pine barrens may be a limiting factor in the distribution of anurans. *Rana virgatipes* and *Hyla andersoni* embryos tolerate more strongly acid solutions than any of the other species tested. *Rana palustris* and *Acris g. crepitans* have the least tolerance to such conditions and these species are practically absent from unaltered pine barrens habitats. Seven of the eleven species tested require bog water or tap water acidified with hydrocloric acid at at a pH of 4.1 or higher for normal development.

5. *Hyla c. crucifer* is capable of spawning successfully in bog water at a pH of 4.2-4.5. *Pseudacris* is able to spawn in bog water at pH 4.7, or perhaps even lower.

6. We recognize the probability that additional factors are involved in limiting the distribution of local anurans in the barrens. In fact, it is likely that none of the species is either restricted to or excluded from the pine barrens by the pH factor alone. It is possible that for some species, however, pH may have some significance since many of the bogs and swamps are too acid for normal embryonic development to occur. Other physical or chemical factors in the bog water, at present unknown, may have deleterious effects on the embryos, the larvae, or on the fertilization process itself.

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ECOLOGICAL STUDIES OF THE ARTHROPODS ASSOCIATED WITH CERTAIN DECAYING MATERIALS IN FOUR HABITATS

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Introduction

When plants and animals in any habitat die, they are set upon by saprophagous organisms. During decay there is a succession of organisms associated with the decaying material, that is, the number and kind of associated organisms change as decay proceeds. The succession of organisms is influenced by variations in vegetation and microclimate. This influence is chiefly through effects on the course of decay and the character of the fauna of the area. Since a great diversity of vegetational types (and a corresponding diversity of microclimates) may occur in an area of a few acres, the animals associated with similar decaying materials in adjacent habitats may be quite different.

Many studies have been made on the arthropods associated with decaying substances in single habitats, but in only a few cases have direct comparisons of different habitats been made and most of these are in the nature of casual observations. Jaques (1915) found that Coleoptera are most active at fish "in damp shaded places and resort to fish of the sun-heated beach only of necessity."

Park (1931) made some general observations on the effect of moisture upon the beetles associated with fungi. Walsh (1931, 1933) set carrion-baited traps in "wood" and "moor" and recorded the catch. Kaufman (1937) found that of two carrion-baited traps in his garden, the one in the moister situation was the more productive. Savely (1939) studied the successions of animals in oak and pine logs and investigated the microclimate within the decaying logs. Mohr (1943) made an excellent study of the arthropods associated with cattle dung in open pastures. He states that the environment in which the dung is dropped has a profound effect upon its fauna but presents no detailed comparison of differing habitats. Reed (1953) investigated differences in the arthropods associated with dog carcasses in wooded areas and in open pastures.

Since comparative studies are so few, this study was undertaken to determine what sorts of similarities and differences may occur in the arthropods associated with decaying materials in different habitats in the same area. It involves (1) the description of four local habitats in regard to certain aspects of their vegetation and microclimate and (2) the analysis of arthropod collections from three organic materials placed as baits in each of the four habitats.

The writer is indebted to Dr. Arthur C. Cole, Jr. and Dr. Royal E. Shanks for numerous suggestions in connection with the planning of this study, and to Dr. Donald J. Borror and Dr. John N. Wolfe for advice and criticism in the completion of the project and in the preparation of this manuscript. The following systematists contributed freely of their time and skill in the identification of the various taxonomic groups encountered in this study: E. W. Baker, Acarina; B. D. Burks, Hymenoptera; O. L. Cartwright, Scarabaeidae; R. V. Chamberlin, Myriapoda; E. A. Chapin, Coleoptera; A. C. Cole, Jr., Formicidae; R. H. Foote, Diptera; C. A. Frost, Coleoptera; W. J. Gertsch, Araneae; L. R. Gillogly, Nitidulidae; C. J. Goodnight, Phalangida; J. N. Knull, Coleoptera; K. V. Krombein, Hymenoptera; C. F. W. Muesebeck, Hymenoptera; Alvah Peterson, immature insects; C. W. Sabrosky, Diptera; M. W. Sanderson, Staphylinidae; R. E. Shanks, flowering plants; A. J. Sharp, flowering plants; E. L. Sleeper, Curculionidae; W. C. Stehr, Carabidae; A. Stone, Diptera; E. S. Thomas, Orthoptera; J. K. Underwood, grasses and sedges; L. M. Walkley, Ichneumonidae; L. H. Weld, Hymenoptera; R. L. Wenzel, Histeridae; W. W. Wirth, Diptera; D. L. Wray, Collembola; and F. N. Young, Hydrophilidae.

THE HABITATS STUDIED

This study is based upon field work done from June 24 until August 6, 1952, in four habitats of differing vegetation about eight miles southeast of Camden, Tennessee. Figure 1 shows the exact locations and the topographic relationships of the habitats. The following general descriptions of the vegetation in each of the selected habitats were substantiated by sampling.

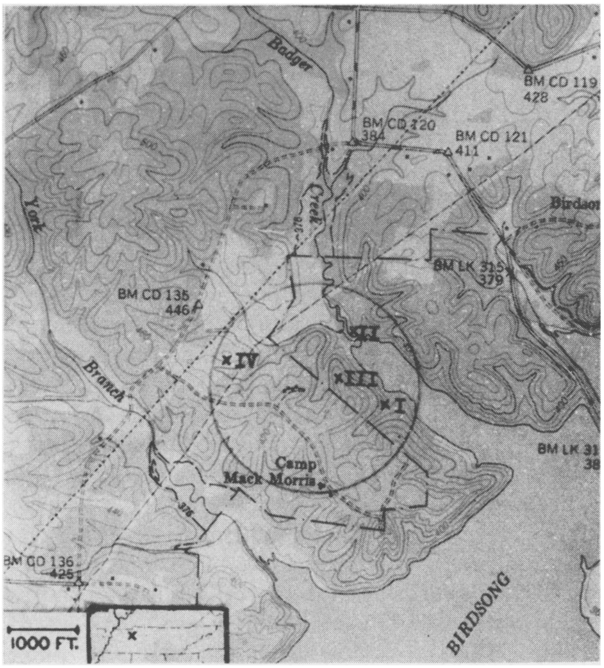

FIG. 1. Topographic map of study area: 35° 58′ N Lat., 88° 04′ W Long. Habitats are indicated by small *x*'s within circle. The X on the insert map of Tennessee indicates the general location of the area.

Habitat I was located near the mouth of a valley draining northeastward. The relatively level valley floor was locally interrupted by shallow drainage channels. A rich deciduous forest dominated by red maple (*Acer rubrum*) and sweet gum (*Liquidambar styraciflua*) formed a tree canopy with a coverage of about 80% *Quercus velutina*, *Quercus alba*, and *Nyssa sylvatica* were important subdominant canopy species. Commercially valuable trees had been removed from the area about twenty years before. Hazelnut (*Corylus americana*) and *Euonymus americanus*, together with many young trees, formed a well-developed shrub layer. Ground cover was sparse but varied.

Habitat II was situated in the flood plain of Badger Creek, thirty yards north of the creek. That the area was periodically flooded was evidenced by drift washed against the bases of trees; shallow drainage channels were present. About twenty yards north of the area, the ground rose slightly above the level of flooding. A marshy area associated with Kentucky Lake began thirty yards east. The forest in Habitat II was a park-like stand of large deciduous trees with little shrub layer and few small trees. Six species were prominent in the canopy—*Quercus falcata, Quercus alba, Liquidambar styraciflua, Carya ovata, Nyssa sylvatica,* and *Liriodendron tulipifera.* Hornbeam (*Carpinus caroliniana*) formed a relatively continuous tree understory, even predominating over the canopy species in basal area (about 20%) and in number of stems (about 45%). There was no evidence of lumbering. Grasses and sedges were markedly dominant in the sparse ground cover.

Habitat III was on a SE-NW ridge approximately forty yards wide and with steep sides. The forest canopy in Habitat III was quite broken, having a coverage of only about 30%. Post oak (*Quercus stellata*) and white oak (*Quercus alba*) were the dominants. *Quercus marilandica, Quercus coccinea, Quercus velutina,* and *Carya glabra* were important subdominants. The area had evidently been lumbered at the same time as Habitat I. The shrub layer was well-developed and quite dense in some places, *Vaccinium stamineum* being the dominant shrub. The herbaceous layer was extremely sparse, with poison ivy (*Rhus radicans*) the most conspicuous component.

Habitat IV was an abandoned field with rocky soil twenty yards from the top of a hill, on a south-facing slope. A wooded draw was fifty yards south. The area had been planted with pines (*Pinus rigida*) in the fall of 1946. However, the pines were too small to appreciably influence the microclimate, and a fire in the spring of the year of the study (1952) had resulted in the death of many of the trees. The ground cover was relatively uniform but covered only about 20% of the soil. *Andropogon virginicus* was dominant.

