle Road, 732 m, tanglefoot trap Site A-3, IV.1977–III.1978, Papp & R.F. Nagata (BISHOP); 6, Piionua nr Awehi Stream, 823 m, IV.1978, swarming, 1800 h, K. Adee (BISHOP).

Distribution. Tropical Africa, southern Asia, Japan, Korea, Philippines, Indonesia, Australia, New Guinea, Caroline Is, Samoa, Hawaiian Is, and N America.

Hosts. In Hawaii, host records include the following genera: *Acacia*, *Aleurites*, *Cordyline*, *Eucalyptus*, *Litchi*, *Metrosideros*, *Myrsine*, *Persea*, *Poinciana*, *Saccharum*, *Samanea*, *Sapindus*, and *Schinus*. Numerous hosts were reported by Beeson (1930: 255, 257)

from India and vicinity in the following genera: *Albizia*, *Artocarpus*, *Cedrela*, *Cinnamomum*, *Dillenia*, *Eugenia*, *Grevillea*, *Hevea*, *Holigarna*, *Hopea*, *Lagerstroemia*, *Leea*, *Mangifera*, *Saccharum*, *Shorea*, *Sterculia*, and *Terminalia*. Hosts in Samoa were discussed by Beaver (1976: 539) and included *Albizia*, *Cedrela*, *Leucaena*, *Macadamia*, and *Theobroma*.

Remarks. This adventive species first appeared on the island of Hawaii in 1950 and by the end of the decade it was obviously established on most of the windward islands. This borer attacks both monocots and dicots, including some agriculturally important host species; on Hawaiian islands, it has spread into native forest environments where its hosts include the important endemic trees *Acacia koa* and *Metrosideros collina polymorpha*.

This species is rather distinctive because of its larger body size combined with reddish color and granulate sculpture of the elytral declivity.

Xylosandrus morigerus (Blandford)

FIG. 12

Xyleborus morigerus Blandford, 1894, Insect Life **6**: 264 (Nova Guinea, in caulibus orchidum).—Beeson, 1929, Insects Samoa **4**(4): 233 (Samoa); 1930, Indian For. Rec. **14**(10): 249 (Ceylon, hosts).—Swezey, 1935, Proc. Hawaii. Entomol. Soc. **9**(1): 6 (Oahu, ex *Dendrobium superbiens*), 108 (list).—Beeson, 1938, J. Fed. Malay States Mus. **18**(2): 293 (list).—Schedl, 1942, Mitt. Münchner Entomol. Ges. **32**: 163 (Australien, Fiji, host); 1950, Bishop Mus. Occas. Pap. **20**(3): 39 (preceding cited); 1951, *ibid.* **20**(10): 136 (Samoa).—Wood, 1960, Insects Micronesia **18**(1): 51 (key), 53, fig. 9a (Mariana Is, Caroline Is).

Xylosandrus morigerus: Browne, 1963, Entomol. Ber. Nederland **23**: 55; 1974, Commonw. For. Rev. **53**: 66 (Fiji, + general distribution).—Beaver, 1976, Bull. Entomol. Res. **65**: 543 (Samoa, hosts).—Roberts, 1977, J. Nat. Hist. **11**: 269 (Fiji, hosts).—Wood, 1977, Great Basin Nat. **37**(1): 68, 74 (probable origin, introductions).—Beaver & Browne, 1978, Orient. Insects **12**(4): 614 (Penang, hosts, general distribution).

Material examined. OAHU: 12, [Honolulu] IX.1933, ex orchids from New Jersey, H.L. Lyon (BISHOP, HSDA); 3, Honolulu, I.1934, ex stems of *Dendrobium superbiens* imported from Australia, Lyon (HSDA); 1♂, same data (HSDA).

Distribution. Madagascar, southern Asia, Australia, Pacific islands, and Central to S America.

Hosts. Numerous. Hawaiian records are restricted to orchids from 2 instances, including *Dendrobium superbiens* imported from Australia. Beeson (1930: 249) recorded another dendrobium, *D. phalaenopsis*, from New Guinea and listed further hosts, presumably from Oriental and Pacific areas: coffee, cocoa, *Crotalaria anagyroides*, *Leucaena glauca*, *Schleichera trijuga*, *Swietenia mahagoni*, *S. microphylla*, *Tectona grandis*, and *Tephrosia vogelii*. Beaver (1976: 543) listed from the Samoan island Upolu *Albizia falcata*, *Albizia* sp., *Cedrela* sp., *Freycinetia hombronii*, and 9 unidentified rain forest trees. Roberts (1977: 269) discussed hosts from the Fijian island Viti Levu: *Swietenia macrophylla*, *Barringtonia* sp., *Ficus* sp., *Litsea* sp., and *Freycinetia storckii*.

Remarks. *Xylo. morigerus* is doubtfully established in the Hawaiian Islands. Beaver (1976) noted the distributional patterns of *compactus* and *morigerus* on Upolu, a Samoan island on which both species are established. There, some partitioning is apparent, with the former more common in cultivated areas and the latter more fre-

quent in the rain forest. On Hawaiian islands, *compactus* has become common in both cultivated and forested areas while *morigerus* has not been taken afield at all.

Genus *Xyleborinus* Reitter

One adventive species is known from the Hawaiian Is; it is treated below and is also diagnosed in the key to genera.

Xyleborinus saxeseni (Ratzeburg)

FIG. 14–15

Bostrichus saxeseni Ratzeburg, 1837, Forstinsekten 1: 167 (Europe).

Xyleborus frigidus Blackburn, 1885, Trans. R. Dublin Soc. ser. 2, 3: 193 (Maui: Haleakala, about 4000 ft [1220 m], a single specimen taken from dry twig of *Acacia falcata*; holotype in BMNH).—Perkins, 1900, Fauna Hawaii. 2(3): 178 (cities preceding).—Kleine, 1914, Stettin. Entomol. Ztg 75: 302 (list).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 292 (list).—Swezey, 1941, Proc. Hawaii. Entomol. Soc. 11(1): 124 (original collection cited; host corrected to *Acacia koa*); 1954, B. P. Bishop Mus. Spec. Publ. 44: 14 (Maui, *Acacia koa*). **New synonymy.**

Xyleborinus saxeseni: Reitter, 1913, Wien. Entomol. Ztg 32: 83 (Europa, Kaukasus, Kanarischen Inseln, Nordamerika).—Wood, 1977, Great Basin Nat. 37(1): 68, 73 (probable origin, introductions).

Xyleborus pseudoangustatus Schedl, 1949, Proc. R. Soc. Queensl. 60(2): 28, fig. 1 (Australia: Queensland, New South Wales; types in BMNH, Coll. Schedl); 1941, Proc. Hawaii. Entomol. Soc. 11(1): 116 (Maui, Oahu, ex *Acacia koa*; Oahu, ex *Xylosma hawaiiense*).—Swezey, 1941, ibid. 11(1): 123 (Oahu, ex *Pipturus*, *Perrottetia*; Maui, ex *Byronia*; Hawaii, ex *Acacia koa*), 126 (hosts); 1954, B. P. Bishop Mus. Spec. Publ. 44: 14 (Oahu, Maui, Hawaii, *Acacia koa*), 109 (Maui, *Ilex anomala*), 155 (Oahu, *Perrottetia sandwicensis*), 162 (Oahu, *Pipturus*).

Xyleborus saxeseni: Ford, 1955, Proc. Hawaii. Entomol. Soc. 15(3): 388 (Oahu: Puu Palikea, *Acacia koa*; Wahiawa, at light).—Schedl, 1964, Reichenbachia 3(29): 313 (*pseudoangustatus* synonymized).—Bright, 1968, Can. Entomol. 100: 1297 (key), 1309, map 7 (includes synonymy for North American names; distribution for North America).—Samuelson, 1978, Proc. Hawaii. Entomol. Soc. 22(3): 414 (Hawaii, ex ohia).

Material examined. HAWAII: 2, Hilo, IX.1968, ex dead *Eucalyptus*, C.J. Davis (HSDA); 1, Hilo Forest Res., nr Saddle Road, 670–1280 m, VII.1972, ex *Metrosideros*, BR.1972.10, W.E. Ruffin (BISHOP); 4, same area, S of Saddle Road, road below Tree Planting Road, ca. 1200 m, VII.1972, ex *Metrosideros*, BR, GAS. 1972.12, Ruffin & G.A. Samuelson (BISHOP); 39, same area, but 670 m, VIII.1972, ex trunk 10 cm dbh dead *Metrosideros* trunk, GAS.1972.37A, Samuelson (BISHOP); 3♂, same data (BISHOP); 1, same area, without elevation, VIII.1972, Ruffin (BISHOP); 1, same area, 1–2 km S of Saddle Road, ca. 1200 m, X.1972, ex *Myrsine*, BR.1972.69, Ruffin (BISHOP); 4, same area, nr Saddle Road, 610 m, XII.1976, *Metrosideros* acetone-heartwood extract on tanglefoot trap, R.P. Papp (BISHOP); 23, same area but 732 m, tanglefoot trap Site A-3, V.1977–III.1978, Papp & R.F. Nagata (BISHOP); 1, Honaunau-Captain Cook, V.1964, ex avocado, C. Hammond (HSDA); 1, Kahaalu Forest Res., above Kona, Donkey Mill Road, 800 m, I.1974, flying, Samuelson (BISHOP); 1, Kilauea, VIII.1895, R.C.L. Perkins (BISHOP); 8, Kilauea, Kipuka Puauu, X.1929, *Acacia koa*, O.H. Swezey (BISHOP, HSDA); 1, same data but *Ureva* (HSDA); 11, Kilauea, Byron Ledge, VII.1972, ex burned *Metrosideros* trunks, GAS.1972.20, Samuelson (BISHOP); 2♂, same data (BISHOP); 2, Kulani, IX.1970, ex *Melastoma*, E. Yoshioka (HSDA). MAUI: 1, Haiku, XI.1947, N.L.H. Krauss (BISHOP); 1, Haelaau, XII.1928, *Byronia*, Swezey (BISHOP); 1, Haleakala (holotype ♀ of *frigidus*; BMNH); 1, same loc., 915 m, yr 1900, Perkins no. 845, Perkins (BISHOP). LANAI: 2, Lanai City, X.1976, S Kahoohalahala (HSDA). OAHU: 1, Halawa Heights, IV.1964, kiawe, D.M. Tsuda (BISHOP); 5, Haleauau, I.1932, *Pipturus*, Swezey (HSDA); 1, Honolulu, X.1964, J.L. Gressitt (BISHOP); 15, Kahauiki, IX.1924, ex koa, Swezey (HSDA); 2, Kawaiioa Ridge, X.1934, *Perrottetia*, Swezey (HSDA); 1, Kawiwi, VII.1957, *Cordyline*, E.J. Ford Jr (BISHOP); 3, Manoa Val, XII.1930, dead *Pipturus*, Swezey (HSDA); 3, Mt Tantalus, III.1963, flying, Samuelson (BISHOP); 4, Poamoho Trail, 549 m, VII.1976, ex *Metrosideros collina*, Stein no. 76-1, J.D. Stein (BISHOP, IPHF); 1♂, same data (IPHF); 1, nr Punaluu, XII.1955, *Acacia koa*, Ford (BISHOP); 9, Puu Palikea, VI.1954, *Acacia koa*, Ford

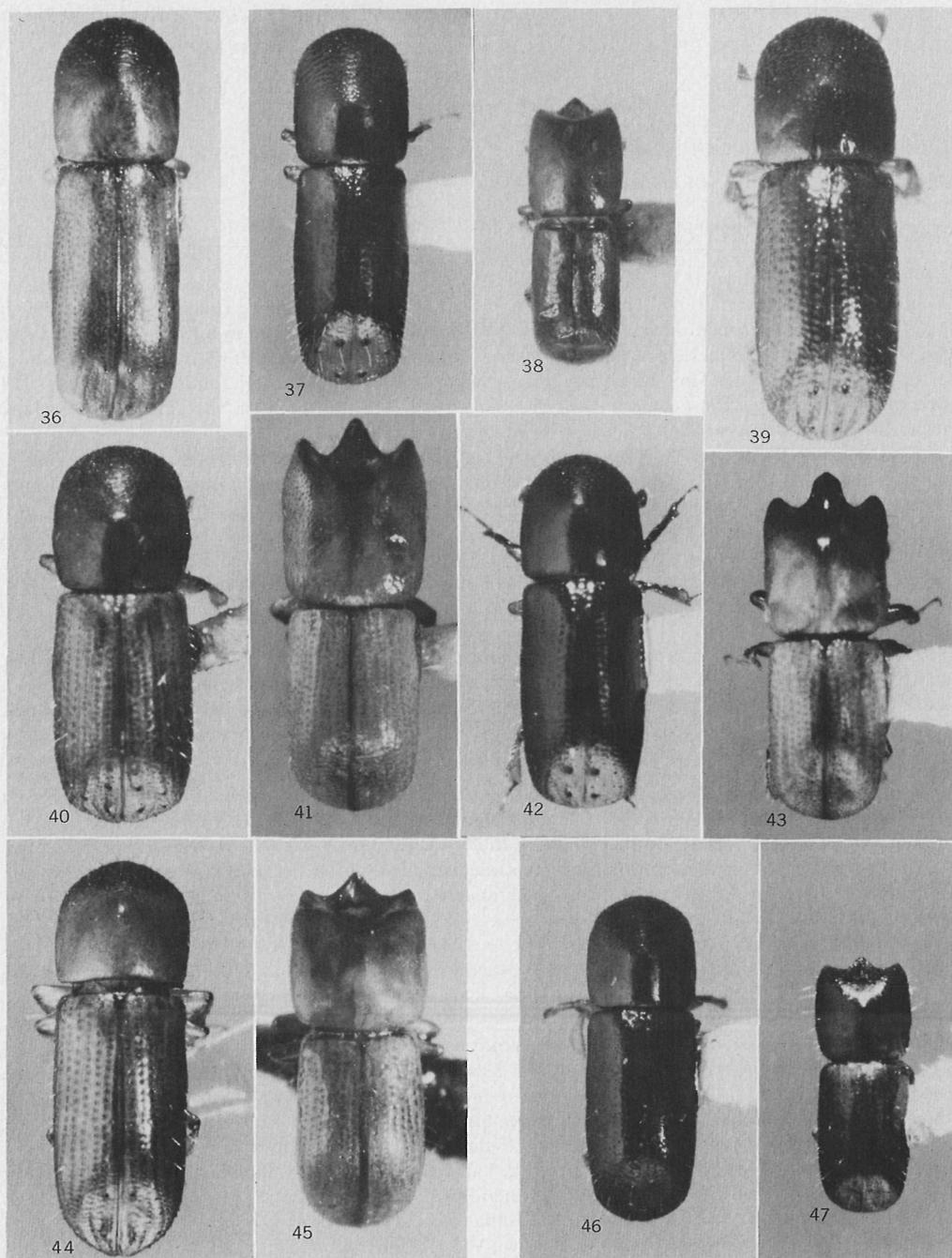


FIG. 36-47. Hawaiian *Xyleborus*, dorsal view. **36**, *arcturus* ♀ (holotype); **37**, *lanaiensis* ♀; **38**, *lanaiensis* ♂; **39**, *oahuensis* ♀; **40**, *scabratus* ♀; **41**, *scabratus* ♂ (lectotype); **42**, *simillimus* ♀; **43**, *simillimus* ♂; **44**, *tantalus* ♀; **45**, *tantalus* ♂; **46**, *vulcanus* ♀; **47**, *vulcanus* ♂. Figures to same scale.

(BISHOP, HSDA); 4, same loc., VII.1955, Ford (BISHOP); 3, Wahiawa, VIII.1954, Ford (BISHOP); 5, same loc., II,XII.1955, Ford (BISHOP); 1, same loc., IX.1958, light trap, Ford (BISHOP); 2, Waianae Mts, V.1953, VII.1955, Ford (BISHOP); 1, Waipio Ridge, IX.1934, Swezey (HSDA). KAUAI: 1, Kalaheo, XII.1965, ex *Eucalyptus*, D. Sugawa (HSDA); 23, Kokee, V.1968, ex *Myrica faya*, R. Hobdy, D. Sugawa (HSDA).

Distribution. Widespread throughout the Holarctic; also Australia, Hawaiian Is.

Hosts. In Hawaii, the following hosts are recorded: *Acacia koa* (koa), *Eucalyptus*, *Ilex anomala* [= *Byronia sandwicensis*] (kawau), *Melastoma*, *Metrosideros collina polymorpha* (ohia), *Myrica faya* (firetree), *Myrsine* (kolea), *Perrottetia sandwicensis* (olomea), *Persea americana* (avocado), *Pipturus* (mamaki), *Prosopis pallida* (kiawe), *Urera* (opuhe), *Xylosma hawaiiense* (maua). Bright (1968) examined material from nearly all North American genera of deciduous trees, plus *Libocedrus*, *Pinus*, and *Tsuga*.

Remarks. This adventive species seems to have been well established in Hawaii, at least on the islands of Hawaii and Maui, before the end of the last century. Throughout these islands this species tends to occur most commonly at moderate elevations. This species is distinct from other xyleborines on Hawaiian islands by having the scutellum conical.

Genus *Xyleborus* Eichhoff

At least 24 species of *Xyleborus* are now known to occur in the Hawaiian Is. Of these species, 18 are thought to be endemic to the islands and 6 adventive. This does not count 3 names applied to ♂-described endemics that are likely to be associated with females known by other names. Another species, *similis* Ferrari, included in the key below, is not counted, as it probably did not reach the Hawaiian Is.

