DISTRIBUTION OF LYCOSIDAE AMONG VARIOUS HABITATS IN MACKINAC COUNTY, MICHIGAN, INCLUDING RECORDS OF DIURNAL AND NOCTURNAL ACTIVITY

By

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ABSTRACT

DISTRIBUTION OF LYCOSIDAE AMONG VARIOUS HABITATS
IN MACKINAC COUNTY, MICHIGAN,
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Portions of a square mile in the Upper Penninsula of Michigan were sampled over a period of three months in an effort to determine the distribution of species of Lycosidae among various habitats and to observe their diurnal-nocturnal activities.

Randomly placed pitfall traps provided a weekly means of sampling populations in seven habitats within the section. Regularly placed pitfall traps provided recordings of diurnal activity in two habitats.

Individuals of Pardosa moesta Banks were captured in the greatest number. Tarentula aculeata (Clerck) and Trochosa pratensis (Emerton) were the only species captured in all seven habitats. The evidence of activity during the day and inactivity at night, as indicated in the diurnal-nocturnal study, is attributed to the tactile cueing of these spiders in motion in darkness.

Dedicated to

Gale R. Gleason, Jr.

Geolycosa missouriensis, with young, guarding the entrance to her burrow

ACKNOWLEDGEMENTS

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Rhonda Hines was responsible for the excellent pictorial summary of the field work, and to her I extend my heartfelt thanks. Jim O'Neil took and presented to me the introductory picture of the wolf spider, and to him I am also deeply grateful.

Lastly, I would like to thank my wife, Jolene, for the many unselfish hours she devoted to helping prepare this entire manuscript.

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INTRODUCTION

Wolf spiders constitute a family of hunting spiders in the Order Araneae of the Class Arachnida. Unlike most other families, these spiders do not construct a web for the capture of food, but instead stalk their prey on the ground. As a retreat, some construct tubular tunnels in the soil, and others utilize natural depressions under rocks and debris. Others never use a retreat, but are found running through grass, among dead leaves on the forest floor, or over sandy and stony areas (Kaston, 1978).

Sometimes considered as pests in human dwellings, wolf spiders are important in helping control other invertebrate pests, particularly insects; Dondale (1962) has speculated on their use in pest control. Enemies of the Lycosidae include other spiders and some species of insects and birds, but parasites and availability of food also help control spider populations (Levi, Levi and Zim, 1968).

An understanding of the role of the environment in the natural selection of these creatures can be enhanced by knowledge of their optimal habitats. Collectors generally record the habitats in which they find specific spiders. However, to this author's knowledge, no one has yet attempted to experimentally determine whether or not specific spiders are restricted to specific habitats.

Furthermore, taxonomic studies on the Lycosidae sensu strictu have not been performed in Michigan prior to this undertaking. Indeed, it appears to have been the rule that individuals of the

Lycosidae have been reported either incidentally or in the context of larger studies involving all the Araneae. Also, studies of the Lycosidae in Michigan reflect heavy bias toward collecting in the Lower Penninsula.

Chickering (1932; 1933; 1935) and Chickering and Bacorn (1933) published early taxonomic studies on six genera and 32 species of Lycosidae, all from the Lower Penninsula. Drew (1957) found four genera and eight species of Lycosidae in a woodlot near Lansing, and Hindle (1972) listed five genera and eight species from the area of Bog Lake, Michigan. One early study (Chickering, 1934) involved a subset of two genera and four species in an Upper Penninsula collection near Marquette, Grand Marais, and Ishpeming. Vail (1974) reported five genera and 16 species in his statewide survey of spiders associated with dwellings. While Drew (1965) tabulated six genera and 23 species in his Beaver Island survey, and Bixler (1967) reported six genera and 14 species from Isle Royale, no Lycosidae have yet been reported from Mackinac County.

The objectives of this study were:

1. to determine the species and frequency of species of Lycosidae in the area chosen in Mackinac County, and thus add to the knowledge of Lycosidae fauna in the Upper Penninsula of Michigan;
2. to examine the distribution of Lycosidae among diverse habitats.

3. to study some habits and diel activity the Lycosidae demonstrate.

STUDY AREA

All species of Lycosidae reported in this study were obtained from a one square mile area in Newton Township (T43N, R11W: S29), Mackinac County, Michigan. The study area (Fig. 1) is immediately west of Gould City, and bounded on the north by U.S.-2, east by Gould City Road, and south by Corinne Road. The western edge of this section has no visible natural or artificial boundary. The grade for the Soo Line Railroad cuts from the southwest corner of the section diagonally to north of the middle of the eastern boundary. The only inhabited houses in the section are those that border the western side of Gould City Road.

A man-made sandpit, centered in the southeast quarter of the section, is accessible from Corinne Road via a seldom used two-track road. A permanent pond approximately 75 meters in diameter is located in the northeast quarter of the southeast quarter of the section. East of this pond, and bordering on Gould City Road, a temporary pond approximately 120 meters in diameter appears in the spring of the year.

The area is approximately three-quarters grassland. The northwest quarter of the section is occupied by a stand of hardwoods, approximately 90% of which are sugar maple (Acer saccharum Marshall). A stand of conifers, primarily cedars (Thuja occidentalis Linnaeus), occupies the southwest quarter of the southeast quarter of the section. Scattered throughout the section are several stands of scotch pine

