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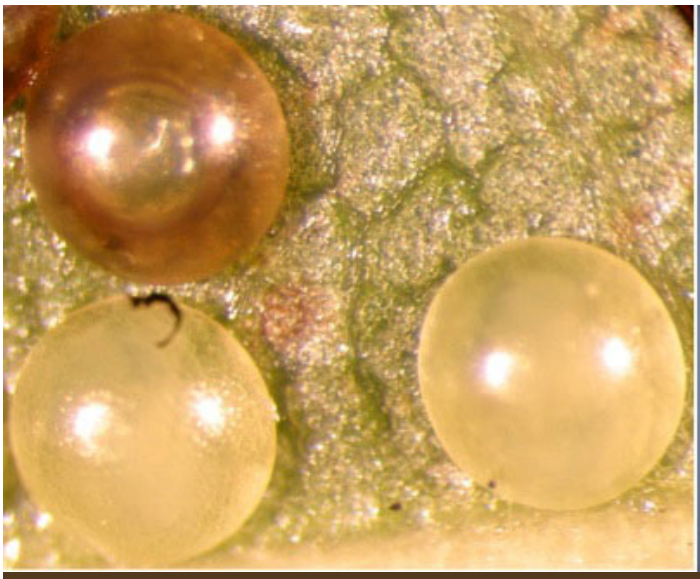

GLUPHISIA SEPTENTRIONIS WALKER

Insect Pest Management in Hybrid Poplars Series

By
Alejandro I. Del Pozo-Valdivia, Department of Entomology and Plant Pathology, North Carolina State University. **John J. Brown**, Department of Entomology, Washington State University

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Gluphisia Septentrionis Walker

Gluphisia septentrionis Walker (Lepidoptera: Notodontidae)

Introduction

Outbreak populations of the common pebble moth, *Gluphisia septentrionis* can totally defoliate thousands of hectares of poplar trees (Leininger et al. 2004; Del Pozo-Valdivia 2011). Professional IPM practitioners can use this publication as a guide toward identifying *Gluphisia*, monitoring the population, and controlling *Gluphisia* outbreaks in the Pacific Northwest.

Taxonomy

Worldwide, many Notodontidae species are major defoliators of poplar trees. Packard (1895) was the first to report *G. septentrionis* in the Pacific Northwest. He identified three other *Gluphisia* species; *G. lintneri* (Grote), *G. severa* Edwards, and *G. avimacula* Hudson. He found that these other *Gluphisia* species also fed on poplar in California and New York (Packard, 1895). Crabo et al. (2016) collected *G. severa* in coastal rain forest and high mountain forest, and *G. avimacula* in British Columbia, Canada, where larvae feed on aspen (*Populus tremuloides*).

Hosts

Gluphisia septentrionis feeds on *Populus* species, including *P. trichocarpa*, *P. nigra*, *P. tremuloides*, *P. balsamifera*, and *Populus* hybrid species. Other host species include *Alnus incana* (alder), *Betula alleghaniensis* (birch), *B. papyrifera*, *Juglans cinerea* (butternut), *Liquidambar styraciflua* (sweetgum), *Ulmus americana* (elm), *Salix* (willow), and *Tilia* (linden or basswood; Robinson et al. 2015).

Range

Gluphisia have been collected throughout the US, from Maine to California and South Carolina to Washington, with the exception of some southeastern states (BAMONA 2011). During the mid-1900s, *G. septentrionis* was reported to occur only in southeastern Canada and parts of the northeastern US. However, most recent sources indicate that this moth has been collected from Maine, west to Washington, south to California and east to Mississippi and Ohio River drainage (Leininger et al. 2004).

Life History

Gluphisia septentrionis has been called the “common pebble moth,” because the adult’s resting shape is cryptic. Adults are small, dark, grayish moths with a wingspan of 2.5–3.3 cm. The front wings are rounded gray with irregularly shaped beige and dark gray bands, and the hind wings are light gray (Leininger et al. 2004). Males in laboratory conditions have a short lifespan (6 days) and can mate at least three times (Smedley and Eisner 1996). The eggs are small and flattened at the bottom (Stehr 2005). Descriptions of the last instar larva indicates that it is a pale green caterpillar, 3.3–3.8 cm long with small, reddish, transversal stripes dorsally (Leininger et al. 2004; Wagner 2005). *Gluphisia* possess a classic noctuid pupa (Figure 1) slightly flatted dorsally and ventrally (Miller 1992).

