THE SYSTEMATIC AND THE ECOLOGICAL ASSOCIATION OF THE BLATTISOCIDAE GARMAN (= ACEOSEJIDAE WHARTON AND BAKER) TO THE POLYPORACEAE

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ABSTRACT

THE SYSTEMATIC AND THE ECOLOGICAL ASSOCIATION
OF THE BLATTISOCIDAE GARMAN (= ACEOSEJIDAE WHARTON AND BAKER)
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The objective was to determine the species and numbers of mites of the Blattisocidae and their relationship to the other mites and arthropods that occupy the bracket fungi. During the years 1960-1962 approximately 175 samples of woody shelf fungi were collected from the upper and lower peninsulas of Michigan from some 18 counties. The mites and other arthropods were collected from these samples by a modified Berlese funnel technique with a 60 watt incandescent bulb supplying the heat to dry out the fungus. The mites were separated from the other arthropods and a large number of mites were mounted on slides. The Blattisocid females were then identified to species and the other mites and arthropods were then identified at least to families. Discussion includes the fungus as a habitat for mites and other arthropods, the possible food habits and predators of the blattisocids, the environmental conditions for adequate survival and reproduction, the apparent lack of overwintering of adults of species in this family, and the distribution of the family.

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INTRODUCTION

History of the Investigation

The Polyporaceae, composed of many shelf fungi serve as a microhabitat for many arthropods as well as other invertebrates. Studies of microhabitats such as tree hole litter and log mold were initiated by Park (1931) in this country and has been continued by him and associates until the present time. Numerous authors have investigated bracket fungi as a habitat for Coleoptera. However, Graves (1956) in his thesis investigated fauna associated with this habitat and published a paper in 1960 on the insects found here.

Mites are probably the most numerous of the inhabitants of the polypores but little mention was made of the group by Graves. The Blattisocidae, the primary focus of this treatise, is a relatively new family being erected by Wharton and Baker (1952). Since 1959 numerous species have been found and described by investigators working with this family. Graves (1960) did not mention mites belonging to this family in the fungi he collected and analyzed.

Wharton and Baker (1952) proposed the family Aceosejidae with Aceoseius muricatus (Koch) as the type species. Evans (1958) concluded that Aceoseius muricatus was a synonym of Lasioseius muricatus and thus the latter became the type species of both the family and subfamily. Garman (1948) proposed a suprageneric name for one of the genera included by Evans in the Aceosejinae, Blattisocius Keegan. Therefore,

in accordance with the Law of Priority the type species Blattisocius triodons became the basis for the family and subfamily names (Chant, 1963).

The Scope of the Investigation

This study encompasses approximately 175 samples of fungi collected at random from some eighteen counties in the upper and lower peninsulas of Michigan. The collections were made by this investigator and Dr. T. W. Porter.

The study was concentrated primarily on the blattisocid mites and their role in the fungus habitat. Apparent associations have been discussed as to the possibility that particular species of blattisocid mite may be restricted to a particular Polypore species. The relationship of other mite families and arthropod groups has been examined to determine their role in habitat restriction of blattisocids.

The various ecological stages or seres a polypore undergoes and the importance of each of these stages as a habitat for blattisocid mites is discussed. The possible effects of the physical environment on the presence and abundance of these mites is evaluated.

A major portion of this study is devoted to the review and organization of the systematics of the Blattisocidae.

METHODS AND MATERIALS

A fungus sporophore was collected and placed in a large plastic bag. A label, containing date, locality information and number of sample was placed in the bag with the fungus and the bag secured at the top to avoid contamination until the collection was back in the laboratory. These bags were often stored in a cold room or refrigerator at an approximate temperature of 5° C. until ready for treatment. The entire contents of the bag were then placed in a modified Berlese funnel under the heat of a sixty-watt bulb for three to five days. The length of time in a funnel depended on the amount of moisture in the fungus. A 250 ml. wide-mouthed jar containing 70% ethyl alcohol was placed beneath the funnel to collect any specimens falling from it. See Plate I for the set up of the apparatus. After the three to five day period, the collection jar was capped with the specimen number inside for the data record. The contents of each jar were then transferred to a finger bowl where the mites were separated from the other arthropods by pipette and placed in a series of vials with the sample number included. The vials used for approximately the first 25 samples were small glass containers with bakelite screw tops. Eventually vials with corks were used because (1) they can be labeled for easy identification, and (2) they provide a tighter seal allowing less chance for evaporation of the alcohol preservative. The letter "M" was penciled on the corks to designate mite vials and the letter "I" was used to designate vials containing other invertebrates.

Fig. 1.--A photograph of the Berlese apparatus.

Next, the mites were prepared for examination by placing them on slides. The mounting medium chosen was a modified Berlese solution called Hoyer's. This medium is miscible with water and alcohol and it continues to clear the specimens. The formula for the medium from Baker and Wharton (1959) is as follows:

50 grams distilled water,

30 grams gum arabic (clear crystals),

200 grams chloral hydrate,

and 20 grams glycerin

Since this medium has a tendency to absorb moisture from the air, the slides so prepared were sealed with a ringing compound.

Preparation of slides began by placing a small drop of Hoyer's in the center of the slide. Each slide was identified by etching the appropriate sample number on it with a glass marking pencil. The contents of the correspondingly numbered vial was then transferred to a Syracuse watch glass and placed under a dissecting microscope. A single mite was then picked up with a flattened dissecting needle and placed on the slide ventral side up, since most of the characters used for identification are located on that side. Using another dissecting needle, a 32 x 24 mm. round cover slip was then lowered gently into place on the slide. Slight pressure was applied to the cover slip to spread both the Hoyer's solution and the legs of the mite. The slides were placed in an oven set at approximately 28° C. for drying. After drying, excess media was scraped from around the edges of the cover slip with a single-edged razor blade. The slide was then ringed. For approximately the first hundred slides fingernail polish was used for ringing the coverslip. However, the polish had a tendency to crack

after a short period of time, allowing moisture to get in and the coverslip had to be remounted. Other ringing materials were suggested and discarded for the same reasons. Finally, in the summer of 1962, aluminum paint was tried and found to be a more satisfactory ringing compound. The only disadvantage with the aluminum paint is that it takes slightly longer to dry than fingernail polish.

The finished slides were examined with a phase contrast microscope and the specimen identified.

Illustrations were made with the aid of a camera lucida and were photographed and reduced to one-half the size originally drawn.

POLYPORACEAE

Morphology

General Considerations

The most recognizable and significant portion of the fungus is the "fruiting body" or "sporophore" (Overholts, 1953). It is commonly called a conch or bracket. According to Overholts it can be sessile (without a stalk) as in Fomes sp. or stipitate (stalked) as in most Polyporus sp. It ranges from a few millimeters in width and one or two millimeters in thickness to a width of 75 centimeters and 30 to 50 centimeters in thickness (Bessey, 1935). Bessey also reports that the life span of a bracket may range from only a short time (a few months) to a period of up to eighty years. They may be brightly colored, as in Polyporus sulphureus, or of very dull grays, browns, or blacks, as in numerous species of Fomes. They may have a smooth pileal surface, or it may be hirsute, and they may show many other inter-specific variations.

Specific Morphology of a Sporophore

A sporophore consists of a pileus (the upper surface plus the context tissue directly beneath it, a tube layer, a pore surface, and within the tubes a hymenium (Overholts, 1953). Overholts states that the context varies in thickness due to the variation of the number of

layers of hyphae that comprise it. The hymenium, which lies within the tube layer bears the basidia (the spore-forming structures).

Systematics of the Polyporaceae

The systematics found in this section are those of Alexopoulos (1962). The Polyporaceae belong to the Division: Mycota, Subdivision: Eumycotina, Class: Basidiomycetes, Subclass: Homobasidiomycetidae, Series: Hymenomycetes, Order: Polyporales and Family: Polyporaceae.

The eumycotina or "true fungi" are characterized by being filamentous and having cell walls. They reproduce both asexually and sexually. The Class Basidiomycetes include fungi whose spores are borne on the outside of special structures called basidia. The subclass Homobasidiomycetidae is characterized by a simple non-septate basidium with no resting spores. The series Hymenomycetes which are classified in two orders. The Polyporales bear their basidia in a well defined hymenium in pores or on gills with the texture of the basidiocarp not soft and putrescent. The family Polyporaceae are fungi in which the basidia line the inner surface of deep tubes.

Ecological Succession of the Sporophore

There are five microseres or stages through which a polypore passes (Graves, 1960). Stage I encompasses the newly formed sporophore which is fleshy and moist. Arthropods tend to be found on the surface of the pileus and tubes and are apparently temporary in their occupation. State II entails the development and dissemination of spores and most of the arthropod fauna are highly transitory in nature. Stage III begins a breaking down of the tissues of the sporophore and the tube layer.

The tube layer and context are often riddled by insects and other arthropods. Stabe IV is divided into "A" and "B" portion by Graves, "A" being the dry shell of the sporophore and "B" being the wet shell, obviously corresponding to the amount of moisture available at the time. The arthropod fauna is not as numerous at this stage as they are in Stage III since there are few tissues remaining to provide shelter and food. Stage V occurs when the sporophore is detached, falls to the ground and becomes a part of the forest floor.

This investigation found the above classification relatively unimportant since the mites are apparently only temporary occupants in Stages I and II and a possible confusion could result from the occupants in Stage V since there is no way of ascertaining whether these are occupants of the forest floor or true fungus dwellers.

Stage III was of significant value in this study only when one is considering annual Polypores since their succession can be followed through the various stages. This is not meant to imply that the perennial species do not undergo the same succession but since their life span is very long it would be difficult and very time-consuming to approach this problem in such a manner.

This investigator, during the summer of 1960, collected fungi from a dead tree in which they (fruiting bodies) ranged from the base of the tree beneath the forest floor vegetation into the brighter sunlight. It was noted that the area beneath the vegetation where the fungi was more moist contained numerous Mesostigmatid and Trombiculiform mites whereas the area most exposed contained mostly ants and Oribatid mites. This sample was recorded in the data section originally as

number 3 and 3a, 3 being below the vegetation cover and 3a being above. They were combined by the author because the fungi were all of the same species.

BLATTISOCIDAE

Biology of the Family

Food Habits

The paragraph that follows is modified from Baker and Wharton (1952).

The mouth parts of an arachnid consists of a pair of chelicerae and pepipalps. In the acarines, the most primitive type of chelicerae terminate in chelae that are quite similar structurally to the chelae of many decapod crustaceans. The chela is composed of a dorsal, fixed digit and a ventral, movable one, each equipped with teeth which may be opposable. This type of chela is used for grasping prey and crushing other types of food. This primitive type of chela may be modified to form a needle-like structure, or the fixed digit may be lacking in certain parasitic forms. The pedipalps of acarines originate laterally from the palpal coxae. The pedipalps become enlarged in the Trombiculiformes and function as accessory chelicerae. These often function as a hand enabling the mite to pick up and hold food and other objects. The other suborders generally have unmodified pedipalps.

The blattisocids found in this study have typical chelate chelicerae and non-modified six-segmented pedipalps. The chelicerae suggest therefore those of the typical predatory mite. The blattisocids generally live in the soil, under bark, in stored animal or plant products of all kinds, insect cultures and colonies (Chant, 1963).

Three species of blattisocids, Lasioseius boomsani, Lasioseius ometus, and Lasioseius dendroctoni are all associated with bark-boring beetles (Womersley, 1956 and Chant, 1963). Chant also suggests that L. dendroctoni which gets its specific name from being under the elytra of Dendroctonus sp., a scolytid beetle, and L. drosophili which is associated with Drosophila sp., may be parasitic on these respective hosts because of their specialized leg armaments.

Considerable research has also been reported on the food habits of the genus Blattisocius and three of its species. Blattisocius tarsolis was reported to feed on the larvae of moths of the genera Ephestia and Sitotroga (Hughes, 1959). Blattisocius tarsalis was reported by Hughes (1961) to be parasitic on the two genera above, and also on Plodina sp. Cunliffe and Baker (1953) reported Blattisocius keegani on citrus trees and in nests of pack rats of the genus Neotoma. Rivard (1963) identified Blattisocius dendriticus feeding on the eggs of larvae on the eggs and nymphal stages of Tyrophagus putrescentiae, a sarcoptiform mite. Hughes (1961) reported that on the two occasions when she collected Lasioseius penicilliger, they were in abundance but no visible food supply was detected. She therefore surmised that they must feed on microscopic molds.

Predators

During this investigation no direct evidence was found to indicate that blattisocids are preyed upon by any other mites or insects. However, Lord (1949) reported that the lack of information about incidental bark-inhabiting species is due to their relative lack of attention. He pointed out that not only are mites predators of other

mites, but insects such as thrips, coccinellids, chrysopids, and cecidomyid larvae are often predators as well. Although he also mentioned that spiders feed on fruit mites (red and clover mites), he thought they are of little importance in the control of any mites.

Within the fungi sampled, this study found only three of the above groups represented. There was an abundance of thrips and cecidomyid larvae and an occasional spider. Whether these groups tended to reduce the population of blattisocids by predation is in the realm of future investigation.