Techniques

The arthropods studied were trapped on three materials—cornmeal, cantaloupe, and fish. In each habitat a circle of twelve traps, each ten feet (3.05 m) from its nearest neighbor, was laid out (Fig. 2). The traps were No. 10 (gallon-size) tin cans buried flush with the soil surface. The mouths of the traps were covered with foot-square pieces of galvanized metal resting on stones about two inches in diameter. The cans were washed thoroughly before burial in order to prevent any attraction of arthropods by residual food. Each circle of traps was divided into three replicates of four traps each. Replicate A consisted of the first four traps in a clockwise direction from north, replicate B of the next four, etc.

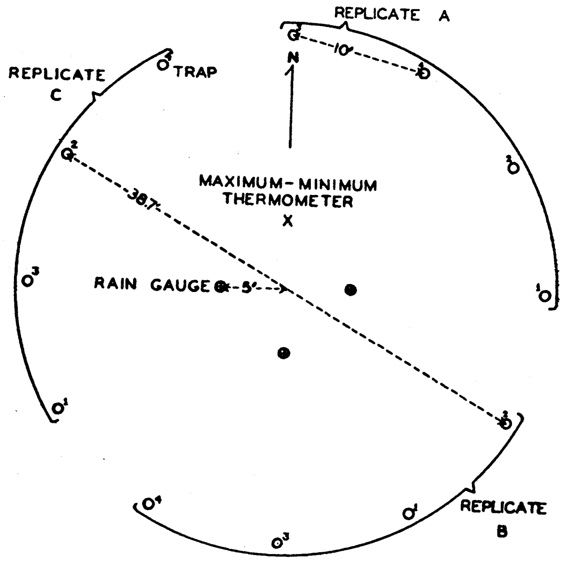

FIG. 2. Sample experimental setup of a trap circle. Numbers by traps refer to baits: 1-check; 2-cornmeal; 3-cantaloupe; 4-fish.

One trap in each replicate in each habitat (twelve traps in all) was left unbaited to serve as a check on the number and type of animals which entered the traps accidentally; likewise, one trap in each replicate was baited with 125 cc of fresh cornmeal, one was baited with a quarter of a ripe cantaloupe, and one with one-half pound of raw fish (carp). Within each replicate the arrangement of the baits was determined by drawing numbers.

The study was started June 24 and continued through August 6. Fresh baits, in clean cans, were put out when the old ones ceased to attract arthropods to any marked degree. The cornmeal traps were rebaited July 31; the cantaloupe traps were rebaited July 7 and July 27; the fish, July 13 and July 27. The amount of fish in these last two baitings was reduced to about a third of that of the first baiting, due to the tremendous numbers of insects attracted by the larger amount.

Every other day, usually in the afternoon, arthropods were collected from each trap. Forceps were the principal collecting device used. Forms which could readily fly escaped. Where possible, 100% collections were made of the remaining forms; however, certain of the smaller ones were sometimes so numerous that only a portion could be collected in the time available. Species too small to be noticed were frequently collected along with the debris adhering to the larger forms. All collections were preserved in vials of 70% alcohol and labeled as to date, habitat, bait, and replicate. The condition of the bait at the time of each collection was recorded. During

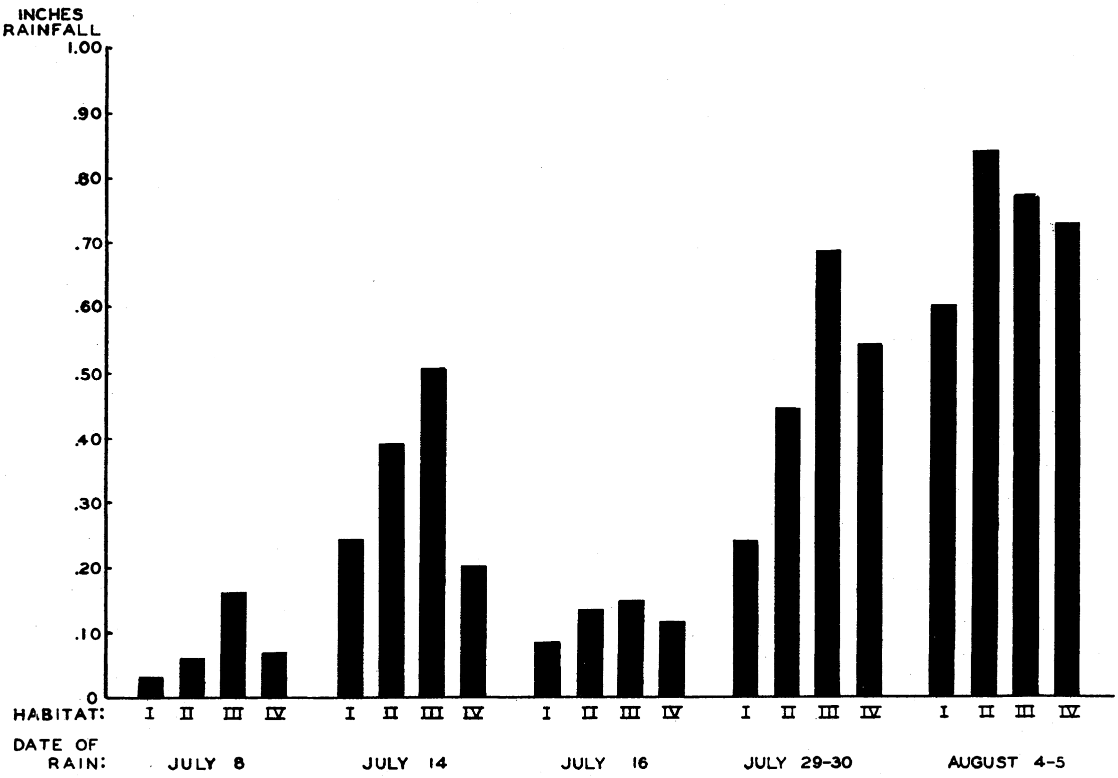

FIG. 3. Rainfall reaching the ground cover during period of study. The four habitats are I-mesic forest, II-bottom forest, III-ridge forest, IV-old field.

the course of the study 1008 collections were made.

Microclimatic Conditions

It was possible to measure only a few of the microclimatic factors of the different habitats; however, these factors give an idea of other differences which must have occurred. The following factors were examined in this study: (1) rainfall at ground level, (2) maximum and minimum air temperatures at one foot above the substrate, (3) soil temperatures at a depth of about 4½ inches (11.5 cm). These factors were selected because they could be measured with the available equipment and in the available time because of their value as indicators of other factors.

Rainfall

In each of the four study areas were placed three simple rain gauges made of No. 10 cans with screen wire in the bottom to reduce splashing. The gauges were fixed on the surface of the ground and were located five feet east, south, and west of the center of each circle of traps (Fig. 2). No attempt was made to place the gauges in the open, so the "effective" rainfall rather than the total rainfall was measured. Water trickling down the trunks of trees was not measured. After each rain the rainfall was calculated from the volume of water collected in the gauges.

The relationships of the habitats as to amount of effective rainfall seem to have been rather variable, as the graphs in Figure 3 illustrate. In general, however, Habitats I, II, and III ranked in that order in terms of increasing effective rainfall. This is as would be expected, since these three habitats rank in the same order in terms of decreasing amount of vegetation which would intercept part of the rain, allowing it to evaporate without reaching the ground.

Although Habitat IV had the least intercepting vegetation (all the gauges in this habitat were completely in the open), the recorded rainfall in that habitat was in every case less than that of Habitat III and frequently less than that of Habitat II. The most reasonable explanation seems to be that the actual rainfall was less in this habitat than in the other three habitats. Two facts make this explanation plausible: (1) The rainfall was of the thundershower type in every instance. (2) The first three habitats are grouped rather closely and are all within 400 feet of an arm of Kentucky Lake known as Badger Creek, while Habitat IV is apart from the other study areas and about one-third mile from Badger Creek (Fig. 1).

Other factors which might have contributed to the lack of correlation between readings in Habitat IV and those in the other three habitats are these: (1) The location of the gauges in Habitat III (and possibly Habitat II) might have been such that drainage from overhanging vegetation "funneled" an abnormal amount of rain into these gauges. This does not seem to be the case, since if the individual gauges are ranked in order of amount of rain caught during a particular rain, their order in relation to the habitat from which each comes is practically identical with the order of the totals from each habitat—*i.e.*, the amounts of rain caught by gauges in one habitat do not usually overlap with amounts caught by gauges in other habitats. In only one instance did a gauge in Habitat III have less water than did the gauge with the greatest catch in Habitat IV (2 cc less). Therefore, for this explanation to be correct, all three gauges in Habitat III would have to have been in spots of unusually high "effective" rainfall, and that seems unlikely. (2) Between time of rainfall and time of measurement, evaporation from the gauges in Habitat IV was probably greater than that in any of the other areas; however, in no case did more than part of a day elapse between rainfall and measurement, and amount of evaporation in Habitats IV and III should not have differed much, for the temperatures were quite similar. (3) A decrease in the catch of rain gauges may be due to the effect of wind eddying across their orifices. Since Habitat IV was the most open, wind effect should have been greatest in that habitat; however, the literature on wind effect, in general, points to differences of considerably less magnitude than those recorded in this study (Kittredge 1948).

