ENTOMOLOGY

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ABSTRACTS

Distribution of *Aedes stimulans* (Walker) in east central United States. R. E. SIVERLY, Department of Physiology and Health Science, Ball State University, Muncie, Indiana 47306.——*Aedes stimulans* occurred most frequently within the study area on Wisconsinan drift. This species probably was displaced southward during Wisconsinan glaciation and, during the recent postglacial period, may have occupied forested tracts in continuous distribution from central Indiana and central Ohio to the Gulf of Mexico.

Shifts from mesic forests to grasslands and/or oak-hickory forest, changes in drainage patterns, and more recently agriculture and urbanization are believed contributive to disjunction in its distribution and to curtailment of the southern limit of its range. *Aedes stimulans* was found on Illinoian drift in relict colonies in three counties in southeastern Indiana and in one county in southwestern Ohio. Relicts also were found in driftless areas in south central Indiana and in northern Kentucky. No specimens were collected south of Oldham County, Kentucky.

Aedes stimulans was associated with Clermont soil on Illinoian drift, and with Lawrence and Guthrie soils in driftless areas. Regardless of parent soil material, this species was found most frequently on wet, depressional terraces and uplands and in beech-maple forests, and less frequently in upland mesic forests. It was absent in oak-hickory tracts regardless of elevation, and absent from beech-maple tracts on first bottoms.

Observations in this study suggest that the pattern of continuous to disjunct distribution followed by extinction occurred in Kentucky and Tennessee, and that extinction will be the next phase of this pattern with respect to the relict colonies of *A. stimulans* south of the Wisconsinan glacial boundary. These observations also raise doubts regarding the validity of the 1920 record of *A. stimulans* in Mississippi.

Soil types, in addition to climate and vegetation, were useful in predicting occurrence of *A. stimulans* within its present range in the study area.

Observations on Overwintering of the Northern House Mosquito, *Culex pipiens pipiens* L., in Eastern Indiana. DONALD A. SHROYER, Department of Entomology, Purdue University, Lafayette, Indiana, 47907, and R. E. SIVERLY, Department of Physiology and Health Science, Ball State University, Muncie, Indiana 47306.——Overwinter-

ing local populations of *Culex pipiens pipiens* L. in Delaware, Henry, and Jennings counties, Indiana, were studied November through April 1971-72. Hibernacula included house crawlspaces, basements, road culverts, a cave, a coal bin, a pumphouse, and a canning factory. Maximum adult counts ranged from 41 to an estimated 6,000; large overwintering local populations at two sites were attributable to extensive production areas (waste lagoons) in the vicinity. Relative humidity in hibernacula ranged from 57-97 per cent, and temperatures of 23-70° Fahrenheit were recorded. At two sites living mosquitoes were observed at 23° and 25° Fahrenheit.

No males were observed at any overwintering site. Dissection of 173 female *Culex pipiens pipiens* did not reveal a single virgin mosquito. Spermatozoa were usually active and presumably viable, even in females collected in April. Examination of ovarian tracheation of 169 females taken from the hibernacula revealed that 13 were parous, a parity rate of 7.69 per cent. All nulliparous females had ova in Christophers' Stage I. Two parous females possessed a few advanced, yolk-laden ova from the previous gonotrophic cycle, in addition to Stage I ova.

While there was no evidence that blood-feeding occurred in nature during the overwintering period, live females transferred indoors fed both on avian and mammalian hosts after being maintained from 1 to 9 days at 70-80°Fahrenheit, a 15-hour light, 9-hour dark photoperiod, and 70-80 per cent relative humidity.

At one hibernaculum the surviving overwintering population left the site between April 3 and April 17. Overwintering local populations had left two other hibernacula by March 30 and April 10.

Effects of Different Densities on Life Table Characteristics of *Aedes aegypti* (L.) RAYMOND J. RUSSO, Department of Biology, University of Notre Dame, Notre Dame, Indiana 46556.——In the area of mosquito biology, few articles have been published on the effects of adult density on population growth parameters. This study assays the effects of different population densities by increasing the number of mosquitoes in a given environment (a gallon container). Four population parameters were studied; net reproductive rate, intrinsic rate of increase and mean male and female adult life spans.

Two strains were compared over six densities ranging from 2 to 200 individuals per gallon container. Although densities in nature seldom reach the maximum used in this study, high densities are necessary to exaggerate the effects produced. The sex ratio in each cage was established at one to one. Sufficient food source was supplied both in terms of carbohydrate (sugared apple slices) and protein (blood meals taken by female mosquitoes from anesthetized mice). Populations were raised in the insectaries of the Vector Biology Laboratory at the University of Notre Dame at 26° Centigrade and 80 per cent relative humidity. Every two days the number of each sex that had died was determined and the deposited eggs were removed and counted. In addition to testing for strain and density effects, a third major variable affecting the re-

sponse characters was examined by regulating the space available for oviposition. A second set of cages had four ovicups per cage instead of the usual one per cage.