Dispersal Mechanisms

The Mesostigmata have no special developmental stages that are specially designed as is the hypopus of some of the Sarcoptiformes (Acaridiae) for dispersal. These hypopal stages are called phoretic nymphs. This means that prior to the adult stage the mite goes through a stage that is capable of attaching itself (usually by suckers and setae) to other animals and is therefore carried wherever that animal chooses to go. It is not a feeding parasitic stage since the only benefit the mite seems to derive is getting from place to place.

Certain parasitic Mesostigmata are provided with modified setae on their legs or body as well as modified mouth parts for attachment to their hosts. There are sometimes other bizarre modifications used for attachment and therefore dispersal, in parasitic or mutualistic forms. However, only two species of blattisocids known at this time, Lasioseius dendroctoni and Lasioseius drosophili seem to show any great leg modifications. The free-living blattisocids which were the concern of this study may be found attached to the surface of a beetle's elytra which

seems to indicate a phoretic habit but these same species occur frequently alone in this habitat. Since they have no special morphological adaptations for this habit, it seems a rather haphazard way of getting from fungus to fungus. Some of these same species are found in the soil or on the bark of trees so perhaps their habitation of the fungi is temporary. Proctolaelaps pygmaeus is quite often found in the nests of small mammals, suggesting it might use these mammals as a means of dispersal (Hughes, 1961).

Seasonal Variation of Population Size

The more heavily sclerotized mites such as the Oribatei were found throughout the winter months by this investigator in the fungi collected. They were not, however as abundant between November and February of the years 1960-61 and 1961-62 as they were the other eight months in each of these years. Numerous beetles were also found in the fungi during this time but they were also less abundant than in the warmer months.

Hughes (1959) reported that the larval and nymphal stages of Oribatei require a habitat where the atmosphere approaches saturation. He also stated that their food is usually plant material that is nearly saturated with moisture and they show a preference for plant material that has been attacked by bacteria and fungi and also the mycelia and fruiting bodies of the fungi itself. Phytoseiidae, according to Hughes (1959) as well as other predaceous Mesostigmata can exist and also seem to prefer a drier environment. Winston (1963) in his studies on the clover mite, Bryobia praetiosa in Boulder, Colorado found that they were active during the winter in the mild

climate of this area. They also fed and reproduced throughout the winter and laid "summer" (diapause) eggs which did not hatch until early Fall. He found no active forms during the summer. By running humidity tests in the laboratory, Winston found that the death of this species occurred more rapidly in the lower humidities but leveled off at the upper levels. This is a species in which males are unknown, females reproducing by parthenogenesis. Winston and Nelson (1965) reports that restriction of water loss is accomplished by the active work of a mechanism in the cuticle, possibly the epidermal cells. They also postulated that above 50% relative humidity the mechanism can regulate water loss but below this humidity water loss seems rapid and the mechanism has little effectiveness.

Hughes (1961) reported that the life cycle of Melichares agilis of the family Blattisocidae takes from seven to nine days at 23° C. at a relative humidity of 87%.

Helle (1968) reported that in Tetranychus urticae when occurring in the temperate zones may pass the winter in the egg stage. He shows that this is both a response to the photoperiod and to the temperature. He found within this species certain strains that undergo diapause and other strains that do not. It was found that between a photoperiod of 12-14 hours at 19.5° C. the number of diapausing females seem to range from 12.5% to 100% for different strains. At 21° C. he reported no diapausal response and at 17° C. the number of diapausing females increased considerably for the same photoperiod.

Systematic and Morphological Treatment of the Family and Related Arthropoda

Classification of the Blattisocidae with Characteristics of Each of the Higher Categories

The classification that follows is taken and modified from Wharton and Baker (1952), Evans (1957, 1958) and Hughes (1961).

Phylum: Arthropoda--Metameric animals with an exoskeleton and jointed appendages.

Subphylum: Chelicerata--Arthropods without antennae or mandibles, their mouth parts consist of chelicerae and pedipalps.

Class: Arachnida--Chelicerates without gill books; may possess lung books or trachae as a respiratory apparatus; prosoma with a pair of chelicerae, a pair of pedipalps and four pairs of walking legs.

Order: Acarina--A single prosomal carapace and broad junction between the prosoma and opisthosoma; spiracles and trachae present among free-living forms, parasites often respire through very thin cuticles; one to four pairs of coxal glands in malpighian tubes for excretion or both.

Suborder: Mesostigmata--A single pair of stigmata lateral to the legs that are usually associated with an elongated peritreme; hypostome not developed for piercing.

Supercohort: Monogynaspida--Females with a primary genital cover usually well-developed and functional bearing a pair of genital setae; chelicerae without filamentous excrescences on movable digit; corniculi usually arising from anterior or antero-lateral margin of hypostome and projecting forward.

Cohort: Gamasina--Females epigynal (genital) plate well-developed or reduced, with one pair of genital setae; male chelicerae with or without spermatodactyl; male genital aperture within sternal plate or at anterior margin.

Superfamily: Parasitoidea--Coxae cylindrical and widely removed from each other so that the tritosternum is clearly visible; gnathosoma terminal in position so that it is clearly visible when viewed from above; dorsal shield with one or two shields and ventral surface with a large number of distinct, separate plates in the female; the stigmata open on the sides between Coxae III and IV.

Family: Blattisocidae--Two tined claw on the palpal tarsus; dorsal shield entire with more than twenty-three pairs of setae; female with ventri-anal shield in most species.

(The characteristics of the subfamilies are found in the key to the selected females of the fungi found in part #3 of this section.)

In the discussion above this investigator found no legal justification in the rules of zoological Nomenclature for including the higher categories, supercohort or cohort. However, there is a natural separation between the two large supercohorts, Monogynaspida and Trigynaspida based primarily on the number of genital plates in the female but other characteristics as well. There is also a natural distinction between the cohorts, Uropodina, Liroaspina, and Gamasina. It seems, therefore, unsatisfactory to ignore these natural distinctions even if it means adding higher categories that are not legally recognized by the rules of nomenclature.

Morphology of the Blattisocidae

In terrestrial Parasitoidea, the female is used in the identification of families, genera, and species because it is the most abundant of the sexes, males often being unknown. The degree of sclerotization of the various ventral plates found in the right half of Figure 2 is significant in the identification of the three taxonomic categories mentioned above. The dorsal chaetotaxy also plays an important role in the group's systematics, as well as the characteristics of the gnathosoma. The right half of Figure 2 represents the ventral surface of a Parasitoid mite with all parts labeled and the left half of Figure 2 represents the dorsum of "typical" blattisocid mite with the posterodorsal setae used in the systematics properly labeled. The left half of Figure 3 shows the gnathosoma of a mite of the subfamily Blattisocinae and the right half of the same figure the gnathosoma of one of the subfamily Platyseiinae. Figure 4 represents a lateral view of a blattisocid; Figure 5, a leg of a blattisocine mite, and Figure 6, leg II of a platyseiine mite.

Numerous variations are found among the species of blattisocids from the "typical" parasitoid mite of Figure 2. The area posterior to the gnathosoma is probably the most variable although the subfamilial classification is based on gnathosomal setal characteristics (See Figure 3). The genus Proctolaelaps differs from Lasioseius by the absence of a ventral plate and a large anal opening. Lasioseius muricatus is the only blattisocine mite this investigator found that has a large pair of jugular plates upon which rest the first pair of sternal setae. Another difference that exists between species of

Fig. 2.--Left half--Dorsal view of a "typical" Blattisocid mite showing the labeling of the setae in the posterior half of the dorsal shield (after Evans, 1957). Right half--Ventral view of a "typical" Parasitoid mite showing plates as follows (after Wharton and Baker, 1959):

1. Tritosternum
2. Praeendopodal plate
3. Jugalar plate
4. Exopodal plate
5. Endopodal plate
6. Peritrematal plate
7. Sternal shield
8. Metasternal shield
9. Metapodal plate
10. Genital plate
11. Ventri-anal shield
12. Anal opening

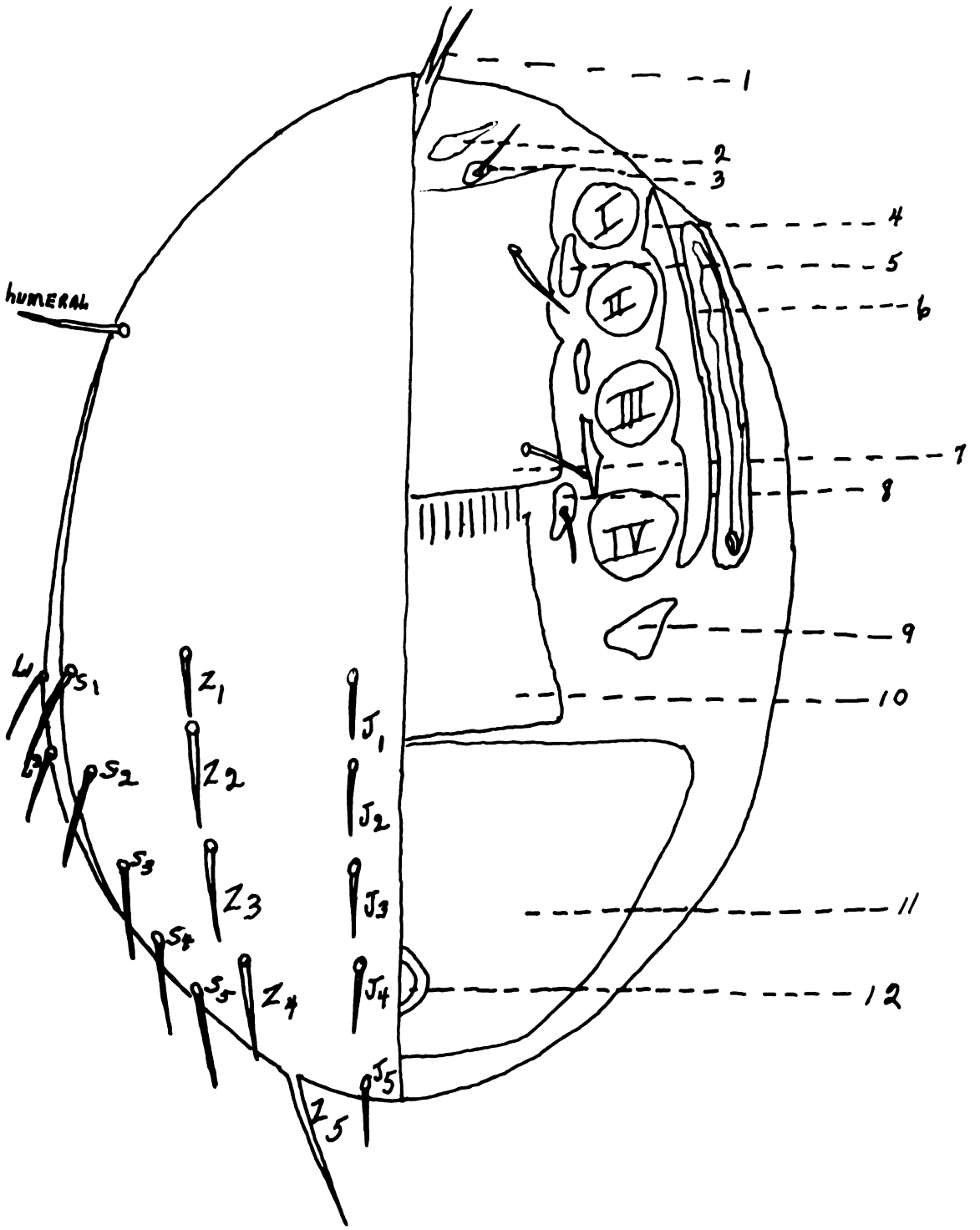

Fig. 2.--(Left half)--Dorsal surface of a Blattisocine mite. (Right half)--Ventral surface of a Parasitoid mite.

Fig. 3.--(Left half) Gnathosomal area of Blattisocine mite. (Right half) Gnathosomal area of Platyseiine mite.
1. The palpal trochanter showing long setae.
2. Internal rostral seta long compared to the internal rostrae of Blattisocine mites.

Fig. 4.--Lateral view of a Blattisocid mite.
1. Tritosternum
2. Exopodal plate
3. Genital plate
4. Metapodal plate
5. Ventri-anal plate
6. Peritrematal plate
7. Dorsal shield

Fig. 5.--Leg of a Blattisocine mite.
1a. Tarsal claw apparatus with pad-like pulvillus and two claws flanking the pulvillus.

Fig. 6. Leg II of a Platyseiine mite.
1. Triradiate pulvillus spread out around the tarsal claws.
2. Long recurved setae on the tibia which is not present in a leg of the Blattisocinae.

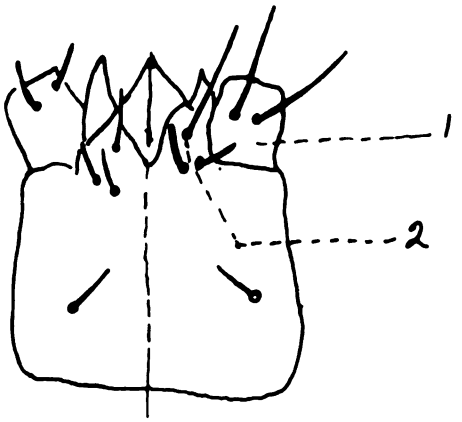

Fig. 3.--(Left half) Gnathosomal area of Blattisocine mite. (Right half) Gnathosomal area of Platyseiine mite.