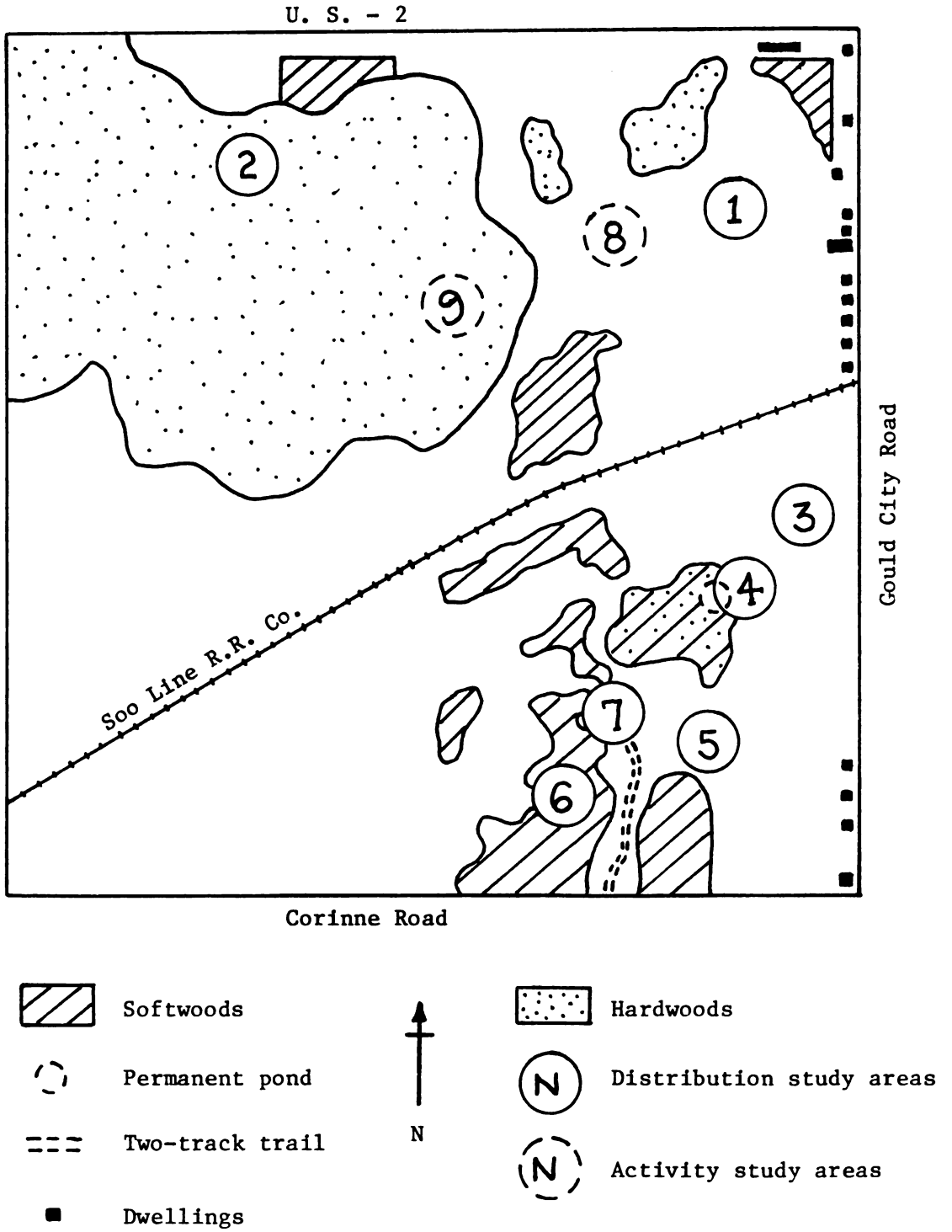

FIGURE 1: Study Area in Newton Township, Michigan, used for studying habitats and activities of the Lycosidae.

(Pinus sylvestris Linnaeus) that were planted in the late 1950's.

In this study, nine plots in seven different habitats were set up and numbered. Plots one through seven corresponded to the habitat study; plots eight and nine corresponded to the diurnal-nocturnal study. In a format similar to that of Boyd (1960) and Duffey (1966), the seven habitats containing these plots were selected on the basis of their superficial differences. These habitats represented areas of 1) grass, 2) hardwoods, 3) forb-grass vernal flooding, 4) pond shore, 5) rock terrain, 6) soft-woods, and 7) sand. A description of these habitats:

Habitat 1:

This area was located in the middle of a grassy field in the center of the section's northeast quarter. A mat approximately three centimeters thick was formed by short grass (Gramineae) mixed with previous years residue. Clumps of goldenrod (Solidago spp.) were scattered throughout. A thin layer of mosses (Musci) covered the ground beneath the mat (Fig. 2).

Habitat 2:

This area was located near the center of the deciduous forest that covered the greater portion of the northwest quarter of the section. Sugar maples approximately ten meters tall were the major flora. Other deciduous trees scattered throughout included a few paper birch (Betula papyrifera Marshall), beech (Fagus grandifolia Ehrhart), ironwood (Ostrya virginiana Miller), and yellow birch (Betula lutea Michaux). Some aspen (Populus spp.) were also present. The

FIGURE 2 (ABOVE): Study Area #1 used for Lycosidae habitat study; major ground cover was grass and goldenrod.

FIGURE 3 (BELOW): Study Area #2 used for Lycosidae habitat study; major ground cover was sugar maples.

most abundant saplings and seedlings were maple and beech. The soil was extensively covered with leaf litter, small twigs, and sticks (Fig. 3).

Habitat 3:

This area lies in the northeast corner of the southeast corner of the section and represents a low, grassy field that floods each spring when the permanent pond adjacent to it overflows. At the beginning of the study, after the flood water had dissipated, approximately 90% of the mud floor was covered with moss. As summer progressed, grasses sprouted, and near the end of the study this habitat resembled Habitat 1. During summer this area supported goldenrod, milkweed (Asclepias spp.), clover (Trifolium spp.), and miscellaneous forbs (Fig. 4).

Habitat 4:

Located in the southeast quarter of the section, this area was the eastern border of the permanent pond, and supported a variety of vegetative types. Among these were aspens of various sizes, apple trees, a few spruce (Picea glauca Moench) saplings, some willow (Salix spp.), cedar saplings and seedlings, and various forbs. Goldenrod and clover were both fairly abundant. The floor was typically grasses and forbs growing through the litter-covered moss (Fig. 5).

Habitat 5:

Located in the southeast quarter of the southeast quarter of the section, this area is characterized by its exposed rock floor. It is on a ledge overlooking Gould City Road. Sugar maples in

FIGURE 4 (ABOVE): Study Area #3 used for Lycosidae habitat study; area was completely submerged two months prior to time of photograph.

FIGURE 5 (BELOW): Study Area #4 used for Lycosidae habitat study; permanent pond in background is not visible in this photograph.

this area were approximately 12 meters tall. Grass in this area was sparsely distributed, as were the seedlings and forbs (Fig. 6).

Habitat 6:

Located on the western side of the southeast quarter of the southeast quarter of the section, this area consisted of cedars approximately nine meters tall interspersed with a few spruce, cedar saplings and several paper birch trees. The area had a floor covering of cedar needles approximately two centimeters deep. Much of the floor was shaded, and a few scattered grasses were evident (Fig. 7).

Habitat 7:

This area consisted of a region in which sand had been removed from the side of a hill in the southwest quarter of the southeast quarter of the section. The excavated area measured approximately 25 meters in diameter. Although mature aspen surrounded the area, the pit was relatively free of vegetation. There were scattered goldenrod, grasses and forbs, and numerous aspen seedlings; however the area has the appearance of a sandy hillside on the edge of a field (Fig. 8).

