BioOne COMPLETE

# Distribution, Biology, and Identification of Argyresthia pruniella in Washington State

Authors: Looney, Chris, Lagasa, Eric, and Passoa, Steven

Source: The Journal of the Lepidopterists' Society, 71(2) : 117-122

Published By: The Lepidopterists' Society

URL: https://doi.org/10.18473/lepi.71i2.a7

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Downloaded From: https://complete.bioone.org/journals/The-Journal-of-the-Lepidopterists'-Society on 22 Jan 2025
Terms of Use: https://complete.bioone.org/terms-of-use

*Journal of the Lepidopterists' Society*
71(2), 2017, 117–122

# DISTRIBUTION, BIOLOGY, AND IDENTIFICATION OF *ARGYRESTHIA PRUNIELLA* IN WASHINGTON STATE

**Additional key words:** cherry blossom moth, cherry fruit moth, *Argyresthia ephippella*

*Argyresthia pruniella* (Clerck, 1759) (=*Argyresthia ephippella*) (Lepidoptera: Argyresthiidae) is a minor to moderate pest of cherries that sometimes causes severe damage to cherry crops in parts of Europe (Wimshurst 1928, Carter 1984, Alford 2007, Jaastad 2007). Called the cherry blossom moth or cherry fruit moth, the species is a well-documented herbivore of *Prunus* blossoms and buds (Wimshurst 1928, Jancke 1932, Jasstad 2007). Other recorded hosts include *Pyrus* (Spuler 1910, Lewis and Sohn 2015), *Sorbus* (Réal and Balachowsky 1966, Lewis and Sohn 2015), *Malus* (Alford 1978, 2007), *Lonicera* (Réal and Balachowsky 1966), and *Corylus* (Réal and Balachowsky 1966, Lewis and Sohn 2015), although given the host specialization common within *Argyresthia* some of these records are dubious and likely due to misidentification (J.F. Landry pers. comm.; also see comments in Réal and Balachowsky 1966). The current distribution of *A. pruniella* includes the United Kingdom and most of continental Europe (see country lists in Zhang 1994, Karsholt and Razowski 1996, Lewis and Sohn 2015), Russia (Gershenzon 1989), Asia Minor (Agassiz 1996), and British Columbia, Canada (deWaard et al. 2009). Here we confirm the establishment of *A. pruniella* in the continental United States based on pheromone trapping of adults and larval collections in Washington State. We also give notes on the biology and identification of this pest.

The phenology and morphology of *A. pruniella* has been fairly well studied, with accounts scattered throughout the literature. Eggs are initially pale brown, later turning grey, and are oval, flattened, with raised reticulations, and a circle of small hooks at one end (Carter 1984, Agassiz 1996, Réal and Balachowsky 1966: fig. 93). They are laid in sheltered areas of the host plant, including cracks in the bark, at leaf scars, beneath bud scales, or at the base of shoots and spurs (Jancke 1932, Alford 2007). Most eggs hatch the following spring, although some larvae will emerge in September and overwinter in a silk hibernaculum beneath the empty egg (Carter 1984, Alford 2007).

The larva of *A. pruniella* was described by Werner (1958). He stated that the thoracic L setae form a slanted line on T2 and T3, SD1 is dorsad of the spiracle on A3, the prolegs of A3–6 have 12 crochets in a circle and the tarsal setae are long and bent apically. In the few specimens we examined (n=2), the thoracic setae form a slightly bent diagonal line, there are 12-14 crochets in a circle on the prolegs of A3–6 and there is a single very long tarsal seta that was either broken or not bent apically. The mandible has four teeth, no retinaculum, and only four of six setae are on the prothoracic shield. Werner (1958) noted that a related species also in North America, *A. conjugella*, has six setae on the prothoracic shield, there are 28–34 crochets on the prolegs of A3–6 and the body pinacula


FIG. 1. Outer cocoon, inner cocoon, and pupa of *A. pruniella*, reared from *Prunus avium*.

