THIRD ANNOTATED LIST OF PHYMATA PREY RECORDS (PHYMATIDAE, HEMIPTERA)

W. V. BALDUF[1]
University of Illinois

During the three years 1938, 1939 and 1940 I made a study of the prey utilized by our common ambush bug, *Phymata pennsylvanica americana* Melin in the vicinity of Urbana, Illinois. The method employed was direct search for the predator as it occupied flowers, mostly wild, growing along roads, ditches and pastures. When Phymatas were discovered possessing prey, the latter was taken from their grasp and placed in a vial with notes identifying the ambush plant and stating whether the preying bug was single, and if so its sex, or coupled or mating, or in some other combination to be described below. Throughout the project I included prey specimens found dead under circumstances that left no reasonable doubt that they had been killed and discarded by *Phymata*. These, however, represent less than 10 per cent of the total. Excepting a few from fifth instar nymphs, all the prey recorded during the study pertained to adult bugs.

The present report, which is intended as the last of this series, embraces the records for 1940. The annotated lists for the preceding two years have already been published (Balduf, 1939, 1940).

TABLE I

INSECT PREY OF *Phymata*, 1940

SYSTEMATIC POSITION OF PREY TAKEN			SPECIMENS CAPTURED	INCLUSIVE DATES
Genus	Species	Family		
	COLEOPTERA			
Diabrotica	*12-punctata* (Fabr.)	Chrysomelidae	10	VII-17: X-5
Diabrotica	*longicornis* Say	Chrysomelidae	1	IX-6
	HYMENOPTERA			
Amblyteles	*brevicinctor* (Say)	Ichneumonidae	1	VII-17
Porizon	sp.	Ichneumonidae	1	VII-19
Microbracon	*tenuiceps* Mues.	Braconidae	1	VII-19
Bassus	*annulipes* (Cr.)	Braconidae	2	IX-2
Urisigalphus	*femoratus* Cwfd.	Braconidae	2	IX-7: IX-9
Apanteles	*forbesi* Vier.	Braconidae	1	IX-19
.....	.....	Pteromalidae	1	IX-19
Apis	*mellifica* Linn.	Apidae	8	IX-4: X-5
Bombus	*impatiens* Cress.	Bombidae	1	IX-11
Agapostemon	*radiatus* (Say)	Andrenidae	2	VIII-9: IX-16
Calliopsis	*andreniformis* Sm.	Andrenidae	6	VII-25: X-21
Andrena	*nubecula* Sm.	Andrenidae	1	IX-4
Halictus	*provancheri* D. T.	Halictidae	8	VII-17: IX-28
Halictus	*stultus* Cress.	Halictidae	4	VII-19: XI-2
Halictus	*coriaceus* Sm.	Halictidae	1	VII-25
Halictus	*pruinosus* Robt.	Halictidae	1	VII-25
Halictus	*ligatus* Say	Halictidae	1	VII-25
Halictus	*albipennis* Robt.	Halictidae	1	VIII-9

[1]Contribution No. 223 from the Entomological Laboratories of the University of Illinois. I am again indebted to Mr. C. F. W. Muesebeck and several of his scientific staff in the United States National Museum for determining the prey insects reported here.

TABLE I—(Continued)

