Journal of the Minnesota Academy of Science

Volume 31 | Number 2 Article 11

1964

Populations of Peritrichs on the Pond Snail, Physa gyrina Say

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Populations of Peritrichs on the Pond Snail, Physa gyrina *Say* [1]

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Introduction: There are many obscure niches in a pond that make fascinating ecological studies. The shell of a pond snail such as *Physa gyrina* Say, is one of these. In this study alone, 18 species of attached animals and plants were found growing on *P. gyrina* shells. About half of these species occurred on the shells in large numbers and completed a large part of their life cycle there. On *P. gyrina*, the most abundant animals included three species of protozoans and a tendipedid larva. The protozoan species, *Epistylus niagarae* Stokes, *Opercularia ramosa* Stokes, and *Vorticella campanula* Ehrenberg all belong to the order Peritrichida (Pl. 1). *E. niagarae* and *O. ramosa* grew in large multi-headed colonies, while *V. campanula* generally grew in groups of single-stalked heads. These animals were studied in detail in order to determine some of the interrelationships between the animals, the environment, and the host snail. Snails were collected from one Minnesota locality at regular intervals for a period of eighty days and the shells examined under a microscope. At the same time observations were made both on the behavior of the snails and on the environmental conditions. The study showed that both the numbers and species of snail shell peritrichs are largely dependent on the behavior patterns of the snail, which in turn are affected by conditions in the water.

Locality: *Physa gyrina* were collected from Lake William, a small lake, located about fifteen miles west of Minneapolis, Minnesota. The lake is about nine acres in area with a maximum depth of four feet. It is very fertile and supports a large population of small fish. About half of its circumference is bordered by mature maple-basswood climax forest. The remaining half is bordered by county roads or by private lawns. The chief substrate of the littoral zone in this open area is gravel from the road bed. However, about a third of the road bed area supports a luxuriant growth of grasses, sedges, cattails and willows, plus a few large deciduous trees. The litter from such vegetation, according to DeWitt (1955), provides particularly good habitat for *P. gyrina*. Consequently, it supported the largest population of snails (15 to 30 per square meter) of any area in the lake. Most snails were collected from this area in water 3 to 15 cm. deep. During the study period, April 1 to June 18, 1963, frequent rains raised the lake level, flooding a zone of upland vegetation 10–50 cm. wide. This new area was quickly occupied by *P. gyrina*.

Methods: Since *P. gyrina* occurs primarily in the littoral zone (DeWitt, 1955), the entire sample was collected from shore by hand or dip net. Collections were made twice a week. The snail shells were examined microscopically immediately after collection (Table 1). The species and size of the peritrich colonies were noted, as were any other animals or algae found on the shell. Next, the length of each shell was measured. Collection was deliberately limited to snails that had overwintered (those 7 mm and longer, according to DeWitt, 1955). This was done to be sure that the snails collected represented the same substrate throughout the study period. The adult *P. gyrina* varied in length from 9–19 mm., with a mean of 13 mm. When immature snails became abundant, however, samples were collected and examined separately. In all, 853 snails were examined.

The temperature of the water and the concentration of dissolved oxygen as determined by the Winkler method, were also recorded. These samples were taken in the late afternoon when the water temperature and oxygen concentration were usually at their maximum.

