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LABORATORY STUDIES ON THE FEEDING HABITS
OF SALTMARSH ACARINA, WITH NOTES ON THEIR BEHAVIOUR

BY

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INTRODUCTION.

One aspect of my study of the ecology of salt-marsh Acarina at Llanrhidian, S. Wales (Luxton 1964 a) was to investigate the habits of these Acarina in an attempt to explain the often surprising results of a statistical analysis of community structure. Acarina are difficult to rear in the laboratory and the following notes on their habits are certainly incomplete. Moreover, it is impossible to provide each species with all the potential foods present in the habitat. Consequently, the actual associations of microarthropods within a particular habitat and the reasons for these associations must remain a matter of conjecture. These data, however, serve in some small way to fill the gap between information gleaned by sampling in the field and the actual responses exhibited by the animals when in their habitat. This paper deals with the feeding biology of the most abundant Oribatei and Mesostigmata found in the salt-marsh soils.

MATERIALS AND METHODS.

Hartenstein (1962) has noted that information regarding the feeding habits of Acarina may be secured in three general ways:—

1. Examination of the gut contents and observation of the feeding habits of the organisms in nature.
2. A study of the feeding habits of individual species when fed upon known foods in the laboratory.

Acarologia, t. VIII, fasc. 1, 1966.
Probably each method is necessary in order to elucidate fully the role of Acarina in nature but the present work is mainly confined to the second method.

Acarina for laboratory culture were collected from samples of salt-marsh turf of a half square metre in area. They were extracted in the large funnel extractor of Macfadyen (1961) and collected in aluminium canisters containing moistened plaster of Paris and charcoal mixed in the ratio 9:1. Individuals were handled with a moist camel hair brush.

For cultures containing many animals straight sided crystallising dishes of 70 mm diameter and 50 mm in depth, plugged with polythene covered corks, were used. These were about one third filled with the charcoal/plaster of Paris mixture which was kept moist with distilled water. All the Acarina observed lived for long periods on this material. The moistened plaster of Paris kept the atmosphere in the culture vessel at approximately 100% relative humidity and the charcoal present caused a readily visible colour change when the cultures were in danger of drying out. For general feeding studies small Petri dishes of 45 mm diameter were used. The rim of the Petri dish was coated with a thin film of petroleum jelly to prevent the escape of Acarina. However, it was found that small species such as Punctoribates quadrivertex were able to surmount all such barriers; these species were kept on plaster of Paris in tightly corked 2" x 1" tubes.

All culture vessels were kept in a constant temperature room at 15°C. The relative humidity within the corked vessels was always at about 100%. However, the small Petri dishes with their loosely fitting glass covers could only be kept at a high humidity level by placing them in a humidity chamber. This was constructed by placing some glycerine and water mixture (S.G. 1.2 (Johnson 1940) in the bottom of a circular aquarium tank and erecting an aluminium platform just above the surface of the liquid. The platform which held the culture vessels was perforated with 1" diameter holes to allow the free circulation of moist air. The ground-glass rim of the tank was lightly smeared with petroleum jelly and a glass plate served as a lid. The cultures were observed at frequent intervals (usually once in 24 hours).

I was fortunate to receive from Dr G. J. F. Pugh of the Botany Department, University of Nottingham, ten species of salt-marsh soil fungus grown in pure culture. To provide material for the feeding of the oribatids the fungi were plated out on malt agar, consisting of 8 g of malt extract, 5 g of Oxoid No. 3 agar, 500 mls tap-water. These ingredients were autoclaved in a 750 ml flask at 15 lb/sq in for 15 minutes and poured, still molten, into Petri dishes. The fungi were fed to the oribatids by providing each culture vessel with a section of agar containing an adherent portion of fungus.

Pugh (1962 a, b and c) and Turner and Pugh (1961) have written extensively on the ecology of salt-marsh soil fungi and some notes from these workers on the biology of the fungus species used are relevant at this stage.