Areas eight and nine, which contained the plots used in the diurnal-nocturnal activity study, were located in Habitats 1 and 2 respectively (Figs. 9, 10). Therefore, each of these two habitats contained two sets of plots; one for the habitat study, and one for the diurnal-nocturnal activity study. Each of the five other habitats contained only a plot for the habitat study.

FIGURE 6 (ABOVE): Study Area #5 used for Lycosidae habitat study; major ground cover was rock and grass.

FIGURE 7 (BELOW): Study Area #6 used for Lycosidae habitat study; major ground cover was cedar.

FIGURE 8 (ABOVE): Study Area #7 used for Lycosidae habitat study; major ground cover was sand.

FIGURE 9 (BELOW): Site of diurnal-nocturnal Lycosidae activity study in field; plot measures six meters by six meters.

FIGURE 10 (ABOVE): Site of diurnal-nocturnal activity study in hardwoods; plot measures six meters by six meters.

FIGURE 11 (BELOW): Initial placement of pitfall trap in Lycosidae habitat study showing antifreeze and flag.

HABITAT STUDY

The habitat study was designed to satisfy the objective of determining the species of Lycosidae in each of the seven selected habitats within the study area. Satisfying this objective allows a comparison of the species of Lycosidae of each habitat.

Methods

Within each of the seven selected habitats, ten pitfall traps were randomly placed on a north-south oriented grid in a ten by ten meter area which had been selected for its characteristic habitat.

This investigator used pitfall traps similar to those used by Fichter (1941), Mitchell (1963) and Best (1977). Each trap consisted of a 600 ml white plastic food container having a diameter of 11.4 cm across the open top, a diameter of 9.0 cm across the bottom, and having a depth of 7.2 cm. Containers were obtained from Michigan State University Food Stores and came equipped with clear plastic snap-on lids.

Traps consisting of containers were set in the ground with their lips flush to the substrate. No protective covers were used. Each trap was accompanied by a red marker flag to help locate traps which would later be concealed by undergrowth (Fig. 11).

Each of the traps was filled with approximately 200 ml of Chemcraft® antifreeze. This ethylene glycol based commercial solution has a low evaporation rate, kills and preserves spiders, and

is less expensive than laboratory grade ethylene glycol recommended for pitfall traps (Best, 1977). In addition, the blue hue of the solution provides a visual measure of rainwater dilution (Fig. 12).

Each of the seventy traps was picked up and replaced each week during the study. Each lid was labeled with a habitat, trap, and collection date number. In the laboratory, the contents of each trap were sorted. Spiders in each trap were transferred to six-dram vials containing approximately 75% ethyl alcohol and three drops of glycerin. All spiders were preserved for later identification with this technique.

All wolf spiders in this study and in the diurnal-nocturnal activity study were identified to genus and species using Kaston (1948). In some instances Kaston (1978), Levi and Field (1954), and Levi, Levi and Zim (1968) were used in making determinations. Spiders of the genus Pirata were identified using keys provided by Wallace and Exline (1977).

Results and Discussion

A total of 2218 wolf spiders were identified to species (Fig. 13). Although the eight genera and 22 species of Lycosidae reported in this study is less than the nine genera and 50 species this author has determined to have previously been reported from Michigan by Chickering (1932; 1933; 1934; 1935), Chickering and Bacorn (1933), Drew (1957; 1965), Bixler (1967), Hindle (1972) and Vail (1974), these findings add to the checklist of Lycosidae from the mainland

FIGURE 12: Pitfall trap in Habitat 7 of the Lycosidae habitat study; rainwater dilution of antifreeze and labelling technique can both be seen.

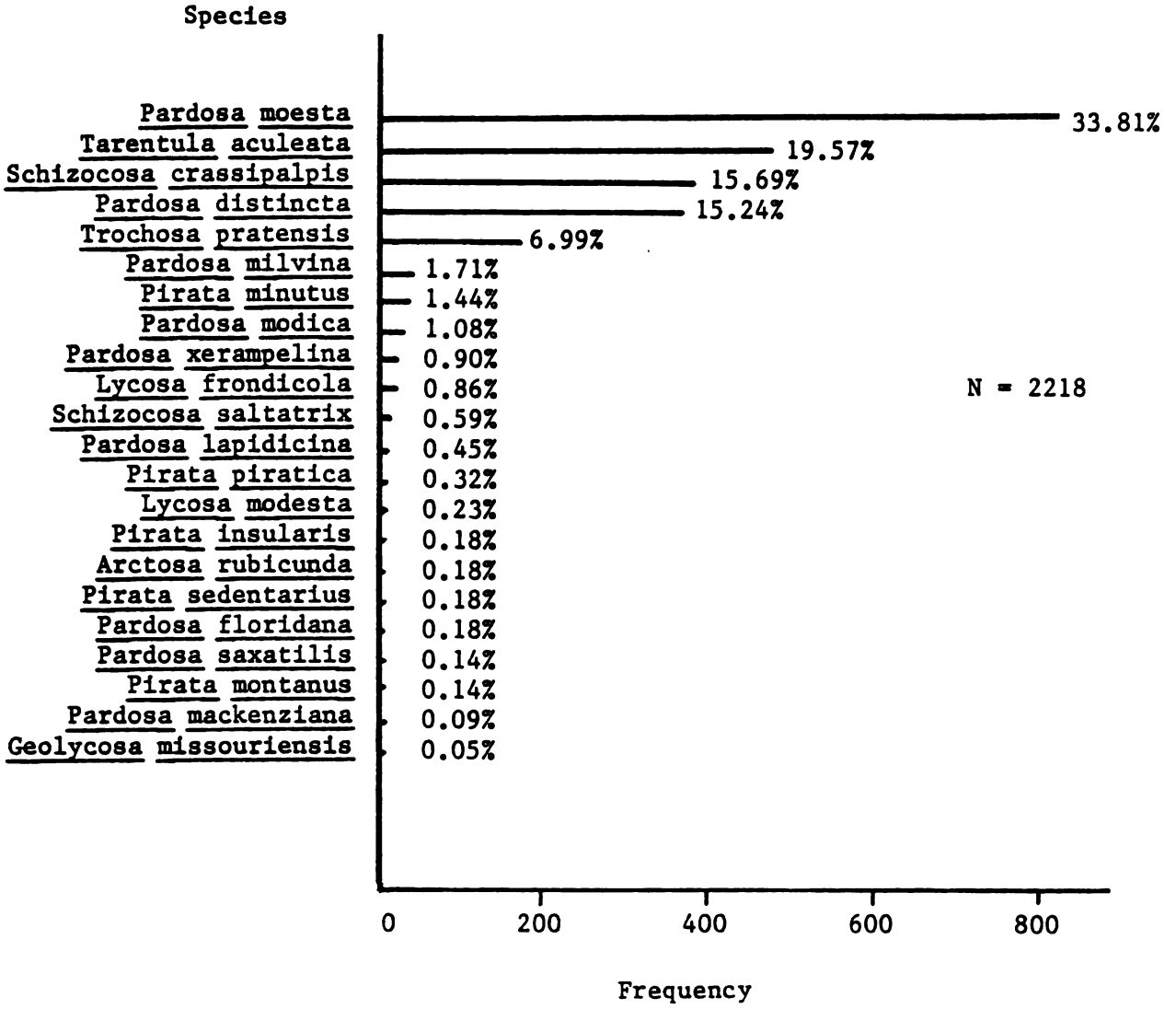

FIGURE 13: Species and percentages of Lycosid spiders by frequency of occurrence, captured in all areas throughout study.

