The Native and Introduced Bark and Ambrosia Beetles of Michigan (Coleoptera: Curculionidae, Scolytinae)

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Abstract

Our knowledge of the biogeography of Scolytinae of eastern temperate North America is very patchy. We used data from hand collecting, trapped material (from 65 of 83 counties), and museum collections, supplemented by literature records, to compile a list comprising 107 bark beetle species in 45 genera for Michigan, a state with an especially rich diversity of woody plants. We provide detailed collection data documenting 32 species not previously catalogued for Michigan, 23 of which are new state records; the genera *Trypophloeus* and *Trischidias* are reported from Michigan for the first time. Fifteen Michigan scolytines are not native to North America; *Ambrosiodmus rubricollis* (Eichhoff), *Crypturgus pusillus* (Gyllenhal), *Euwallacea validus* (Eichhoff), *Xyleborus californicus* Wood, *Xylosandrus crassiusculus* (Motschulsky) have not previously been found in the state. We report Michigan hosts for 67 species, including 49 new host associations for the 93 native species. Despite identifying over 4000 specimens for this study, we fully expect to find many more species: over 30 additional species occur in the Great Lakes region.

Faunistic studies are a first step towards a deeper understanding of the ecology of local biotic communities. These studies provide records of diversity and serve as reference points for the assessment of faunal differences due to time, space, or environmental conditions. To increase the understanding of regional scolytine faunas, we present a study begun in 1978 of the bark and ambrosia beetles of Michigan. The state is heavily forested and particularly rich in woody plants, with over 100 species of trees (Barnes and Wagner, Jr. 1981) and over 200 species of shrubs (Billington 1949).

Bark and ambrosia beetles (Curculionidae, Scolytinae) are primary decomposers of wood which occur throughout the forests and suburban landscapes of North America (Wood 1982). Wood's landmark monograph (1982) of North and Central American Scolytinae was based upon three decades of his taxonomic work (but see also Bright 1976, 1981) and greatly expanded the only previous general treatment of the bark beetles of North America (Chamberlin 1939). Wood's monumental summary provided a foundation of knowledge about the diversity and host plant usage of bark beetles of the north temperate zone. Nonetheless, gaps in our knowledge of both biogeography and host affinities remain. Scolytinae are tiny insects which spend most of their lives hidden inside plant tissues, and many species are seldom if ever encountered by general collectors;

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furthermore, bark beetle collecting has focused on economic pests and as a result has been strongly biased towards species breeding in conifers.

Although the overall distributions of most species are well known for North America, finer details of regional distributions are often lacking, especially for the northeastern U.S. Thorough regional studies of temperate forests are relatively few, and recent works have covered the western states (California, Bright and Stark 1973; Idaho, Furniss and Johnson 1987; Montana, Gast et al. 1989; Oregon, Furniss et al. 1992; Washington, Furniss and Johnson 1995) more thoroughly than eastern (Indiana, Deyrup 1981, Deyrup and Atkinson 1987; Maryland, Rabaglia 2003; Delaware, Rabaglia and Valenti 2003).

Documentation of regional scolytine faunas is increasing due to advances in collecting methodology, and in particular to large scale trapping studies designed to detect and monitor the spread of exotic species. Trapping is based largely on attraction to ethanol, tree volatiles (such as α-pinene) or turpentine, or bark beetle pheromone components (Atkinson et al. 1988, Hoebeke 1994, Humble 2001, Rabaglia 2003, Rabaglia and Valenti 2003, LaBonte et al. 2005). While many, perhaps most, scolytines can be trapped by these methods, some can not: populations may simply be in too low numbers or too locally distributed, or the species may differ in their biologies such that they are not attracted by these chemical compounds (Kirkendall, unpublished data). Furthermore, trapping tells us little or nothing about host relationships. Comprehensive faunal lists, then, are best achieved by a combination of (1) trapping, (2) examining dead branches and stems from as many different woody plant species as possible, and (3) identifying the bark beetles present in older, local collections.

The only previous work dealing specifically with the distribution of Michigan scolytines is from the 19th century (LeConte 1878), though Roeper (1995) reviews the feeding behavior and host plants of the scolytine ambrosia beetles then known from the state. In recent works, approximately 78 species are recorded from Michigan (Wood 1982, Wood and Bright 1992, Bright and Skidmore 1997, 2002), but many widespread species native to northeastern US or southeastern Canada are not listed as occurring in the state.

Materials and Methods

This study of the bark and ambrosia beetles of Michigan includes extensive hand collected, trapped, and identified museum specimens. From 1978–1980, Kirkendall collected widely from potential host plants, focusing especially on the poorly documented bark and ambrosia beetles breeding in hardwoods. Most collecting was done in Michigan's Lower Peninsula, especially on the E. S. George Reserve near Pinckney, in Livingston Co. (http://sitemaker.umich.edu/esgr/home) incidental to Kirkendall's thesis research; only one three-day trip to Michigan's Upper Peninsula was made, and only one daytrip to southernmost counties.

Two decades later (2007–2009), researchers from Michigan State University (MSU,), Michigan Technological University (MTU), Michigan Department of Natural Resources and Environment (MDNRE), and Michigan Department of Agriculture (MDA), sponsored by US-Forest Service and US- Animal and Plant Health Inspection Service (APHIS), trapped several thousand scolytine specimens during statewide (65 of 83 counties) surveys for exotic bark beetles and *Sirex noctilio* F. Each Lindgren 8-unit funnel trap was baited either with 1) ethanol; 2) ethanol and α-pinene; 3) α-pinene and β-pinene (sirex lure); or 4) ipsdienol, *cis*-verbenol and 2-methyl-3-buten-2-ol (exotic ips lure) (Rabaglia 2008). Also, unbaited Lindgren 8-unit funnel traps were hung from chemically stressed trap trees (Anonymous 2007).

Finally, we identified hundreds of specimens in each of the two major insect collections in Michigan: the A.J. Cook Arthropod Research Collection

of Michigan State University (MSUC), and the entomology collection of the University of Michigan Museum of Zoology (UMMZ).

Authors Cognato and Kirkendall identified beetles using keys (Bright 1976, Wood 1982, Rabaglia et al. 2006) and when available, compared material with specimens authenticated by S. L. Wood and D. E. Bright. Expert botanists identified plant hosts of difficult genera or species complexes (e.g., *Quercus*, *Salix*) (see Acknowledgments). Information on larval feeding behavior and host plant relationships was taken from Wood (1982), Wood and Bright (1992), Bright and Skidmore (1997, 2002) and, for *Pityophthorus*, from Blackman (1919, 1922) or Swaine (1918).

Much of the information for MSUC specimens is available at http://www.arc.ent.msu.edu/holdings.php in a searchable database, which is periodically updated. To date ca. 4500 Michigan specimens representing 53 species are included in that database. Voucher specimens from trapping are deposited in the MSUC and most of Kirkendall's collections (ca. 1200 specimens) are deposited in the UMMZ with some material remaining in his research collection.

Results and Discussion

Based on literature records and the specimens examined for this study, there are 45 genera comprising 107 species of Scolytinae in Michigan (Table 1). Ninety-three species are native, and 14 are species introduced to North America. We report 32 species not previously catalogued for Michigan in Wood and Bright (1992) or its supplements, six of which were recently documented elsewhere (Haack and Poland 2005; Manor 2005, 2006; Sullivan 2006; Haack and Petrice 2009), three of which were mentioned in an overlooked paper by retired Alma University professor Richard Roeper (Roeper et al. 1980) and one of which (*Xyleborus volvulus* F.) we consider a failed introduction: thus, 22 species are new for Michigan. Five of the 22 newly recorded are alien species now well established in North America. In addition to providing new state records, our surveys increase the knowledge of species distributions within Michigan (as recorded in the database). In addition, *Carphoborus dunni* Swaine was the first record for the U.S. and was only the second collection ever of this species (Kirkendall 1982).