KEY TO HAWAIIAN SPECIES OF *Xyleborus*

- I. Asperities distinct, prominent on pronotal anterior slope; prothorax more cylindrical in x-section, discal summit convex or subangularly raised and anterior slope convex; anterior margin of pronotum entire; eye distinctly longer and broader with emargination well developed; capable of flight; general facies less variable; size usually larger ♀
- II. Asperities obsolescent or obsolete on pronotal anterior slope; prothorax less cylindrical in x-section, discal area ± depressed or irregular and anterior slope convex or flattened or concave; anterior margin of pronotum entire or emarginate sublaterally with anteriomedian prominence; eye distinctly shorter and narrower, emargination greatly reduced or not; incapable of flight; general facies more variable; size usually smaller ♂

♀

- 1. Body length commonly <2.75 mm [1.9–2.75 mm ± 0.05] 2
- Body length commonly >2.75 mm [2.75–5.0 mm ± 0.05] 11
- 2. Body form relatively slender, commonly 0.34–0.39× as broad as long

- [always 0.40× or less]; anterior margin of pronotum with low serrations or not 3
- Body form relatively robust, commonly 0.45× as broad as long [0.41× or more]; anterior margin of pronotum with 6-8 low serrations; dorsum orange-fuscous to piceous; length 2.0-2.6 mm ... (S Asia, Australia, Pacific) **fornicatus**
- 3. Elytron as viewed from above with apical outline ± convex, at most with small tubercles barely exceeding curvature of apical margin 4
- Elytron with apical outline interrupted by large spines far-exceeding curvature of apical margin; anterior margin of pronotum with about 8 small serrations; dorsum orange-fuscous; length 1.95-2.4 mm ... (Central America, Hawaiian Is: Oahu) **spinulosus**
- 4. Pronotal summit placed near middle; procoxae contiguous or nearly so; anterior margin of pronotum unarmed 5
- Pronotal summit placed well behind middle; procoxae distinctly separated; anterior margin of pronotum with 6-8 low serrations; dorsum yellow- to orange-fuscous; length 2.35-2.6 mm ... (endemic: Hawaii, Maui, Lanai, Oahu) **ignobilis**
- 5. Pronotal disc with summit region transversely ± angulate in profile (FIG. 1-4) 6
- Pronotal disc with summit region transversely convex in profile (FIG. 5-8) 7
- 6. Elytral declivity relatively steep and distinctly impressed, concave in part; declivital punctures faintly striate in part; outlines of pronotal and elytral apices rather abruptly rounded; dorsum orange-testaceous to orange-fuscous; length 2.5-3.15 mm ... (endemic: Oahu to Hawaii) (part) **dubiosus**
- Elytral declivity relatively gradual and not impressed, surface ± convex, flattened at most; declivital punctures not striate; outlines of pronotal and elytral apices gradually rounded; dorsum yellow-testaceous to orange-fuscous; length 2.45-2.8 mm ... (endemic: Oahu, Kauai) **rugatus**
- 7. Elytron with 1 declivital tubercle much larger than others 8
- Elytron with largest declivital tubercles subequal in size 9
- 8. Pronotum with anterior margin subtruncate, briefly convex, declivital interstice 1 with 1 tubercle distinctly larger than others; dorsum orange-testaceous; length 2.3-2.5 mm ... (E Africa, SE Asia, Australia, Pacific excluding Hawaiian Is) (**similis**)
- Pronotum with anterior margin moderately and evenly convex; declivital interstice 3 with 1 tubercle distinctly larger than others; dorsum orange-testaceous to red-fuscous; length 2.3-2.9 mm ... (pantropical) (part) **ferrugineus**
- 9. Elytral declivity relatively gradual, ± convex; declivital interstices largely impunctate; dorsum yellow- to orange-testaceous 10

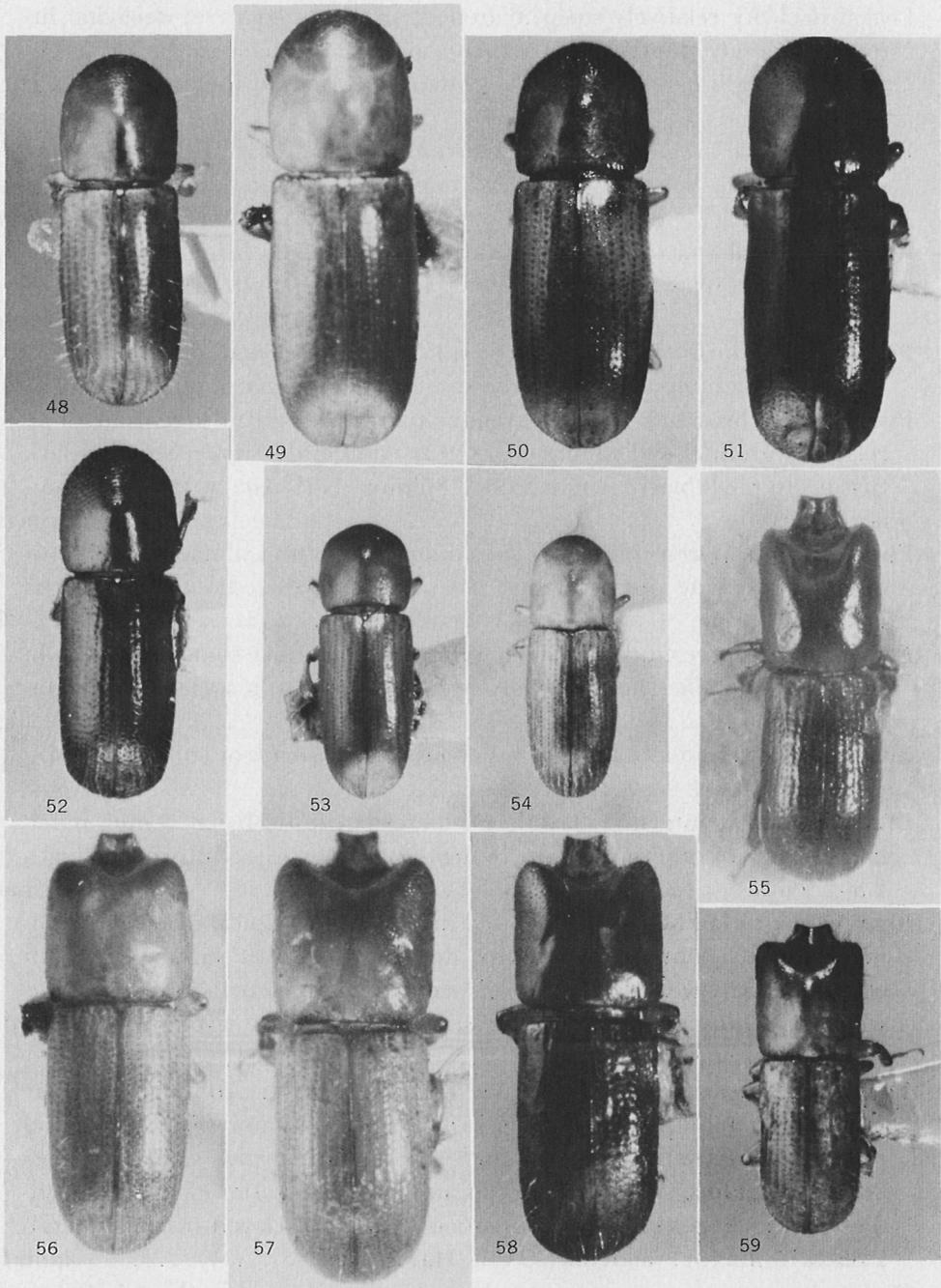


FIG. 48-59. Hawaiian *Xyleborus*, dorsal view. 48, *hawaiiensis* ♀; 49, *hiiaaka* ♀; 50, *kauaiensis* ♀; 51, *molokaiensis* ♀; 52, *mauiensis* ♀; 53, *pele* ♀; 54, *pleiades* ♀ (holotype); 55, *exsectus* ♂; 56, *hiiaaka* ♂; 57, *kauaiensis* ♂; 58, *molokaiensis* ♂; 59, *mauiensis* ♂. Most figures to same scale but FIG. 50-51 reduced about 8% and FIG. 53-54 reduced about 50%.

- Elytral declivity relatively steep, flattened, shallowly concave; declivital interstices closely punctulate-asperulate; dorsum orange- to dark orange-fuscous; length 2.3-2.95 mm ... (endemic: Hawaii to Kauai) (part) **vulcanus**
- 10. Elytral declivital area opaque or opalescent, relatively dull; declivital tubercles tending to be slightly smaller; length 2.2-2.4 mm ... (pantropical) **affinis**
 Elytral declivital area clear, smooth-alutaceous, relatively bright and shining; declivital tubercles tending to be slightly larger; length 2.2-2.4 mm ... (pantropical) **perforans**
- 11. Pronotum distinctly longer than broad; elytral declivital slope relatively abrupt and commencing well behind middle; dorsum not pitch black ... 12
 Pronotum as broad as long or broader than long; elytral declivital slope relatively gradual and commencing near middle; dorsum ± shining dark fuscous to pitch black; length 3.55-3.85 mm ... (S Asia to Japan, Hawaiian Is: Oahu) **interjectus**
- 12. Elytral declivital area shining to subshining, smooth to alutaceous, even if closely punctulate or asperulate; not usually associated with araliaceous hosts 13
 Elytral declivital area dull, opaque to granulate; if surface somewhat smooth, then with satinlike sheen; usually (so far as known) associated with araliaceous hosts 23
- 13. Elytral declivital interstice 3 with tubercles absent, small, or subequal in size to others if large 14
 Elytral declivital interstice 3 with 1 tubercle near declivital center much larger than all others; dorsum orange-testaceous to red-fuscous; length 2.3-2.9 mm ... (pantropical) (part) **ferrugineus**
- 14. Elytral apex rather abruptly narrowed in dorsal view, apical curvature commencing well behind point where declivity begins at summit (FIG. 9); elytral declivity with slope relatively steep; declivital surfaces shining and with or without conspicuous interstitial punctures or asperities besides larger tubercles 15
 Elytral apex rather gradually narrowed, apical curvature commencing near or slightly behind point where declivity begins at summit (FIG. 10); elytral declivity relatively long-sloping and gently concave with surfaces rather uniformly glossy, even if alutaceous and bearing a series of minute granules besides larger tubercles; dorsum orange- to dark red-fuscous; length 2.85-3.75 mm ... (endemic: Oahu, Hawaii) **tantalus**
- 15. Pronotal summit region transversely ± angulate in profile (FIG. 1-4) ... 16
 Pronotal summit region transversely convex in profile (FIG. 5-8) 19
- 16. Elytral declivity usually moderately impressed; tubercles of elytral declivital interstice 1 small or moderate in size; ectoapical angle of elytron convex or angulate 17

- Elytral declivity flattened or shallowly impressed; elytral declivital interstice 1 with 2 very large tubercles, these placed above and below declivital center; ectoapical angle of elytron convex 18
17. Elytral declivital interstice 3 with 1 distinct tubercle, tubercle placed above declivital center; ectoapical angle of elytron angulate; dorsum orange- to dark fuscous; length 3.0–3.25 mm ... (endemic: Hawaii) .. **nubilus, n. sp.**
- Elytral declivital interstice 3 with 2–3 distinct tubercles, these placed above and below declivital center and distinctly larger than asperities as may occur on posterolateral part or elsewhere on declivity; ectoapical angle of elytron commonly convex, sometimes ± angulate; dorsum orange-testaceous to orange-fuscous; length 2.5–3.15 mm ... (endemic: Oahu to Hawaii) (part) **dubiosus**
18. Elytral declivital interstice 3 with moderately large tubercle above or near declivital center; dorsum orange- to dark fuscous; length 3.4 mm ... (endemic: Kauai) species
- Elytral declivital interstice 3 with tubercle above obsolete or minute, asperities sometimes present along interstice but not distinctly larger than those of posterolateral portion of declivity; dorsum orange- to dark red-fuscous; length 2.9–3.25 mm ... (endemic: Hawaii) **simillimus**
19. Body length commonly 3.0 mm or more and with elytral declivity flattened to moderately concave; if 2.75–3.0 mm, then declivity moderately concave; declivital tubercles ± moderate to large 20
- Body length <3.0 mm; elytral declivity flattened to shallowly concave, with surface closely punctulate-asperulate and tubercles small to moderate; dorsum orange- to dark orange-fuscous; length 2.3–2.95 mm ... (endemic: Hawaii to Kauai) (part) **vulcanus**
20. Body form relatively slender, about 3× as long as broad; side of pronotum straight to weakly convex 21
- Body form relatively robust, about 2.8× or less as long as broad; side of pronotum slightly convex; elytral declivity flattened to weakly concave; declivital tubercles on interstices 1 and 3 moderately large, dorsum orange- to red-fuscous; length 3.25–3.6 mm ... (endemic: Oahu) .. **scabratus**
21. Anterior margin of pronotum weakly produced, curvature even or not and occupying about apical 0.20 or less of pronotal length; elytral declivity with tubercle below declivital center on interstice 3 small or absent 22
- Anterior margin of pronotum moderately produced and evenly convex, with curvature occupying about apical 0.25 of pronotal length; elytral declivity with tubercle below center of interstice 3 about as large as lower tubercle on interstice 1; dorsum orange-testaceous to dark red-fuscous; length 3.2–3.75 mm ... (endemic: Hawaii) **arcturus, n. sp.**
22. Anterior margin of pronotum broadly and evenly convex; pronotum usually slightly broadened anteriorly and distinctly broader than basal elytral region; elytral declivity with tubercles on interstice 3 often obsolescent,

- sometimes developed but smaller than tubercles on interstice 1; declivital surface moderately impressed across central portion; dorsum orange- to red-fuscous; length 2.75-3.45 mm ... (endemic: Lanai, Oahu) .. **lanaiensis**
- Anterior margin of pronotum briefly convex medially and somewhat flattened sublaterally; pronotum parallel-sided and subequal in breadth to basal elytral region; elytral declivity with tubercle on interstice 3 well developed, almost as large as others; declivital surface shallowly concave; dorsum orange- to dark red-fuscous; length 3.75-3.85 mm ... (endemic: Oahu) **oahuensis**
23. Body length <3.5 mm, usually 3.25 mm or less; elytral apex \pm evenly rounded 24
 Body length 3.5 mm or more; elytral apex obliquely narrowed or \pm evenly rounded 25
24. Elytral declivital surface feebly impressed at most; declivital interstitial sculpture rough with small asperities (individual raised grains); dorsum orange-testaceous to dark red-fuscous; length 2.85-3.25 mm ... (endemic: Maui, Molokai) **mauiensis**
- Elytral declivital surface slightly to moderately impressed; declivital interstitial sculpture finely granulate with usually few asperities, or if sculpture \pm rough, then surface well impressed; dorsum orange-testaceous to dark red-fuscous; length 2.9-3.4 mm ... (endemic: Hawaii, Maui, Lanai, Oahu, Kauai) **hawaiiensis**
25. Elytral apex convexly narrowed to apex 26
 Elytral apex obliquely narrowed to subtruncate extremity; elytral base not excavate for reception of pronotal base; pronotum \pm parallel-sided; dorsum yellow- to dark orange-fuscous; length 3.7-4.1 ... (endemic: Hawaii) **hiika, n. sp.**
26. Body length 4.3 mm or more; elytral base excavate for reception of pronotal base; basal margin of elytron not quite transverse, slightly convex-oblique near scutellar angle; pronotum moderately convex at side 27
 Body length <4.3 mm; elytral base not excavate for reception of pronotal base, but steeply declivitous; basal margin of elytron transverse; pronotum \pm parallel-sided 28
27. Elytral declivity finely granulate, with conspicuous scattered asperities; dorsum yellow- to orange-testaceous; length 4.5-4.6 mm ... (endemic: Maui) **pleiades, n. sp.**
- Elytral declivity finely granulate-opaque, without conspicuous asperities; dorsum orange-testaceous to orange-fuscous; length 4.85-4.95 mm ... (endemic: Hawaii) **pele, n. sp.**
28. Elytral disc smooth-alutaceous; overall color tending to be paler, testaceous to fuscous; length 3.55-3.8 mm ... (endemic: Kauai) **kauaiensis**
- Elytral disc dull, finely granulate; overall color tending to be darker, reddish

fuscous to subpiceous; length 3.7–4.15 mm . . . (endemic: Molokai, Maui, Lanai, Oahu) **molokaiensis**

♂

Names marked with 1 asterisk (*) indicate ♂-described species having ♀ presently associated; 2 asterisks (**) indicate ♂-described species not yet associated with ♀. Not all the species are keyed: 2 endemic groups of species are keyed only to their respective grouping, each with included taxa listed. Coloration is not given in this part of the key: ♂ tend to be much paler than ♀.