Upper Penninsula of Michigan established by contributions from Chickering (1934) and Vail (1974).

The species most prevalent in the area studied was Pardosa moesta. Individuals of this species were captured in numbers almost twice that of the next most common species, Tarentula aculeata. These two species, along with Schizocosa crassipalpis, Pardosa distincta and Trochosa pratensis, accounted for over 90% of all individuals captured in this study. Species with numbers of individuals totaling less than 1% of all individuals captured, and habitats in which found, are listed in Table I.

A summation of species:

Arctosa rubicunda (Keyserling)

Geolycosa missouriensis (Banks)

Lycosa frondicola Emerton

modesta (Keyserling)

Pardosa distincta (Blackwall)

floridana Banks

lapidicina Emerton

mackenziana (Keyserling)

milvina (Hentz)

modica (Blackwall)

moesta Banks

saxatilis (Hentz)

xerampelina (Keyserling)

Pirata insularis Emerton

TABLE I: SPECIES OF LYCOSIDAE REPRESENTED BY LESS THAN 1% OF TOTAL CAPTURE AND HABITATS IN WHICH FOUND

Species	Total Captured	Area 1	2	3	4	5	6	7
Arctosa rubicunda	4			2	2			
Geolycosa missouriensis	1							1
Lycosa frondicola	19	1	1			10	4	3
Lycosa modesta	5	2		2	1			
Pardosa floridana	4			3		1		
Pardosa lapidicina	10	1		3	3	2		1
Pardosa saxatilis	3	1		1	1			
Pardosa xerampelina	20			2	12	5		1
Pardosa mackenziana	2		2					
Pirata insularis	4			2	2			
Pirata montanus	3				3			
Pirata piratica	7			3	4			
Pirata sedentarius	4				4			
Schizocosa saltatrix	13				3	6	1	3

TABLE II: COMBINED RECORD FOR SIX LEAST COMMON LYCOSIDAE SPECIES OF DIURNAL-NOCTURNAL STUDY

Species	Total Captured Woods + Field	Time (hrs) 2400 - 0300	0300 - 0600	0600 - 0900	0900 - 1200	1200 - 1500	1500 - 1800	1800 - 2100	2100 - 2400
Lycosa frondicola	2			1					1
Pardosa moesta	4				3	1			
Pardosa xerampelina	3					2		1	
Pirata minutus	2			1	1				
Schizocosa saltatrix	1			1					
Trochosa pratensis	4				1		2		1

minutus Emerton

montanus Emerton

piratica (Olivier)

sedentarius Montgomery

Schizocosa crassipalpis (Emerton)

saltatrix (Hentz)

Tarentula aculeata (Clerck)

Trochosa pratensis (Emerton)

Kaston (1948) indicated the habitats from which his specimens were obtained. In general, species collected in this study were found in the habitats he described for the same species. For example, Kaston (1948) and Bixler (1967) both list Pardosa distincta as an open field species, and the results presented here (Figs. 14a, 16a) agree with their studies. It is notable that Barnes (1953) did not report this species in his study of non-forest spiders in North Carolina. According to Kaston (1978), the range of this species is New England and adjacent Canada south to North Carolina and west to Arizona and Montana. Therefore, the results of Barnes (1953) reflect either the range of this species or the distribution of collectors.

In his study of spiders in an overgrazed pasture in eastern Ontario, Turnbull (1966) cites Pardosa saxatilis, Pardosa milvina and Pirata minutus as three of his most commonly found species. This study is in concurrence; Pardosa saxatilis (Table I), Pardosa milvina (Figs. 14c, 16b) and Pirata minutus (Figs. 14c, 16c) were all

