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**Proceedings of the Entomological Society of Washington.**

[Washington, etc. :Entomological Society of Washington]

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**v. 103 2001 July-Oct...:** <http://www.biodiversitylibrary.org/item/54775>

Page(s): Page 1011, Page 1012, Page 1013, Page 1014, Page 1015, Page 1016, Page 1017,  
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## EXOTIC WOODBORING COLEOPTERA (MICROMALTHIDAE, SCOLYTIDAE) AND HYMENOPTERA (XIPHYDRIIDAE) NEW TO OREGON AND WASHINGTON

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**Abstract.**—Concerns about the unintentional introduction of exotic woodboring insects prompted surveys of high-risk sites in Washington in 1996 and Oregon in 1997 and 1998. Ports, port areas, mills and businesses known to have received or handled imported wood or wood products were monitored using Lindgren funnel traps and/or Scots pine bait logs. Seven species of beetles, *Micromalthus debilis* LeConte (Micromalthidae), *Gnathotrichus materiarius* (Fitch), *Hylastes opacus* Erichson, *Xyleborinus alni* (Niisima), *Xyleborus californicus* Wood, *Xyleborus pfeili* (Ratzeburg), *Xyloterinus politus* (Say) (Scolytidae), and one species of wood wasp, *Xiphydria prolongata* (Geoffroy) (Xiphydriidae), are recorded from Oregon, Washington, the western United States, or North America for the first time. These species are native to Asia, Europe, or the eastern United States. Most probably pose little immediate threat to the overall health of our forests, agricultural systems, and urban or rural environments. *Hylastes opacus*, a Palearctic species previously established in the eastern U.S., is a known pest of pines. *Xiphydria prolongata* has been implicated as a passive carrier of watermark disease of willows. Six (75%) of these species have hardwood hosts, implicating dunnage and solid wood packing material as probable pathways of introduction. Thirty-eight percent of the sites monitored in Oregon produced one or more new species records. These detections underscore the need for 1) effective regulations and certification, quarantine, and port inspection programs to prevent the introduction of exotic woodboring insects and 2) for systematic surveys of high-risk areas to determine which introduced organisms may already be established.

**Key Words:** exotic, woodborers, Micromalthidae, Scolytidae, Xiphydriidae

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Woodboring beetles, particularly bark and ambrosia beetles (Scolytidae), are the most frequently intercepted insects on wood articles at U.S. ports of entry (Haack and Cavey 1997). Typical modes of introduction include raw logs, lumber, and solid wood packing material and dunnage associated with a wide range of commodities from Europe, Asia, and other foreign sources. Pest risk assessments identifying wood-

associated pests, their likelihood of introduction, probability of establishment, and potential impacts have been recently completed in response to the demand for foreign timber and wood products (USDA Forest Service 1991, 1992, 1993, 1998). Regulations designed to mitigate potential pest risks have been developed as organisms or pathways of introduction were identified. Among the most recent are those regulating



solid wood packing material from China (USDA-APHIS 1998). These regulations, along with port inspection, certification, and monitoring programs, serve as the first line of defense against the introduction of exotic organisms.

Despite such efforts, the number of exotic bark beetles established in North America has steadily increased (Marchant and Borden 1976, Wood 1977, Atkinson et al. 1990, Hoebeke 1994, L. M. Humble, unpublished data). While the impact of many of these recently introduced species is unknown, the pine shoot beetle, *Tomicus piniperda* (L.) (Scolytidae), has prompted intensive research, regulatory, and management programs (Haack et al. 1997). Recent discoveries of Asian longhorned beetle, *Anoplophora glabripennis* (Motschulsky) (Cerambycidae), in New York and Chicago prompted large-scale emergency quarantine, survey, and eradication programs (Haack et al. 1996, Poland et al. 1998). Exotic organisms such as these threaten the health of North American forests, agricultural systems, and urban and rural environments (US Congress, OTA 1993, Liebhold et al. 1995).