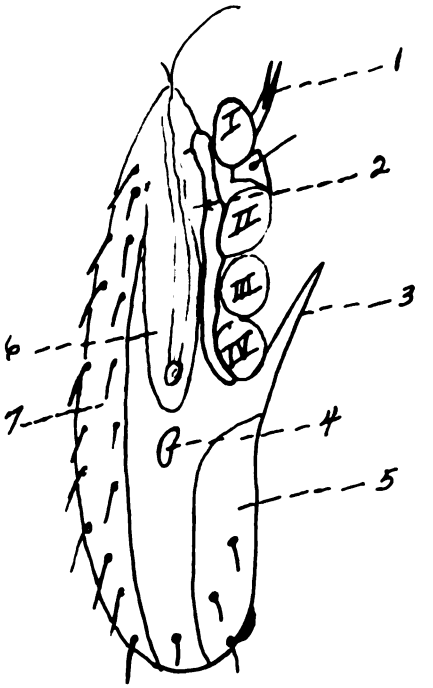

Fig. 4.--Lateral view of a Blattisocid mite.

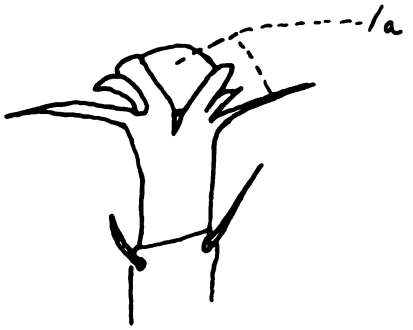

Fig. 5.--Leg of a Blattisocine mite.

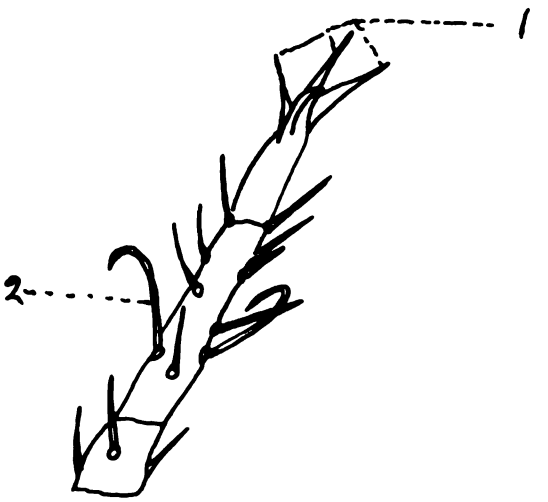

Fig. 6.--Leg II of a Platyseiine mite.

Lasioseius is the size and number of the metapodal plates. The number of preanal setae among the species of Lasioseius this investigation recorded may be four or six. The size and shape of the sternal plate and its degree of sclerotization is another specific variation, as well as the degree of sclerotization of the endopodal plates.

On the dorsal surface Proctolaelaps differs from Lasioseius by having more than 15 pairs of setae on the "posterodoral shield." This is so because the marginals of the posterodorsal region are found on the dorsal shield in Proctolaelaps but are on the interscutal membrane in Lasioseius. The "anterodorsal" shield of blattisocines shows variations ranging from eight to twenty-three pairs of setae. This wide variation in numbers of setal pairs plus the gnathosomal characters, ventral plate variations, and by other characters that are specific in nature.

The genus Zerconopsis belongs to the subfamily Platyseiinae (the characteristics of the subfamily, genus and species will appear in the key in the next section).

Key to the Adult Females of the Blattisocidae of Selected Fungi

The following key is adapted from Evans (1957, 1958), Evans and Hyatt (1960), Hughes (1961) and Chant (1963).

1. Rostral setae and internal setae on palptrochanter long, whip-like (Figure 3) tarsi II and III, and often IV provided with a pair of long lanceolate setae usually incurved distally (Figure 6); para-anal setae situated in line with the posterior margin of the anus; peritrematal shield may extend beyond the posterior margin of coxae IV and the peritreme may be developed posterior to the stigma; median lobe of pulvillus of legs II-IV often lanceolate (Figure 6) . . . . . Platyseiinae

   A. Dorsal shield with three pairs of paddle-like setae; genital shield narrow, without setae; with two pairs of metapodal plates . . . . . Zerconopsis michaeli

1. Rostral setae and internal setae on polptrochanter never long and whip-like (Figure 3); tarsi II-IV without specialized setae; peritreme and peritremal shield normal; para-anal setae normal in position; pulvillus never lanceolate (Figure 5) . . . . . Blattisocinae . . 2

2. Marginal (M) series of setae on lateral margin of posterior region of dorsal shield; posterodorsal area with 20 pairs of setae; and plate only with enlarged opening (Figures 7 and 8) . . . . . Proctolaelaps pygmaeus

2. Marginal (M) series of setae on lateral interscutal membrane (see Figure 2); posterior region with never more than 15 pairs of setae; ventri-anal shield present in most forms without enlarged anal opening . . . . . Lasioseius . . 3

3. Ventri-anal shield with four pairs of pre-anal setae; four pairs of accessory plates on margin of dorsal shield . . . . . *Lasioseius meridionalis*

3. Ventri-anal shield with six pairs of preanal setae; without dorsal, marginal accessory plates 4

4. Dorsal shield with 36 or more pairs of dorsal setae 5

4. Dorsal shield with only 33 pairs of dorsal setae 7

5. Legs II and III with large, thick spurs. . . *Lasioseius drosophili*

5. Legs II and III without spurs 6

6. First pair of sternal setae on strongly sclerotized jugular plates; with 38 pairs of dorsal setae . . . . *Lasioseius muricatus*

6. First pair of sternal setae on sternal shield; 36 pairs of dorsal setae . . . . . *Lasioseius penicilliger*

7. One pair of large, triangular, metapodal plates; posterior Z and S setae not lanceolate . . . . *Lasioseius confusus*

7. Two pairs of small metapodal plates; posterior Z and S setae lanceolate . . . . . *Lasioseius lanciolatus*

Plate and Plate Descriptions

The following plates and descriptions are taken and modified from Evans (1958), Evans and Hyatt (1960) and Chant (1963).

Proctolaelaps pygmaeus (Müller)
(Figures 7 and 8)

Gamasus pygmaeus Müller, J. 1859

Holostaspis pygmaea Müller, J. 1860

Hypoaspis hypudaei Oudemans, A. C. 1902

Hypoaspis pygmaeus (Müller), Oudemans, A. C. 1914

Lasioseius innumerabilis Berbese, A. 1918

Typhlodromus bulbicolus Oudemans, A. C. 1929

Haemolaelaps pygmaeus (Müller), Wolf, B. 1934-1938

Thinozercon pygmaeus Müller, Buitendijk, A. M. 1945

Garmania bulbicola (Oudemans), Nesbitt, H. H. J. 1951

Lasioseius alpiners Schweizer, J. 1949

Lasioseius ventritrichosis Schweizer, J. 1949

Garmania hypudaei (Oudemans), Evans, G. O. 1954

Jordensia hypudaei (Oudemans), Evans, G. O. 1957

Garmania pygmaeus (Mull.), Samsinak, K. 1960

Proctolaelaps (P) pygmaeus (Muller), Athias-Henriot, C. 1961

Dorsal shield with 43 pairs of simple setae, 20 on the posterior region (see Figure 7). Setae fairly long, those of the J series slightly longer than distances between their bases. The ventral surface is normal for the genus except that the anus is very large, and the peritrematal plates are not found posteriorly with the exapodal plates (Figure 8). Corniculi sinous, unbranched. First pair of rostral setae stout, spine-like. Fixed digit of chelicerae multidentate. Five marginal setae on the dorsal shield and not on the interscutal membrane as in Blattisocius sp.

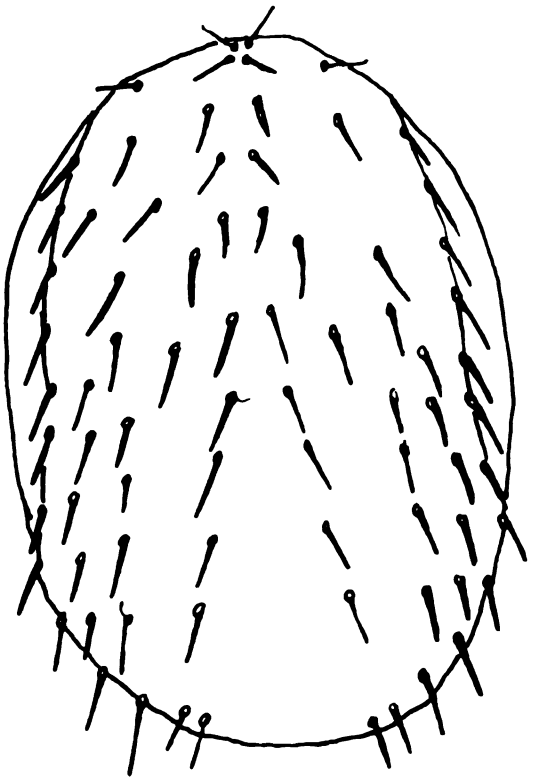

Fig. 7.--Dorsal area of Proctolaelaps pygmaeus.

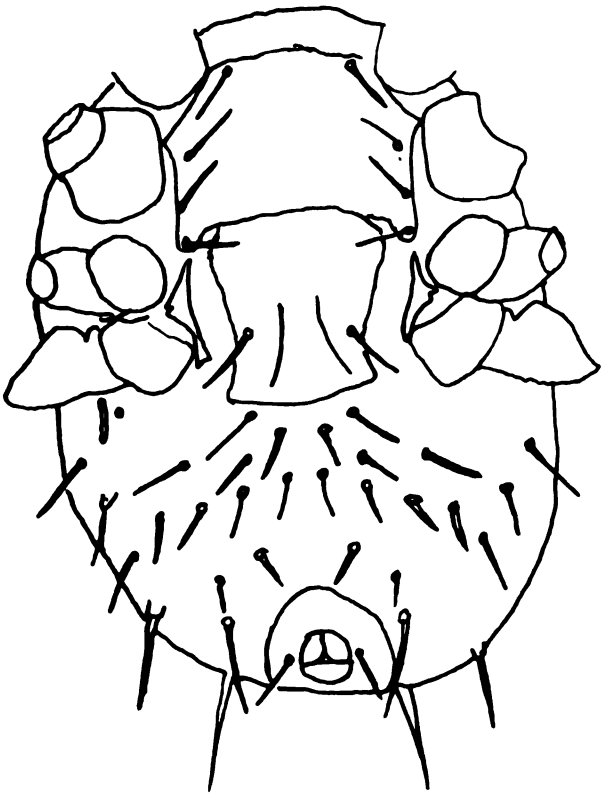

Fig. 8.--Ventral area of Proctolaelaps pygmaeus.

Zerconopsis michaeli Evans and Hyatt
(Figures 9 and 10)

Dorsal shield with a heavy distinct pattern of depressions; lateral margins irregular, posterior margin crenate (see Figure 9). "Anterodorsal" shield with nineteen pairs of setae of which one is paddle-like, the remainder simple (see Figure 9). "Posterodorsal" shield with fourteen pairs of setae, two of which are paddle-like, the others simple. Sternal shield plain bearing three pairs of simple setae (see Figure 10). Genital shield narrow, setae just off the shield. Ventri-anal shield with a pattern of reticulations and dots, and bearing eleven setae of which the post anal is long and stout. There are two pair of plates between the genital and ventri-anal shields. Venter of gnathosoma with rostral and palptrochanter long and whip-like. All setae on pedipalp simple.

Locality: Evans and Hyatt (1960) reported a single female from England and this author reported also a single female from Polyporus adustus in sample #19 in Kalamazoo Co., Michigan.

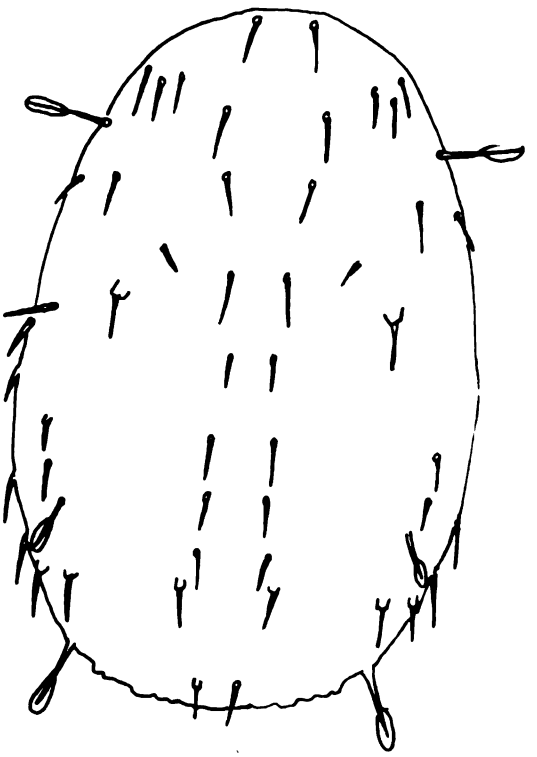

Fig. 9.--Dorsal area of Zerconopsis michaeli.