Systematic Position of Prey Taken			Specimens Captured	Inclusive Dates
Genus	Species	Family		
	Hymenoptera (Continued)			
Halictus	*versatus* Robt.	Halictidae	17	IX-6: X-28
Halictus	spp.	Halictidae	8	IX-19: X-28
Augochlorella	*striata* (Prov.)	Halictidae	1	IX-28
Paralictus	*platyparius* Robt.	Halictidae	1	X-5
Coelioxys	*octodentata* Say	Megachilidae	1	VII-26
Hylaeus	*stevensi* Cwfd.	Hylaeidae	1	IX-14
Epeolus	*bifasciatus* Cress.	Nomadidae	1	IX-3
Philanthus	*ventilabris* Fabr.	Sphecidae	1	VII-17
Sphex	*placidus* (Sm.)	Sphecidae	5	VII-20: VII-25
Larropsis	*distincta* (Sm.)	Sphecidae	1	IX-7
Crabro	sp.	Sphecidae	1	IX-26
Psen	*cressoni* (Pack.)	Sphecidae	1	IX-28
Cerceris	*finitima* Cress.	Sphecidae	1	VII-20
Cerceris	*clypeata* Cress.	Sphecidae	1	VII-25
Cerceris	sp.	Sphecidae	1	IX-14
Neoformica	sp.	Formicidae	6	VII-17: VII-25
Formica	*pallidefulva nitidiventris* Em.	Formicidae	1	IX-11
Formica	*pallidefulva schaufussi incerta* Em.	Formicidae	1	IX-26
	Lepidoptera			
Ascia	*rapae* (L.)	Pieridae	2	VII-25: IX-28
Colias	*philodice philodice* Godt.	Pieridae	2	IX-11: IX-13
Colias	*eurytheme* Bdv.	Pieridae	8	IX-28: X-28
Everes	*comyntas comyntas* Godt.	Lycaenidae	3	VII-25: IX-12
Polites	*themistocles* (Latr.)	Hesperiidae	1	IX-12
Pyrgus	*communis communis* (Gr.)	Hesperiidae	2	IX-12: IX-21
Schinia	*acigera* Gn.	Phalaenidae	1	IX-19
Rhodophora	*gaurae* (A. & S.)	Phalaenidae	1	VIII-8
Tarachidia	*candefacta* Hbn.?	Phalaenidae	1	IX-7
Prodenia	*ornithogalli* Gn.	Phalaenidae	1	X-5
Feltia	*subgothica* (Haw.)	Phalaenidae	24	IX-7: X-5
Caenurgina	*erechtea* (Cram.)	Phalaenidae	2	IX-12
Crambus	*albellus* Clem?	Crambidae	1	IX-16
Scythris	sp.	Schthridae	1	XI-2
	Diptera			
Eugnoriste	*brevirostris* Coq.	Mycetophilidae	1	VII-17
Sciara	sp.	Mycetophilidae	5	IX-21: IX-28
Aedes	*vexans* (Mg.)	Culicidae	3	IX-16: IX-26
Culex	*tarsalis* Coq.	Culicidae	1	IX-26
Empis	*clausa* Coq.	Empididae	8	IX-14: IX-19
Occemyia	sp.	Conopidae	4	IX-19: X-28
Sparnipolius	*fulvus* (Wied.)	Bombyliidae	15	IX-11: IX-28
Madiza	sp.	Chloropidae	1	IX-6
Hippelates	sp.	Chloropidae	1	IX-26
Hylemya	sp.	Anthomyidae	12	VII-20: IX-28
Sarcophaga	*tenuiventris* V. d. W.	Sarcophagidae	1	IX-11
Sarcophaga	*salva* Aldr.	Sarcophagidae	1	IX-12
Sarcophaga	*sinuata* Mg.	Sarcophagidae	1	IX-28
Sarcophaga	*lherminieri* R. D.	Sarcophagidae	2	IX-19: IX-28
Sarcophaga	sp.	Sarcophagidae	1	IX-19
Senotainia	sp.	Sarcophagidae	1	IX-28
Pollenia	*rudis* (Mg.)	Calliphoridae	1	IX-4

TABLE I—(Continued)