1. Cephalosporium sp. — Very free sporing and quite common on salt-marshes. They are slightly more abundant in the more mature reaches of the marsh.
2. *Gliocladium roseum.* — A cellulose decomposer, found very commonly in the mature regions of the salt-marsh. Not found very often in the lower regions. Free sporing.

3. *Ascochyta obiones.* — Found on dead leaves and in soil associated characteristically with *Halimione portulacoides.*

4. *Fusarium solani.* — Distributed throughout the marsh.

5. *Fusarium culmorum.* — Also distributed throughout the salt-marsh. A powerful cellulose decomposer.

6. *Cercospora salina.* — Probably the most typical salt-marsh fungus known. Found throughout the marsh but in greater concentrations near the top.


8. *Mortierella alpina.* — Found throughout the marsh, though more abundantly in the upper reaches.


10. *Alternaria tenuis.* — Most commonly found in the upper marsh. Found frequently on debris.

Pugh (1962 a) has pointed out that salt-marsh fungi are not as numerous as those in other soils and suggests that this might be because of the regular flooding of the soils. It would seem that some soil fungi in the marsh soils have definite habitat preferences. The oribatids studied tended to show palatability preferences, and it is possible that the distributions of food materials play an important part in the delimitation of communities and the zonation of species (Luxton 1964 b).

I. ORIBATEI.

The fungi were presented to specimens of each oribatid under study in individual Petri dishes. A control was also set up with agar alone provided as food material.

The oribatids studied were *Hermannia pulchella* (Will.), *Hygroribates schneideri* (Ouds.) and *Punctoribates quadrivertex* (Halb.). The detailed results of the experiment are given in Table I.

Certain preferences are evident from this table. Generally speaking *Gliocladium roseum, Fusarium culmorum* and *Mortierella alpina* are avoided by the oribatids under study. However this may be due to the artificial conditions of the culture vessel when fast-growing fungi such as these tend to produce large masses of mycelium.

Preferred foods are generally taken as being those where many faecal pellets are produced in the culture vessel. Some measure was also made of the fecundity of the species on the different fungi, although it is not known whether or not eggs laid early in the life of the culture were the result of fertilisations before collection in the field.

It is probable that under natural conditions a greater variety of food materials would be available for the oribatids. Generally speaking other workers have found
that oribatids feed on decaying plant matter. I am of the opinion that nourishment is frequently derived from the fungal and bacterial growths on these materials. Probably, the main food materials available for the oribatids would be soil fungi and the algal growth which covers the soil surface in certain areas.

Woodring & Cook (1962) found that their oribatids would nibble at almost anything including filter paper, pencil erasure, wool, wood and powdered charcoal. In my study starved oribatids of all three species would eat the loose surface layer of plaster of Paris. This material was found regularly in the guts of specimens which had died in culture. However, if fungal or other material was placed in culture plaster of Paris tended to be ignored as an item of diet. As Woodring & Cook (1962) have pointed out, those species living in a restricted habitat can be assumed to feed primarily on the material that makes up their environment. However, a great many different food materials would present themselves to soil inhabiting oribatids. Forsslund (1939) analysed the faecal pellets of freshly caught oribatids and found mostly fungal hyphae with smaller amounts of fungal spores. In this study some squash preparations of the guts of freshly caught oribatids were made. The contents were composed mainly of chopped up fungal hyphae.

All three species of oribatid under study were presented with fresh grass leaves and stems. Although the specimens in culture congregated in and around them no feeding was observed and no faecal pellets appeared in culture.

Some decomposing stems of Salicornia europaea were collected from tidal drift and placed in culture with specimens of each of the three oribatid species. The Oribatei were seen to browse upon this material and to insinuate themselves into the axils and holes of the stems. At no time were any of the oribatid species seen to be actually consuming the rotting stems although they may have been feeding on the pulpy interior out of sight. Most individuals confined themselves to the surface of the rotten stem and browsed thereon. When placed into culture with a piece of rotten stem and a section of fungus on agar the oribatids invariably chose the stem. This might have been because the stem provided nooks into which the animals could crawl for shelter.

