guanosine 3′,5′-monophosphate (cyclic GMP) stimulates GH synthesis in the rat pituitary (*17*). Experiments in vitro have demonstrated stimulation of protein synthesis in the rat pituitary by dibutyryl cyclic AMP (*18*). Studies by George and co-workers (*19*) showed that acetylcholine (ACh) perfusion of isolated rat heart causes an increase in myocardial cyclic GMP. This latter observation and the more recent finding that oxotremorine, which raises the ACh content in the mouse brain, produces a large increase in cyclic GMP in cerebral cortex and cerebellum (*20*) support a possible relation between ACh and the cyclic nucleotide mechanism. The findings that inhibitors of ChE stimulate protein synthesis, that ACh may increase cyclic GMP, and that the latter has a role in the control of synthesis and release of GH suggest a possible cholinergic mechanism in the synthesis and release of GH in the rat pituitary.

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Predation of Schistosomiasis Vector Snails by Ostracoda (Crustacea)

Abstract. *An ostracod species of* Cypretta *is an effective predator in laboratory experiments on 1- to 3-day-old* Biomphalaria glabrata, *a vector snail of the blood fluke that causes the tropical and subtropical disease schistosomiasis.*

Schistosomiasis is a disease in tropical and subtropical areas that is caused by several species of human blood flukes which require certain species of snails as intermediate hosts. Deschiens *et al.* (*1*) noted that the ostracod *Cypridopsis hartwigi* Müller, 1900, attacked and killed the intermediate host snails *Bulinus contortus* (Michaud, 1829) and *Planorbis glabratus* Say, 1818 (= *Biomphalaria glabrata*); although Deschiens *et al.* did not record quantitative data, they speculated whether or not this ostracod could be used for the biological control of the snails. After observing ostracods killing vector snails in breeding aquariums, Lo (*2*) experimented with *Cypridopsis vidua* (O. F. Müller, 1776) collected near Ann Arbor, Michigan, and 2-day-old *B. glabrata* from Puerto Rico. He used ten groups, each with 1 snail and 5, 15, or 45 ostracods; in his experiments, 50 percent of the snails died in little more than 15 days when 5 ostracods were present and in 8 days when 15 and 45 ostracods were present. Kawata (*3*) noted that in his cultures of *B. glabrata* an ostracod species was an efficient predator on young snails and that the ostracods so irritated adult snails that the snails left the water, then weakened, and either died or were killed by the ostracods.

Our experiments were performed with 1- to 3-day-old snails of the red mutant (albino) strain of *Biomphalaria glabrata* and adults of the ostracod species *Cypretta kawatai* Sohn and Kornicker (*4, 5*). We placed 25 to 500 ostracods with 5 snails in dishes 80 mm in diameter containing distilled water maintained at a constant depth of 20 mm. A small amount of $CaCO_3$ slurry and lettuce was added to each experiment and control group as a source of calcium and as food for the snails and the ostracods. All were kept at room temperature (24° to 26°C). In each experimental and control group, the number of days it took for 50 percent of the original snail population to die was determined by observation. The results are shown in Fig. 1.

These data indicate that under laboratory conditions *C. kawatai* is an effective predator on the young of *B. glabrata* and that the rate of predation increases dramatically with an increase in the number of ostracods. Fifty percent of the snails in the control group (no ostracods present) died in an average of approximately 46 days. In the experiments involving 25 ostra-

Table 1. Experiments with 10 to 50 snails; the diameter of the dish and the number of ostracods are varied. The water depth is 20 mm and the temperature 24° to 26°C; *N* is the number of experiments. The limits of error are for 1 standard error of the mean.

N	Diameter (mm)	Snails (No.)	Ostracods (No.)	Ostracods per milliliter of water	Mean days, 50 percent mortality	Range (days)
5	105	10	500	2.89	0.50 ± 0.02	0.5– 0.6
5	105	10	250	1.45	0.64 ± 0.09	0.5– 1.0
5	190	10	500	0.88	2.40 ± 1.16	0.6– 7.0
5	80	10	50	0.50	2.85 ± 0.84	1.0– 6.0
6	80	10	25	0.25	12.15 ± 3.96	1.7–21.0
3	80	20	100	0.99	3.28	1.7– 4.5
2	80	30	250	2.49	1.54	0.6– 2.5
2	80	40	100	0.99	2.0	1.7 –2.3
1	80	50	250	2.49	1.8	

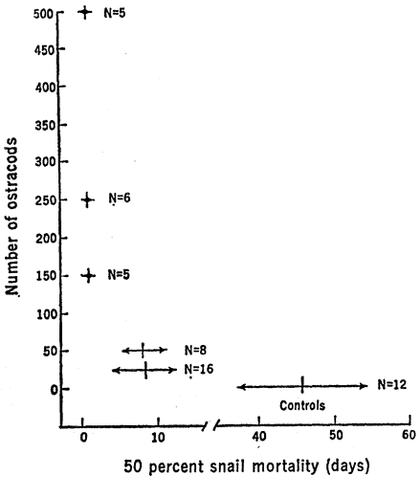

Fig. 1. Number of days for 50 percent of the snails to die; *N* is the number of experiments; the mean is at the midpoint of each line, and the arrow extends 1 standard error in each direction.

cods, 50 percent of the snails died in an average of approximately 9 days. In experiments involving 500 ostracods, 50 percent of the snails died in an average of less than 1 day.