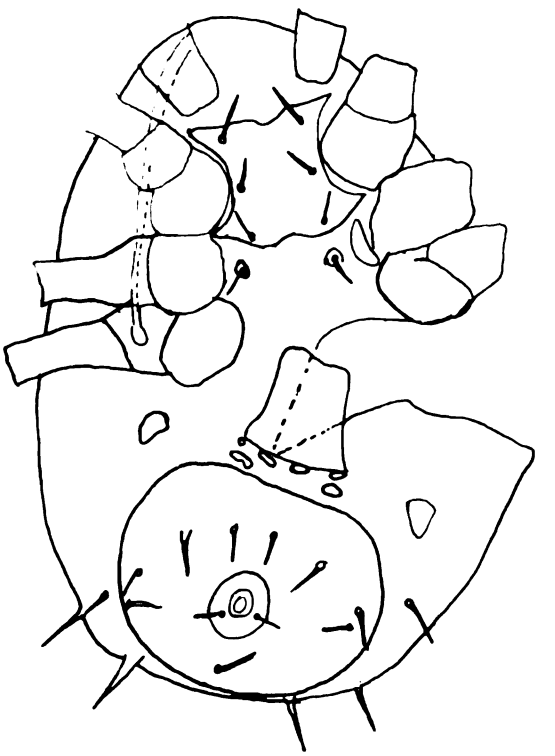

Fig. 10.--Ventral view of Zerconopsis michaeli.

Lasioseius muricatus (C. L. Koch)
(Figures 11 and 12)

Sejus muricatus Koch, C. L. (1839)

Laelaps ligoniformis Michael, A. D. (1892)

Ameroseius pseudocometa Schweizer, J. (1922)

Aceosejus muricatus, Sellnick, M. (1941)

A large strongly sclerotized species. Dorsal shield reticulated and punctured with thirty-eight pairs of setae (see Figure 11). "Anterodorsal" shield with twenty-three pairs of setae. Setae of rows Z and S on the "posterodorsal" shield spinose and situated on tubercles.

Angular plates large and heavily sclerotized. Sternal shield punctured and two pairs of simple setae. Metasternals free and bearing a pair of simple setae. Genital plate wedge-shaped and with a pair of simple setae. Four platelets between genital and large ventri-anal shield. The latter with six pairs of pre-anal setae. Peritrematal shield large, fused with the exopodal shield in the region of coxae IV. Endopodal shields well developed in the region of coxae III and IV.

Distribution: Evans (1958) reported these from Polyporus sp. in Germany, Switzerland, and the British Isles. This author found them in numerous Polyporaceae throughout the counties collected from in the state of Michigan.

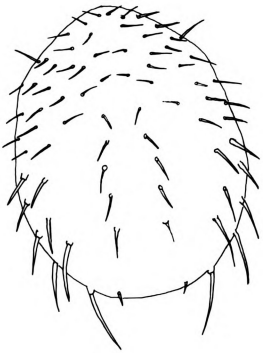

Fig. 11.--Dorsal area of Lasioseius muricatus.

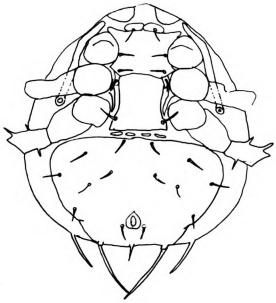

Fig. 12.--Ventral area of Lasioseius muricatus.

Lasioseius penicilliger Berlese
(Figures 13 and 14)

Lasioseius (Zercoseius) penicilliger Berlese, A. (1916)

Dorsal shield strongly sclerotized, reticulate-scabrid and bearing thirty-six pairs of serrated setae of which those in the posterior third of the shield tend to be lanceolate (Figure 13). Setae Z_5 very long up to 65μ in some specimens. With two pairs of marginal setae on the membrane lateral to the "Anterodorsal" shield. Pre-endopodal plates weakly sclerotized. Sternal shield has a slightly concave posterior margin and bears three pairs of setae. Fourth pair of setae on metasternal plates. Ventri-anal shield with six pairs of pre-anal setae. Two pairs of metapodal plates.

Distribution: Evans (1958) reports this species from Glasgow, Scotland and this investigator found two specimens, both from Marquette County, Michigan.

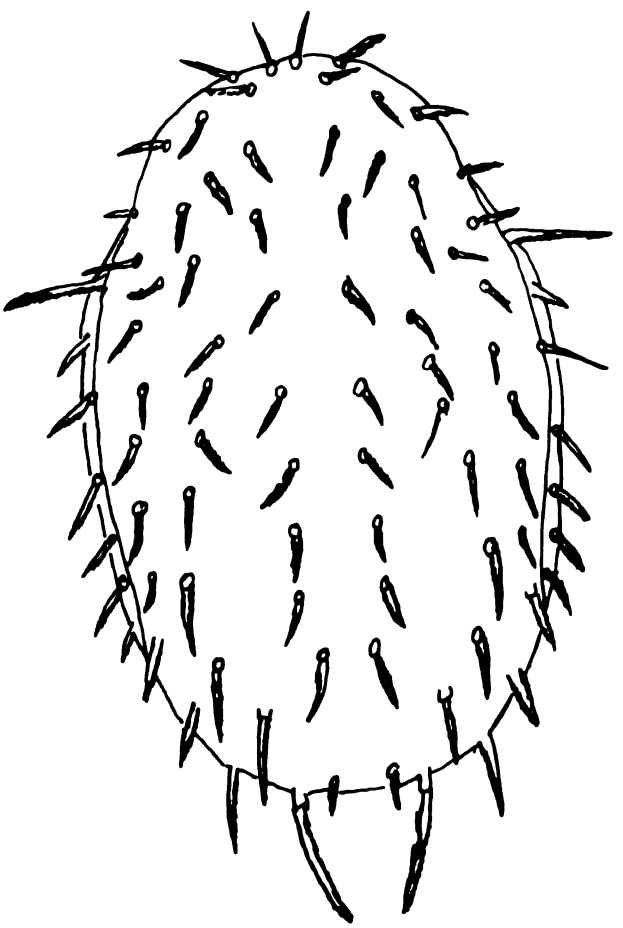

Fig. 13.--Dorsal view of Lasioseius penicilliger.

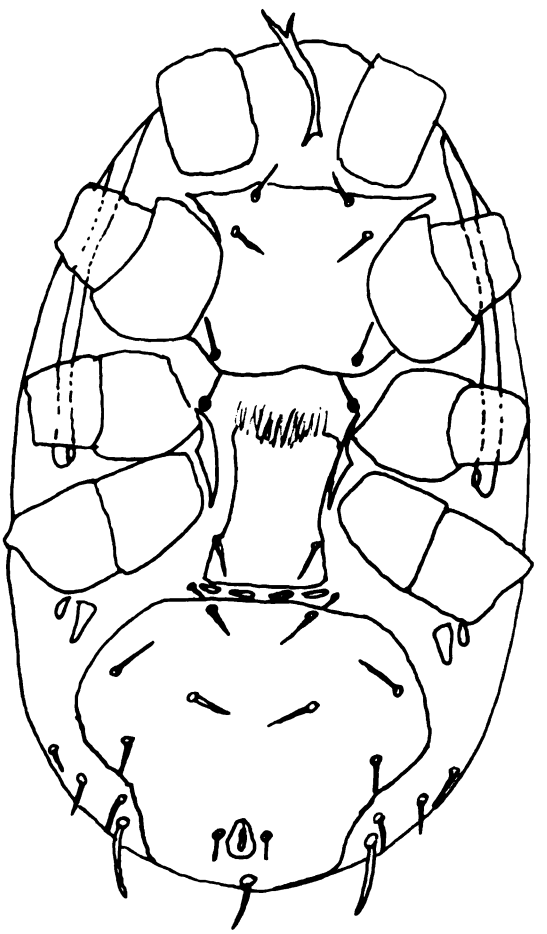

Fig. 14.--Ventral view of Lasioseius penicilliger.

Lasioseius confusus Evans (1958)
(Figures 15 and 16)

Dorsal shield lightly reticulated, with 33 pairs of simple setae, 15 on the posterior region (Figure 15). Shield lightly punctate near posterior margin. Posterior setae strong, spine-like. Marginal setae on interscutal membrane, 2 pairs on anterior area and 6 pairs on posterior area. Sternal shield well sclerotized, sculptured, punctate, and with three pairs of setae. Fourth pair on metasternal plates. Genital shield sculptured with genital setae. Six pairs of preanal setae. Two pairs of small plates between genital and ventri-anal shield. Two pairs of setae on membrane surrounding ventri-anal shield. One pair of large triangular metapodal plates.

Distribution: Evans (1958) reported specimens from Cornwall England and also in Wales. Chant (1963) reported specimens collected in soil from Roane County, Tennessee and from soil in Manitoba, Canada. This investigator found single specimens from Fomes applanatus in Marquette Co. and Polyporus tulipiferae in Clinton Co., Michigan.

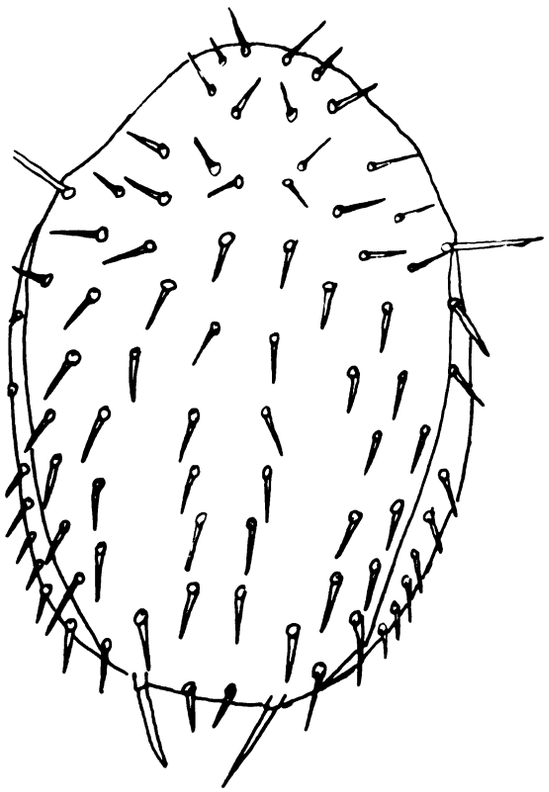

Fig. 15.--Dorsal area of Lasioseius confusus.

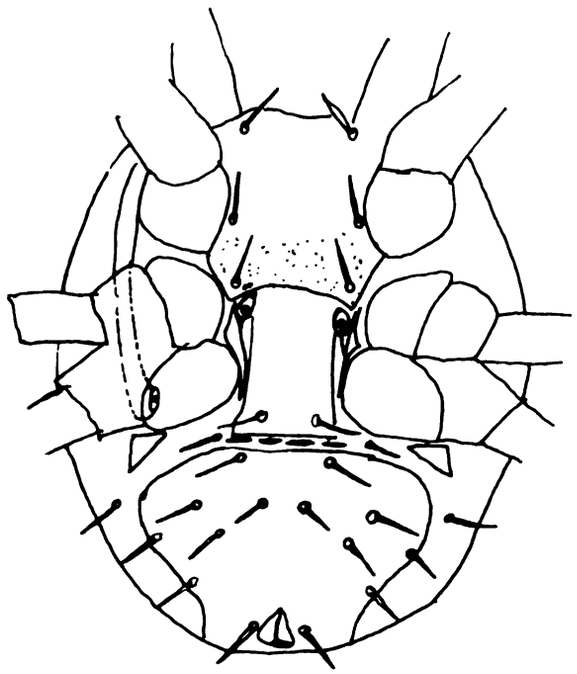

Fig. 16.--Ventral area of Lasioseius confusus.

Lasioseius lanciolatus Chant (1963)
(Figures 17 and 18)

Dorsal shield as in L. confusus except that the posterior Z and S setae are lanceolate (Figure 17). Pre-endopodal plates weakly sclerotized. Sternal shield densely punctate, with three pairs of setae. Fourth pair of sternal setae on metasternal plates. Endopodal plates conspicous in the region of coxae III and IV. Genital shield narrow with genital setae. Two pairs of small, elongate plates between genital and ventri-anal shield. Six pairs of preanal setae. Two pairs of metapodal plates.

Distribution: Chant (1963) reported specimens collected from a greenhouse in Davis, California, on barley at Corvallis, Oregon and from poplar at Alvarado, California. This investigator has two specimens found along with L. confusus in Marquette and Clinton Counties, Michigan.

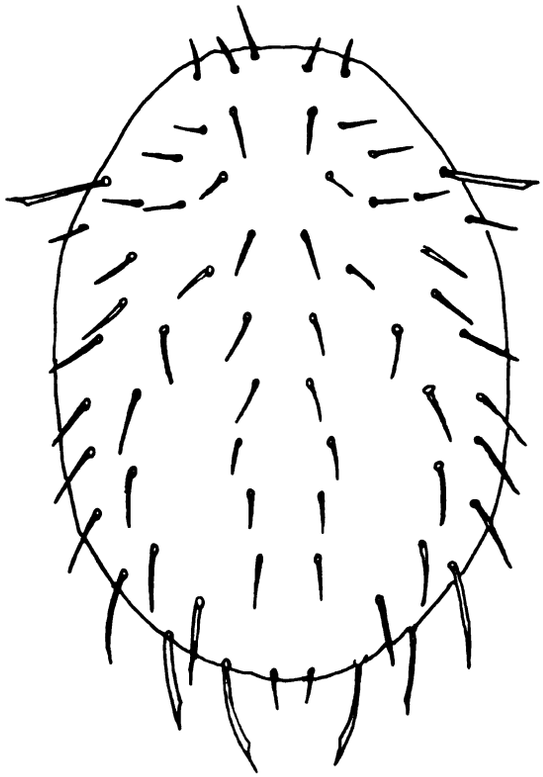

Fig. 17.--Dorsal area of Lasioseius lanciolatus.

