Dispersal of Algae and Protozoa by the Mud Dauber Wasp (Sceliphron caementarium Drury)

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INTRODUCTION

The dispersal of algae and protozoa from isolated streams, ponds, and lakes has long been an interesting problem and one of ecological significance. Some of the basic problems presented by algae and protozoa are: undesirable tastes and odors in water supplies; the clogging of filters in water treatment plants (Palmer, 1962), causing waters to be undesirable for recreation purposes; and possible death of fishes and other animals, either by the production of a toxin or by acting as a barrier to oxygen penetration of the water surface (Gorham, 1962; Palmer, 1962).

Within the last 10 years several investigators have shown how algae and protozoa can be dispersed by winds (Schlichting, 1961, 1964) and by water fowl and shore birds (Proctor, 1959; Schlichting, 1960; Malone, 1965). Prior to the work done by Parsons, Schlichting, and Stewart (1966), Stewart and Schlichting (1966), and Revill, Stewart, and Schlichting (1967 a&b), there was a dearth of information concerning the role played by insects in the dispersal of algae. Migula (1888) reported 23 species of algae attached to species of aquatic beetles. Irénée-Marie (1938) found *Closterium* on a dytiscid beetle, and desmids occurring on a dragonfly. Maguire (1959) reported algae from washings of mosquitoes and other insects, but he only classified the algae as green, blue-green, unicellular or filamentous. Maguire later (1963) reported the dispersal of aquatic organisms by dragonflies.

The present study was designed to determine whether mud daubers are transporters of viable algae and/or protozoa, and if so, on which part of the insect these organisms are transported.

MATERIALS AND METHODS

Sterile soil-water extract and Bristol's medium with a pH of 6.5-7.0 were used throughout this experiment.

Sterile 4-dr shell vials, containing approximately 10 ml of sterile soil water extract and Bristol's medium, were used for inoculations. The media were checked for viable algae and protozoa over a 6-week period of culturing.

One species of mud dauber *(Sceliphron caementarium)* was collected by the use of a detergent-washed insect net. Random washings were made of the net as controls. All insects were captured in flight and never near water.

Ten insects were captured in the field, placed in sterile shell vials, and taken to the laboratory. After no more than 5 min, five of the insects were secured with sterile forceps and the heads, wings, and legs removed. The body parts and the body were placed in separate vials containing media. Controls were run at this time to insure against contamination from the air. The vials were agitated by hand and the parts were allowed to remain in the media for 24 hr and then removed. The five remaining insects were pinned for species identification.

All of the above inoculated vials and controls were then placed under continuous light at a temperature of approximately 26 C.

All cultures and controls were examined microscopically for the presence of algae and protozoa at intervals of 1, 3, and 5 weeks. The vials were agitated by hand for a period of 1 min before examination. At each examination three drops of each culture were removed with sterile pipettes. Three transects and a scanning search were made for each slide.

RESULTS

Table I shows the results of washings from the various insect parts and the genera found in these washings in respect to the number of tubes (5) for each part washed.

Of the division Chlorophyta, *Chlorococcum* was found in more washings than the other green genera (8 positive tubes); *Chlamydomonas* next with 6; followed by *Chlorella, Gloeocystis,* and *Protococcus* (2); and with *Kirchneriella* and the *Pandorina*-like organisms occurring only in one tube. Two genera of blue-greens, *Anacystis* and *Phormidium,* were found in only one tube each.

Of the four genera of protozoa found, *Colpoda* appeared in the most abundance (11 tubes), followed by *Okimonas* (8), *Bodo* (2), and with *Amoeba* being found in only one tube.

Of the various insect body parts washed, the body (thorax and abdomen), appeared to be the most important carrier of algae and protozoa (Table II) with a total of 11 genera being cultured from it. The other body parts appeared to carry about the same number, head (5), wings (4), and legs (4).

Of the four net and sham controls, only one net control was positive and this was for *Colpoda.*

CONCLUSIONS

The results of this study show that *Sceliphron caementarium* may be a relatively important carrier of algae and protozoa. Nine genera of algae and four genera of protozoa were carried by the insects. These numbers are much lower than those for certain Diptera, craneflies, and midges found by Revill, Stewart, and Schlichting (1967 a&b), but the wasps prob-

TABLE I. GENERA FOUND IN RELATION TO THE BODY PARTS WASHED (5 TUBES FOR EACH PART).

Organisms	Head	Legs	Wings	Body	Total Positive tubes for genus
Cyanophyta					
Anacystis	0	1	0	0	1
Phormidium	0	0	0	1	1
Chlorophyta					
Chlamydomonas	3	0	0	3	6
Chlorella	0	0	0	2	2
Chlorococcum	1	1	2	4	8
Gloeocystis	0	0	0	2	2
Kirchneriella	0	0	0	1	1
Pandorina-like	0	0	0	1	1
Protococcus	1	0	1	0	2
Protozoa					
Amoeba	0	0	0	1	1
Bodo	0	0	0	2	2
Colpoda	2	3	4	2	11
Okimonas	0	4	1	3	8
Protozoan cyst	1	2	5	5	13
Eumycophyta					
Unidentified fungal spore	0	2	3	2	7
Unidentified fungal hyphae	0	0	0	1	1

TABLE II. NUMBER OF GENERA FOUND ON EACH BODY PART.

	Body	Wings	Legs	Head
Cyanophyta	1	0	1	0
Chlorophyta	6	2	1	3
Protozoa	4	2	2	2
Total genera for each part	11	4	4	5

ably do not frequent the water as often as the above mentioned insects. The wasp's activity along the banks of lakes, streams, and ponds while collecting mud is assumed to account for the algae and protozoa carried.

Of the body parts washed, the body itself appears to be the most important carrier of algae and protozoa, with the head, wings, and legs following in that order.

No literature could be found on the distance that these insects might fly, but they were observed flying several hundred yards, far enough to carry the organisms from one isolated pool to another.

Most of the genera found were similar to those previously reported by Stewart and Schlichting (1966).

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