Increasing volumes of imported wood, wood products, and other foreign commodities have been arriving at Pacific Northwest ports. In Oregon, over 50 million board feet of logs, green lumber, railroad ties, and wood chips from New Zealand, Chile, Brazil, Mexico, and Russia were imported from 1991–1998 (Oregon Dept. Agriculture, unpublished data). In response to the increasing number of non-indigenous species becoming established in the northeastern U.S., the United States Department of Agriculture targeted six exotic bark beetle species for survey through its Cooperative Agricultural Pest Survey (CAPS) program beginning in 1994 (Cavey 1993). Consequently, CAPS surveys for exotic woodboring beetles and wood wasps were conducted at high-risk sites in Washington in 1996 and Oregon in 1997–98. Target species included the bark beetles (Scolyti-

dae) *Hylastes opacus* Erichson, *Hylurgus ligniperda* (F.), *Ips typographus* (L.), and *T. piniperda*, and the European wood wasp, *Sirex noctilio* (F.) (Siricidae).

#### MATERIALS AND METHODS

Trapping surveys were conducted in the Washington port areas of Seattle, Tacoma, Olympia, Aberdeen, Longview, and Vancouver in 1996, and the Oregon ports of Portland and Coos Bay in 1997 and 1998. Additional high-risk sites surveyed in Oregon included a site across from the port of Longview, WA, several mills receiving foreign wood products, an exotic woods importer, warehouses receiving imported commodities, and wood recyclers. Lindgren traps (8-, 12-, or 16-funnel) baited with exotic bark beetle lure (EBB: ipsdienol, methylbutenol, and cis-verbenol), pine shoot beetle lure (AP: alpha-pinene), woodborer lures (AP-EtOH: alpha-pinene and ethanol ultra-high release [UHR] pouches), or ethanol UHR lures (EtOH), (Phero Tech Inc., Delta, BC) were the primary survey means. Traps were monitored weekly from late March to June 4 in Washington and biweekly from February through September and early October in Oregon. Bait logs of Scots pine (*Pinus sylvestris* L.), a preferred host for pine shoot beetle, were also placed at all Oregon trap sites in 1997 and 1998 and at additional high-risk sites in 1998. Upon removal, bait logs were placed in emergence tubes and monitored biweekly for insect emergence. Unless otherwise noted, all collection records refer to specimens collected in Lindgren funnel traps and are reported by: state, county, city (site type), lure, collection date, collector(s), and (number of specimens collected).

Non-scolytid beetles from the Oregon surveys were generally identified by LaBonte, based upon available literature and comparison with identified material in the insect collection of the Oregon Dept. of Agriculture (ODAC), Salem, OR, or the Oregon State Arthropod Collection (OSAC), Oregon State University, Corval-



lis, OR. Scolytidae and Xiphydriidae identifications were provided or confirmed by several taxonomic authorities (see Acknowledgments). Unless otherwise stated, specimens collected in the Oregon surveys are housed in the ODAC. Washington survey specimens were deposited in the William F. Barr Entomological Museum (WFBM) at the University of Idaho.

## RESULTS

Two hundred and sixty-three species of woodboring or wood-associated beetles and wood wasps were identified in Oregon, totalling 26,986 specimens. Approximately 2,100 specimens comprising 29 species of wood-associated beetles were identified from the Washington survey. Seven species of beetles, *Micromalthus debilis* LeConte (Micromalthidae), *Gnathotrichus materiarius* (Fitch), *Hylastes opacus* Erichson, *Xyleborinus alni* (Niisima), *Xyleborus californicus* Wood, *Xyleborus pfeili* (Ratzeburg), *Xyloterinus politus* (Say) (Scolytidae), and one species of wood wasp, *Xiphydria prolongata* (Geoffroy) (Xiphydriidae), are recorded from Oregon, Washington, the western United States, or North America for the first time. New Oregon county records for *Xyleborus californicus* and *Xyleborus xylographus* (Say) are included as well.

### NEW OREGON AND WASHINGTON RECORDS

#### Coleoptera Micromalthidae

##### *Micromalthus debilis* LeConte

Records.—Oregon: Lane Co., Jasper (mill site), EtOH, 2 IX 1998, W. R. Estabrook & M. T. Savelich (1). Washington: King Co., Federal Way, V 1998 (exact date unavailable), in bank building, associated with bank vault, R. Mix (100's); Kitsap Co., Poulsbo, 17 VII 1998, in bank building, associated with bank vault, D. Suomi (100's).