Some choice experiments were set up with the ten species of soil fungi and a piece of agar as control. These fungi were arranged at regular intervals around the outside rim of each of five culture vessels and some thirty specimens of a single oribatid species were introduced to each vessel. The reaction of the oribatids were observed each day and the numbers feeding on each piece of fungus were noted. The Hermannia pulchella adults confined themselves almost entirely to Cercospora salina. The older nymphs of this species, however, seemed to feed and also develop best on Fusarium solani with some attraction for Cercospora salina. The younger nymphs and the larvae were also attracted to Fusarium solani with smaller numbers feeding on Ascochyta obiones. It is possible therefore, that food preferences differ throughout the developmental stages. Wallwork (1958) also reports this phenomenon for an unidentified species of Hermannia. The above observation also
confirms WALLWORK's statement that "it may be meaningless to discuss the efficacy of a species in litter breakdown, if only one stage in the life cycle is considered". Hygroribates schneideri adults seem to be attracted to the fungi in the following order: Alternaria tenuis, Fusarium solani and Cercospora salina. Punctoribates quadrivertex has the following preferences: Cercospora salina, Ascochytula obiones and Alternaria tenuis. In no case were the mites attracted to the agar.

It is interesting to note that the fungi most attractive to these oribatids are those with a universal and abundant distribution. The most commonly chosen by all species, Cercospora salina, is noted as the most typical salt-marsh fungus known.

**Hermannia pulchella.**

_Hermannia_ sp. has been reported by both Woolley (1960) and WALLWORK (1958) as feeding on woody tissue. HARTENSTEIN (1962) classifies it, with oribatids such as Platynothrus peltifer, as being capable of ingesting and consuming wood and leaf tissue but preferring fungi.

WALLWORK (1958) has said: "woody tissue could be prepared for ingestion by means of these heavy masticating organs (i.e. chelicerae of _Hermannia_ sp.) but for the absorption of food through the gut wall in these cases, a rather specialised digestive system would be needed to cope with woody elements. Information concerning the digestive systems of these soil-inhabiting mites is wanting, but these selective feeders on wood must be capable of digesting this material." But is this necessarily so? Faecal pellets of _Hermannia_ sp. feeding solely on woody tissue have been found to be composed entirely of finely shredded wood particles. _Hermannia_ sp. will feed on decaying wood and it is possible that it extracts its nourishment from the fungi and bacteria growing therein, passing the woody material out as waste. That _Hermannia_ and related species have mouthparts suited to masticating wood does not necessarily imply that they digest wood but only that they may be better adapted to exploit this particular fungal supply.

WALLWORK also observed _Hermannia_ sp. feeding on the dead bodies of their fellows. Although plenty of opportunity was presented for such feeding in these cultures it was never observed in any of the detritus feeding mites.

The specimens of _Hermannia pulchella_ laid many eggs whilst in culture. These were deposited in small holes in the plaster of Paris and often covered by a glistening transparent fluid which disappeared after a day or so. This fluid did not fix the egg to the hole as the egg was easily removed with a camel hair brush. Spermatophores were regularly deposited in large aggregations and usually on the glass sides of the culture chamber. Copulation was never observed. The eggs often hatched and the larvae fed almost immediately on the fungus in the dish. They would also take, if nothing else was available, scrapings of the alga _Pleurococcus_. The food could be seen in their guts through their semi-transparent body walls. Unfortunately, no success was achieved in rearing this mite from egg to adult.
It would seem from field observation that the life-cycle of _Hermannia pulchella_ takes approximately twelve months.

Observations of the faecal pellets in culture showed them to be composed of pieces of fungal hyphae with a few spores. Sometimes these particles were in a matrix of a jelly-like substance (probably agar) which would suggest that this oribatid uses its massive chelicerae to masticate any suitable object containing fungus, without discrimination.

