1994 Ecological Studies of the
Poweshiek Skipper (*Oarisma poweshiek*) in Wisconsin

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Wisconsin Department of Natural Resources
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Recently eclosed poweshiek skipper larva and partially consumed egg case

First instar poweshiek skipper larva on prairie dropseed
# TABLE OF CONTENTS

**INTRODUCTION** .............................................. 1

**OBJECTIVES** ............................................ 1

**PROCEDURES** ........................................... 1

**RESULTS** ............................................... 2

  Melendy's Prairie ........................................ 2

  Kettle Moraine Fen and Low Prairie ...................... 2

  Scuppernong Prairie ...................................... 2
    Flight Period and Transect Survey (2)
    Nectar Plants (3)
    Mating Behavior (3)
    Chasing Behavior (4)
    Marking (4)
    Survey for Immatures (4)
    Larval Food Plants (6)
    Overwintering (6)

**DISCUSSION** ............................................ 6

**MANAGEMENT** ........................................... 8

**ACKNOWLEDGEMENTS** .................................... 9

**APPENDIX** (Tables and Figures) ...................... 10
INTRODUCTION

This report summarizes results from the second field season of a planned four-year (1993-1996) study of the poweshiek skipper, *Oarisma poweshiek* (Parker), in Wisconsin. An overview of the objectives for the study, summary of published natural history accounts, procedures, and results from the first field season are compiled in my report to the Bureau of Endangered Resources submitted in March 1994.

Developing guidelines for management of existing poweshiek skipper populations is a highly desirable, projected application for the information gathered over the course of this study.

OBJECTIVES

The primary objective during the 1994 field season was to gather additional baseline information on the natural history of the poweshiek skipper at the two known population sites in Wisconsin. This included estimating population sizes, determining larval food plants and development rates of immatures, cataloging nectar plants used, determining portions of habitat occupied, documenting flight period, adult longevity, and any other factors pertinent to the survival of the species.

PROCEDURES

Melendy's Prairie, Kettle Moraine Fen and Low Prairie, and Scuppernong Prairie, all in Waukesha County, were the three sites surveyed for poweshiek skipper activity in 1994.

Scuppernong Prairie was again selected as the primary site for monitoring poweshiek skippers because larger population sizes had been recorded there in the recent past, and baseline data gathered at the site in 1993 was available for comparative purposes. The same methods were used to survey for adults and to track immatures as in 1993. Five transect lines, rather than the six used in 1993, (Figure 1) were established to assess the relative distribution and numbers of adults on the approximately 15 acres of preferred habitat at the site. Fifteen transect surveys were conducted between June 27 and July 28 to obtain an estimate of the adult population, and more than one-hundred plants with eggs were tagged and monitored to gather information on immatures. I also visited the site on September 20 and December 23 to see the general condition of the vegetation, and
observe particular aspects of poweshiek skipper natural history (for example, the size, location, and position of larvae found).

Three females were collected on June 30 to obtain eggs for captive rearing. In September 1994, 10 captive-reared larvae were transferred onto prairie dropseed plants, *Sporobolus heterolepis*, in pots with mixed prairie species including little bluestem, *Schizachyrium scoparium*, and an undetermined sedge, probably *Carex buxbaumii*. The pots were sunk into the ground outdoors at my home in Milwaukee for observations on overwintering behavior. The larvae were all approximately nine millimeters in length and had molted four to five times.

**RESULTS**

**Melendy’s Prairie**

Melendy’s Prairie was surveyed for poweshiek skipper activity on June 30 at the height of the flight period at Scuppernong Prairie. No poweshiek skipper adults or immatures were found there.

**Kettle Moraine Fen and Low Prairie**

Kettle Moraine Fen and Low Prairie (Figure 2) was also surveyed on June 30. Ten adults were sighted in the wet-mesic prairie area south of the oak woods and north of the Ice Age Trail where there were extensive patches of prairie dropseed. No adults were sighted in the low prairie areas north of the old farm lane or in the dry-mesic prairie in the far SW corner of the site, which was burned earlier in the year. One female was observed laying an egg on a blade of prairie dropseed at 1357 hours, and feeding was observed on black-eyed Susan flowers, *Rudbeckia hirta*.

A group of seven observers surveyed the site again on July 6. Five adults were sighted in the same prairie dropseed areas as noted above and one adult was sighted in an area directly west. Adults were observed flying over the dropseed areas, perching on vegetation, and feeding on black-eyed Susan flowers. The site was not surveyed for immatures.

