Mompha epilobiella (Momphidae), a European Moth in the Pacific Northwest, with Notes on Associated Parasitoids

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MOMPHA EPILOBIELLA (MOMPHIDAE), A EUROPEAN MOTH IN THE PACIFIC NORTHWEST, WITH NOTES ON ASSOCIATED PARASITOIDS

Additional key words: introduced species, biological control agent, noxious weeds.

Momphidae is a primarily Holarctic gelechioid family, comprising 60 described species in six genera (Koster & Sinev 2003; Pohl et al. 2010). About 40 named species are known from the United States and Canada, although there are potentially many species yet to be described (Powell & Opler 2009). The North American fauna is represented predominantly by the genus *Mompha*, unique among lepidopteran genera for specializing on the family Onagraceae.

Adult *Mompha* are small moths, with forewing lengths varying from ~2.5 to 8 mm. Larvae are typically leaf miners or stem miners, while a few species induce galls in plant stems and tips (Koster & Sinev 2003). *Oenothera* and *Epilobium* are the most common host genera in western North America (Powell & Opler 2009). Host damage varies, from little or no obvious damage to significant depredation that can reduce host plant fecundity (Doak 1992; DeWalt 2006). The host specificity displayed by some *Mompha* species makes them potentially valuable biological control agents for weeds (Bradley et al. 1973; Winder 2002; Culliney et al. 2003).

Mompha epilobiella ([Denis & Schiffermüller] 1775) is common throughout Europe, parts of Asia Minor, and low-lying regions of Central Asia (Koster & Sinev 2003). The species is typically associated with marshes and wetlands in Europe, as is its primary host plant, *Epilobium hirsutum* L. Other infrequent hosts include *E. montanum* L., *E. palustre* L., *Chamaenerion angustifolium* (L.), and *Oenothera* sp. (Koster & Sinev 2003). Ivinskis (1982) records larvae of *M. epilobiella* from *Lythrum salicaria* L. (purple loosestrife) and *Eupatorium cannibinum* L. in the 1970s but provides no evidence of successful rearing. Early instars mine leaves and bore into flower buds, whereas later-stage larvae feed in clumps of webbed apical leaves (Koster & Sinev 2003). Mature larvae pupate between leaves, and the species overwinters in the adult stage (Koster & Sinev 2003).

Epilobium hirsutum is a Eurasian introduction to North America and a widespread weed of natural and man-made wetlands in the northeastern United States and adjacent Canada, as well as Oregon, Washington, and British Columbia in the Pacific Northwest. The plant is commonly associated with ballast sites and was sometimes introduced inadvertently via that pathway; in some of the earliest records from the eastern seaboard it was recorded sporadically in "waste sites" (Trelease 1891). Its spread was likely aided by its status as an ornamental plant (Stuckey 1970). At one time the species was sold in nurseries, and some Washington gardeners considered it an attractive replacement for purple loosestrife (L. Baldwin pers. comm.). The plant has been known from Washington State since the 1930s, with the earliest detections made in Klickitat County (WTU 2011).

To date, *E. hirsutum* has been found in eleven counties in Washington. Franklin, Island, Klickitat, and Whatcom have infestations of up to 40 hectares, while the remaining counties all report infestations under four hectares (WSDOE 2010). The plant is categorized as a class B noxious weed in Washington State, and its sale and transport are prohibited (WAC 16-752-505). In Whatcom County in particular, *E. hirsutum* has become established in several wetlands, often co-occurring with purple loosestrife, another class B noxious weed. When established, *E. hirsutum* can form large, nearly monotypic stands, often replacing more diverse assemblages of native species.

Mompha epilobiella was collected relatively recently in New York and Quebec (Sinev 1996). We report here the first records of *M. epilobiella* from the western

FIG. 1. *Epilobium hirsutum* infestation (pink-tinged vegetation) near Crockett Lake, Whatcom County, WA (photo by S. Horton).

TABLE 1. *Mompha epilobiella* specimens, parasitoids, and damage localities, 2005–2007.

Locality	Collection Date	Method	Species					
			Mompha epilobiella		*Elasmus setosiscutellatus*		*Temelucha* sp.	
			F	M	F	M	F	M
Island Co. WA N48.169942 W122.637361	23 May 2005	hand collected / reared	0	1	0	0	0	0
Whatcom Co. WA N48.773547 W122.437183	22 Aug. 2007 emerged 1-10 Sept. 2007	hand collected / reared	38	26	25	3	3	0
Klickitat Co. WA N45.70404 W121.43746	August, 2007	damage only	-	-	-			
Franklin Co. WA N46.4459 W119.2331	26 Sept. 2010	*Lobesia botrana* pheromone trap	0	1	0	0	0	0
Franklin Co. WA N46.327881 W119.120119	August, 2010	damage only	-	-	-			

United States, from four counties in Washington State, all associated with its host plant, *E. hirsutum*. The first specimens of *M. epilobiella* from Washington were collected in Island County in 2005. On 23 May 2005, JA collected samples of non-flowering *E. hirsutum* along the side of a highway adjacent to Crockett Lake in Island County, WA. The *E. hirsutum* infestation at this locality is approximately 20 hectares, and spreads along both sides of road throughout a wetland area (Fig. 1). Plant samples were collected to document the weed's occurrence in the county, and the presence of the insects was neither noticed nor expected at the time. JA later discovered larvae in apical stems while pressing the Crockett Lake samples, and removed and placed both a larva and plant material at room temperature for rearing. The larva pupated on 30 May 2005, and an adult moth emerged around 6 June 2005.