A strange habit, for which I have no explanation, was observed on occasion with adult _Hermannia pulchella_. Two individuals would oppose their ventral surfaces and push at each other with their four pairs of legs. This did not seem to be a chance occurrence or an attempt to remove themselves from the close proximity of their fellows. It happened fairly regularly and the phenomenon continued for several minutes. No attempt at copulation was made during the course of this action. The only parts involved were the legs. A similar behaviour was observed on one occasion with a larva which lay on its back for some considerable time rolling a small ball of plaster of Paris over and over in its legs.

*Hygroribates schneideri.*

This species is a truly viviparous form and often produced juveniles whilst in culture. It is a very slow moving species.

Most authorities consider the members of this oribatid group to be algivorous. However, the results of these observations show that it will survive quite well on a fungal diet. The fungal hyphae seen in faecal pellets were not so finely chopped as those seen in _Hermannia pulchella_. On the whole, the faecal pellets observed were composed of fungal hyphae but in the culture fed with _Verticillium lateritum_ the pink faecal pellets were composed mainly of spores. An experiment was set up in which specimens of _Hygroribates schneideri_ were offered both fungus and a quantity of filamentous alga collected from the salt-mash. No obvious choice was made and the mites fed both on the fungus and the alga. This was evident from the composition of the faecal pellets in the culture vessel. However, it seemed that the individuals would feed entirely on one or other of the food materials as the faecal pellets were composed either entirely of fungus material or of algal material. Probably this species will consume whichever food material is the most conveniently available.

Specimens of the closely related genus _Ameronothrus_ have been observed browsing on algal growths in and around barnacles, and very often specimens were collected from the field which had filamentous algae attached to the rough integument. _Hygroribates schneideri_ does not seem to deposit spermatophores en masse as is the case with _Hermannia pulchella_. On the contrary, where they appeared in a culture it was usually singly or in twos or threes.
Punctoribates quadrivertex.

Small and very fast moving, with a tendency to aggregate in large groups if the humidity level of the culture begins to fall. They are also extremely active climbers, as suggested by their field habits, and often reach the roof of the culture vessel. Such small Acarina are probably important as regards the dispersal of fungal spores. In cultures where the fungus was free-sporing the bodies of these oribatids would become liberally coated with spores.

Eggs were often laid in culture, being deposited in holes in the plaster of Paris. Larvae invariably hatched from these eggs and immediately fed on the available fungal material.

2. Mesostigmata.

The feeding behaviour of the Mesostigmata has been described in less detail in the literature than that of the Oribatei. This is possibly because they are thought not to have such a directly important effect on soil fertility as do the Oribatei. The Mesostigmata described here all proved to be carnivorous, and predatory to some degree.

A number of factors seem to be important when assessing the success of predators in a particular habitat. The various Mesostigmata differ conspicuously in the design of the mouthparts and in their rapidity of movement. Some of the Mesostigmata under study (e.g. Ololaelaps venetus) have exceedingly weak chelicerae which are useless for holding large and active prey species such as the Isotomidae. Also this mite is relatively slow moving and at a distinct disadvantage when pursuing rapidly moving prey. Possibly the most successful type of microarthropod predator, i.e. the one exploiting the greatest range of prey, would be that type with a large body size, a fast-moving gait and strong mouthparts.

The behaviour of predators in a Petri dish is certainly artificial. In this situation the prey species is rather more exposed to attack and the confined space makes its escape difficult. However, much useful information can be gathered by comparing the behaviour of the different predators when presented with the same prey.

The Mesostigmata kept in culture vessels in the laboratory were: Macrocheles subbadius (Berl.); Cheiroleius (= Sejus) necorniger (Ouds.); Ololaelaps venetus (Berl.) and Pergamasus longicornis (Berl.). The prey types which are available in the salt-marsh habitat are not too numerous. Those selected for experiment were Staphylinid beetle larvae, Stratiomyid Dipteran larvae, various Collembola species, Oribatid nymphs and larvae, and Cheylostigmates species. The Dipteran larvae were killed and cut up before presentation to the predators in order to test their reactions to a carrion diet. Results are presented in Table II. The only diet on which offspring was produced in all predator species was Dipteran larva carrion. The reason for this may have been that a suitable region, i.e. soft,
moist viscera, was available for offspring deposition which was lacking in other culture vessels.