**Scuppernong Prairie**

**Flight Period and Transect Survey**

Adult activity, including egg laying, was first recorded during a site visit on June 25. Transect survey data for the flight period are summarized in the Appendix (Tables 1 and 2). The highest number of adults counted during a
transect survey was 110 on June 30. The last adult sighted was one worn female found in the vicinity of transect two on July 22.

One male was seen in the gravel parking lot across the road (county highway N) on June 27 at 1249 hours. It was observed continuously for about 10 minutes, and was seen walking around probing the damp soil and vegetation with its proboscis extended and presumably drinking (a behavior sometimes referred to as "puddling").

Individuals were also seen flying out into Wilton Road at the north end of the prairie a few times. This generally occurred when one male was chasing another individual. However, aside from these few instances, adults were not found during occasional surveys made north of Wilton Road, west of county highway N (both north and south of the parking lot), and south of the southern prairie area dominated by little bluestem (for example, the old orchard area with remnants of prairie vegetation).

Nectar Plants

Adults were observed feeding primarily at the flowers of black-eyed Susan which is common at the site. Feeding was also documented at the flowers of spiked lobelia, Lobelia spicata, downy wood-mint, Blephilia ciliata, and wing-angled purple loosestrife, Lythrum alatum.

I observed a female poweshiek skipper, that was feeding on a black-eyed Susan flower, chase a smaller Polites peckius skipper off the flower when it landed and attempted to feed. Competition for feeding sites was not observed frequently, and the abundance of nectar plants did not appear to be a limiting factor at Scuppernong prairie, so this aspect of poweshiek skipper natural history was not studied in any detail.

Mating Behavior

Several attempted matings were observed. Typically a male flew to a female that was perched or feeding, the male approached the female and tried to line up parallel to her body, curling his abdomen around toward hers. Unreceptive females showed one or more of the following responses: the female moved sideways away from the male, tipped the end of her abdomen against the substrate thereby preventing the male from coupling, and the female opened or flicked (rapidly opened and closed) her wings. The male response was usually to flying off. In one instance, when a second attempted mating followed seconds after the first, the female dropped off the perch down into the lower grass and litter layer and remained there virtually motionless with wings closed, for several minutes.
The male walked around the perch and then flew off. All of the observed attempted matings occurred very quickly, with less than one minute time elapsed.

One of the pairs found in copulation was observed for a period of time. The pair was discovered at 1024 hours near the middle of transect two perched on a prairie dock leaf. Their bodies formed a straight line, joined together at the abdomens, with heads facing opposite directions. They were inadvertently disturbed, and dropped off the leaf down into the grass below, but remained there almost motionless and still coupled until 1038 hours. After they separated, the male flew up to a prairie dock plant, basked for about one minute and then flew away. The female remained on the same grass blade. She curled her abdomen around touching the tip to the blade three different times but nothing was observed (for example, fluid expelled). She was still in the same position at 1121 hours and was collected.

**Chasing Behavior**

Both inter- and intraspecific chasing behavior was noted. Male poweshieks were seen flying after other poweshieck skippers, and also after an unidentified moth, and Polites mystic and P. peckius skippers (species common at the site).

**Marking**

I tried marking a few poweshieck skippers with individual consecutive numbers on the ventral hindwings written with a blue Sharpie felt-tip marker. Each skipper was first chilled briefly in a small cooler with an ice pack. I discontinued the effort after marking only four individuals (three males and one female) because the method was not satisfactory. It took too long for individuals to cool down, and under the existing field conditions, they warmed up too quickly to be handled safely and easily. All were collected and released in transect one, due east of the wooden sign. None were resighted.

**Survey for Immatures**

A total of 130 eggs were tagged and checked between July 1 and July 28 at Scuppernong Prairie. Far more eggs were sighted than tagged due to time/personnel limitations, but eggs were found in all prairie areas where suitable larval food plants were growing. One-hundred-and-four eggs were tagged on prairie dropseed, twenty on little bluestem, three on prairie dock, Silphium terebinthinaceum, two on spike rush, Eleocharis sp., and
one on an undetermined grass tentatively identified as Indian grass, *Sorghastrum nutans*. Ovipositions were observed at least once on all of the plant species listed above, except for the undetermined grass.