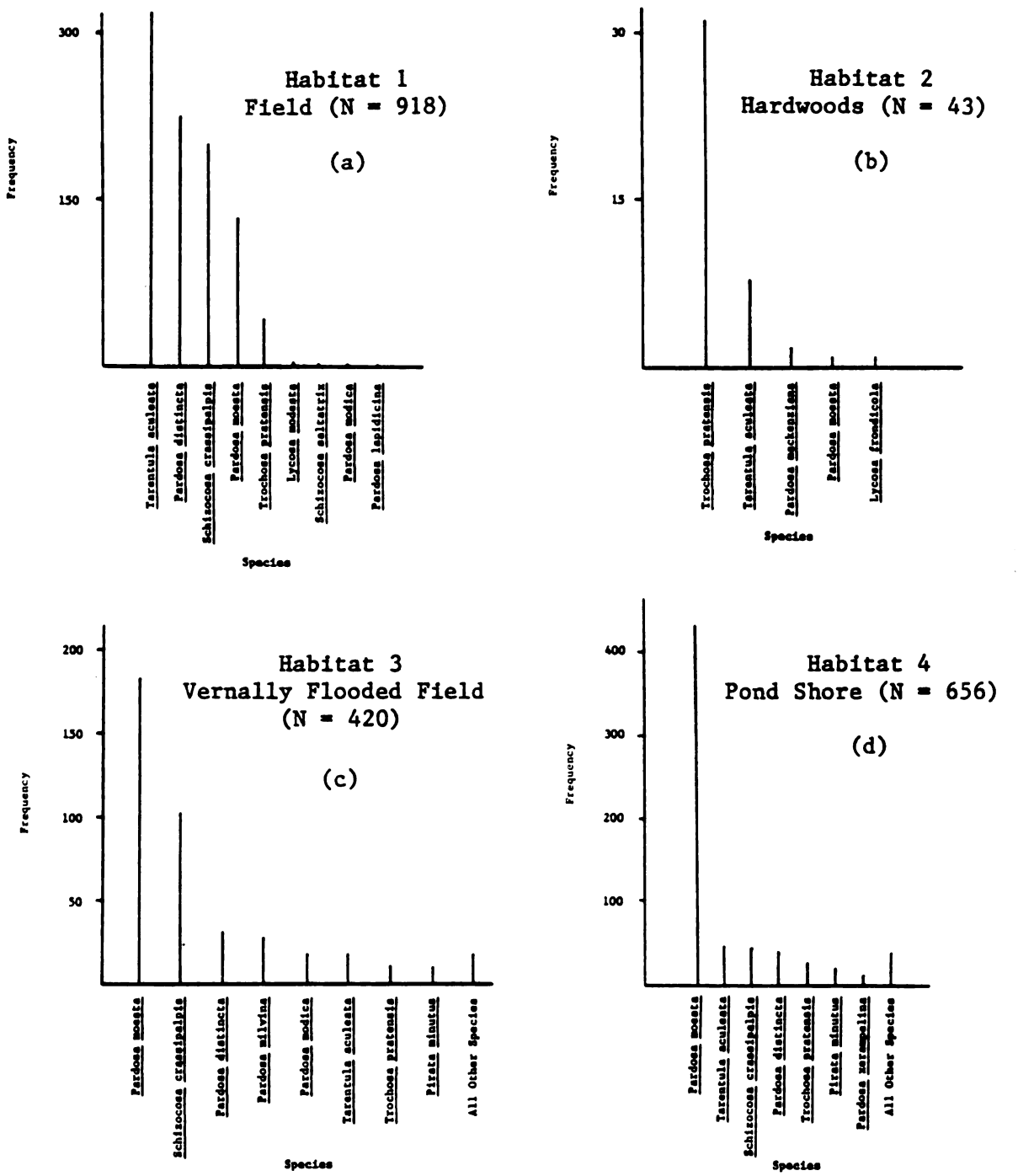

FIGURE 14: Lycosidae species composition of (a) grass field, (b) hardwoods, (c) vernally flooded field and (d) pond edge habitats of the Lycosidae habitat study. The total number of individuals captured from June through August is given for each Habitat.

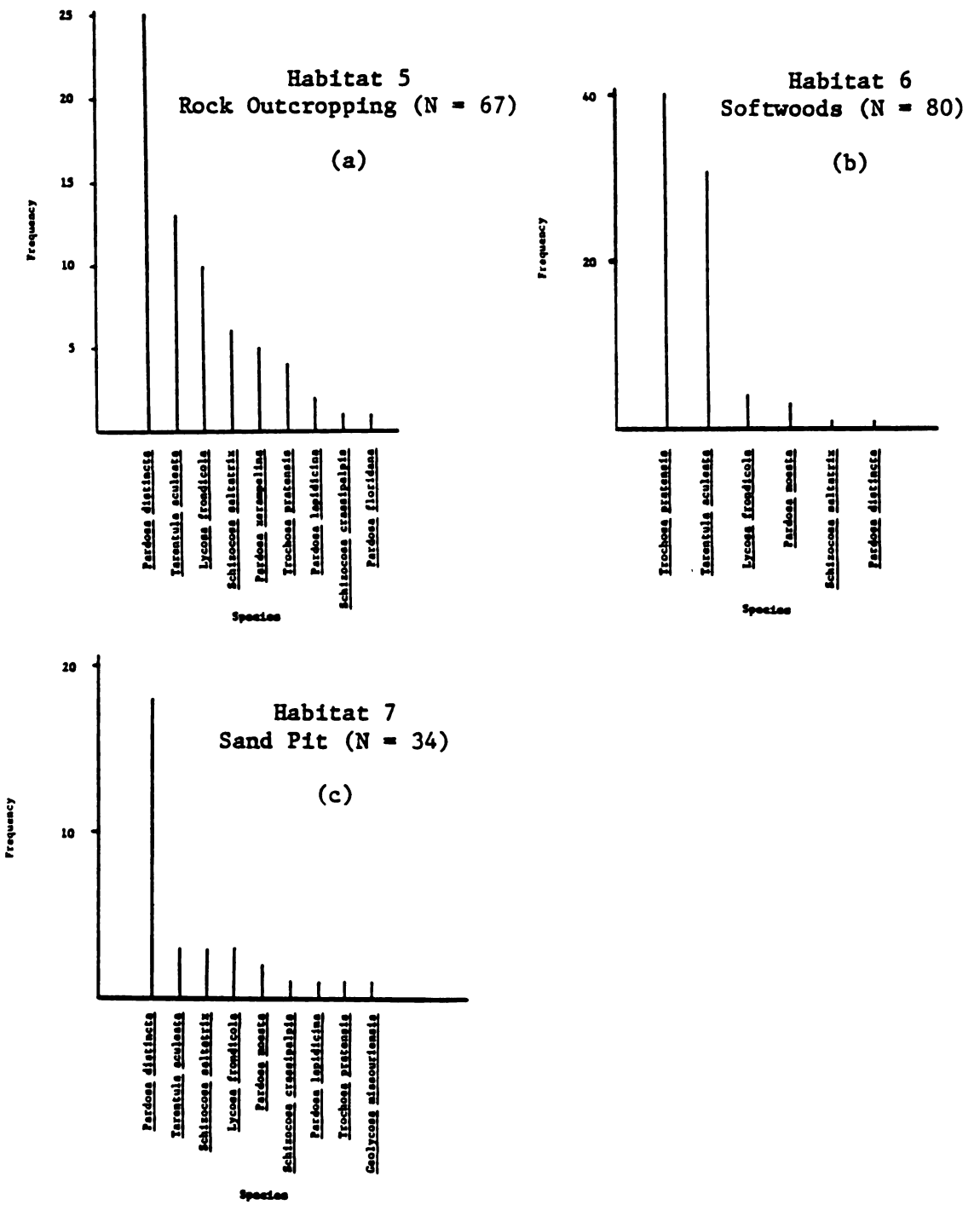

FIGURE 15: Lycosidae species composition of (a) rock outcropping, (b) softwoods and (c) sand pit habitats. The total number of individuals captured from June through August is given for each Habitat.