- 1. Pronotum with profile of anterior margin convex in dorsal view; margin lacking small or large anteromedian projection 2
 Pronotum with profile of anterior margin not convex in dorsal view; margin angulate at extremity or with small or large anteromedian projection . . . 5
- 2. Pronotum with anterior margin broad, subtruncate to convex 3
 Pronotum with anterior margin narrowed, sides converging to rather briefly rounded apex; length 1.7–2.1 mm . . . (endemic: Lanai, Hawaii) **agamus****
- 3. Pronotum distinctly longer than broad, >1.1× as long as broad; pronotal disc convex or slightly raised medially 4
 Pronotum distinctly broader than long, <0.9× as long as broad; pronotal disc broadly convex, sometimes with slight median impression near summit; length 1.4–1.65 mm . . . (S Asia, Australia, Pacific) **fornicatus**
- 4. Pronotal disc evenly convex; anterior slope also convex, surface punctate, smooth-alutaceous, shining; length 1.6–1.8 mm . . . (Central America, Hawaiian Is: Oahu) **spinulosus**
 Pronotal disc longitudinally carinate, carina most pronounced at summit; anterior slope ± flattened, surface asperulate-punctate, rather dull; length 1.75–1.85 mm . . . (endemic: Oahu) **rugatus**
- 5. Pronotum with extremity of anterior margin angulate or slightly produced as a small tubercle, projection <0.1× as long as pronotum 6
 Pronotum with extremity of anterior margin strongly produced, projection 0.1× or more as long as pronotum 7
- 6. Pronotum with extremity slightly produced, terminated as a small tooth; elytral declivity opaque, dull; length 1.95 mm . . . (pantropical) **affinis**
 Pronotum with extremity angulate, little-produced, terminated as a small blunt tubercle; elytral declivity smooth, shining; length 2.0 mm . . . (pantropical) **perforans**
- 7. Pronotum with apex of projection acute, briefly convex, or angulate in outline; usually not associated with araliaceous hosts 8
 Pronotum with apex of projection broad and shallowly emarginate, emargination concave in outline; usually associated with araliaceous

- hosts endemic complex:
exsectus** [3.15-3.35 mm; Maui]; **hiiaaka, n. sp.** [3.45-3.65 mm; Hawaii];
kauaiensis [3.9 mm; Kauai]; **mauiensis** [2.7-3.0 mm; Maui, Molokai];
molokaiensis [2.75-3.65 mm; Molokai, Maui, Lanai, Oahu]
8. Pronotum with anterior angle obtuse in dorsal view 9
Pronotum with anterior angle \pm acute and prominent in dorsal view 10
9. Elytral declivity with 1 tubercle much larger than others placed near decliv-
ital center on interstice 3; length 2.3 mm ... (pantropical) **ferrugineus**
Elytral declivity lacking 1 large tubercle; tubercles usually small with larg-
est subequal in size; length 2.15-2.35 mm ... (endemic: Oahu
to Hawaii) (part; minor form) **dubiosus**
10. Pronotum with extremity briefly rounded 11
Pronotum with extremity obtusely angulate; length 2.9-3.1 mm ... (en-
demic: Hawaii) **simillimus**
11. Elytral apex gradually narrowed in dorsal view, curvature commencing near
point where declivity begins; declivital interstices impunctate, smooth and
shining; length 3.1 mm ... (endemic: Oahu, Hawaii) **tantalus**
Elytral apex rather suddenly narrowed, curvature commencing well be-
hind point where declivity begins; declivital interstices usually punctu-
late or roughened endemic complex:
dubiosus (part; major form) [2.6 mm; Oahu to Hawaii]; **lanaiensis** [2.3-2.6
mm; Lanai, Oahu]; **littoralis**** [2.8 mm; Molokai]; **scabratus*** [3.2-3.45
mm; Oahu]; **vulcanus*** [2.3-2.5 mm; Hawaii to Kauai]

Xyleborus affinis Eichhoff

FIG. 20-21

Xyleborus affinis Eichhoff, 1867, Berl. Entomol. Z. **11**: 401 (America borealis).—Kleine, 1914, Stettin. Entomol. Ztg **75**: 303 (Hawaii).—Wood, 1960, Insects Micronesia **18**(1): 53 (key), 71, fig. 13f (Caroline Is).—Bright, 1968, Can. Entomol. **100**: 1298 (key), 1300 (key), 1315, map 11, fig. 15 (North America, hosts).—Bianchi, 1968, Proc. Hawaii. Entomol. Soc. **20**(1): 9 (Kauai, breeding in healthy sugar cane).—Wood, 1977, Great Basin Nat. **37**(1): 68, 73 (probable origin, introductions).—Beaver & Browne, 1978, Orient. Insects **12**(4): 602 (Penang, host).

Xyleborus mascarensis Eichhoff, 1878, Mém. Soc. R. Sci. Liège ser. 2, **8**: 374 (as *affinis* var. *Beta mascarensis*, ex St. Maurizio).—Van Zwaluwenburg, 1956, Proc. Hawaii. Entomol. Soc. **16**(1): 9 (Oahu: Makaha Val, ex fallen mango branch).

Collection localities (BISHOP, HSDA). KAUAI: Puhi, Wailua. OAHU: Aiea Heights, Barbers Point, Eka-hanui Gulch, Honolulu, Kahaluu Val, Kalihi Val, Kaneohe, Kawiwi, Kuliouou, Lualualei, Makua Val, Manoa Val, Mt Kaala, Niu Val, Puu Kua, Puu Lanipo, Wahiawa. MAUI: Kihei. HAWAII: Hilo, Kulani, nr Pahoa, Puueo. Abundant on most or all windward islands.

Distribution. Pantropical, extending to the temperate zone in eastern North America.

Hosts. Hawaiian records include *Acacia*, *Aleurites*, *Araucaria*, *Cordyline*, *Ilex*, *Lagerstroemia*, *Mangifera*, *Melastoma*, *Myrsine*, *Saccharum*, and *Washingtonia*; also, specimens have been taken from mahogany panels in a new house and from plywood. Bright (1968: 1316) listed 9 genera of hardwoods from North America.

Remarks. In Hawaiian collections, this species has been confused with *perforans* (Wollaston), which it closely resembles. Both species are adventive to the Hawaiian Is, with possibly *affinis* the later arrival. The earliest Hawaiian record for *affinis* was reported by Kleine (1914), but dates from specimens in Hawaiian collections indicate that this species was not common until the 1950's. For *perforans*, dates go back to the last century.

This species differs from *perforans* by having the elytral declivital area flatter and declivital tubercles smaller, as well as sculpture of declivity dull or opaque instead of strongly shining.

Xyleborus agamus Perkins

FIG. 28

Xyleborus agamus Perkins, 1900, Fauna Hawaii. 2(3): 178 (Lanai; syntype in BMNH is here designated as lectotype).—Kleine, 1914, Stettin. Entomol. Ztg 75: 302 (list).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 291 (list).

Xyleborus immaturus ♂: Perkins, 1900, Fauna Hawaii. 2(3): 178 (Hawaii).

Type material examined (syntype series). LANAI: lectotype ♂ (BMNH), Lanai, 3000 ft [915 m], I.1894 [R.C.L. Perkins, Fauna Hawaiiensis]; 1 paralectotype ♂, same data as lectotype (BISHOP).

Other material. HAWAII: 1♂, Kona, 3000 ft [915 m], VIII.1894, Perkins no. 142, Perkins, Fauna Hawaiiensis (BISHOP); 1♂, Olaa, XI.1896, Perkins [Fauna Hawaiiensis] (BISHOP).

Distribution. Endemic to Hawaiian Is; thus far known from 2 islands: Lanai, Hawaii.

Hosts. Unknown.

Remarks. This is a ♂-described species without associated females. The anteriorly narrowed pronotum is unique among known Hawaiian males, but it has similarities to the pronotum of the ♀ of *ignobilis* Perkins. The latter is known only from females and has been bred from *Freycinetia*. Two males in Bishop Museum are probably the same specimens which Perkins assigned to *immaturus* Blackburn in *Fauna Hawaiiensis*; they are the specimens from the island of Hawaii cited above.

Xyleborus arcturus Samuelson, new species

FIG. 36

Holotype ♀. Form slender, about 3.15× as long as broad; subparallel-sided, pronotal and elytral apex briefly terminated, broadly convex. Body surfaces largely orange-testaceous, scutellum and fine elytral sutural line fuscous; appendages slightly paler than body. Vestiture pale (mostly rubbed off on type): fine, moderately close on pronotal anterior slope (paratype), rather sparse on elytron, with declivital setae sparse, with close adpressed short hairs on declivity (paratype). Length 3.6 mm; breadth 1.15 mm.

Frons somewhat flattened between median area and eye, sculpture finely granulate, rather closely punctate except narrow median impunctate area; eye with emargination $\frac{5}{8}$ -dividing eye, angle of emargination barely acute. Pronotum about 1.2× as long as broad and 0.6× as long as elytron; broadest along middle; side turgid; anterior margin moderately and evenly convex; discal summit placed slightly anterior to middle (apical 0.46) as viewed from above; pronotum in transverse profile rather briefly convex at summit but not quite subangulate, much less convex laterally; sculpture asperate-granulate on anterior slope and smooth-alutaceous on basal discal region; punctures on basal discal region mostly 0.4× as large as interspaces. Scutellum smooth, briefly impressed near center. Elytron about 3.95× as long as broad; side straight along basal 0.2, postbasally broadened slightly to along middle; thence feebly narrowed to preapex; apical 0.11 convexly narrowed to extremity, discal striae mostly not impressed, but stria 1 slightly impressed

on apical 0.5 of disc; discal punctures rather small with rows tending to be a little irregular; punctures mostly $0.5\times$ as large as transverse interspaces and $0.3\times$ as large as interstices; interstices mostly flat, with only innermost 2 feebly convex apically; sculpture smooth-alutaceous with occasional interstitial punctures; elytral declivity moderately steep, oblique and occupying apical 0.25 of elytron in lateral view; surface shallowly impressed centrally; sculpture with stria punctures roughened and interstitial grains present, interspaces smooth-alutaceous overall; tubercles moderately large and placed as follows: interstice 1 with 1 tubercle (largest) at commencement of declivity and 1 below declivital center; interstice 3 with tubercle below nearly in line transversely with innermost lower tubercle and sometimes (right elytron on type) with minute tubercle above, near declivital center.

Variation ($n = 3$). Body surfaces in 2 paratypes range from orange-testaceous to dark red-fuscous, darker on pronotal anterior slope and sometimes so on elytron laterally; scutellum dark fuscous. The smaller paratype has basal portion of pronotal disc finely granulate instead of smooth-alutaceous and elytral declivity slightly less concave with principal tubercles moderately small. Length 3.2-3.75 mm.

Holotype ♀ (BISHOP 12,102), HAWAIIAN IS: HAWAII I: S Kona, 16.VIII.1919, O.H. Swezey; 2 paratopotype ♀, same data as holotype (BISHOP, BMNH).

Hosts. Unknown.

Remarks. The new species resembles *lanaiensis* Perkins in general facies and was originally assigned to the latter by O. H. Swezey. *X. arcturus*, n. sp. differs from the latter by having the anterior margin of the pronotum moderately and evenly convex instead of more broadly, shallowly convex in dorsal view; also, *lanaiensis* has the pronotal summit more broadly and evenly convex in transverse profile and the lower declivital tubercle on interstice 3 obsolete or small instead of subequal in prominence to the lower tubercle of interstice 1.

Xyleborus dubiosus Perkins

FIG. 1, 9, 33-35

Xyleborus dubiosus Perkins, 1900, Fauna Hawaii. 2(3): 177 (Maui: Iao Val; holotype in BMNH).—Kleine, 1914, Stettin. Entomol. Ztg 75: 302 (list).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 292 (list).

Xyleborus truncatus: Perkins, 1900, Fauna Hawaii. 2(3): 175 (part: Lanai).

♂ *nov.* Form unlike ♀, prothorax modified; body $2.6\times$ as long as broad, broadest across prothorax. Prothorax about $1.25\times$ as long as broad and $0.9\times$ as long as elytron (on horizontal plane); side nearly straight along middle, convexly narrowed basally; anterior angle barely acute, slightly projecting; anterior margin broadly and shallowly concave between anterior angle and apex of anteromedian projection, depth of emargination about $0.12\times$ as long as length of prothorax; median projection with angle barely acute, extremity briefly rounded; profile of pronotum in lateral view with anterior region descending moderately from disc to anterior angle, thence becoming vertical to base of apical projection; anterior slope concave, remainder irregularly convex, with summit feebly produced; sculpture finely granulate dorsally and \pm smooth on anterior slope, moderately punctate anterolaterally, including decurved region (as seen ventrally), punctures sparser and less conspicuous inside concave anterior slope, discally and posteriorly. Elytron about $2.9\times$ as long as broad, broadest across basal 0.3; side \pm straight, but feebly convex postbasally with remainder slightly narrowed to apical 0.15, thence convexly narrowed to extremity; central discal punctures mostly $1.5-2\times$ as large as transverse interspaces and $1\times$ as large as interstices; interstices smooth-alutaceous; declivity weakly depressed centrally; declivital sculpture alutaceous, set with 2-3 small granules on interstices 1 and 3 and 1 small tubercle above declivital center on interstices 1 and 3. Body length 2.6 mm; breadth 1.0 mm [♂, Oahu I: Puu Kaneoha, X.1958, *Pipturus*, E.J. Ford Jr (BISHOP)].

♂ (minor form). Similar to preceding, except appearing teneral and prothorax with anterior angle square to obtuse and not projecting. Body about $2.55\times$ as long as broad; prothorax about $1.1\times$ as long as broad and $0.8\times$ as long as elytron (on horizontal plane); elytron $3.05\times$ as long as broad; central discal punctures mostly $2\times$ as large as transverse interspaces and $1\times$ as large as interstices; declivital sculpture:

3–4 small granules on interstices 1 and 3, 1–2 small tubercles on interstice 1, and 1 on interstice 3. Body length 2.4 mm; breadth 0.95 mm [Oahu I: Puu Kaneoaha, X.1958, *Pipturus*, E.J. Ford Jr (BISHOP)].

Type material examined. MAUI: holotype ♀, Iao Val, [IV–V].1894, Perkins no. 118 [R.C.L. Perkins, Fauna Hawaiiensis] (BMNH).

Other material. OAHU: 1, Oahu, 1902, R.C.L. Perkins (BISHOP); 7, Castle Trail, 2000 ft [610 m], V.1938, *Pipturus*, E.C. Zimmerman (BISHOP); 4, Cooke Trail, IV.1919, *Perrottetia*, O.H. Swezey (BISHOP); 5, same data [Swezey?] (HSDA); 1, Haleauau, III.1940, ex *Pipturus*, Swezey (HSDA); 1, Kahuku, X.1927, Swezey (HSDA); 21, Kaumuahona, VI.1917, *Bobeia*, J.C. Bridwell (BISHOP, CNCI); 2, same loc., II.1928, ex *Bobeia*, Swezey (HSDA); 3, Kawailoa Ridge, X.1934, ohia ha, Swezey (HSDA); 12, Manoa, XI.1919, ohia ha, Bridwell (HSDA); 15, same loc., I.1920, *Straussia*, Bridwell (HSDA); 1, same loc., XII.1930, dead *Pipturus*, Swezey (BISHOP); 1, Mt Kaala, I.1929, *Pipturus*, Swezey (HSDA); 1, same loc., VI.1951, E.J. Ford Jr (BISHOP); 1, same loc., IV.1954, J.L. Gressitt (BISHOP); 5, Mt Tantalus, IX.1906, on mamaki, Perkins (BISHOP); 3, same loc., without date, mamaki [Perkins] (BISHOP); 1, same loc., without further data (BISHOP); 1, Nuuanu, XI.1916, poha, W.M. Giffard & D.T. Fullaway (HSDA); 1, Palolo, IX.1912, Swezey (HSDA); 3, same loc., XII.1921, ohia ha, Swezey (HSDA); 1, Pupukea, XII.1935, dead *Bobeia*, N.L.H. Krauss (BISHOP); 4, Puu Kaneoaha, X.1958, *Pipturus*, Ford (BISHOP); 2♂, same data (BISHOP); 9, Waianae Mts, VI.1953, Ford (BISHOP); 1♂, same data (BISHOP). MOLOKAI: 2, Kainalu, 1700 ft [518 m], VII.1927, *Straussia*, Swezey (BISHOP); 6, above Waikolu Val, 1400 m, IV.1955, *Coprosma*, Ford (BISHOP); 3, same loc., 1400 m, V.1955, *Pipturus*, Ford (BISHOP). LANAI: 1, Lanai, 2000 ft [610 m], I.1894, Perkins no. 80, Perkins, Fauna Hawaiiensis (BISHOP). MAUI: 3, Nahiku, 1500 ft [457 m], VII.1929, *Pipturus*, Swezey (BISHOP); 1, Kipahulu Val, 1250 m, VIII.1967, N. Wilson (BISHOP). HAWAII: 1, Hawaii, Koebele (BISHOP); 7, Kilauea, VII.1934, ex *Pipturus*, Swezey (HSDA).

Distribution. Endemic to Hawaiian Is; most windward islands: Oahu, Molokai, Lanai, Maui, Hawaii.

Hosts. *Bobeia* (ahakea), *Coprosma* (pilo), *Eugenia sandwicensis* (ohia ha), *Perrottetia sandwicensis* (olomea), *Physalis peruviana* (poha), *Pipturus* (mamaki), *Psychotria* [as *Straussia*] (kopiko).

Remarks. This endemic species appears widespread on at least several islands, occurring on a number of different hosts. In collections it has been frequently confused with *vulcanus* Perkins [usually as *truncatus* Sharp]. These species are separated by the transverse profile of the pronotal summit: angulate in *dubiosus* and convex in *vulcanus*. This species shows variation in proportions of the pronotum and elytra and in the sculpture of the elytral declivity. Such differences are seen in different series from different hosts. It is possible that the material treated here may eventually be shown to represent more than 1 species. *X. dubiosus* is close to *simillimus* Perkins [Hawaii] because of the angulate pronotal summit. The former tends to have the declivital tubercles on interstice 1 smaller and with these tubercles subequal or slightly larger than the tubercles on interstice 3; the latter species consistently has the tubercles on interstice 1 large and the tubercle on interstice 3 obsolete or minute.

***Xyleborus exsectus* Perkins**

FIG. 55

Xyleborus exsectus Perkins, 1900, Fauna Hawaii. 2(3): 179, pl. 10, fig. 2 (Maui: Haleakala; syntype in BMNH is here designated as lectotype).—Kleine, 1914, Stettin. Entomol. Ztg 75: 302 (list).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 292 (list).

Type material examined (syntype series). MAUI: lectotype ♂ (BMNH), Haleakala, 5000 ft [1525 m], V.1896

[R.C.L. Perkins, Fauna Hawaiiensis]; 1 paralectotype ♂, same data as lectotype (BISHOP); 1 paralectotype ♂, same loc., III.1894, Perkins, Fauna Hawaiiensis (BISHOP).

Distribution. Endemic to Hawaiian Is; thus far known from the type-series from Maui.

Hosts. Unknown.

Remarks. This is an endemic ♂-described species without associated females and is part of a complex of borers frequently associated with araliaceous hosts. There is a possibility that this may be the ♂ of the ♀-described *molokaiensis* Perkins. Further studies are needed to ascertain this.

Xyleborus ferrugineus (Fabricius)

FIG. 24-25

Bostrichus ferrugineus Fabricius, 1801, Syst. Eleutheratorum 2: 388 (America meridionali).

Xyleborus confusus Eichhoff, 1867, Berl. Entomol. Z. 11: 401 (Chile, Venezuela); 1878, Mém. Soc. R. Sci. Liège ser. 2, 8: 384 (America meridionalis, Madagascar).—Perkins, 1900, Fauna Hawaii. 2(3): 177 (Oahu, Maui, Kauai, Hawaii).—Schedl, 1941, Proc. Hawaii. Entomol. Soc. 11(1): 116 (Oahu, hosts).—Swezey, 1941, ibid. 11(1): 123 (Oahu, hosts, Molokai, Guam), 126 (hosts); 1954, B. P. Bishop Mus. Spec. Publ. 44: 38, 71, 112, 162, 168, 216 (hosts, Hawaiian records, all Oahu).—Schedl, 1950, Bishop Mus. Occas. Pap. 20(3): 41 (Fiji).