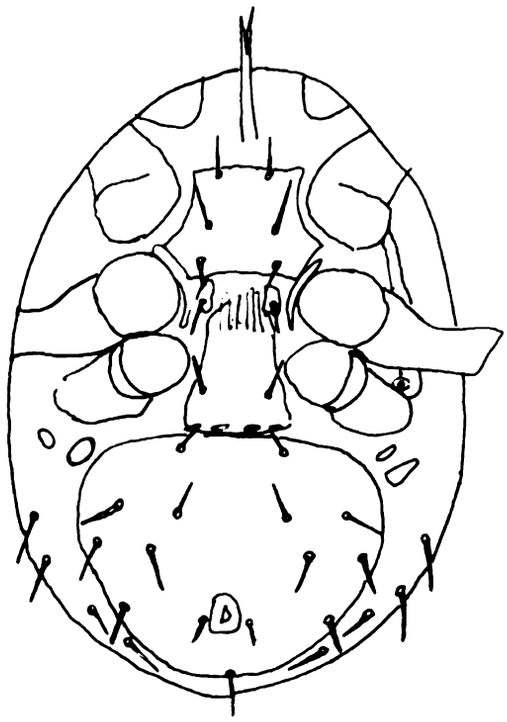

Fig. 18.--Ventral view of Lasioseius lanciolatus.

Lasioseius drosophili Chant (1963)
(Figures 19, 20, and 21a and b)

Dorsal shield lightly reticulate, with 36 pairs of setae, 21 pairs on the "anterodorsal" shield (Figure 19). All setae on anterior region short. Most setae on posterior region short, those along posterior margin longer. Pre-endopodal plates poorly developed. Sternal shield lightly reticulate having three pairs of setae, fourth pair on minute metasternal plates. Endopodal plates well developed in region of Coxae III and IV. Two pairs of elongate plates between genital and ventri-anal shields. Ventri-anal shield with six pairs of pre-anal setae. Two pairs of metapodal plates, one pair much larger than the other. Legs I and IV normal, without macrosetae. Legs II and III swollen basally, with a number of strong spurs on femur, genu and tarsus (Figure 21).

Distribution: Chant (1963) reported that the holotype and two other females were collected in 1934 on Drosophila sp. at College Park, Maryland. This investigator found this species in sample #152 from Clinton Co. and #161 from Ogemaw Co. in Michigan and there were larvae of Drosophila sp. in both samples.

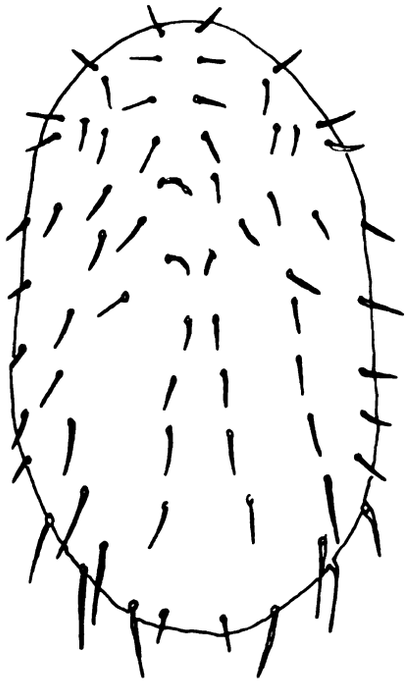

Fig. 19.--Dorsal area of Lasioseius drosophili.

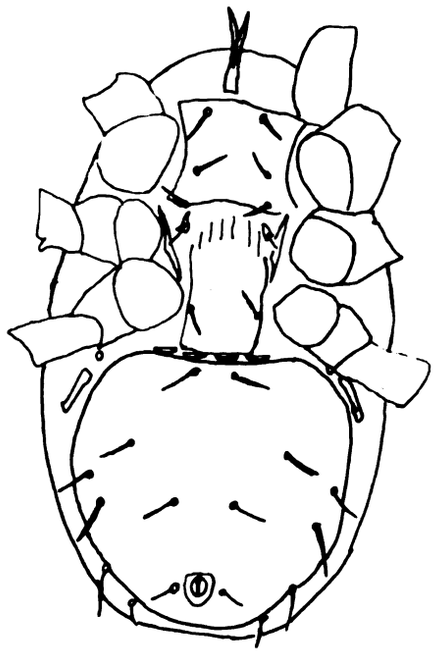

Fig. 20.--Ventral area of Lasioseius drosophili.

Fig. 21a.-- Leg II of L. drosophili.

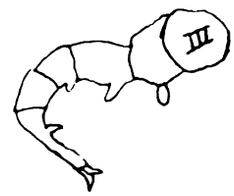

Fig. 21b.-- Leg III of L. drosophili.

Lasioseius meridionalis Chant (1963)
(Figures 22 and 23)

Dorsal shield slightly sculptured, and with 36 pairs of setae, (Figure 22) 21 on anterior region. Four pairs accessory plates on margin of dorsal shield, two in the anterior region. All setae slightly thickened, Z_5 serrated. Eight pairs of setae on interscutal membrane, two pairs in the anterior region. Sternal shield smooth with three pairs of setae, fourth pair on metasternal plates. Endopodal plates evident in the region of coxae III and IV. Two pairs of elongate platelets between genital and ventri-anal shields (these are sometimes fused to form a continous strip). Ventri-anal shield triangular with four pairs of pre-anal setae. All setae on tarsus IV longer than normal.

Distribution: Chant (1963) reported collections from Coral Gables, Florida and also from "bulb roots" and orchid plants from Mexico. Of all the Blattisocids collected from the fungi these were exceeded in number and places found only by Lasioseius muricatus in this study.

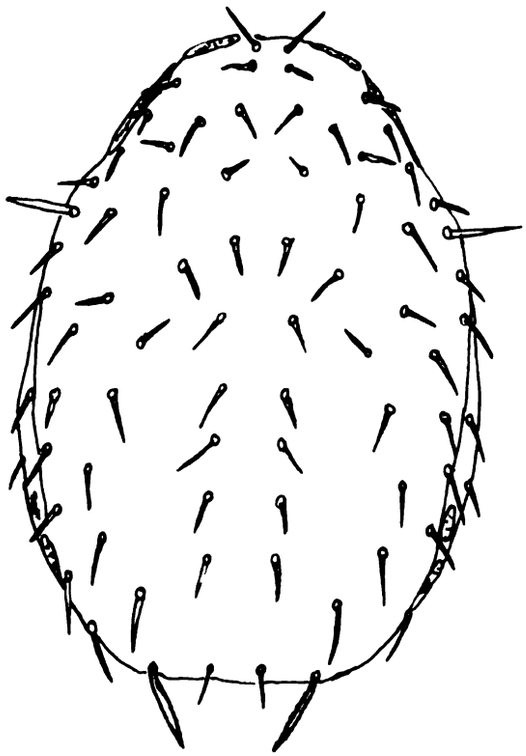

Fig. 22.--Dorsal area of Lasioseius meridionalis.

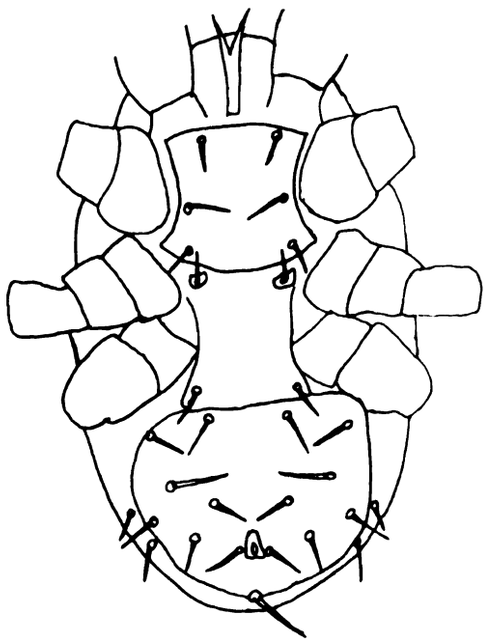

Fig. 23.--Ventral area of Lasioseius meridionalis.

A Check List of the Arthropod Groups Including Mites Other Than Blattisocids that Inhabit Polyporaceae

The following arthropods were classified using Wharton and Baker (1952), Borror and DeLong (1937), Baker et al. (1958), Peterson (1960) and Eddy (1965).

Phylum Arthropoda

Subphylum Mandibulata

Class Hexapoda

Order Collembola

Families

Poduridae

Entomobryidae

Sminthuridae

Order Thysanoptera

Families

Merothripidae

Phloethripidae

Thripidae

Order Coleoptera

Families

Mycetophagidae

Ptilidae

Tenelerionidae

Diaperis sp.

Boletherus cornutus

Cisidae

Erotylidae

Staphylinidae

Elateridae

Order Diptera

Families

Mycetophilidae

Cecidomyidae

Drosophilidae

Drosophila sp.

Sciaridae

Phoridae

Fungivoridae

Platypezidae

Otitidae

Order Hymenoptera

Families

Formicidae

Braconidae

Class Chilopoda

Order Lithobiomorpha

Family

Lithobidae

Lithobius sp.

Order Geophilomorpha

Family

Geophilidae

Geophilus sp.

Class Diplopoda

Order Chilognath

Family

Julidae

Parajulus sp.

Class Eucrustacea

Order Isopoda

Subphylum Chelicerata

Class Arachnida

Order Acarina

Suborder Mesostigmata

Superfamily Parasitoidea

Families

Parasitidae

Parasitus eugamasus

Veigaiaidae

Neoparasitidae

Digamasellidae

Digamasellus sp.

Laelaptidae

Podicinidae

Superfamily Zerconoidea

Family

Zerconidae

Suborder Trombidiformes

Superfamily Chelytoidea

Family

Chelytidae

Superfamily Erythraeoidea

Family

Erythraeidae

Superfamily Trombidioidea

Family

Trombiculidae

Superfamily Eupodoidea

Families

Eupodidae

Rhagidiidae

Superfamily Bdelloidea

Family

Bdellidae

Suborder Sarcoptiformes

Supercohort Oribatei

Superfamily Phthiracaroidea

Family

Phthiracaridae

Superfamily Belbidoidea

Families

Belbidae

Licaridae

Superfamily Pelopoidea

Family

Galumnidae

Superfamily Camisoidea

Family

Camasidae

DATA

The arthropods and fungi collected were identified using Comstock (1950), Wharton and Baker (1952), Alexopoulous (1952), Overholts (1953), Borror and DeLong (1957), Baker et al. (1958), Evans (1958), Peterson (1960), Chant (1963), and Eddy (1965).

In the following data tables one will find that the samples are not all in chronological order. This occurred as a result of a back log of samples and they were recorded as they were treated in the Berlese funnels. Also, there are numbers missing. Three factors were responsible namely (1) The samples were examined and nothing of significance to this work was found; (2) to avoid number duplication this investigator often skipped a block of numbers when samples were stored and others were being collected and (3) some of the samples were suspected to be contaminated from insects flying into the collecting jar and these were therefore discarded.

