(2)

Report for

ZOOLOGY 369

Investigation in

Natural History of Invertebrates

Directed by Dr. Frank E. Eggleton

Fall Semester, 1948-49

Gertrude L. Ward
Ann Arbor, Mich.
January 1949

Introduction: An investigation into the natural history of some of the spiders in the region of Ann Arbor, Washtenaw county, Michigan, was begun on October 19, 1948. It was believed advisable to sample the spider population in order to determine the material available for further study. During this sampling, observations were made on:

1. temperature, weather and conditions of surroundings
2. activity of the spider
3. presence or absence of a web or nest
4. presence of other invertebrates.

Method: The spiders were caught in several ways; for example, with a forceps, by hand, or, when possible, by putting a vial over the spider, letting the animal walk in, or allowing it to drop into a vial held beneath it. A few spiders were observed without being collected, and several egg capsules were collected. Most collecting was done at White's woods and the Fred Ferguson farm, Dixboro road.

Taken back to the Natural Science building, the captured spiders were kept in vials, usually 2-dram screw-cap vials for small individuals, 2-ounce square packers for larger spiders, and 4-ounce square packers for the largest. Room temperature varied between approximately 20 to 27 degrees Centigrade.

No regular feeding schedule was maintained as the spiders of different sizes seemed to require varying amounts of food. From October until January, Drosophila sp. was the usual food. A few phalangids were occasionally fed to the larger spiders. Beginning on January 7, aphids were generally used as food. The

aphids have an advantage as food supply because no etherizing is required, as is necessary when using Drosophila, and the fact that many sizes of aphids are found concurrently. Sometimes the Drosophila have seemed too large for the smaller spiders to handle.

If the vials were very dry when food was introduced, a drop of tap water was placed inside. The spiders were often observed to go to the water, and, apparently, drink it.

As spiders died, they were placed in 70 per cent alcohol. Records were kept on the date of spider's death and other phenomena, such as molting.

During the winter vacation, most of the spiders alive at the time were placed in a cold room in the basement of the Natural Science building. They were put in a room at 15.5 degrees Centigrade on December 13. On December 17 the spiders were fed and moved to a slightly colder room, 10 degrees Centigrade, until January 3. Thirteen spiders, most of them Coras fidelis (Agelenidae), were taken to Richmond, Indiana, where they were kept at a temperature of approximately 21 degrees Centigrade. They were returned to Ann Arbor on January 2, 1949. All of the latter group were fed Drosophila during the two-week period and were alive January 2. Of the group kept in the cold room, 11 were dead, out of a total of 39.

Observations: When the larger spiders were found, many of them were in webs in protected places such as old stumps, under bark of fallen logs or under stones. Most frequently, the agelenids were in webs, while the Thomisidae were merely hiding under some objects. Spiderlings, many of the unclassified, but including

lycosids and pisaurids, were usually active. The sluggish spiders included the Thomisidae and Attidae, at the lower temperatures. The attids were found abundantly on the tops of fence posts (cedar) on the Ferguson farm and very active at 28 degrees Centigrade. Most of the members of this family were distributed one to a post, with an occasional Thomisidae sharing the same post. The spiderlings were in more or less moist locations, usually among grassroots or leaves of the forest floor.

Activity in the field may be tabulated as follows:

<u>active</u> (80)		<u>in a web or nest</u> (30)		<u>sluggish</u> (6)	
no.	°C	no.	°C	no.	°C
1	at 2.5°	3	at 2°	3	at 6°
2	" 7	3	" 2.5	1	" 7
3	" 8.5	2	" 5.5	1	" 9.5
1	" 9	2	" 6	1	" 11.5
13	" 11	1	" 7		
12	" 11.5	7	" 8.5		
12	" 13.5	2	" 11		
6	" 14	4	" 11.5		
14	" 17	4	" 13.5		
11	" 20.5	1	" 14		
1	" 21	1	" 17		
1	" 22.2				
3	" 28				

It would be best if this data could be interpreted in the light of information which I do not have, that is, the area covered and time spent in the field, at the specific temperatures. It does show, however, that spiders can be active at near-freezing temperatures.

Other animals associated with spiders in the field included isopods, phalangids, <u>Anguispira alternata</u>, grasshopper (<u>Melanoplus femur-rubrum</u>), milkweed beetle (<u>Tetraopes</u> sp.), and ants. Isopods were commonly found under logs where spiders were located in nests, apparently not preyed upon because of their tough exoskeleton. Phalangids were observed with spiders, for example

under logs and planks, and apparently were not preyed upon by the spiders. In captivity some spiders rejected phalangids as food while other individuals of the same species, Coras fidelis, readily fed upon them. The use of phalangids as food may depend upon the degree of hunger of the spider.