Xyleborus insularis Sharp, 1885, Trans. R. Dublin Soc. ser. 2, 3: 193 (Oahu, Kauai; type in BMNH).

Xyleborus ferrugineus: Eggers, 1929, Wien. Entomol. Ztg 46: 47.—Wood, 1960, Insects Micronesia 18(1): 52 (key), 64, fig. 13a (Mariana Is, Caroline Is, Gilbert Is).—Schedl, 1960, Coleopt. Bull. 14(1): 8 (synonymy, remarks).—Ford, 1961, Proc. Hawaii. Entomol. Soc. 17(3): 318 (cites preceding).—Bright, 1968, Can. Entomol. 100: 1297 (key), 1300 (key), 1312, fig. 2, 4, 13, map 9 (North America).—Browne, 1974, Commonw. For. Rev. 53: 65 (Fiji).—Roberts, 1977, J. Nat. Hist. 11: 256 (Fiji, hosts).—Wood, 1977, Great Basin Nat. 37(1): 68, 73 (probable origin, introductions).

Material examined. KAUAI: 1, Kauai, Koebele (BISHOP); 1, Kauai, 4000 ft [1220 m], X.1895, Perkins no. 560, R.C.L. Perkins (BISHOP); 15, Olokele Canyon, VIII.1925, kukui, O.H. Swezey (BISHOP); 1, Kokee, VII.1937, E.C. Zimmerman (BISHOP). OAHU: 1, Cooke Trail, IV.1919, *Perrottetia*, Swezey (BISHOP); 7, Hauula, XI.1929, kukui, Swezey (HSDA); 1♂, same data (HSDA); 1, same data, but ohia ai (HSDA); 1, Honolulu, VIII.1929 (BISHOP); 1, Honolulu, 2000 ft [610 m], XI.1892, Perkins (BISHOP); 1, same loc., VI.1900, Perkins no. 789, Perkins (BISHOP); 1, Kahuku, X.1927, Swezey (HSDA); 2, Kalihi Val, XII.1952, E.J. Ford Jr (BISHOP); 6, Kamokonui Val, X.1933, N.L.H. Krauss (BISHOP); 1, SE Koolau Mts, IX.1917, J.C. Bridwell (BISHOP); 1, Koolau Mts, V.1952, Ford (BISHOP); 1, Kukuiala Val, IV.1936, R.L. Usinger (BISHOP); 5, Kuliouou, XII.1927, kukui, Swezey (HSDA); 1, same data, but *Tetraplasandra* (HSDA); 7, Makalcha Val, XII.1919, kukui, Swezey (HSDA); 1, same data but *Pipturus* (BISHOP); 3, Makiki Val, XII.1924, ex kukui, Swezey (HSDA); 1, Manoa Val, XII.1919, F.X. Williams (HSDA); 6, same loc., XII.1926, kukui, Swezey (HSDA); 1, same loc., I.1929, E.H. Bryan Jr (BISHOP); 8, same loc., XII.1930, dead *Pipturus*, Swezey (BISHOP, HSDA); 1, Mt Kaala, V.1928, 2000 ft [610 m], A.M. Adamson (BISHOP); 1, same loc., I.1929, *Pipturus*, Swezey (HSDA); 3, same loc., 1000 ft [305 m], XII.1950, *Acacia koa*, Ford (BISHOP); 2, same loc., XII.1955, Ford (BISHOP); 10, Mt Olympus, XI.1909, Swezey (HSDA); 7, Mt Tantalus, 1300 ft [396 m], III.1905, W.M. Giffard (HSDA); 2, same data but Giffard no. 839 (HSDA); 1, same data but on fallen kukui (HSDA); 1, same loc., 1200 ft [366 m], V.1906, Giffard no. 112, Giffard (BISHOP); 4, same loc., X.1906, mamaki [some spms without date or host], Perkins (BISHOP); 2, same loc., IX.1923, S.C. Ball (BISHOP); 1, same loc., XI.1926, *Pipturus*, Swezey (HSDA); 1, same data but without host (HSDA); 7, same loc., IX, XI, XII.1929, F.C. Hadden (BISHOP); 3, same loc., X.1929, at light, Hadden (BISHOP); 1, Maunawili, ex av[ocado] pear, I.1905, Giffard (HSDA); 5, Niu Val, V.1959, Ford (BISHOP); 5, Palolo, XII.1921, kukui, Swezey (HSDA); 1, same loc., XII.1922, Swezey (HSDA); 6, Paumalu, VI.1935, *Dracaena*, Usinger (BISHOP); 1, same loc., VI.1935, *Dracaena*, Swezey (HSDA); 1, Puu Kanehoa, VIII.1959, Ford (BISHOP); 4, Puu Kaua, X.1953 (BISHOP); 1♂, same data (BISHOP); 1, Puu Lanipo, XII.1956, *Cordylina*, Ford (BISHOP); 3, Waiahole, VIII.1933, kukui, Swezey (HSDA); 9, same data but *Pisonia* (HSDA); 3, Waialae Iki, IV.1921, Swezey (HSDA); 1, same loc., I.1929, Bryan

(BISHOP); 1, Waialua coast, IX.1900, Perkins no. 760, Perkins (BISHOP); 3, Waianae Mts, IV.1892, kukui wood, Perkins no. 7, Perkins (BISHOP); 1, same data, but kukui tree, Perkins no. 29 (BISHOP); 3, same loc., VIII.1954, *Aleurites moluccana*, Ford (BISHOP); 1, same loc., II.1955, *Aleurites*, Ford (BISHOP); 1, Waimano Trail, VIII.1955, dead kukui tree, Ford (BISHOP). MOLOKAI: 1, Kainalu, 1500 ft [457 m], VII.1927, Swezey (BISHOP); 1, same loc. and elevation, VII.1927, at light, Bryan (BISHOP). LANAI: 1, Maunalei Gulch, X.1947, N.L.H. Krauss (BISHOP). HAWAII: 2, Hawaii, Koebele (BISHOP); 4, Hawaii, yr 189-, Perkins no. 764, Perkins (BISHOP); 1, Honokaa, X.1908 (HSDA); 1, slopes of Hualalai, Kona side, 4000–6000 ft [1220–1830 m], VI.1905, J. Kotinsky, W.M. Giffard Collection (BISHOP); 1, Kona, Kaawaloa, 1500 ft [457 m], no date, Perkins no. 404, Perkins (BISHOP). Hawaiian Is: 5, locality not determined, Perkins no. 859, Perkins (BISHOP).

Distribution. Most tropical and subtropical regions, extending to temperate eastern North America; also Pacific islands from western Micronesia to Samoa and Hawaiian Is.

Hosts. Hawaiian records include *Aleurites moluccana* (kukui), *Bobea elatior* (ahakea), *Eugenia malaccensis* (mountain apple, ohia ai), *Perrottetia sandwicensis* (olomea), *Pipturus albidus* (mamaki), *Pisonia* (aulu or papala), *Pleomele aurea* [= *Dracaena*] (halapepe), and *Tetraplasandra* (ohe).

Remarks. This adventive species appears to have been well established in Hawaiian forests by the time it was first collected on Oahu and Kauai last century. This species tends to occur at moderate elevations and breeds in several kinds of endemic trees. The large declivital tubercle on interstice 3 near the declivital center distinguishes this species from other Hawaiian congeners.

Xyleborus fornicatus Eichhoff

FIG. 16–17

Xyleborus fornicatus Eichhoff, 1868, Berl. Entomol. Z. **12**: 151 (Ceylon); 1878, Mém. Soc. R. Sci. Liège ser. 2, **8**: 327 (Ceylon).—Schedl, 1934, Stylops **2**: 177 (nec *ignobilis* Perkins), 178 (Hawaiian Is, without locality).—Beeson, 1930, Indian For. Rec. **14**(10): 234 (Ceylon, India, Burma, hosts).—Swezey, 1936, Proc. Hawaii. Entomol. Soc. **9**(2): 208 (Maui, *Enterolobium*); 1941, *ibid.* **11**(1): 121 (Oahu, Molokai, Maui, Hawaii, hosts), 125 (hosts).—Schedl, 1941, *ibid.* **11**(1): 112 (Oahu, Maui, Hawaii, hosts).—Swezey, 1949, *ibid.* **13**(3): 327 (Oahu, breadfruit); 1950, *ibid.* **14**(1): 187 (Oahu, breadfruit).—Wood, 1960, Insects Micronesia **18**(1): 51 (key), 56, fig. 10c (Bonin Is, Caroline Is).—Au, 1967, Proc. Hawaii. Entomol. Soc. **19**(3): 337 (Kauai, monkeypod).—Browne, 1974, Commonw. For. Rev. **53**: 65 (Fiji, + general distribution).—Roberts, 1977, J. Nat. Hist. **11**: 259 (Fiji, hosts).—Beaver & Browne, 1978, Orient. Insects **12**(4): 608 (Penang, + general distribution).

Xyleborus fornicator: Schedl, 1934, Stylops **3**: 178 (Hawaiian Is, without locality).

Xyleborus ignobilis: Schedl, 1934, Stylops **3**: 177 (treated as questionably synonymous with *fornicatus* Eichhoff).—Beeson, 1938, J. Fed Malay States Mus. **18**(2): 292 (part).

Collection localities (BISHOP, HSDA). KAUAI: Kilauea, Poipu. OAHU: Aiea Heights, Barbers Point, Damon Flat, Ewa, Kailua [?Oahu], Kaimuki, Kohala, Kualoa, Honolulu, Makiki, Manoa Val, Moanalua, Mt Kaala, Mt Tantalus, Puunene, Wahiawa, Waianae, Waianae Mts, Waipio. MOLOKAI: Mapulehu. MAUI: Iao Val, Lahaina. HAWAII: Hilo, Holualoa, Kohala, Kukuau, ?Puako. Abundant on most or all windward islands.

Distribution. S Asia, Indonesia, Australia, New Guinea, Micronesia, and Hawaiian Is.

Hosts. Hawaiian records include *Acacia*, *Albizia*, *Aleurites*, *Artocarpus*, *Citrus*, *Colvillea*, *Cucumis*, *Enterolobium*, *Eugenia*, *Ficus*, *Leucaena*, *Litchi*, *Macadamia*, *Mangifera*, *Noth-*

opanax, *Persea*, *Ricinus*, *Samanea*, *Schinus*, *Spondias*, *Sterculia*, and *Tamarindus*. Beeson (1930: 235, 236) listed hosts from southern Asia.

Remarks. This adventive species may not have become established in Hawaii until the present century, for it is absent in *Fauna Hawaiiensis* material and the earliest specimen in Bishop Museum was collected in 1912, from avocado. The robust body form distinguishes this species from Hawaiian congeners; it has the facies of an oversized *Xylosandrus compactus* (Eichhoff).

Xyleborus hawaiiensis Perkins

FIG. 6, 48

Xyleborus hawaiiensis Perkins, 1900, *Fauna Hawaii*. 2(3): 175 (Hawaii: Hilo; syntype in BMNH is here designated as lectotype).—Beeson, 1938, *J. Fed. Malay States Mus.* 18(2): 929 (list).—Schedl, 1941, *Proc. Hawaii. Entomol. Soc.* 11(1): 112 (Oahu, *Pipturus*).—Swezey, 1941, *ibid.* 11(1): 121 (Oahu, hosts); 1954, *B. P. Bishop Mus. Spec. Publ.* 44: 73 (Oahu, *Dubautia*), 162 (Oahu, *Pipturus*).

Xyleborus hawaiiensis: Kleine, 1914, *Stettin. Entomol. Ztg* 75: 303 (orthogr. error; list).

Type material examined (syntype series). HAWAII: lectotype ♀ (BMNH), Hilo, 2000 ft [610 m], I.1896, Perkins no. 697 [R.C.L. Perkins, *Fauna Hawaiiensis*]; 1 paralectotype ♀, same data as lectotype (BISHOP); 1 paralectotype ♀, Hilo, 1800 ft [550 m], XII.1895 [Perkins], *Fauna Hawaiiensis* (BISHOP).

Other material. HAWAII: 4, Kilauea, VII.1906 [R.C.L. Perkins] (BISHOP); 1, same loc., VII.1934, *Cheirodendron*, O.H. Swezey (HSDA); 1, Kulani Prison Road, 245 m, VII.1970, *Tetraplasandra hawaiiensis*, W.C. Gagné (BISHOP); 1, S Kona, VIII.1949, *Cheirodendron*, Swezey (BISHOP); 3, upper Hamakua Ditch Trail, X.1929, *Cheirodendron*, Swezey (BISHOP). MAUI: 1, Waihoi Val, 610 m, VII.1972, *Tetraplasandra meiandra*, Gagné (BISHOP). LANAI: 4, Ridge Road, 900 m, VI.1971, *Tetraplasandra*, J.L. Gressitt (BISHOP). OAHU: 4, Castle Trail, 610 m, V.1938, *Pipturus*, E.C. Zimmerman (BISHOP); 1, Haleauau, III.1940, *Pipturus*, Swezey (HSDA); 2, Hauula Val, V.1925, *Pipturus*, Swezey (BISHOP, HSDA); 1, Kahana, IX.1924, *Pipturus*, Swezey (HSDA); 4, nr Kahana, III.1970, ex *Tetraplasandra*, S.L. Montgomery (BISHOP); 1, Kamokunui Val, X.1933, *Pipturus*, Swezey (HSDA); 4, Kaumuahona, XI.1918, *Cheirodendron*, Swezey (BISHOP); 5, Kawailoa Ridge, X.1953, E.J. Ford Jr (BISHOP, CNCI); 2, Kawailoa Trail, IX.1953, *Cheirodendron* [Ford] (BISHOP); 7, Makaleha Val, XII.1919, *Pipturus*, Swezey (BISHOP, HSDA); 1, Manoa Val, VII.1953, *Cheirodendron*, Ford (BISHOP); 1, Mt Kaala, I.1928, *Pipturus*, Swezey (HSDA); 2, same loc., III.1951, *Pipturus albidus*, Ford (BISHOP); 3, same loc., 765 m, VI.1951, *Pipturus albidus*, Ford (BISHOP). KAUAI: 1, Kaunuahua Ridge, Kokee State Park, 1065 m, VIII.1970, Gagné (BISHOP); 1, Kokee-Kalalau Trail, VIII.1925, *Cheirodendron*, Swezey (BISHOP); 2, Mohihi, VIII.1925, *Tetraplasandra*, Swezey (BISHOP); 1, Mt Kahili, 915 m, IX.1970, *Tetraplasandra meiandra*, Gagné (BISHOP).

Distribution. Endemic to Hawaiian Is; most windward islands: Hawaii, Maui, Lanai, Oahu, Kauai. New to Maui, Lanai, Kauai.

Hosts. *Cheirodendron* (olapa), *Dubautia laxa* (naenae), *Pipturus albidus* (mamaki), *Tetraplasandra hawaiiensis* (ohe), *T. meiandra* (ohe).

Remarks. This species appears somewhat variable and is close to or perhaps conspecific with *mauiensis* Perkins; differs from the latter by having elytral declivity slightly to moderately impressed instead of convex to feebly impressed and overall declivital sculpture smoother. Specimens from the islands of Hawaii and Maui tend to be darker, with elytral declivity more broadly impressed; specimens from Oahu, ex *Pipturus*, tend to have declivity smoothest and least impressed; specimens from Kauai tend to be larger and have principal declivital tubercles larger.

Xyleborus hiiaka Samuelson, **new species**

FIG. 5, 49, 56

Xyleborus kauaiensis: Schedl, 1934, *Stylops* 3: 177 (♂ nov.; Hawaii: upper Hamakua Ditch Trail).—Swezey, 1954, B. P. Bishop Mus. Spec. Publ. 44: 49 (part: Hawaii: Kohala Mts).—Schedl, 1979, *Kat. Naturhist. Mus. Wien* 3(2): 131 [part: allotype (♂) in Sammlung Schedl (not of type-series)]. [= *hiiaka*, n. sp.]

Holotype ♀. Form fairly slender, 2.85× as long as broad, slightly turgid along side of pronotum near middle and elytra along middle; elytral preapex obliquely narrowed to nearly truncate apex. Body surfaces yellow- to orange-testaceous, scutellum and fine sutural line of elytron dark fuscous; appendages mostly yellow-testaceous. Vestiture pale, golden, moderate in frontoclypeal region, ± moderate on anterior pronotal slope, ± sparse on elytral disc, with both short and long setae; declivital bristles sparse, longest. Length 3.85 mm; breadth 1.35 mm.

Frons broadly and evenly convex transversely, sculpture granulate and in part closely punctate, particularly sublaterally; eye with emargination ½-dividing eye, angle of emargination barely acute. Pronotum about 1.15× as long as broad and 0.65× as long as elytron, broadest slightly basad of middle; side slightly and evenly convex, anterior margin moderately and evenly convex; discal summit placed slightly basad of middle; pronotum in transverse profile rather arched with summit moderately convex and with sides weakly convex; surface finely asperate on anterior slope, finely granulate basally; basal punctures moderately small, mostly 0.3–0.4× as large as interspaces. Scutellum nearly smooth, ± obsoletely granulate, surface slightly turgid. Elytron about 3.5× as long as broad; side feebly broadened postbasally to middle, thence narrowed to preapex, apical 0.20 wedge-shaped with extremity truncate—this condition is more pronounced with insect viewed obliquely from anterodorsal aspect; discal striae not impressed; discal punctures moderately small: mostly 0.5–0.7× as large as transverse interspaces and 0.3× as large as interstices; interstices not raised; discal sculpture smooth-alutaceous with fine interstitial punctures; elytral declivity moderately steep, sinuate in lateral view, surface slightly impressed; impression occupying interstice 2 and parts of adjoining interstices 1 and 3, being bounded below by raised central part of interstice 3; sculpture of declivity finely granulate-opaque, with principal tubercles small; declivital puncture rows distinct, with 2nd stria somewhat impressed below declivital center; declivital tubercles placed as follows: interstice 1 with a series of 3 or 4 small tubercles from summit to below declivital center; interstice 3 with 2 or 3 minute tubercles extending from summit to below center.