The rainfall data from the study areas were compared with those from two nearby TVA rainfall stations—Johnsonville Steam Plant and Cavvia, located six and thirteen miles from the study areas (U. S. Dept. Commerce 1952). The spottiness of the rainfall during the course of the study is substantiated by the high variability in both dates of rainfall and amounts among the three localities (the two TVA stations and the study areas). In all three localities, however, rainfall until about the first of August was extremely light and infrequent. Indeed the whole area experienced the worst drought in many years as evidenced by the widespread browning of even mature trees on ridge sites and as confirmed by the local residents and by data compiled by TVA. Habitats III and IV were particularly affected by the drought conditions, in that a noticeable portion of the ground cover died during the course of the study.

Air Temperatures

In each of the four habitats a maximum-minimum thermometer of Six's type (gray plastic back, Taylor Instrument Company) was mounted horizontally on a ⅜ x 3 x 12 inch board facing north one foot above the substrate. Standard mountings held the thermometers about ½ inch from the mounting boards, permitting free circulation of air. In each habitat the installation was located five feet north of the center of the trap circle (Fig. 2). At each tending of the traps —*i.e.*, every other day from June 25 through August 6—the thermometers were read as to maxima and minima and reset. The thermometers were calibrated both before and after the study, and the readings were corrected accordingly.

An attempt was made to correlate U. S. Weather Bureau data with those from the study areas. The nearest station recording maximum and minimum temperatures was Paris, Tennessee, 27 miles NNW. The temperature data obtained at Paris showed the same trends as the data from the habitats (U. S. Dept. Commerce 1952).

Figure 4 shows graphically, for the period from June 25 through August 6, the absolute maximum temperature, the mean two-day maximum, the mean (obtained by averaging the mean maximum temperature with the mean minimum), the mean two-day minimum, and the absolute minimum for each of the study areas and for the USWB station at Paris. The data for Habitat II are partly derived by extrapolation, since it was discovered on July 9 that the thermometer had been stolen.

Although the extremes are slightly greater and the mean figures somewhat lower, the temperatures in Habitat I agree very closely with the USWB data. This agreement may be explained on the basis that the tight canopy and abundant understory produced a sheltered situation quite similar in effect to that of the slatted wooden box used by the USWB.

The absence of a well-developed shrub layer in Habitat II was probably responsible for the slightly greater extremes—both average and absolute—than those recorded in Habitat I. However, the sheltering effect of the vegetation in the case of maximum temperatures was still quite pronounced as compared to these effects in the remaining two habitats.

The data from Habitats III and IV show absolute maxima of about 122° F and mean maxima of about 111° F. These high readings were in

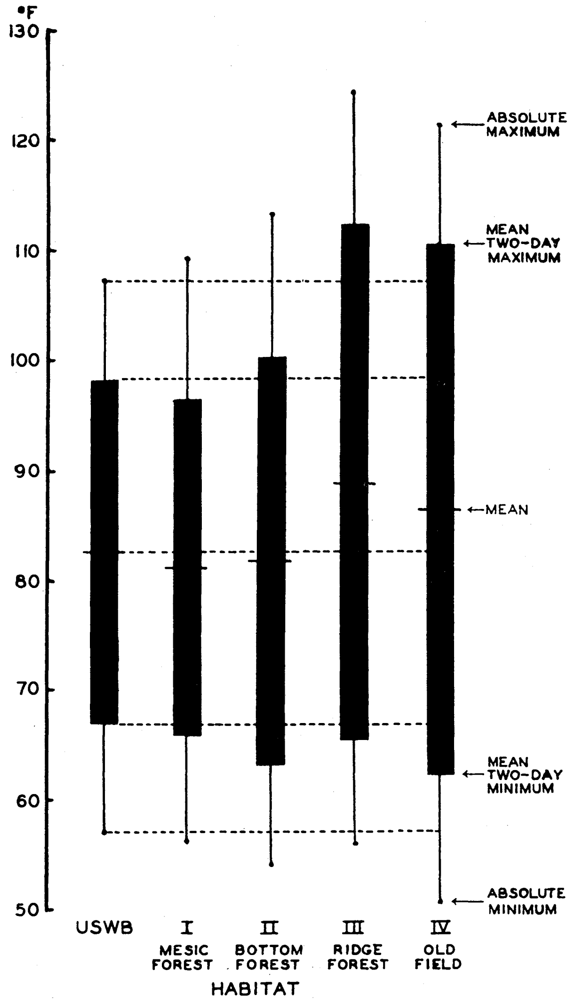

Fig. 4. Relationships of temperature in habitats, June 25 to August 6. Thermometers one foot above the ground. Data for Habitat II partly derived by extrapolation.

part due to heating by direct radiation, since both thermometers were almost completely in the open. Nevertheless, this effect was considrably lessened by the fact that the thermometers faced north. Although the maxima in Habitat III average higher than those in Habitat IV, the difference (1.8° F) may probably be ascribed to chance differences in heating by direct radiation, since Habitat III is in fact the more sheltered habitat. The minimum temperatures were consistently lowest in Habitat IV, where there was practically no tree or shrub cover which might retard heat loss at night.

Soil Temperatures

Soil temperatures in each habitat were taken with a glass laboratory thermometer every six days during the study. A rat-tail file was used to make a hole in the soil, and the thermometer was inserted to a depth of 4¾ inches. Readings were made to the nearest ½ degree Fahrenheit. Time of measurement varied from 10:30 a.m. to 5:30 p.m., but all measurements for any one day were made within narrower limits. Table I shows that Habitat IV had by far the highest diurnal soil temperatures, with recordings averaging 14.7° F above the mean for all four habitats and with a maximum of 103.5° F. The soil temperatures in Habitats I and II were about the same, with those in Habitat II being slightly higher in most cases. Soil temperatures in Habitat III averaged about 5° F higher than those in Habitats I and II.

Table I. Soil temperatures taken during period of study with a glass laboratory thermometer inserted to a depth of 4¾ inches

Date	Mean (°F)	Deviation from Mean				Range (°F)
		Habitat I	Habitat II	Habitat III	Habitat IV	
June 27	82.1	−6	−6.5	+3	+10	16.5
July 3	82.5	−7	−6.5	−2	+15.5	22.5
July 9	74.6	−4.5	−3.5	−3	+11.5	16
July 15	78.1	−6	−3.5	−3	+13	19
July 21	84.2	−8	−9	0	+17	26
July 27	83.1	−10	−5	−5	+20	30
Aug. 2	82.2	−9	−8	+1	+16	25
Average of all dates	81.0	−7.4	−6.1	−1.3	+14.7	22.1

Discussion

From the preceding microclimatic data, it is apparent that animals near, on, or in the ground in Habitats I and II were subjected to extremes of temperature much less than in the other two habitats. The remarkably high temperatures of both soil and air recorded in Habitat IV mark it as especially rigorous.

Although instruments to measure evaporation were not available, observations on soil moisture conditions and upon the process of decay of the baits indicated that Habitats I and II had almost equal evaporation rates, while Habitat III had a markedly higher rate and Habitat IV an even higher one. The differences in effective rainfall in the habitats did not compensate for differences in evaporation to any noticeable degree.

Results of Collections

From Unbaited Traps

The three unbaited traps in each habitat served as checks on the numbers and kinds of animals which might be collected in a trap without direct relationship to the bait in that trap. In collecting from the unbaited traps, even very small specimens could be seen against the bare tin, so collections were close to 100%. A total of 121 species of arthropods were collected from unbaited traps; Table II lists those species collected three or more times in at least one habitat.