Downloaded From: https://complete.bioone.org/journals/The-Journal-of-the-Lepidopterists'-Society on 22 Jan 2025
Terms of Use: https://complete.bioone.org/terms-of-use

are pigmented. This partially conflicts with the drawing in Stehr (1987: 407) that showed *A. conjugella* with only 14 crochets on A3–6 and unpigmented body pinacula. Perhaps the best way to separate the two species is to note that *A. pruniella* has four instead of six setae on the prothoracic shield. Both Werner (1958) and Stehr (1987) agreed that the prothoracic shield of *A. conjugella* encloses six setae. Werner (1958: 54) considered the prothoracic shield of *A. pruniella* to be undivided, but our specimens have it split medially, as is typical of most lepidopteran larvae.

Larvae mine the flowering shoots in the early spring (Agassiz 1996, see drawing of damage in Gershenzon 1989: fig. 324) and may be present before bud burst. Later in the season they enter the ovaries of flowers or developing fruit (Jancke 1932, Alford 2007). Each larva can consume 5–7 buds or flowers, resulting in considerable yield loss, especially in unsprayed orchards (Wimshurst 1928, Jaastad 2007). Fully-grown larvae descend to the ground in May to pupate (Agassiz 1996).

The pupa of *A. pruniella* is pale brown with a greenish tint and is surrounded by a double walled cocoon (Agassiz 1996). The inner layer is dense and thick while the outer portion is net-like (Fig. 1). A similar cocoon was shown for a related European species, *A. bonnetella*, by Sterling and Parsons (2012). The pupa of *A. pruniella* was illustrated by Gershenzon (1989) and by Patočka and Turčáni (2005). Agassiz (1996) mentions the presence of spines flanking the anal slit as a recognition feature for *A. pruniella*, but *A. conjugella* and several other European species share this character (Patočka and Turčáni 2005). The differences between *A. pruniella* and *A. conjugella* listed by Patočka and Turčáni (2005) are probably too subtle to be useful for anyone without a large collection and abundant reference material.

Both *A. pruniella* and *A. conjugella* have a long maxilla that extends past the prothoracic legs. This is somewhat unusual compared to other members of the genus, but pupae of *Argyresthia* found on any other host besides cherry in Washington State are probably best identified to only to genus. An important biological difference is that *A. conjugella* overwinters as a pupa, while *A. pruniella* overwinters as eggs or early instar larvae, with pupae present in summer (Agassiz 1996). *Argyresthia pruniella* pupates in the soil, and adults emerge six to seven weeks later (Jancke 1932, Agassiz 1996, Alford 2007).

The adult of *A. pruniella* (Fig. 2) was illustrated in color by several authors including Friese (1969), Agassiz (1996), Parenti (2000) and Sterling and Parsons (2012). In Europe, *A. pruniella* is most similar to *A. bonnetella* but the two species differ in details of the forewing markings (see Agassiz 1996, Sterling and Parsons 2012). The male genitalia of *A. pruniella* were illustrated by Gershenzon (1989). *Argyresthia pruniella* adults typically begin to fly in late June and July when they can be observed resting on foliage and tree trunks in the 'tail up' pose characteristic of Argyresthiidae (Wimshurst 1928, Jancke 1932, see Robinson et al. 1994: fig. 28).

TABLE 1. Number of sites trapped and results for *Argyresthia pruniella* surveys in Washington State, 2012–2013.

| | 2012 | | 2013 | |
|---|---|---|---|---|
| **County** | **Sites** | **Positive Sites/ Moths Captured** | **Sites** | **Positive Sites/ Moths Captured** |
| Whatcom | 60 | 18/171 | 69 | 24/816 |
| Skagit | 21 | 0 | 33 | 0 |
| Snohomish | 10 | 0 | 10 | 0 |
| King | 10 | 0 | - | - |
| Pierce | 12 | 0 | - | - |
| Thurston | 10 | 0 | - | - |
| Clark | 1 | 0 | - | - |
| Skamania | 3 | 0 | - | - |
| San Juan | - | - | 21 | 5/11 |
| Clallam | - | - | 9 | 0 |
| Grant | 11 | 0 | 12 | 0 |
| Okanogan | 7 | 0 | 7 | 0 |