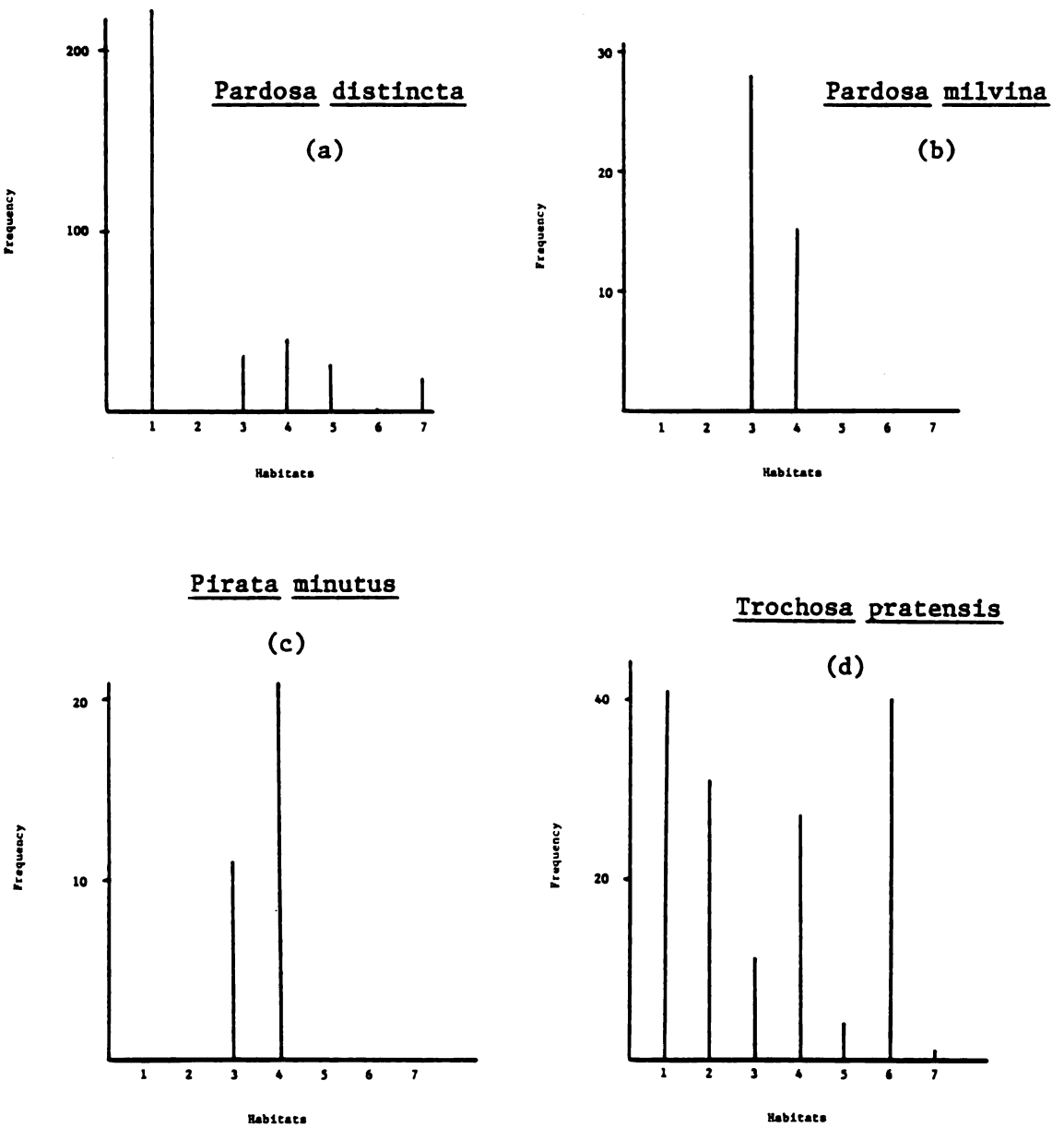

FIGURE 16: Distribution of (a) Pardosa distincta, (b) Pardosa milvina, (c) Pirata minutus and (d) Trochosa pratensis among habitats of the Lycosidae habitat study.

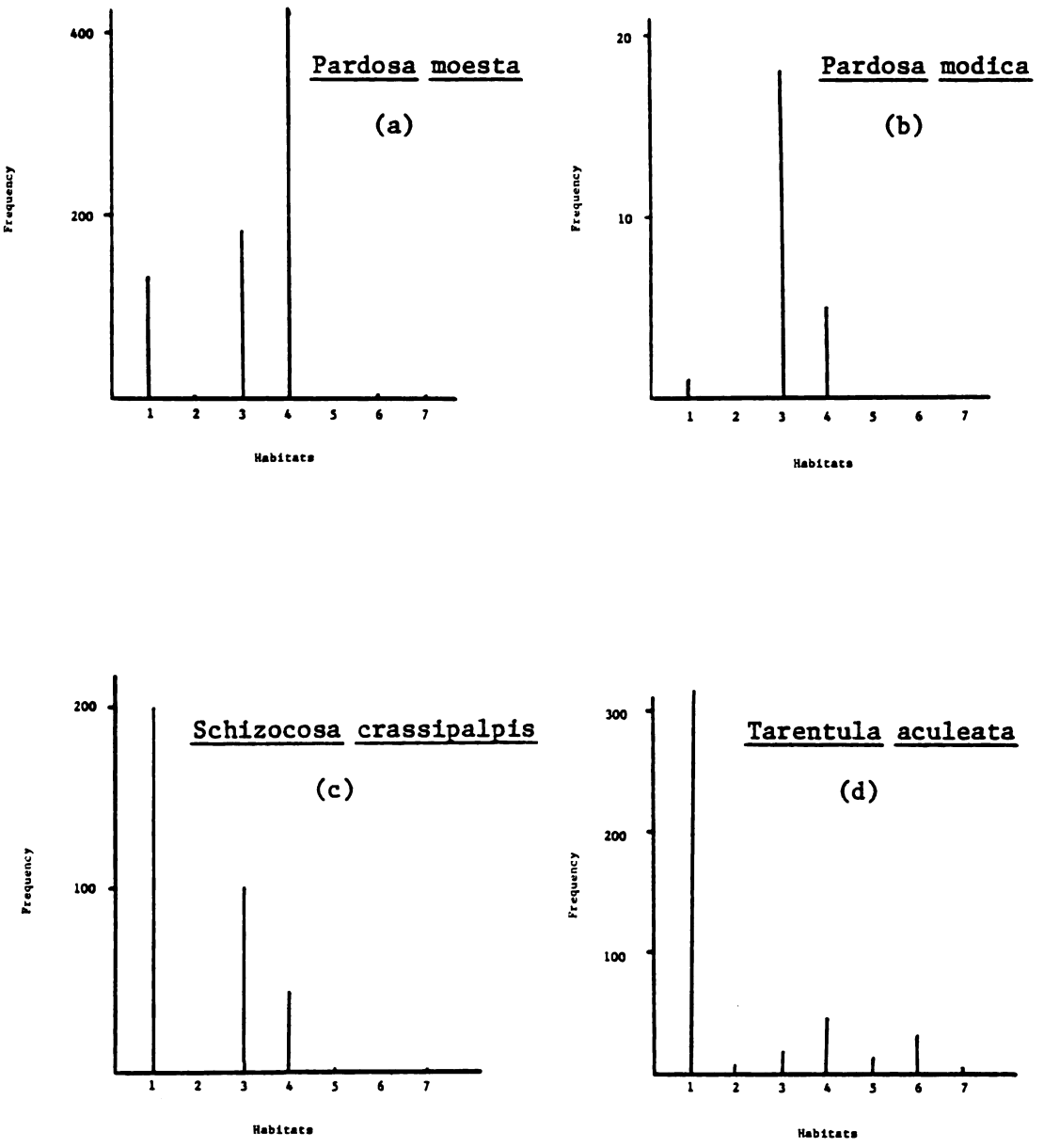

FIGURE 17: Distribution of (a) Pardosa moesta, (b) Pardosa modica, (c) Schizocosa crassipalpis and (d) Tarentula aculeata among habitats of the Lycosidae habitat study.