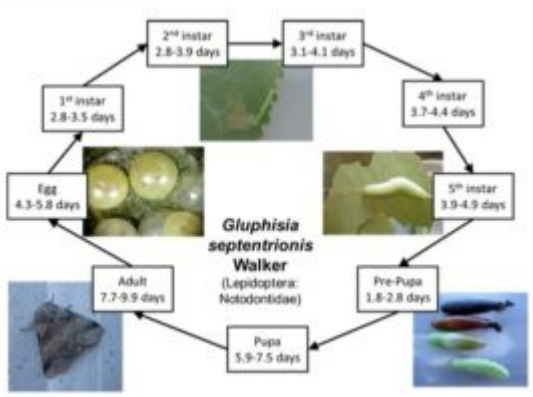

Figure 1. Life cycle of *Gluphisia septentrionis* (Photos by A. Del Pozo-Valdivia).

Del Pozo-Valdivia (2011) researched *G. septentrionis*’ life cycle (Figure 1). This moth flies in some regions of Canada and the Pacific Northwest from early May through June, and also from July through August (Scott 2011). Those two flight periods can be represented with data from the University of Alberta E.H. Strickland Entomological Museum (Anweiler n.d.). Leininger et al. (2004) indicates that *G. septentrionis* may have two generations per year in Louisiana, with a large adult emergence in June. *Gluphisia* can develop from an egg to an adult in 28 to 37 days, allowing for a second flight of adults in mid-summer. This second generation of *Gluphisia* pupates in September and October and overwinters as a pupa (Stehr 2005).

Damage

Gluphisia was first noticed in eastern Oregon in 2004. Three years later, this lepidopteran defoliated 80% of 350 acres (141 hectares) near Boardman, Oregon, and within five years the Boardman tree farm experienced 8,000 acres (3,237 hectares) per year defoliated by *Gluphisia*. Initial damage by first instar larvae is characterized by skeletonization (Figure 2a) of the leaf surface, then severe defoliation radiating away from the initial infestation, leaving only the mid-rib of each leaf (Figure 2b). Early instar larvae create a silk anchor web (Figure 3) on the underside of leaf, thus avoiding wind displacement. Late instar larvae can consume up to 95% of a 36 cm^2 poplar leaf in 24 hours (Del Pozo-Valdivia 2011). *Gluphisia septentrionis* are gregarious feeders and large populations can be clumped in their distribution. *Gluphisia* populations can increase to damaging levels after one or two years.

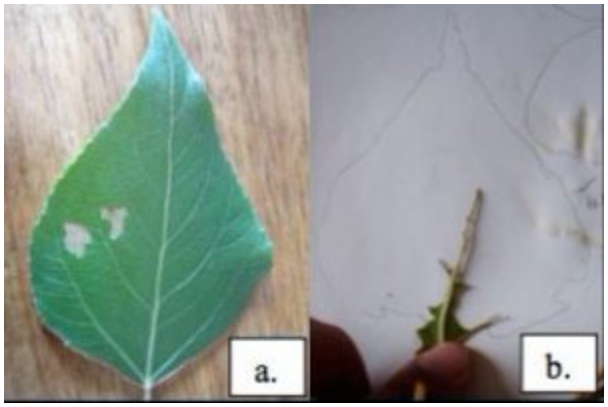

Figure 2. First instar *Gluphisia septentrionis* skeletonizing the leaf (a) and later instar damage leaving only the mid-rib of the leaf (b) (Photos by A. Del Pozo-Valdivia).

Figure 3. Silk spun by first instar *Gluphisia* larva on the underside of a leaf (Photo by A. Del Pozo-Valdivia).

Figure 4. *Eulophus orgyiae* wasp attacking a *Gluphisia* larva (Photo by A. Del Pozo-Valdivia).

Figure 5. *Eulophus orgyiae* pupae next to their *Gluphisia* host (Photo by J. Brown).

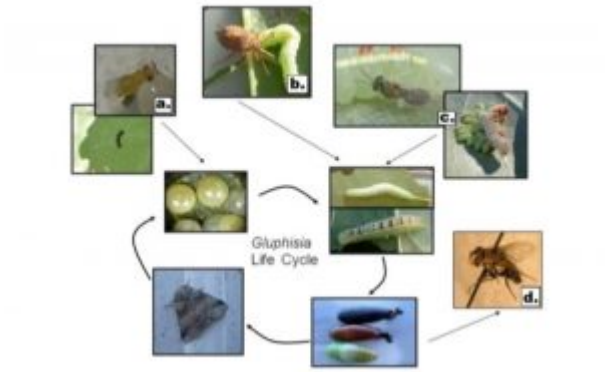

Figure 6. Parasitoids and predators of *Gluphisia*: (a) *Trichogramma* spp., (b) a predatory stink bug, (c) *Eulophus orgyiae*, and (d) a Tachinid fly. (Photos by A. Del Pozo-Valdivia).