Allotype ♂. Form fairly slender, 2.9× as long as broad, subparallel-sided, broadest across pronotum prebasally; pronotum narrowed anteriorly to broadly emarginate anteromedian projection. Color as in ♀. Vestiture: pronotum submoderately clothed anterolaterally, concavity of anterior slope with adpressed setae; elytron rather sparsely clothed with short and long hairs, longest setae laterally and on declivity. Length 3.65 mm; breadth 1.3 mm.

Frons impressed medially, obsoletely granulate, ± smooth, shining; eye with emargination obtuse. Pronotum about 1.25× as long as broad and 0.75× as long as elytron; side feebly convex from base to anterior 0.25, thence obliquely narrowed and descending to ± horizontal anteromedian projection; extreme apex of projection with emargination slightly concave; anterior slope broadly concave, becoming more deeply so at projection; basal 0.5 broadly convex; sculpture finely granulate, nearly smooth; discal punctures small: mostly 0.3–0.5× as large as interspaces. Elytra broadest basally, narrower than pronotum; elytron about 3.45× as long as broad; side feebly narrowed to apical 0.3, thence more strongly and convexly narrowed to fairly broad, weakly convex extremity; discal interstices feebly swollen, smooth-alutaceous; elytral declivity slightly more gradual and less impressed than in ♀; declivital sculpture finely granulate, tubercles obsolescent: 1 or 2 minute tubercles distinct on interstice 1; striae feebly impressed.

Variation ($n = 40$). Color varies from yellow-testaceous with fine fuscous sutural line to dark orange-fuscous, with darkest specimens having elytra darker (nearly piceous) than pronotum (dark orange-fuscous). All ♀ have the characteristic wedge-shaped elytral apex. Protibial preapex (♀) with 9–11 teeth, commonly with 10 or 11. Body length ♀: 3.65–4.05 mm, mean 3.81; ♂: 3.45–3.65 mm, mean 3.56.

Holotype ♀ (BISHOP 12,103), HAWAIIAN IS: HAWAII I: upper Hamakua Ditch Trail, 7.X.1929, *Cheirodendron*, no collector label; allotype ♂ (BISHOP), same loc., 3.X.1929, *Cheirodendron*, R.R. Whitten; paratopotypes: 4♀, same data as holotype

(BISHOP); 3♀, same data as preceding but with F.C. Hadden collector (BISHOP); 1♂, 1♀, same data, except 2.X.1929, Whitten (BISHOP); 1♂, 1♀, same data except 3.X.1929, Whitten (BISHOP); 4♀, same data except 3.X.1929, O.H. Swezey (BISHOP, CNCI); 13♀, same data except 4.X.1929, Swezey (BISHOP, BMNH, CASC, HSDA, NMNH, NMW, SLWC, UH); 4♀, same data, but with additional label, Kohala Mts, 3.IX.1919, Swezey (HSDA, UH); paratypes: 1♂, 2♀, Kilauea, VII.1906, R.C.L. Perkins (BISHOP); 1♀, presumably of same series, without data (BISHOP); 2♀, same loc., 9.VII.1934, *Cheirodendron*, Swezey (HSDA, UH); 1♀, Olaa, 29 mi [48 km from Hilo], 2300 ft [700 m], I.1920, D.T. Fullaway (HSDA).

Host. *Cheirodendron* (olapa).

Remarks. This species belongs to the complex associated with araliaceous hosts. In general facies it most closely resembles *kauaiensis* Perkins, to which it was assigned by earlier authors; it differs from *kauaiensis* and other members of the complex by having the elytral apex wedge-shaped instead of convex in females and the anterior angle of the pronotum quite oblique instead of nearly square or acute in males.

The name patronizes the Hawaiian goddess Hiiaka, sister of Pele.

Xyleborus ignobilis Perkins

FIG. 29

Xyleborus ignobilis Perkins, 1900, Fauna Hawaii. 2(3): 180 (Hawaii: windward and lee sides of the island; syntype in BMNH [Hilo] is here designated as lectotype).—Kleine, 1914, Stettin. Entomol. Ztg 75: 302 (list).—Schedl, 1934, Stylops 3: 177 [nec *formicatus* Eichhoff].—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 292 (list) [nec *formicatus* Eichhoff].

Type material examined (syntype series). HAWAII: lectotype ♀ (BMNH), Hilo, 2000 ft [610 m], I.1896, Perkins no. 557 [R.C.L. Perkins, Fauna Hawaiiensis]; 1 paralectotype ♀, same data, Perkins no. 697 (BISHOP); 1 paralectotype ♀, Kona, 2000 ft [610 m], IX.1892, Perkins no. 395, Perkins, Fauna Hawaiiensis (BISHOP).

Other material (BISHOP). HAWAII: 1, Glenwood, III.1919, O.H. Swezey. OAHU: 22, [Mt] Lanihuli, X.1919, *Freycinetia*, E.H. Bryan Jr (+ CNCI); 14, same loc., X.1919, ie-ie, Swezey; 1, Kaluanui, X.1934, Bryan. LANAI: 1, Lanai Mts, X.1947, N.L.H. Krauss. MAUI: 3, Maui, Lyon, Perkins Collection; 1, Kipahulu Val, Camp 2, 1250 m, VIII.1967, N. Wilson.

Perkins stated that each of the 3 specimens (syntypes) were taken in a different locality; thus the 2 specimens from Hilo are presumably of different collections.

Distribution. Endemic to the Hawaiian Is; 4 islands: Hawaii, Maui, Lanai, Oahu. New to Lanai, Maui.

Host. *Freycinetia arborea* (ie-ie).

Remarks. This species and *rugatus* Blackburn are somewhat similar in body form, but the latter lacks serrations on the anterior margin of the pronotum. Sculpturing of the elytral declivity also differs in these species, with tubercles absent in *ignobilis* and present in *rugatus*. Both species are borers of monocots: *ignobilis* has been bred only from a native *Freycinetia* and *rugatus* mostly from an introduced *Cordyline* and an endemic *Pleomele* [= *Dracaena*].

Xyleborus interjectus Blandford

FIG. 27

Xyleborus interjectus Blandford, 1894, Trans. Entomol. Soc. London **1894**: 576 (Japan; China, Chusan Is; type in BMNH).—Beeson, 1930, Indian For. Rec. **14**(10): 239, fig. 2 (India, Burma, Andaman Is; range includes Ceylon, Sumatra, Java, Batoe Is, Indo-China, Japan).—Schedl, 1975, Rev. Suisse Zool. **82**(3): 451 (India: W Bengal: Darjeeling; Kerala: Cardamom Hills).

Material examined. OAHU: 1, Palolo Val, 16.III.1976, S. Sato (UH); 1, same loc., 23.III.1976, Sato (BISHOP); 2, same loc., 3.X.1976, Arlene Ota (HSDA, NMNH); 1, [Kahaluu Val] Ahuimanu Rd, 100–120 m, 8.XII.1979, flying at dusk, G.A. Samuelson (BISHOP).

Distribution. S Asia from Sri Lanka and India to China and throughout continental islands bordering Asia from Indonesia to Japan. Adventive to the Hawaiian Is; thus far collected only from Oahu.

Hosts. Unknown in Hawaii. Beeson (1930: 240) reported that this species is primarily a borer of soft-wooded timbers and that it also rears broods in sapwood of some hardwoods. The following host genera were listed by Beeson: *Acer*, *Albizia*, *Anogeissus*, *Anthocephalus*, *Artocarpus*, *Bombax*, *Casearia*, *Castanopsis*, *Cedrela*, *Dipterocarpus*, *Erythrina*, *Euphorbia*, *Ficus*, *Garuga*, *Gmelina*, *Kydia*, *Mallotus*, *Michelia*, *Odina*, *Pterocarpus*, *Pterospermum*, *Sarcocephalus*, *Shorea*, *Spondias*, *Sterculia*, *Tectona*, *Terminalia*, *Tetrameles*, and *Xylia*.

Remarks. This species differs from all other congeners on Hawaiian islands by the following combination of characters: body length well over 3 mm (3.55–3.75 mm in spms examined), prothorax as broad as long or broader than long, color dark fuscous to pitch black. Dr D. M. Anderson (NMNH) confirmed the identity of 2 of the specimens collected on Oahu.

Xyleborus kauaiensis Perkins

FIG. 50, 57

Xyleborus kauaiensis Perkins, 1900, Fauna Hawaii. **2**(3): 174 (Kauai: Halemanu and above Waimea, 4000 ft [1220 m]; syntype in BMNH is here designated as lectotype).—Kleine, 1914, Stettin. Entomol. Ztg **75**: 303 (list).—Beeson, 1938, J. Fed. Malay States Mus. **18**(2): 292 (Kauai, Oahu listed).—Swezey, 1941, Proc. Hawaii. Entomol. Soc. **11**(1): 122 (part: Kauai, *Cheirodendron*), 126 (host); 1954, B. P. Bishop Mus. Spec. Publ. **44**: 49 (part: Kauai, *Cheirodendron*).

♂ *nov.* Form unlike ♀, prothorax modified; body 2.8× as long as broad, broadest across prothorax slightly behind anterior angles. Prothorax about 1.3× as long as broad and 0.9× as long as elytron (on horizontal plane); side nearly straight, feebly sinuate, gradually but feebly broadened anteriorly; anterior margin abruptly, nearly transversely narrowed as it descends between convex anterior angle and anteromedian projection; projection fairly broad, becoming parallel-sided with extremity concave in outline; profile of pronotum in lateral view descending nearly vertically anteriorly; anterior slope deeply concave, remainder of pronotum convex; sculpture finely granulate, nearly smooth, moderately punctate on anterior slope and anterolateral area, punctures distinctly smaller discally and posteriorly. Elytron about 3.05× as long as broad, broadest near middle; side nearly straight basally and becoming slightly narrowed from about middle to apical 0.2, thence convexly narrowed to extremity; central discal punctures mostly 1.5–2× as large as transverse interspaces and 0.5–0.7× as large as interstices; interstices smooth-alutaceous; declivity briefly flattened centrally, otherwise convex; declivital sculpture dull, granulate and set with small granules overall and 3–4 small tubercles on interstice 1. Body length 3.9 mm; breadth 1.4 mm. [♂, Kauai I: S Mohihi Ridge, 8.VII.1937, E.C. Zimmerman (BISHOP)].

Type material examined (syntype series). KAUAI: lectotype ♀ (BMNH), Kauai, 4000 ft [1220 m], VIII.1896,

Perkins no. 704 [R.C.L. Perkins, Fauna Hawaiiensis]; 1 paralectotype ♀, Kauai, 4000 ft [1220 m], V.1895, Perkins no. 365, Perkins, Fauna Hawaiiensis (BISHOP); 1 paralectotype ♀, Halemanu, 4000 ft [1220 m], V.1895, Perkins, Fauna Hawaiiensis (BISHOP).

Other material (BISHOP). KAUAI: 2, trail from Kokee to Kalalau, VIII.1925, *Cheirodendron*, O.H. Swezey; 12, Mohihi, VIII.1925, *Cheirodendron*, Swezey (+ CNCI); 1, S Mohihi Ridge, VII.1937, E.C. Zimmerman; 1 ♂, same data.

Distribution. Endemic to Hawaiian Is; possibly monoinisular: Kauai.

Host. *Cheirodendron* (olapa).

Remarks. *X. kauaiensis* is near *molokaiensis* Perkins; it differs from same by tending to have paler overall coloration and by having the elytral disc smooth-alutaceous instead of granulate, the elytral declivity narrower and the elytral apex less broadly rounded.

The series, including the ♂ nov. described by Schedl (1934) [Hawaii I: upper Hamakua Ditch Trail (part in BISHOP)], represents a different species, *hiika*, n. sp. (see key). A single specimen assigned here as near *kauaiensis*, from the island of Hawaii [Kilauea, VII.1906, Perkins (BISHOP)], resembles material from Kauai in coloration and smooth elytral disc, but it has the elytral apex more broadly rounded and the declivital tubercle on interstice 3 much larger.

Xyleborus lanaiensis Perkins

FIG. 7, 37-38

Xyleborus lanaiensis Perkins, 1900, Fauna Hawaiiensis 2(3): 176 (Lanai, 2000 ft [610 m]; syntype in BMNH is here designated as lectotype).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 293 (list).—Schedl, 1941, Proc. Hawaii. Entomol. Soc. 11(1): 115, fig. 2 (♂ described, Oahu, *Sideroxylon*).—Swezey, 1941, ibid. 11(1): 122 (Oahu, *Sideroxylon*, *Sapindus*), 125 (hosts); 1954, B. P. Bishop Mus. Spec. Publ. 44: 187 (Oahu, *Sapindus*), 198 (Oahu, Lanai, *Sideroxylon*).

Xyleborus lauaiensis: Kleine, 1914, Stettin. Entomol. Ztg 75: 303 (orthogr. error).

Type material examined (syntype series). LANAI: lectotype ♀ (BMNH), Lanai, 2000 ft [610 m], I.1894, Perkins no. 80 [R.C.L. Perkins, Fauna Hawaiiensis]; 2 paralectotype ♀, same data as lectotype (BISHOP).

Other material. OAHU: 1, Haleauau, XI.1926, *Sideroxylon*, O.H. Swezey (HSDA); 3 ♂, same data (BISHOP, HSDA); 1, same loc., I.1933, *Sideroxylon*, Swezey (HSDA); 11, Halona Val, Waianae Mts, III.1933, *Sapindus*, Swezey (BISHOP, HSDA); 3, same loc., IX.1957, *Sapindus*, E.J. Ford Jr (BISHOP); 5, same loc., VIII.1959, *Sapindus*, Ford (BISHOP, HSDA); 9, Mt Kaala, XI.1926, *Sideroxylon*, Swezey (BISHOP, HSDA); 1, Pohakea Pass, I.1954, *Sapindus*, Ford (BISHOP); 8, Puu Kaua, X.1953, *Sideroxylon*, Ford (BISHOP, CNCI).

Distribution. Endemic to Hawaiian Is; 2 islands: Lanai, Oahu.

Hosts. *Planchonella sandwicense* [= *Sideroxylon*] (aulu, kaulu, alaa), *Sapindus oahuensis* (aulu, kaulu, lonomea).

Remarks. Both this species and *oahuensis* Perkins are rather slender, being about 3.0× as long as broad, and both have the prothorax around 1.25× as long as broad. *X. lanaiensis* differs from the latter in being shorter and by having the pronotum slightly broader in relation to elytral breadth. These species, along with *arcturus*, n. sp., appear to be closely allied.

Xyleborus littoralis Perkins

Xyleborus littoralis Perkins, 1900, Fauna Hawaii. 2(3): 179 (Molokai: at sea level; holotype in BMNH).—Kleine, 1914, Stettin. Entomol. Ztg 75: 302 (list).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 293 (list).

Material examined. MOLOKAI: holotype ♀, Kaunakakai, 1893 [R.C.L. Perkins, Fauna Hawaiiensis] (BMNH).

Distribution. Endemic to Hawaiian Is; 1 island: Molokai.

Hosts. Unknown.

Remarks. This species is based on the male and is not yet associated with the female. Although the affinities of this species remain somewhat vague, they would be near *vulcanus* Perkins, which also has a pronounced median pronotal projection that is briefly rounded apically, instead of emarginate apically. The only ♂-♀-associated xyleborines from Molokai or Maui that I have seen thus far are the *Cheirodendron*-associated species *mauiensis* Perkins and *molokaiensis* Perkins. Males of neither of those species agree with this species, as they have the pronotal extremity broadly emarginate apically.

Xyleborus mauiensis Perkins

FIG. 52, 59

Xyleborus mauiensis Perkins, 1900, Fauna Hawaii. 2(3): 175 (Maui: Haleakala, 5000 ft [1525 m], on *Cheirodendron*; syntype in BMNH is here designated as lectotype).—Kleine, 1914, Stettin. Entomol. Ztg 75: 303 (list).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 293 (list).—Swezey, 1941, Proc. Hawaii. Entomol. Soc. 11(1): 126 (host).

Xyleborus mauensis: Swezey, 1941, Proc. Hawaii. Entomol. Soc. 11(1): 124 (orthogr. error; Maui, *Cheirodendron*).

♂ *nov.* Form unlike ♀, prothorax modified; body 2.9× as long as broad, broadest across prothorax slightly behind anterior angles. Prothorax about 1.45× as long as broad and 0.95× as long as elytron (on horizontal plane); side nearly straight, somewhat sinuate, gradually but feebly broadened anteriorly; anterior margin abruptly, nearly transversely narrowed as it descends between convex anterior angle and anteromedian projection; projection obliquely narrowed to fairly broad emarginate extremity; outline of extremity concave; profile of pronotum in lateral view descending nearly vertically anteriorly; anterior slope deeply concave, remainder of pronotum convex; sculpture finely granulate, nearly smooth, moderately punctate on anterolateral area, punctures relatively sparse on concave anterior slope and disc. Elytron about 3.05× as long as broad, broadest across anterior 0.34; side feebly broadened postbasally, remainder rather straight and slightly narrowed to apical 0.2, thence convexly narrowed to extremity; central discal punctures mostly 1× as large as transverse interspaces and 0.7× as large as interstices; interstices smooth-alutaceous; declivity flattened centrally; declivital surface dull, granulate and set with small granules overall and about 3 small tubercles on interstice 1. Body length 2.75 mm; breadth 0.95 mm. [♂, Maui I: Haelaau, 18.XII.1928, *Cheirodendron*, O.H. Swezey (BISHOP)].

Type material examined (syntype series). MAUI: lectotype ♀ (BMNH), Haleakala, 5000 ft [1525 m], V.1896, Perkins no. 608 [R.C.L. Perkins, Fauna Hawaiiensis]; 2 paralectotype ♀, same data as lectotype (BISHOP).

Other material. MAUI: 8, Haelaau, XII.1928, *Cheirodendron*, O.H. Swezey (BISHOP, HSDA); 1 ♂, same data (BISHOP); 7, Kaulalewelewe-Puu Kukui Trail, I.1973, *Cheirodendron*, C.J. Davis (HSDA); 2, Kula Pipeline, VI.1927, *Cheirodendron*, Swezey (HSDA); 3, Pohakea Gulch, 1090 m, IV.1971, *Cheirodendron trigynum*, W.C. Gagné (BISHOP). MOLOKAI: 16, above Waikolu Val, 1400 m, IV.1955, E.J. Ford Jr (BISHOP, CNCI, HSDA); 3 ♂, same data (BISHOP).

