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## A STUDY IN THE SUMMER PHENOLOGY OF DIONYCHIOUS SPIDERS FROM NORTHERN MINNESOTA FORESTS<sup>1</sup>

Bruce Cutler,<sup>2</sup> Lee H. Grim<sup>3</sup> and H. M. Kulman<sup>4</sup>

### ABSTRACT

Dionychious ground layer spiders from *Larix* and *Populus* stands were collected by pitfall traps. The typical pattern of dominant, influent and accessory species was well marked. *Populus* stands had greater diversity of species than *Larix* stands. Those species characterized by large male:female sex ratios had sharp peaks in the first month of collecting, and others had smaller early season peaks or early season and late season peaks. Traps with an apron leading to the trap caught twice as many specimens compared to traps without an apron.

### INTRODUCTION

While there have been a number of papers involved with the phenology of ground layer spiders (Huhta, 1965, 1971; Russell-Smith and Swann, 1972), relatively little emphasis has been placed on the dionychious spiders, except for Merrett (1967). This is in part due to the larger absolute numbers of trionychious spiders in and on the surface layers of the soil. The commonest families collected in pitfall traps in the northern parts of the United States, Canada, and northern Europe are: the Clubionidae, Gnaphosidae and Thomisidae among the Dionychia; Agelenidae, Hahniidae, Lycosidae, Linyphiidae (*sensu lato*), Theridiidae among the Trionychia; and Amauriobiidae among the Cribellata. In the Minnesota collections discussed here lycosids outnumbered all other spiders by a factor of about five to one.

We have been somewhat conservative in our application of the terms Dionychia and Trionychia, fully realizing the obsolete nature of these taxa. However, it remains that in the northern parts of the Holarctic these terms clearly define certain distinguishable groups of spiders. The dionychious spiders in these parts of the Holarctic comprise a diverse group of vagrant hunting spiders. No snares are built, though retreats and eggsacs are made. The commonest families are the Clubionidae, Gnaphosidae, Salticidae, and Thomisidae.

### METHODS

Two forest community types were sampled in the summer of 1972. All were in eastern Lake of the Woods and northern Koochiching Counties in north central Minnesota. The two forest types were *Larix laricina* (Du Roi) K. Koch stands in sphagnum bogs, and *Populus tremuloides* Michx. on mesic sites. Stands were sampled from the end of May until early October in *Populus* and from early June until mid August in *Larix*. All were sampled at approximately two to three week intervals (Figs. 1 to 4).

The traps were conventional pitfall traps of two designs. The basic design was a tin can, 9.5 cm in diameter by 12 cm deep, containing about 3 cm of antifreeze and water in about a 3:1 ratio. The can was sunk in the ground so that the lip lay flush with the ground surface. In the other design the same can was used but the cans were set in the center of a 0.09 m<sup>2</sup> piece of plywood which was set on the ground so that the lip of the

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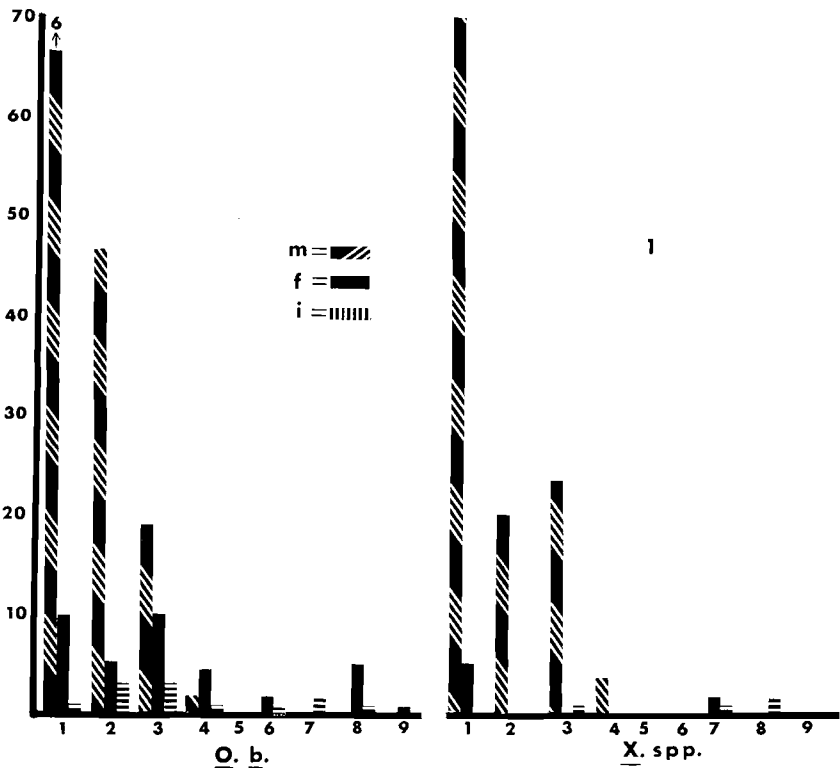