found in relatively open areas. Individuals of Pardosa saxatilis were captured only in the spring of the year in areas of pond edge and vernally flooded field, a time during which the vernally flooded field was void of grasses and the pond edge had little ground cover. Pardosa milvina was in the vernally flooded field only in the spring of the year, just after the water had dissipated and the area was void of grass. Kaston (1948) reports Pirata minutus as a marsh lowland inhabitant. This study found Pirata minutus to be exclusively an inhabitant of habitats three and four, the vernally flooded lowland and pond shore habitats (Fig. 16c).

Schizocosa crassipalpis was found predominantly in the grass field (Fig. 17c). It became increasingly abundant in the vernally flooded area as the summer progressed and this area dried and became more like area one. Schizocosa crassipalpis is clearly a meadow species, being absent in both hardwoods and softwoods.

As indicated in Table I, several species of Lycosidae were found in only a single habitat. These species included Geolycosa missouriensis, Pardosa mackenziana, Pirata montanus and Pirata sedentarius. Since they were represented by only a few individuals, it is difficult to make a valid assignment of specific habitats to these species. Another individual of Geolycosa missouriensis, for example, was observed in another habitat but did not fall into a pitfall trap. Therefore, it was not included in Table I. As might be expected, no species represented by less than 1% of the total capture was found in all seven areas studied.

Species commonly trapped (greater than 1% of the total number of captured individuals) in this study generally tended to be absent from at least one habitat. For example, Pardosa distincta (Fig. 16a) is rare in the hardwoods and softwoods. Because a number of biotic and physical factors may determine the habitat of a particular species (Lowrie, 1948), it is difficult to properly assess one variable as the cause of a particular species being present or absent in a given habitat. It is possible that Pardosa distincta has a light or temperature requirement that eliminates this species from the woods. Predation may reduce the number of individuals of this species in these two areas, or perhaps the darkness in the woods causes these spiders to rely heavily on tactile cues, thus avoiding pitfall traps more readily. Curtis (1980) has compared the efficiency of different types of pitfall traps in spider community studies, and it is possible the type of pitfall trap used in this study is inefficient in capturing this species of Lycosidae.

Pardosa modica was found almost exclusively in area three (Fig. 17b), the vernally flooded field, but a few were collected in areas one and four, the grass field and pond shore areas. Kaston (1948) describes these habitats in his reference to collecting this species, and therefore these data agree.

Trochosa pratensis (Fig. 16d) and Tarentula aculeata (Fig. 17d) are the only species found in all seven of the habitats examined. While the reason for this is not entirely clear, the large number

of individuals of both of these species also reflects their adaptive success. Apparently, they can not only survive in the variety of habitats examined, they also do well reproductively. Kaston (1978) describes the ranges of both of these species as extending across the northern United States and southern Canada, with Trochosa pratensis found as far south as North Carolina. It appears these spiders are in the middle of their geographical range in the Upper Penninsula of Michigan, and thus might be expected to be surviving there.

Other species of Lycosidae represented by large numbers of individuals in this study were not ubiquitous. However, the areas in which these other species appear to be absent were generally low yield areas for all species of Lycosidae. Therefore, there is a possibility that biases associated with the pitfall traps are responsible for their absence in the pitfall traps in those areas.

Interestingly enough, Bixler (1967) found Tarentula aculeata to be a forest species. The data from this study indicate Tarentula aculeata is clearly a field species (Fig. 17d). It is possible that on Isle Royale Tarentula aculeata could not adopt its normal habitat and therefore adapted to the forest. Recalling the biotic factors mentioned by Lowrie (1948), it is possible that Tarentula aculeata survived on Isle Royale because a woodland competitor had failed to colonize the island. Equally plausable is the possibility that a predator of Tarentula aculeata had not colonized Isle Royale. The absence of interspecific competitive or predatory factors may have insured the survival of Tarentula aculeata on Isle Royale.

The most intriguing spider associated with the habitat study was Geolycosa missouriensis. The photograph at the beginning of this manuscript shows a female of this species at the entrance to a burrow in the sand of habitat seven. This spider, with her young, was the only animal observed at the entrance to that burrow, and she was never observed away from the burrow. She retreated into the burrow when approached, and quickly cleared the entrance of debris, such as straw, twigs, and pebbles, placed deliberately to observe her reaction.

Two other geolycosids were observed in the rocky outcropping area, where they had somehow managed to construct a burrow in the soil between the rocks. While it was originally thought that a Geolycosa population had entered the area via a belt of sandy soil extending nine miles from the beach of Lake Michigan, the burrows in the rocky substratum indicated Geolycosa did not need a continuum of sand to extend its range. Furthermore, the fact that no geolycosids were captured in pitfall traps suggests they remain close to their burrows, at least during the season of this study.

DIURNAL-NOCTURNAL ACTIVITY STUDY

Past research has demonstrated the feasibility of invertebrate activity studies based on pitfall analyses of different habitats (Williams, 1959; Pedigo, 1970). However, Muma and Muma (1949) suggest caution in interpreting diurnal pitfall data because of their findings that some species of spiders exhibit vertical daily migration as well as, or other than, horizontal daily migrations.

Methods

Areas eight and nine, which represented areas in the grass field habitat and deciduous forest habitat, were examined for diurnal-nocturnal movement of Lycosidae. For a 24 hour period beginning every two weeks - six times from June through August - 36 pitfall traps were placed evenly in a six by six meter area in each of the two habitats (Figs. 9, 10). All 72 traps were emptied and recharged every three hours, so that eight collections were made during each 24 hour period. Spiders of each collection time were separated into vials corresponding to their respective areas of capture.