There are at least 30 additional native species and several recently introduced exotic scolytines which occur elsewhere in the Great Lakes region (e.g., Deyrup 1981, Wood 1982, Deyrup and Atkinson 1987, Hoebeke 1994, Hoebeke and Acciavatti 2006, Lightle et al. 2007). These species breed in hosts present in Michigan, and we believe many are likely to be found in this state with further collecting. Two represent genera not yet recorded from Michigan (*Scierus annectans* LeConte, recorded from Ontario, and *Xylechinus americanus* Blackman, known from Ontario and New York). Fully 20 species have been collected in Indiana but not Michigan (Deyrup 1981, Deyrup and Atkinson 1987).

The 107 scolytine species recorded from Michigan is quite similar to most of those from other temperate state inventories: Washington (105), Oregon (121), Idaho (105), Montana (96), Indiana (92), and Maryland (110). The diversity for Oregon is strikingly higher; contributing factors include the long history of bark beetle research in the state and the unusually diverse woody vegetation (Furniss et al. 1992). At the low end of the range is Indiana (92 spp.) despite intensive collecting by bark beetle specialist Mark Deyrup; however, given that Indiana is considerably smaller in area than the other states (except for Maryland), and its forests are small and fragmented, this number is surprisingly high.

Michigan host records from this study, for 67 scolytine species, are reported in Table 1, including 49 new host associations for the native species. The Michigan scolytines are about evenly divided between hardwood-breeding species (53) and those utilizing conifers (49); three alien species breed regularly in both

Table 1. The Scolytinae fauna of Michigan. For the sake of continuity and ease of comparison with older literature, the species are arranged alphabetically within Wood's system of subfamilies and tribes or subtribes (Wood 1982). Scolytine species whose occurrence in Michigan is not indicated in Wood (1982), Wood and Bright (1992), or Bright and Skidmore (1997, 2002) are preceded by the symbol *. Michigan hosts: hosts recorded by the authors of this study, or given on specimens we examined, with number of independent collections in parentheses; for complete host lists, see Wood (1982) and Wood and Bright (1992), and for additional Michigan hosts see Hazen and Roeper (1980), Roeper et al. (1980), and Roeper et al. (1987). Host species not given in Wood (1982) are preceded by the symbol *. All are verified breeding records. Host records not in the text are from collections made by Kirkendall (1978-1980).

Wood's tribes	Scolytine species	Michigan host	Feeding Habits
	Introduced species		
Hylastini	**Hylastes opacus* Erichson	---	Inner bark
Hylesinini	*Hylastinus obscurus* (Marsham)	---	Clover roots
Tomicini	*Tomicus piniperda* (Linnaeus)	---	Inner bark
Scolytini	**Scolytus mali* (Bechstein)	*Malus pumila* (exotic)	Inner bark
Scolytini	*Scolytus multistriatus* (Marsham)	exotic and native *Ulmus* sp. (4)	Inner bark
Scolytini	*Scolytus rugulosus* (Muller)	*Malus pumila*, *Prunus serotina*	Inner bark
Scolytini	**Scolytus scheryrewi* Semenov	---	Inner bark
Crypturgini	**Crypturgus pusillus* (Gyllenhal)	**Pinus* sp.	Inner bark
Xyleborini	**Ambrosiodmus rubricollis* (Eichhoff)	---	Fungi
Xyleborini	**Ambrosiophilus atratus* (Eichhoff)	---	Fungi
Xyleborini	**Euwallacea validus* (Eichhoff)	---	Fungi
Xyleborini	**Xyleborinus alni* (Niisima)	---	Fungi
Xyleborini	**Xyleborus californicus* Wood	---	Fungi
Xyleborini	**Xylosandrus crassiusculus* (Motschulsky)	---	Fungi
Xyleborini	**Xylosandrus germanus* (Blandford)	*Pinus* sp.	Fungi
	Native species		
Hylastini	*Hylastes porculus* Erichson	---	Inner bark
Hylastini	*Hylurgops rugipennis* (Mannerheim)	---	Inner bark
Hylesinini	*Hylesinus aculeatus* Say	**Fraxinus pennsylvanica*	Inner bark
Hylesinini	*Hylesinus criddlei* (Swaine)	*Fraxinus pennsylvanica* (2)	Inner bark

Table 1. Continued.

Wood's tribes	Scolytine species	Michigan host	Feeding Habits
Hylesinini	*Hylesinus pruinosus* Eichhoff	---	Inner bark
Tomicini	*Dendroctonus murrayanae* Hopkins	---	Inner bark
Tomicini	*Dendroctonus rufipennis* Kirby	*Picea glauca* (2)	Inner bark
Tomicini	*Dendroctonus simplex* LeConte	*Larix laricina*	Inner bark
Tomicini	*Dendroctonus valens* LeConte	*Pinus strobes*	Inner bark
Tomicini	*Hylurgopinus rufipes* (Eichhoff)	---	Inner bark
Bothrosternini	*Cnesinus strigicollis* LeConte	---	Hardwood pith
Phloeotribini	*Phloeotribus dentifrons* (Blackman)	*Celtis occidentalis*	Inner bark
Phloeotribini	*Phloeotribus frontalis* (Olivier)	---	Inner bark
Phloeotribini	*Phloeotribus liminaris* (Harris)	**Malus pumila* (exotic), *Prunus* sp. (2), *P. serontina*	Inner bark
Phloeotribini	**Phloeotribus piceae* Swaine	*Picea glauca* (2), **P. mariana*	Inner bark
Phloeotribini	**Phloeotribus scabricollis* (Hopkins)	*Ptelea trifoliata*	Inner bark
Phloeosinini	**Chramesus hicoriae* LeConte	*Carya glabra* (2), *C. ovata* (2), *C.* sp. (4)	Inner bark
Phloeosinini	*Phloeosinus canadensis* Swaine	*Thuja occidentalis*	Inner bark
Phloeosinini	**Phloeosinus dentatus* (Say)	*Juniperus virginiana* (3), *Thuja occidentalis*	Inner bark
Phloeosinini	*Phloeosinus pini* Swaine	---	Inner bark
Polygraphini	*Carphoborus dunni* Swaine	*Larix laricina* (4)	Inner bark
Polygraphini	*Polygraphus rufipennis* (Kirby)	**Larix laricina, Picea sp., *Picea mariana, *Pinus banksiana* (4)	Inner bark
Scolytini	**Scolytus muticus* Say	*Celtis occidentalis*	Inner bark
Scolytini	*Scolytus piceae* (Swaine)	**Larix laricina*	Inner bark
Scolytini	*Scolytus quadrispinosus* Say	---	Inner bark
Micracini	*Hylocurus binodatus* Wood	---	Sapwood
Micracini	*Hylocurus rudis* (LeConte)[a]	*Carya* sp.	Sapwood
Micracini	*Micracis suturalis* LeConte	*Cercis Canadensis*	Sapwood
Micracini	**Micracis swainei* Blackman	*Salix discolor*	Sapwood
Micracini	*Micracisella opacicollis* (LeConte) [a]	---	Hardwood pith
Micracini	*Pseudothysanoes rigidus* (LeConte)	*Tilia americana* (2)	Inner bark

Table 1. Continued.

