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AN INLAND POPULATION OF *POANES VIATOR* (HESPERIIDAE) ASSOCIATED WITH *PHRAGMITES AUSTRALIS*, THE COMMON REED

Additional Key Words: Host plant switching, invasive plants, evolution, *Ancyloxypha numitor*

Shapiro (1971a) showed that "inland" and "coastal" populations of *Poanes viator* (Edwards) differ not only in the range of larval host plants but also in superficial adult characters to warrant separate subspecific status, i.e., inland *P. viator viator* (Edwards), a *Carex* (Cyperaceae)-feeder and coastal *P. viator zizaniae* Shapiro, a *Zizania/Phragmites* (Poaceae)-feeder, respectively. Shapiro suggested (1971b) that inland populations in the Great Lakes region were derived from coastal refugia following glacial retreat, and that they were subsequently cut off from the coastal populations when the opening of St. Lawrence River disrupted the wetland system that connected both populations until that time. The possibility was later raised that the northward expansion may have occurred along the Mississippi valley as well (Shapiro 1977). A potentially important issue not addressed in his thesis is the role of host plant switching that must have taken place at some point. For example, isolation of the inland populations might not have occurred without host plant switching from Poaceae to *Carex*, or vice versa in the coastal populations. Regardless of the exact cause and history of current status, an ability to shift host plants is likely to have played a significant role in the evolutionary success of this skipper.

This note describes two inland populations of *P. viator* in Western New York State (WNY). One uses *Phragmites australis* (Cav.) Trin. in the absence of appropriate *Carex*, and the other is suspected to do so in spite of accessibility to *Carex*. Implications of the finding will be discussed in the light of our current understanding of the plant *P. australis* (henceforth referred to as *Phragmites*).

Poanes viator is a highly localized, but not necessarily rare species in WNY. More than a dozen widely separated colonies are known to us in this area; but, with the exception of at least one described below, all are associated with broad-leaved sedges, such as *Carex lacustris* Willd., which often form chest-high monocultures in partially wooded swamps. The first *Phragmites*-associated colony is located in the Town of Porter, Niagara County, and occupies a portion of a 21-acre open area with artificial ponds. Dense secondary woods surround the open area. The open space and the ponds were created in early 1980s by clearing the woods and are currently maintained by the Niagara River Anglers Association (NRAA) as its preserve. *Phragmites* was not present initially, and may have been introduced by bulldozers used for pond excavation. *Poanes viator* was discovered in this location by one of us in 2001 when a small number of adults was found nectaring on Pickerelweed (*Pontederia cordata* L.). In July 2003, after failing to find broad-leaved sedges in the open area or surrounding woods, we by chance came across several adult males flitting among *Phragmites*, just as one often sees them on the Atlantic coast. The stands of *Phragmites* were small but expanding, occupying an area of about an acre. A short series of specimens of both sexes was collected and compared with longer series from other WNY colonies as well as a series from the Atlantic coast. They were indistinguishable from the former in terms of wing markings and the average size (forewing length ± s.d. in ♂ [n=7], 17.29 ± 0.34mm; ♀ [n =3], 19.60 ± 0.53mm, vs. other WNY ♂ [n=35], 16.94 ± 0.64mm; ♀ [n=7], 19.96 ± 0.68mm; $p < 0.25$ and $p < 0.50$ for same sex comparisons by Student's t-test in ♂ and ♀, respectively; the null hypothesis is not rejected in either). John M. Burns kindly confirmed the identification. He was asked to identify the series in a blind fashion, i.e., with the data labels replaced by code numbers and without prior knowledge why he was being asked to do so. Therefore the obvious possibility, that the population simply represents an accidentally transplanted colony of the coastal subspecies, could be ruled out. A single larva was found on *Phragmites* in this colony in late May 2004, but it unfortunately died of an unknown cause. However, its identity was affirmed by a comparison with several *P. viator* larvae obtained in early June 2004 at two Rhode Island colonies, where they fed on *Phragmites*, as previously reported (Tewksbury et al. 2002). We believe that the founders of this small population in WNY switched their host plant from *Carex* to *Phragmites*.

