Reports

A Protozoon (Dileptus; Ciliata) Predatory upon Metazoa

Abstract. *Dileptus*, a common holotrich, may function as a predator upon a variety of metazoan animals representing such varied phyla as Cnidaria, Platyhelminthes, Aschelminthes, Annelida, and Mollusca. Very young animals and wounded animals are especially vulnerable. Effective predation is directly related to the concentration of *Dileptus* to which the victim is exposed.

Cultures of planarian flatworms (*Dugesia dorotocephala*) have been maintained in our laboratory for several years; they are fed small pieces of beef liver about once a week. On 14 July 1960 there was no sign of a worm in a pan which, a week earlier, had contained several thousand baby worms. Examination of the water revealed it to be swarming with *Dileptus* sp., a common holotrich ciliate. (No attempt is here made to identify the species because the taxonomy of the genus is being revised by Jean Dragesco of Paris.)

Some of the *Dileptus* were removed to Syracuse watchglasses, and fresh baby planarians were added and observed. Contact with the proboscis of *Dileptus* produced an immediate and violent withdrawal response on the part of the worms. Within the first 12 minutes, one worm was seen to be "stung" 27 times. Within 90 minutes, all of the worms under observation had been immobilized and were being devoured by *Dileptus*, which were converging and swarming upon each victim. Within a few hours there was no recognizable trace of the worms other than masses of cells, upon which the *Dileptus* were busily feeding.

Apparently the *Dileptus* thrived upon the beef liver which was supplied for the worms until the population of *Dileptus* reached a critical concentration at or above which they could feed upon the planarians.

Dileptus has long been known to be predatory upon a variety of protozoa (chiefly flagellates and ciliates) and even upon an occasional rotifer (*1*), but no one has previously reported predation upon macroscopic organisms. The offensive weapons of *Dileptus* are the "toxic trichocysts" which line the ventral surface of the proboscis (*1, 2*). Since these trichocysts were seen to be so effective against baby planarians, it seemed logical to test other potential victims. Every small animal tested exhibited a violent response to contact with the ventral surface of a *Dileptus* proboscis.

In general, as might be expected susceptibility to attack is closely correlated with relative amount of exposure to trichocysts. A single *Dileptus* can kill *Stenostomum* (Turbellaria: Catenulida). As few as five *Dileptus* may destroy a baby pond snail (*Physa*), an amphistome cercaria (Trematoda), or a tiny planarian, if the victim happens to make no effective movement at the critical moment. Destruction of *Hydra* requires a larger number of *Dileptus*.

Those animals which are big enough and fast enough or which have impervious coverings (cuticle, shell, mucus) are able to survive. Even these, however, if impeded in their escape or if deprived of their protective coverings, are rendered vulnerable. Thus, for example, a fingernail clam (*Sphaerium*), with a chip of shell removed so that *Dileptus* has access to the tissues, can be destroyed, whereas a similar clam would survive if intact. Wounds in such animals as nematodes (*Cephalobus*) and aquatic oligochaetes (*Nais*, branchiobdellids) greatly increase the likelihood of destruction by *Dileptus*, not only because of exposure of tissues to attack but also because *Dileptus* is apparently "attracted" by chemicals liberated in the vicinity of the wound. A film depicting the destruction of several types of invertebrates by *Dileptus* was shown at the First International Conference on Protozoology, which was held in Prague during August 1961.

The extent to which *Dileptus* functions as a predator upon metazoa under natural conditions is not known, but it has been demonstrated to be a potential predator for a variety of small invertebrates, and it probably acts as a scavenger wherever injured or dead animals are available.

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References

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Haplosporidium costale (Sporozoa) Associated with a Disease of Virginia Oysters

Abstract. A new species of *Haplosporidium* is reported as the cause of a previously unrecognized disease of *Crassostrea virginica* (Gmelin) on the Eastern Shore of Virginia. The species is characterized by small (3.1 by 2.6 μ) operculate spores without projections. Infections are first seen in late winter, and mortality reaches its peak in early June.

In 1959 plans were made to follow possible invasion of Chesapeake Bay by the agent "MSX," which destroyed the oyster industry in Delaware Bay (*1*). The patterns of mortality associated with *Dermocystidium marinum* and certain less serious diseases had been well worked out (*2*). During studies in 1959, 1960, and 1961 certain deviations from expected mortality patterns were noted at Seaside, on the Eastern Shore of Virginia. Oysters began to die abruptly in mid-

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Type manuscripts double-spaced and submit one ribbon copy and one carbon copy.

Limit the report proper to the equivalent of 1200 words. This space includes that occupied by illustrative material as well as by the references and notes.

Limit illustrative material to *one* 2-column figure (that is, a figure whose width equals two columns of text) or to *one* 2-column table or to *two* 1-column illustrations, which may consist of two figures or two tables or one of each.

For further details see "Suggestions to contributors" [*Science* **125**, 16 (1957)].