Wood's tribes	Scolytine species	Michigan host	Feeding Habits
Ipini	*Ips calligraphus* (Germar)	---	Inner bark
Ipini	*Ips grandicollis* (Eichhoff)	*Pinus banksiana* (2), **P. strobus* (2)	Inner bark
Ipini	*Ips perroti* Swaine	*Pinus banksiana* (5)	Inner bark
Ipini	*Ips perturbatus* (Eichhoff)	*Picea glauca* (2)	Inner bark
Ipini	*Ips pini* (Say)	*Pinus banksiana* (3), **P. resinosa*	Inner bark
Ipini	*Orthotomicus caelatus* (Eichhoff)	*Pinus resinosa* (2), *P. strobus*	Inner bark
Ipini	**Orthotomicus latidens* (LeConte)	**Larix laricina*	Inner bark
Ipini	*Pityogenes hopkinsi* Swaine	*Pinus strobus* (4)	Inner bark
Ipini	*Pityogenes plagiatus* (LeConte)	*Pinus banksiana* (2)	Inner bark
Ipini	*Pityokteines sparsus* (LeConte) [a]	*Abies balsamea* (3)	Inner bark
Dryocoetini	*Dryocoetes affaber* (Mannerheim)	---	Inner bark
Dryocoetini	*Dryocoetes autographus* (Ratzeburg)	*Larix laricina, Picea mariana*	Inner bark
Dryocoetini	*Dryocoetes betulae* Hopkins	*Betula papyrifera*	Inner bark
Dryocoetini	**Dryocoetes granicollis* (LeConte)	---	Inner bark
Dryocoetini	*Lymantor decipiens* (LeConte) [a]	*Acer* sp., **Ilex verticillata, *Prunus* sp., **Robinia pseudoacacia* (5)	Fungi
Crypturgini	*Crypturgus borealis* Swaine	*Picea mariana*	Inner bark
Xyloterini	**Trypodendron betulae* Swaine	**Betula lutea, B. papyrifera*	Sapwood/Fungi
Xyloterini	*Trypodendron lineatum* (Olivier)	*Picea glauca*	Sapwood/Fungi
Xyloterini	*Trypodendron retusum* (LeConte)	*Populus grandidentata* (5), *P. tremuloides* (7)	Sapwood/Fungi
Xyloterini	**Trypodendron rufitarsus* (Kirby)	---	Sapwood/Fungi
Xyloterini	*Xyloterinus politus* Hagedorn	*Acer rubrum, A. saccharinum, Betula lutea, Fagus grandifolia, Quercus alba, Quercus* sp. (2), *Tsuga canadensis*	Sapwood/Fungi

Table 1. Continued.

Wood's tribes	Scolytine species	Michigan host	Feeding Habits
Xyleborini	**Anisandrus obesus* (LeConte)	**Populus grandidentata* (2)	Fungi
Xyleborini	*Anisandrus dispar* (Fabricius)	**Populus tremuloides*	Fungi
Xyleborini	*Anisandrus sayi* (Hopkins)	*Acer rubrum* (3), **Carya glabra,*C. ovata*	Fungi
Xyleborini	*Xyleborinus saxeseni* (Ratzeburg)	*Prunus serotina*	Fungi
Xyleborini	*Xyleborus affinis* Eichhoff	*Populus grandidentata*	Fungi
Xyleborini	**Xyleborus celsus* Eichhoff	---	Fungi
Xyleborini	*Xyleborus ferrugineus* (Fabricius)	---	Fungi
Xyleborini	**Xyleborus planicollis* Zimmermann	---	Fungi
Xyleborini	*Xyleborus xylographus* (Say)	---	Fungi
Cryphalini	*Cryphalus ruficollis* Hopkins	*Picea mariana*	Inner bark
Cryphalini	**Hypothenemus dissimilis* (Zimmermann)	*Carya glabra, C.* sp. *Quercus alba* (3), *Q. macrocarpa, Q. prinus*	Inner bark
Cryphalini	*Hypothenemus eruditus* Westwood	---	Inner bark
Cryphalini	**Trischidias atoma* (Hopkins)	**Morus rubra, *Sambucus canadensis*	Fungi
Cryphalini	**Trypophloeus populi* Hopkins	*Populus tremuloides*	Inner bark
Cryphalini	**Trypophloeus striatulus* (Mannerheim)	**Salix discolor, *S. subsericea*	Inner bark
Corthylini	*Conophthorus coniperda* (Schwarz) [a]	---	*Pinus* cones
Corthylini	*Conophthorus resinosae* Hopkins	---	*Pinus* cones
Corthylini	*Pityophthorus balsameus* Blackman	*Pinus banksiana, P. resinosa, *Picea mariana*	Inner bark
Corthylini	**Pityophthorus briscoei* Blackman	**Picea mariana*	Inner bark
Corthylini	*Pityophthorus cariniceps* LeConte [a]	*Pinus resinosa, P. strobus* (2)	Inner bark
Corthylini	*Pityophthorus concavus* Blackman [a]	---	Inner bark
Corthylini	*Pityophthorus consimilis* LeConte [a]	**Larix laricina* (2), **Picea mariana, P. strobes Pinus banksiana* (2),	Inner bark
Corthylini	*Pityophthorus crinalis* Blackman	**Toxicodendron radicans*	Inner bark
Corthylini	*Pityophthorus intextus* Swaine	**Picea mariana*	Inner bark
Corthylini	*Pityophthorus lautus* Eichhoff	*Acer saccharinum*, *Hamamelis virginiana, Rhus copallina, R. glabra, R. typhina* (many records *R. glabra* and *R. typhina*)	Inner bark

Table 1. Continued.

Wood's tribes	Scolytine species	Michigan host	Feeding Habits
Corthylini	*Pityophthorus opaculus* LeConte [a]	*Picea glauca* (2), **P. mariana*	Inner bark
Corthylini	*Pityophthorus puberulus* (LeConte)	*Pinus resinosa* (6), *P. strobus* (2)	Inner bark
Corthylini	*Pityophthorus pulchellus* Eichhoff [a]	---	Inner bark
Corthylini	*Pityophthorus pulicarius* (Zimmermann)	*P. resinosa*	Inner bark
Corthylini	*Pityophthorus pullus* (Zimmermann)	---	Inner bark
Corthylini	*Pityophthorus ramiperda* Swaine	---	unknown
Corthylini	**Pseudopityophthorus asperulus* (LeConte)	**Fagus grandifolia, Quercus bicolor*	Inner bark
Corthylini	*Pseudopityophthorus minutissimus* (Zimmermann)	**Carpinus caroliniana, *Fagus grandifolia, *Prunus* sp., *Quercus alba, *Q. bicolor* (3), *Q. ellipsoidalis, Q. velutina* (4)	Inner bark
Corthylini	*Pseudopityophthorus pruinosus* (Eichhoff)	---	Inner bark
Corthylini	**Corthylus columbianus* Hopkins	---	Sapwood/Fungi
Corthylini	*Corthylus punctatissimus* (Zimmermann)	**Acer rubrum* (2), **A. saccharum, *Amelanchier* sp. *Carpinus caroliniana, *Cornus racemosa, *Corylus americana, *Quercus velutina*	Sapwood/Fungi
Corthylini	*Gnathotrichus materiarius* (Fitch)	*Pinus sylvestris* (exotic)	Sapwood/Fungi
Corthylini	*Monarthrum fasciatum* (Say)	**Populus grandidentata, *Quercus velutina, Quercus* sp. (2)	Sapwood/Fungi
Corthylini	*Monarthrum mali* (Fitch)	**Populus grandidentata, *Quercus alba* (2), *Q. rubra, *Quercus velutina*	Sapwood/Fungi

[a]Species described from Michigan.

conifers and hardwoods; *Euwallacea validus* (Eichhoff), *Xyleborinus saxeseni* (Ratzeburg), *Xylosandrus germanus* Blandford, and one alien species in clover; *Hylastinus obscurus* (Marsham); and the host usage of one rare native species (*Xyleborus planicollis* Zimmerman) has not been documented. These beetles breed in a variety of host plant tissues: 64 species are true bark beetles, breeding in the inner bark; 27 species are ambrosia beetles, cultivating fungi in tunnels in sapwood; 8 species breed in the pith or wood of twigs; and 4 species breed in sapwood without the aid of mutualistic fungi. In addition, two *Conophthorus* species attack developing pine cones and the exotic *H. obscurus* breeds in the roots of clover. *Lymantor decipiens* (LeConte) and *Trischidias atoma* (Hopkins) occur in ascomycete fungus-infested wood of twigs whether they feed on both wood and fungi is unclear (Deyrup 1987, Kirkendall unpublished). The habits of one species, *Pityophthorus ramiperda* Swaine, are not known.