TABLE II. Species collected three or more times from unbaited traps in at least one habitat. The first figure in each entry is the number of times the species was collected in check traps in that habitat; the second is the total number of specimens taken from check traps in that habitat

Species	Habitat			
	I	II	III	IV
Orthoptera				
Ceuthophilus stygius	3 - 3	......	......	......
Ceuthophilus divergens	......	14 - 18	......	......
Nemobius carolinus	......	3 - 3*	......	......
Coleoptera—Carabidae				
Carabus vinctus vinctus	......	5 - 5	......	......
Pasimachus depressus	......	......	4 - 4*	......
Lepidoptera—Arctiidae				
Undetermined sp. (larvae)	......	......	......	3 - 3*
Hymenoptera—Formicidae				
Stigmatomma p. pallipes	......	......	3 - 3*	......
Aphaenogaster rudis	5 - 9	......	......	......
Aphaenogaster treatae	......	......	3 - 3*	5 - 17**
Pheidole spp.	......	......	......	11 - 13
Crematogaster lineolata subopaca	......	......	14 - 19	20 - 44
Monomorium minimum	......	......	3 - 3*	......
Myrmecina americana	3 - 3*	......	.....	. . .
Iridomyrmex pruinosus	. . .	. . .	. . .	13 - 22
Paratrechina parvula	11 - 12	. . .	. . .	5 - 10*
Phalangida				
Libitiodes ornata	. . .	3 - 5	. . . .	......
Leiobunum nigripes	7 - 14	5 - 11*	......	......
Leiobunum politum	14 - 24	10 - 13	......	......
Araneae				
Anahita punctulata	6 - 7	. . . .	. . . .	......
Lycosa helluo	......	4 - 4*	......	......
Pirata alachua	16 - 20	5 - 6	......	......
Schizocosa crassipes	......	13 - 17	7 - 7	4 - 4*
Schizocosa retrorsa	......	9 - 10	......	6 - 6
Latrodectus mactans	......	......	......	5 - 6

*Collected from only two of the three replicates in the habitat.
**Collected from only one of the three replicates in the habitat.

Since there was no attractant in the empty cans, the animals found in the check traps must have come upon them by chance. The actual entering of the traps, however, may have been due to a positive response to the conditions of temperature, moisture, and light associated with the trap. Certain arthropods that could easily escape, such as phalangids, nevertheless remained in the traps until the time of collection, possibly due to favorable conditions within the traps. On the other hand, arthropods such as ground beetles once in the trap could not escape.

The species collected from the check traps were mostly general predators or general scavengers which would be expected to move about more or less at random in the areas in which they occur. The species attracted in large numbers to the baited traps were seldom collected from the check traps, even though these were only a few yards away. For example, no carrion beetles (Silphidae) were found in check traps, whereas 1312 were collected from the traps baited with fish.

In general, species taken in check traps in a habitat were collected in all three replicates if they occurred with high enough frequency for this to be likely. In the case of the ant *Aphenogaster treatae* in Habitat IV, the location of a nest may have been responsible for its being collected five times from one check trap and never from the other two.

Differences among the habitats in the arthropods collected from the checks are striking. Indeed only one species was prominent in more than two habitats, and the majority were prominent only in one. Habitats I and II were characterized by an abundance of phalangids and spiders, while Habitats III and IV showed a predominance of ants. Habitat I showed a few ants, but Habitat II had none occurring with notable frequency. The camel cricket *Ceuthophilus divergens* was very prominent in Habitat II.

From Traps Baited with Cornmeal

Under the conditions of this study the cornmeal bait usually exhibited little decomposition, and there was little change in the arthropods collected from it. In a few instances the meal became sour and moldy as a result of rain water running into the can, and in such cases additional species were collected.

A total of 130 species were collected from cornmal traps. Table III lists for each habitat those species deemed attracted to the cornmeal. The following test was used as a criterion for attraction. For each species a null hypothesis was formulated that the probability of the species being taken was independent of whether the trap was baited or not. The probability of any resulting distribution of collections of a species from baited and unbaited traps could then be computed from the binomial $(p+q)^n$, where n is the number of collections and $p=q=\frac{1}{2}$. A probability value was obtained for each observed distribution which deviated, in favor of the baited traps, from that expected on the basis of the null hypothesis. Each value was the sum of the probabilities of equal and greater deviations in favor of the baited traps. Each was obtained from tables of the cumulative binomial distribution. If the probability was equal to or less than .05, the null hypothesis was rejected, and the species was considered to have been attracted to the bait.

At the risk of pointing out the obvious, species not included in the table may have been attracted

TABLE III. Species attracted to cornmeal-baited traps. See text for criterion used. The first figure in each entry is the number of times the species was collected in cornmeal traps in that habitat; the second is the total number of specimens taken from cornmeal traps in that habitat. The numbers in parentheses refer to the check-trap data for the same species

Species	Habitat			
	I	II	III	IV
Orthoptera				
Blattidae				
Parcoblatta uhleriana	8 - 17*	......	30 - 91	......
Parcoblatta caudelli	......	......	20 - 37	6 - 8
Parcoblatta spp. (nymphs)	......	......	26 - 50	......
Tettigoniidae				
Ceuthophilus stygius	15 - 22	......	7 - 9	......
	(3 - 3)	......	......	......
Ceuthophilus uhleri	13 - 20	......	9 - 14	......
Ceuthophilus divergens	14 - 24	29 - 65	7 - 9*	......
	......	(14 - 18)	......	......
Gryllidae				
Nemobius maculatus	6 - 9	......	......	......
Nemobius carolinus	10 - 12	14 - 17	......	......
	......	(3 - 3)	......	......
Nemobius confusus	8 - 10	......	......	......
Acheta assimilis	......	7 - 9*	7 - 8	......
	......	......	(1 - 1)	......
Hemiptera—Reduviidae				
Undetermined sp. (nymphs)	......	......	15 - 18	......
	......	......	(1 - 1)	......
Coleoptera				
Carabidae				
Platynus striatopunctatus	......	5 - 5	......	......
Galerita bicolor	......	9 - 13	......	......
	......	(2 - 2)	......	......
Chlaenius erythropus	......	5 - 5*	......	......
Nitidulidae				
Stelidota octomaculata	......	......	8 - 17*	......
Mycetophagidae				
Litargus didesmus	5 - 16*	8 - 23*	......	......
Hymenoptera—Formicidae				
Aphaenogaster rudis	20 - 36	......	......	......
	(5 - 9)	......	......	......
Aphaenogaster treatae	......	......	14 - 25	......
	......	......	(3 - 3)	......
Monomorium minimum	......	......	10 - 69*	......
	......	......	(3 - 3)	......
Phalangida—Cosmetidae				
Libitiodes ornata	5 - 10*	......	......	......

*Collected from only two of the three replicates in the habitat.

to the bait (and vice versa). For example, species collected less than five times cannot be included among the attracted, since at least five collections are necessary to produce probabilities small enough to reject the null hypothesis. Thus a species that was highly attracted, but rare, would not be listed.

The species considered, attracted to cornmeal may be divided into two groups. The first and largest group is composed of those species which occurred with more or less equal frequency throughout the period of study with little regard to the age and condition of the bait. All species listed in Table III, except *Stelidota octomaculata* and *Litargus didesmus,* belong in this category. There was considerable variation with the habitat as to which groups and species predominated (see Table III).

The second species group attracted to cornmeal in this study consists of only two species—the beetles *Stelidota octomaculata* and *Litargus didesmus*. These species were found only in cornmeal which had become moldy or sour. Since this occurred only in a few instances, the absence of the beetles in any particular habitat might have been due merely to a lack of an attractive bait.

A point of interest is that no insects which are considered pests of stored cornmeal (*e.g.,* mealworms, Indian-meal moth) were associated with any of the cornmeal baits during this study.

An important consideration in connection with the cornmeal baits is that except in the rare cases of wetting they remained identical in all habitats. Therefore, they should have had the same attractiveness in each habitat, and the differences in the species attracted should have been due to differences in the species within and about the habitat. The fact that no species was attracted in all four habitats and only one was attracted in three of the habitats seems to indicate that no forms came from great distances. Whatever attractiveness the cornmeal had must have been of short range.

Table IV, derived from the data in Table III, is a summary of the similarities among the four habitats as to the species attracted to cornmeal.

TABLE IV. Similarities in the species attracted to cornmeal in the four habitats

Habitat	Total spp. attracted to cornmeal	% of Species also Attracted in Habitat			
		I	II	III	IV
I	10	..	30	40	0
II	7	43	..	29	0
III	10	40	20	..	10
IV	1	0	0	100	..

The wooded habitats—I, II, and III—all have species in common, whereas the lone species attracted in Habitat IV is shared only by Habitat III, the driest of the other three.