A pisaurid was found under the same log which was covering a group of approximately 75 Anguispira alternata. It seems most probable that the spider walked under the edge of the log as it was raised.

The grasshopper and milkweed beetle were found dormant at 6 degrees Centigrade under a small rotting log with representatives of the Argiopidae, Thomisidae and Lycosidae, as well as isopods. Ants were found generally where spiders were active, not in nests.

Webs and Nests: After the spiders were placed in vials, some of them made webs of one sort or another. Perhaps these "webs" would be better classified as nests. There are definite individual variations, although the species differences are most noticeable.

In general, the most elaborate webs were those made by the Agelenidae, especially Coras fidelis. Of this species, the individuals that appear to be females (possibly immature males) have the largest webs. One male has made no attempt at web or nest building.

The Attidae have merely a coating a silk strands over the sides of their vials and appear to use them to aid in walking over the glass. Two attids, however, have built nests. One has two small webbed platforms on upper corners of a 4-ounce packer, and the spider often rests in one or the other. The other attid, a smaller one, has a web across the opening to its

2-dram vial. This web is made of five parallel sheets of spun silk, placed horizontally to the opening so that Drosophila are introduced between the layers.

Another spider, so far unidentified, has spun platforms or nests in the upper four corners of its 4-ounce packer. Two small unidentified spiders have nests in the shoulders of their 2-dram vials.

Feeding Habits: The Agelenidae, as is characteristic of the family, wait in their webs for the appearance of food, then rush out of a tunnel to pounce upon it. The Attidae become very active upon the appearance of food and often make short dashes around their vials before grasping the small prey.

One spider, tentatively identified as Trachelas sp. (Clubionidae), was found in a small, compact nest on a stone pillar, but made no attempt at nest building after capture. She pounced upon flies while they were still etherized and she seemed to try to gather several in front of her.

A small unidentified spider was accustomed to hang in a flimsy web, and after Drosophila were introduced into the 2-dram vial, to dash out and wrap each fly in a net of silk.

Another unidentified spider spent most of its time hanging inverted with its legs folded in a way that reminded me of a bat. When flies were introduced into the 4-ounce packer, the spider would swing out from his perch and capture them, apparently in their flight. This spider was found on a fence-post, near posts where attids were abundant.

Several spiders were noticed to have lost legs, and this seemed to occur even when they were not molting. A possible

explanation me be the use of legs as food when other animals are not found. Possibly the loss was due to injury at the time of capture, or after a molt. The last reason would apply only to #43 (see following table), but seems not to explain the loss since it occurred a month after molting. In the case of the lycosid, #102, since the loss of legs came only two days after capture, injury at the time of collection may be the explanation.

#	Date of capture	date of molt	date when legs were missing
43	Oct. 30, 1948	Dec. 9	Jan. 9, 1949 (2 left rear legs)
90	Nov. 11	none	Jan. 6 (right rear leg)
102	Nov. 23	none	Nov. 25, 1948 (right and left second legs; exoskelton of one was found in vial)

Molting: The total number of spiders molting was 33; of this number, 29 molted once, and 4 molted twice. Four spiders died in the process of their first molt in captivity. This may have been due to lack of moisture in their vials, to to some unknown cause. Tabulation of the identification of molting spiders, and dates of molts follow:

Identification (tentative):

of 29 spiders molting once:
- 9 unknown
- 4 Agelenidae
- 1 Argiopidae
- 1 Attidae
- 2 Clubionidae
- 3 Lycosidae
- 1 Pholcidae
- 2 Pisauridae
- 6 Thomisidae

of 4 spiders molting twice:
- 2 unknown
- 1 Agelenidae
- 1 Thomisidae

of 4 spiders dying at first molt (included in the 29 above)
- 1 Attidae
- 1 Clubionidae
- 2 Lycosidae

Dates of molts:

No.	date of capture	First molt	Second molt
5	Oct. 19	Nov. 21	Dec. 9
8	"	Nov. 21	-
9	"	Dec. 16	-
10	"	Oct. 25	-
11	Oct. 21	Nov. 10	-
12	"	Nov. 3	-
13	"	Nov. 10	-
18	"	Oct. 30	-
25	Oct. 26	Nov. 10	-
33	"	Jan. 4	-
35	"	Dec. 13	-
42	Oct. 30	Dec. 8	-
43	"	Dec. 9	-
46	"	?	Dec. 9
48	Nov. 2	Jan. 9	-
49	"	Nov. 21	-
53	"	Nov. 21	-
58	"	Dec. 6	-
64	Nov. 3	Dec. 10	-
68	Nov. 4	Dec. 9	-
69	"	Nov. 21	Dec. 9
73	"	Dec. 9	-
80	Nov. 11	Dec. 7	-
87	"	Dec. 3	-
93	Nov. 16	Jan. 4	-
94	"	Jan. 13	-
96	"	Dec. 9	-
101	Nov. 23	Jan. 9	-
108	"	Dec. 11	Jan. 14
109	"	Jan. 9	-
110	Nov. 30	Jan. 8	-
116	Dec. 11	Jan. 12	-
117	"	Jan. 14	-

(Dates of molts may vary by a day or so because of failure to check the vials daily, especially at the start of the investigation.)

Vital Statistics:

Spiders collected:	114
Observed in field: (not collected)	3
Alive Jan. 15:	36
Dead Jan. 15:	78

Deaths were probably due to several causes, including

1. injury at capture
2. old age
3. lack of sufficient moisture
4. " " " food
5. difficulty in molting
6. unknown, possibly including bacteria or molds

Over the two-week winter vacation 39 spiders were put into a colder temperature. On. Dec. 13 they were placed at a temperature of 15.5 degrees Centigrade, then on Dec. 17 the spiders were fed and placed at a temperature of 10 degrees Centigrade until Jan. 3. The vials were checked for moisture on Dec. 17 and recorded as being obviously wet or dry. On Jan. 3 the number of spiders dying was checked against the figures for the high or low humidity, with the results in the following table:

Vials:	moist	dry
	21	18
Spiders dead in above:	4	7

The fairly high correlation of deaths with dry vials may have a significance and should be investigated further.

The number os days following capture that each spider lived are recorded on the following graphs. This is for 62 spiders whose dates of death were actually known, not those kept over the vacation period. (Graphs: pages 9 and 10.)