The results were discussed in terms of significant differences between the strains of mosquitoes used, among the six densities covered and the number of oviposition sites.

MODABUND: The Computerized MOSQUITO DATA BANK at the UNIVERSITY of NOTRE DAME. THEODORE J. CROVELLO, Biology Department, University of Notre Dame, Notre Dame, Indiana 46556. ——Making use of the bibliographic work of Doctor Helen Sollers-Riedel, we have created a computerized data bank of 25,000 mosquito references from the past two decades. For each reference we have captured the author, date, title, citation and one subject field (as decided by Doctor Sollers-Riedel). While the data bank is still growing, even now we can carry out high speed searches for any key word, *et cetera*, in any of the above categories. For example, the request, find all references categorized as genetics over the last two decades. Print these out alphabetically by author. This would require a search of the 25,000 references and would produce an alphabetical listing of 213 genetics references. This search service is available on a cost basis. We did not undertake this project to make money, but to enhance mosquito biology.

Cereal Leaf Beetle Parasitoid Release Program. ROBERT BRUCE CUMMINGS, Indiana Department of Natural Resources, Indianapolis, Indiana 46204.——The Cereal Leaf Beetle is native to Europe, therefore, some natural enemies from that area have been collected and colonized. The egg parasitoid, *Anaphes flavipes* (Foerster), and three larval parasitoids, *Tetrasticus julis* (Walker), *Diaparsis carinifer* (Thompson) and *Lemophagus curtus* (Townes), have been released in eight states. Many recoveries of these parasitoids have been made, usually at the release site during the following year. It was shown that extensive defoliation by the cereal leaf beetle was required to effect yield loss in oats. It is hoped that with the establishment of these parasitoids, economic control of the Cereal Leaf Beetle may be achieved.

Beta-alanine use by "ebony" and "black" *Drosophila*. M. E. JACOBS, Biology Department, Goshen College, Goshen, Indiana 46526.—— "Ebony" *Drosophila melanogaster* fail to incorporate beta-alamine into cuticular proteins, although this amino acid occurs in the hemocoel. Ebony flies are less desiccation resistant and less successful in mating than normal. "Black" *D. melanogaster* incorporate beta-alanine into the cuticular proteins when it is injected, but synthesis of this amino acid is inhibited in this mutant, the block occurring between aspartic acid and uracil. Normal tan phenocopies are readily produced by injection of black flies with beta-alanine. The injection increases desiccation resistance and mating success of the phenocopies.

The Winter Stonefly Genus *Allocapnia* in Indiana (Plecoptera: Capniidae). GARY R. FINNI, Department of Biology, Allegheny College, Meadville, Pa. 16335.——Eleven species of the genus *Allocapnia* have

been collected from Indiana. Those collected include *A. forbesi* Frison, *A. granulata* (Claassen), *A. illinoensis* Frison, *A. indianae* Ricker, *A. mystica* Frison, *A. nivicola* (Fitch), *A. ohioensis* Ross and Ricker, *A. pygmaea* (Burmeister), *A. recta* (Claassen), *A. rickeri* Frison, and *A. vivipara* (Claassen). A key was provided to separate the adults of these species. A key was also provided to separate the naiads of seven known species.

NOTES

Telephone Cable Penetration by *Xylobiops basilaris* (Say) (Coleoptera: Bostrichidae). JOHN J. FAVINGER and CLAUDE F. WADE, Indiana Department of Natural Resources, Indianapolis, Indiana 46204.——The lead cable borer, *Scobicia declivis* (Le Conte), has long been a problem in California and other areas. Under certain conditions this bostrichid beetle bores through the lead sheathing of telephone cables causing short circuiting when moisture enters the cables. Similar damage was called to the attention of the Division of Entomology early in January 1972, by Mr. Ray Tannis of the Indiana Testing Laboratories. A section of damaged cable had been submitted to the laboratory by Indiana Bell Telephone Company. Shorts had occurred in the Beech Grove area where an underground 400-pair lead-cased cable emerged from the ground and became an aerial cable. The lead sheathing was protected by a metal U-guard at the base of the first pole. A large poison-ivy vine, *Rhus radicans* L., grew at the base of the pole and entered the U-guard, sharing the available space with the cable. The vine was apparently undisturbed for several years because it filled most of the space inside the U-guard not occupied by the cable which was about 30 millimeters in diameter. The vine was eventually cut off at ground level leaving the severed section inside the guard. The vine apparently became infested with at least two species of wood-boring beetles, the larger of which caused the shorting of the telephone circuits by penetrating the lead sheath of the cable. Tenetative identification of fragmentary adult specimens remaining in the sheath was determined as *Xylobiops basilaris*, the red-shouldered, shot-hole borer, a native insect first described by Thomas Say (1). Larval specimens in the vine segment were reared to adults and identified as *Xylobiops basilaris*. Attempts to simulate the conditions of penetration in the laboratory were not completely successful, but some shaving of lead by later emerging adults was noted. Another much smaller species also emerged from the dead vine and was sent to specialists at the U.S. National Museum for identification. This second species was a scolytid and identified by Dr. Donald Anderson as *Pityophthorus crinilis* Blackman (J. M. Kingsolver, personal communication April 13, 1972). No lead boring was noted for this smaller beetle. This is a new state record for this species. The holes made by the larger beetle were about 2.5 millimeters in diameter and very similar in size and appearance to those made by *Scobicia declivis*. As near as could be determined all penetrations of the lead sheath were extensions of the exit hole made by the adult bostrichid in emerging from the dead vine. A number of insects will occasionally attack lead or other metals when it is in the way of emerging