Systematic Position of Prey Taken			Specimens Captured	Inclusive Dates
Genus	Species	Family		
	DIPTERA—(Continued)			
Cochliomyia	*macellaria* (F.)	Calliphoridae	2	IX-7: IX-28
Lucilia	*illustris* (Mg.)	Calliphoridae	1	IX-19
Stomoxys	*calcitrans* (L.)	Muscidae	1	IX-16
	spp.	Tachinidae	4	IX-2
Chaetogaedia	*monticola* Big.	Tachinidae	1	IX-3
Voria	*ruralis* (Fall.)	Tachinidae	1	IX-3
Paradidyma	sp.	Tachinidae	1	IX-12
Winthemia	sp.	Tachinidae	3	IX-19
Archytas	sp.	Tachinidae	1	IX-28
Hyalomya	*aldrichi* Tns.	Tachinidae	6	IX-30: X-28
Cistogaster	*immaculata* Macq.	Tachinidae	1	IX-30
Cistogaster	*occidua* (Wlk.)	Tachinidae	2	X-23
Sphaerophoria	*cylindrica* (Say)	Syrphidae	3	VII-25: IX-28
Eristalis	*arbustorum* (L.)	Syrphidae	5	VII-25: IX-28
Eristalis	*tenax* (L.)	Syrphidae	7	VIII-8: X-23
Allograpta	*obliqua* (Say)	Syrphidae	1	VIII-8
Syritta	*pipiens* (L.)	Syrphidae	8	IX-16: X-23
Syrphus	*wiedemanni* Johns.	Syrphidae	2	IX-3: IX-12
Syrphus	sp.	Syrphidae	1	X-23
Mesogramma	geminata (Say)	Syrphidae	1	X-23
	NEUROPTERA			
Chrysopa	*plorabunda* Fitch	Chrysopidae	1	IX-12
	HEMIPTERA			
Corizus	*lateralis* Say	Corizidae	1	VII-20
Lygus	*pratensis* (L.)	Miridae	4	VII-20: X-17
Lygus	*pratensis oblineatus* (Say)	Miridae	1	IX-2
Lygus	*pratensis strigulatus* (Wlk.)	Miridae	1	IX-6
Plagiognathus	*politus* Uhl.	Miridae	5	IX-3: IX-30
Adelphocoris	*rapidus* (Say)	Miridae	9	VII-27: X-21
Peribalus	*limbolarius* Stal.	Pentatomidae	1	IX-2

SUMMARY

The list for 1940 embraces 97 species and a few varieties represented by a total of 228 individuals, all of which were insects in the adult state excepting an advanced nymph of the common mirid bug, *Adelphocoris rapidus*. These species belong to six orders—Coleoptera, Hymenoptera, Lepidoptera, Diptera, Neuroptera and Hemiptera. A large part of the total is bees, moths and flies. Members of the holometabolous orders again constitute by far most of the prey, or 92.36 per cent as contrasted with 7.64 per cent Heterometabola. This predominance of Holometabola merely signifies that chrysomelid beetles, moths, butterflies, bees, wasps, ants and many kinds of dipterous flies take as a considerable part of their food the pollen, petals or nectar of flowers and by that practice attract their predatory enemy *Phymata* to the same situations.

Moreover, as in 1938 and 1939, the prey value of the several species composing the list exhibits great plasticity. Were records of the present kind taken for years without end, they would obviously continue indefinitely to be characterized by such variation. The causes lie, in general, in the fluctuations in the climatic and biotic influences that surround the insect fauna everywhere. Some species appear

for the first time in this list, while others present in 1938 and 1939 are lacking from it, and those represented consistently in all the three years played changing roles in respect to their quantitative prey value.

FEEDING COMBINATIONS

Of the 228 instances of predation reported for this year, the sex of the preying phymatid was noted in 268. The several preying combinations and their relative frequency are summed up in Table II.

TABLE II

PREYING COMBINATIONS

PREY FED ON BY	NUMBER	PER CENT OF TOTAL	PREY FED ON BY	NUMBER	PER CENT OF TOTAL
Single males	61	22.75	Mating males	0	0.00
Single females	131	48.85	Mating females	5	1.85
Coupled males	6	2.28	Both sexes of mating pairs	1	0.36
Coupled females	51	19.04	Other combinations	6	2.28
Both sexes of coupled pairs	7	2.59	Grand totals	268	100.00%

It will be seen that 71.50 per cent of the 268 prey insects were found in possession of single male or female captors, i. e., Phymatas neither coupled nor *in copulo;* that 19.04 per cent was captured by females of coupled pairs as against only 2.28 by males of couples; that five females engaged in feeding while mating as compared with no males feeding alone in that relation. In one instance, the members of a mating pair fed simultaneously on a small mirid bug, *Plagiognathus politus.*