Comments.—These data represent new northwestern U.S. and state records. This species is indigenous to North America east of the Rocky Mountains (Lawrence 1991).

Larvae occur in decaying wood, predominantly hardwoods such as chestnut and oak, but also in conifers such as Douglas-fir and pine (Atkins 1982). This beetle has been spread via commerce to many parts of the world (Atkins 1982), presumably via wooden building and packing material. The sole member of the family Micromalthidae, *M. debilis* has one of the most complex life cycles of any insect, including three types of paedogenetic larvae (Lawrence 1991).

*Micromalthus debilis* has been found infesting the wood panels forming the walls and floors of bank vaults and safes (Weintraub 1995). The high moisture content of this wood apparently provides ideal conditions for these beetles. *Micromalthus debilis* is known from safes in Las Vegas (16 V 1994, P. Bowerman), and Carson City (VI 1993, E. Benes), NV (J. Knight, personal communication).

*Micromalthus debilis* is probably established in Oregon and Washington. Although the Oregon record is represented by only a single specimen, a substantial population was probably present in order for an individual to be trapped. The Washington populations have been resident in the bank buildings for up to seven years. The beetles accumulated in great numbers at windows and other locations, and it seems likely some escaped into the surrounding woods, which have ample suitable host material (D. Suomi, personal communication). The status of the Nevada populations is unknown.

#### Scolytidae

##### *Gnathotrichus materiarius* (Fitch)

Records.—Oregon: Wasco Co., The Dalles (mill site), AP-EtOH, 4 V 1998 (2); EBB, 14 IX 1998 (1). All specimens collected by T. A. Stafford.

Comments.—These data represent new western North American and state records. This species is indigenous to eastern North America, extending west to SD, and it has been introduced in France and adjacent European countries, as well as the Dominican



Republic (Wood 1977, 1982, in litt.). *Gnathotrichus materiarius* may have reached Oregon through natural dispersal since this species was found in western SD in 1962 (S. L. Wood, in litt.). Hosts are pine, spruce, and Douglas-fir (Wood 1982, Bright and Skidmore 1997). One specimen has been deposited in the National Museum of Natural History, Smithsonian Institution (USNM).

*Hylastes opacus* Erichson

Records.—Oregon: Linn Co., Sweet Home (mill site), W. R. Estabrook and M. T. Savelich (1); Multnomah Co., Portland (port vicinity), T. A. Stafford (1); Wasco Co., The Dalles (industrial site), T. A. Stafford (4). All specimens were found 22 III 1998 dead in emergence tubes containing bait logs of *Pinus sylvestris* placed in early 1997.

Comments.—These data represent new western North American and state records. This Palearctic species was recently recorded from ME, NH, NY, WV (Hoebeke 1994, Rabaglia and Cavey 1994), and ON and PQ (Bright and Skidmore 1997). It is a noxious pest in nurseries and pine plantations in Europe and is occasionally intercepted in pine dunnage at major U.S. ports (Hoebeke 1994). The hosts are primarily pines, especially *P. sylvestris*, although other conifers are sometimes attacked (Hoebeke 1994, Bright and Skidmore 1997). Two specimens have been deposited in the USNM.

*Xyleborinus alni* (Niisima)

Records.—Oregon: Columbia Co., Rainier (port vicinity), 25 IV 1997 (2), (AP-EtOH, 1; EBB, 1); 9 V 1997 (11) (AP-EtOH, 9; EBB, 2), G. I. Fowles; Multnomah Co., Portland (port area and warehouse sites) (3), AP-EtOH (27 III 1998, 2; 22 V 1998, 1), G. I. Fowles. Washington: Pierce Co., Tacoma (port areas), 3-11 IV 1996 (3) (AP, 1; EtOH, 1; EBB, 1), EBB, 11-17 IV 1996 (1); Thurston Co., Olympia (port areas), 12 III-1 IV 1996 (5) (EtOH, 4; EBB,

1), 27 III-9 IV 1996 (11) (EtOH, 10; EBB, 1). All Washington specimens were collected by H. Kamping.