Fig. 1. Histogram for dionychous spider taxa in Table 2 (from *Populus* stands). Vertical axis = number of specimens, horizontal axis = trapping intervals. The intervals, all during 1972, are: 1. V/25-VI/8; 2. VI/8-VI/20; 3. VI/20-VI/30; 4. VI/30-VII/14; 5. VII/14-VII/28 (all from this interval were lost); 6. VII/28-VIII/10; 7. VIII/10-VIII/20; 8. VIII/20-IX/12; 9. IX/12-X/3. m, f, i = male, female, immature. *O. b.* = *Oxyptila bryantae*; *X. spp.* = *Xysticus* spp.

can was flush with the top surface of the plywood, and the rim of the board was sunk flush with the ground surface, providing an apron. In all cases (apron or not), a 0.09 m<sup>2</sup> board was propped up with nails to a height of about 4 cm over the trap to keep out rain and large debris. The aprons were used on half of the traps in aspen only. At each site within the stands 15 traps were set out in *Larix*, and 20 in *Populus*. The traps were placed 15 or more meters apart.

RESULTS

Table 1 gives the species composition and numbers collected throughout the season. Ten species were found in *Populus* but not in *Larix*, while two were collected in *Larix* but not in *Populus*. The spiders are seen to fall into dominant, influent and accessory classes as divided by Luczak (1963), exhibiting this common phenomenon even within a subgroup of an order.

Figures 1 to 4 are histograms of the numbers of dominant species (pooled species for *Xysticus*) as they occurred over the season. The six categories for *Populus*, and the four for *Larix* each accounted for 92% of all dionychous spiders caught within the respective stand types. The selectiveness of the catch for male thomisids is apparent. It seems unlikely that the male:female sex ratios are so discrepant. A more likely explanation is

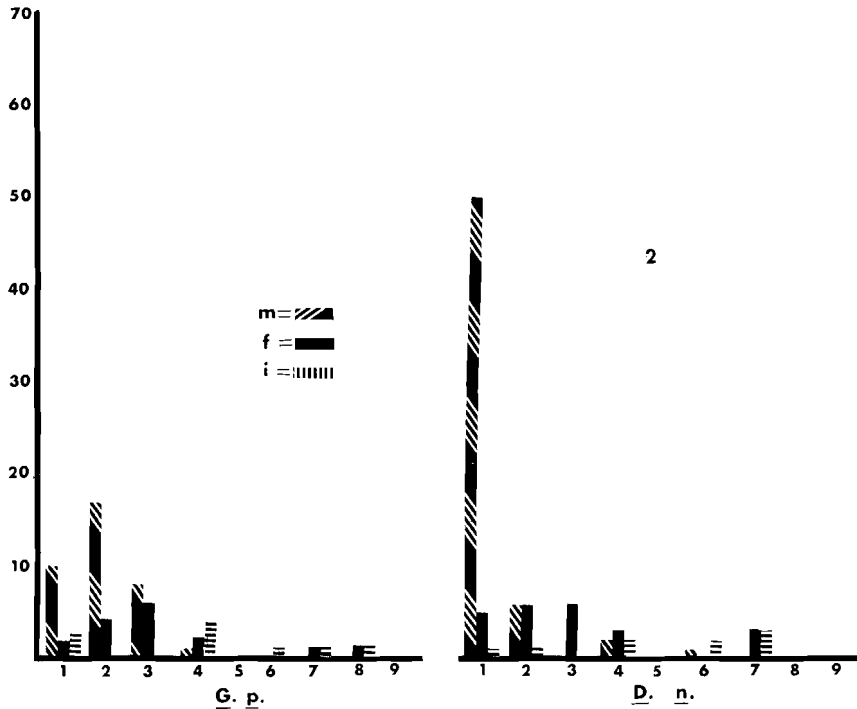


Fig. 2. For explanation see legend for Figure 1. *G. p.* = *Gnaphosa parvula*; *D. n.* = *Drassylus niger*.