From Traps Baited with Cantaloupe

Some 278 species were collected from the cantaloupe baits. Table V lists for each habitat those species attracted to the cantaloupe. The same statistical test was used as a criterion of attraction as in the case of the collections from cornmeal. The application of the test to the cantaloupe collections has this weakness: The collection of freely flying forms depended upon their becoming entrapped in the liquid associated with decomposition. Hence for these forms, the check trap data have no real

TABLE V. Species attracted to cantaloupe-baited traps. The first figure in each entry is the number of times the species was collected in cantaloupe traps in that habitat; the second is the total number of specimens taken from cantaloupe traps in that habitat. The numbers in parentheses refer to the check-trap data for the same species

Species	Habitat			
	I	II	III	IV
Diplopoda				
Narceus americanus	......	......	5 - 5	......
Orthoptera				
Blattidae				
Ischnoptera deropeltiformis	......	6 - 7*	5 - 5*	......
Parcoblatta uhleriana	13 - 22	......	20 - 97	......
Parcoblatta caudelli	......	......	17 - 31	14 - 48
Parcoblatta spp. (nymphs)	9 - 32	......	28 - 115	7 - 8*
Tettigoniidae				
Ceuthophilus stygius	......	9 - 15*	......	......
	......	(1 - 1)	......	......
Ceuthophilus uhleri	......	......	5 - 8	......
Coleoptera				
Carabidae				
Evarthrus americanus	6 - 6	......	......	......
Platynus tenuis	7 - 25**	......	......	......
Hydrophilidae				
Cercyon analis	38 - 151	33 - 114	......	......
Leiodidae				
Colenis impunctata	......	......	5 - 5*	......
Staphylinidae				
Oxytelus sp.	39 - 170	52 - 295	41 - 224	......
	......	(1 - 1)	......	......
Aderocharis corticinus	7 - 8	5 - 6*	......	......
Rugilus sp.	6 - 8*	13 - 19	......	......
Philonthus cyanipennis	......	6 - 7*	......	......
Philonthus blandus	13 - 28	9 - 13	......	......
Philonthus sp. #1	11 - 14	10 - 16	11 - 21	......
Philonthus sp. #2	......	7 - 8	......	......
Belonuchus formosus	11 - 22	18 - 35	8 - 11	......
Platydracus sp. #1 and *maculosus*	5 - 5	16 - 24	......	......
Platydracus fossator	18 - 24	7 - 9*	18 - 23	......
	(2 - 2)	......	......	......
Tachinus fimbriatus	6 - 13	6 - 7*	......	......
Tachinus pallipes	......	5 - 7*	......	......
Lordithon axillaris	5 - 7*	......	......	......
Atheta spp.	29 - 61	29 - 65	31 62	......
Ptiliidae				
Sp. #1	5 - 5	......	.. ...	.....
Histeridae				
Hister abbreviatus	......	5 - 7*	......	......
Hister depurator	......	8 - 11	5 - 5	......
Phelister mobilensis	5 - 5	......	16 - 21	......
Nitidulidae				
Carpophilus sayi	......	......	14 - 62	10 - 85
Stelidota geminata	24 - 179	20 - 53	19 - 50	......
Stelidota octomaculata	......	......	5 - 5	......
Pallodes pallidus	......	......	6 - 6	......
Glischrochilus obtusus	5 - 5*	......	......	......
Glischrochilus fasciatus	......	......	7 - 10	......
Glischrochilus q. quadrisignatus	6 - 9	10 - 22	10 - 17	......
Mycetophagidae				
Typhaea stercorea	......	......	......	9 - 84
Scarabaeidae				
Deltochilum gibbosum	5 - 7	15 - 42	......	......
Ateuchus histeroides	......	7 - 13	8 - 16*	......
Onthophagus hecate	18 - 31	63 - 490	6 - 7	......
	......	(1 - 1)	......	......
Onthophagus striatulus	......	8 - 13	5 - 5*	......
	......	(1 - 1)	......	......
Onthophagus pennsylvanicus	8 - 9	13 - 20	......	......
Ataenius platensis	......	......	......	9 - 20
Geotrupes splendidus	10 - 15	17 - 36	7 - 9	......

TABLE V. Continued

Species	Habitat			
	I	II	III	IV
Diptera				
Stratiomyidae				
Undetermined spp. (larvae)	25 - 97	30 - 86	16 - 52	......
Drosophilidae				
Undetermined spp. (larvae)	8 - 17	16 - 42	7 - 11	......
Sphaeroceridae				
Leptocera winnemana	8 - 8	20 - 42	......	......
Sphaerocera annulicornis	12 - 12	6 - 8	......	......
Sarcophagidae				
Undetermined spp. (larvae)	......	14 - 33	7 - 34	9 - 23
	......	(1 - 1)	......	......
Hymenoptera				
Pteromalidae				
Spalangia sp.	......	5 - 5*	......	......
Formicidae				
Crematogaster lineolata subopaca	......	......	......	35 - 139
	......	......	......	(20 - 44)
Iridomyrmex pruinosus	......	......	......	28 - 68
	......	......	......	(13 - 22)
Camponotus pennsylvanicus	12 - 79	14 - 20	......	......
	......	(2 - 2)	......	......
Prenolepis imparis	9 - 46*	......	......	......
Araneae—Salticidae				
Sitticus cursor	......	......	......	5 - 5
Acarina				
Undetermined spp.	14 - 99	49 - 358	17 - 76	......
	(2 - 2)	(1 - 1)	(3 - 3)	......

*Collected from only two of the three replicates in the habitat.
**Collected from only one of the three replicates in the habitat.

meaning and there can be no good test of attraction. However, three of these forms are included in the table on the basis that species which could not escape are usually classed as attracted when collected in similar numbers.

There are three other important limitations to the data recorded in Table V: (1) The fact that no adult flies were collected in large numbers from cantaloupe in Habitats III and IV almost certainly resulted from a lack of ensnaring liquid rather than an absence of flies. The scarcity of collections of adults of those species common as larvae confirms this judgment. (2) In the case of species less than 5 mm in length, the number of individuals has little significance since they were sometimes so abundant that collection of all the individuals was impossible in the time available. An attempt was made to collect a sample large enough to insure the inclusion of all important species. (3) In a few taxonomic groups, such as the mites, species were not separated. Such groups must be included in the table because of their prominence in the collections, even though it is misleading to compare directly data for groups of species with those for single species.

The cantaloupe bait differed from the cornmeal in that it had a definite course of decay in each habitat. As the cantaloupe decomposed, there

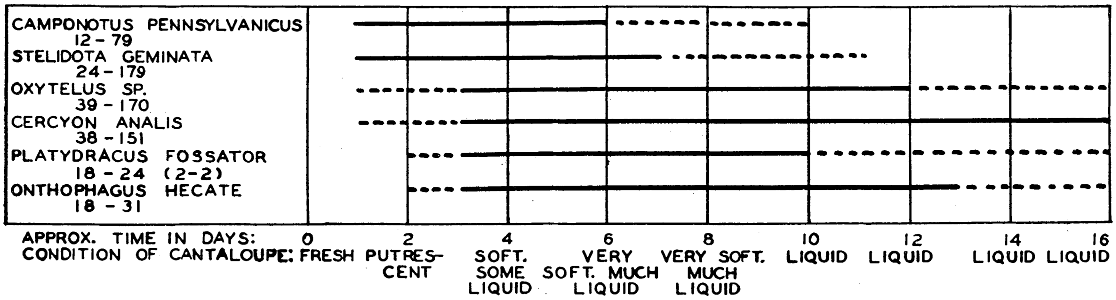

FIG. 5. Changes in attractiveness of cantaloupe in Habitat I (mesic forest). The number of times the species was collected and the total number of individuals collected are indicated below each species name. Figures in parentheses refer to check-trap data for the same species. The line after each species name refers to the presence of the species at various stages of decay. The relative abundance of a given species at different times is indicated by a solid line (abundant) or a broken line (scarce).

were marked changes in the numbers and species of arthropods attracted to it. The course of decay varied a great deal from habitat to habitat. The most important factor was probably the rate of evaporation from the traps. The variations recorded in soil and air temperatures (Table I and Fig. 4) give some indication of the differing conditions under which the baits in different habitats decayed. In Habitats I and II the cantaloupe became soft and mushy and finally decomposed into a watery liquid. In Habitat III the initial stages were similar to those in the preceding habitats, but instead of finally becoming a watery liquid the mush dried to a hard cake-like substance. In Habitat IV drying was evident from the first, the final product being the shriveled, dried remains of the original section of cantaloupe.

Figure 5 shows graphically the changes in attractiveness of the cantaloupe baits in Habitat I to the most important species associated with them. Species included are those which occurred in three or more of the nine sequences (three baitings, each with three replicates) studied *and* which either were collected in numbers of at least thirty or were collected at least fifteen times in excess of check-trap data. These arbitrary limits correspond roughly to the minimum data required to judge a species as to the relative attractiveness of cantaloupe in various stages of decomposition. Groups which could not be separated to species—e.g. *Atheta* spp.—are not included, since individual species within such groups do not necessarily have similar responses to the bait. The horizontal scale of the graph indicates the stage of decomposition of the cantaloupe. Condition of the bait is described at regular intervals, each interval representing approximately two days. The exact time intervals occupied by the various stages of decay varied somewhat among the three baitings and among the three replicates. The presence of a species at any particular stage of decay is shown by a line (either solid or broken). Figures 6, 7, and 8 show the same information for Habitats II, III, and IV respectively.