Below, we present full collection data for species not recorded from Michigan in Wood's monograph (Wood 1982) or the world catalogue (Wood and Bright 1992) or its supplements (Bright and Skidmore 1997, 2002).

Exotic Scolytinae species

Ambrosiodmus rubricollis (Eichhoff). USA: Michigan, Allegan Co., Saugatuck State Park, N 42° 42.043', W 86° 11.780', (+)-α-pinene and ethanol, 24.VII.2008, Col: N. Barc and A. Smith (2). Ionia Co., Saranac-Lowell State Game Area, 3 miles NE of Lowell, N 42° 57' 39",W 85° 18' 32", Elev. 248 m, exotic ips lure,18.VI.2007-02.VII.2007, Col: N. Barc & A. Smith (3).

This species is endemic to Asia (Wood and Bright 1992). Since its discovery in Maryland in 1968, it has spread throughout the eastern U.S. seaboard and into the Midwest (Rabaglia et al. 2006, Lightle et al. 2007). These records represent its most northern distribution.

Ambrosiophilus atratus (Eichhoff). USA: Michigan, Clinton Co., E. State Rd., 2 mi. N of Lansing at UV light trap, 27.V.2008, Col: G.L. Parsons (1). Ionia Co., Saranac-Lowell State Game Area, 3 miles NE of Lowell, N 42° 57' 39", W 85° 18' 32", Elev. 248 m, ethanol, 19.V.2007-02.VI.2007, Col: N. Barc and A. Smith (2). Kalamazoo Co. N42.2185, W85.5351, 12.VI.2008-24.VI.2008, funnel trap baited with ips trilure, Col: J. Ryan (1). Kent Co., Cannonsburg State Game Area, 5 miles East of Grand Rapids, N 43° 2' 8", W 85° 29' 27", Elev.: 258m, ethanol, 19.V.2007-02.VI.2007, Col: N. Barc and A. Smith (1). Oakland Co. 2.VI.2008, funnel trap baited with sirex lure, Col: Mike Philip (1).

A specimen of this species was first collected from Oakland Co. in 2004 (Manor 2006). It was recently transferred from *Xyleborus* to this newly recognized genus (Hulcr and Cognato 2009). Hulcr and Cognato (ibid.) report the species from Cassopolis, MI and Clinton Co., MI; the latter record is erroneous. This species is endemic to Asia and is distributed throughout the eastern U.S. (Wood and Bright 1992, Rabaglia et al. 2006). These records represent its most northern distribution.

Crypturgus pusillus (Gyllenhal). USA: Michigan, Crawford Co., N 44° 31' 33", W 84° 44' 44", α-pinene, 11.VII.2007, Col: M-JB (1). Ingham Co., E. State Rd., 2 miles North of Lansing, N 42° 47' 3", W 84° 32' 10", Elev. 261m, (+) α-pinene and ethanol, 19.V.2007-02.VI.2007, Col: Gary L. Parsons (6). Jackson Co., Site 608F EDRR siricid study, girdled Pinus sp., 28.VI.2008 (2). Livingston Co., Livingston State Recreation Area, N 42° 26' 14", W 83° 58' 42", α-pinene, 28.VI.2007 (5). Oakland Co., Commerce, 3500 Wixom Rd., N 42° 34' 13", W 84° 33' 10", (+)-α-pinene and ethanol, 07.VI.2007-20.VI.2007, Col: Roger Mech (1).

This species occurs throughout the Holarctic (Wood and Bright 1992). These records represent its most northern and western distribution in eastern North America. *Crypturgus* are tiny and cryptic, and are uncommon in collections. They are found in small or large colonies and use the tunnels of other wood-boring beetles as the starting point for their own (Blackman and Stage 1924); their fine, meandering tunnels are easily overlooked. A native species not

on our list, *C. alutaceus* Schwarz, has been recorded from conifers in neighboring Indiana (Deyrup and Atkinson 1987), and likely occurs in Michigan.

Euwallacea validus (Eichhoff). USA: Michigan, Clinton Co., Rose Lake Wildlife Research Area, T5N, R1W, S22, ex. dead logs and trees, 21.IX.2006, Col. Anthony I. Cognato (14). Ingham Co., N42.6581, W84.1907, 13.V.2008–5. VI.2008, funnel trap baited with ethanol and sirex lure, Col: C. Diamond (1).

This species is endemic to Asia (Wood and Bright 1992). Since its discovery in New York in 1976, it has spread throughout the Mid-Atlantic states and into the Midwest (Rabaglia et al. 2006, Lightle et al. 2007). These records represent its most northern distribution.

Hylastes opacus Erichson. USA: Michigan, Alcona Co., Sandhill Rd., N 44° 50' 52", W 83° 20' 45", α-pinene, 28.V.2008, Col: TE (1). Allegan Co., Saugatuck State Park, N 42° 42.043', W 86° 11.780', (+)-α-pinene and ethanol, 16.V.2008, 06.VIII.2008, Col: N. Barc & A. Smith (3). Alpena Co., Norway Ridge, N 45° 2' 41",W 83° 33' 30", α-pinene, 22.V.2007, Col: TE (2). Ingham Co., E. State Rd., 2 miles North of Lansing, N 42° 47' 3", W 84° 32' 10", Elev. 261m, (+)-α-pinene and ethanol,19.V.2007-02.VI.2007, Col: Gary L. Parsons (1). Ionia Co., Saranac-Lowell State Game Area, 3 miles NE of Lowell, N 42° 57' 39",W 85° 18' 32", Elev. 248m, (+)-α-pinene and ethanol exotic ips lure,18. VI.2007-02.VII.2007, Col: N. Barc & A. Smith (1). Kent Co., Cannonsburg State Game Area, 5 miles East of Grand Rapids, N 43° 2' 8", W 85° 29' 27", Elev.: 258m, (+)-α-pinene and ethanol, exotic ips lure, 02.VI.2007-18.VI.2007, Col: N. Barc and A. Smith (2). Macomb Co., Shelby Twp., 4300 Main Park Rd., N 42° 44' 15", W 84° 3' 51", exotic ips lure, 22.V.2007-07.VI.2007, Col: Roger Mech (7). Muskegon Co., Muskegon State Park, N 44° 01.952', W 86° 20.662', (+)-α-pinene and ethanol,16.V.2008, Col: N. Barc & A. Smith (1). Ogemaw Co., Refuge Rd., N 44° 23' 41", W 84° 23' 17", (+)-α-pinene and ethanol, ethanol, exotic ips lure, 22.V.2008, 04.VI.2008, Col: W. Radtke (14). Roscommon Co, Gerrish, N. Higgins Lake Rd., N 44° 30' 43", W 84° 44' 9.4", (+)-α-pinene and ethanol, ethanol, 22.V.2008, Col: W. Radtke (2).

Specimens of this species were first collected from Ingham Co. in 2001 (Haack and Poland 2005). This species is endemic to Eurasia (Wood and Bright 1992). Since its discovery in New York in 1987, it has spread throughout Ontario, Canada, northeastern U.S. and occurs in Oregon (Bright and Skidmore 1997, Haack 2006). These records likely represent an extension of its northeastern U.S. distribution.