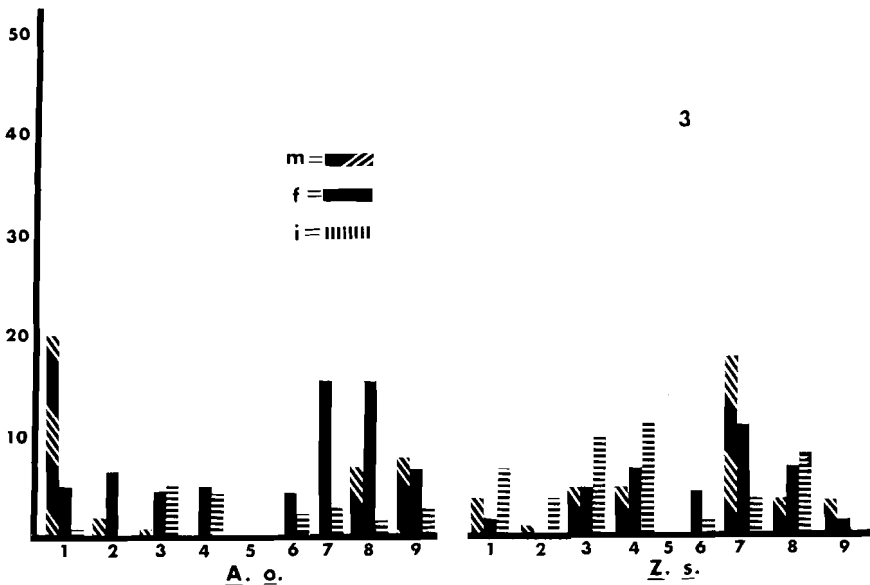


Fig. 3. For explanation see legend for Figure 1. *A. o.* = *Agroeca ornata*; *Z. s.* = *Zelotes subterraneus*.

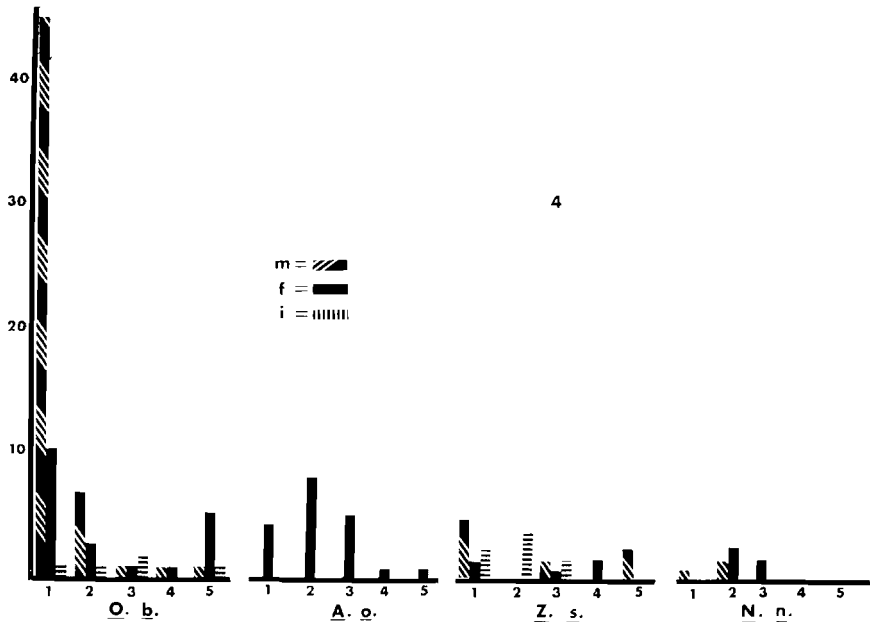


Fig. 4. Histogram for major dionychous spider species caught in *Larix* stands. Vertical axis = number of specimens, horizontal axis = trapping intervals. The intervals, all during 1972, are: 1. VI/1-VI/15; 2. VI/15-VII/2; 3. VII/2-VII/15; 4. VII/15-VIII/1; 5. VIII/1-VIII/15. m, f, i = male, female, immature. *O. b.* = *Oxyptila bryantae*; *A. o.* = *Agroeca ornata*; *Z. s.* = *Zelotes subterraneus*; *N. n.* = *Neon nellii*.

the wandering of the males during mating, in a hunt for the relatively sedentary females. The numbers of spiders caught from this family drops off rapidly after the period of male activity. In *Agroeca* and *Zelotes* the captures reflect the probable true nature of the activity of these spiders. It is also of interest that these spiders exhibit a bimodal activity period during the summer season in *Populus* stands. The absence of this bimodality in *Larix* may result from the absence of September collecting, or from microclimate conditions in the *Larix* stands. Those spiders which show a distinct male bias in the catch do not show this bimodality, even if the females alone are compared. Huhta (1965) remarked on this drop in abundance of litter layer spiders in midsummer in Finnish forests. He believes that this is a result of drying out of the surface layers, and of the spiders seeking the deeper litter layers, or cracks to avoid desiccation. The English species examined by Merrett (1967) exhibited varied phenology types. The English species within genera found in Minnesota may or may not have the same phenology patterns as the Minnesota species. This is not unexpected, since the habitat was so different. Merrett also found that within one genus the different species had different phenology patterns.

