ARCHIPS XYLOSTEANA (L.) (LEPIDOPTERA: TORTRICIDAE), A PALEARCTIC LEAFROLLER NEW TO NORTH AMERICA

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Abstract.—Archips xylosteana (L.), a widespread Palearctic tortricid moth, is reported from four localities in St. John’s, Newfoundland, the first records of this species in North America. Adults were found on a variety of ornamental trees and shrubs on the campus of Memorial University in August 2005 and 2006. This immigrant tortricid, a minor pest of rosaceous fruit trees and shrubs, is redescribed and diagnosed. Photographs of the adult male and female are provided to facilitate its recognition. Its worldwide distribution and biology are summarized.

Key Words: Lepidoptera, Tortricidae, Archips xylosteana, new records, adventive species, Atlantic Canada

Since 1993, we (E.R.H. and A.G.W.) have made 11 survey collecting trips to the Atlantic Provinces of Canada, with the goal of detecting non-native insects not recorded previously from North America. We collected mainly in and around Halifax, Nova Scotia, and St. John’s, Newfoundland, both considered high-risk areas for the unintentional introduction of Palearctic insects. In August 2005 and 2006, numerous adults of the Eurasian tortricid Archips xylosteana (L.) were taken at several locations in St. John’s, Newfoundland (by E.R.H. and A.G.W.). Here, we list the first North American records for this newly detected immigrant; provide a diagnosis, description, and photographs of the moth to facilitate its recognition; and review its Old World distribution, biology, damage, and hosts.

The genus Archips Hübner is widely distributed in the Holarctic Region, especially in the Asian part of the Palearctic (Kruse and Sperling 2002). In the Nearctic Region, the genus is represented by at least 24 species (Razowski 1977, Powell 1983, Brown 2005). Archips rosana (L.) was introduced accidentally to North America prior to 1890 (Comstock and Slingerland 1890) and is well established in the western and eastern portions of the continent, with fewer records from the middle. Archips fuscupreana Walsingham has been in the northeastern United States since at least 1982 (Maier and Mastro 1998, Maier 2003), and in the Northwest since at least 1995 (LaGasa et al. 1997). Archips podana (Scopoli) was first introduced into North America in British Columbia, Canada, earlier this century, and was not
discovered in the United States until 2000 in northwestern Whatcom County, Washington (LaGasa et al. 2003). With the addition of *A. xylosteana* to the fauna, the number of Palearctic species of *Archips* in North America now stands at four.

**Diagnosis and Description**

*Archips xylosteana* (L.)

(Figs. 1–6)

Diagnosis. — *Archips xylosteana* (Figs. 1–4) is similar to many other Archipini in size, wing shape, and color pattern. It is most similar to the European *A. crataegana* (Hübner) but differs in its more variegated forewing maculation and its smaller size (Bradley et al. 1973, Alford 1984). Some strongly patterned individuals of the Holarctic *A. rosana* also are similar to *A. xylosteana*, but the latter can be distinguished by the sacculus being narrower medially (Razowski 2002). The extremely long cestum of the female genitalia, as long as the ductus bursae, also distinguishes *A. xylosteana* from similar-appearing congeners.
Description (after Bradley et al. 1973; Razowski 1977, 2002; Meijerman and Ulenberg 2004).—Adult. Male (Fig. 1). **Head:** Vertex and frons pale brownish cream, often mixed with rust; labial palpus concolorous with head. **Thorax:** Dorsum pale brownish cream; legs unmodified. Forewing length 7–10 mm; costal fold occupying basal two-thirds of wing, with patch of featherlike scales near its distal end; forewing ground color whitish ochreous with variable gray, slightly refractive suffusion; markings reddish brown, thinly edged with ground color; basal blotch variably developed, usually a thumb-shaped patch extending subbasally from dorsum; median fascia slender in costal one-fourth, broadened toward tornus, inner margin sinuate; small black-brown dot at end of discal cell; subapical spot semi-ovate, usually contiguous with paler pistol-shaped subterminal marking; a reddish-brown spot or elongate marking at apex or in apical part of termen. Cilia concolorous with ground color of distal portion of wing, gray-brown at tornus, mixed rust at apex. Hindwing grayish brown, mixed ferruginous in apical area. Cilia pale ochreous-cream or cream, brownish in caudal part of wing, with brown basal line. **Abdomen:** Pale brownish cream. **Genitalia** (Fig. 5) with uncus parallel-sided, slightly broader in distal half, with truncate tip; socius vestigial; gnathos large with long, pointed terminal plate; valva rounded-ovobate, sacculus with short free termination. Aedeagus short,
tapering apically, pointed ventro-apically, with slender subapical lateral process; vesica usually with 6 deciduous cornuti.