Comments.—These data are the first published North American and state records for this species. The previous known distribution includes Europe (Austria, Germany, Poland, and Czechoslovakia) and Asia (Japan and eastern Russia) (Wood and Bright 1992, Bright and Skidmore 1997). At least the Oregon specimens appear to be the result of an introduction from Japan (S. L. Wood, in litt.). Subsequent to these records, *X. alni* was identified from voucher material collected in 1995 at four sites around Vancouver, BC (L. M. Humble, unpublished data). Hosts are alder, birch, hazel, linden, oak, and willow (Wood and Bright 1992, Bright and Skidmore 1997). Examination of potential host material near the Port of Olympia in April, 1997, verified a breeding population from wind-thrown alder, *Alnus rubra* Bongard. One Oregon specimen has been deposited in the USNM and the Washington specimens have been deposited in the WFBM.

*Xyleborus californicus* Wood

Records.—Oregon: Lane Co., Jasper (mill site), AP-EtOH, 29 V 1997, W. R. Estabrook (1); AP-EtOH, 29 IV 1998, W. R. Estabrook & M. T. Savelich (3); 2 VI 1998, W. R. Estabrook & M. T. Savelich (2) (AP-EtOH, 1; EtOH, 1); Multnomah Co., Portland (warehouse site), AP-EtOH, 29 IV 1998, K. A. Puls (2). Washington: Clark Co., Vancouver (port vicinity), EtOH, 1-10 IV 1996, H. Kamping (1).

Comments.—These data represent new Washington state and Oregon county records. This species was previously recorded from CA (8 specimens) and OR, Marion Co. (2 specimens) (Furniss et al. 1992). It was also recently recorded from the eastern U.S. in AR, DE, MD, and SC (Vandenberg et al. 2000). Despite the specific epithet, this species is now known to be indigenous to the northern Palearctic (Vandenberg et al. 2000), based upon specimens from Siberia



examined by S. L. Wood. Its hosts are unknown (Hobson and Bright 1994), but this species can probably be found in species of oak (S. L. Wood, in litt.) and was found in an oak stump in AR (Vandenberg et al. 2000). One specimen has been deposited in the USNM and the Washington specimen has been deposited in the WFBM.

*Xyleborus pfeili* (Ratzeburg)

Records.—Oregon: Lane Co., Jasper (mill site); AP-EtOH (2) (10 VI 1997, 1; 16 VI 1998, 1); EtOH (9) (18 V 1998, 6; 16 VI 1998, 1; 29 VI 1998, 1; 2 IX 1998, 1); EBB, 27 VII 1998 (1). All specimens were collected by W. R. Estabrook and M. T. Savelich.

Comments.—These data are new western North American and Oregon records. This species is indigenous to Africa, Asia, Europe, and has been introduced into New Zealand (Wood and Bright 1992). It has been recently recorded as an introduction into the eastern U.S., in MD (Vandenberg et al. 2000). Its hosts include a wide variety of deciduous trees, including alder, beech, elm, maple, oak, and poplar, as well as several conifers (Wood and Bright 1992). One specimen has been deposited in the USNM.

*Xyleborus xylographus* (Say)

Records.—Oregon: Lane Co., Goshen (mill site), AP-EtOH, (2) (16 VI 1998, 1; 2 VII 1998, 1). Both specimens were collected by W. R. Estabrook & M. T. Savelich.

Comments.—These data represent a new Oregon county record. This species is indigenous to the Antilles and eastern North America from ON and PQ to the Gulf Coast (Wood and Bright 1992). The previous records from western North America (BC, CA, OR) represent introductions (Wood and Bright 1992). The prior OR record was based upon a single specimen from Yamhill Co. (Furniss et al. 1992). The hosts of this species are primarily oaks, rarely other deciduous trees and some conifers (Wood and Bright 1992, Solomon 1995). One specimen has been deposited in the USNM.

*Xyloterinus politus* (Say)

Records.—Washington: King Co., Seattle (port vicinity), EBB, 6 V – 4 VI 1996, H. Kamping (1).