Table 2 gives the distribution of catches of the six dominant in traps with or without aprons from *Populus*. The total does not correspond to the total for the season since in the first two samplings the catches were combined. As may be seen, the traps with aprons caught almost exactly double the number of dionychous spiders than the traps without aprons. Comparing pairs against each other (traps with and without aprons) over the season, the traps with aprons had larger catches 78% of the time, traps without aprons had larger catches 11% of the time, and in the remainder the same number were caught in both trap types. Thus by any criterion, the traps with aprons were more efficient in catching dionychous spiders.

Table 1. Numbers of specimens of the different species of spiders caught in *Larix* and *Populus* stands.

	<i>Larix</i>	<i>Populus</i>
<b>CLUBIONIDAE</b>		
<i>Agroeca emertoni</i> Kaston	0	1
<i>Agroeca ornata</i> Banks	19	130
<i>Agroeca pratensis</i> Emerton	1	0
<i>Castianeira cingulata</i> (C. L. Koch) bicolor form	0	3
<i>Clubiona canadensis</i> Emerton	0	2
<i>Clubiona kaston</i> Gertsch	0	1
<i>Clubiona</i> sp.	2	2
<i>Phrurotimpus borealis</i> (Emerton)	0	11
<i>Scotinella pugnatus</i> (Emerton)	1	2
<i>Scotinella</i> sp.	1	0
<b>GNAPHOSIDAE</b>		
<i>Drassylus niger</i> (Banks)	0	90
<i>Drassylus</i> sp.	0	1
<i>Gnaphosa parvula</i> Banks	0	65
<i>Gnaphosa sericata</i> (L. Koch)	0	2
<i>Haplodrassus hiemalis</i> (Emerton)	0	4
<i>Micaria montana</i> Emerton	0	4
<i>Zelotes subterraneus</i> (C. L. Koch)	24	121
<b>SALTICIDAE</b>		
<i>Metaphidippus</i> sp.	0	1
<i>Neon nellii</i> Peckham and Peckham	7	3
<b>THOMISIDAE</b>		
<i>Oxyptila bryantae</i> Gertsch	71	191
<i>Tibellus maritimus</i> (Menge)	0	1
<i>Xysticus elegans</i> Keyserling	1	88
<i>Xysticus ellipticus</i> Turnbull, Dondale and Redner	0	1
<i>Xysticus ferox</i> (Hentz)	0	37
<i>Xysticus luctuosus</i> (Blackwall)	2	3
<i>Xysticus obscurus</i> Collett	2	0
<i>Xysticus</i> sp.	0	6
Total	131	770

Table 2. Comparison of number of specimens caught in traps with or without aprons. See text for discussion.

	Apron	No apron
<b>CLUBIONIDAE</b>		
<i>Agroeca ornata</i>	70	29
<b>GNAPHOSIDAE</b>		
<i>Drassylus niger</i>	18	7
<i>Gnaphosa parvula</i>	19	9
<i>Zelotes subterraneus</i>	70	40
<b>THOMISIDAE</b>		
<i>Oxyptila bryantae</i>	31	24
All <i>Xysticus</i> spp.	29	10
Total	237	119

### PARASITES

Three spiders from *Populus* had abdominal nematode parasites. These were a female *Zelotes subterraneus* taken in June, a presumptive female *Oxyptila bryantae* taken in August, and a presumptive female lycosid taken late August-early September. It is assumed in the last two cases that the spiders were female since they were large, but no female genitalia were seen since the epigynal region was destroyed.

A male *Z. subterraneus* taken in mid August from *Populus* was approximately two-thirds the size of the other males of this species taken. Except for the smaller size there were no abnormalities, no large parasites were seen, and the palpi were of normal structure and size in proportion to the body size.

### DISCUSSION

It would be tempting to try and deduce life history patterns from this study, however without having winter data this would be unduly speculative. In addition, information based on one season's data is too subject to the vicissitudes of an abnormal data set to make broad generalizations, even with a large number of specimens. What is instructive is the bias apparent in collecting with a pitfall type trap, especially within the Trionychia. The wandering lycosids were very well represented, but the numbers of linyphiids were extremely low, and probably reflected no more than a few per cent of their true abundance. Turnbull (1973) has amply remarked on this problem. The reader is referred to his excellent and acerbic comments.

### ACKNOWLEDGMENT

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