Table 5 and Figures 5 to 8 show important differences in the species attracted to the cantaloupe baits in the four habitats. These differences resulted from two factors: (1) differences in the arthropods in the vicinities of the habitats and (2) differences in the baits in the habitats (due

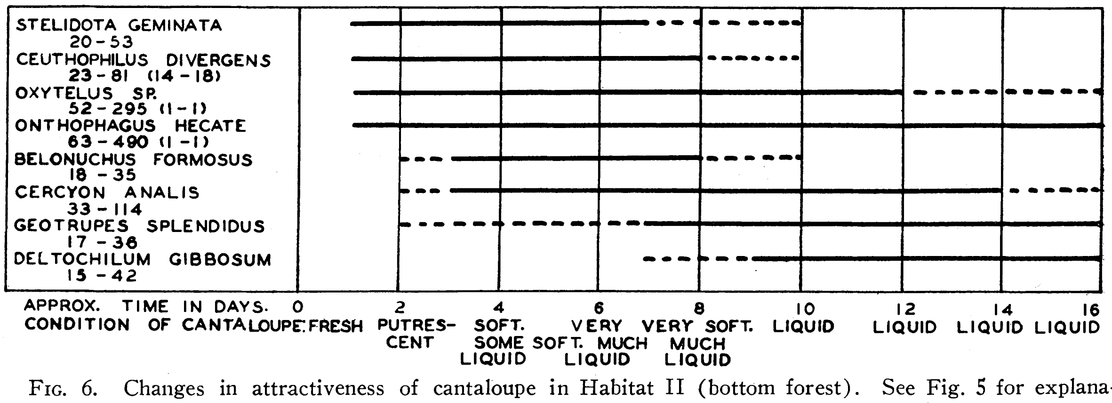

FIG. 6. Changes in attractiveness of cantaloupe in Habitat II (bottom forest). See Fig. 5 for explanation.

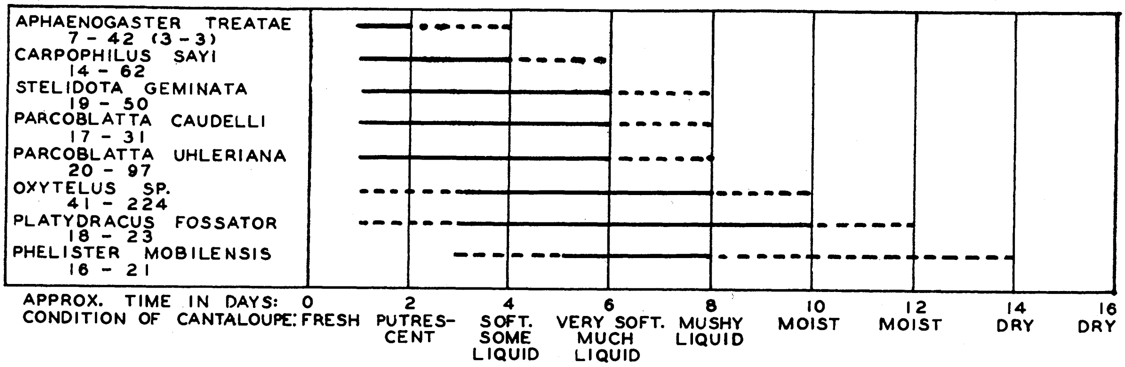

FIG. 7. Changes in attractiveness of cantaloupe in Habitat III (ridge forest). See Fig. 5 for explanation.

to differences in the course of decay). In the case of the check traps and the dry cornmeal traps, only the first factor was operative.

TABLE VI. Similarities in the species attracted to cantaloupe in the four habitats

Habitat	Total spp. attracted to cantaloupe	% of Species also Attracted in Habitat			
		I	II	III	IV
I	26	. .	69	38	0
II	28	64	. .	43	0
III	22	45	55	. .	9
IV	7	0	0	29	. .

Table VI, derived from the data in Table V, is a summary of the similarities among the four habitats as to the species collected at cantaloupe. Only separate species were included in the tabulation—*i.e.* groups not determined to species were omitted. Habitats I and II are shown to be more closely related in their cantaloupe fauna than any other two habitats. Habitat III is related almost equally to Habitats I and II and has two species in common with Habitat IV. Five of the seven important species on cantaloupe in Habitat IV are of importance only in that habitat.

From Traps Baited with Fish

There were 255 species collected from fish-baited traps. Table VII lists for each habitat those species attracted to the fish. The same criterion of attraction as before was used, and the same limitations apply to these data as applied in the case of the cantaloupe data.

Like the cantaloupe baits, the fish baits decomposed somewhat differently in the various habitats. Again the most important factor was probably the rate of evaporation from the traps. In Habitats I and II the fish became putrid and soft until finally it was reduced to a foul-smelling liquid. This liquid gradually dried until a mild-smelling solid remained. In Habitat III the fish became putrid and soft but soon began to dry, and the pieces were more or less intact at the end of the process. In Habitat IV drying began immediately, and the portions of fish soon became hard and leathery.

Figures 9 to 12 show the changes in attractiveness of the fish baits in the four habitats. The data are presented in the same manner as in the preceding four figures.

Table VIII was compiled from the data in Table VII and summarizes the similarities in the species collected at fish in the four habitats. These similarities fall into much the same pattern as they did in the cantaloupe bait. The presence in Habitats I and II of small percentages of the species important in Habitat IV is the only major difference.

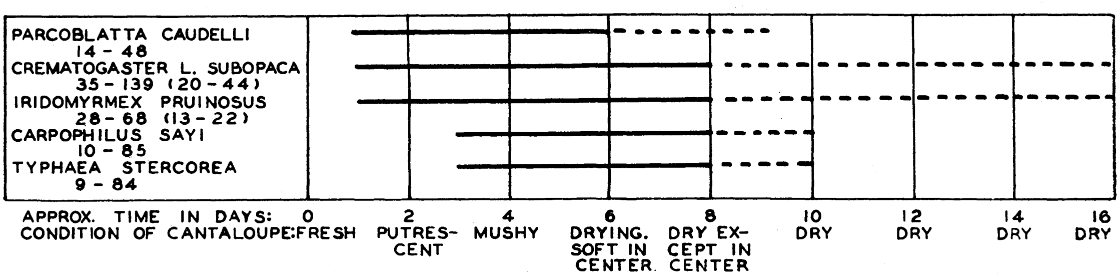

FIG. 8. Changes in attractiveness of cantaloupe in Habitat IV (old field). See Fig. 5 for explanation.

TABLE VII. Species attracted to fish-baited traps. The first figure in each entry is the number of times the species was collected in fish traps in that habitat; the second is the total number of specimens taken from fish traps in that habitat. The numbers in parentheses refer to the check-trap data for the same species