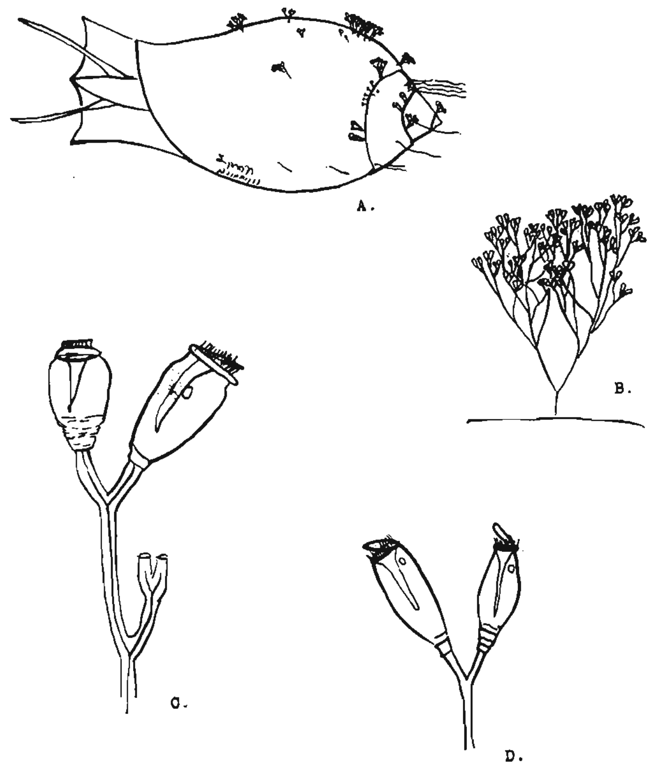

PLATE 1.—a. *Physa gyrina* (X-4) with peritrich colonies and algae. b. Mature colony of *E. niagarae* (X 75). c. *E. niagarae* heads (X 325). d. *O. ramosa* heads (X 325).

[1] The author wishes to thank Dr. James Underhill of the University of Minnesota for his kind help and encouragement throughout the study.

TABLE 1. Data Summary

Sampling Date	Number of P. gyrina	Percentage with E. niagarae	O. ramosa	V. campanula	Peritrichs
April 1	65	13.9	0	1.5	15.4
April 6	65	24.6	0	0	24.6
April 9	54	22.5	0	27.8	44.5*
April 16	50	76.0	0	10.0	80.0
April 20	55	41.8	0	1.8	41.8
April 23	50	30.0	0	2.0	32.0
April 27	55	63.6	0	18.2	67.2
April 30	48	58.4	0	2.1	60.5
May 4	50	50.0	0	0	50.0
May 7	50	46.0	0	0	46.0
May 11	50	100.0	26.0	2.0	100.0
May 14	25	100.0	44.0	0	100.0
May 18	40	95.0	50.0	35.0	100.0
May 21	35	82.8	71.5	28.4	97.0
May 25	25	88.0	64.0	0	92.0
May 28	30	66.7	33.3	6.7	82.4
June 1	32	56.2	31.2	3.1	62.4
June 4	30	40.0	26.6	3.3	50.0
June 15	28	35.6	64.4	57.1	92.6
June 18	28	42.9	53.6	46.5	71.5

* Including *Zoothamnium* sp.

Snail Shell Fauna and Flora: The following is a complete list of all organisms found living on the shells of *P. gyrina*:

Fauna:

Protozoa

Peritrichida:

Epistylus niagarae Kellicott — abundant
Opercularia ramosa Stokes — abundant
Rhabdostyla vernalis Stokes — common on foot and tentacles
Vorticella campanula Ehrenberg — periodically abundant

Zoothamnium sp. — occasional

Heterotrichida:

Stentor sp. — common late April and early May

Coelenterata

Hydra pseudoligactis Hyman — occasional

Rotatoria

Floscularia sp. — occasional

Bryozoa

Fredericella sultana Blumenback — occasional

Arthropoda

Tenipedidae

Chironomus sp. — periodically abundant

Flora:

Algae

Spirogyra — abundant
Oedogonium — abundant
Nostoc — occasional
Chaetophora — occasional
Coleochate — common as green patches
Cocceneis pediculus Ehrenberg — occasional
Gomphonema — occasional
Characium — common latter half of period

PERITRICHIDA: *Introduction.*

Although the Order Peritrichida is well known taxonomically (Kahl, 1935, Corliss, 1962), surprisingly little is known about the ecology of the numerous sessile species. Peritrichs are found on almost every freshwater animal or plant that is large enough to support them. The species on which they typically occur is usually mentioned in taxonomic studies. Bishop and Jahn (1941) in a study of the peritrichs of northern Iowa found four species growing on turtles, on algal filaments on the turtle carapaces, on Chironomus larvae, and on cyclops. Two of these peritrichs, *E. niagarae* and *O. ramosa*, together with *V. campanula,* were the species most frequently encountered in this study.

Snail shells are mentioned as a peritrich substrate by Kahl (1935) and Nenniger (1948). Nenniger found three species of peritrich on four species of European snails, including *Physa.* During the present study peritrichs were found on three species of snails besides *Physa gyrina*: *Gyraulus parvus Say, Helisoma trivolvis* Say, and *Stagnicola exilis* Lea. *P. gyrina* was studied most intensively, however, because of its abundance in Lake William and because its life history is well known (DeWitt, 1955). It should be noted here that one other species of snail examined, *Aplexa hypnosum* Linneaus, never supported any peritrichs or algae. The shell of this species is apparently too smooth to allow sessile species to attach themselves.