Eleven eggs were never found again after tagging. Two were knocked off the plants when visitors inadvertently trampled the area, and the fates of the rest are unknown. Ten eggs appeared to have suffered predation or parasitism. When examined with magnification, a few had puncture marks and their contents had been sucked out. Others turned black and their contents dried up. It is presumed that larvae eclosed successfully from the other one-hundred-and-nine tagged eggs, as evidenced by the partially eaten egg cases found. (Typically, part or most of the upper portion of the egg case above the basal plate is consumed by a poweshiek larva upon emerging.) In some instances, newly emerged larvae or feeding damage were observed near egg cases.

Oviposition times were recorded for 10 of the tagged eggs. These eggs were monitored in order to get an estimate on the length of development in the egg stage. Larvae eclosed in about 12 days under field conditions (all took more than nine and fewer than 13 days). An additional four eggs were collected immediately after oviposition and brought indoors for monitoring. Larvae eclosed in seven, eight, 10 and 10 days respectively for these.

In all, thirty-two larvae were found, either on plants with tags, or on plants in the vicinity. It’s likely that some larvae originated from untagged eggs. Only two of the larvae were resighted more than once. Larvae did not construct shelters. Many skipper species use strands of silk to bind leaves into a structure which is characteristic for the species or species group. All larvae found were on food plants, and most were resting along the middle (rather than edge) of a grass blade, facing the basal end of the blade. No thickened pads of silk were visible on the blades. Feeding occurred at or near the tip of the blade, and feeding damage usually took the form of a notched area along one edge or the entire tip eaten away.

The last observation date at Scuppernong Prairie in 1994 was December 23. One larva, about eight millimeters long, was found resting head down on a brown little bluestem grass blade at a height of three to four centimeters above ground level. No shelter or feeding damage was apparent. The sky was overcast, and the air temperature was in the upper 30s °F with a wind chill factor of 19 °F. The larva did not move but appeared to be healthy.
Larval Food Plants

Larvae were found feeding or resting on both prairie dropseed and little bluestem plants at the Scuppernong site. No larvae or feeding damage were found on the prairie dock or spike rush plants where eggs were laid. Numerous plants were examined in addition to those with tagged eggs.

Overwintering

The only poweshiek larva found at Scuppernong Prairie in 1993 was collected and transferred to a potted little bluestem plant for overwintering outdoors. It did not complete development successfully.

I was able to track only one of the 10 captive-reared larvae placed on potted prairie dropseed plants outdoors for the winter. The last observation prior to submission of this report was on March 25, 1995. There was movement between plants, but the larva remained within about a three centimeter area from late November through March. Despite the movement, no feeding was apparent during the winter months, and no constructed shelter or silk pad was visible. The larva adopted a vertical resting position facing head down on a grass or sedge blade near the base of the plant. The size, general appearance, and posture of the larva, as well as its location on the plant closely matched the larva found at Scuppernong Prairie on December 23. The fates of the other nine larvae are unknown.

DISCUSSION

As in 1993, the primary objective during the 1994 field season was to add to the baseline information available on the natural history of the poweshiek skipper. New information from this year's study includes: 1) the discovery that especially under very hot and humid weather conditions, females oviposit on plants that do not support larval development, 2) confirmation that prairie dropseed and little bluestem are used as larval food plants, and 3) observations that larvae feed, rest, and overwinter on food plants without constructing protective shelters.

The flight period of poweshiek skippers at Scuppernong Prairie, probably began a few days prior to the site visit on June 25. Adult emergence and peak numbers were about five days earlier than in 1993, and more than three times as many adults were counted throughout the flight period. A comparison between 1993 and 1994 numbers is illustrated in Figure 3.

In addition to the significant increase in population size in 1994, there was
also a notable increase in the levels of adult activity (including egg-laying) in the dry-mesic portions of the site (Table 2). These areas include extensive patches of prairie dropseed and little bluestem grasses, plant species now documented as larval food plants. The ratio of adults counted in transect one (more dry-mesic habitat) to adults counted in transect two (more wet-mesic areas) is 0.48 for 1993 and 0.89 for 1994. Similarly, in the dry-mesic transect line to the east (1993 transect six and 1994 transect three) the ratio is 0.15 for 1993 and 0.58 for 1994. A value of 1.0 would indicate that equal numbers were found in both transects.