Female (Figs. 2–4). Head: Essentially as described for male. Thorax: Dorsum pale brownish cream. Forewing length 9–11 mm; forewing broad; costa curved in basal one-third, slightly concave before apex; apex longer than in male; termen sinuate, convex and rounded postmedially; forewing pattern and maculation as in male, or markings darker, less reddish. Hindwing gray, apical area sometimes tinged with yellow or cupreous. Abdomen: Genitalia (Fig. 6) with sterigma weakly sclerotized with short caudal portion and small median process; anterior cup-shaped portion well developed, broad posteriorly, tapering anteriorly, partially fused with sclerite of antrum; cestum reaching almost to the anterior end of ductus bursae; corpus bursae round, signum with well-developed capitulum.

Sexual dimorphism and color variation.—Male with distinct costal fold and long antennal setae; female without costal fold, apex slightly produced, slightly greater forewing length, and antenna filiform, lacking conspicuous setae (Bradley et al. 1973). Considerable variation in forewing markings; inner margin of median fascia often shallowly sinuous or nearly angulate at middle; terminal markings often reduced to small irregularly shaped spot; ground color and markings in some specimens very pale, exceptionally dark in others (Bradley et al. 1973). For illustrations of adults see Bradley and Martin (1956), Bradley et al. (1973), Razowski (2002), and Meijerman and Ulenberg (2004). For illustrations of male and female genitalia see Razowski (1977, 2002).

Immature stages.—Egg: Ovoid, flattened, laid in a rounded imbricate mass, covered by a purplish-brown collereral secretion. Larva: Last instar 16–22 mm long; whitish gray, sometimes gray or dark bluish gray, with paler sides; head shiny black; prothoracic shield black or dark brown, with a whitish midline and collar; anal comb present. Chaetotaxy as described by Swatschek (1958). Pupa: About 10–15 mm long; reddish brown to dark brown or black; cremaster elongate; abdominal segments 2 and 3 with transverse folds dorsally, front margin of transverse fold reaching far behind, especially in segment 2, hind margin of the fold distinctly undulate; abdominal segments with some conspicuous hairs, dorsal pits absent; abdominal segments 3–8 with characteristic double row of spines.

**Distribution**

Archips xylosteana is native to most of Europe (Bulgaria, France, Germany, Lithuania, Poland, Portugal, Romania, Spain, Sweden, United Kingdom, Ukraine) (Bradley et al. 1973, Zhang 1994, Leraut and Luquet 1995, Razowski 2002), eastern and central Asia (China, Iran, Japan, Kazakhstan, Korea, far eastern Russia, Siberia, Turkey, Turkmenia) (Shiraki 1952, Bradley et al. 1973, Kuznetzov 1978, Zhang 1994, Byun et al. 1998), and northern Africa (Algeria) (Leraut and Luquet 1995).

New North American records (based on specimens examined).—CANADA: Newfoundland: St. John’s, Memorial University campus, N43°34.407, W52°43.856, 5 August 2005 (3 males, 1 female), 5–8 August 2006 (13 males, 25 females); St. John’s, Bowring Park, N47°31.680, W52°45.016, 6–8 August 2006 (3 males, 15 females); St. John’s, Southside Road, N47°33.909, W52°45.758, 6 August 2006 (1 male, 1 female). Based on our collecting, Archips xylosteana appears to be established in the St. John’s area of the Avalon Peninsula.

Voucher specimens of *A. xylosteana* are deposited in the Canadian National
Collection of Insects, Ottawa, Ontario; Cornell University Insect Collection, Ithaca, NY; and National Museum of Natural History, Smithsonian Institution, Washington, DC.

BIology AND Damage

Known in the Palearctic Region as the variegated golden tortrix (Carter 1984, Zhang 1994), apple leaf roller (Shiraki 1952), and brown oak tortrix (Alford 1984, 1995, 2007; Dickler 1991), *A. xylosteana* is a polyphagous minor pest of fruit trees such as apple, pear, plum, and cherry (Balachowsky 1966, Razowski 1977, Kuznetzov 1978, Dickler 1991, Alford 2007). In the United Kingdom, it occurs in woodlands and gardens (Bradley et al. 1973), whereas in the former USSR and adjacent countries it can be found in forest nurseries and plantations (Kryzhanovskii 1988). Dickler (1991) recognized *A. xylosteana*, along with *A. rosana* and *A. crapegana*, as important “bud-attacking” species.