Downloaded From: https://complete.bioone.org/journals/The-Journal-of-the-Lepidopterists'-Society on 22 Jan 2025
Terms of Use: https://complete.bioone.org/terms-of-use


FIG. 2. *Argyresthia pruniella*, male. Emerged 15 April 2013 from eggs collected in Blaine, WA on *Prunus avium*.

They fly at dusk and can be beaten from trees or collected with light traps (deWaard et al. 2009, Sterling and Parsons 2012) or pheromone baited traps.

Carter (1984) and Agassiz (1996) stated that *A. pruniella* was introduced to North America, but provided no specimen or collection details. It is not clear if they were referring to undocumented personal communications or if they were simply in error. The claim could stem from Ferguson's (1975) comment that a reared specimen of *A. conjugella* from Nova Scotia could have been a misidentified *A. ephippella*, a junior synonym of *A. pruniella* (J.F. Landry pers. comm.). The first confirmed North American record for *A. pruniella* was from specimens collected in 2007 during a light-trap survey at a park in Vancouver, British Columbia, Canada (deWaard et al. 2009). A small series of *A. pruniella* collected in the 1960s from Nova Scotia, Canada, was later discovered in the United States National Museum collection (USNM) (deWaard et al. 2009); we have been unable to find any other confirmed North American records. Subsequent to publication of the British Columbia records, the Washington State Department of Agriculture (WSDA) implemented pheromone trap surveys throughout Washington and larval surveys in the western part of the state.

Traps were placed for *A. pruniella* in 2011, 2012, and 2013. Eleven sites in Blaine, WA, located on the Washington-British Columbia border, were trapped in late summer 2011. In 2012, 145 sites were trapped in eight western and two eastern Washington counties. In 2013, 161 sites were trapped in five western and two eastern Washington counties (Table 1; Fig. 2). Traps were located in cherry (*Prunus avium*) or other *Prunus* trees in roadside or residential settings. Trap configurations consisted of septa lures loaded with Z11–16Ald in red or white reusable large plastic delta traps (Alphascents) with hot melt pressure-applied adhesive inserts. Traps were first placed in the field during mid-July in 2011, during early June in 2012, and from April to May in 2013. They were checked semi-weekly until late September in all years and then removed. All traps were screened for moths at the WSDA Olympia entomology laboratory. Voucher specimens of *A. pruniella* were deposited in the WSDA Arthropod Collection, USNM collection, and the collection of S. C. Passoa.

In March, April, and May of 2013, twigs were collected from four sites in Blaine, WA where adult moths were detected in the previous survey season. Twigs were examined under the microscope for eggs, larvae, and evidence of damage. All discovered larvae were retained for rearing. Samples were collected from *Prunus avium*, *Malus*, and *Amelanchier*, all rosaceous species that were in bloom during the larval sampling.

*Argyresthia pruniella* adults were trapped at 30 sites in two western Washington counties during the three years of sampling (Table 1). Seventeen specimens were detected at three sites in the 2011 survey. The 2012 survey resulted in 171 total moths collected across 18 positive sites, all in Whatcom County. The 2013 survey detected 827 moths at 29 sites, five of which were in San Juan County. No moths were detected in eastern Washington in either year (Table 1). Early trap placement in 2013 apparently captured the entire flight period, with the first moths collected after traps had been deployed for more than a month. The end of the flight period is unclear, as a few moths continued to be trapped in each year up to trap removal in mid to late September (Fig. 3); Jancke (1932) recorded adults until late September in Germany.