The suggestion, based on 1993 data, that poweshiek skippers may have a preference for wetter portions of the habitat is erroneous based the observations made in 1994. It is more likely that the moist areas along the swale through the center of the prairie served as refugia (allowing higher survivorship of immatures) when the site was burned, and as the poweshiek population recovered, other equally suitable areas were repopulated. The last prescribed burn occurred in April 1991.

In contrast, the population size at Kettle Moraine Fen and Low Prairie was astonishingly low in 1994. Ten individuals were counted on June 30 compared to 110 at Scuppernong Prairie, despite the availability of three to four times the amount of suitable habitat, with identical adult and larval food plants. The individuals sighted were all found near extensive areas of prairie dropseed in the wet-mesic prairie. The last prescribed burn in this area was also in April 1991.

The current management plans for both the Scuppernong and Kettle Moraine sites were approved in 1990. The plan for Scuppernong Prairie recommends burning the entire 25 acre site as one unit every three years, with the exception of about one acre, which is to be left with unburned patches in a designated area believed to be the poweshiek skipper population center (shown on Figure 1). The plan also indicates the prescribed burn should occur prior to May 1 to lessen the impact on overwintering poweshiek larvae. The most recent prescribed burns occurred in 1967, 1971, 1975, 1981, 1985, 1988, 1989, and 1991. The prescribed burn which would have occurred in 1994 was postponed due to this study.

The management plan for the Kettle Moraine site follows the same basic recommendations as above, except the site is divided into three burn units (shown on Figure 2), with at least one unit to be left unburned in a given year. A wildfire burned the site in 1975, and prescribed burns occurred in unit 3 (low prairie) in 1989, unit 2 (wet-mesic prairie) in 1991, unit 3 (oak woods) in 1992, and unit 1 (dry-mesic prairie) in 1994.
Although specific recommendations were made with the stated intent to minimize the detrimental impact on poweshiek skipper and other invertebrates, the management plans were developed with almost no information about the natural history or population biology of poweshieks at the sites. The data gathered so far strongly suggest that a three year prescribed burn frequency, and/or the design of the burn units, is limiting poweshiek skipper populations to levels well below the carrying capacity at each of the sites. In fact, had the spring 1994 burn taken place in unit two at Kettle Moraine Fen and Low Prairie, as prescribed, the poweshiek population might well have been burned out of existence there.

A long range plan is on file at the Bureau to join all three of the sites examined into one large contiguous tract of restored prairie. Ideally, the existing poweshiek populations should be managed at levels that would promote dispersal into these new areas as they are restored. Continued tracking of poweshiek population levels at the Scuppernong and Kettle Moraine Prairies and adjoining land over the next two years should provide further insight into aspects of dispersal and colonization.

Many other aspects of poweshiek population biology are still poorly known. Dissection of a poweshiek female in 1992 yielded a count of 79 ova, but adult longevity and average number of eggs laid in the wild have not been determined. The small size, cryptic color, feeding and resting behaviors of the larvae, and the growth form and density of the larval food plants make surveying for poweshiek larvae both difficult and extremely time-consuming. In tracking immatures in 1994, it was not possible to distinguish between the difficulty in resighting larvae due to movement or cryptis and actual survivorship. Using transect counts to survey for adults will probably continue to provide the best indication of population trends over the course of this study.

Follow up in the next two years should also include status surveys of other sites supporting the confirmed larval food plants, especially prairie dropseed. A list is currently being compiled.

MANAGEMENT

Conducting this study over the course of several years provides an opportunity to formulate and test alternative strategies for maintaining and improving the quality of the two prairie sites where the only known populations of poweshiek skippers in Wisconsin remain. To this end, I met with Cathy Bleser, Eric Epstein, and Mark Martin of the Bureau of Endangered Resources on November 7, 1994 to discuss preliminary results
from the 1994 field season. Controlling the spread and invasion of woody plants and exotics is a concern at all the prairie sites. It is necessary for preservation of prairie flora and fauna, including poweshiek skippers. However, the managers will address tree/brush removal with selective cutting rather than burning for 1995, and will continue to address the feasibility of linking these prairie remnants.