Poduridae tended to repel all the predators studied. The predators would attempt to attack these Collembola but would immediately retreat after the first contact. It is possible that the Poduridae secrete some noxious fluid.

Oribatid nymphs did not actively repel any of the predators but few were eaten, possibly because it was impossible for any of the weaker predators to pierce the hardening integument. Only *Pergamasus longicornis* was able to overcome successfully this barrier.

All the predators would approach the prey source with their first pair of legs waving in the air. They would then touch the prey lightly and briefly before attacking (in the case of an acceptable prey) or retreating. Pauly (1956) has suggested that chemoreceptors are present in these legs and the behaviour of these predators would tend to confirm this observation.

*Macrocheles subbadius.*

This species is capable of surviving for long periods without food. Several specimens were starved in the laboratory for more than three months. During this time no attempts were made to kill and eat each other, although if a specimen died in the culture vessel there were often signs that it had been partly eaten before it was removed.

The only food material which was readily accepted by this species was the Dipteran larva carrion. Hungry specimens were attracted to a fresh corpse from several cms distance as soon as it was placed in the culture vessel. Many *Macrocheles* juveniles were found on the corpse during the course of this study.

Often the dried integuments of Isotomid juveniles were found. However, the *Macrocheles* were never observed to attack these Collembola. Even when springtail and Mesostigmatid met directly in the culture the springtail was ignored. It is possible that this species will take Isotomid juveniles but I have made no direct observations to corroborate this.

It is more likely that *Macrocheles subbadius* is a carrion feeder in nature. It has also been reported from dung and may be coprophilous or may feed on the eggs and larvae of Diptera or on Nematodes which it finds in this situation. This may also, of course, be the case in the salt-marsh soils where Dipteran eggs, larvae, and also Nematodes, are plentiful and there is much dung from domestic stock.

*Cheiroseius (= Sejus) necorniger.*

This species is a true predator and has a far wider range of food sources than *Macrocheles subbadius.*

Staphylinid beetle larvae seem to be among the favourite foods of *Cheiroseius (= Sejus) necorniger.* It will consume large quantities of these larvae. Twelve larvae were consumed by six *Cheiroseius* adults in two days. The mode of con-
sumption seems to be typical of acarine predators. The integument is pierced by
the chelicerae and the body contents drained leaving the dry and empty integument.
If the prey is a convenient size for carrying, the predator will move around the
culture vessel with it until the body fluids have been exhausted.

*Cheiroseiusr (= Sejus) neocorniger* was also very much attracted to the Dipteran
carrion. Here the method of feeding was to embed the mouthparts in the soft
exposed tissues of the food material and to drain off nourishment until the appetite
was satisfied. Often the predator would remove a small piece of tissue with a
backward jerk of the gnathosoma and carry this about the culture vessel until the
meal was finished.

A major item of the natural diet of this species is probably Isotomid juveniles.
These were taken readily and quite easily captured by a hungry predator. Newly
hatched Isotomids were taken for preference and the adults could be handled by
the predator only if these had first been stunned by squashing slightly to make
their escape difficult. They are capable of dismembering a dead Isotomid for
themselves and were often observed to remove a limb from the prey before com­
mening to feed upon it. The method of capturing the smaller Isotomids was
as follows. The predator would approach the prey, constantly waving its first
pair of legs in the air. When the prey was within reach the predator would touch
it lightly with its forelegs. Isotomids are possessed of powerful springing organs
and on being handled in this way would leap for safety. At the same time the
predator would seize the prey with its chelicerae and either leap slightly with it
or be carried into the air by the momentum of the prey. In any case, in all
observations of this capture, the prey seemed to be caught in mid-air. The
predator would cling to the prey for several seconds until the prey was weakened
and then either change its grip to another part of the body or continue its meal
at leisure.