adults or burrowing larvae, but to the authors' knowledge, this is the first case of this type of insect damage to lead telephone cables in Indiana.

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New Records of Indiana Collembola. JOHN W. HART, Hayes Research Foundation, Inc., Richmond, Indiana 47374.——Sixty-nine species and forms of Collembola were reported from Indiana by the author (2) in 1969. An additional 15 were reported in 1970 (3). This paper lists 32 previously unreported and removes from the previous lists *Pseudosinella petterseni* Börner from the 1969 paper and *Folsomia quadrioculata* (Tullberg) from the second. In all, 114 species and forms of Collembola are known to occur in Indiana. New records follow:

Xenylla grisea Axelson, 1900; *Hypogastrura nivicola* (Fitch), 1847 (1); *Willemia similis* Mills, 1934; *Friesea sublimis* MacNamara, 1926; *Pseudachorutes lunatus* Folsom, 1916; *P. subcrassoides* Mills, 1934; *Paranura caeca* Folsom, 1916; *P. colorata* Mills, 1934; *Neanura persimilis* Mills, 1934; *Agrenia bidenticulata* (Tullberg), 1876; *Spinisotoma dispersa* Wray, 1952; *Metisotoma capitona* Maynard, 1951 [*?=Cephalotoma grandiceps* (Reuter), 1891]; *Isotoma tigrina olivacea* (Tullberg), 1871; *Vertagopus arborea nigra* (MacGillivray), 1896; *Sinella coeca* (Schött), 1896; *Entomobrya clitellaria* Guthrie, 1903; *E. gisini* Christiansen, 1958; *Lepidocyrtus unifasciatus* James, 1933; *Neelides minutus* (Folsom), 1901; *Megalothorax incertoides* Mills, 1936; *Sminthurides aquaticus* (Bourlet), 1841; *S. globocerus* Folsom and Mills, 1938; *S. occultus* Mills, 1936; *Arrhopalites caecus* (Tullberg), 1871; *Sminthurinus elegans cancellus* Maynard, 1951; *S. minutus* (MacGillivray), 1894; *S. niger* (Lubbock), 1868; *Sminthurus facialis* Banks; 1903; *Sphyrotheca curvisetis* (Guthrie), 1903; *Deuterosminthurus repandus* (Ågren), 1903; *Dicyrtoma flammea* Maynard, 1951; *Ptenothrix oswegatchiensis* Maynard, 1951.

The assistance of Dr. David L. Wray and Dr. Petter F. Bellinger is gratefully acknowledged. They have verified many of the records included, and their help has made the study most enjoyable. Author's voucher specimens are located in the Joseph Moore Museum, Earlham College.

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Growth of *Chalybion zimmermanni* Dahlbom in Captivity (Hymenoptera: Sphecidae). GERTRUDE L. WARD, Joseph Moore Museum, Earlham College, Richmond, Indiana 47374.——In the summer of 1969 the larval growth of *Chalybion zimmermanni* Dahlbom was observed. Search of the literature failed to reveal reports of measured growth by this species. An adult female *Chalybion zimmermanni* had completed several nests in a structural wooden plate on the second floor of a shed near Centerville, Wayne County, Indiana. She had utilized existing holes in

the wood. On August 3 she was seen putting spiders in a cell. Because the cell was not closed and no new spiders had been added by August 7, the 17 spiders in the cell were removed. The first spider placed in the cell had a young larva clinging to the dorsum of the abdomen on which it was feeding.

The larva and spiders were placed in a Syracuse-type watch glass and covered with another watch glass to prevent dehydration. This was kept at about 72° Fahrenheit. Observations were made with a stereozoom microscope. Measurements are reported in Table 1. The 17 spiders were identified as follows (1, 2); 13 *Theridion* (*Theridion*) *frondeum* Hentz (females), 3 *Araneus* spp. (2 males, 1 female), 1 *Cyclosa conica* (Pallas) (sex undetermined).