1960	Name of Fungus	Locality	Date
Sample #1	*Fomes applanatus*	Ingham Co. Baker Wood Lot	May 6
Collector: C. S. Scarborough		MSU Campus	

Acarina	Hexapoda
Mesostigmata	Coleoptera
Digamasellidae	Tenebrionidae (adults and larvae)
Trombiculiformes	Staphylinidae (adults)
Chelytidae Rhagidiidae	Diptera
Sarcoptiformes (Oribatei)	Cecidomyidae
Galumnidae	Collembola
Belbidae	Entomobryidae

Sample #2	*Fomes applanatus*	Ingham Co. Baker Wood Lot	May 6
Collector: C.S.S.		MSU Campus	

Acarina	Hexapoda
Mesostigmata	Coleoptera
Blattisocidae	Tenebrionidae
Lasiosieus muricatus	*Diaperis sp.* (3 adults)
Digamasellidae	*Boletherus cornutus* (2 adults)
Digamasellus sp.	Mycetophagidae (adults only)
Trombiculiformes	Collembola
Chelytidae	Poduridae
Rhagidiidae	Chilopoda
Sarcoptiformes (Oribatei)	*Geophilus sp.*
Belbidae	

Sample #3	*Polyporus conchifer*	Kalamazoo Co. Gull Lake	June 30
Collector: C.S.S.		Biological Station	

Acarina	
Mesostigmata	Hexapoda
Blattisocidae	Collembola
Lasioseius muricatus	Entomobryidae
Parasitidae	Poduridae
Digamasellidae	Hemiptera
Digamasellus sp.	Aradidae
Vegaiaidae	Coleoptera
Sarcoptiformes (Oribatei)	Staphylindae (adults)
Belbidae	Cisidae (adults)
Trombiculiformes	Silphidae (adults)
Chelytidae	Hymenoptera
	Formicidae

1960	Name of Fungus	Locality	Date
Sample #4 Collector: C.S.S.	Polyporus sp.	Kalamazoo Co. Gull Lake Biological Station	June 30

Acarina
- Sarcoptiformes (Oribatei)
  - Belbidae

Hexapoda
- Collembola
  - Sminthuridae
- Coleoptera
  - Tenebrionidae
    - Diaperis sp. (adults)
    - Boletherus cornutus (adults)

Sample #5 Collector: C.S.S.	Polyporus adustus	Kalamazoo Co. T1S:R9W:S8	July 7

Acarina
- Mesostigmata
  - Blatisocidal
    - Lasioseius muricatus
  - Digamasellidae
  - Parasitidae
  - Podocinidae
- Trombiculiformes
  - Chelytidae
  - Eupodidae

Hexapoda
- Collembola
  - Entomobryidae
  - Poduridae
- Thysanoptera
  - Phloethripidae
- Hemiptera
  - Aradidae
- Coleoptera
  - Tenebrionidae
- Diptera
  - Fungivoridae

Sample #6 Collector: C.S.S.	Polyporus adustus	Kalamazoo Co. T1S:R9W:S8	July 7

Acarina
- Mesostigmata
  - Digamasellidae
- Sarcoptiformes (Oribatei)
  - Belbidae

- Chilopoda
  - Lithobius sp.

Hexapoda
- Collembola
  - Entomobryidae
  - Sminthuridae
- Hemiptera
  - Aradidae
- Thysanoptera
  - Phloethripidae
- Diptera
  - Platypezidae

1960	Name of Fungus	Locality	Date
Sample #7	*Polyporus sp.*	Kalamazoo Co. Augusta Creek Kellogg Forest	July 9
Collector: C.S.S.			
Acarina Mesostigmata Blattisocidae *Lasioseius meridionalis* Digamasellidae *Digamasellus sp.* Sarcoptiformes (Oribatei) Belbidae Galumnidae		Hexapoda Collembola Sminthuridae Coleoptera Staphylinidae (adult) Cisidae (adults) Tenebrionidae (adults) *Boletherus cornutus* Diptera Cecidomyidae (larvae) Hymenoptera Braconidae	
Sample #8	*Polyporus radiatus*	Wintergreen Lake Kellogg Bird Sanctuary	July 9
Collector: C.S.S.			
Acarina Sarcoptiformes (Oribatei) Belbidae Golumnidae		Hexapoda Coleoptera Staphylinidae (adults) Hymenoptera Formicidae (workers)	
Sample #9	*Polyporus radiatus*	Otis Lake Bog Barry Co. T3N:R9W:S3	July 9
Acarina Sarcoptiformes (Oribatei) Belbidae		Hexapoda Coleoptera Tenebrionidae (adults)	

1960	Name of Fungus	Locality	Date
Sample #10	Polyporus radiatus	Otis Lake Bog Barry Co.	July 9
Collector: C.S.S.		T3N:R9W:S3	
Acarina Mesostigmata Blattisocidae Lasioseius muricatus Digamasellidae Digamasellus sp. Trombiculiformes Erythraeidae Trombiculidae Bdellidae Eupodidae		Hexapoda Collembola Entomobryidae Poduridae Thysanoptera Thripidae Coleoptera Mycetophagidae Staphylinidae Hymenoptera Braconidae Diptera Platypezidae	
Sample #11	Polyporus versidolor	Hastings Fish Ponds	July 13
Collector: C.S.S.		Barry Co.	
Acarina Mesostigmata Blattisocidae Lasioseius muricatus Sarcoptiformes (Oribatei) Belbidae		Hexapoda Collembola Entomobryidae Poduridae Coleoptera Tenebrionidae (adults)	
Sample #12	Polyporus fibrillosus	Allegan Co. Swan Creek	July 20
Collector: C.S.S.		T2N:R14W:S18	
Acarina Sarcoptiformes (Oribatei) Belbidae Galumnidae		Hexapoda Coleoptera Tenebrionidae (adults) Staphylinidae (adults) Cisidae (adults) Hymenoptera Formicidae (workers)	

1960	Name of Fungus	Locality	Date
Sample #13	*Polyporus betulinus*	Allegan Co. Swan Creek	July 20
Collector: C.S.S.		T2N:R14W:S9	
Acarina Mesostigmata Blattisocidae *Lasioseius muricatus* Digamasellidae *Digamasellus* Sarcoptiformes (Oribatei) Belbidae		Hexapoda Collembola Entomobryidae Poduridae Thysanoptera Phloethripidae Coleoptera Tenebrionidae (adults)	
Sample #14	*Polyporus volvatus*	Pine Point Allegan Co.	July 20
Collector: C.S.S.		T2N:R13W:S19	
Acarina Mesostigmata Digamasellidae Sarcoptiformes (Oribatei) Belbidae		Hexapoda Coleoptera Tenebrionidae Cisidae	
Samples #16-18	*Polyporus versicolor*	Swan Creek Allegan Co.	July 20
Collector: C.S.S.		T2N:R14W:S8	
Acarina Sarcoptiformes (Oribatei) Belbidae Pthiracaridae		Hexapoda (none present)	
Sample #19	*Polyporus adustus*	Agusta Creek Kellogg Forest	July 23
Collector: C.S.S.		Kalamazoo Co.	
Acarina Mesostigmata Blattisocidae *Zerconopsis michaeli* Digamasellidae *Digamasellus* sp.		Hexapoda Hymenoptera Formicidae	

1960	Name of Fungus	Locality	Date
Sample #24 Collector: C.S.S.	Polyporus adustus	Kalamazoo Co. T1S:R9W:S8	July 29
Acarina Mesostigmata Blattisocidae Lasioseius muricatus Digamasellidae Digamasellus sp. Trombiculiformes Chelytidae		Hexapoda Collembola Entomobryidae Poduridae Thysanoptera Thripidae Phloethripidae Hemiptera Aradidae Coleoptera Staphylinidae (adults)	
Sample #25 Collector: C.S.S.	Polyporus adustus	Kalamazoo Co. T1S:R9W:S8	July 29
Acarina Mesostigmata Parasitidae Trombiculiformes Rhagidiidae Sarcoptiformes (Oribatei) Eupodidae		Hexapoda Collembola Poduridae Thysanoptera Merothripidae Coleoptera Tenebrionidae (adults) Diptera Platypezidae	
Sample #26 Collector: C.S.S.	Polyporus gilvus	Kalamazoo Co. Gull Lake Biol. Station	August 4
Acarina Mesostigmata Blattisocidae Lasioseius meridionalis Digamasellidae Sarcoptiformes (Oribitei) Belbidae Licaridae Camasidae		Hexapoda Collembola Poduridae Thysanoptera Phloethripidae Diptera Fungivoridae Colloptera Mycetophagidae (adults)	

1960	Name of Fungus	Locality	Date
Sample #31	Polyporus radiatus	Kalamazoo Co. Gull Lake Biol. Station Old Married Housing	August 9
Collector: C.S.S.			
Acarina Sarcoptiformes (Oribatei) Belbidae Galumnidae		Hexapoda Absent	
Sample #35	Fomes fomentarius	Mackinaw Co. Hog Island Point Park	Sept. 15
Collector: T. W. Porter			
Acarina Mesostigmata Digamasellidae Digamasellus sp. Podocinidae Trombiculiformes Bdellidae Eupodidae Sarcoptiformes (Oribatei) Galumnidae		Hexapoda Collembola Poduridae Coleoptera Elateridae	
Sample #37	Fomes applanatus	Mackinaw Co. Hog Island Point Park	Sept. 15
Collector: T.W.P.			
Acarina Mesostigmata Blattisocidae Lasioseius muricatas Lasioseius meridionalis Digamasellidae Parasitidae Neoparasitidae		Hexapoda Collembola Poduridae Coleoptera Staphlinidae Erotylidae Elateridae	
Sample #38	Polyporus semispinus	Deer Lake Park Alge Co.	Sept. 9
Collector: T.W.P.			
Acarina Mesostigmata Digameselbidae Trombiculiformes Rhagidiidae		Hexapoda Collembola Entomobryidae Hemiptera Aradidae	

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1960	Name of Fungus	Locality	Date
Sample #40 Collector: T.W.P.	*Fomes officianalis*	Deer Lake Park Alge Co.	Sept. 9
Acarina Mesostigmata Digamasellidae Parasitidae Sarcoptiformes (Oribatei) Belbidae		Hexapoda Coleoptera Tenebrionidae (adults) *Boletherus cornutus* Cisidae Diptera Mycetophilidae	
Sample #41 Collector: T.W.P.	*Polylporus tsugae*	Rush Lake Huron Mts. Marquette Co.	Sept. 9
Acarina Mesostigmata Digamasillidae *Digamasellus* sp. Blattisocidae *Lasioseius muricatus* *Lasioseius meridionalis* Neoparasitidae Sarcoptiformes Belbidae Galumnidae		Hexapoda Collembola Entomobrijidae Poduridae Coleoptera Tenbrionidae (adults) *Boletherus cornutus* Staphylinidae Diptera Otitidae	
Sample #43 Collector: T.W.P.	*Fomes fomentarius*	Rush Lake Huron Mts. Marquette Co.	Sept. 9
Acarina Mesostigmata *Lasioseius muricatus* *Lasioseius pencilliger* *Lasioseius meridionalis* Trombiculiformes Chelytidae Rhagidiidae Sarcoptiformes (Oribatei) Phthiracaridae		Hexapoda Coleoptera Tenbrionidae (adults and larvae)	
Sample #44 Collector: T.W.P.	*Polyporus tsugae*	Rush Lake Huron Mts. Marquette Co.	Sept. 9
Acarina Mesotigmata Blattisocidae *Lasioseius muricatus* *Lasioseius meridionalis* Zerconidae		Hexapoda Thysanoptera Phloethripidae Diptera Cecidomyidae (larvae)	

1960	Name of Fungus	Locality	Date
Sample #45	Polyporus tsugae	Howe Lake Huron Mts.	Sept. 14
Collector: T.W.P.		Marquette Co.	

Acarina
- Mesostigmata
  - Blattisocidae
    - Lasioseius muricatus
  - Digamasellidae
    - Digamasellus sp.
- Sarcoptiformes (Oribatei)
  - Belbidae

Hexapoda
- Collembola
  - Poduridae
- Coleoptera
  - Cisidae
- Diptera
  - Cecidomyidae

Sample #46	Polyporus tulipiferae	Deer Lake Park	Sept. 15
Collector: T.W.P.		Alge Co.	

Acarina
- Sarcoptiformes (Oribatei)
  - Belbidae
  - Galumnidae

Hexapoda
- Collembola
  - Poduridae
- Thysanoptera
  - Merothripidae
- Coleoptera
  - Tenebrionidae (adults and larvae)

Sample #49	Fomes ignarius	Purdy Bog	Sept. 27
Collector: T.W.P.		Barry Co.	

Acarina
- Mesostigmata
  - Blattisocidae
    - Lasioseius muricatus
  - Digamasellidae
  - Neoparasitidae
- Trombiculiformes
  - Chelytidae
  - Bdellidae

Hexapoda
- Coleoptera
  - Tenebrionidae (adults)
    - Boletherus cornutus
  - Silphidae (adults)

1960	Name of Fungus	Locality	Date
Sample #50	*Fomes applanatus*	Ingham Co. Sanford Wood Lot	Oct. 24
Collector: C. S. Scarborough		MSU Campus	

Acarina	Hexapoda
Mesostigmata	Coleoptera
Neoparasitidae	Tenebrionidae
Digamesellidae	*Boletherus cornutus*
Sarcoptiformes (Oribatei)	Carabidae
Belbidae	Cisidae
Camasidae	Collembola
Chilopoda	Entomobryidae
Lithobius sp.	

Sample #53	*Polyporus pubescens*	Howe Lake Huron Mts.	Sept. 14
Collector: T. W. Porter		Marquette Co.	

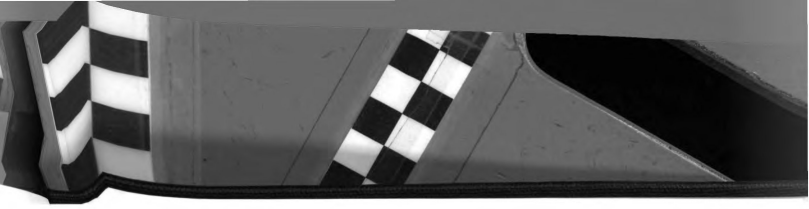
Acarina	Hexapoda
Mesostigmata	Thysanoptera
Blattisocidae	Phloethripidae
Lasioseius muricatus	
Lasioseius meridionalis	
Lasioseius penicilliger	
Digamasellidae	
Sarcoptiformes (Oribatei)	
Galumnidae	

Sample #54	*Polyporus tsugae*	Howe Lake Huron Mts.	Sept. 14
Collector: T.W.P.		Marquette Co.	