Scolytus mali (Bechstein). USA: Michigan, Allegan Co., Fennville area, on apple trees (Rosaceae), 30.VI.2003, Col: Peter McGhee (6). Genesee Co., Richfield County Park, N 43° 6' 2", W 83° 33' 29", ethanol, 16.VI.2008, Col: Roger Mech (1). Ingham Co., E. State Rd., 2 miles North of Lansing, N 42° 47' 3", W 84° 32' 10", Elev. 261 m, exotic ips lure, 02.VI.2007-18.VI.2007, Col: Gary L. Parsons (1). Livingston Co., E. S. George Reserve, 42° 28' N, 84° 00' W, 17.ix.1978, apple tree (Malus pumila Miller), Col: L. R. Kirkendall (1). Saginaw Co., St. Charles, 08.VII.1968, rotary trap, Col: James G. Truchan (1).

Sullivan (2006) first reported the MI occurrence of this species but a specimen was first collected from Saginaw Co. in 1968. This species is native to Northern Africa, Europe, and Western Asia and is introduced to northeastern North America (Wood and Bright 1992). These records represent its most northern and western distribution in eastern North America; it has been present in Michigan since at least 1968. This monogynous bark beetle breeds most commonly in the trunks and branches of trees in the Rosaceae (*Malus*, *Pyrus*, *Prunus*), though elms (*Ulmus*) are also recorded as hosts (Wood 1982).

Scolytus schevyrewi Semenov. USA: Michigan, Kent Co., N42.9630, W85.5013, 20.V.2008- 5.V.2008, funnel trap baited with ethanol and sirex lure, Col: L. Bos. Wayne Co., Trenton-Woodhaven, 26.VII.2004, funnel trap, α-pinene, trapWY4, Col: T. Dutton (1).

This Asian endemic was recently discovered in Colorado and Utah in 2003 and first collected in Wayne Co. (Manor 2005). This species is widely distributed in Western U.S. and likely occurs throughout U.S. (Negrón et al. 2005).

Xyleborinus alni (Niisima). USA: Michigan, Antrim County, Eastport, Fred Stehr's residence, N 45° 08.284', W 85° 22.495', (+)-α-pinene and ethanol, ethanol, 01.V.2008-14.VI.2008, Col: Fred Stehr (9). Macomb Co, Armada, 7715 North Avenue, N 42° 51' 58", W 82° 53' 7", 07.V.2007, Col: D. Dehn, USDA, APHIS, PPQ (1). Macomb Co., Wolcott Mills Metro Park, N 42° 45' 49", W 82° 56' 0", (+)-α-pinene and exotic ips lure, 19.IV.2007, Col: D. Dehn, USDA, APHIS, PPQ (2). Oakland Co., Holly State Game Area, N 42° 49' 17", W 83° 30' 37", (+)-α-pinene and exotic ips lure, 24.IV.2007, Col: S. Rehberg, USDA, APHIS, PPQ (2). St. Clair Co., Fort Gratiot, Lakeport State Park, 43° 7' 16", 82° 29' 47", (+)-α-pinene and ethanol, 24.IV.2007, Col: S. Rehberg, USDA, APHIS, PPQ (1). St. Clair Co., Goodells, N 42° 58' 3", W 82° 40' 42", (+)-α-pinene and ethanol, 24.IV.2007, Col: S. Rehberg, USDA, APHIS, PPQ (1). St. Clair Co., Port Huron State Game Area, N 43° 5' 58", W 82° 37' 5", (+)-α-pinene and exotic ips lure, 24.IV.2007, Col: S. Rehberg, USDA, APHIS, PPQ (1).

This Asian endemic species was first discovered in western U.S. in 1996 and since soon thereafter was also found in the eastern U.S. (Mudge et al. 2001, Hoebeke and Rabaglia 2007). Its occurrence in Michigan is not unexpected but it was not collected until 2005 (Oakland Co.: Manor 2006).

Xyleborus californicus Wood. USA: Michigan, Allegan Co., Saugatuck State Park, N 42° 42.043', W 86° 11.780', (+)-α-pinene and ethanol, ethanol, 30.V.2008-13,VI.2008, 13.VI.2008-27.VI.2008, 10.VII.2008, 24.VII.2008, 06.VIII.2008, 21.VIII.2008, Col: N. Barc and A. Smith (228). Gratiot Co., Forest Hill Natural Area, N 43° 27' 18", W 84° 43' 39", (+)-α-pinene and ethanol, 17.VII.2008, Col: Roger Mech (1). Ionia Co., Saranac-Lowell State Game Area, 3 miles NE of Lowell, N 42° 57' 39",W 85° 18' 32", Elev. 248m, ethanol, 02.VI.2007-18.VI.2007, Col: N. Barc & A. Smith (1). Kent Co., Cannonsburg State Game Area, 5 miles East of Grand Rapids, N 43° 2' 8", W 85° 29' 27", Elev.:258m, ethanol, 02.VI.2007-18.VI.2007, Col: N. Barc and A. Smith (2). Livingston Co., Howell, 214 Inverness St., N 42° 37' 0.4", W 84° 55' 41", ethanol, 23.V.2007-07.VI.2007, Col: Roger Mech (1). Mason Co., Ludington State Park, N 44° 01.952', W 86° 30.475', exotic ips lure 13.VI.2008 Col: N. Barc and A. Smith (1).

This species is apparently endemic to the Palearctic (Wood and Bright 1992); in the U.S., it is distributed along the west coast, in mid-Atlantic and southern states and the midwest (Rabaglia et al. 2006, Lightle et al. 2007). Host usage in America has not been investigated; in Germany, where it has been recently introduced, it is one of the most common ambrosia beetles of hardwood forests (Bussler and Immler 2007). These records represent its most northern distribution in North America.

This species was originally described by S. L. Wood in 1975, who suspected it to be an introduced species given its then limited distribution and morphological distinctness. Michail Mandelstham (in Rabaglia et al. 2006) suggested it might actually be *Xyleborus bodoanus* Reitter, which is now place in *Cyclorhipidion* (Bussler 2006). We confirm this synonymy, which is being formally published elsewhere (Knizek, pers. comm.).

Xylosandrus crassiusculus (Motschulsky). USA: Michigan, Berrien Co., N42.0777, W86.3977, 8.VIII.2008-27.VIII.2008, funnel trap baited with ethanol and sirex lure, Col: J. Bock (1). Branch Co., N41.9360, W85.0129, 24.VI.2008-16.VII.2008, funnel trap baited with ethanol, Col: T. Kellam (1). Emmet Co., N45.3499, W85.0510, 11.IX.2009, funnel trap baited with ethanol, Col: B. Patterson (1). Van Buren Co., N42.3295, W86.3050, 15.VI.2009- 8.VII.2009, funnel trap baited with Ips trilure, Col: P. Scott (1).

This Asian endemic is distributed throughout the southeastern and midwestern U.S. (Rabaglia et al. 2006, Lightle et al. 2007). These records represent its most northern distribution. This species is a pest of nursery stock and fruit trees in the southern states (Kovach and Gorsuch 1985, Oliver and Mannion 2001) and may pose a threat to these industries in the northern states. It breeds in a wide variety of broadleaf shrubs and trees.