Table 1 is a summary of additional experiments with 10 to 50 snails 1 to 3 days old in dishes 80, 105, and 190 mm in diameter. These data indicate that 50 percent of the snails in the experimental groups died significantly before the same percentage of those in the control groups (shown in Fig. 1) and that snail abundance has relatively little effect on the rate of snail predation by *C. kawatai*. They also suggest that the rate of predation is controlled by the density of ostracods.

Experiments were conducted at temperatures lower and higher than room temperature. *Cypretta kawatai* is an effective predator at temperatures between 15° and 30°C, and 12°C is near the lower range of its temperature tolerance.

The ostracods *Cypridopsis vidua* and *Cypricercus reticulatus* (Zaddach, 1844) are known to eat snail feces (*2*). We added snail feces to the lettuce in three experiments with 250 ostracods and 5 snails. In these experiments, 50 percent of the snails died in 0.6 to 3.9 days. In five additional experiments with 250 ostracods and 5 snails, we added a small amount of feces daily. We had to terminate this set in 5 days. During this observation period, 50 percent of the snails had died in only two of the experimental groups. These data indicate that additional feces decrease the rate of ostracod predation.

Our experiments indicate that *C. kawatai* is a more effective predator than the species used by Lo (*2*). We established that *C. kawatai* is parthenogenetic and lays eggs 14 days after hatching; these eggs hatch in 4 days. Adult individuals were observed to lay as many as 60 eggs during an 8-day period. This species can be raised in quantity for experimentation in nature.

We collected *C. kawatai* in aquariums containing *B. glabrata* both in Baltimore, Maryland, and Washington, D.C. (*5*). The geographic habitat of this species is probably Brazil, the same as that of the red mutant strain of *B. glabrata* (*6*). The ostracods could have been transported with the snails in the water, or as eggs either attached to the snails' shells or in their digestive tracts (*7*).

The growing interest in the biological control of trematode diseases makes information on all enemies of vector snails significant (*8*). Field tests are necessary to determine the efficacy of ostracods as a biological control.

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4. Deliberate *nomen nudum* [see G. G. Simpson, *Science* **161**, 75 (1968)]. We will validate this species in a specialty journal.
5. We thank Dr. K. Kawata, Johns Hopkins University School of Hygiene and Public Health, Baltimore, Maryland, for giving us breeding specimens of *B. glabrata* and *C. kawatai*; Dr. P. Chiang and J. Bourgeois, Johns Hopkins University Department of Pathobiology, for allowing us to collect specimens of *C. kawatai* from aquariums in their laboratory; Dr. J. I. Bruce, Schistosomiasis Research Unit, Department of Medical Zoology, Walter Reed Army Institute of Research, Washington, D.C., for specimens of *C. Kawatai* in his aquariums.
6. After this report was completed we received an unpublished progress report, "Notes on laboratory and field observations regarding planorbides' competitors and predators: protozoans, crustaceans and mollusks," presented by R. M. de Andrate on 30 April 1971 at the Sociedade de Biologia de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil. He reported that a species of *Cypretta* was seen to attack and kill in laboratory aquariums snail vectors of schistosomiasis mansoni.
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Homology between Nucleic Acids of Blue-Green Algae and Chloroplasts of Euglena gracilis

Abstract. *Ribosomal RNA from several blue-green algae was hybridized to DNA from* Euglena gracilis *chloroplasts by the membrane filter procedure. This hydridization was competitive with chloroplast ribosomal RNA and indicates significant genetic homology between blue-green algae and plastids from* Euglena gracilis.

The measurement of nucleic acid homologies and hence genetic relatedness by the degree of hybridization of single-stranded DNA from two species has been applied to several prokaryotic taxonomic questions (*1*), and the extension of the technique to DNA-RNA hybridization makes use of the highly conserved sequences thought to occur in ribosomal RNA (*2*). We describe here some experiments in which *Euglena gracilis* chloroplast DNA is hybridized with ribosomal RNA from several species of blue-green algae and bacteria. The degrees of similarity between the fine structure and chemical composition of chloroplasts and blue-green algae have been described. For many years the theory initially propounded by Mereschkowsky (*3*) that plant plastids were derived from an endosymbiont comparable to a blue-green algae received little attention and less experimental support. However, increasing information on the morphology and function of nucleic acids from both chloroplasts and blue-green algae has provided evidence both in support of and contrary to their suggested evolutionary origin (*4*). Our data indicates a significant degree of homology between nucleic acids of *E. gracilis* chloroplasts