SHORE-FLY (DIPTERA: EPHYDRIDAE) COLONIZATION OF SALINE HABITATS IN OHIO[1]

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ABSTRACT: A new habitat record for *Glenanthe salina* is reported in Ohio. *G. salina* has not been collected in Ohio since the original freshwater locality was contaminated with untreated sewage during 1979-80. Collection records suggest that *G. salina* and *Psilopa girschneri* colonized saline habitats at Rittman during 1995 and the early 1970s, respectively. In all probability, hypersaline habitat at Rittman, Ohio was colonized by a third species, *Ephydra gracilis*, during the early half of the twentieth century.

The Ephydridae or shore-flies (Diptera) are in the superfamily Ephydroidea and are closely related to the Camillidae (Mathis and Zatwarnicki, 1995). Shore-flies are found in aquatic, semi-aquatic, marine coastal, hypersaline, and terrestrial habitats (Foote, 1995). Habitat distribution and abundance of shore-flies have been studied in aquatic habitats in Iowa (Deonier, 1965), and Ohio (Scheiring and Foote, 1973; Deonier and Regensburg, 1978; Steinly and Deonier, 1980; Larson and Foote, 1997). Additionally, ephydrid habitat and community composition have been the focus of investigations within limited geographic areas in California (Barnby and Resh, 1984), Connecticut (Steinly, 1984a, 1986, 1992), Illinois (Steinly et al., 1987), North Dakota (Harris and Deonier, 1979), Ohio (Steinly 1978, 1984b), and Washington (Zack, 1979). In most of the Nearctic investigations, habitats were delimited by vegetation type, substratum conformation, and/or surface water abundance. While the ecology of shore flies has received much attention during the last three decades, most ephydrid ranges, habitat distributions, population and community characteristics, and life cycle requirements remain unknown. In this paper, a new habitat and locality record is reported for Ohio. The colonization of saline habitats in Ohio and the distribution of selected shore fly species are discussed.

METHODS

Adult shore-flies were collected annually with a modified aerial sweep net (Regensberg, 1977) from saline habitats and a freshwater creek at Rittman, Ohio (Wayne Co.) and Beaver Creek, Amherst, Ohio (Lorain Co.), respectively. The use of a fine mesh net with detachable bags (Regensburg, 1977) reduced the probability of escape by very small species (Mathis, 1995). In the field, adults were killed with ethyl acetate and debris was removed before transporting the samples to the laboratory in petri plates. In the laboratory, adult specimens were point-mounted and examined to ascertain reproductive condition. Voucher specimens of field-collected material have been deposited in the Miami University Insect Collection.

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RESULTS

For the first time, *Glenanthe salina* Mathis has been collected from saline habitats in Ohio. These habitats contained an unidentified grass species, *Salicornia* sp., and decaying vegetation. Gravid *G. salina* females were found in all samples. All specimens were collected by B. A. Steinly.

Glenanthe salina Mathis.

Wayne Co.: Rittman Salt Works, Chippewa Ck., 40° 58.1'N, 81°46.4'W, VI-27-1996, mud at edge of *Salicornia* sp., 1 adult; VIII-16-1996, *Salicornia* sp., 4 adults; VIII-16-1996, edge of pool over decaying filamentous algae, 6 adults; VI-27-1996, salt encrusted mud at edge of *Salicornia* sp., 88 adults; VI-27-1996, shoreline rocks, mud, debris, 2 adults; VI-27-96, Broomgrass and *Salicornia* sp. 9 adults; VI-27-96, salt marsh edge mud and *Salicornia* sp., 41 adults; VIII-16-1996, decaying filamentous algae, 12 adults; VI-27-1996, salt marsh *Salicornia* sp., 15 adults ; VIII-16-1996, dry salt water seep *Salicornia* sp. cover, 1 adult; VIII-16-1996, dead filamentous algae pool shore, 1 adult; IX-15-1997, mud shore edge of *Salicornia* sp., 1 adult; VIII-16-96, dry salt seep with live and decaying *Salicornia* sp., 16 adults; IX-15-1997, mud at edge of *Salicornia* sp., 82 adults; IX-15-1997, decaying vegetation, 1 adults; IX-15-1997, emergent *Salicornia* sp., 25 adults; IX-15-1997, mud shore acid pool, 1 adult; IX-15-97, mud shore, 7 adults.