Identifications: for the 114 captured spiders

Agelenidae
- Agelena sp.
- Coras fidelis
- unknown species

Argiopidae
- unknown species

Attidae
- Phidippus audax
- unknown species

Clubionidae
- Trachelas sp.
- unknown species

Lycosidae
- Lycosa sp.
- unknown species

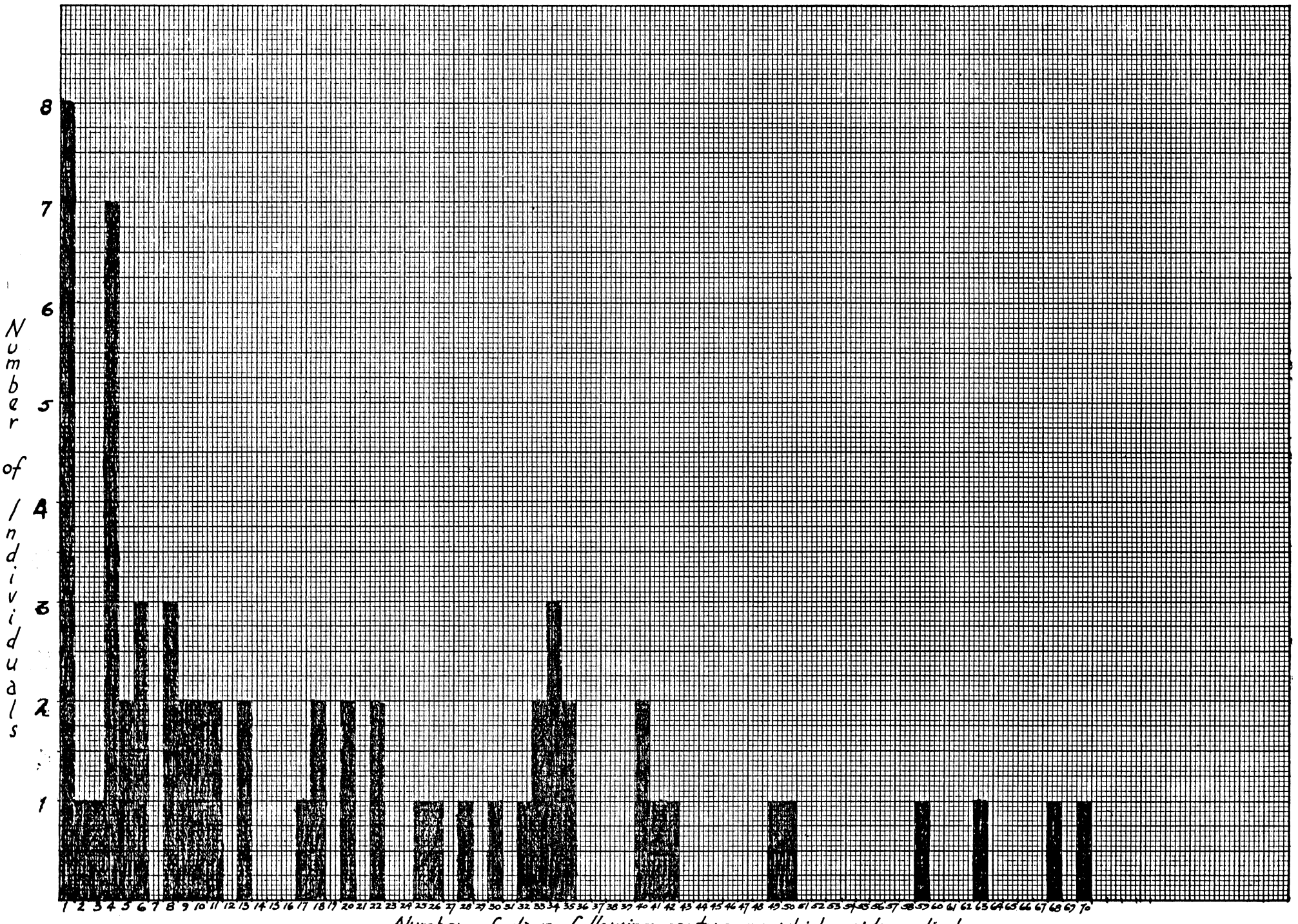
Pholcidae
- unknown species

Pisauridae
- Pisaurina mira
- unknown species

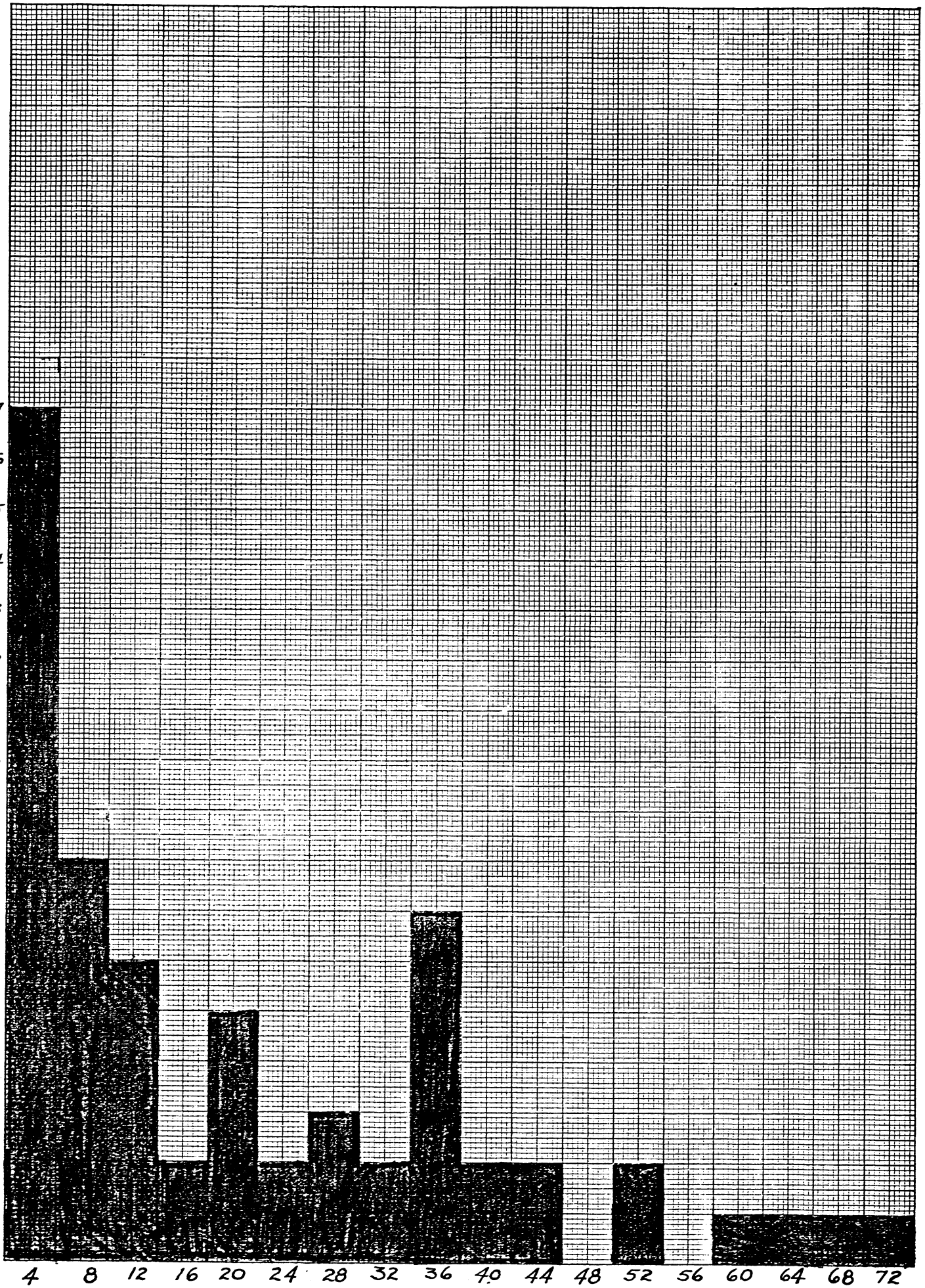
Thomisidae
- Tibellus sp.
- unknown species