PERITRICHIDA: *Population Dynamics.*

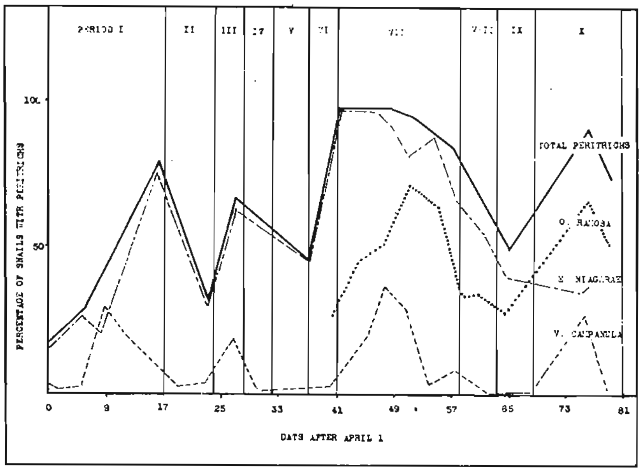

FIGURE 1.—Percentage frequency curves of P. gyrina shells supporting peritrich colonies from April 1 to June 18. The percent occurrence was determined independently for each peritrich species.

The populations of snail shell peritrichs showed marked fluctuations during the entire study period (Fig. 1). The period between April 1 and May 11 was, for the peritrichs as a whole, one of population growth, interrupted by two sharp dips and recoveries. The population then remained stable for about a week, dropped steadily for two weeks, climbed to another peak in ten days, and then started to decline again. The *E. niagarae* curve followed the total peritrich population curve until June 4, when it continued to fall instead of rising as the overall curve did. The overall rise was caused by an increase in the *O. ramosa* population, which had reached a previous peak a full week before *E. niagarae*. It should be noted that *O. ramosa* was not observed before May 11. The reasons for this are uncertain. It was found, however, that, when environmental conditions were good, *O. ramosa* was not able to compete effectively with *E. niagarae*, largely because of size differences. *O. ramosa* is small, an individual head being 60 microns long. A mature colony usually has 40 to 50 heads and stands 500-700 microns high. Each colony is usually spaced some distance from its nearest neighbor of the same species. *E. niagarae*, on the other hand, is a large species, each head being about 150 microns high. Although an individual colony seldom exceeds 60 heads, a number of colonies will grow together in tall (3 mm.) groups of 300-500 heads. Occasionally a single snail shell will bear one continuous mass of such *E. niagarae* colonies. *O. ramosa* apparently cannot stand this competition and at such times only a colony or two will be found growing underneath or on the edge of the *E. niagarae* colonial groups. They will also grow on the less favorable portions of the snail shell, i.e., the very top and undersides. For these reasons the first part of the *O. ramosa* curve is somewhat deceptive; for although the peritrich occurred on 70% of the snails, it did so only as one or two colonies among many of *E. niagarae*. In the latter part of the period, however, when conditions on the snail shell became severe, *O. ramosa* was able to multiply while *E. niagarae* died off. Even so, *O. ramosa* grew only as small, widely spaced colonies.

The *V. campanula* curve is somewhat of a puzzle. It is suspected, however, that the snail shell is strictly a fair weather home for this species: when conditions become too difficult they simply leave for a more stable substrate. They were observed growing at all times on various crustacea, larvae and plants. On snails they occasionally form groups of 200-300 individuals and frequently grow underneath and around *E. niagarae* and *O. ramosa* colonies.

PERITRICHIDA: *Environment.*

Environmental fluctuations (Fig. 2) were measured in three ways: oxygen concentration in ppm.; water temperature, and weather conditions. The dissolved oxygen level reached a peak of 11.6 ppm on April 10, eleven days after the ice went out. The level declined until May 14, with two minor peaks, when it leveled off at 4.7 ppm. The decline was probably caused by the decay of a dense mat of winter killed aquatic vegetation. At the end of May the level rose sharply, declined somewhat, and was rising again at the end of the study period. Rises in the oxygen level were caused mostly by wind and rain, although the renewed growth of aquatic plants undoubtedly played a significant role, particularly during the latter half of the period.