In June 2006, JA discovered pupae and late instar larvae in an *E. hirsutum* patch in Bellingham, WA (Whatcom County). The patch was less than 0.5 hectares in extent and was located in a small drainage ditch along a walking/bike trail in a semi-urban area. The site has likely been subject to herbicide sprays in the past for control of *E. hirsutum* and other weeds. Plants were between 1.5 and 2 meters tall and were in full flower and seed set. We returned to this location in August 2007 and collected plant material with *M. epilobiella* larvae and pupae for lab rearing and identification. The majority of the plant damage was concentrated in auxiliary shoots; although the damage was noticeable, there were no obvious impacts on individual plant vigor. In August 2007, JA noted damage to *E. hirsutum* consistent with *M. epilobiella* feeding in an infestation east of Bingen, Klickitat County, WA. There are several *E. hirsutum* infestations, generally less than a half hectare each, along a state highway in this area. We collected samples from plants between 1-1.8 m tall. Most damage was restricted to auxiliary shoots and was readily visible. One *M. epilobiella* specimen was recovered as a non-target catch in a *Lobesia botrana* moth pheromone trap from Franklin County, WA, in 2010, and damage to *E. hirsutum* consistent with *M. epilobiella* feeding was observed in Pasco, WA in August 2010. Locality data for adult *M. epilobiella* specimens and damage are provided in Table 1.

In addition to *M. epilobiella*, we reared two species of parasitoid wasps, all from the Whatcom County site. Three female *Temelucha* sp. (Hymenoptera: Ichneumonidae: Cremastinae) were reared from three *M. epilobiella* pupae. *Temelucha* species typically parasitize leaf-mining and stem-boring Hymenoptera and other insect orders (Townes 1971). Twenty-eight specimens (3 male, 25 female) of *Elasmus setosiscutellatus* Crawford (Hymenoptera: Eulophidae) were reared from the *M. epilobiella* pupae (Table 1). *Elasmus* species are primary parasitoids of several species of Lepidoptera, and less commonly, ichneumonids and braconids parasitizing Lepidoptera (Gibson et al. 1997). *Elasmus setosiscutellatus* is a

widely distributed species in the US (Burks 1979), known from habitats as diverse as marshes in Florida (McCoy & Rey 1987) to pine plantations in Kansas (McKnight 1973). *Elasmus* specimens were identified using Burks (1965). All moth and parasitoids specimens are retained in the Washington State Department of Agriculture Collection, in Olympia, WA.

Based on reared specimens, visible signs of damage, and the non-target catch in eastern Washington, *M. epilobiella* appears to be widely distributed among Washington *E. hirsutum* infestations. It is unclear how long the moth has been in Washington State. We have not located any *M. epilobiella* specimens in museum collections at Washington State University or other regional collections. *Mompha epilobiella* was only recently recorded from the eastern United States (Sinev 1996), although this group of moths is often poorly collected and prone to being ignored in collections. The close proximity of our *M. epilobiella* detections to British Columbia and Oregon suggests that it could be even more widespread than our data show. The concealed habit and small size of this moth suggest that it could initially have been transported with its host plant, with subsequent spread in the region through natural dispersal. Generally, *E. hirsutum* has not been as high a priority for weed control as many other species in Washington and has historically escaped vigorous treatment, which may have facilitated the establishment and spread of *M. epilobiella*.

The introduction of this moth could potentially impact any of the 14 native *Epilobium* species, eight of which are in the same section of the genus as *E. hirsutum* (Wagner & Hoch 2005). Most species are widespread and of no conservation concern. A potential exception is *E. pygmaeum*, an uncommon species associated with vernal pools and under review for potential conservation action in Washington State. We have not observed *M. epilobiella* feeding on native *Epilobium* species in limited survey efforts to date. The host record for *Oenothera* sp. (Koster & Sinev 2003) is