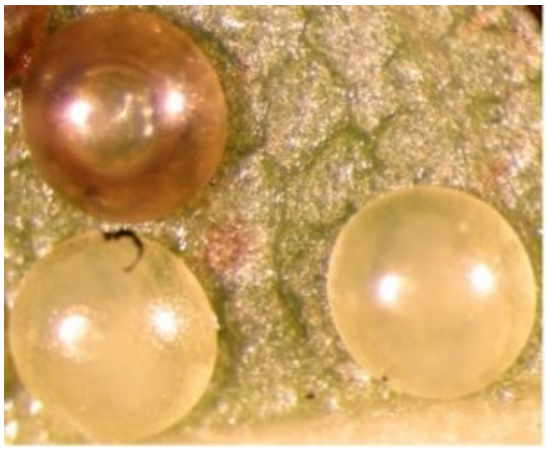

Figure 7. *Gluphisia* eggs, two cream colored healthy eggs (bottom two eggs) and one darker egg parasitized by *Trichogramma* (Photo by A. Del Pozo-Valdivia).

Biological Control

There are no commercial biocontrol agents available for hybrid poplar growers to control *Gluphisia*. However, minimal use or at least judicious use of insecticides can favor increases of endemic populations or emigrating biocontrol agents. These include *Eulophus orgyiae* (Figures 4, 5, and 6c), a parasitoid of *G. septentrionis*, and *Orthosia hibisci* Guenee (Lepidoptera: Noctuidae). Once established, *E. orgyiae* pupae can be manually relocated to areas experiencing defoliation by these Lepidoptera pests (Del Pozo-Valdivia 2011). *Trichogramma* spp. (Figures 6a and 7), an egg parasitoid of *G. septentrionis*, *O. hibisci*, and other defoliators are extremely susceptible to contact with neuroactive insecticides. *Gluphisia* pupae can be parasitized by tachinid flies (Figure 6d) and *Gluphisia* larvae are hosts for various predators (Figure 6b).

Monitoring

Monitoring populations of *Gluphisia* is essential, and control measures should target early instars with an insect growth regulating insecticide to protect existing beneficial arthropod biological control agents. When larvae evade detection and grow to late instars, large outbreaks of *Gluphisia* can be controlled with several broad-spectrum insecticides that kill all insects upon contact. Scouts must realize the dimorphic (Figure 8) character of late instars; the dorsal red bands are not always present. Light trapping in poplar plantations can be used to monitor adult moth populations (Leininger et al. 2004). However, examining foliage for viable eggs and larvae after the peak flight of adults is another way to evaluate pest populations (Spear-O'mara and Allen 2007). These two methods might be too expensive and labor intensive if they must be implemented over a large area.

Another less expensive option would be to implement a monitoring system based on pheromone- baited traps. In Lepidopterans, sex pheromones from different Noctuids have been identified, tested, and synthesized in order to implement a monitoring system (Witzgall et al. 2010). In the case of Notodontids, there are very few sex pheromones identified and synthesized (Bestmann et al. 1993; Spear-O'mara and Allen 2007), but none are commercially available.

Figure 8. Most typical larval morph with red dorsal bands between yellow strips compared to a less common lightly colored morph without red bands (Photos by A. Del Pozo-Valdivia).

Management

Currently an insect growth regulator Dimilin (diflubenzuron) has a derogation allowing it to be used on Forest Stewardship Council (FSC) certified poplars. Dimilin should be used to target populations of early instar *Gluphisia*. If larvae have developed to the final instar, use Steward (indoxacarb) according to label instructions. Other FSC-allowed insecticides include Conserve (spinosad) and Coragen (chlorantraniliprole). If poplars are not being grown for FSC certification, several alternative insecticides will control this pest. *Gluphisia* populations can be controlled by spraying organophosphate insecticides (chlorpyrifos, dimethoate, or malathion—Special Local Needs registration for malathion use OR-080024 and WA-960004), a carbamate (carbaryl), or synthetic pyrethroids (cyhalothrin or permethrin) according to labeled instructions. Currently, Oregon and Washington have registered the use of all these insecticides to protect tree pulp/wood production.

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Use pesticides with care. Apply them only to plants, animals, or sites as listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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