Several non-target species were also captured, including three species of *Argyresthia*, and *Scoparia* sp. (Crambidae). *Argyresthia pruniella* is most likely to be confused with *A. conjugella* because both species have a similar forewing pattern. They may be distinguished by their head color, ground color of the forewing, and dark spot on the inner margin of the forewing. The head of *A. pruniella* is pure white, the forewing ground color is a dark brown, and the spot dividing the white bar on the inner margin is a contrasting dark brown to blue-black. This differs from *A. conjugella* that has a very faint

Downloaded From: https://complete.bioone.org/journals/The-Journal-of-the-Lepidopterists'-Society on 22 Jan 2025
Terms of Use: https://complete.bioone.org/terms-of-use

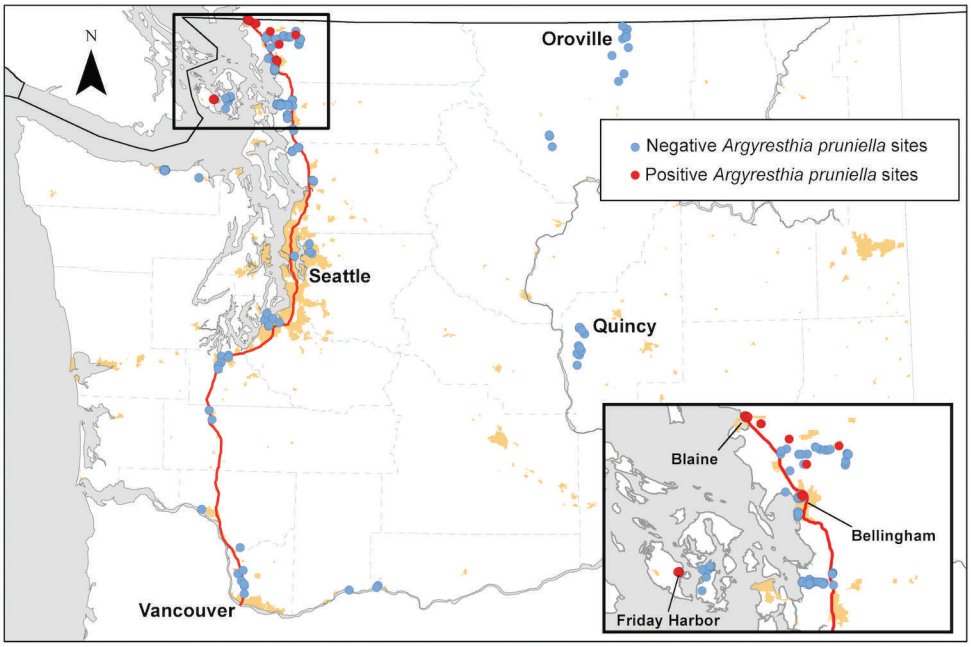


FIG. 3. Positive and negative traps sites for *A. pruniella* in Washington State, 2011–2013.