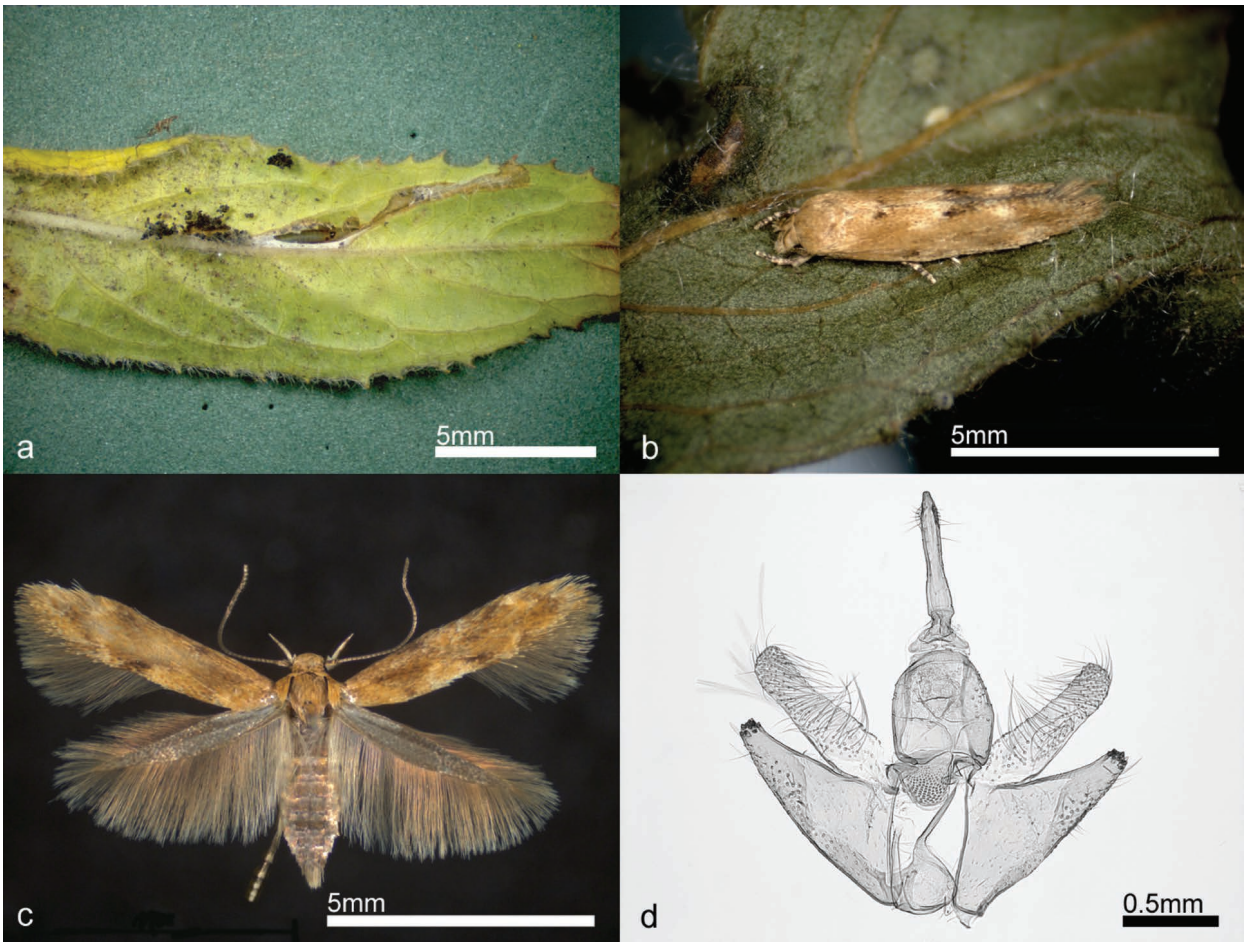

FIG. 2. *Mompha epilobiella.* **a,** larva in mine; **b,** adult in repose; **c,** adult, spread; **d,** male genitalia (aedeagus removed).

potentially alarming; Washington State has two State Threatened and one State Sensitive *Oenothera* species that occur near some of the *M. epilobiella* detections. While *Oenothera* is not a preferred host, land managers and researchers should be aware of potential impacts to these species.

Some regional field biologists have recently noted populations of *E. hirsutum* that appear to be in poor health and have reduced density, despite lack of active weed control (L. Baldwin pers. comm.). This suggests that *M. epilobiella* could be affecting plant vigor, either alone or synergistically with plant competition or other disease agents. For example, JA observed *E. hirsutum* populations in Klickitat County that were also attacked by a rust fungus (*Pucciniastrum* sp.) that appeared to be the primary factor in reducing plant health. The impact of *M. epilobiella* on *E. hirsutum* may be worth investigating, particularly given the scientific and institutional challenges of screening and importing novel biological control agents (Delfosse 2005; Messing & Wright 2006; Scoles et al. 2008).

Adventive insects such as *M. epilobiella* could be a component of biocontrol programs and noxious weed control in the future. Although host-specificity testing would still be needed prior to interstate transport, the "real-world" open-field testing opportunities afforded to researchers by already naturalized populations might provide novel and valuable information about a control agent's environmental safety. The results of open-field experiments and broad surveys for nontarget attack could provide more nuanced assessment of potential biocontrol agents than could be achieved with controlled pre-release trials alone. There is some precedent for this—after accidental introduction and establishment in eastern North America, the seed-feeding bruchid *Bruchidius villosus* (F.) underwent host-specificity testing and was ultimately approved and released as a biocontrol agent for *Cytisus scoparius* (L.) in the Pacific Northwest (Coombs et al. 2008).

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