TABLE 1. *Development of* Chalybion zimmermanni *Dahlbom in Wayne County, Indiana.*

Date	Condition of egg	Length of larva, mm	Adult
Aug. 3, 1969	laid		
6	hatched		
7		3	
8		5	
10		8	
11		10.5	
12		molted	
13		16	
14		16.5	
16		17	
17		started to spin cocoon	
June 27, 1970			male emerged

The larva fed continually throughout the day as long as it was attached to a spider. When a spider was drained of fluids, the larva loosened its hold and made searching movements by curving and undulating its body. These movements were often ineffective in the watch glass and a spider had to be placed close to the larva for it to be found. No doubt these movements would have been suitable for locating spiders within the confines of a cell.

In the early days of its growth, the larva seemed to have difficulty piercing the abdominal walls of the spiders. A drop of clear fluid, possibly from a salivary gland, was usually seen on the spider's abdomen just prior to the first incision.

Molting occurred August 12. The exuviae split in the mid-dorsal line and the larve squirmed and wriggled until the old cuticle was moved down to the posterior third of the body. Then the larve started feeding on a spider. It eventually freed itself from the exuviae. No other cast-off cuticles were seen. A few extra spiders were fed to the larva because there had been space in the original nest cell for more spiders.

On August 13, the larva was seen using its new mandibles on its own venter. This might have been a cleaning activity. When it was given another *Theridion frondeum* it resumed feeding. The new mandibles were distinctly darker than the earlier ones. On August 14 the larva

was placed in an empty mud cell made by *Sceliphron caementarium* (Drury) so that its cocoon would take a suitable shape. It fed for 2 more days and at 11 AM on August 17 it started to spin the thin white outer threads which are characteristic of the cocoon of this species. Spinning continued for at least 36 hours. At 10:30 PM on August 18 the cocoon appeared brown and the larva could still be seen moving inside it. The pupal case was 12 mm by 5 mm on August 20. It was placed in a small box, returned to the shed on November 23 and allowed to remain for the next several months. An adult male *Chalybion zimmermanni* was released when it emerged from the cell on June 27, 1972. The wasp measured 17mm in length.

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***Melittobia chalybii* Ashmead (Hymenoptera: Eulophidae) as a Parasite of *Chalybion zimmermanni* Dahlbom (Hymenoptera: Sphecidae).** GERTRUDE L. WARD, Joseph Moore Museum, Earlham College, Richmond, Indiana 47374.——The eulophid wasp, *Melittobia chalybii* Ashmead, has been regarded as a parasite of many insects (2), including three wasps which nest in mud cases and occur in Indiana. These are *Sceliphron caementarium* (Drury), *Trypargilum politum* (Say) and *Chalybion californicum* (Saussure). It is of economic importance in Canada where it has been found as a parasite of *Megachile rotundata* (Fabricius), a pollinator of alfalfa (3). This report adds *Chalybion zimmermanni* Dahlbom as a host insect. The presence of *Chalybion zimmermanni* in Indiana was reported in 1969 (5).

Schmieder (4) described the life history of *Melittobia chalybii* from *Trypargilum politum*, stating that a fertilized female leaves the host cell in which she has matured and walks or hops to another cell. Although these females bear long wings, they rarely use them. A female enters a cell either before the final closure is made or through a small opening between lumps of dry mud. She is less than 1 mm in length. After about 12 days of feeding she lays eggs which develop rapidly. They hatch and mature in about 2 weeks. All of the parasites feed on the host larva or on the spiders which were placed in the cell as food for the larva. As successive generations develop the total population of parasites may reach 500 (1). The female which originally entered the cell usually lives from 60 to 75 days and continues to lay eggs during this time. Most of the first generation females live no longer than 3 days although some may live for 30 days. Finally, long-winged females are produced which bore out of the cell after copulation and seek new hosts.

Polymorphism is evident and two forms of each sex have been described by Schmieder (4). These are designated as the type-form and the second-form. Type-form females bear long wings. Type-form males, second-form females and second-form males have short wings. Type-form males have slightly larger wings than second-form males.

The specimens upon which this report is based were found in Union County, Indiana, 4 miles southwest of the village of Liberty. The nest of *Chalybion zimmermanni* was located in the loft of a small barn at the Brookville Ecological Research Center operated by Earlham College and Miami University. The nest had been made in 1970 and was opened by the author on 14 July 1972. No live specimens were found, but there were parts identifiable as one type-form female, one type-form male and one second-form male. These are on deposit in the collection of the Joseph Moore Museum, Earlham College, Richmond, Indiana.

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