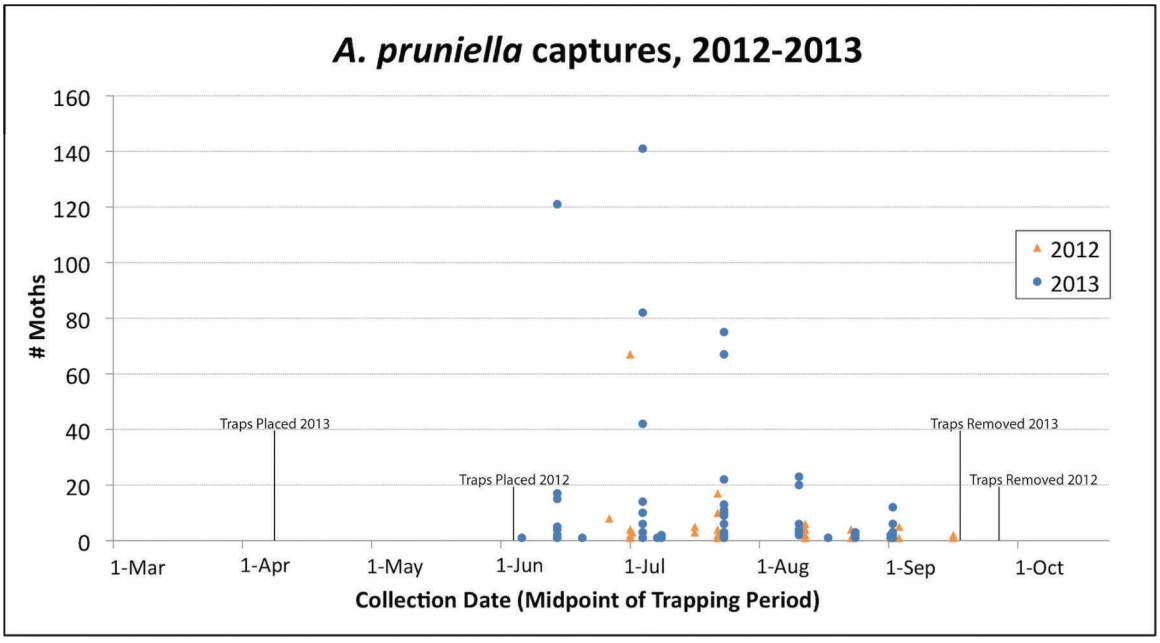


FIG. 4. *Argyresthia pruniella* trap captures, 2012–2013.

Downloaded From: https://complete.bioone.org/journals/The-Journal-of-the-Lepidopterists'-Society on 22 Jan 2025
Terms of Use: https://complete.bioone.org/terms-of-use

orange tint on the white head, a forewing that is gray, and a grayish spot on the inner margin. The male genitalia is also different, and as with many moths, this is the most reliable method of identification. The base of the sclerotized anal tube has three long curved setae in *A. conjugella* that are absent in *A. pruniella* (Gershenzon 1989: 357).

Eggs were detected with difficulty on a few twigs from four *P. avium* trees sampled on 11 March, 2013. No live larvae were found. The eggs were retained, but no larvae eclosed. Larvae of *A. pruniella*, *Spilonota ocellana* (Tortricidae), and *Operophtera brumata* (Geometridae) were readily detected on twigs collected from two *P. avium* trees on 15 April, 2013. We examined 924 individual flowers and observed *A. pruniella* larvae or likely damage from this species in 7% and 2.8% of flowers from the two trees, respectively. Eight more trees were sampled 5 May, 2013; one *Malus*, one *Amelanchier*, and six *P. avium*. No larvae or evidence of larvae were observed feeding on *Amelanchier* (252 flowers examined) or *Malus* (158 flowers examined). Larvae were largely absent from the *P. avium* at this time (4051 flowers examined), with detections made on only a single tree. Many blossom clusters evidenced feeding across multiple flowers in the April and May collections.

More sites were positive and many more moths were collected per site in 2013 than in 2012. Moth capture rate was strikingly higher, with 5.4 moths/trap-day in 2013 and 1.5 moths/trap-day in 2012. This could be partly due to different timing; traps were not deployed in 2012 until early June, potentially missing earlier flight activity. In contrast, traps were placed in late April in 2013. However, the peak capture in 2012 was during the first trapping interval, between early and late June. This time period was also the peak flight in 2013, with the earliest moth captures between 6 and 16 June (Fig. 4). Additionally, seven sites that were trapped in both years were only positive in 2013. It is tempting to view these collection data as evidence for an increasing population, although inter-year variability could also explain these results. This is particularly true given the relatively late start in 2012; the possibility that peak flight occurred before traps were deployed cannot be discounted. However, over 120 more degree-days were accumulated by early June in 2013 than in 2012. These data plus the timing of peak moth capture in both years suggest that adult moth density was indeed greater in 2013 than 2012, due either to increasing populations or a more favorable year for moths.