Counting all the above feeding bugs as individuals, i. e., disregarding the several paired combinations, I find males were concerned in only 81 instances whereas females totaled 199. In other words, 29 per cent of the feeding was done by males and 71 per cent by the females. The corresponding data for 1938 were 25.9 and 74.1, and for 1939, 17.9 and 82.1 per cents. These figures give a three-year average of 24.27 and 75.73 per cent, for male and female, respectively, showing that, on the whole, the females capture and feed approximately three times more frequently than the males. In general they also utilize larger insects than the males secure. In terms of actual quantity of food substance ingested, the females may be conservatively estimated to take four times more quantity of food than the males. More or less complete data taken during the three years show that the sex ratio annually averaged approximately 1 : 1. This normal intersexual disparity in rate of feeding is correlated with the much greater bulk of sexual products, expressed in terms of eggs, developed by the female. This correlation is indicated also by weights of almost 500 males and females collected on seven different dates between July 17 and September 28, the period representing the inception, and rise to the peak, of sexual productivity. On July 17, the average young male weighed 0.0210 gr. and the female 0.0340 gr., or 1.63 times the weight of the male, while on September 2, the respective weights had mounted to 0.0270 and 0.0540—the average female weighing twice the average male. This greater rate of acceleration in weight in the female runs parallel with the greater bulk of sexual products yielded by this sex. Spermatogenesis requires a smaller quantity of nutriment than oögenesis.

In addition to the majority feeding combinations noted above, the following unusual cases deserve brief description.

1. Two males and a female feeding together separately on a *Sphex placidus*.
2. Male and female feeding separately and simultaneously on an *Eristalis arbustorum*.
3. Female of a coupled pair feeding on an adult of *Adelphocoris rapidus* while the mate fed on a chloropid fly, *Madiza* sp.
4. Two males feeding on a screw worm fly, *Cochliomyia macellaria*, while only one of them held the captive.
5. A male holding a wasp, *Psen cressoni*, with one front leg and an anthomyid fly, *Hylemya* sp., with the other. Both captives were dead; had doubtlessly been captured and killed by this bug.
6. A female holding a dead bee, *Halictus versatus*, with one front leg and another bee of the same species with the other. The bug was feeding on the latter captive.
7. The female of a coupled pair had just captured a moth, *Feltia subgothica*—the latter fluttering vigorously as I came upon the scene. Within a minute, the bug drew the resisting moth in reach of her proboscis. In another minute the deadening injection had inactivated the moth. Sitting on his mate's back during this period, the male now moved forward to come in on the kill.
8. A female was found holding to the head and thorax of a tachinid fly and seemed to be feeding. Considering that *Phymata* has not been seen to date to seize dead insects and that the body of the fly was torn raggedly, I suspect some chewing predator—wasp or beetle—had eaten away the abdomen and a part of the thorax of the fly which *Phymata* had captured and killed.
9. A male *Phymata* held with one front leg to the extended siphon of an adult *Feltia subgothica* that had approached a flower of *Aster multiflorus* to feed. Having grasped the siphon near its apex, the bug was unable to draw the moth within reach of his stylets to inject the inactivating fluid. The moth fluttered violently, shaking the plant sharply, and threatened to jerk the bug from his perch. During the subsequent 10 minutes, the moth relaxed at intervals its efforts to escape, and in these lulls the bug renewed, without success, his efforts to make contact with his piercing organs. In the following 15 minutes the moth hung limp except for brief and feeble struggles, and in a few minutes more was dropped by the frustrated bug. Sixteen hours later *Feltia* was dead of exhaustion, while *Phymata* crawled about in perky fashion. At this time, the moth weighed 0.0354 gr., the bug 0.0167, or less than half his captive.

REFERENCES CITED

Balduf, W. V. Food habits of *Phymata pennsylvanica americana* Melin, Canadian Entomologist, March, 1939, 66–74.

More ambush bug prey records, Bul. Brooklyn Entom. Soc., 35, 1940, 161–169.

Life History of *Phymata pennsylvanica americana* Melin, Ann. Ent. Soc. Amer., 34, 1941, 204–214.