In July 2004, another colony of *P. viator* was located in the Town of Lewiston, Niagara County, about 6 miles (9.6 km) southeast of the Town of Porter locality. In

contrast to the first, this colony is associated with a large *Typha* marsh of at least two thousand acres, and the sedges occur mostly as undergrowth of the taller *Typha*. Stands of *Phragmites* occur in disturbed sections of the marsh, i.e., along a high voltage power line, with impoverished *Typha* and broad-leaved sedges still present as undergrowth. *Poanes viator* was observed flying in and out of dense *Phragmites* to visit flowers of Swamp Milkweed (*Asclepias incarnata* L.) in a small opening in the middle of a stand. Portions of the marsh are bordered by woods in which the broad-leaved *Carex* grew in the absence of *Typha* or *Phragmites*. *Poanes viator* could be found among those sedges within the woods as well, at least a quarter of a mile (400 m) away from the nearest stands of *Phragmites*. This colony is of interest as an example of circumstances that may encourage *Carex* to *Phragmites* shifting. Indeed, shifting may have already taken place in a part of the population. The colony nearest to the above is located on Grand Island in the Niagara River, Erie County, 6 miles (9.6 km) further south, where the skipper seems to be restricted to sedge meadows. However, it is possible, perhaps likely, that other *Phragmites*-associated colonies of the inland subspecies have been overlooked in WNY and elsewhere in the Great Lakes region.

We do not know what causes host plant shifting in *P. viator* from *Carex* to *Phragmites*. Possibly, the choice between these host plants in *P. viator* has always been relatively unrestricted, but lack of opportunities prevented it from happening until recently. Another possibility, which is not mutually exclusive with the one above, is that the exotic variant of *Phragmites* is more palatable to *P. viator* than the native varieties which are being replaced by the former, as we discuss below.

Phragmites australis is an invasive plant rapidly expanding in inland as well as coastal wetlands. It has been a part of the native flora at least since the late Pleistocene in southwestern North America (Hansen 1978). Holocene records are available from both the Pacific and Atlantic coasts (Orson 1999; Goman and Wells 2000). However, the plant was apparently uncommon until an aggressive genetic variant was introduced, probably from Europe, sometime in early 1800s on the Atlantic seaboard and began to expand in the late 19th century and replace less aggressive native genotypes (Saltonstall 2002, 2003). Interestingly, only 5 native herbivores of *Phragmites* have been identified in North America, in contrast to over 150 in Europe, according to Tewksbury et al. (2002). Yet, chloroplast DNA sequences indicate that historical North American specimens from herbaria as well as existing stands of native plants form an isolated cluster of unique genotypes. They are not closely related to those found elsewhere in the world (Saltonstall 2002), suggesting a long period of isolation on this continent. To what extent the present day coastal populations of *P. viator* had been affected by this botanical event is not obvious. Nevertheless, it is generally acknowledged that the coastal *P. viator* is spreading along with the expanding *Phragmites* (e.g., Gochfeld & Burger 1997; Tewksbury et al. 2002). In coastal New England, most if not all *P. viator* populations are now associated with the exotic plant, even though the larvae readily accept the native ones in the laboratory (A. Lambert, L. Tewksbury and R. Casagrande, pers. com.).

It remains unclear whether the genetic variations in *Phragmites*, with potential differences in plant chemistry, are a factor in host plant selection by the herbivorous arthropods, including *P. viator*. Host plant shifting in *P. viator* could have been facilitated if the spreading exotic *Phragmites* is more palatable than a native plant. It turns out, however, that the *Phragmites* associated with the Town of Porter population is a native plant (A. Lambert, pers. com.), presumably of the widespread haplotype E. Thus, native *Phragmites* does serve as a natural host plant for the inland *P. viator*. However, the possibility remains open that the exotic genotype made it easier to shift initially and that, once the shift had taken place, native as well as exotic plants could be used. Aside from palatability, invasiveness itself is relevant for creating situations favorable for host plant shifting. In fact, some populations of the native haplotype E seem to be invasive (Saltonstall 2003).