Species	HABITAT			
	I	II	III	IV
Diplopoda				
Narceus americanus	......	......	10 - 11	......
Orthoptera				
Blattidae				
Parcoblatta uhleriana	......	......	18 - 48	......
Parcoblatta caudelli	......	......	10 - 16*	7 - 12
Parcoblatta spp. (nymphs)	......	......	10 - 18	......
Tettigoniidae				
Ceuthophilus divergens	......	......	5 - 8	......
Hemiptera—Coriscidae				
Coriscus eurinus	......	......	......	17 - 31
Coleoptera				
Carabidae				
Chlaenius erythropus	5 - 5	......	......	......
Hydrophilidae				
Cercyon analis	15 - 21	......	......	......
Pemelus costatus	10 - 12	......	......	......
Silphidae				
Nicrophorus orbicollis	36 - 153	25 - 175	21 - 70	6 - 7
Nicrophorus americanus	......	9 - 9	......	......
Nicrophorus pustulatus	......	......	5 - 13*	......
Nicrophorus tomentosus	15 - 21	9 - 19*	6 - 11*	......
Silpha littoralis surinamensis	19 - 268	6 - 22*	17 - 253	......
Silpha lit. surinamensis (larvae)	6 - 27*	......	......	......
Thanatophilus americana	24 - 91	18 - 42	14 - 29	......
Nemadus horni	5 - 6*	......	......	......
Prionochaeta opaca	23 - 62	13 - 18	......	......
Staphylinidae				
Oxytelus insignitus	......	10 - 61	......	......
Oxytelus sp.	36 - 463	27 - 298	31 - 285	5 - 8*
	......	(1 - 1)	......	......
Rugilus sp.	8 - 8	14 - 31	......	......
Philonthus cyanipennis	5 - 5*	......	......	......
Philonthus sp. #1	9 - 12	......	6 - 7	......
Philonthus sp. #2	5 - 5	......	......	......
Philonthus sp. #3	......	5 - 7**	......	......
Philonthus sp. #4	6 - 6	......	......	......
Platydracus maculosus	15 - 27	24 - 56	5 - 6	......
Platydracus sp. #1	18 - 26	14 - 31	30 - 57	9 - 15
Platydracus femoratus	7 - 7	9 - 26	......	......
Platydracus fossator	31 - 41	10 - 11	16 - 17	......
	(2 - 2)	......	......	......
Ontholestes cingulatus	10 - 12	21 - 40	......	......
Staphylinus maxillosus	......	......	15 - 34	5 - 7
Tachinus pallipes	......	6 - 8	......	......
Atheta spp.	22 - 34	21 - 87	10 - 16	......
Aleochara sp.	24 - 44	17 - 58	8 - 11	......
Baryodma sp.	......	......	......	5 - 6
Ptiliidae				
Sp. #1	5 - 10*	......	......	......
Histeridae				
Hister coenosus	14 - 24	14 - 24	14 - 23	......
Hister abbreviatus	16 - 30	21 - 36	9 - 23	......
Hister depurator	23 - 44	23 - 62	12- 19	......
Atholus sedecimstriatus	......	5 - 7*	......	......
Phelister mobilensis	......	6 - 6	15 - 22	......
Saprinus assimilis	47 - 240	33 - 281	46 - 438	13 - 21
Saprinus semistriatus	......	......	13 - 19	5 - 8
Saprinus orbiculatus	......	......	......	10 - 35
Dermestidae				
Dermestes caninus	......	......	21 - 55	33 - 184
Undetermined spp. (larvae)	......	......	......	7 - 21
Nitidulidae				
Omosita colon	6 - 7*	8 - 17*	13 - 23	5 - 7
Monotomidae				
Monotoma americana	......	......	......	5 - 15*
Scarabaeidae				
Deltochilum gibbosum	20 - 31	19 - 49	16 - 30	......
Ateuchus histeroides	7 - 12	......	8 - 12	......
Onthophagus hecate	6 - 6	19 - 46	6 - 6	......
	......	(1 - 1)	......	......
Onthophagus pennsylvanicus	......	6 - 12*	13 - 21	......
Ataenius platensis	......	......	......	13 - 31
Geotrupes splendidus	14 - 24	18 - 33	16 - 22	......
Trogidae				
Trox monachus	13 - 21	13 - 18	9 - 10	......
Trox asper	......	......	......	15 - 23
Diptera				
Empididae				
Drapetis sp.	......	9 - 20	12 - 19	......
Phoridae				
Conicera atra	7 - 8	......	......	......
Diploneura cornuta	13 - 83	11 - 196*	6 - 22	......
Diploneura incisuralis	......	6 - 41*	......	......
Megaselia scalaris	......	8 - 28*	......	......
Megaselia juli	7 - 8	7 - 29*	......	......
Megaselia spp.	10 - 13	13 - 37*	......	......
Puliciphora sp. (wingless ♀ ♀)	18 - 43	7 - 27	14 - 19	......
Drosophilidae				
Undetermined spp. (larvae)	......	6 - 12	......	......
Chloropidae				
Hippelates bishoppi	......	6 - 18*	......	......
Sphaeroceridae				
Leptocera fontinalis	13 - 49	8 - 29	......	......
Leptocera winnemana	19 - 60	9 - 26	5 - 7	......
Leptocera undescribed sp.	9 - 26	......	......	......
Leptocera sp. #1	23 - 127	15 - 70	7 - 12*	......
Leptocera sp. #2	15 - 44	8 - 19*	......	......
Leptocera sp. #3	8 - 10	......	......	......
Leptocera sp. #4	7 - 18	......	......	......
Sphaerocera annulicornis	10 - 14	9 - 11	......	......
Sphaerocera undescribed sp.	7 - 12	11 - 31*	......	......
Muscidae				
Fannia sp. (larvae)	9 - 17*	9 - 18	......	......
Sarcophagidae				
Sarcophaga bullata	5 - 10	......	......	......
Undetermined spp. (larvae)	47 - 305	22 - 114	54 - 287	39 - 258
	......	(1 - 1)	......	......
Calliphoridae				
Phormia regina	6 - 14	......	......	......
Undetermined spp. (larvae)	......	5 - 37*	......	6 - 7
Hymenoptera—Formicidae				
Crematogaster lineolata subopaca	......	......	......	29 - 120
	......	......	......	(20 - 44)
Camponotus pennsylvanicus	6 - 7*	......	......	......
Paratrechina parvula	......	......	......	10 - 15
	......	......	......	(5 - 10)
Araneae—Thomisidae				
Xysticus ferox	......	......	14 - 20	......
Acarina				
Undetermined spp.	52- 563	31 - 516	28 - 304	10 - 56
	(2 - 2)	(1 - 1)	(3 - 3)	......

*Collected from only two of the three replicates in the habitat.
**Collected from only one of the three replicates in the habitat.

DISCUSSION

When the total collections of arthropods from all traps in all habitats are considered, the same relationships among habitats are exhibited as in the more limited cases of the species classed as

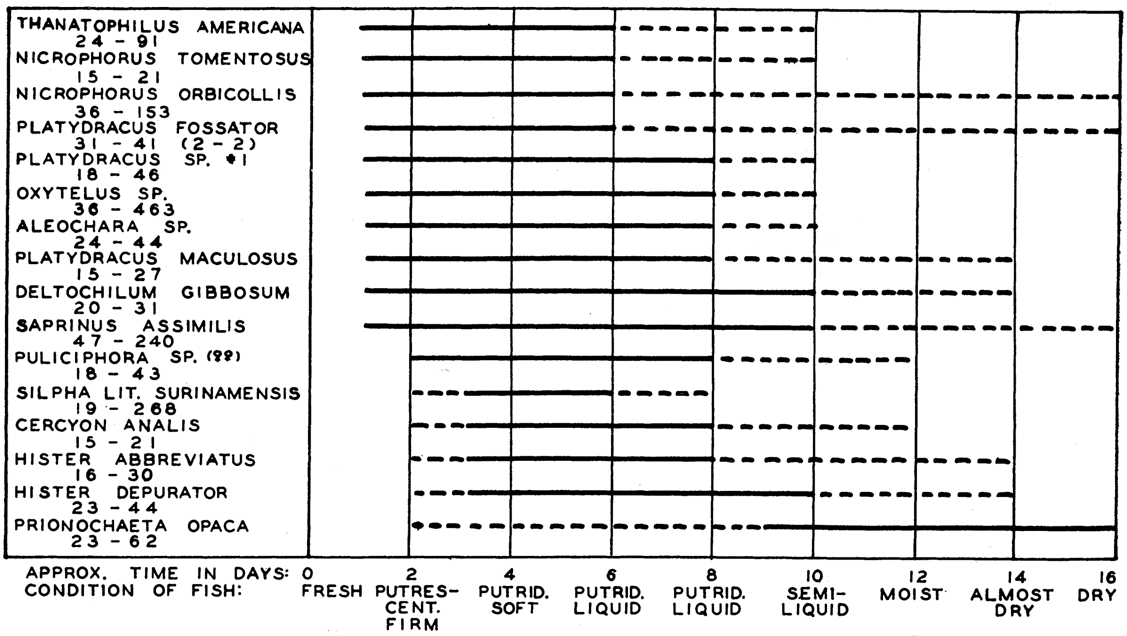

Fig. 9. Changes in attractiveness of fish in Habitat I (mesic forest). See Fig. 5 for explanation.

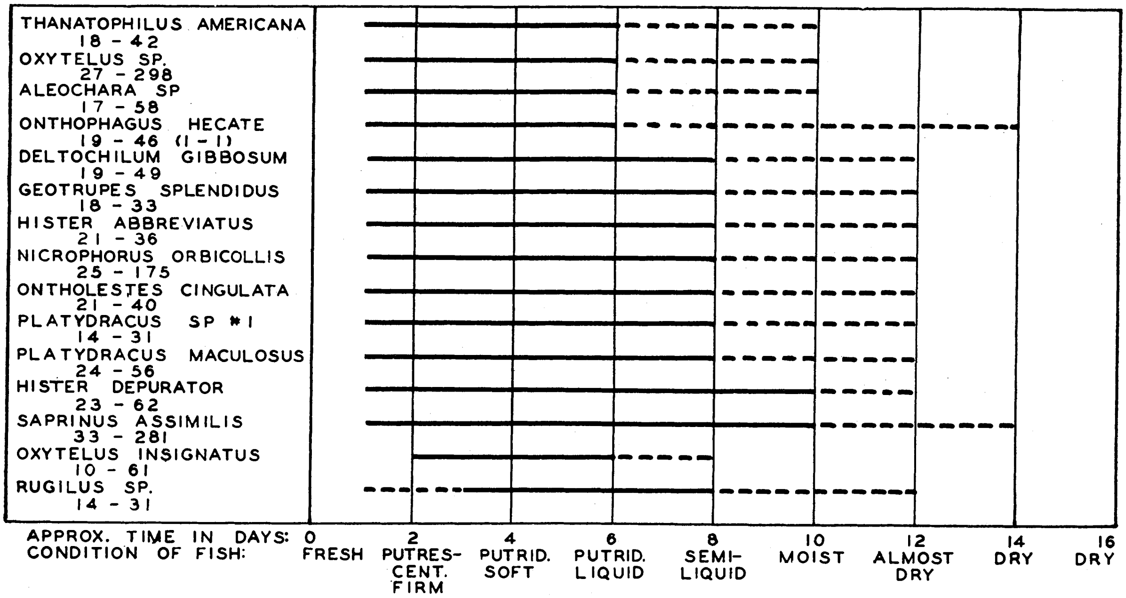

Fig. 10. Changes in attractiveness of fish in Habitat II (bottom forest). See Fig. 5 for explanation.

attracted to individual baits. Table IX is a summary of the similarities among habitats on the basis of all collections. Habitats I and II are clearly more alike than any other two habitats in respect to the species collected. Habitat III is nearly equally related to these two. Habitat IV has no close similarities with any of the other three habitats but is closest to Habit III, the driest of the wooded habitats. These relationships correlate nicely with the vegetational and microclimatic relationships recorded.