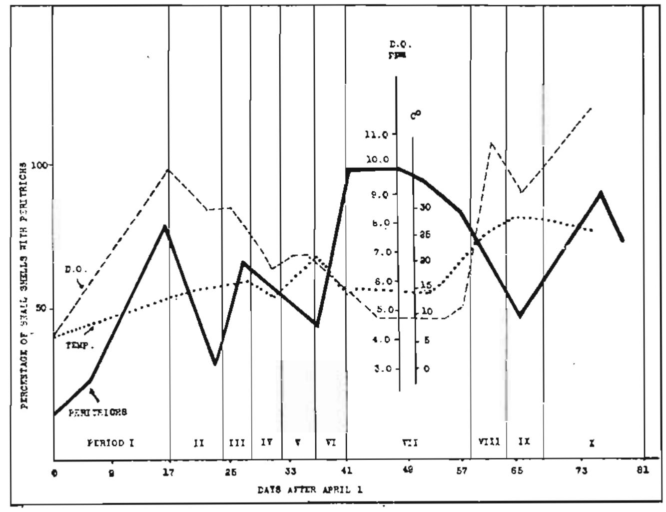

FIGURE 2.—Relationship between dissolved oxygen in ppm. (dashed line), temperature in degrees Centigrade (dotted line), atmospheric conditions (numbered sections) and per cent frequency of *P. gyrina* shells supporting peritrich colonies (heavy line).

The water temperature rose throughout the period. Between April 21 and May 11 it fluctuated greatly, due to unstable weather. Water temperature leveled off during the last two weeks in May at about 13° C. As might be expected, atmospheric conditions during this period were also relatively stable, with maximum day time temperatures between 20 and 25° C.

From personal observations and according to Cheatum (1934), pulmonate snails, such as *P. gyrina*, come to the surface for air more often when the dissolved oxygen level is low and the water temperature is high. In order to fill the pulmonary sac, the snail must crawl out onto a piece of vegetation until the sac can be opened to the air. This generally exposes the front and top half of the shell. When conditions in the water become uncomfort-

TABLE 2. Weather Periods. (Data from U.S. Weather Bureau records for Minneapolis.)

Period	Dates	Av. Max. Temp.	Av. Min. Temp.	Precipitation	Conditions
I	April 1-16	64°F.	35°F.	0.21 in.	clear, warm days cold nights
II	April 17-23	50	31	0.52	cold and overcast strong winds, snow
III	April 24-27	68	41	0.0	warm and humid
IV	April 28-May 1	57	37	0.70	cool, windy and rainy
V	May 2-6	68	41	0.25	warm, windy and rainy
VI	May 7-10	81	54	0.93	hot and stormy
VII	May 11-26	64	43	1.79	heavy rain at first; then cool and stable
VIII	May 27-June 2	72	52	1.53	warm and stormy
IX	June 3-7	86	63	tr.	hot and humid
X	June 8-18	76	46	0.82	cooler, wet

able to the snail, it may remain out of the water longer than the short time required to fill the sac, allowing the shell to dry completely. This happened particularly often during the latter half of the study.

For convenience in assessing the effects of atmospheric conditions on peritrich populations, the study period was divided up into ten sections in each of which the weather pattern was relatively constant (Table 2).

PERITRICHIDA: *Population Ecology.*

There is a surprisingly close correlation between weather conditions and peritrich populations (Fig. 2). The reasons for this correlation are evident when the data and ecological conditions are examined on a period by period basis.

PERIOD I (APRIL 1 TO 16)

The high concentration of dissolved oxygen and low water temperatures put the snails' trips to get air at a minimum, thus allowing time and space for the protozoans to increase. As would be expected, there is a steady increase in the number of snails colonized by peritrichs. Yet if the observations of von Niplow (1956) for *E. rotans* apply to other peritrich species, the cold water (7-10°C.) should slow development and growth of the Lake William peritrichs. Similarly, the peritrich population should also be limited by the slow growth of their bacterial food supply (Noland, 1925). Again, as would be expected the actual peritrich population was low. At the April 16 peak most of the snails supported only 1-4 colonies, usually of under 20 heads each. Only one-fourth of the snails having peritrichs on their shells had mature colonies of 50 or more heads among them. One shell, however, was completely covered with tall *E. niagarae* colonies.