Distribution. Endemic to Hawaiian Is; 2 islands: Maui, Molokai. New to Molokai.

Host. *Cheirodendron trigynum* (olapa).

Remarks. This species is similar to *hawaiiensis* Perkins in form and size; it differs from same and other Hawaiian species in same size category (2.85–3.4 mm) by having elytral declivity not or feebly impressed and declivital sculpture rough.

Xyleborus molokaiensis Perkins

FIG. 51, 58

Xyleborus molokaiensis Perkins, 1900, Fauna Hawaii. 2(3): 174 (Molokai, above 4000 ft [1220 m] in wet decaying wood of *Cheirodendron*; syntype in BMNH is here designated as lectotype).—Kleine, 1914, Stettin. Entomol. Ztg 75: 303 (list).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 293 (list).—Swezey, 1941, Proc. Hawaii. Entomol. Soc. 11(1): 124, 126 (host).

♂ *nov.* Form unlike ♀, prothorax modified; body 2.8× as long as broad, broadest across middle of prothorax. Prothorax about 1.35× as long as broad and 0.95× as long as elytron (on horizontal plane); side nearly straight, somewhat sinuate; anterior margin abruptly, nearly transversely narrowed as it descends between convex anterior angle and anteromedian projection; projection fairly broad, becoming parallel-sided with extremity concave in outline; profile of pronotum in lateral view descending nearly vertically anteriorly; anterior slope deeply concave, remainder of pronotum convex; sculpture finely granulate, moderately punctate anteriorly and laterally, punctures smaller discally. Elytron about 3.05× as long as broad, broadest along middle; side nearly straight to about apical 0.2, thence convexly narrowed to extremity; central discal punctures mostly 2-3× as large as transverse interspaces and 1× as large as interstices; interstices granulate; declivity ± convex; declivital sculpture dull, granulate and set with larger granules overall and small tubercles: 3 on interstice 1, and 2 on interstice 3. Body length 3.6 mm; breadth 1.3 mm [♂, Molokai I: above Waikolu Val, 1400 m, 29.IV.1955, E.J. Ford Jr (BISHOP)].

Type material examined (syntype series). MOLOKAI: lectotype ♀ (BMNH), Molokai, 4000 ft [1220 m], X.1893, [R.C.L. Perkins, Fauna Hawaiiensis]; 1 paralectotype ♀, Molokai Mts, 4500 ft [1370 m], 18.VI.1893, Perkins no. 182, Perkins (BISHOP); 1 paralectotype ♀, Molokai, 4500 ft [1370 m], VI.1893, Perkins, Fauna Hawaiiensis (BISHOP); 2 paralectotype ♀, same data but without month (BISHOP).

Other material (all BISHOP). MOLOKAI: 4, above Waikolu Val, IV.1955, *Cheirodendron*, E.J. Ford Jr; 1♂, same data but without host; MAUI: 5, Koolau Forest Res., 1525 m, VIII.1973, in rotting *Cheirodendron trigynum*, W.C. Gagné; 3, Hanawi Stream, Koolau Forest Res., 1525 m, VIII.1973, ex *Cheirodendron trigynum*, Gagné; 1, Haleaau, 915 m, XII.1928, W.M. Walker. LANAI: 1, Halepaakai, VII.1894, Perkins no. 134, Perkins. OAHU: 1, Manoa Val, VII.1953, Ford; 1♂, same data, + *Cheirodendron*; 1, Kawaiolo Forest Res., Peahinaia Trail, 700 m, VIII.1973, *Ilex anomala*, Gagné.

Distribution. Endemic to Hawaiian Is; 4 islands: Molokai, Maui, Lanai, Oahu. New to Maui, Lanai, Oahu.

Hosts. *Cheirodendron trigynum* (olapa), *Ilex anomala* (kawau).

Remarks. Near *kauaiensis* Perkins; differs from same by tending to have darker overall coloration and by dull, granulate elytral disc; see also remarks under the latter species. The syntypes differ from subsequent material from Molokai and other islands by slightly larger size and elytral declivity tending to be more uniformly flattened with striae impressions not very evident, interstriae surfaces rougher, asperulate, and principal tubercles smaller.

Xyleborus nubilus Samuelson, **new species**

FIG. 2, 32

Holotype ♀. Form slender, 3× as long as broad, ± parallel-sided; breadths at pronotal and elytral base subequal; elytra feebly broadened postbasally, broadest near middle, apex brief. Body surfaces largely orange-fuscous to dark fuscous: pronotal base relatively pale, orange-fuscous; elytral disc dark with slight dull bluish lustre laterally and preapically; antenna and legs largely orange-testaceous; pubescence pale, golden: moderate on anterior pronotal slope; sparse and relatively short on elytral disc and declivity. Length 3.2 mm; breadth 1.1 mm.

Frons broad, somewhat flattened between median area and eye, sculpture granulate, moderately punctate throughout eye-level, but narrowly impunctate medially; eye with emargination $\frac{3}{8}$ -dividing eye, angle of emargination nearly square. Pronotum about 1.1× as long as broad and 0.55× as long as elytron; broadest near middle but basal region generally broader than anterior, with side feebly turgid basally,

then straight anteriorly to moderately and evenly convex anterior margin; discal summit placed slightly anterior to middle (apical 0.46) as viewed from above; summit subangulate in transverse profile; surface asperate anteriorly, granulate basally, with occasional nearly obsolete asperities; basal discal punctures small, mostly about 0.3× as large as interspaces. Scutellum smooth, surface feebly impressed. Elytron about 3.9× as long as broad; side slightly broadened postbasally to middle, then narrowed to preapex; apical 0.15 briefly narrowed to extremity, with margin straight in part; ectoapical angle distinctly angulate with apex viewed obliquely; discal striae not impressed; discal punctures moderately large: mostly 0.7–1× as large as transverse interspaces and 0.5–0.7× as large as interstices; interstices not raised, sculpture smooth-alutaceous with occasional minute interstitial punctures; elytral declivity moderately steep, surface well-impressed centrally, obliquely so from near suture above to near pronounced ectoapical angle below; sutural area convex below; sculpture of declivity smooth-alutaceous but roughened by striae and interstitial punctures; striae rows 2 and 3 slightly impressed; declivital tubercles small and placed as follows: interstice 1 with 1 tubercle (largest) above declivital center and 2nd tubercle below minute, obsolescent; interstice 3 with 1 small tubercle above.

Variation ($n = 42$). Color dorsally orange-fuscous to dark orange-fuscous; in pale specimens dull bluish lustre of elytron is absent. Declivital tubercles in some specimens slightly larger than those of holotype, including lower tubercle on interstice 1. Length 2.95–3.25 mm; mean 3.11.

Holotype ♀ (BISHOP 12,104), HAWAIIAN IS: HAWAII I: Hilo Forest Reserve, 1–2 km S of Saddle Road, ca. 1200 m, X.1972, ex *Myrsine*, BR.1972.69, W.E. Ruffin; 40 paratopotype ♀, same data as holotype (BISHOP, BMNH, CASC, CNCI, HSDA, NMNH, NMW, SLWC, UH); 1 paratype ♀, Kilauea, 29 mi [48 km from Hilo], VIII.1911, ex kolea, W.M. Giffard (BISHOP).

Hosts. *Myrsine* (kolea).

Remarks. This species is related to *dubiosus* Perkins and *simillimus* Perkins because of the subangulate pronotal summit in transverse profile; it differs from both species by having the elytral declivity more deeply impressed, the declivital sculpture generally rougher but with principal tubercles smaller, and the ectoapical angle of the elytron more pronounced, being angulate instead of ± rounded.

Xyleborus oahuensis Perkins

FIG. 39

Xyleborus oahuensis Perkins, 1900, Fauna Hawaii. 2(3): 177 (Oahu, northern part of the Koolau Range at about 1000 ft [305 m]; holotype in BMNH).—Kleine, 1914, Stettin. Entomol. Ztg 75: 303 (list).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 293 (list).

Type material examined. OAHU: holotype ♀, Waialua, 1000 ft [305 m], II.1892 [R.C.L. Perkins, Fauna Hawaiiensis] (BMNH).

Other material. OAHU: 2, Poamoho Trail, I.1954, *Pelea*, E.J. Ford Jr [1 specimen lacking host label] (BISHOP).

Distribution. Endemic to Hawaiian Is; 1 island: Oahu.

Host. *Pelea* (alani).

Remarks. This species differs from its former variety, *scabratus* Schedl, new status, by having slenderer body form (comparative data under *scabratus*) and larger declivital tubercles with otherwise smoother sculpture on declivital interstices. *X. scabratus*, based on the male, fortunately has associated females and is treated here as a full species. *X. oahuensis* is also allied to *lanaiensis* Perkins, from which it differs by having pronotum slightly more parallel-sided with anterior margin less evenly convex and

longer body length. Label data of the holotype places the type-locality of *oahuensis* in the Waianae Range, not the Koolau Range. The 2 subsequent specimens, however, are from the Koolau Range.

Xyleborus pele Samuelson, new species

FIG. 53

Holotype ♀. Form fairly slender, 2.85× as long as broad; pronotum convex along middle, slightly narrowed basally; elytra ± parallel-sided before middle, thence narrowed. Body surfaces largely orange-fuscous; appendages paler. Vestiture pale, not exceedingly long dorsally; pronotal setae rather fine, moderately close on anterior slope; elytral bristles coarser and sparser, with short adpressed hairs evident, particularly on declivity. Length 4.95 mm; breadth 1.7 mm.

Frons broadly convex, surface granulate, closely punctate anterolaterally; eye with emargination $\frac{3}{5}$ -dividing eye, angle of emargination barely acute. Pronotum about 1.1× as long as broad and 0.6× as long as elytron, broadest near middle; side slightly convex, narrowed anteriorly and posteriorly; anterior margin convex medially, thence somewhat flattened sublaterally and oblique to convex anterior angle; pronotal summit placed near middle in dorsal view; pronotum in transverse profile with summit convex, then flatter, slightly convex laterally; surface rather finely asperate on anterior slope, finely granulate overall; discal punctures on basal 0.5 ± tuberculate, mostly 0.3× as large as interspaces. Scutellum obsoletely granulate, shining; surface turgid. Elytra slightly broader than pronotum; elytron about 3.6× as long as broad; extreme base with declivital face concave for reception of pronotal base; side feebly broadened to basal 0.37, thence gradually narrowed to preapex; apical 0.2 convexly narrowed to extremity; discal striae feebly impressed; discal punctures mostly 0.7× as large as transverse interspaces and 0.3× as large as interstices; interstices not raised; discal sculpture obsoletely granulate, shining and bearing fine interstitial punctures; elytral declivity moderately steep; surface weakly impressed; impression shallow, occupying stria 1 above and stria 2 below; sculpture finely granulate-opaque producing a dull sheen; tubercles minute: interstice 1 with a series of 6 along declivity; interstice 2 with several grains above; interstice 3 with a series of 5 along declivity.

Variation ($n = 3$). The 2 paratypes agree with the holotype in most respects. Both paratypes have granules on declivital interstice 3 slightly larger than those on interstice 1 instead of ± uniformly minute as in the holotype. Length 4.7-4.85 mm.

Holotype ♀ (BISHOP 12,105), HAWAIIAN IS: HAWAII I: Olaa, 29 mi [48 km from Hilo], 3800 ft [1159 m], 19.VIII.1920, W.M. Giffard; 1 paratype ♀, Kilauea, 4000 ft [1220 m], VII.1912, Giffard (BISHOP); 1 paratype ♀, upper Hamakua Ditch Trail, 3.X.1929, *Cheirodendron*, R.R. Whitten (BISHOP).

Host. *Cheirodendron* (olapa).

Remarks. This is the largest Hawaiian species of *Xyleborus* and belongs to the complex associated with araliaceous hosts. Closely related to *pleiades*, n. sp. from Maui because of the closely fitting pronotal and elytral bases, as the elytral bases have their declivital faces excavated for reception of the pronotal margin; differs from the latter species by having elytral declivity slightly more impressed and declivital sculpture smoother.

The name commemorates the Hawaiian goddess Pele.

Xyleborus perforans (Wollaston)

FIG. 22-23

Tomicus perforans Wollaston, 1857, Cat. Coleopt. Madeira Br. Mus.: 96 (Madeira).—Eichhoff, 1878, Mém.

Soc. R. Sci. Liège ser. 3, 8: 403 (diagnosis).

Bostrichus testaceus Walker, 1859, Ann. Mag. Nat. Hist. ser. 3, 3: 260 (Ceylon).

Xyleborus kraatzii Eichhoff, 1868, Berl. Entomol. Z. 12: 152 (as *kraatzii*; Ceylon); 1878, Mém. Soc. R. Sci.

- Liège ser. 3, **8**: 374 (Ceylon, Asia, Madagascar).—Beeson, 1929, Insects Samoa **4**(4): 240 (Samoa); 1930, Indian For. Rec. **14**(10): 241, fig. 3 (India and vicinity, hosts); 1938, J. Fed. Malay States Mus. **18**(2): 292 (Hawaii, Bismarck Arch., Solomons, Marquesas, Society Is, Henderson); 1940, Bishop Mus. Occas. Pap. **15**(18): 198 (Society Is, Tuamotu Is).—Krauss, 1944, Proc. Hawaii. Entomol. Soc. **12**(1): 88 (Maui).—Schedl, 1951, Bishop Mus. Occas. Pap. **20**(10): 140 [refers to *testaceus* (Walker)].
- Xyleborus immaturus* Blackburn, 1885, Trans. R. Dublin Soc. ser. 2, **3**: 193 (Oahu, 2000 ft [610 m]); also Hawaii; type in BMNH).—Perkins, 1900, Fauna Hawaii. **2**(3): 178 (Hawaii).—Kleine, 1914, Stettin. Entomol. Ztg **75**: 302 (list).—Pope, 1924, Hawaii Agric. Exp. Stn. Bull. **51**: 14 (control on avocado).
- Xyleborus testaceus*: Hagedorn, 1910, Coleopt. Cat. **26**(4): 112 (Ceylon).—Schedl, 1941, Proc. Hawaii. Entomol. Soc. **11**(1): 116 (*immaturus* Blackburn synonymized; Oahu, Maui, Hawaii, hosts).—Swezey, 1941, *ibid.* **11**(1): 123 (Oahu, Maui, hosts), 126 (hosts).—Schedl, 1942, Bishop Mus. Bull. **172**: 148 (Guam, hosts); 1942, Mitt. Münch. Entomol. Ges. **32**: 164 (Fiji, Salomon Is, hosts); 1950, Bishop Mus. Occ. Pap. **20**(3): 40 (Fiji, host); 1951, *ibid.* **20**(10): 141 (Samoa, hosts).—Swezey, 1954, B. P. Bishop Mus. Spec. Publ. **44**: 14, 38, 71, 78, 109, 112, 162 (hosts, Hawaiian records).
- Xyleborus pubescens*: Perkins, 1913, Fauna Hawaii., Introduction: 124 (*pubescens* [auct.?] = *immaturus* Blackburn).
- Xyleborus perforans*: Paine, 1934, Agric. J. Fiji **7**: 39 (Fiji, host).—Browne, 1955, J. Sarawak Mus. **6**: 355 (*testaceus* Walker synonymized).—Wood, 1960, Insects Micronesia **18**(1): 53 (key), 70, fig. 13e (Bonin Is, Mariana Is, Palau, Caroline Is, Marshall Is).—Gray & Wylie, 1974, Pac. Insects **16**(1): 86 (Papua New Guinea, hosts).—Browne, 1974, Commonw. For. Rev. **53**: 65 (Fiji).—Beaver, 1976, Bull. Entomol. Res. **65**: 541 (Samoa, hosts).—Roberts, 1977, J. Nat. Hist. **11**: 263 (Fiji, hosts).—Beaver & Browne, 1978, Orient. Insects **12**(4): 53 (Penang, hosts).—Wood, 1979, Great Basin Nat. **39**(2): 136 (very near *v. volvulus* (Fabricius), general distribution).
- Xyleborus testaceus*: Beardsley & Tuthill, 1959, Proc. Hawaii. Entomol. Soc. **17**(1): 60 (orthogr. error, Niihau).
- Xyleborus volvulus*: Wood, 1977, Great Basin Nat. **37**(1): 68, 73 (part).

Collection localities (BISHOP, HSDA). KAUAI: Lihue, Wailua. OAHU: Aiea, Ewa, Ford I, Haleauau, Honolulu, Kailua, Kalama Crater, Makiki, Manoa, Mt Kaala, Mt Tantalus, Maunawili, Nuuanu, Palolo, Pau-malu, Wahiawa, Waialua, Waianae Mts, Waikane. MAUI: Haelaau, Haiku, Hana, Mahena, Nahihu. HAWAII: Hilo, Honaunau-Captain Cook, Honokaa, Kahaluu, Kaiwiki, Kalohiki, Kapoho, Kona, Olaa, Pepeekeo, Waiohinu. Abundant on most or all windward islands.

Distribution. Pantropical; widespread throughout Oceania.

Hosts. Hawaiian records include the following host genera: *Acacia*, *Aleurites*, *Arucaria*, *Bobea*, *Cassia*, *Cordyline*, *Elaeocarpus*, *Eucalyptus*, *Eugenia*, *Ilex*, *Mangifera*, *Nothopanax*, *Persea*, *Phoenix*, *Pipturus*, *Pisonia*, *Poinciana*, *Prosopis*, *Saccharum*, and *Straussia*. Beeson (1930: 242) listed many hosts for India and vicinity, Gray & Wylie (1974: 86) listed hosts for Papua New Guinea, Beaver (1976: 541) discussed hosts from Samoa, and Roberts (1977: 263) discussed several hosts from Fiji.

Remarks. This species was among the first scolytids to be reported for Hawaii (as *X. immaturus* Blackburn). At the time, late last century, it was undoubtedly widespread and thought to be endemic. If this species was coincident with man in Hawaii, it may have arrived early, perhaps with Polynesians. The beetles could have been transported about in timbers and poles of canoes or in sugar cane aboard. Authors have commented on the great abundance of this species throughout the Oriental Region and Pacific islands.