To conclude, we may be witnessing another landmark event in the evolution of this species: Given opportunities and time, the inland *P. viator* with the newly acquired adaptability may one day become a common species of disturbed wetlands and roadside ditches. This is good news for the inland populations, since their native habitat is disappearing from many areas. Indeed, diminishing native habitats and concurrent spreading of *Phragmites* would be a potent selective pressure favoring *Phragmites* as a host plant. A recent precedent for range expansion in Eastern North America as a direct consequence of host plant adaptation to a spreading alien plant is the skipper *Erynnis baptisiae* (Forbes), as initially reported by Shapiro (1979).

During the course of our observation, another skipper, *Ancyloxypha numitor* (Fabricius), was found to be using *Phragmites australis* as a larval host plant at the Town of Porter locality: Several larvae were found in 2003 and 2004 in typical shelters of folded leaf, with feeding damage above and below the folded portion; they were reared to adults. Thus, at least three native

North American skippers use *Phragmites* as a larval host, i.e., the above two and *Ochlodes yuma* (Edwards).

Note: The NRAA preserve in the Town of Porter is not open to public. Those who wish to observe the colony are welcome to contact the Association or one of the authors. The colony is small and should be protected. The NRAA has a web site (www.niagarariveranglers.com) that includes a brief description of the preserve, an aerial photograph, directions and contact information.

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LIFE HISTORY AND MYRMECOPHILY OF *NEOMYRINA NIVEA PERICULOSA* (LYCAENIDAE: THECLINAE)

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The life histories of many species of Lycaenidae have been described and of these, a large percentage are commonly associated with ants (Ballmer and Pratt, 1989; Fiedler, 1991; Eastwood and Fraser, 1999; Pierce et al., 2002). While most descriptions are for temperate species, fauna from the Malaysian tropics are becoming more well-represented in the literature (Fleming, 1975; Fiedler, 1991; Corbet and Pendlebury, 1992; Fiedler et al., 1996). One species that remains poorly known though, is the White Imperial butterfly, *Neomyrina nivea periculosa* Fruhstorfer (Lycaenidae: Theclinae).

The genus *Neomyrina* Distant is represented by only a single species *nivea* with additional described subspecies (Corbet and Pendlebury, 1992). *N. nivea hiemalis* Godman and Salvin occurs in mainland Thailand and Malaysia and is considered rare (Fleming,1975; Pinratana, 1992) . *N. nivea periculosa* has been recorded from southern Burma to Thailand, throughout peninsular Malaysia including Langkawi Island, and into Sumatra. *N. nivea periculosa* is considered more common than *N. nivea hiemalis* (Pinratana, 1992; D'Abrera, 2001). This butterfly is still typically rare, but may be locally common when encountered (Corbet and Pendlebury, 1992). *N. nivea* were observed in Thailand and central Laos by Igarashi and Fukuda (2000) and they have published aspects of the life history of the species.

Eggs and Early Instars (Fig. 1a-b). Eggs of *N. nivea periculosa* (n=7) were found in December 2002 on 2 m tall *Balanocarpus heimii* (King) (Dipterocarpaceae) trees in a shady area of the 1600-ha Forest Research Institute of Malaysia (FRIM) nursery, 15 km northwest of Kuala Lumpur in the southern peninsula of Malaysia. The eggs were deposited in small groups around the stems and leaf buds of the terminal growth. Several *Crematogaster* sp. ants (Formicidae: Myrmicinae) were observed to be in close proximity to the eggs at the time of collection and to the extrafloral nectaries of the hostplant. The eggs, plant material, and approximately 20 ants were transported to