Acarina	Hexapoda
Mesostigmata	Thysanoptera
Blattisocidae	Phlothripidae
Lasioseius muricatus	Coleoptera
Sarcoptiformes (Oribatei)	Staphylinidae (adults)
Galumnidae	Diptera
	Sciaridae (larvae)

Sample #68	*Polyporus tsugae*	Huron Mts.	Sept. 12
Collector: T.W.P.		T52N:R29W:S15	

Acarina	Hexapoda
Mesostigmata	Coleoptera
Blattisocidae	Ptilidae
Lasioseius muricatus	
Digamasellidae	
Digamasellus sp.	



1960	Name of Fungus	Locality	Date
Sample #70 Collector: T.W.P.	Polyporus versicolor	Huron Mts. T52N:R29W:S15	Sept. 12
Acarina Mesostigmata Blattisocidae Lasioseius meridionalis Digamasellidae Zerconidae		Hexapoda Coleoptera Cisidae	
Sample #72 Collector: T.W.P.	Polyporus versicolor	Garden Lake Delta Co.	Nov. 20
Acarina Mesostigmata Digamasellidae Trombiculiformes Chelytidae Bdellidae Eupodidae Sarcoptiformes (Oribatei) Galumnidae Belbidae		Hexapoda Thysanoptera Phloethripidae Coleoptera Staphylinidae	
Sample #73 Collector: T.W.P.	Fomes annosus	Garden Lake Delta Co.	Nov. 20
Acarina Sarcoptiformes (Oribatei) Galumnidae		Hexapoda Coleoptera Ptilidae Hymenoptera Braconidae	
Sample #74 Collector: T.W.P.	Polyporus betulinus	Delta Co. T39N:R18W:S2	Nov. 19
No visible arthropods of any kind.			
Sample #76 Collector: T.W.P.	Daedola confragosa	Howe Lake Huron Mts. Marquette Co.	Sept. 14
Acarina Mesostigmata Blattisocidae Lasioseius meridionalis Sarcoptiformes (Oribatei) Phthiracaridae		Hexapoda Thysanoptera Phloethripidae Coleoptera Silphidae	

1960	Name of Fungus	Locality	Date
Sample #77	*Polyporus semispinus*	Howe Lake Huron Mts.	Sept. 25
Collector: T.W.P.		Marquette Co.	

Acarina	Hexapoda
Sarcoptiformes (Oribatei)	Coleoptera
Galumnidae	Cisidae (adults)
	Elateridae (larvae)

Sample #79	*Polyporus adustus*	Gratiot-Saginaw Game Area	Sept. 25
Collector: T.W.P.		TION:RIE:S9	

Acarina	Hexapoda
Mesostigmata	Thysanoptera
Blattisocidae	Phlotthripidae
Lasioseius muricatus	Coleoptera
Zerconidae	Cisidae
Trombiculiformes	
Chelytidae	
Rhagidiidae	

Sample #86	*Fomes applanatus*	Howe Lake Huron Mts.	Sept. 15
Collector: T.W.P.		Marquette Co.	

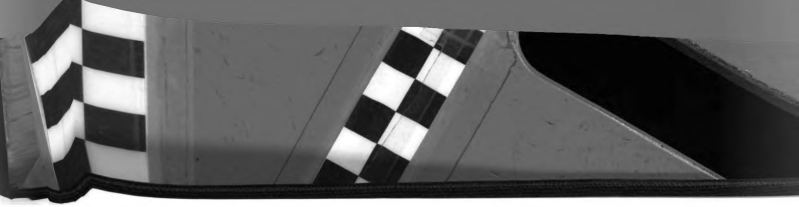
Acarina	Hexapoda
Mesostigmata	Collembola
Blattisocidae	Poduridae
Lasioseius lanciolatus	Diptera
Lasioseius confusus	Platypezidae
Sarcoptiformes (Oribatei)	
Belbidae	
Galumnidae	

Samples #87-111 were collected between Nov. 19, 1960 and Feb. 28, 1961 and while the Hexapods and the Oribatei were adequately represented, no Mesostigmata were found in these samples.

1961	Name of Fungus	Locality	Date
Sample #112 Collector: T.W.P.	*Fomes applanatus*	Rose Lake Clinton Co.	May 1
Acarina Mesostigmata Blattisocidae *Lasioseius muricatus* Digamasellidae Parasitidae Tromibiculiformes Chelytidae Bdellidae Sarcoptiformes (Oribatei) Galumnidae Phthiracaridae		Hexapoda Collembola Sminthuridae Coleoptera Tenebrionidae *Boletherus cornutus* Chilopoda *Geophilus sp.*	
Sample #113 Collector: T.W.P.	*Polyporus versicolor*	Rose Lake Clinton Co.	May 1
Acarina Mesostigmata Digamesellidae Sarcoptiformes (Oribatei) Licaridae Camasidae		Hexapoda Coleoptera Cisidae Eroytilidae	
Samples #114-#117 Collector: T.W.P.	*Fomes applanatus*	Rose Lake Clinton Co.	May 1
Acarina Mesostigmata Blattisocidae *Lasioseius muricatus* *Lasioseius meridionalis* Digamasellidae Parasitidae Neoparasitidae Trombiculiformes Chelytidae Trombiculidae Sarcoptiformes (Oribatei) Galumnidae Belbidae		Hexapoda Collembola Poduridae Entomobryidae Coleoptera Tenebrionidae (adults and larvae) Cisidae (adults) Staphylinidae (adults) Diptera Fungivoridae Cecidomyidae Platypezidae	

1961	Name of Fungus	Locality	Date
Sample #119 Collector: T.W.P.	*Polyporus betulinus*	Saginaw Co. TION:R2E:S32	June 4
Acarina Mesostigmata Digamasellidae Zerconidae Parasitidae Sarcoptiformes (Oribatei) Galumnidae Belbidae		Hexapoda Collembola Poduridae Thysanoptera Thripidae Coleoptera Tenebrionidae *Diaperis sp.* Erotylidae	
Sample #122 Collector: T.W.P.	*Polyporus betulinus*	Alge Co. Adam's Trail Beyond Kingston	Sept. 9
Acarina Mesostigmata Digamasellidae Parasitidae Vegaiaidae Sarcoptiformes (Oribatei) Belbidae		Hexapoda Collembola Poduridae Hemiptera Aradidae Coleoptera Staphylinidae	
Sample #123 Collector: T.W.P.	*Polyporus semisupinus*	Schoolcraft Co. N. Seney	Sept. 9
Acarina Mesostigmata Blattisocidae *Lasioseius muricatus*		Hexapoda Collembola Entomobryidae	
Sample #124 Collector: T.W.P.	*Polyporus versicolor*	Schoolcraft Co. N. Seney	Sept. 9
Acarina Sarcoptiformes (Oribatei) Galumnidae Belbidae		Hexapoda Collembola Poduridae Thysanoptera Phloethripidae	

1961	Name of Fungus	Locality	Date
Sample #125 Collector: T.W.P.	*Polyporus betulinus*	Union River Porcupine Mts.	Sept. 5
Acarina Mesostigmata Blattisocidae *Lasioseius muricatus* Parasitidae Vegaiaidae Trombiculiformes Bdellidae Rhagidiidae Chelytidae Sarcoptiformes (Oribatei) Phthiracaridae		Hexapoda Collembola Poduridae Thysanoptera Phloethripidae Coleoptera Tenebrionidae *Diaperis sp.* Cisidae Silphidae Hymenoptera Braconidae	
Sample #127 Collector: T.W.P.	*Fomes applanatus*	Union River Porcupine Mts.	Sept. 5
Acarina Mesostigmata Digamasellidae Trombiculiformes Eupodidae Chelytidae		Hexapoda Collembola Entomobryidae Coleoptera Mycetophagidae (adults) Diperta Sciaridae (larvae) Fungivoridae (larvae)	
Sample #128 Collector: T.W.P.	*Polyporus tsugae*	Lake of the Clouds Porcupine Mts.	Sept. 4
Acarina Mesostigmata Blattisocidae *Lasioseius muricatus* Trombiculiformes Rhagidiidae		Hexapoda (absent)	



1961	Name of Fungus	Locality	Date
Sample #129	Fomes officinalis	Delta Co.	Sept. 9
Collector: T.W.P.		Garden Lake	

Acarina
- Mesostigmata
  - Blattisocidae
    - Lasioseius muricatus
  - Trombiculiformes
    - Erythraeidae
    - Chelytidae
    - Trombiculidae

Hexapoda
- Collembola
  - Poduridae
- Thysanoptera
  - Merothripidae
- Coleoptera
  - Tenebrionidae (adults and larvae)
- Diptera
  - Mycetophilidae
- Hymenoptera
  - Braconidae

Samples #130-#145 were collected between the 11th of Nov. 1961 and the 18th of Nov. 1961. They show a variety of insects plus both sarcoptiform and trombicuform mites but no Mesostigmata.

1962	Name of Fungus	Locality	Date
Sample #146 and #148 Collector: T.W.P.	Polyporus adustus	Rose Lake	April 15
Acarina Mesostigmata Blattisocidae Proctolaelaps pygmaeus Trombiculiformes Eupodidae Rhagidiidae Sarcopiformes (Oribatei) Galumnidae		Hexapoda Collembola Poduridae Thysanoptera Thripidae Phloethripidae Coleoptera Tenebrionidae Cisidae	
Sample #149 Collector: T.W.P. No arthropods present	Polyporus velutinus	Dansville Game Area Boy Scout Camp	April 12
Samples #150-#151 Collector: T.W.P.	Polyporus versicolor	Danville Game Area Boy Scout Camp	April 12
Acarina Mesostigmata Digamasellidae Parasitidae Zerconidae Trombiculiformes Chelytidae Bdellidae		Hexapoda Collembola Entomobryidae Sminthuridae Thysanoptera Phloethripidae Coleoptera Tenebrionidae (adults and larvae)	
Sample #152 Collector: T.W.P.	Polyporus versicolor	Clinton Co. Rose Lake Boy Scout Area	April 12
Acarina Mesostigmata Blattisocidae Lasioseius drosophili Lasioseius meridionalis Sarcoptiformes (Oribatei) Belbidae Galumnidae		Hexapoda Collembola Entomobryidae Thysanoptera Thripidae Coleoptera Tenebrionidae (adults) Lampyridae (adults) Diptera Drosophilidae (larvae)	

1962	Name of Fungus	Locality	Date
Sample #153			
	No apparent arthropods		
Sample #154	Polyporus tulipiferae	Rose Lake Clinton Co.	April 14
Collector: T.W.P.		Scout Area	
Acarina Mesostigmata Blattisocidae Lasioseius confusus Lasioseius muricatus Lasioseius lanciolatus Digamesellidae Digamasellus sp. Trombiculiformes Chelytidae Eupodidae Sarcoptiformes (Oribatei) Galumnidae Belbidae		Hexapoda (none present)	
Sample #155	Polyporus adustus	Rose Lake Clinton Co.	April 14
Collector: T.W.P.		Scout Area	
Acarina Mesostigmata Digamasellidae Sorcoptiformes (Oribatei) Phthiracaridae		Hexapoda Diptera Platypezidae	
Sample #156	Polyporus versicolor	Rose Lake Clinton Co.	April 14
Collector: T.W.P.		Scout Area	
Acarina Sarcoptiformes (Oribatei) Galumnidae Belbidae		Hexapoda Coleoptera Staphylinidae (adults) Cisidae (adults)	

1962	Name of Fungus	Locality	Date
Sample #158 Collector: T.W.P.	Polyporus cinnabarinus	Ogemaw Co. West Branch	May 19

Acarina
- Mesostigmata
  - Blattisocidae
    - Lasioseius penicilliger
    - Lasioseius meridionalis
  - Parasitidae
- Sarcoptiformes (Oribatei)
  - Phthiracaridae

Hexapoda
- Coleoptera
  - Cisidae (adults)
  - Tenbrionidae (adults and larvae)
- Thysanoptera
  - Phlotthripidae

Isopoda (1 specimen)

Sample #161 Collector: T.W.P.	Polyporus sp.	Ogemaw Co. West Branch	May 19

Acarina
- Mesostigmata
  - Blattisocidae
    - Lasioseius drosophili
  - Digamasellidae
- Trombiculiformes
  - Chelytidae
  - Trombiculidae
- Sarcoptiformes (Oribatei)
  - Galumnidae
  - Belbidae

Hexapoda
- Collembola
  - Poduridae
- Coleoptera
  - Tenebrionidaes (adults)
  - Cisidae (adults)
- Diptera
  - Drosophilidae (larvae)

Samples #162-#172 yielded nothing but insects and Oribatid mites.