This species closely resembles *affinis* Eichhoff. In addition to the remarks under the latter, the following differences between the 2 appear to exist in Hawaiian series:

perforans is slightly more slender and has the lateral margin of the elytron more gradually broadened postbasally.

***Xyleborus pleiades* Samuelson, new species**

FIG. 54

Holotype ♀. Form and vestiture similar to *Xyleborus pele*, n. sp. Body 2.8× as long as broad. Body surfaces largely orange-testaceous, elytron with fine fuscous line at suture; appendages yellow- to orange-testaceous; vestiture pale. Length 4.6 mm; breadth 1.65 mm.

Frons broadly convex, surface finely granulate, moderately punctate anterolaterally; eye with emargination $\frac{7}{12}$ -dividing eye, angle of emargination barely acute. Pronotum about 1.15× as long as broad and 0.6× as long as elytron; sculpture finely asperate, finely granulate overall; discal punctures 0.3–0.5× as large as interspaces on basal 0.5. Elytron 3.44× as long as broad, broadest at basal 0.35; side feebly broadened to before middle, thence gradually narrowed to preapex, apical 0.25 convexly narrowed to extremity; discal striae finely impressed; discal punctures mostly 1× as large as transverse interspaces and 0.4–0.6× as large as interstices; interstices feebly convex mesally; discal sculpture smooth-alutaceous and bearing fine interstitial punctures; elytral declivity ± moderately steep, surface somewhat flattened with striae rather finely and shallowly impressed; declivital sculpture finely granulate with series of 5 or 6 small tubercles on interstices 1–3.

Variation ($n = 2$). The paratype is close to the holotype in most respects. Length 4.4–4.45 mm.

Holotype ♀ (BISHOP 12,106), HAWAIIAN IS: MAUI I (E): Kipahulu Val, camp 2, 18–20.VIII.1967, N. Wilson; 1 paratopotype ♀, same data as holotype (BISHOP).

Hosts. Unknown.

Remarks. Very closely allied to *pele*, n. sp. Differs mainly from the latter in having elytral declivity flatter and declivital sculpture rougher.

***Xyleborus rugatus* Blackburn**

FIG. 3, 30–31

Xyleborus rugatus Blackburn, 1885, Trans. R. Dublin Soc. ser. 2, 3: 192 (Oahu; holotype in BMNH).—Perkins 1900, Fauna Hawaii. 2(3): 178 (cites preceding).—Kleine, 1914, Stettin. Entomol. Ztg 75: 302 (list).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 293 (list).

Xyleborus nuuanus Schedl, 1941, Proc. Hawaii. Entomol. Soc. 11(1): 114 (Oahu: Nuuanu; syntypes in BISHOP).—Swezey, 1941, *ibid.* 11(1): 122 (cites preceding), 125 (host); 1954, B. P. Bishop Mus. Spec. Publ. 44: 71 (Oahu, *Dracaena*). **New synonymy.**

♂ *nov.* Form stouter than in ♀; body 2.4× as long as broad, broadest across elytra near apical 0.4. Prothorax about 1.0× as long as broad and 0.65× as long as elytron (on horizontal plane); side feebly convex along middle; anterior margin convex but less so sublaterally and just perceptibly angulate at extremity; extremity turgid, obtuse; profile of pronotum in lateral view flattened and descending obliquely anteriorly; anterior slope flattened on each side of distinct median line, sculpture moderately asperulate-punctulate; discal summit with median raised line, disc otherwise convex with sculpture finely granulate and ± sparsely punctate, punctures somewhat asperulate. Elytron about 2.9× as long as broad, about as broad as pronotal base at humeral angles; side weakly convex and gradually broadened from posthumeral region to apical 0.4, then convexly narrowed to extremity; central discal punctures mostly 2–3× as large as transverse interspaces and 1× as large as interstices; interstices alutaceous, weakly swollen; declivity with slope rather gradual, shallowly and longitudinally impressed from summit to preapex; declivital sculpture alutaceous and set with about 3 or 4 small tubercles on each of the 3 innermost interstices. Body length 1.85 mm; breadth 0.8 mm [♂, Oahu I: Manoa, 20.XII.1919, ex ti, J.C. Bridwell (BISHOP)].

Material examined. OAHU: holotype ♀, Oahu, T. Blackburn (BMNH); 1, Kalihi Val, 1000 ft [305 m], XI.1960, L.W. Quate (BISHOP); 7, Kawiwi, VII.1957, *Cordyline*, E.J. Ford Jr (BISHOP); 1, Manoa Val, XII.1919, ex ti, J.C. Bridwell (HSDA); 2♂, same data (BISHOP, HSDA); 13, Mt Kaala, XII.1955, Ford (BISHOP, CNCI, HSDA); 1, Mt Tantalus, 1300 ft [396 m], V.1935, on *Dracaena aurea*, W.M. Giffard (HSDA); 5, same loc., I.1938, ex ti, E.C. Zimmerman (BISHOP); 5 (svntvdes of *nuuanus* Schedl), Nuuanu, X.1919, ex *Dracaena*,

Bridwell (BISHOP, HSDA); 1, Nuuanu Pali, no date, Perkins no. 801, R.C.L. Perkins (BISHOP); 1, same loc., XII.1900, Perkins no. 803, Perkins (BISHOP); 9, same loc., Perkins no. 835, Perkins (BISHOP); 1, Paumalu, VI.1935, *Dracaena*, R.L. Usinger (BISHOP); 3, Puu Pane, II.1970, ex *Dracaena* stem, S.L. Montgomery (BISHOP); 17, Waianae Mts, I.1955, *Cordyline*, Ford (BISHOP, CNCI, HSDA); 1, same data, except from *Aleurites* (BISHOP). KAUAI: 1, Mololii, 2000 ft [610 m], VIII.1970, ex *Dracaena*, Montgomery (BISHOP).

Distribution. Endemic to Hawaiian Is; 2 islands: Oahu, Kauai. New to Kauai.

Hosts. *Cordyline terminalis* (ti), *Pleomele aurea* [= *Dracaena*] (halapepe); also, 1 record from *Aleurites moluccana* (kukui).

Remarks. This species was among the first xyleborines to be described from the Hawaiian Is, but most subsequent material remained unidentified or was placed under the junior synonym *nuuanus* Schedl. Perkins' series was not included in *Fauna Hawaiiensis*. One reason why subsequent material was not treated as this species is because of the possible confusion on the body length of the holotype, which measures 2.55 mm instead of 3.25 mm as stated in the original description. This species and *ignobilis* Perkins are recorded from monocot hosts and both species have similar facies. *X. rugatus* differs from the latter by having procoxae nearly contiguous instead of slightly separated, anterior margin of pronotum lacking conspicuous denticles, and elytral declivital region bearing distinct small tubercles instead of being devoid of them.

***Xyleborus scabratus* Schedl, new status**

FIG. 40–41

Xyleborus oahuensis var. *scabratus* Schedl, 1941, Proc. Hawaii. Entomol. Soc. **11**(1): 113, fig. 1 (Oahu: Pupu-kea, ex *Xylosma*; Honolulu; syntype in BISHOP is here designated as lectotype).—Swezey, 1941, *ibid.* **11**(1): 122 (cites preceding), 125 (host).—Schedl, 1979, Kat. Naturhist. Mus. Wien **3**(2): 174 [holotype (♀), allotype (♂), 3♀, 1♂ paratype in Sammlung Schedl (=paralectotypes by present designation; types not designated in original publication; description based on ♂, not ♀)].

Lectotype ♂. As characterized in original description, but principal declivital tubercles on interstices 1 and 3 instead of 2 and 3. Length 3.45 mm; breadth 1.3 mm.

Allolectotype ♀ (description). Form fairly slender, nearly 2.8× as long as broad; parallel-sided; pronotal anterior margin and elytral apex briefly rounded. Body surfaces orange-fuscous, with elytral punctures and fine sutural line dark fuscous; appendages paler. Vestiture fine, pale; pronotum moderately clothed with slender setae on anterior slope; elytra more sparsely clothed with shorter setae. Length 3.6 mm; breadth 1.3 mm.

Frons shallowly concave laterally at level of eyes and broadly convex above, sculpture granulate, moderately punctate; eye with emargination $\frac{5}{8}$ -dividing eye, angle of emargination barely acute. Pronotum about 1.1× as long as broad and 0.65× as long as elytron; broadest along middle, breadth subequal to elytral breadth; discal summit placed near middle in dorsal view; pronotum in transverse profile broadly convex across summit and nearly as convex laterally; side weakly convex; anterior margin briefly rounded, briefly but nearly truncate at extremity; sculpture rather closely asperate and granulate on anterior slope and laterally with preceding rougher region delimiting a smooth semicircular zone on basal part of disc; smooth zone shining and bearing punctures mostly 0.3× as large as interspaces. Scutellum slightly longer than broad, apex rounded, surface smooth, turgid. Elytron 3.45× as long as broad; side feebly broadened postbasally to slightly behind middle (apical 0.45), thence feebly narrowed to preapex; apical 0.15 briefly rounded; discal striae not impressed, although closely punctate; discal punctures mostly 1× as large as transverse interspaces and 0.5–0.7× as large as interstices; interstices not raised; sculpture smooth-alutaceous and bearing minute interstitial punctures; elytral declivity rather steep in lateral profile; sculpture rough, somewhat wrinkled and alutaceous overall; striae punctures fairly large; principal tubercles large, arranged as follows: interstice 1 with 2 above declivital center and 1 below, uppermost tubercle smaller than others; interstice 3 with 1 large tubercle slightly above declivital center.

Type material examined (syntype series). OAHU: lectotype ♂ (BISHOP 12,107), Pupukea, 26.IV.1925, *Xylosma*, O.H. Swezey; allolectotype ♀ (BISHOP), same data, mounted with lectotype; 5♀ paralectotypes with question [in part], 1♂ specimen, same data as preceding (BISHOP, HSDA, UH).

Other material. OAHU: 2♀, Honolulu, 19.VI.1925, F.C. Hadden (BISHOP, HSDA); 4♀, same data, but lacking collector's name (BISHOP, HSDA).

Distribution. Endemic to Hawaiian Is; 1 island: Oahu.

Host. *Xylosma hawaiiense* (maua).

Remarks. This species is allied to *oahuensis* Perkins, to which it was originally assigned as a variety. It differs from the latter by having stouter body form (\bar{x} 2.7× as long as broad instead of 2.94), including stouter pronotum (\bar{x} 1.13× as long as broad instead of 1.22), shorter body length (\bar{x} 3.44 mm instead of 3.77), and by having the pronotum more broadly convex anteriorly and the sides fairly turgid instead of rather straight. [\bar{x} *scabratus* $n = 8$; *oahuensis* $n = 3$.] The *scabratus* material treated here is fairly uniform in general facies, even though specimens are from 2 distant localities on Oahu. The lectotype and allolectotype were certainly seen by Schedl, but possibly not part of the remaining specimens of the Pupukea series. Accordingly, these latter specimens are assigned as paralectotypes with some question.

Xyleborus similis Ferrari

FIG. 26

Bostrichus ferrugineus Boheman, 1858 (nec Fabricius, 1801), Kongliga . . . Eugenie 2: 88 (Insulae Keelings). *Xyleborus similis* Ferrari, 1867, Die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 24.—Eggers, 1929, Wien. Entomol. Ztg 46: 48 (synonymy).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 294 (Samoa).—Schedl, 1942, Bishop Museum Bull. 172: 149 (Guam); 1942, Mitt. Münch. Entomol. Ges. 32: 163 (Salomon Is, host); 1942, Tijdschr. Entomol. 85: 47 (♂, Java); 1960, Coleopt. Bull. 14(1): 11 (remarks on synonymy).—Wood, 1960, Insects Micronesia 18(1): 52 (key), 66, fig. 13b (Mariana Is, Caroline Is, Marshall Is; Hawaiian Is mentioned in general distribution).—Beaver & Browne, 1978, Orient. Insects 12(4): 613 (Penang, hosts, general distribution).

Xyleborus confusus: Hagedorn, 1910, Coleopt. Cat. 26(4): 100 (part).

Distribution. E Africa, SE Asia, Indonesia, Philippines, Australia, Solomon Is, Micronesia, and Samoa. Doubtfully Hawaiian Is.

Remarks. Hawaiian material has not turned up in the collections examined. Published records citing Hawaiian specimens of *similis* do not seem to exist, either. This species might have become attached to the Hawaiian fauna through Hagedorn's (1910: 100) treatment of *Xyleborus confusus* Eichhoff, which correctly included the Hawaiian *insularis* Sharp as a junior synonym, but incorrectly included 2 additional junior synonyms: *Bostrichus ferrugineus* Boheman and *Xyleborus similis* Ferrari. Eggers (1929) separated the latter 2 names from the former 2, treating the latter as a valid species: *similis* Ferrari.

Xyleborus simillimus Perkins

FIG. 42-43

Xyleborus simillimus Perkins, 1900, Fauna Hawaii. 2(3): 176 (Hawaii: above Hilo, 1800 ft [550 m]; syntype in BMNH is here designated as lectotype).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 294 (list).—Samuelson, 1978, Proc. Hawaii. Entomol. Soc. 22(3): 414 (Hawaii, ex *Metrosideros collina polymorpha*).

Xyleborus similimus: Kleine, 1914, Stettin. Entomol. Ztg 75: 303 (orthogr. error; list).

♂ *nov.* Form unlike ♀, prothorax modified and rather robust relative to elytra; body 2.65× as long as broad, broadest across prothorax slightly behind anterior angles. Prothorax about 1.35× as long as broad and 1.05× as long as elytron (on horizontal plane); side nearly straight, feebly sinuate and gradually broadened from base to near produced anterior angle; anterior margin concave sublaterally as it descends between anterior angle and anteromedian projection; projection fairly broad, becoming parallel-sided with extremity obtusely angulate; profile of pronotum in lateral view with anterior region descending nearly vertically except for projecting anterior angle; anterior slope deeply concave, remainder of pronotum convex with summit feebly swollen; sculpture finely granulate, nearly smooth and moderately punctulate. Elytron about 2.85× as long as broad; side rather straight to apical 0.2, then convexly narrowed to extremity; central discal punctures mostly 1–1.5× as large as transverse interspaces and 0.7–1× as large as interstices; interstices smooth-alutaceous; declivity shallowly depressed centrally; declivital sculpture smooth-alutaceous, set with many small granules and 2 small tubercles on interstice 1, each above and below declivital center. Body length 2.9 mm; breadth 1.1 mm [♂, Hawaii I: Saddle Road, 600 m, 24.VIII.1972, *Metrosideros* trunk, dbh 10 cm, GAS.1972.45, G.A. Samuelson (BISHOP)].

Type material examined (syntype series). HAWAII: lectotype ♀ (BMNH), Hilo, 1800 ft [550 m], XII.1895, Perkins no. 558 [R.C.L. Perkins collection [Fauna Hawaiiensis]]; 1 paralectotype ♀, Olaa, IX.1896, Perkins no. 688, Perkins, R.C.L. Perkins collection [Fauna Hawaiiensis] (BISHOP).

Other material (mostly BISHOP). HAWAII: 1, Hawaii, year 189-, Perkins no. 764, Perkins; 1, Hilo Forest Res., S of Saddle Road, 670 m, VII.1972, ex trunk 12.5 cm dead *Metrosideros*, BR, GAS.1972.03, W.E. Ruffin & G.A. Samuelson; 9, same area, nr Saddle Road, 670–1280 m, VII.1972, ex *Metrosideros*, BR.1972.10, Ruffin; 2♂, same data; 17, same area, S of Saddle Road, 670 m, VIII.1972, ex trunk 10 cm dbh dead *Metrosideros*, GAS.1972.37A, Samuelson (BISHOP, CNCI); 3♂, same data; 2, same loc., 600 m, VIII.1972, ex trunk 10 cm dbh dead *Metrosideros*, GAS.1972.45, Samuelson; 1♂, same data; 2, same area, road below Tree Planting Road, S of Saddle Road, ca. 1200 m, VII.1972, ex *Metrosideros* trunk, BR.1972.12, Ruffin; 1, same loc., ca. 1200 m, VII.1972, ex trunk 12.5 cm dbh dead *Metrosideros*, GAS.1972.09, Samuelson; 3, same loc., ca. 1200 m, VIII.1972, ex trunk 12 cm dbh dead *Metrosideros*, GAS.1972.41, Samuelson; 1, same area, Tree Planting Road, 2 km S of Saddle Road, 1280 m, X.1972, ex *Metrosideros*, BR.1972.89, Ruffin; 2, same area, nr Saddle Road, 610 m, XII.1976, *Metrosideros* acetone-heartwood extract on tanglefoot trap, R.P. Papp; 300+, same area, nr Saddle Road, 732 m, tanglefoot trap Site A-3, IV.1977–III.1978, Papp & R.F. Nagata; 35, same area, Lava Barrier Road [road below Tree Planting Road nr Saddle Road], 1219 m, tanglefoot trap Site LBR, IV.1977–III.1978, Papp & Nagata; 3, Kahaluu Forest Res., above Kona, Donkey Mill Road, 850 m, X.1973, ex bole 25 cm dbh *Metrosideros* in decline, GAS.1973.80, Samuelson; 14, same loc., 850 m, X.1973, ex bole 43 cm dbh *Metrosideros* in decline, GAS.1973.85, Samuelson; 1, Kilauea, 4000 ft [1220 m], XII.1912, E.M. Ehrhorn (HSDA); 1, same loc., Bird Park, VIII.1923, W.M. Giffard; 2, Kipahoe, 640 m, I.1975, ex bole 46 cm dbh dead *Metrosideros*, GAS.1975.10, Samuelson; 5, Niulii, V.1917, O.H. Swezey; 4, same data (HSDA); 18, Puna Distr, U.S. Forest Service transect, 335 m, emerged IV.1976, ex *Metrosideros* slash, Papp.

Distribution. Endemic to Hawaiian Is; 1 island: Hawaii.

Host. *Metrosideros collina polymorpha* (ohia lehua).