ACKNOWLEDGEMENTS

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Special thanks to student intern, Rebecca Jansen, for her valuable assistance with population surveys. I also had help with surveys for immature poweshicks from Raymond J. Sullivan (volunteer) and Kristin Turk (Milwaukee Public Museum Starr intern). Neil Luebke (Curator of Botany, Milwaukee Public Museum) provided assistance with several of the plant identifications.
**APPENDIX**

Table 1

1994 POWESHEIK SKIPPER POPULATION MONITORING: TRANSECT SURVEY DATA FROM SCUPPERNONG PRAIRIE TOTAL NUMBERS OF ADULTS COUNTED

<table>
<thead>
<tr>
<th>Dates (1994)</th>
<th>No. Adults Counted</th>
<th>Weather Conditions (Temp.°F/at Time 0000 hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/27</td>
<td>30</td>
<td>81°/1300 hours, mostly sunny, light S wind</td>
</tr>
<tr>
<td>06/28</td>
<td>32</td>
<td>80°/1105 hours, sunny-ptyl.clidy., light S wind</td>
</tr>
<tr>
<td>06/30</td>
<td>110</td>
<td>78°/0940 hours, sunny-ptyl.clidy., calm</td>
</tr>
<tr>
<td>07/01</td>
<td>54</td>
<td>76°/0940 hours, overcast, light variable winds</td>
</tr>
<tr>
<td>07/03</td>
<td>50</td>
<td>69°/1000 hours, cloudy, light SE winds</td>
</tr>
<tr>
<td>07/05</td>
<td>48</td>
<td>90°/1100 hours, ptyl.clidy., humid</td>
</tr>
<tr>
<td>07/06</td>
<td>40</td>
<td>80°/0850 hours, overcast &amp; hazy</td>
</tr>
<tr>
<td>07/07</td>
<td>25</td>
<td>83°/0945 hours, mostly cldy. (sun &amp; thunder)</td>
</tr>
<tr>
<td>07/09</td>
<td>(11)</td>
<td>70°/0900 hours, (weather became unfavorable)</td>
</tr>
<tr>
<td>07/10</td>
<td>24</td>
<td>67°/1045 hours, sunny, light breeze</td>
</tr>
<tr>
<td>07/12</td>
<td>6</td>
<td>82°/1040 hours, ptyl.cludgy, SW winds</td>
</tr>
<tr>
<td>07/13</td>
<td>7</td>
<td>72°/1437 hours, sunny, light W winds</td>
</tr>
<tr>
<td>07/15</td>
<td>3</td>
<td>77°/1520 hours, ptyl.clidy., calm</td>
</tr>
<tr>
<td>07/22</td>
<td>1</td>
<td>-1500 hours, ptyl.clidy.</td>
</tr>
<tr>
<td>07/28</td>
<td>0</td>
<td>70°/0930 hours, sunny, calm</td>
</tr>
</tbody>
</table>

Table 2

1993 and 1994 POWESHEIK SKIPPER POPULATION MONITORING: TRANSECT SURVEY DATA FROM SCUPPERNONG PRAIRIE DISTRIBUTIONS OF ADULTS COUNTED (excluding 07/09/95)

<table>
<thead>
<tr>
<th>1994 Transects (1993 Transects)</th>
<th>1 (1)</th>
<th>2 (2)</th>
<th>3 (6)</th>
<th>4 (4)</th>
<th>- (5)</th>
<th>5 (3)</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994 No. Adults</td>
<td>123</td>
<td>137</td>
<td>79</td>
<td>54</td>
<td>-</td>
<td>37</td>
<td>430</td>
</tr>
<tr>
<td>1993 No. Adults</td>
<td>16</td>
<td>33</td>
<td>5</td>
<td>26</td>
<td>26</td>
<td>23</td>
<td>129</td>
</tr>
</tbody>
</table>
FIGURE 1

SCUPPERNONG PRAIRIE
STATE NATURAL AREA

- 1993 Transect Lines
- 1994 Transect Lines
- alternate unburned areas

C.T.H. "GN"          S.T.H. 67 (1.3 miles)

SEDGES

C.T.H. "N"

SCUPPERNONG MARSH

SCATTERED OAKS

LOW PRAIRIE
alternate
unburned

NATURAL AREA BOUNDARY

PARKING

SCALE IN FEET

0 330 660 990

11
KETTLE MORaine FEN AND LOW PRAIRIE
STATE NATURAL AREA

FIGURE 2
BURN UNITS

FIGURE 3

TRANSECT SURVEY DATA FROM SCUPPERNONG PRAIRIE

1993/94 Transect Survey Counts
Poweshiek Skipper Adults Sighted

No. Adults

0 20 40 60 80 100 120

June - July

1994
1993