This species is univoltine in Eurasia (Bradley et al. 1973, Carter 1984, Dickler 1991). Adults are most numerous in July in the United Kingdom (Bradley et al. 1973, Alford 2007), from the end of June to mid-August in parts of Europe and Japan (Razowski 1977), and from early July to mid-August in far eastern Russia (Razowski 1977). Eggs are present from July through April (Carter 1984). Overwintering eggs are laid on branches or trunks in small masses, then coated with a brownish secretion that camouflages them on the bark (Alfaro 1950, Balachowsky 1966, Razowski 1977, Carter 1984, Dickler 1991, Alford 2007). Eggs hatch in late March, April, or early May in Europe (Alford 2007); neonates start to feed at the green-tip stage of host development (pome and stone fruits) (Dickler 1991) and begin feeding on the underside of the leaves. Early instars chew through vegetation and flower buds, whereas later instars feed inside a tightly rolled leaf edge, usually on fully expanded foliage at the shoot tips, and skeletonize the leaf (Kryzhanovskii 1988, Meijerman and Ulenberg 2004, Alford 2007). Larvae continue to feed until early June, usually requiring 30–40 d to reach maturity. Larvae also will feed on young fruitlets, resulting in the development of corky blemishes on the skin. In May or June, pupation takes place in a transversely rolled leaf or between two spun leaves (Alford 1995). The pupal stage typically lasts 9–12 d (Razowski 1977). Larval shelters may disfigure host plants and cause concern, but feeding is confined mainly to fully expanded leaves and therefore has little or no significance (Alford 1995).

Hosts.—Host plants documented in the literature include *Acer* spp. (Aceraceae); *Alnus* sp., *Betula* sp., and *Corylus avellana* L. (Betulaceae); *Lonicera* sp. (Caprifoliaceae); *Cornus controversa* Hemsley (Cornaceae); *Rhododendron* sp. (Ericaceae); *Castanea* sp., *Quercus acutissima* Carruthers, *Q. cerris* L., *Q. dentata* Thunberg, *Q. robur* L., *Fagus* sp. (Fagaceae); *Hypericum* sp. (Hypericaceae); *Fraxinus excelsior* L. (Oleaceae); *Abies* sp. (Pinaceae); *Crataegus* sp., *Malus pumila* Miller, *Prunus apetala* (Siebold & Zuccarini) Fanchet and Savatier, *P. armeniaca* L., *P. avium* (L.) L., *P. serrulata* Lindley var. *sppontanea* (Maximowicz) E. H. Wilson, *Pyrus pyrifolia* (Burman) Nakai, *P. ussuriensis* Maximowicz, *Rubus* sp., and *Sorbus aucuparia* L. (Rosaceae); *Citrus* sp. (Rutaceae); *Salix cinerea* L., *Salix* sp., *Populus* sp. (Salicaceae); *Tilia* sp. (Tiliaeae); and *Ulmus davidiana* Planchon var. *japonica* (Rehder) Nakai (Ulmaceae) (Disque 1908; Shiraki 1952; Wilson and Becker 1960; Bradley et al. 1973; Yashuda 1975; Razowski 1977; Kuznetzov 1978; Park 1983; Carter 1984; Zhang 1994; Alford 1995, 2007; Teramoto 1996; Byun et al. 1998; Jaros and Spitzer 2002;
Meijerman and Ulenberg 2004; Konno 2005).

The majority of specimens collected on the campus of Memorial University and Bowring Park were beaten from foliage of various ornamental trees and shrubs, namely European ash (F. excelsior) (Oleaceae); crabapple (Malus sp.), mountain-ash (Sorbus sp.), chokeberry (Aronia sp.) (Rosaceae); English oak (Q. robur) (Fagaceae); linden (Tilia sp.) (Tiliaceae); and cranberry-bush (Viburnum sp.) (Caprifoliaceae).

ACKNOWLEDGMENTS

We thank Murray H. Colbo (Department of Biology, Memorial University of Newfoundland [MUN]) for his help and hospitality when E.R.H. and A.G.W. visited St. John’s in 2004, 2005, and 2006, and Peter J. Scott (Department of Biology, MUN) for identifying several plants. We also are grateful to Robert A. Schall (USDA, APHIS, PPQ, Riverdale, MD) for technical assistance in gathering literature on A. xylosteana, Kent Loeffler (Department of Plant Pathology, Cornell University, Ithaca, NY) for providing photographs of A. xylosteana, and Józef Razowski (Polish Academy of Sciences, Institute of Systematic Zoology, Krakow, Poland) for permission to use the line drawings of the male and female genitalia of A. xylosteana.

This research was supported by the Cornell University Agricultural Experiment Station federal formula funds, Project Nos. NYC-139404 to ERH, received from Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture.

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