Comments.—This is a new record for the western U.S. and Washington. This species is native to eastern Canada and the eastern U.S. (Wood 1982, Bright 1976). It has been recently recorded from BC (L. M. Humble, unpublished data). Its hosts are primarily deciduous trees, including maple, alder, birch, and oak, although it has been rarely found in conifers (Wood 1982). The specimen has been deposited in the WFBM.

HYMENOPTERA

Xiphydriidae

*Xiphydria prolongata* (Geoffroy)

Records.—Oregon: Multnomah Co., Portland (wood recycling facility), AP-EtOH, 19 VIII 1998, T. A. Stafford (1).

Comments.—This is a new western North American and state record. Previous North American records include MI and NJ (Smith 1983). This European species is known as the “willow wood wasp.” It has been recorded from Finland south to Italy and from England east to Siberia (Smith 1978). Its hosts are deciduous trees, including maple, alder, birch, plane tree, poplar, oak, willow, and elm (Smith 1983). Unlike other insects in this paper, xiphydriids are primarily associated with partially decayed wood (Furniss and Carolin 1977). *Xiphydria prolongata* has been implicated as a passive carrier of watermark disease of willows (Gray 1940).

DISCUSSION

We record eight species of exotic wood-boring insects from Oregon, Washington, the Pacific Northwest, the western U.S., western North America, or North America, for the first time. They are native to several regions of the world, including Asia, Europe, and the eastern U.S., indicating both inter- and intra-continental pathways of introduction. While much attention has been



paid to organisms introduced from foreign sources and their impacts, the same is not true for introductions from domestic sources. The potential ecological and economic impacts of "regional exotics" are a significant cause for concern as well (Pimentel et al. 2000) as regions of the country with distinct faunal components are becoming increasingly homogeneous.

Six of the sixteen sites surveyed in Oregon (38%), yielded new U.S. or state records of exotic woodboring insects. These are sobering results. While all the sites surveyed had a high potential for introduction (ports, mills, warehouses, and wood recyclers), only a modest portion of such sites were surveyed. Other systematic surveys for exotic bark beetles have also produced new state, U.S., or Canadian records (Atkinson et al. 1990, Hoebeke 1994, Rabaglia 1998, Vandenberg et al. 2000, L. M. Humble, unpublished data). These detections emphasize the need for surveys to determine which introduced organisms may already be established, particularly in high-risk areas, and to assess the efficacy of port inspection, certification, treatment, and quarantine programs. As further surveys are conducted, detections of additional non-indigenous species are expected.

Seventy-five percent of the exotic species documented in this paper have hardwood hosts, implicating dunnage and solid wood packing material as probable introduction pathways. Woodboring ambrosia beetles and wood wasps are most likely transported within the wood itself. Bark beetles and the wood-associated *Micromalthis debilis* probably hitchhike under bark, in cracks or crevices, or are otherwise associated with wood, wood products, packing material, or raw wood craft items. Live adults of two species of exotic longhorned beetles (Coleoptera: Cerambycidae) have recently been intercepted in Oregon with goods imported from China. *Monochamus alternatus* Hope was found inside a shrink-wrapped wooden pallet of transformers at an electronics manufacturing company. *Callidiellum villosul-*

*um* (Fairmaire) was intercepted after emerging from trunks of manufactured Christmas trees (cedar logs with bark and artificial limbs) in Oregon and ten other states. These interceptions illustrate the ease with which woodboring pests can escape detection at ports-of-entry and be distributed to other locations.

Whether or not detections represent established populations in all cases is uncertain. Records of only a single individual are suspect. However, it seems likely that substantial populations must be present in order for an individual to be trapped. Lindgren funnel trap recapture efficiency for several species of scolytids was extremely low, ranging from 0–10% (Turchin and Odendaal 1996, Barclay et al. 1998, E. A. Allen, unpub. data). The scolytids *Hylastes opacus*, *Xyleborinus alni*, *Xyleborus californicus*, and *X. pfeili*, are clearly established as these records stem from multiple individuals, multiple collection sites, multiple years, or a combination of all three. An effort to find an established population of *Micromalthis debilis* at the Jasper, Lane Co., site in February 1999 was unsuccessful.