Xylosandrus germanus (Blandford). USA: Michigan, Allegan Co., Saugatuck State Park, N 42° 42.043', W 86° 11.780', (+)-α-pinene and ethanol, ethanol, exotic ips lure 01.V.2008-16.V.2008, 30.V.2008, 13.VI.2008, 27.VI.2008, 10. VII.2008, 24.VII.2008, 06.VIII.2008, 21.VIII.2008 Col: N. Barc and A. Smith (98). Antrim Co., Eastport , Fred Stehr's residence, N 45° 08.284', W 85° 22.495', (+)-α-pinene and ethanol, ethanol,01.V.2008-14.VI.2008, 28.VI.2008, 11.VII.2008. 24. VII.2008, 08.VIII.2008, 21.VIII.2008, 19.IX.2008, Col: Fred Stehr (25). Emmet Co., N 45° 40' 17", W 84° 56' 17", α-pinene 26.VI.2007, Col: M-JB (1). Genesee Co., Richfield County Park, N 43° 6' 2", W 83° 33' 29", (+-)α-pinene and ethanol, ethanol, exotic ips lure, 27.V.2008, 16.VI.2008, 02.VII.2008, 18.VII.2008, 28.VII.2008, 15.VIII.2008, 10.IX.2008, Col: Roger Mech (80). Grand Traverse Co., Paradise, Voice Rd., exotic ips lure, N 44° 37' 0.7", W 85° 30' 39.5", Col: W. Radtke (1). Gratiot Co., Forest Hill Natural Area, N 43° 27' 18", W 84° 43' 39", (+)-α-pinene and ethanol, ethanol, exotic ips lure, 21.V.2008, 03.VI.2008, 17.VI.2008, 02.VII.2008, 17.VII.2008, 29.VII.2008, 15.VIII.2008, 10.IX.2008, Col: Roger Mech (308). Ingham Co., Lansing, Crego Park, N 42° 42' 56", W 84° 31' 20, Elev.: 245m, α-pinene and ethanol, ethanol, exotic ips lure 19.V.2007-02.VI.2007, 18.VI.2007, 02.VII.2007, 16.VII.2007, 30.VII.2007, 13.VIII.2007, 27.VIII.2007, 10.IX.2007, Col: N. Barc and A. Smith (192). Ingham Co., E. State Rd., 2 miles North of Lansing, N 42° 47' 3", W 84° 32' 10", Elev. 261m, (+)-α-pinene and ethanol, ethanol, 19.V.2007-02.VI.2007,02. VII.2007, 16.VII.2007, 30.VII.2007, 13.VIII.2007, 24.IX.2007, Col: Gary L. Parsons (12). Ionia Co., Saranac-Lowell State Game Area, 3 miles NE of Lowell, N 42° 57' 39", W 85° 18' 32", Elev: 248m, (+)-α-pinene and ethanol, ethanol, exotic ips lure, 19.V.2007-02.VI.2007, 18.VI.2007, 02.VII.2007, 16.VII.2007, 30.VII.2007, 13.VIII.2007, 27.VIII.2007, 10.IX.2007, Col: N. Barc and A. Smith (107). Jackson Co., Site 608F EDRR Siricid Study, girdled *Pinus* sp., 28.VI.2008 (1). Kent Co., Cannonsburg State Game Area, 5 miles East of Grand Rapids, N 43° 2' 8", W 85° 29' 27", Elev.: 258m, (+)-α-pinene and ethanol, ethanol, exotic ips lure, 19.V.2007-02.VI.2007, 18.VI.2007, 02.VII.2007, 16.VII.2007, 30.VII.2007, 13.VIII.2007, 27.VIII.2007, 10.IX.2007, Col: N. Barc & A. Smith (137). Livingston Co., Brighton, 4631 Bishop Lake Rd., N 42° 30' 29", W 84° 51' 4", (+)α-pinene and ethanol, ethanol, exotic ips lure, 22.V.2007-05.VI.2007, 19. VI.2007, 17.VII.2007, 02.X.2007, Col: Roger Mech (64). Livingston Co., Howell, 214 Inverness St., N 42° 37' 0.4", W 84° 55' 41", (+)-α-pinene and ethanol, ethanol, exotic ips lure, 23.V.2007-07.VI.2007, 20.VI.2007, 06.VII.2007, 17.VII.2007, 01.VIII.2007, 14.VIII.2008, 05.IX.2007, Col: Roger Mech (101). Macomb Co., Shelby Twp., 4300 Main Park Rd., N 42° 44' 15", W 84° 3' 51", (+)-α-pinene and ethanol, ethanol, exotic ips lure, 22.V.2007-05.VI.2007, 19.VI.2007, 05.VII.2007, 01.VIII.2007, 14.VIII.2007, 05.IX.2007 Col: Roger Mech (83). Macomb Co., N 42° 42' 55", W 83° 4' 43", 22.VI.2007 (4). Mason Co., Ludington State Park, N 44° 01.952', W 86° 30.475', (+)-α-pinene and ethanol, ethanol, exotic ips lure, 30.V.2008-13.VI.2008, 27.VI.2008, 10.VII.2008, 24.VII.2008, 6.VIII.2008,21. VIII.2008, 03.IX.2008, 16.IX.2008, Col: N. Barc & A. Smith (329). Muskegon Co., Muskegon State Park, N 44° 01.952', W 86° 20.662', (+)-α-pinene and ethanol, ethanol, exotic ips lure, 16.V.2008, 30.V.2008-13.VI.2008, 13.VI.2008-27.VI.2008, 10.VII.2008, 24.VII.2008, 06.VIII.2008, 21.VIII.2008, 03.IX.2008, 16.IX.2008, Col: N. Barc & A. Smith (992). Oakland Co., Commerce, 3500 Wixom Rd., N 42° 34' 13", W 84° 33' 10", (+)-α-pinene and ethanol, ethanol, exotic ips lure, 23.V.2007-07.VI.2007, 19.VI.2007, 06.VII.2007, 17.VII.2007, 01.VIII.2007, 05.IX.2007, 02.X.2007, Col: Roger Mech (49). Roscommon Co, Gerrish, N. Higgins Lake Rd.,

N 44° 30' 43", W 84° 44' 9.4", (+)α-pinene and ethanol,10.IX.2008, Col: W. Radtke (1). Washtenaw Co., Saline, at picnic, 1.viii.1980, Col: L. R. Kirkendall, W. D. Hamilton, and N. A. Moran (2). Wayne Co. Grosse Ile, Parke Lane, N 42° 10' 14", W 84° 8' 41", (+)-α-pinene and ethanol, ethanol, exotic ips lure, 23.V.2007-07.VI.2007, 20.VI.2007, 06.VII.2007, 17.VII.2007, 01.VIII.2007, 05.IX.2007, Col: Roger Mech (76).

This ambrosia beetle, introduced from Asia, is established from coast to coast in the U.S. and Canada (Humble 2001, LaBonte et al. 2005, Rabaglia et al. 2006). The first state record was from a picnic in southern Michigan in 1980 but this species was only recently reported occurring in MI (Haack and Petrice 2009). The species is highly polyphagous, breeding in a wide variety of hardwoods and conifers.

Native Scolytinae Species

Anisandrus obesus (LeConte). USA: Michigan, Gratiot Co., Forest Hill Natural Area, N 43° 27' 18", W 84° 43' 39", ethanol, 03.VI.2008 Col: Roger Mech (4). Livingston Co., E. S. George Reserve, N 42° 28', W 84° 00', 2.IX.1980, 30.X.1980, *Populus grandidentata* Michaux, Col: L. R. Kirkendall (2). Newaygo Co., 5 mi. North Newaygo, Ex: Malaise trap at 6 ft height, 18-25.VI.1975, Col: T.A. Bowling (1). Washtenaw Co., Waterloo State Rec. Area, 4 mi. W of Chelsea, 42° 21' 41" N, 84° 11' 27" W, 12.VIII.1980, *Populus grandidentata*, Col: L. R. Kirkendall (8).

This species occurs throughout northeastern North America and in the northern midwestern U.S. (Wood and Bright 1992) and was expected to occur in Michigan. It was first reported in the study by Roeper et al. (1980) on the ambrosia fungi associated with Michigan scolytines, from Antrim and Gratiot counties, ex *Acer rubrum* L., *A. saccharum* L., and *P. grandidentata*. The species is apparently rare: there are relatively few specimens in older collections, and few individuals are captured in traps or at light (e.g., this study; Deyrup 1981; see also Rabaglia et al. 2006). This polyphagous ambrosia beetle breeds in hardwoods (Wood 1982).