Sample #173 Collector: T.W.P.	Polyporus sp.	Barry Co. T4N:R8W:S2	June 2

Acarina
- Mesostigmata
  - Blattisocidae
    - Lasioseius muricatus
    - Lasioseius meridionalis
  - Neoparasitidae
- Trombiculiformes
  - Erythraeidae
- Sarcoptiformes (Oribatei)
  - Galumnidae
  - Belbidae

Hexapoda
- Thysanoptera
  - Phloethripidae
- Coleoptera
  - Tenebrionidae (adults)
- Hymenoptera
  - Formicidae (workers)

1962	Name of Fungus	Locality	Date
Samples #174 and #175 Collector: T.W.P.	*Polyporus versicolor*	Barry Co. T4N:R8W:S2	June 2
Acarina Mesostigmata Blattisocidae *Lasioseius muricatus* Digamasellidae Parasitidae		Hexapoda Collembola Poduridae Thysanoptera Phloethripidae	
Sample #180 Collector: T.W.P.	*Fomes applanatus*	Livingston Co. T4N:R4E:S24	June 7
Acarina Mesostigmata Blattisocidae *Lasioseius muricatus* Digamasellidae		Hexapoda Thysanoptera Phloethripidae Coleoptera Tenebrionidae (adults)	
Sample #182 Collector: T.W.P.	*Polyporus versicolor*	Washtenaw Co. T2S:R3E:S6	June 6
Acarina Mesostigmata Blattisocidae *Lasioseius muricatus* *Lasioseius meridionalis* Neoparasitidae Sarcoptiformes (Oribatei) Galumnidae Camasidae		Hexapoda Thysanoptera Phloethripidae Coleoptera Tenebrionidae (larvae and adults) Cisidae (adults) Silphidae	
Sample #183 Collector: T.W.P.	*Polyporus versicolor*	Washtenaw Co. T2S:R3E:S6	June 6
Acarina Mesostigmata *Lasioseius muricatus* *Lasioseius meridionalis* Parasitidae Sarcoptiformes (Oribatei) Galumnidae Belbidae		Hexapoda Collembola Poduridae Thysanoptera Phloethripidae Coleoptera Staphylinidae (adults)	

1962	Name of Fungus	Locality	Date
Sample #184 Collector: T.W.P.	Polyporus versicolor	Washtenaw Co. T2S:R3E:S5	June 6
Acarina Mesostigmata Digamasellidae Blattisocidae Lasioseius sp. (♂)		Hexapoda Collembola Entomobryidae Coleoptera Staphylinidae (adults) Silphidae (adults) Hymenoptera Braconidae (adults)	
Sample #185 Collector: T.W.P.	Polyporus semispenus	Washtenaw Co. T2S:R3E:S6	June 6
Acarina Mesostigmata Blattisocidae Lasioseius muricatus Neoparasitidae Zerconidae Trombiculiformes Chelytidae Bdellidae Sarcoptiformes (Oribatei) Galumnidae Belbidae		Hexapoda Collembola Poduridae Coleoptera Silphidae Cisidae Diploploda Parajulus sp.	
Sample #187 Collector: T.W.P.	Polyporus versicolor	Jackson Co. T2S:R2E:S6	June 6
Acarina Mesostigmata Digamasellidae Trombiculiformes Trombiculidae Sarcoptiformes (Oribatei) Galumnidae		Hexapoda Thysanoptera Phloethripidae Hemiptera Aradidae Coleoptera Tenebrionidae (adults)	

1962	Name of Fungus	Locality	Date
Sample #189 Collector: T.W.P.	*Polyporus adustus*	Jackson Co. T1S:R1E:S31	June 6
Acarina Mesostigmata Digamasellidae Trombiculiformes Chelytidae Sarcoptiformes (Oribatei) Belbidae		Hexapoda Collembola Entomobryidae Thysanoptera Phloethripidae Coleoptera Tenebrionidae (adults and larvae) Cisidae	
Sample #190 Collector: T.W.P.	*Polyporus semisupinus*	Jackson Co. T2S:R1E:S1	June 6
Acarina Mesostigmata Blattisocidae *Lasioseius muricatus* Neoparasitidae		Hexapoda (absent)	
Sample #191 Collector: T.W.P.	*Polyporus hirsutus*	Jackson Co. T2S:R1E:S1	June 6
Acarina Mesostigmata Blattisocidae *Lasioseius muricatus* Digamasellidae Vegaiaidae Sarcoptiformes (Oribatei) Belbidae		Hexapoda Collembola Sminthuridae Coleoptera Tenebrionidae (adults) Cisidae (adults) Silphidae (adults)	
Samples #192 and #193	*Daedalea confragosa* *Fomes fomentarius*	Ingham Co. T2N:R1E:S29 and S30	June 6
#192 no mites or insects found. #193 Acarina--Mesostigmata--Digamasellidae only.			

1962	Name of Fungus	Locality	Date
Sample #195 Collector: T.W.P.	Polyporus versicolor	Jackson Co. T1S:R2E:S31	June 6
Acarina Mesostigmata Blattisocidae Lasioseius meridionalis		Hexapoda absent	
Sample #198 Collector: T.W.P.	Polyporus versicolor	Jackson Co. T1S:R2E:S31	June 6
Acarina Mesostigmata Blattisocidae Lasioseius meridionalis Lasioseius muricatus Trombiculiformes Chelytidae		Hexapoda Collembola Entomobryidae Thysanoptera Phloethripidae Coleoptera Staphylinidae Diptera Cecidomyidae (larvae)	

DISCUSSION

The Blattisocidae were found in the bracket fungi collected to be represented by the following species: Zerconopsis michaeli, Proctolaelaps pygmaeus, Lasioseius muricatus, L. meridionalis, L. drosophili, L. lanciolatus, L. confusus, and L. penicilliger.

Zerconopsis michaeli is the only representative of the Platyseiinae found in the fungi collected. It was present in sample #19 (Polyporus adustus). This is the first known record of this species in North America. It was reported from England by Evans (1960) and then determined a new species.

Proctolaelaps pygmaeus was represented by two specimens, one each from samples #146 and #148. It was first described in 1859 and has been reported since from Europe, South Africa, Indonesia, Australia, New Zealand and North America. It not only has a varied distribution but it also has been found in a wide variety of habitats, being found in small mammal nests, feeding on tyroglyphid mites in leaf litter samples, in soil samples, on rotting trees, and on bark of healthy trees. This is the first known record of its appearance in bracket fungi.

Lasioseius muricatus was the most widely represented of the Blattisocinae found in the samples collected. As far as can be ascertained from the literature, this is the first record of this species in North America although Evans (1958) reported it from Polyporus sp. in Germany, Switzerland, and the British Isles. There seems to be no

restricting factors as far as this species is concerned except that they are always found in bracket fungi and secondly, the weather. This seems to be indicated by the fact that no representatives of this species or any other blattisocids were found in the samples collected between November and February of 1960-'61 or 1961-'62. They were found with other mites and arthropods, and in least one sample, were the only arthropods represented.

Lasioseius meridionalis was the second best represented of the blattisocines after L. muricatus, occurring enough to warrant its inclusion as a true inhabitant of bracket fungi. It occurred with L. muricatus and also with other mites and/or arthropods but unlike L. muricatus it was never found alone.

Lasioseius drosophili was represented by a number of specimens found in only two samples. Of the various species found in this study this is the only one in which the female shows leg setal modifications (spurs) on legs II and III (Figure 21). Also found in this particular habitat are larval representatives of Drosophila sp. indicating that this mite species is perhaps restricted to a particular habitat by the presence of these larvae. The presence of the leg spurs in these female specimens apparently have some adaptive significance although none can be accounted for from this study. Chant (1963) suggested that they are parasitic on Drosophila sp. and that this accounted for the leg spurs, but of the numerous specimens found none were attached to the insect larvae.

Three other species, Lasioseius lanciolatus, L. confusus and L. penicilliger were found sparsely represented in the fungi collected. Since these three forms represent both soil and bark inhabiting species

and are not widely represented here, perhaps they are only accidental or temporary inhabitants.

From the data collected and analyzed for this work, it seems that the woody shelf fungi rivals the tree hole, log mold, and leaf litter as a successful habitat for arthropods. The most numerous of the mites are the Oribatei, often appearing in the thousands in a single large sporophore. Also found in conjunction with the Oribatids are a wide variety of larval and adult insects and numerous other mites. The fungus provides shelter and often food for a number of these arthropods whereas some are predaceous or parasitic on others.

The heavily sclerotized mites (Oribatids) and insects were found to overwinter as adults but are in fewer numbers. Few other mites, including most of the Mesostigmata, were found in the fungi during the winter months with the collecting techniques employed. However, most of the mesostigmatids seem adequately sclerotized to survive the winter in the fungus habitat. Some Tetranychidae (Trombidiformes), which show about the same degree of sclerotization as the Blattisocidae, overwinter in the egg stage in the temperate zone and this suggests that, perhaps, the blattisocids do likewise. Some mites are known to overwinter as immatures but no evidence of this was found for the mesostigmatids.

Graves (1960) reported that some soft-bodied mites and certain insects were not collected with the Berlese technique using an incandescent bulb since it created too much heat for the specimen to tolerate and they crawled back into the fungus and died. Even though the softer-bodied mites and insects were not collected in the greatest abundance with the method used in this study practically all samples showed some of these specimens.

The relative humidity, temperature, and the photoperiod plays an important role in the survival and reproductive cycle of mites and insects. Winston (1963) reported that for the clover mite (Bryobia praetiosa), the greater the relative humidity, the greater the survival rate of this mite even under conditions of starvation. Another study by Helle (1968) pointed out that the photoperiod was responsible for induction of diapause (resting stage) in eggs of Tetranychus sp. in temperate regions. In experiments conducted by Helle, he found that at a temperature of 19.5° C. (± 0.75° C.) most eggs would enter diapause at a photoperiod of 12 hours or less and most would not enter diapause at a photoperiod above 12 hours. Another significant idea that resulted from this work of Helle and others is that diapause cannot be broken once it has set in until the winter season has passed or an equivalent time at a photoperiod greater than 12 hours. This suggests that certain mesostigmatids that are not found during the winter months in this study (see Data) might also overwinter as eggs.

Melichares agilis (Blattisocinae), although not found in this study, was reported by Hughes (1961) to complete its life cycle in seven to nine days at a temperature of 23° C. and a relative humidity of 87 per cent. This indicates that a point near room temperature and a high relative humidity is necessary for the survival and reproductive success of blattisocine mites.

CONCLUSIONS

1. There are two major Blattisocid inhabitants of the woody shelf fungi. They are Lasioseius muricatus and Lasioseius meridionalis.
2. Lasioseius muricatus is apparently restricted to the bracket fungi, for it has not as yet been reported from other habitats. It is not species specific, however, occurring in a wide variety of Polyporaceae.
3. Lasioseius drosophili is restricted to fungi containing Drosophila sp. larvae, although at this point it is not known whether the association is predaceous or parasitic.
4. Blattisocidae do not overwinter as adults in the Polyporaceae although are well represented from early March to late October in this habitat.
5. Oribatei and other heavily sclerotized arthropods overwinter as adults, being adequately represented in the period between late October and early March in the Polyporaceae.
6. There was no evidence found in the Polyporaceae to indicate predation by other arthropods on the Blattisocidae.
7. Lasioseius meridionalis as well as the other lesser represented species are not restricted to the woody shelf fungi.
8. The Blattisocidae are well represented in the woody shelf fungi of Michigan on both peninsulas.

9. The survival and reproductive success of mites depends upon a high relative humidity which makes the woody shelf fungi an ideal habitat for mites.
10. Blattisocidae are very well represented in the Polyporaceae by females but males were seldom found.
11. The most numerous mite representatives belong to the supercohort Oribatei.
12. There are no specialized immature stages in the Blattisocidae (bracket fungal species) that are used primarily for dispersal as in the case in some Sarcoptiformes.

SUMMARY

One hundred fifty specimens of woody shelf fungi were collected in the years 1960 to 1962. These were placed in a Berlese funnel under the heat of an incandescent bulb and allowed to stand until the fungus had completely dried. The fungi were classified to species in most instances and the annual collections were identified.

Eight species of Blattisocids were collected from the fungi, mounted on slides, and identified. Other mites and arthropods that occupied the same fungus were identified at least to family and the presence of these arthropods was correlated with the presence or absence of Blattisocidae. The blattisocids that occupy the fungi have varied habits except perhaps Lasioseius drosophili which apparently are restricted to fungi that contain larvae of Drosophila sp. These show leg modifications that suggest a specific adaptation to this habitat. On the other hand, Lasioseius muricatus and L. meridionalis appear in the fungus among a variety of arthropods including other mites and show no apparent adaptations in setae or mouth parts.

Zerconopsis michaeli of the Platyseiinae was represented by only one specimen and very little information on this species is found in the literature. Proctolaelaps pygmaeus, L. lanciolatus and L. confusus are so sparsely represented in the fungi collected here that very little is known of their habits. Their sparse representation suggests, however that they may be accidental inhabitants of the fungi being normally, either bark or forest floor inhabitants.

The majority of the overwintering adult mites belonged to the Oribatei. No adult or immature (larval or nymphal) stage of Blattisocidae were found to overwinter. This suggests that they overwinter in the fungus in the egg stage or perhaps in the forest floor as adults.

It has been suggested by numerous authors that the optimum conditions for adequate survival and reproduction of mites is a combination of a high relative humidity, temperature above 20° C. and a photoperiod of 12 hours or above. Although some mites may overwinter it is highly unlikely that they are active during the winter months in the fungi since their numbers were much less than during the warmer months.

No predation on Blattisocids was observed by this author and although they exhibit the typical predaceous mite mouth parts there is no evidence to suggest that any specimens except Lasioseius drosophili are restricted to feeding on any insect species or mite, or if they derive their nourishment from the tissues of the fungus itself.

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