Life cycles of snail-killing flies: *Pherbellia griseicollis*, *Sciomyza dryomyzina*, *S. simplex*, and *S. testacea* (Diptera: Sciomyzidae)

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INTRODUCTION

The basic life cycles of four species of snail-killing flies occurring in northern Europe are described from observations in nature and from laboratory rearings. Of the four species, all but *Sciomyza testacea* Macquart also occur in North America. The larvae are obligatory predators or parasitoids of aquatic or terrestrial snails. The following aspects are discussed: flight period, microhabitat, mating, oviposition, duration of immature stages, larval prey, feeding behavior, and related behavioral aspects. The geographical distribution of each species is illustrated.

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scribed their immature stages; he also described the puparium of *S. dryomyzina*. *Sciomyza aristalis* is a parasitoid of *Succinea ovalis* Say, a common woodland snail of the northeastern United States. The female fly lays its eggs diagonally across the suture of the shell of the host. Upon hatching, the larva penetrates between the mantle and shell. The snail remains alive for seven or eight days while the larva develops into the third instar. After the snail dies, the larva continues to feed on the decaying flesh, then pupates in the shell. Berg (1964) also reared *S. aristalis* through the complete life cycle, and confirmed Foote’s report that the invading first instar larva wedges itself inward between the mantle and the shell until it loses all contact with the air. The posterior spiracles of the larvae are not exposed in the aperture until 5-8 days later, about the time that the snail dies.

The biology of *S. varia* (as *Pteromicra inermis* Steyskal) was briefly mentioned by Berg et al. (1959) and Berg (1961), and was described in detail by Berg (1964). This species is one of the most highly specialized parasitoid Sciomyzidae, apparently restricted to attacking stranded or aestivating *Lymnaea palustris* Müller (= *Stagnicola elodes* (Say)), an aquatic snail. The female fly lays one to several eggs along the suture of the shell of the host, but apparently only one larva can be successful in establishing itself between the mantle and shell. The snail dies after about 6 days, the larva continues to feed on the decaying tissue for about 2 more days, and then pupates in the shell, forming an unusual puparium that is peculiarly adapted to fill a complete whorl of the shell. J. K. Barnes (pers. comm.) has noted that, “In the field and laboratory, the larvae [of *S. varia* (Coquillett)] are parasitoids of stranded *Lymnaea palustris* (= *Stagnicola elodes* (Say)), each larva attacking a single individual and pupating inside its shell”. In northern Europe, *Colobaea bifasciella* (Fallén) is an almost exact ecological equivalent of *S. varia* (Knutson 1970).

Foote’s limited rearing of *S. simplex* established the fact that this species does not oviposit onto the shell, that the larva kills and feeds on several snails, and that the puparium is formed away from the shell. The observations presented here on *S. simplex* further elucidate the life cycle of this species and show that the larvae are not restricted to feeding on succineid snails but rather have a broad prey range, especially in laboratory rearings.

*Sciomyza dryomyzina* Zetterstedt, 1846

*Sciomyza dryomyzina*, a Holarctic species, is widespread in the Palaeartic, where it is known from Ireland and across most of Europe to Karelian ASSR; it is also recorded from western Siberia (Fig. 2). In the Nearctic it is known from the Northwest Territories to Newfoundland and south to Idaho and Montana (Fig. 1). The adults are distinguished from other members of the genus by the following characters: one to several fine, short hairs along the posterior margin of the mesopleuron; palpi entirely yellow; third antennal segment of darkest specimens close to color of the lightest specimens of *S. testacea*; center of face not darkened; dorsum of thorax subshiny reddish brown; and front femora darkened on apical half or more (more extensively darkened in the female). As in *S. simplex*, the anterior half of the frons is shiny in the female and pruinose in the male; in *S. testacea* the frons is shiny in both sexes. The frons of the male is much narrower anteriorly than it is in *S. testacea*.

The male genitalia of a reared specimen from Sweden were compared with those of a specimen from the Matanuska Valley, Alaska, and with the figures presented by Rozkošný (1984). The specimens and figures agree well except that in the specimen from Sweden the bristles on the anterior surstylus are stronger and not as evenly dispersed over the surface but are more restricted to the apical portion. Rozkošný (1984 and in litt.) described and figured distinct differences in the cerci of *S. dryomyzina* and *S. testacea*. The apical portion is strongly bifid, with a long mesal projection in *S. dryomyzina*, whereas it is weakly bifid with only a blunt mesal projection in *S. testacea*; this character is best seen in flat slide preparations. Prof. Rozkošný confirmed my identifications of *S. dryomyzina* and *S. testacea*, noting “I found no significant differences between your material and the examined specimens from Central Europe as regards the external morphology as well as the male genitalia”.

The biological information available on this relatively uncommon species is limited. Berg (1953) collected about 300 living *Oxyloma decampepigould* Pilsbry (Succineidae) from emergent vegetation in an *Equisetum* marsh in the Matanuska Valley, Alaska. After holding the snails in the laboratory for a few days, he noticed that several had