*Cheiroseiusr (= Sejus) neocorniger* will take the larvae and protonymphs of most
Oribatei but seems unable to pierce the integument of the more strongly sclerotised
nymphs. They are repelled by *Cheylostigmaeus* and were never observed to feed
on this Prostigmatid. Apparently they can survive for about one month without
food.

*Ololaelaps venetus.*

This species will live for about two months without food. Individuals will
not kill and consume each other but will feed upon any dead bodies of their own
species left in the culture vessel.

The mouthparts of this mite are very weak and initially it was considered not
as a predator at all but possibly a fungus feeder. However, adults were never
observed to feed on fungus in culture. Protonymphs in this culture vessel were
often found among the fungal mycelium. It is not known whether they were actually
feeding on the fungal hyphae or whether they were merely seeking protection there.
Beetle larvae were readily consumed. *Ololaelaps venetus* is rather ponderous, and the slow-moving beetle larvae may provide a food-source in their natural habitat. Exposed tissues of Dipteran larvae served to attract all the individuals in a culture to this source. The predator made many attempts to capture Isotomid juveniles but was never successful in my observation. If the Isotomid was somewhat stunned before presentation it was easily captured by the predator and readily consumed. The slow moving larvae of many oribatids were also taken but, once again, the thick integument of the nymphs proved impenetrable. The predator readily consumed *Cheylostigmaeus* sp. On one occasion a *Cheylostigmaeus* in this culture was observed to be puncturing and draining an *Ololaelaps* egg. *Ololaelaps* will also take specimens of *Onychiurus debilis* if these are presented in culture.

*Pergamasus longicornis*.

This species is one of the most active of all microarthropod predators. Their appetite seems to be immense and all foods presented, except for the Poduridae, were accepted.

BHATTACHARYYA (1962) maintains that *Pergamasus* sp. feed more readily on sluggish prey. Throughout the course of my observations it seemed that *Pergamasus longicornis* would feed readily on almost any prey.

The exposed viscera of the Dipteran larvae were attacked immediately this food material was placed in the culture vessel. The predator took small pieces of the viscera by holding them with the chelicerae and giving a backward jerk of the gnathosoma. It would then carry the food material around until it had finished its meal. Whereas with all other predators fed on this diet much of the corpse was left after several days, with *P. longicornis* only the larval integument was left after two days. Live Dipteran larvae were also placed in this culture but still remained alive after several days. It is possible that the predator is unable to pierce the extremely thick integument.

Isotomid juveniles were easily overcome by this predator. The adult Isotomids were sometimes attacked especially when these had been somewhat weakened. Only once was a *Pergamasus* observed to overcome a large healthy adult Isotomid. In this case the predator grasped the prey by the middle leg and kept its grip even though the Isotomid jumped about the dish in its efforts to escape. Eventually the Isotomid became still with exhaustion, or perhaps from the effects of poison injected by the predator, and the predator transferred its grip to other parts of the body in quick succession until the springtail was oozing body fluid through a number of punctures (leg, neck and antennae). Several specimens of *Pergamasus* were then attracted to the prey corpse and tore open the integument in the region of the abdomen and the neck. The neck seemed to be the favourite place for attack. The viscera were attacked and legs removed.

Oribatid nymphs and larvae did not seem to be a particularly attractive food although they were taken if nothing else was available. Even the larger and
heavily sclerotised tritonymphs of *Hermannia pulchella* were attacked, killed and eaten on occasions. After a meal only the integument was left. Large and heavily sclerotised oribatid adults such as *Hermannia pulchella* and *Hygroribates schneideri* are ignored by *Pergamasus longicornis*. However, adults of such small oribatids as *Punctoribates quadrivertex* were often seized in the region of the gnathosoma and the body contents drained from the orifice made.