DISCUSSION

During the summers of 1996-97, *G. salina* and *Psilopa girschneri* von Röder were collected from saline habitats at Rittman, Ohio (Wayne Co., Ohio). The collection of *G. salina* is the first record of the species from an Ohio salt habitat and the fourth in-land record reported. In a revision of the genus *Glenanthe* (Mathis, 1995), *G. salina* had previously been reported from freshwater habitats along Beaver Creek (Ohio) in 1977. Also, the newly described species has been reported from saline habitats along the Gulf and Atlantic coasts of North America and from a few in-land salt localities in Missouri and Nebraska (Mathis, 1995). Although *G. salina* and *P. girschneri* were found at Beaver Creek in the late 1970s, attempts (by this author) to collect additional specimens from the Lorain Co. locality during the last 20 years have been unsuccessful.

In 1979, the disappearance of *G. salina* and *P. girschneri* from the Lorain Co. locality coincided with the decline in richness of the shore-fly community from 70 to 5 species at Beaver Creek (Steinly and Deonier 1980). In all probability, the release of untreated sewage affluent from two point sources for more than two years, contributed to shore-fly community decline. While discharge of sewage affluent was unabated, the ephydrid community included *Allotrichoma simplex* (Loew), *Discocerina obscurella* (Fallén), *Hydrellia griseola* (Fallén), *H. formosa* Loew, and *Scatella stagnalis* (Fallén). The collection of *P. girschneri* from the only other known Ohio population at Rittman continued from 1975-97.

Although the saline habitats at Rittman were sampled intensively prior to 1973 (Scheiring and Foote, 1973), *P. girschneri* was not collected until 1975 (Steinly and Deonier, 1980). The absence of *P. girschneri* and *G. salina* in

collections between 1972-74 and before 1996, respectively, suggests that the richness of the shore-fly community at Rittman continues to increase. Additionally, the presence of *Ephydra gracilis* Packard suggests that the locality has been colonized by a third shore-fly species within the last 100 years. At the beginning of the 20th century, hypersaline brine was pumped from subterranean salt domes and stored in lagoons. Commercial salt recovery has continued through 1997. Eventually, airborne drift and seepage of salt water contributed to the development of unique aquatic habitats that have been colonized by endemic-regional and immigrant shore-fly species (Scheiring and Foote, 1973; Steinly and Deonier, 1980). In the cases of *E. gracilis* and *G. salina*, the closest known source populations are located at the Great Salt Lake (Utah) and in central Missouri, respectively. The only known populations of *G. salina* are more than four hundred miles west and east (i.e., coastal populations) of Rittman. The nature of species dispersal, colonization and/or introduction is unknown.

The collection of *P. girschneri* and *G. salina* from freshwater and saline habitats suggests that these species have the capacity to exploit different resources. The utilization of saline habitats that contain high ion concentrations and the presence of both species at Beaver Creek suggest that marginal freshwater habitats contaminated with treated sewage may be colonized. Presumably, treated sewage affluent contains ion concentrations that are not found in uncontaminated surface water, but are similar to concentrations in saline habitats.

Transient and long-term colonization by *E. gracilis* has been documented in hypersaline habitats in Illinois and The Great Salt Lake, respectively (Steinly, 1987; Clark, 1976). In all probability, the colonization of salt habitats by small shore-fly species has not been detected because long-term studies of aquatic biodiversity have not been sustained. Also, the adoption of equipment (i.e., fine meshed sweep nets and methods that eliminate the escape of small species) may provide the basis for the detection of shore-fly species that are introduced or moving into saline and aquatic habitats.

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