The degree of difference among the collections in the four habitats is shown by the fact that out of a total of 444 species of arthropods, 224 were collected in only one habitat, 107 were collected in two habitats, 81 in three habitats, and only 32 in all four habitats.

Summary

Four habitats of differing vegetation in Benton County, Tennessee, were studied in the summer of 1952 to determine what sorts of similarities

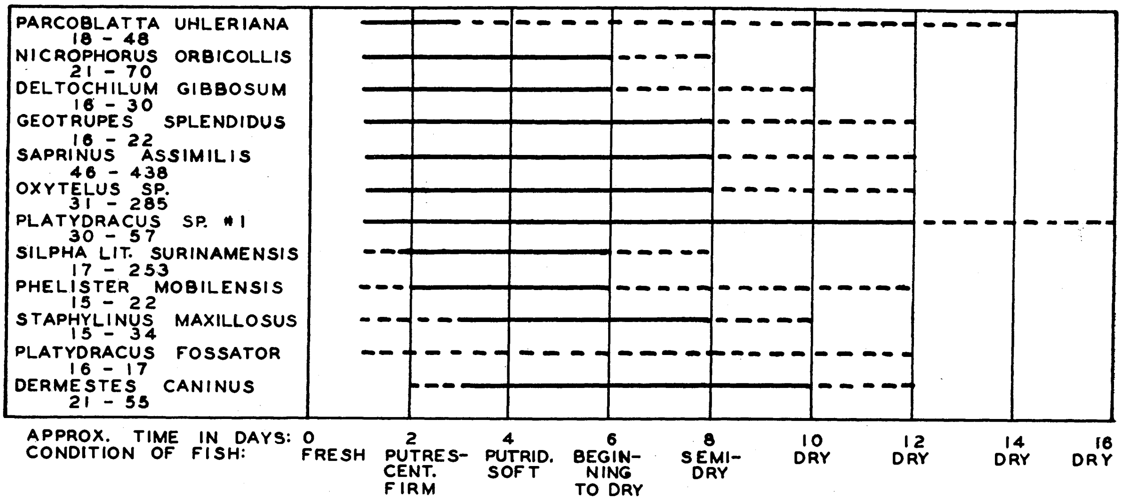

FIG. 11. Changes in attractiveness of fish in Habitat III (ridge forest). See Fig. 5 for explanation.

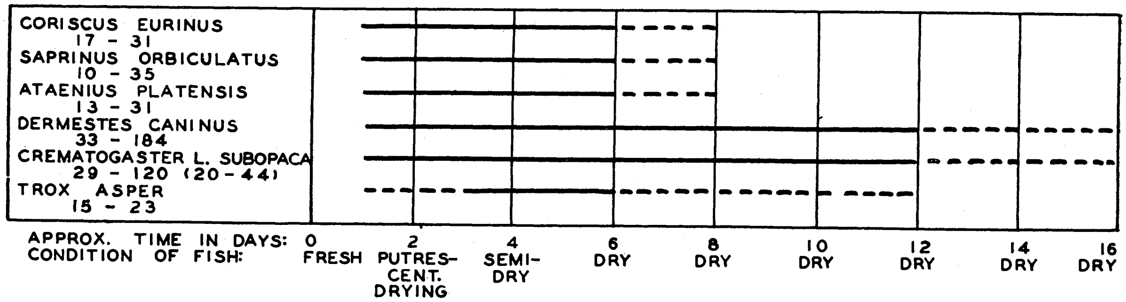

FIG. 12. Changes in attractiveness of fish in Habitat IV (old field). See Fig. 5 for explanation.

TABLE VIII. Similarities in the species attracted to fish in the four habitats

Habitat	Total spp. attracted to fish	% OF SPECIES ALSO ATTRACTED IN HABITAT			
		I	II	III	IV
I	50	. .	66	48	10
II	43	77	. .	56	12
III	35	69	69	. .	26
IV	17	29	29	53	. .

TABLE IX. Similarities in the species collected in the four habitats. A total of 444 species are considered

Habitat	Total spp. collected in Habitat	% OF SPECIES ALSO COLLECTED IN HABITAT			
		I	II	III	IV
I	230	. .	67	54	20
II	248	62	. .	47	19
III	213	58	55	. .	26
IV	118	39	39	47	. .

and differences may occur in the arthropods associated with decaying materials in different habitats in the same area.

Habitat I was in a mesic valley dominated by a maple-gum-oak forest. Habitat II was in a creek bottom with a park-like stand of large oak, gum, hickory, and tulip trees. Habitat III was a dry ridge which had a broken-canopied stand of oak. Habitat IV was on a south-facing slope in a rocky abandoned field.

A study of the microclimates of the habitats showed that the habitats ranked I, II, III in order of increasing effective rainfall. Habitat IV was variable in its relationship with the other habitats but always showed less rainfall than Habitat III. Air temperature extremes at the one-foot level in Habitats III and IV were much greater than in Habitats I and II. Midday soil temperatures at 4½ inches in Habitat IV averaged 15° F higher than similar temperatures in Habitat III and over 20° F higher than those in Habitats I and II. Observations on the drying of soils and baits indicated that evaporation was greatest in Habitat IV and least in Habitats I and II.

In each habitat ground traps replicated three times were used to study the arthropods associated with cornmeal, cantaloupe, and fish. Unbaited traps were used to determine what animals entered the traps without regard to the bait.

Arthropods collected in unbaited traps were general predators or scavengers. Species attracted in large numbers to baited traps were seldom collected from near-by check traps. The species and higher groups taken in unbaited traps varied widely among the habitats.

Except in cases of wetting, the cornmeal baits underwent little change. Nevertheless, 17 species were shown to be attracted to the unaltered meal. The species present suggest that none was attracted from outside the immediate vicinity of the traps.

Cantaloupe underwent a definite course of decay which varied with the habitat. The species associated with cantaloupe changed in kind and number as decomposition progressed. Forty-eight species were shown to be attracted to cantaloupe.

Fish was like cantaloupe in that it underwent a definite course of decay in each habitat and that the associated species changed in kind and number as decomposition progressed. Seventy-seven species were shown to be attracted to fish.

A comparison of the species of arthropods shown to be attracted to fish and cantaloupe in each habitat with those shown to be attracted to the same materials in the other habitats shows that Habitats I and II had more species in common than any other two habitats. Similarly Habitat III was more closely related to I and II than to IV, but had more species in common with IV than did I and II. Of the four habitats, Habitat IV had fewest species and the smallest percentages of these in common with other habitats. When all 444 species collected during the study are considered, the relationships among the habitats, as to species collected in more than one habitat, are the same as above. These relationships are correlated with the observed relationships of the courses of decay in the habitats, and these latter relationships in turn depend largely on the microclimates of the habitats.

The degree of difference in the collections from the various habitats is illustrated by the fact that of the 444 species collected, only 32 species were collected in all four habitats, and 224 species were collected in only one of the four habitats.

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MICROCLIMATIC PATTERNS IN THE ARMY ANT BIVOUAC

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Introduction

The army ants of the New World of the subgenus *Eciton* are characterized by a nomadic pattern of life, the establishment of bivouacs or temporary nests in relatively exposed, generally non-subterranean sites, and a carnivorous diet. The study of the bivouac formation and structure as influenced by the microclimate provides a basis for considering the adaptive significance of this behavior pattern.

Previous investigations had indicated the relative stability of intrabivouac thermal patterns and the reduced range of temperature and relative humidity fluctuations at the bivouac site (Schneirla, Brown, and Brown 1954). The purpose of this investigation was to continue and expand investigations on microclimatic patterns in relation to bivouac formation and structure.

The bivouac of *Eciton hamatum* Fabricius,

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