*Ololaelaps venetus*, a heavily sclerotised Mesostigmatid, is attacked on occasion and entry made to the body cavity via the camerostome and the leg bases. On the whole, however, *Pergamasus* tends to ignore the more heavily sclerotised microarthropods. On no occasion was this predator observed to consume dead specimens of its own young. However, adults were regularly seen draining the bodies of their own young.

An attempt was also made to keep *Digamasellus halophilus* in culture. However, this animal escaped very easily and, due its exceedingly small and flat body, would disappear down the smallest crack in the plaster of Paris. Moreover, cannibalism soon depleted numbers in the culture vessels.

**Acknowledgements.**

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**Summary.**

Feeding behaviour studies with three species of oribatid on ten species of edaphic salt-marsh fungi are described. It is suggested that these oribatids are mainly fungivorous and that *Hygroribates schneideri* may also take filamentous alga. All the oribatids have food preferences and the preferences of the juveniles often differ from those of the adults.

Feeding behaviour studies with four species of Mesostigmata on seven types of food are described. It is suggested that *Pergamasus longicornis* and *Cheiroseius (= Sejus) necorniger* are the most active predators of the four, that *Macrocheles subbadius* is a carrion feeder or a coprophile, and that *Ololaelaps venetus* can only take the smallest and weakest of prey species.

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### Table I.
The Feeding Behaviour of Three Species of Oribatid with Ten Species of Fungus.

<table>
<thead>
<tr>
<th>Species</th>
<th>Cephalosporium sp.</th>
<th>Gladiotus roseum</th>
<th>Acoelomorpha obtusa</th>
<th>Fusarium solani</th>
<th>Fusarium culmorum</th>
<th>Ceratocya salina</th>
<th>Verticillum albo</th>
<th>Mortierella alpina</th>
<th>Scobinaphis brevicans</th>
<th>Altermaria tenax</th>
<th>Agar Control</th>
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<tr>
<td>Hermannia pulchella</td>
<td>A1, A2</td>
<td>A1, A2</td>
<td>A1, A2</td>
<td>R</td>
<td>A1, A2</td>
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<tr>
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<td>A2, A2</td>
<td>A2, A2</td>
<td>A2</td>
<td>A1</td>
<td>A1, A1</td>
<td>R</td>
<td>A1</td>
<td>A1</td>
<td>A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Punctoribates quadrivertex</td>
<td>A1, R</td>
<td>A1, A2</td>
<td>A1, A2</td>
<td>A1</td>
<td>R</td>
<td>R</td>
<td>A1</td>
<td>A1</td>
<td>A1, A2</td>
<td></td>
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</tr>
</tbody>
</table>

Key: A = accepted; A1 = many faecal pellets produced; A2 = few faecal pellets produced; R = rejected; E = eggs or larvae produced in culture; S = spermatophores found in culture.

### Table II.
The Feeding Behaviour of Four Species of Mesostigmata with Seven Types of Prey.

<table>
<thead>
<tr>
<th>Species</th>
<th>Stratiomyid Dipteran larvae (cut up)</th>
<th>Staphylinid Beetle larvae</th>
<th>Poduridae</th>
<th>Isotomidae</th>
<th>Orbatid nymphs</th>
<th>Orbatid larva</th>
<th>Cheylostominae spp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pergamasus longicornis</td>
<td>A</td>
<td>A</td>
<td>R</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Cheiroseius (= Sejus) necorniger</td>
<td>A</td>
<td>A</td>
<td>R</td>
<td>A</td>
<td>R</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Ololaelaps venetus</td>
<td>A</td>
<td>A</td>
<td>R</td>
<td>A</td>
<td>J</td>
<td>J</td>
<td>A</td>
</tr>
<tr>
<td>Macrocheles subbadius</td>
<td>A</td>
<td>J</td>
<td>R</td>
<td>R</td>
<td>A</td>
<td>R</td>
<td>R</td>
</tr>
</tbody>
</table>

Key: A = accepted; R = rejected; E = eggs produced in culture; J = juveniles produced in culture.