Results and Discussion

Assuming pitfall traps can indicate periods of activity in the Lycosidae, the results of this study indicate Pardosa distincta and Schizocosa crassipalpis are most active in the mid-afternoon (Fig. 18). Tarentula aculeata (Fig. 18c) appears to be most active in the mid-afternoon until just before dust. Pitfall data indicate these three

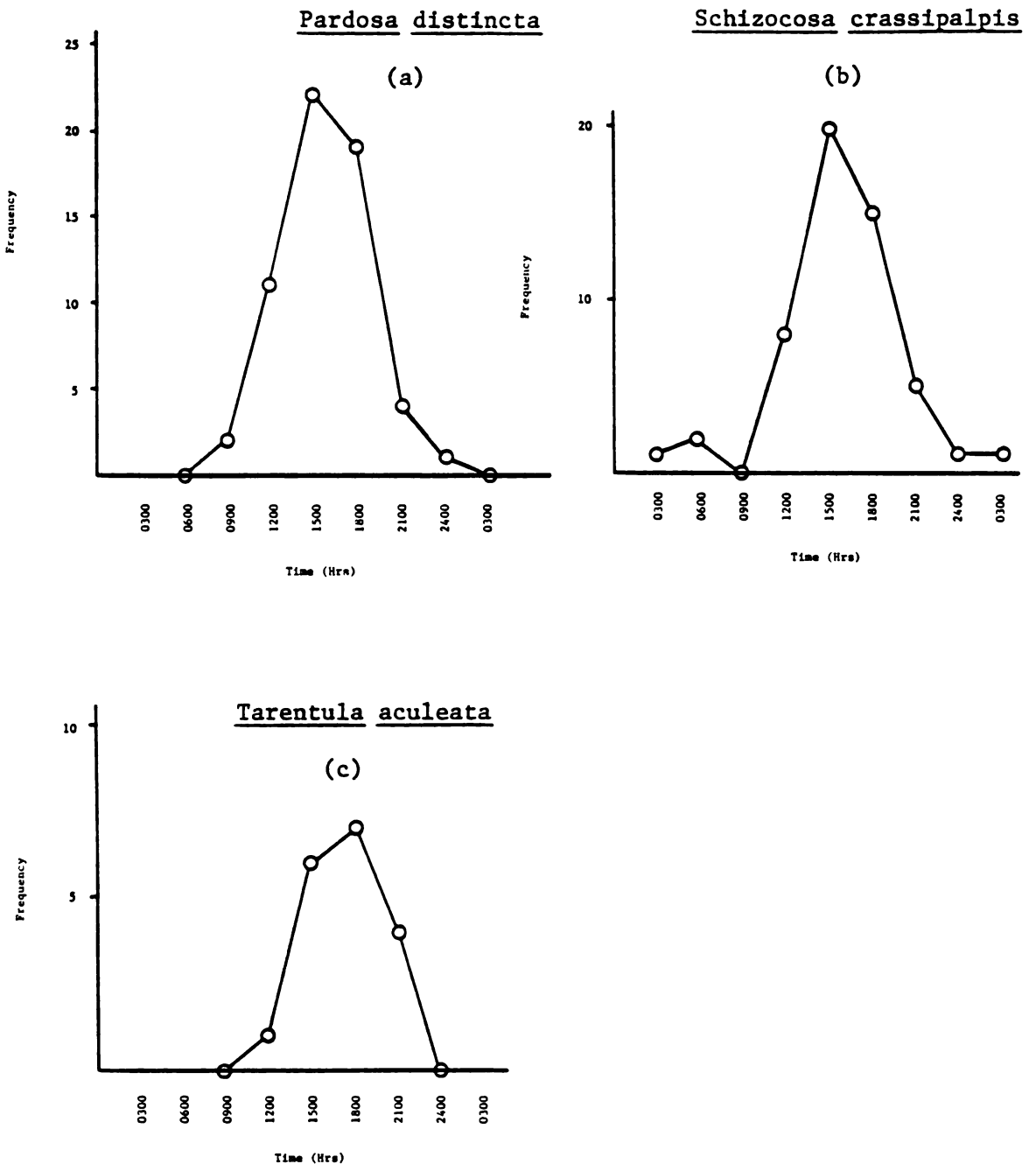

FIGURE 18: Frequency of (a) Pardosa distincta, (b) Schizocosa crassipalpis and (c) Tarentula aculeata capture in 24-hour periods - six collections June 8 - August 31 for grass plus hardwood plots.

species are all inactive at night. Even in the instances of those Lycosidae that were not numerous in the diurnal-nocturnal study (Table II), the available data indicate activity during the day and inactivity at night.

Authors have suggested hunting wolf spiders at night with a flashlight (Levi, Levi and Zim, 1968; Kaston, 1978). After dark, they are supposedly out of hiding and actively seeking prey. In addition, the reflective quality of their eight eyes simplifies the task of locating them in the dark.

While these spiders may reach peak activity during the day as indicated in this study, a bias associated with pitfall traps in diurnal-nocturnal study may be responsible for these results. Haynes (1981) suggests that these spiders operate under different stimuli at various times of the daily cycle. During the day, they probably use visual cues for orientation. At night, they may feel their way over the substrate, advancing cautiously and thus detecting pitfall traps more readily. For this reason, care should be exercised in interpreting invertebrate activity based on diurnal-nocturnal pitfall results.

SUMMARY AND RECOMMENDATIONS

(1) A square mile in the Northern Penninsula of Michigan was studied in an effort to determine the distribution of species of Lycosidae among various habitats and to observe the diurnal activities these species exhibit.

(2) This study took place during the period from May 25 to August 31, 1978.

(3) Randomly placed pitfall traps provided a weekly means of sampling populations in seven habitats within the section.

(4) Regularly placed pitfall traps provided recordings of diurnal activity in two habitats.

(5) A total of 2218 individuals of the Lycosidae were identified to species. This number represented 8 genera and 22 species.

(6) Pardosa moesta Banks was found to be the species most frequently captured, and accounted for 33.8% of the total capture.

(7) Individuals of Tarentula aculeata (Clerck), Schizocosa crassipalpis (Emerton), Pardosa distincta (Blackwall) and Trochosa pratensis (Emerton) comprised 57.5% of the total capture.

(8) Tarentula aculeata (Clerck) and Trochosa pratensis (Emerton) were the only species represented by pitfall captures in all seven habitats sampled.

(9) Activity during the day and inactivity during the night was evidenced by those species of Lycosidae captured in diurnal-nocturnal study, but this is attributed to tactile cueing of these spiders in motion in darkness.

(10) A device for automatic timed emptying of pitfall traps (Williams, 1958) is recommended for activity studies in the future.

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