The quarantine significance of *A. pruniella* is discussed in Ahern (2012). As part of the New Pest Advisory Group process employed when exotic agricultural pests are detected in the United States, the common name "cherry blossom moth" was adopted instead of "cherry fruit moth" since mature fruits are not infested. This distinction is important because the United States exports large quantities of cherries and a common name including "fruit moth" might cause some trading partners to wrongly assume that there is a danger of importing this pest in produce. There are no interception records for *A. pruniella* at United States ports (Jim Young, pers. comm.), which implies that natural spread from British Columbia is the best explanation for this introduction in adjacent Washington State. Further surveys should be conducted to look for further evidence of expanding population size and range, especially in organic cherry orchards that are at the most risk from this pest.

## ACKNOWLEDGEMENTS

This work was partially supported by United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) Cooperative Agreement 12-8550-1585-CA and a grant from the Washington State Department of Agriculture Specialty Crop Block Grant program. Megan Asche (WSU) took the photograph of *A. pruniella* in Fig. 2. We thank WSDA employees Rachel Chai, Warren Hellman, Don Kitchen, Andi Kopit, Diane MacLean, and Arlo Pelegrin for field and laboratory assistance. John Brown (USDA, Systematic Entomology Laboratory) identified our initial samples based on morphology. Thanks to Jim Young (USDA, APHIS, PPQ) for checking interception records at the United States ports from 1985 to 2016. We are grateful for Dr. Jean-François Landry sharing many insights regarding this genus, and to an anonymous reviewer whose contributions improved the readability and accuracy of this note.

## LITERATURE CITED

AGASSIZ, D. J. L. 1996. Yponomeutidae, pp. 39-108. *In* Emmet, A.M. (ed.), The Moths and Butterflies of Great Britain and Ireland. Vol. III. Harley Books. Colchester, England.

AHERN R. (2012) *Argyresthia pruniella*, Clerck: Cherry blossom moth, New Pest Advisory Group (NPAG). Available from: oregonstate.edu/dept/nurspest/cherry_blossom_moth.pdf (Date Accessed: 25 May 2015)

ALFORD, D. V. 1978. Observations on the specificity of pheromone-baited traps for *Cydia funebrana* (Treitschke) (Lepidoptera: Tortricidae). Bull. Entomol. Res. 68: 97-103.

ALFORD, D. V. 2007. Pests of Fruit Crops, A Color Handbook. Academic Press, Burlington, Massachusetts. 461 pp.

CARTER, D. J. 1984. Pest Lepidoptera of Europe with Special Reference to the British Isles. Dr. W. Junk Publishers, Boston, Massachusetts. 431 pp.

DEWAARD, J. R., J.-F. LANDRY, B. C. SCHMIDT, J. DERHOUSOFF, J. A. MCLEAN, & L. M. HUMBLE. 2009. In the dark in a large urban park: DNA barcodes illuminate cryptic and introduced moth species. Biodivers. Conserv. 18: 3825-3839.

FERGUSON, D.C. 1975. Host records for Lepidoptera reared in eastern North America. Technical Bulletin No. 1521. USDA, Washington, DC.

FRIESE, G. 1969 Beiträge zur Insekten-Fauna der DDR: Lepidoptera Argyresthiidae. Beiträge Zur Entomologie 19: 693-752.

GERSHENZON, Z. S. 1989. Family Argyresthiidae. Pp. 456-472. *In* Keys to the Insects of the European Part of the USSR. G. S. Medvedev (ed.). Published for the United States Department of Agriculture, Washington, D.C., Amerind Publishing Company. Translated from Russian by B. R. Sharma.

GERSHENSON, Z. S, T. PAVLÍČEK, V. KRAVCHENKO & E. NEVO. 2006.