It should also be noted that on the first day of the study 60% of the peritrichs observed were groups of single *E. niagarae* heads, each head with its own stalk. In one case they were observed hatching from cysts attached to a dead *P. gyrina* shell.

PERIOD II (APRIL 17 TO 23)

Through the decreasing oxygen level indicates an increasing bacterial population and consequently more food for the peritrichs, the peritrich population declined. Associated with this decline were strong winds, accompanied by cold and snowy weather. The winds caused strong surface currents to carry many of the snails to the windward shore. The windward shore, in this case, was the gravel highway bed which had little vegetation and, consequently, little food for either snail or peritrich. Experiment showed that when deprived of food *E. niagarae* will leave the substrate within 24 hours.

PERIOD III (APRIL 24 TO 27)

Calm weather and warmer temperatures allowed the snails to redistribute themselves to areas suitable for food and ovipositing. Since this was a time of heavy egg laying, the *P. gyrina* spent less time than usual on surface vegetation; consequently, their shells had less opportunity to dry off. This contributed to the increase in the number and size of the peritrich colonies, as did the increased availability of food.

PERIOD IV (APRIL 28 TO MAY 1)

Because of the strong winds, snail movements were generally detrimental to peritrich populations. The snails that weren't blown to unfavorable habitats spent as much time as possible in the bottom debris, at depths of 15-30 cm., to escape from the turbulent surface water. Snails collected during this period frequently had large amounts of organic matter caught among the algal filaments and peritrich stalks on their shells. Small peritrich colonies apparently cannot stand this smothering treatment and leave the shell when organic matter becomes too abundant. The mature colonies of 50 or more heads, however, can stand it and their number actually increased. At the same time the colonies in the 10 to 50 head class decreased in number, while those with less than 10 heads all but disappeared. During the previous population peaks these last two groups had been in the majority.

PERIOD V (MAY 2 TO 6)

High air temperatures, coupled with strong winds, raised the water temperature 6°C in five-days. In reaction to this, the snails tended to crawl out of the water more often than usual, both to fill their pulmonary sacs and apparently to escape unfavorable conditions in the water. Such behavior has also been recorded for other species of pulmonate snails by Cheatum (1934). As a result of this behavior, many of the snails either had their shells dried off or were blown to unfavorable habitats. The peritrich population consequently continued to decline.

PERIOD VI (MAY 7 TO 10)

Though dropping water temperatures, caused by heavy rains and strong winds, might seem to dictate a continued drop in peritrich populations, the exact opposite was the case. There were three reasons for this: (1) the emergent vegetation was now thick enough to block wind currents and to provide more sheltered breathing routes for the snails. Flooded shore vegetation also provided a more stable environment; (2) the falling oxygen level again is related to an increased food supply; (3) the cooler water temperatures and moist air both decreased snail activity and the drying off of the shells.

PERIOD VII (MAY 11 TO 26)

Remarkably stable conditions both in the air and in the water allowed peritrich reproduction to continue unhindered. Colonies were bigger on the average, and every snail supported at least eight during the first week. The rapid die-off of adult snails following ovipositing (DeWitt, 1955), undoubtedly also contributed to this, since peritrichs, with rare exceptions, will not grow on the shell of a dead snail; consequently, they have to form telotrichs and find a new host. While many of the telotrichs will undoubtedly go to other host species such as copepods, some will land on other snails and thus increase the number of colonies per shell. Despite the obvious decrease in adult snail numbers, the population was always large enough to provide plenty of peritrich substrate.

The gradual decrease in peritrich numbers in the latter half of this period is explained under Period VIII.

PERIOD VIII (MAY 27 TO JUNE 2)

The peritrich population decline during this, the preceding, and the following periods was due primarily to a change in snail behavior brought on by the increasing water temperature (6° C. in 5 days). The snails crawled out in increased numbers onto various exposed objects and tended to remain there until the entire shell had dried or even until death by desication occurred. During this period, floating logs and emergent vegetation were covered with snails in various stages of dehydration. Even in the collecting bucket the snails frequently crawled out of the water, a behavior pattern not so prevalent earlier in the study. By the time the dried off snails had crawled back into the water, usually during the cooler night, their shells were completely free of all animals and plants. As a result the peritrich population changed not only in number but in character. Most of the colonies had fewer than 25 heads and mature colonies of *E. niagarae* were uncommon.