Chramesus hicoriae LeConte. USA. Michigan, Clinton Co., E. State Rd., one mile North of Lansing, ultraviolet and white lights, 02.VII.2004, 26.VI.2005, Col: Gary. L. Parsons (2). Livingston Co., E. S. George Reserve, N 42° 28', W 84° 00', 25.VI.1978, 12.VII.1978, 11.II.1979, 1.IV.1979, 22.IV.1979, 28.VIII.1979, 3.III.1980, 2.VII.1980, 4.VII.1980, 6.VII.1980, *Carya* spp. (Juglandaceae), Col: L. R. Kirkendall (93). Oakland Co., Highland Rec. Area Livingston Road at Pettibone Lake Rd. 2.VII.1978 (6). Washtenaw Co., Ann Arbor, Botanical Gardens, 11.VII.1911, Col: T.H. Hubbell (1). Washtenaw Co., Saline. 1.VII.1913, (5).

This species was listed in LeConte (1878) as *Chramesus "icoriae"* (an apparent typographical error) but was not included in subsequent catalogs. We include the following records in confirmation of the occurrence of this species. This bark beetle occurs in the U.S. throughout the range of hickories, *Carya* spp (Blackman and Stage 1924, Wood and Bright 1992). In Michigan, breeding adults were collected from *C. glabra* (Miller) Sweet and *C. ovata* (Miller) K. Koch. Breeding in the lower peninsula begins in July, and offspring overwinter as larvae (Kirkendall, unpublished observations). The species is monogynous, with females initiating the galleries (*contra* Wood 1982:316), and is monogamous for life: males die blocking the gallery system entrance, with the female dead inside (Kirkendall 1983 and unpublished observations).

Corthylus columbianus Hopkins. USA: Michigan, Antrim Co., Eastport, Fred Stehr's residence, N 45° 08.284', W 85° 22.495', Ethanol, 11.VII.2008, Col: Fred Stehr (1). Chippewa Co., Whitefish Point, 30.VII.19, Col: A. W. Andrews (1). Genesee Co., Richfield County Park, N 43° 6' 2", W 83° 33' 29", (+)-α-pinene and ethanol, ethanol, 28.VII.2008, 10.IX.2008, Col: Roger Mech (3). Gratiot Co., Forest Hill Natural Area, N 43° 27' 18", W 84° 43' 39", ethanol, 02.VII.2008,

29.VII.2008, Col: Roger Mech (3). Ingham Co., Lansing, Crego Park, N 42° 42' 56", W 84° 31' 20", Elev.: 245 m, ethanol, 02.VI.2007-18.VI.2007, Col: N. Barc and A. Smith (3). Ionia Co., Saranac-Lowell State Game Area, 3 miles NE of Lowell, N 42° 57' 39",W 85° 18' 32", Elev. 248m, ethanol, exotic ips lure, 02.VI.2007-18. VI.2007, Col: N. Barc and A. Smith , (3). Livingston Co., Howell, 214 Inverness St., N 42° 37' 0.4", W 84° 55' 41", ethanol, 07.VI.2007-20.VI.2007, Col: Roger Mech (1). Oakland Co., Commerce, 3500 Wixom Rd., N 42° 34' 13", W 84° 33' 10", (+)-α-pinene and ethanol, 07.VI.2007-20.VI.2007, Col: Roger Mech (1). Wayne Co. Grosse Ile, Parke Lane, N 42° 10' 14", W 84° 8' 41", ethanol, 23.V.2007-07. VI.2007, Col: Roger Mech (1).

This species occurs through eastern U.S. hardwood forests (Wood and Bright 1992 and therefore we expected to find it in Michigan. This polyphagous ambrosia beetle breeds in trunks of healthy trees without harming them (Kabir and Giese 1966, Nord 1972). Reproducing and overwintering in healthy trees may explain why only one hand-collected specimen was found in MSUC and UMMZ; trapping with attractants revealed the species to be widespread and common.

Dryocoetes granicollis (LeConte). USA: Michigan, Gratiot Co., Forest Hill Natural Area, N 43° 27' 18", W 84° 43' 39", (+)-α-pinene and ethanol, 17.VI.2008, 15.VIII.2008, Col: Roger Mech (2). Ingham Co., Lansing, Crego Park, N 42°42' 56", W 84° 31' 20",Elev: 245m, ethanol, 02.VI.2007-18.VI.2007,Col: N. Barc & A. Smith (1). Livingston Co., Howell, 214 Inverness St., N 42° 37' 0.4", W 84° 55' 41", ethanol, 07.VI.2007-20.VI.2007, Col: Roger Mech (3). Wayne Co. Grosse Ile, Parke Lane, N 42° 10' 14", W 84° 8' 41", exotic ips lure, 03.VII.2007-17.VII.2007, Col: Roger Mech (1). Gratiot Co., Forest Hill Natural Area, N 43° 27' 18", W 84° 43' 39",ethanol,exotic ips lure 03.VI.2008, 17.VI.2008, Col: Roger Mech (4).

This rarely collected species occurs in eastern North America. It breeds in *Picea*, and there are unconfirmed records from *Castanea*, and *Juglans* (Wood 1982). These records represent its northern distributional limit.

Hypothenemus dissimilis (Zimmermann). USA: Michigan, Livingston Co., E. S. George Reserve, N 42° 28', W 84° 00', 22.IV.1979, 19.VII.1979, 23.VIII.1979, 11.IX.1979, 21.IX.1979, 22.IX.1979, 13.VI.1980, *Carya* (Juglandaceae) and *Quercus* (Fagaceae), Col: L. R. Kirkendall (31). Oakland Co., 18.V.1947, Col: B. Summerville (1).

Hypothenemus dissimilis is not often collected, but it is known to be widely distributed in the eastern U.S.; Blackman (1922) records it from Michigan, though neither Wood (1982) nor the catalogues list Michigan among the states from which it is known. This tiny bark beetle has been recorded from a variety of host families (Blackman 1922, Wood 1982); at the E. S. George Reserve, it was collected from *Quercus alba* L. (4 galleries), *Q. macrocarpa* Michaux (1), *Q. prinus* L. (1), *C. glabra* (1), and *Carya* sp. (1) (Kirkendall, unpublished data). It breeds in the pith or wood at the center of twigs and small branches (Blackman 1922).

Micracis swainei Blackman. USA: Michigan, Livingston Co., E. S. George Reserve, N 42° 28', W 84° 00', 8.VI.1980, Salix discolor (Betulaceae), Col: L. R. Kirkendall (3). Washtenaw Co., Ann Arbor, Third Woods, 10.VI.1921, T.H. Hubbell (1).

This xylophagous species is highly polyphagous, breeding in the dry wood of small stems and branches of many trees and shrubs in eastern North America, California, and Mexico and Central America (Wood 1982). The *Salix* specimens were dead, and were taken from old tunnels in a 2-cm-diameter standing dead stem.

Orthotomicus latidens (LeConte). USA: Michigan, Crawford Co., Deward, reared from *Larix laracina* (Pinaceae), 12.III.1917, Col: Pettit (1). Genesee Co., Richfield County Park, N 43° 6' 2", W 83° 33' 29", (+)-α-pinene and ethanol, 27.V.2008, Col: Roger Mech (1).

This species is rarely collected in eastern U.S. although the species is distributed throughout North America and Mexico (Wood and Bright 1992). *Larix* may not be a regular host: previous host records are almost exclusively from pines (Wood 1982).

Phloeosinus dentatus (Say). USA: Michigan, Cheboygan Co., T. 33 N., R 3 W., sec. 12, Sturgeon R. by old U.S. 27, *Thuja occidentalis* (Cupressaceae), 12.VIII.1978, Col: L. R. Kirkendall (1). Livingston Co., E. S. George Reserve, N 42° 28', W 84° 00', 27.VI.1978, 12.VII.1978, 2.VII.1980, *Juniperus virginiana* (Cupressaceae), Col: L. R. Kirkendall (15).