Remarks. This endemic species appears to be monoisular and restricted to its host *Metrosideros*. Swezey (1917: 181) associated this borer with freshly cut or injured wood and stumps of presumably ohia trees. Although the host was not specified directly, the article generally dealt with a declining forest at Niulii where the chief large trees were ohia lehua. The association between *simillimus* and *Metrosideros* was essentially rediscovered by Mr W.E. Ruffin, who encountered workings of *Xyleborus* in dead ohia in 1972, in an area of ohia forest decline in the Saddle area. Ruffin's investigations actually resulted in associating 2 xyleborines with ohia: this species and *Xyleborinus saxeseni* (Ratzeburg).

This species resembles *dubiosus* Perkins, but the latter differs in having tubercles

on declivital interstices \pm uniform in size instead of having tubercles on interstice 1 large and tubercle on 3 minute to obsolete. Also, the declivity is flatter in *simillimus* and more concave in *dubiosus*. Specimens of *simillimus* from various widely separated localities show little variation in sculpturing on the elytral declivity.

Xyleborus spinulosus Blandford

FIG. 18-19

Xyleborus spinulosus Blandford, 1898, Biol. Cent.-Am., Coleopt. 4(6): 201 (Guatemala; type in BMNH).—Wood, 1966, Great Basin Nat. 26(1-2): 32 (Costa Rica, Hawaii; *spinulosus* Schedl synonymized).

Xyleborus spinulosus Schedl, 1934, Stylops 3: 178 (Oahu: Honolulu, Tantalus, 1700 ft [518 m], koa [a host not a locality]).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 294 (list).—Schedl, 1941, Proc. Hawaii. Entomol. Soc. 11(1): 122 (Oahu: Tantalus, ex *Samanea saman*).—Swezey, 1941, ibid. 11(1): 121 (cites preceding material), 125 (error: as *spinulosus*; host).—Schedl, 1950, Bishop Mus. Occas. Pap. 20(3): 36 (emends spelling: Swezey, 1941: 125).—Ford, 1952, Proc. Hawaii. Entomol. Soc. 14(3): 358 (Oahu, *Citrus*).

Material examined. OAHU: 1, Honolulu, VII.1944, tobacco, E.C. Zimmerman (BISHOP); 2, same loc., IX.1948, boring in green mango, C.E. Pemberton (HSDA); 9, Mt Tantalus, Honolulu, V.1918, ex monkey-pod tree, O.H. Swezey (BISHOP, HSDA); 3, same loc., 1700 ft [518 m], X.1925, koa, F.C. Hadden (paratypes of *spinulosus* Schedl; BISHOP); 1, same data, but lacking Tantalus label (BISHOP); 1♂, same loc. and host, XI.1925, lacking collector label (BISHOP); 1, same loc., III.1963, flying, G.A. Samuelson (BISHOP); 4, nr Punaluu, XII.1955, *Acacia koa*, E.J. Ford Jr (BISHOP, CNCI); 3, Pupukea, X.1967, ex *Albizia* twig, C.J. Davis (HSDA); 1, Puu Palikea, XI.1954, J.L. Gressitt (BISHOP); 16, Waianae Mts, Kaneoha-Hapapa Trail, 670 m, no date, attracted to white clothing at 1400 h, W.C. Gagné (BISHOP).

Distribution. Guatemala, Costa Rica, Hawaiian Is (1 island: Oahu).

Hosts. Hawaiian records: *Acacia koa* (koa), *Albizia*, *Citrus*, *Mangifera indica* (mango), *Nicotiana tabacum* (tobacco, paka), *Samanea saman* (monkeypod, ohai).

Remarks. This adventive species appears to be well established on Oahu at moderate elevations. *X. spinulosus* differs from all other smaller members of the genus in Hawaii by having large spines associated with the elytral declivity.

Xyleborus tantalus Schedl

FIG. 4, 10, 44-45

Xyleborus obliquus Sharp, 1885 (nec *Pityophthorus obliquus* LeConte, 1878), Trans. R. Dublin Soc. ser. 2, 3: 192 (near Honolulu; holotype in BMNH).—Perkins, 1900, Fauna Hawaii. 2(3): 176 (Oahu, Hawaii).—Kleine, 1914, Stettin. Entomol. Ztg 75: 302 (list).—Beeson, 1938, J. Fed. Malay States Mus. 18(2): 293 (list).—Wood, 1966, Great Basin Nat. 26(1-2): 32 (*X. tantalus* Schedl synonymized).

Xyleborus tantalus Schedl, 1941, Proc. Hawaii. Entomol. Soc. 11(1): 114 (Oahu: Tantalus, ex *Byronia sandwicensis*; syntype in BISHOP is here designated as lectotype).—Swezey, 1941, ibid. 11(1): 122 (Oahu: Mt Tantalus; Hawaii: S Kona, ex *Byronia*), 125 (host); 1954, B. P. Bishop Mus. Spec. Publ. 44: 109 (Oahu, Hawaii, *Ilex anomala*).—Schedl, 1979, Kat. Naturhist. Mus. Wien 3(2): 249 [holotype (♀), 1 ♀ paratype in Sammlung Schedl (=paralectotypes by present designation; types not designated in original publication)].

♂ *nov.* Form unlike ♀, prothorax modified and rather robust relative to elytra; body 2.55× as long as broad, broadest across prothorax behind middle. Prothorax about 1.15× as long as broad and 0.8× as long as elytron (on horizontal plane); side nearly straight, feebly sinuate; anterior angle produced; anterior margin concave sublaterally as it descends between anterior angle and angulate extremity of anteromedian projection; projection with angle barely acute, briefly rounded; profile of pronotum in lateral view with anterior region sinuate and descending obliquely; anterior slope concave, remainder of pronotum unevenly convex; sculpture finely granulate, punctures small, obscure. Elytron about 3.05× as long as broad, narrower than prothorax at humeral angles; side nearly straight, feebly sinuate and gradually broadened

to apical 0.36, thence convexly narrowed to extremity; central discal punctures mostly 2× as large as transverse interspaces and 0.5× as large as interstices; interstices smooth; declivity with slope >0.3 length of elytron; declivity slightly impressed mesad of puncture row 2; declivital sculpture smooth, nontuberculate. Body length 3.1 mm; breadth 1.25 mm [♂, Hawaii I: S Kona, 11.VIII.1919, *Ilex*, O.H. Swezey (BISHOP)].

Type material examined (syntype series). OAHU: lectotype ♀ (BISHOP 12,108), [Mt] Tantalus, no date, ex *Byronia*, J.C. Bridwell; 3 paralectotype ♀, same data as lectotype (BISHOP, BMNH).

Other material. OAHU: 1 (holotype ♀ of *obliquus* Sharp) (BMNH); 4, Puu Palikea, XI.1954, *Ilex*, E.J. Ford Jr (BISHOP, HSDA); 7, Waianae Mts, V.1953, *Ilex anomala*, Ford (BISHOP, CNCI HSDA); 1, same area, Puu Kawiwi-Mt Kaala, 650–750 m, X.1975, S.L. Montgomery (BISHOP). HAWAII: 1, Glenwood, Olaa, 2300 ft [700 m], IX.1917, W.M. Giffard (BISHOP); 1, Hawaii Volcanoes Natl Park, X.1973, ex *Ilex anomala*, J. Jacobi & C.J. Davis (HSDA); 6, South Kona, VIII.1919, *Ilex*, O.H. Swezey (BISHOP, HSDA); 1♂, same data (BISHOP).

Distribution. Endemic to Hawaiian Is; 2 islands: Oahu, Hawaii.

Host. *Ilex anomala* [= *Byronia sandwicensis*] (kawau).

Remarks. The epithet *tantalus* Schedl is available to replace the senior synonym *obliquus* Sharp. The latter became a junior homonym when Bright (1968: 1301) transferred *Pityophthorus obliquus* LeConte to *Xyleborus*. Three specimens in BISHOP and 1 in BMNH stemming from the Hawaiian Sugar Planters' Association collection are thought to be syntypes of *tantalus*, even though the number of specimens making up the series was not published. The specimen designated here as lectotype bears a Swezey label stating, “% Schedl.”

This is a rather distinctive species among the Hawaiian endemics because of the long sloping declivital region. *X. tantalus* appears to be restricted to *Ilex anomala* and is likely to turn up on other islands where its host grows. Swezey (1954: 109) noted that the majority of *Ilex*-associated insects were casual or immigrant species and he doubted any close association of *tantalus* to *Ilex*. This appears not to be the case, even though such insects may be extremely rare in collections. Recently 3 species and subspecies of endemic *Plagithmysus* cerambycids have been reared from *Ilex* and described as new (Gressitt & Davis 1976).

Xyleborus vulcanus Perkins

FIG. 8, 46–47

Xyleborus truncatus Sharp, 1882, Trans. R. Dublin Soc. ser. 2, **3**: 192 (Oahu; holotype in BMNH) (nec *Tomicus truncatus* Erichson, 1842).—Perkins, 1900, Fauna Hawaii. **2**(3): 175 (part: Hawaii; Lanai specimen is *dubiosus* Perkins).—Kleine, 1914, Stettin. Entomol. Ztg **75**: 302 (list).—Beeson, 1938, J. Fed. Malay States Mus. **18**(2): 294 (list; homonymy noted).—Schedl, 1941, Proc. Hawaii. Entomol. Soc. **11**(1): 112 (part: Oahu).—Swezey, 1941, *ibid.* **11**(1): 122 (part: Oahu, ex *Elaeocarpus bifidus*, *Acacia koa*; other records are *dubiosus* Perkins), 125 (hosts, part); 1954, B. P. Bishop Mus. Spec. Publ. **44**: 78 (Oahu, *Elaeocarpus bifidus*), nec: 38, 155, 162, 214.

Xyleborus vulcanus Perkins, 1900, Fauna Hawaii. **2**(3): 179 (Hawaii: Kilauea; holotype in BMNH).—Kleine, 1914, Stettin. Entomol. Ztg **75**: 302 (list).—Beeson, 1938, J. Fed. Malay States Mus. **18**(2): 294 (list).—Wood, 1966, Great Basin Nat. **26**(1-2): 32 (*truncatus* Sharp synonymized; synonymy given).

Xyleborus adspersus Schedl, 1958, Tijdschr. Entomol. **101**: 152 (new name for *truncatus* Sharp).

Xyleborus pacificus Nunberg, 1959, Beiträge Entomol. **9**: 432 (new name for *truncatus* Sharp).

Material examined. HAWAII: 1 (holotype ♂ of *vulcanus* Perkins), Kilauea, VIII.1896 [R.C.L. Perkins, Fauna Hawaiiensis] (BMNH); 2, same loc., VIII.1895, VIII.1896, Perkins nos. 532, 656, Perkins (BISHOP); 1♂, same loc., I.1915, dead koa forest, W.M. Giffard (BISHOP); 5, same loc., Hawaii Volcanoes Natl Park,

Six Tanks, XI.1944, *Acacia koa*, C.J. Davis (HSDA); 4, same data, but M.L. Tr. Tr. (HSDA); 1, Kaumana, IV.1920, O.H. Swezey (HSDA); 1, Kona, 3000 ft [915 m], VI.1892, Perkins (as *truncatus* Sharp var.) (BMNH); 2, Hilo II.1971, ex *Acacia koa*, E. Yoshioka (HSDA); 1, Waiakea Forest Res., I.1971, ex *Acacia koa*, Davis (HSDA); 1♂, same data (HSDA). MAUI: 3, Olinda, 4500 ft [1372 m], IV.1932, koa, initials O.B. (BISHOP); 1♂, same data (BISHOP); 2, Waikamoi, Olinda, II.1969, ex koa branches, J.L. Gressitt (BISHOP); 1♂, same data (BISHOP); 1, Waikamoi, I.1969, dead koa, Gressitt (BISHOP). LANAI: 1, Lanai, 2000 ft [610 m], Perkins [not spm cited in *Fauna Hawaiiensis*] (BISHOP). OAHU: 1 (holotype ♀ of *truncatus* Sharp), Oahu, without further data (BMNH); 2, Haleauau, XII.1929, *Elaeocarpus*, Swezey (HSDA); 1♂, same data (HSDA); 6, same loc., II.1930, koa, Swezey (HSDA); 7, same loc., IX.1930, *Elaeocarpus*, Swezey (HSDA); 40, Haleauau, Mt Kaala, 2000 ft [610 m], II.1930, ex *Elaeocarpus*, F.C. Hadden [some without host or collector label] (BISHOP, CNCI); 6, Haleauau Val, VII.1954, *Acacia koa*, E.J. Ford Jr (BISHOP); 10, Judd Trail, VIII.1919, *Acacia koa*, Swezey (BISHOP); 5, Kahauiki, IX.1954, koa, Swezey (HSDA); 2♂, same data (HSDA); 6, Koolau Mts, VI.1955, *Acacia koa*, Ford (BISHOP, CNCI); 8, Moanalua Val, IV.1918, XII.1927, and no date, koa, Swezey (HSDA); 1, Moanalua, IV.1922, E.H. Bryan jr (BISHOP); 2, Mt Kaala, XI.1926, *Elaeocarpus*, Swezey (HSDA); 1, same loc., IV.1953, *Elaeocarpus bifidus*, Ford (BISHOP); 3, same loc., IV.1954, Gressitt (BISHOP); 9, Mt Tantalus, 1800 ft [549 m], XII.1908, Giffard (BISHOP); 4, same loc., VII.1926, *Acacia koa*, Hadden (BISHOP); 1, same loc., VII.1930, koa, Swezey (HSDA); 1, same loc., VI.1937, ex koa, E.C. Zimmerman (BISHOP); 1♂, same data (BISHOP); 1, same loc., VII.1959, L.W. Quate (BISHOP); 1, same loc., I.1966, D.M. Tsuda (BISHOP); 1, Poamoho Trail, I.1954, *Pelea*, Ford (BISHOP); 1, same loc., VI.1959, Ford (BISHOP); 3, same loc., 567 m, VII.1976, ex *Acacia koa*, Stein no. 76-2, J.D. Stein (BISHOP, IPIF); 1, Waianae Mts, ?VII.1951, 2000 ft [610 m], *Acacia koa*, Ford (BISHOP); 17, same loc., IV, VII.1953, *Acacia koa* [some lacking host label], Ford (BISHOP). KAUAI: 1, Kokee, VIII.1961, Maa, Miyatake, Yoshimoto (BISHOP); 1, Kumuwela, VII.1922, *Elaeocarpus*, Swezey (HSDA).

Distribution. Endemic to Hawaiian Is; most windward islands: Hawaii, Maui, Lanai, Oahu, Kauai.

Hosts. *Acacia koa* (koa), *Elaeocarpus bifidus* (kalia), *Pelea* (alani). Beetles recorded from koa range from Hawaii to Kauai; the single record from *Pelea* is from Oahu, records from *Elaeocarpus* are from only the 2 islands where the host occurs, Oahu and Kauai.

Remarks. This species has been given 2 replacement names, but neither has priority over the older available name *vulcanus* Perkins, which is valid for at least part of the material treated here. The synonymy follows Wood (1966), but this material could possibly embrace 2 species. This is a question of whether a ♂-described species (*vulcanus* from Hawaii) is the same as a ♀-described species from a different island (*truncatus* from Oahu). Most of the specimens bred from *Acacia koa*, 1 from *Pelea* [Oahu], and a number without host data appear to fit *vulcanus* better than the *Elaeocarpus*-associated specimens in fine morphological points: anterior margin of pronotum more briefly rounded, curvature of pronotal disc more broadly convex in transverse profile, and extreme elytral apex less sinuate. Several koa-bred series are represented by both sexes [Oahu, Maui] and have males which agree fairly well with the holotype of *vulcanus* from Hawaii. Koa-bred females from Hawaii, Maui, and Oahu agree with females lacking host data from Kauai and Lanai. Specimens bred from *Elaeocarpus* [Oahu, Kauai] and a small number without host data [Oahu] agree more closely to the holotype of *truncatus* Sharp in fine points (♂ not present). Some of the smallest koa-bred specimens [Oahu] also tend to resemble the preceding, and that is why this material is presently treated as 1 species. Should future investigations

show this material to comprise 2 species, then the *Elaeocarpus*-bred series [Oahu, Kauai] should revert to *adspersus* Schedl (the earlier replacement name for *truncatus* Sharp) and the koa-associated material should remain as *vulcanus* Perkins.

Smaller specimens of *dubiosus* Perkins resemble this species; the former differs from *vulcanus* by having the transverse profile of the pronotal disc distinctly angulate at the summit instead of convex.

CHECKLIST OF HAWAIIAN XYLEBORINI

This list is thought to include all the xyleborines thus far recorded for the Hawaiian Is. Species are listed in order of appearance in text. Junior synonyms are italicized. One species of doubtful occurrence on Hawaiian islands is listed in parentheses.

Genus **Xylosandrus** Reitter

compactus (Eichhoff)
morstatti (Hagedorn)
 crassiusculus (Motschulsky)
semigranosus (Blandford)
semiopacus (Eichhoff)
 morigerus (Blandford)

Genus **Xyleborinus** Reitter

saxeseni (Ratzeburg)
frigidus (Blackburn)—new synonym
pseudoangustatus (Schedl)

Genus **Xyleborus** Eichhoff

affinis Eichhoff
mascarensis Eichhoff
 agamus Perkins ♂—status ?
 arcturus, n. sp.
 dubiosus Perkins
 exsectus Perkins ♂—status ?
 ferrugineus (Fabricius)
confusus Eichhoff
insularis Sharp
 fornicatus Eichhoff
 hawaiiensis Perkins
 hiiaka, n. sp.
 ignobilis Perkins
 interjectus Blandford

kauaiensis Perkins
 lanaiensis Perkins
 littoralis Perkins ♂—status ?
 mauiensis Perkins
 molokaiensis Perkins
 nubilus, n. sp.
 oahuensis Perkins
 pele, n. sp.
 perforans (Wollaston)
immaturus Blackburn
kratzi Eichhoff
pubescens: Perkins
testaceus (Walker)
 pleiades, n. sp.
 rugatus Blackburn
nuuanus Schedl—new synonym
 scabratus Schedl—new status
 (similis Ferrari)
 simillimus Perkins
 spinulosus Blandford
spinosulus Schedl
 tantalus Schedl—resurrected as
 replacement name
obliquus Sharp (nec LeConte)
 vulcanus Perkins
adspersus Schedl
pacificus Nunberg
truncatus Sharp (nec Erichson)

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