PERIODS IX AND X (JUNE 3 TO 18)

Because the water temperature leveled off, the snails resumed a more normal behavior pattern. The crawling out phenomenon, however, was still common. The resistance of *O. ramosa* to extreme conditions allowed its population to increase while the *E. niagarae* population decreased.

Of the fourteen immature physa (defined by DeWitt as under 7 mm.) examined during this period, only three had small peritrich colonies on their shells.

Other factors: There are three other factors which might affect the number of peritrichs on a snail: predators, other snails, and algae. Noland (1925) showed that predators are seldom a limiting factor in any ciliate population. Personal experience seemed to bear this out as lengthy observations of colonies revealed little predation.

One snail can knock over and otherwise destroy peritrich colonies while cleaning off organic debris and algae on the shell of another snail. Both *P. gyrina* and *G. parvis* were observed in this process, both in the laboratory and in the wild. In the laboratory, if several snails are placed together in a small bottle of water, they will clean each other's shells in a matter of hours.

Algal filaments will compete with peritrichs for living space only if the algal growth becomes exceedingly heavy and clogged with organic matter. The three peritrich species normally grow uninhibited between algal strands, usually *Oedogonium* or *Spirogyra*. In the latter half of the study period, these algae on the snail shell showed about the same population fluctuations as *E. niagarae*.

Other Peritrichs: Two other peritrichs were also found on *P. gyrinas*: *Zoothamnium* sp. and *Rhabdostyla vernalis*. The *Zoothamnium* occurred as colonies on each of six *P. gyrina* on April 9. On April 16 it occurred once as a large colony of over 100 heads. Thereafter it did not appear.

R. vernalis was the only sessile animal ever observed growing on the foot and tentacles of *P. gyrina*. It was found on about 60% of the snails. This small single peritrich (50 microns high) grew on the posterior end of the foot in numbers of 50-300 individuals. It was observed growing on the tentacles of a snail only once.

Two unidentified species of *Epistylus*, as well as *O. ramosa*, were encountered during a brief examination of Lake William snails in the following October. Neither *E. niagarae* nor *V. campanula* were observed.

OTHER ANIMALS: Other animals, with the exception of tendipedid larvae, did not play a significant role on the snail shell or compete much with the peritrichs for living space. For the most part they were animals that would grow on any substrate.

The tendipedid larva, however, occurred in large numbers, one living on each snail. At its population peak in the first week of May it was found on 84% of the snails examined. By May 11 it was down to 20%, by May 14 to zero. The population began building up again in the last week of May and by June 18 it was up 72%. The larva constructed tubes on the underside of the shell, in the groove by the aperture. The tubes were apparently built partly of materials found on the snail shell, as the area around the tubes was always free of algae and peritrichs. It is highly doubtful, however, that the larvae prey extensively on peritrichs, for colonies could usually be found on the same shells as the larvae. The disappearance of the larvae in mid-May was the result of metamorphosis to the adult insect.

Summary: The shell of the pond snail, *Physa gyrina*, acts as a substrate for over 18 species of attached animals and plants. Population studies were conducted on three species of sessile protozoans, *Epistylus niagarae, Opercularia ramosa*, and *Vorticella campanula*. It was found that the population fluctuations of these species while growing on snail shells could be correlated with changes in snail behavior and with environmental conditions. Predation and algal growth were found to have little effect on peritrich populations. The only other animal with significant populations on snail shells was an unidentified species of tendipedid larva, that metamorphosed into the adult insect in mid-May.

LITERATURE CITED

BISHOP, E. L. JR., and JAHN, T. L. 1941. Observations on Colonial Peritrichs of the Okoboji Region. *Proc. Iowa Acad. Sci.* 48:417.

CHEATUM, E. 1934. Limnological Investigations on Respiration. Annual Migratory Cycle and other related Phenomena in Freshwater Pulmonate Snails. *Trans. Amer. Mines Soc.* 53:348-407.

CORLISS, J. 1961. *The Ciliated Protozoa.* New York, Pergamon Press.