Despite preventative measures, exotic organisms continue to accumulate in North American forests and ecosystems at an alarming rate. More than 400 species of exotic insects are known to be naturalized on woody plants in the United States (Mattson et al. 1994). Rearing studies of Scolytidae from native trees collected at two locations in British Columbia found that non-indigenous species comprised the majority of the total scolytid fauna recovered (Humble et al. 1998). Bark beetle trapping surveys in Maryland found that 31% of species were exotics, and, even more disturbing, 94% of individuals were exotics (Rabaglia 1998). Two long-established exotics, *Xyleborus dispar* (F.) and *Xyleborinus saxeseni* (Ratzeburg), were the most numerous scolytids at several sites in Oregon. These two species together accounted for 32% ( $n = 4,942$ ) of all Scolytidae trapped ( $n =$



15,592) during Oregon's 1997 and 1998 surveys. This proportion would have been much higher if not for the results from several relatively pristine sites.

Once established, exotic species forever alter the nature of an ecosystem, and may act as "contributing" or "inciting" factors, or in the worst case, "final straws" leading to irreversible ecological impacts (Mattson 1997). Several publications have recently outlined the impacts exotic species have on biodiversity, the economy, and the overall health of our forests, agricultural ecosystems and urban and rural environments (U.S. Congress, OTA, 1993, Campbell and Schlarbaum 1994, Liebhold et al. 1995, Wallner 1996). Recent estimates of losses due to exotic insect pests are \$13.9 billion per year for crop pests, and \$2.1 billion for forest pests (Pimentel et al. 2000). While most of these new exotics in Oregon and Washington are not expected to have significant economic or ecological consequences, we cannot afford to be complacent. *Tetropium fuscum* (F.) (Coleoptera: Cerambycidae) known to attack stressed or dying spruce in Europe and Asia, was recently found to be attacking large numbers of live, healthy red, white and Norway spruce in Halifax, Nova Scotia (CFIA 2000). Clearly we have much to learn about the impacts and prevalence of exotic species in our forests and urban and rural environments.

#### ACKNOWLEDGMENTS

Gary G. Smith and Gary D. Carpenter (USDA-APHIS-PPQ) shared their expertise and advice on wood imports, port operations, and high-risk sites in Oregon. Malcolm M. Furniss, University of Idaho, Moscow, ID, and Stephen L. Wood, Brigham Young University, Provo, UT, graciously provided many Scolytidae determinations and information in support of these surveys. David R. Smith, Systematic Entomology Laboratory, United States Department of Agriculture, Washington, DC, identified *Xiphydria prolongata* (Geoffroy). Their

combined experience and expertise were indispensable and greatly appreciated. The assistance of Gary L. Parsons and access to the Oregon State Arthropod Collection (Oregon State University, Department of Entomology, Corvallis, OR) for identification purposes was invaluable. E. Richard Hoebeke, Cornell University, Ithaca, NY, Leland M. Humble, Natural Resources Canada, Canadian Forest Service, Victoria, BC, Richard L. Westcott, Oregon Department of Agriculture (ODA), Salem, OR, and several anonymous reviewers all provided helpful suggestions which greatly improved the manuscript.

Numerous individuals assisted with survey implementation and logistics, including Harold Kamping (Washington State Department of Agriculture), and Wayne R. Estabrook, Gretchen I. Fowles, Bridget F. Kramer, Karl A. Puls, Mike T. Savelich and Terri A. Stafford (ODA). Jennifer Williams (ODA) sorted and prepared thousands of specimens; her assistance and perseverance is greatly appreciated. Lindgren funnel traps used in Washington were provided on loan from Ed Holsten, United States Department of Agriculture, Forest Service, Anchorage, AK, and Pat Shea, United States Department of Agriculture, Forest Service, Davis, CA. Their generosity is appreciated.

Funding for these surveys was provided by USDA-APHIS-PPQ, Western Region, Cooperative Agricultural Pest Survey grants 96-8553-0249-CA (Washington), 97-8584-0260-CA, 98-8584-0260-CA (Oregon) and the Oregon general fund.

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