Known as the eastern juniper bark beetle, this species is widespread in eastern North America, where it breeds in various Cupressaceae (Wood 1982). Bigyny has been reported for populations from Georgia (Berisford 1975) but not Mississippi (Blackman 1922): in Michigan, 18 of 18 examined gallery systems in juniper had only one female (Kirkendall, unpublished data). Its congener *P. canadensis* Swaine breeds in *Thuja*, but has so far only been collected from the Upper Peninsula.

Phloeotribus piceae Swaine. USA: Michigan, Cheboygan Co., Pigeon River Forest, Pine Grove Campground, 8 mi. E, 1 mi. S. of Wolverine, dead branch on live *Picea glauca* (Pinaceae), 21.VIII.1980, Col: L. R. Kirkendall (1). Keweenaw Co., Isle Royale, *Picea glauca*, 13.VII.1981, Col: N. A. Moran (1). Mackinac Co., U.S. 2 ca 4 mi. E of St. Ignace, twig of cut *Picea mariana*, 20.VIII.1980, Col: L. R. Kirkendall (1).

This is a largely boreal species; from the contiguous U.S., it has only been collected previously from Minnesota, New York and Maine. Northern Michigan is apparently at the southern limits of its distribution. *P. mariana* is a new host for the species.

Phloeotribus scabricollis (Hopkins). USA: Michigan, Lenawee Co., Bean Ck., 0.3 mi W, 0.5 mi S of Morenci, *Ptelea trifoliata* (Rutaceae), Col: L. R. Kirkendall (13).

This rarely collected species was previously known only from Indiana, Illinois (ex *P. trifoliata*) and Ohio. The species was common in a patch of hop tree (*P. trifoliata).* Old galleries were found in stems and branches; live adults were boring into the bases of leaves. The Ohio host record of *Staphylea trifolia* L. (Staphyleaceae), an unrelated but very similar-appearing plant, could be a mistaken identification.

Pityophthorus briscoei Blackman. USA: Michigan, Luce Co., US 123 at border with Chippewa Co., dead top of small *P. mariana*, 19.VIII.1980, Col: L. R. Kirkendall (1).

The species is known only from eastern Canada and the northeastern U.S. It has been collected from both *Pinus* and *Picea* previously.

Pseudopityophthorus asperulus (LeConte). USA: Michigan, Livingston Co., E. S. George Reserve, N 42° 28', W 84° 00', 10.V.1978, 18.V.1979, 17.VI.1980, 4.VII.1980, *Fagus*, *Quercus*, and window traps, Col: L. R. Kirkendall.

This tiny species was much less common in beeches and oaks than the larger *P. minutissimus* (Zimmermann) (Kirkendall unpublished data); it was collected from small branches *of Fagus grandidentata* Ehrh. and *Quercus bicolor* Willd. *Fagus* is a new host genus (Wood and Bright 1992).

Trypodendron betulae Swaine. USA: Michigan, Cheboygan Co., T.37N., R.3W., sec. 33, U. M. Biological Station, trunk of standing dead *Betula papyrifera*, 14.VIII.1979, Col: L. R. Kirkendall (3). Luce Co., US 123 at border with

Chippewa Co., windthrown *Betula lutea* with green leaves, 19.VIII.1980, Col: L. R. Kirkendall (10).

The first records from Michigan of this species (Roeper et al. 1980: Grand Traverse and Marquette counties, *B. papyrifera*) do not appear in Wood (1982) or subsequent literature. This species breeds primarily in *Betula*, and occurs in birch forests across the upper U.S. and Canada.

Trypodendron rufitarsis (Kirby). Roeper et al. (1980) studied the ambrosia fungus of *T. rufitarsis* and reported this species from Otsego Co., ex *Pinus resinosa* Aiton. This remains the only Michigan record. We have not been able to locate specimens, but *T. rufitarsis* is quite distinctive (Wood 1982: fig. 178). Michigan represents the only U.S. locality east of Minnesota, though the species has been collected in Ontario (Wood and Bright 1992).

Trypodendron scabricollis (LeConte). USA: Michigan, Roscommon Co., Roscommon, 11.XI.1949 (1).

The MSUC specimen is the only known collection from Michigan. This species seems to be rare, having been collected from only a handful of states in the eastern U.S., where it breeds in various species of *Pinus* (Wood and Bright 1992).

Trypophloeus populi Hopkins. USA: Michigan, Livingston Co., E. S. George Reserve, N 42° 28', W 84° 00', 1979, reared from branch of *Populus tremuloides*, Col: L. R. Kirkendall. St. Clair Co. NAD83: 42.9690N, -82.5642W, 26.VI.2007 (1). St. Clair Co. NAD83: 43.0736N, -82.6265W, 27.VI.2007 (1).

This rarely collected species is known mainly from western North America (Saskatchewan, Manitoba; Nevada and Idaho east to Colorado). The only eastern record is one collection from New Brunswick (Wood 1982). This is the first collection of *Trypophloeus* in Michigan and in the eastern U.S., but demonstrates that the species has a transcontinental distribution. This monogynous bark beetle attacks live trees (Petty 1977) and appears to have similar biology to *T. striatulus* (Mannerheim) (see below).

Trypophloeus striatulus (Mannerheim). USA: Michigan, Macinac Co., USFS 3108, 1 mi. N of US 2, 19.VIII.1980, live *Salix* stems, Col: L. R. Kirkendall (9).

A series of *T. striatulus* was collected from live stems of *Salix discolor* and *S. subsericeus* (Andersson) Schneider in a bog. This aggressive bark beetle is considered to be the most important insect enemy of willows (particularly *Salix alaxensis*) in Alaska, and is intimately associated with a staining *Cytospora* fungus (Furniss 2004). In the western U.S. it has also been collected from *Alnus* and *Populus* (Furniss and Johnsen 1995).

Trischidias atoma (Hopkins). USA: Michigan, Leenawee Co. NAD83: N 42.0604, W 84.1415, 28.VI.2007 (5). Livingston Co., E. S. George Reserve, N 42° 28' N, W 84° 00', 19.V.1980, *Sambucus racemosa* (Adoxaceae), Col: L. R. Kirkendall (5). Wayne Co., Lower Huron Metropark, Sycamore Bend Picnic Area, Paw Paw Nature Trail, 25.VIII.1980, *Morus rubra* (Moraceae), Col: L. R. Kirkendall (3).

These are the first records of *Trischidias* from Michigan, and represent the northernmost collections of *T. atoma*, a species otherwise known from scattered collections throughout the eastern U.S. (Atkinson 1993). The species is seldom collected, even by specialists, because of its tiny size (0.6 mm long) and peculiar habits: it is only found in dead, dry twigs infested with a black ascomycete fungus (Deyrup 1987, Atkinson 1993), a niche this species share with the unrelated *Lymantor decipiens* (Swaine 1918).

Xyleborus volvulus (Fabricius). USA: Michigan, Washtenaw Co., 15.IV.1929, R. Mc (sic) (1).

The specimen of this cosmotropical species which is in the UMMZ must represent an interception or an individual emerging from imported tropical wood. No further specimens have been collected. We do not consider this species to be established in Michigan.

Xyleborus planicollis Zimmermann. USA: Michigan, Berrien Co., Paw Paw Lake, 20.vii.1909, Col: E. Liljblad (1) (UMMZ). Ogemaw Co., Refuge Rd., N 44° 23' 41", W 84° 23' 17", ethanol, 15.VIII.2008, 10.IX.2008, Col: W. Radtke (2).

Until recently, this species was confused with *X. xylographus* (Say). Collections of *X. planicollis* are rare, and Rabaglia et al. (2006) list only six states in the eastern U.S. for this species. These records represent the most northern distribution of this species. We cannot find any host records for *X. planicollis*.

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