Unknown genera

No. 5788
10 Millimeters to the Centimeter
MADE IN U.S.A.



Jan. 1949



10 Millimeters to the Centimeter
MADE IN U.S.A.

No. 5788

Egg laying: A small spider was captured Oct. 21 near Blanchard's pond. The spider was under a stone in the bed of a small dry brook, and was active at 11.5 degrees Centigrade. By. Oct. 25 a small loose web had been constructed across the top of the 2-dram vial in which the spider was confined.

On. Nov. 10 the spider was noticed covering with silk a small mass of eggs laid in the curve of the shoulder of the vial. The spider was dead Nov. 16. The eggs showed no sign of hatching by Jan. 15.

Eggs found: Four egg capsules were found, and may be tabulated as follows:

No.	Found	where	temp.	location	results
1.	Oct. 26	White's woods	11.5°C	south-west side of stone pillar at entrance to White's woods	broken in removing; 44 eggs recovered; no hatching
2.	Nov. 2	" "	13.5	in an old stump and well protected under an old web	Jan. 3- several spiderlings found dead; hatched between Dec. 17, 1948 and Jan. 3, 1949.
3.	Nov. 11	Ferguson farm	11.5	under log braced against fence; surrounded by a web	Ichneumon flies emerged Nov. 24
4.	Dec. 2	" "	6	on end of small blade of grass on southwest side of small hillock	Jan. 11- 2 spiderlings found dead

Number 3 was rather interesting in that the Ichneumonidae may have been parasitizing an adult spider in a web. When taken, the web contained large, cream-colored eggs.

Conclusions:

1. Adequate material for study was found during the collecting period, Oct. 19 to Dec. 11, 1948.

2. Spiders were generally active at the warmer temperatures; one spider was found active at 2.5 degrees Centigrade.

3. Spiderlings were found in moist situations, as among grassroots and leaves of the forest floor.

4. Animals associated with spiders in the field included isopods, phalangids, Anguispira alternata, grasshopper (Melanoplus femur-rubrum), milkweed beetle (Tetraopes sp.), and ants.

5. Phalangids were used as food by some of the captive spiders.

6. In captivity, most of the Agelenidae built elaborate funnel webs; Attidae spun crisscross strands of silk on the side walls of their vials. Thomisidae spun a few strands of silk across vials.

7. The spiders used various methods to catch food, most reliance being on webs or rapid darting after prey.

8. Loss of legs, noticed in three spiders, may have been due to injury or to their use as food supply, since they could be regenerated when food would be plentiful.

9. Thirty-three spiders molted in captivity, 29 of this group molting once, and 4 molting twice. Four spiders died during their first molt in captivity.

10. Of 21 spiders kept for two weeks at 10 degrees Centigrade in moist vials, four died. Of 18, kept in dry vials for the same period, seven died, showing correlation of relatively higher death rate with low humidity.

11. Death rate was highest during the first four days after capture, using 62 spiders as a basis of judgment.

Bibliography:

Chickering, A. M. Families of the Spiders of Michigan. Papers of Michigan Academy of Science, 1931.

Comstock, John. An Introduction to Entomology, Pp. 922-23. Ithaca, N. Y. 1940.

_____ The Spider Book. Ithaca, N. Y. 1940.