DEWITT, R. M. 1955. The Ecology and Natural History of the Pond Snail, *Physa gyrina*. *Ecol.* 36:40-44.
KAHL, A. 1935. Peritrichs and Chonotricha in Dahl's *Die Tierwelt Deutschlands*, etc. Part. 30:651.
NENNIGER, U. 1948. Die Peritrichen der Umgebung von Erlangen mit besonderem Berücksichtigen ihrer Wirts . . . usw. *Zool. Jahrb. abt.* Syst. Ökol. u. Georgr. Tiere. 77:169-266.
NIPLOW, F. VON 1956. *Epistylus rotans* Svec im Plankton des Zürichsees. *Schweiz. Zeits. Hydrol.* 18:161.
NOLAND, R. 1925. Factors Influencing the Distribution of Freshwater Ciliates. *Ecol.* Vol. VI; no. 4.
STILLER, J. 1940. Beitrag zur Peritrichenfauna des grossen Ploner Sees in Holstein. *Arch. Hydrobiol.*, 36:263.

ZOOLOGY

Cedar Creek Natural History Area, 1963

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This paper is to inform members of the Minnesota Academy of Science and other citizens of the state as to the present status of the Cedar Creek Natural History Area. It is necessary for several reasons: first, as an opportunity to fully acquaint you with the contributions of the late Dr. Arthur N. Wilcox and Dean T. H. Fenske, and second, because we are entering a new phase in the evolution of the project.

Let us review the project and its objectives briefly. It is an undertaking of many persons and organizations, scientists and non-scientists; teachers and natural history enthusiasts; colleges and the University *in short—the Academy*. It is an area that is devoted to the *preservation of a unique series of habitats in the Anoka Sand Plain and dedicated to scientific and educational pursuits* by interested people not only from the Twin Cities metropolitan area some 30 miles to the south but also throughout the state. It has merited support from major foundations—The Max C. Fleischman Foundation of Nevada; The Louis W. and Maud Hill Foundation of St. Paul and the National Science Foundation. It has come of age since its establishment 23 years ago. Now is the time to make sure it continues to mature and to reiterate that the Minnesota Academy of Science has an important part to play in that process.

I wish also to emphasize the timeliness of the project. Whereas, in 1940 the area was rather remote and not liable to major human pressures now it is being surrounded by the rapidly expanding housing projects. Certainly with the further development of freeways this will continue. The foresight of Dr. W. S. Cooper, Mrs. Cora Corniea, and others was indeed fortunate for us.

Cedar Creek has developed as the result of personal dedication and service by many individuals. Chief of these was Dr. A. N. Wilcox who passed away at his desk on the morning of February 26, 1963. Professor Wilcox was a devoted servant of the Academy and the project before and during his tenure as Director from 1954 to 1962. His contributions of time, energy, and thought were tremendous during this period. Fortunately, they were recognized by the dedication of a plaque in the Cedar Creek Laboratory on October 21, 1962 which was witnessed by some 200 people. This plaque reads: "*In appreciation of long and dedicated service to the development of the Cedar Creek Natural History Area for the use and enjoyment of scholars, inscribed to Arthur N. Wilcox, Director, 1954-1962 by the Minnesota Academy of Science and the University of Minnesota*." These words express succinctly our realization of his contributions and accomplishments.

Dean Emeritus Theodore C. Blegen of the University is another person who, throughout this long period of development, continually looked after and promoted the interests and ideals of the Academy. Although known as an Historian, Dean Blegan had at one time been a biology teacher and fully realized the depth and significance of this project to field biologists.

While undoubtedly most Academy members know of the efforts of these two men I wish to draw your attention to two others. The late Dean T. H. Fenske assumed responsibility for the many details of maintenance in the area in 1960. Dean Fenske was an expert at managing and arranging projects for the University throughout the state. He contributed in many ways to the well-being of the project. Also Stanley J. Wenberg, Vice President for Educational Relations and Development of the University turned his vigorous attention and abilities toward the project on numerous occasions.

Many other people have made contributions as advisors, promoters, donors and helpers in countless ways. Dr. Donald B. Lawrence, Professor of Botany, has been an outstanding example. Truly this project has been a broadly supported one.

I would like to sketch the machinery for conducting Cedar Creek Natural History affairs to you. The central unit is the Advisory Committee which has at least three persons appointed by the President of the Academy, as members. This group, chaired by Dr. A. C. Hodson has