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Diversity of Piophilidae (Diptera) in northern Canada and description of a new Holarctic species of *Parapiophila* McAlpine

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Abstract

Piophilidae (Diptera) were inventoried at 12 sites in boreal and arctic Canada as part of the 1947–1962 Northern Insect Survey and 2010–2011 Northern Biodiversity Program. Seventeen species were identified, including a new Holarctic species: *Parapiophila kugluktuk* sp. n. which is widespread in North America and northern Sweden. *Allopiophila calceata* Duda is considered a junior synonym of *Parapiophila atrifrons* (Melander & Spuler) syn. n. based on morphological and molecular evidence. *Parapiophila baechlii* Merz, previously known from Switzerland, is newly recorded in the Nearctic region, as well as Sweden and northeastern Russia (Cherskiy). *Parapiophila pectiniventris* (Duda), previously known from the Palaearctic region and Greenland, is newly recorded from North America. Species richness was highest in mainland subarctic sites (16 species, 246 specimens). Five species (13 specimens) were collected in boreal sites, and five species (701 specimens) were collected on the high arctic island sites.

Key words: taxonomy, inventory, Nearctic, arctic, biogeography

Introduction

Piophilidae is one of the few families of acalyprate Diptera that is more species-rich and dominant at high latitudes. McAlpine (1977) recorded 45 of the 67 species then described in the northern Holarctic zone, especially montane, boreal and arctic regions. There are now 82 described species of Piophilidae (Pape *et al.* 2009) but the geographic pattern remains similar.

Many of the northern Nearctic specimens studied by McAlpine (1977) were collected by the 1947–1962 Northern Insect Survey (NIS), which sampled at more than 70 sites in boreal and arctic North America. The recent Northern Biodiversity Program (NBP) revisited sites sampled by the NIS to document diversity, distribution and long-term changes in northern arthropods (Blair *et al.* 2012). The NBP collected arthropods in 2010–2011, at 12 sites in three ecozones: northern boreal, subarctic and high arctic.

The objectives of this paper are: to inventory the northern Canadian Piophilidae based on the NBP material, supplemented by NIS specimens from the same sites; to assess their diversity and geographic distribution across ecozones; and to describe a new Holarctic species of *Parapiophila* McAlpine.

Material and methods

The NBP Piophilidae were collected as part of a comprehensive arthropod inventory using standardized, replicated, sampling protocols (Malaise traps, yellow pan traps and sweeping) in 2010–2011. Three wet tundra plots and three mesic tundra plots were established at each of 12 sampling sites. Four sites were northern boreal, near tree line: Goose Bay, Newfoundland and Labrador (53.3°, -60.4°); Moosonee, Ontario (51.3°, -80.6°); Yellowknife, Northwest Territories (62.5°, -113.4°); Norman Wells, Northwest Territories (65.3°, -126.7°). Four sites were subarctic on the mainland: Schefferville, Quebec (54.9°, -66.9°); Churchill, Manitoba (58.7°, -93.8°); Kugluktuk, Nunavut (67.8°, -115.2°); North Fork Pass, Yukon Territory (64.6°, -138.3°). Four sites were on the high arctic

In contrast, species richness of Piophilidae was highest at the subarctic sites. All but one species (*Arctopiophila nigerrima*) were collected in the subarctic ecozone. Some species collected in multiple ecozones were much more abundant in the subarctic sites (e.g., *Liopiophila varipes*, *Neopiophila setaluna*, *Parapiophila penicillata*) (Fig. 12). Although *Actenoptera hilarella* was collected only in subarctic sites in this study, published records (McAlpine 1977) show that it is more widespread in the Nearctic, although rarely collected.

Piophilidae were most abundant at the high arctic sites (701 specimens), but species richness was low. Five species were collected: *Arctopiophila arctica*, *Arctopiophila nigerrima*, *Lasiopiophila pilosa*, *Neopiophila setaluna* and *Parapiophila fulviceps*. *Arctopiophila nigerrima* was collected only at high arctic sites and *A. arctica*, *L. pilosa* and *P. fulviceps* were much more abundant at high arctic than subarctic sites (Fig. 12). The dominance of these species in the high arctic suggests that they may be particularly well-adapted to the harsh conditions on the arctic islands (Downes 1962; McAlpine 1965), although a better understanding of their ecology would be required to identify those adaptations.

Half of the recorded Nearctic species of Piophilidae were identified in the 12 sites sampled in this study, including a new, widespread Holarctic species, and two new North American records. We are aware of additional, undescribed species from other northern sites. A taxonomic revision of Nearctic Piophilidae is ongoing, which will allow for a more comprehensive analysis of geographic patterns of diversity.

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