Downloaded From: https://complete.bioone.org/journals/The-Journal-of-the-Lepidopterists'-Society on 22 Jan 2025
Terms of Use: https://complete.bioone.org/terms-of-use

Yponomeutoid Moths (Lepidoptera: Yponomeutidae, Plutellidae, Argyresthiidae) of Israel. Pensoft Series Faunistica 58. Sofia, Moscow. 200 pp.

JAASTAD, G. 2007. Late dormant oil treatment against black cherry aphid and cherry fruit moth in sweet cherries. J. Appl. Entom. 131: 284-288.

JANCKE, O. 1932. Die Kirschblütenmotte (*Argyresthia pruniella* L.) und ihr Parasit (Ageniaspis atricollis Dalm. Hym.). Gartenbauwissenschaft 6: 303-386.

KARSHOLT O & RAZOWSKI J. 1996. The Lepidoptera of Europe. A distributional checklist. Apollo Books, Stenstrup. 380 pp.

LEWIS, J. A. & SOHN, J. C. 2015. World Catalogue of Insects. Lepidoptera: Yponomeutoidea I (Argyresthiidae, Attevidae, Praydidae, Scythropiidae, and Yponomeutidae). Brill. Leiden, The Netherlands. 253 pp.

PARENTI, U. 2000. Guide to the Microlepidoptera of Europe. Museo Regionale di Scienze Naturali. Torino. 426 pp.

PATOČKA, J. & M. TURČÁNI. 2005. Lepidoptera Pupae. Central European Species. Apollo Books. Stenstrup, Denmark. 863 pp.

RÉAL, P. & A. S. BALACHOWSKY. 1966. Sous-famille des Argyresthiinae, pp 1057. *In* Balachowsky, A. S. (ed.), Entomologie appliqueée a l'agriculture. Masson et Cie. Paris, France.

ROBINSON, G. S., K. R. TUCK & M. SCHAFFER. 1994. A field guide to the smaller moths of south-east Asia. Malaysian Nature Society. Kuala Lumpur, Malaysia. 309 pp.

STEHR, F. W. 1987. Immature Insects. Kendall/Hunt Pub. Dubuque, Iowa. 754 pp.

SPULER, A. 1910. Die Schmetterlinge Europas. Band 2. Stuttgart. 523 pp.

STERLING, P. & M. PARSONS. 2012. Field guide to the micro moths of Great Britain and Ireland. British Wildlife Publishing. Gillingham, England. 416 pp.

WIMSHURST, F. M. 1928. Preliminary note on the cherry fruit moth (*Argyresthia nitidella* Fabr). J. SE. Agr. Col. (Wye) 25: 86-89.

WERNER, K. 1958. Die Larvalsystematik einiger Kleinschmetterlingsfamilien (Hyponomeutidae, Orthoteliidae, Acrolepiidae, Tineidae, Incurvariidae und Adelidae). Akademie-Verlag. Berlin, Germany. 145 pp.

ZHANG B. C. 1994. Index of economically important Lepidoptera. Commonwealth Agricultural Bureau International. Wallingford, United Kingdom. 599 pp.

CHRIS LOONEY, *Pest Program, Plant Protection Division, Washington State Department of Agriculture, P.O. Box 42560, Olympia WA 98504-2560 USA; email: clooney@agr.wa.gov.* ERIC LAGASA, *Pest Program, Plant Protection Division, Washington State Department of Agriculture, P.O. Box 42560, Olympia WA 98504-2560 USA; email: elagasa@agr.wa.gov.* STEVEN PASSOA, *USDA/APHIS/PPQ, USDA/FS Northern Forest Research Station and the Ohio State University, Museum of Biological Diversity, 1315 Kinnear Road, Columbus, OH, 43212 USA; email: Steven.C.Passoa@usda.gov*

*Submitted for publication 28 June 2016; revised and accepted 10 November 2016.*

Downloaded From: https://complete.bioone.org/journals/The-Journal-of-the-Lepidopterists'-Society on 22 Jan 2025
Terms of Use: https://complete.bioone.org/terms-of-use