

Some diseases are caused by simple organisms. These simple organisms can cause sickness or destroy the tissue of the host organism, and sometimes the disease-causing organism can kill the host organism.

Several diseases of humans and other animals are caused by protozoa. Disease-causing protozoa live in the body fluid or cells of the host. The host provides food and shelter during the growth and development of the protozoa, and also provides a protected environment in which the protozoa can reproduce. Disease-causing organisms can be spread rapidly from one organism to another as a result of unsanitary conditions or overcrowding. Disease-causing organisms may also be spread by insect bites.

In this investigation, you are to read the written report made by a biologist and study the data chart compiled by biologists in the field. From this data, you are to construct a map showing the spread of the disease. Then you are to decide where the disease originated and the pattern by which the disease spread.

Materials *(per student or team)*

metric ruler colored pencils graph paper

Procedure

Read the following report made by a biologist describing the spread of a disease in a pheasant population.

Biologist's Report: Spread of *Plasmodium gallinaceum* in a Pheasant Population (April 1986 to August 1987)

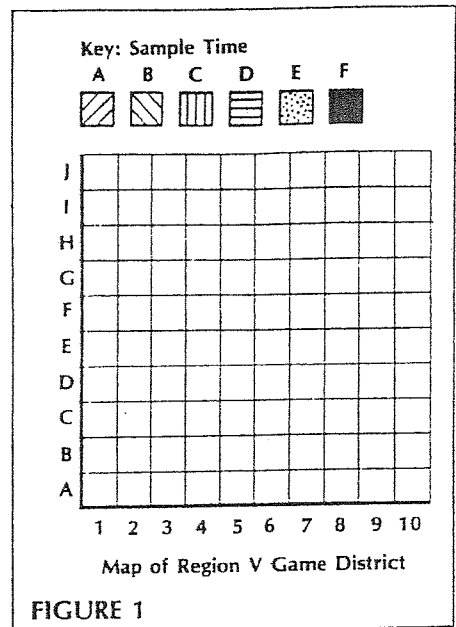
In early April, 1986, a protozoan parasite identified as *Plasmodium gallinaceum* was first isolated in salivary gland cells of a *Culex* mosquito. This parasite causes a disease in birds commonly called bird malaria. The mosquito was found in a roadside ditch in Region V Game District. In late April, 1986, a blood sample was taken from several pheasants in the same game district. One pheasant was found to be carrying a stage in the life cycle of *P. gallinaceum* in several red blood cells.

The presence or absence of the parasite in birds was determined by blood tests done during the warm months of 1986 and 1987. All pheasants tested were live-trapped, tagged, and released. At least three pheasants from each quarter kilometer area of the Region V game district were tested during each of the sample periods. Areas newly infected with bird malaria were recorded in a data chart similar to Table 1.

The life cycle of *P. gallinaceum* is as follows. A *Culex* mosquito bites a bird with malaria. (Chickens, turkeys, pheasants, and grouse are some of the species that may be affected by this disease.) Some protozoa are sucked up in the bird's blood cells that the mosquito takes in. These protozoa then pass along with blood into the mosquito's stomach where they grow and reproduce. Some of them pass into the mosquito's bloodstream and eventually reach the salivary glands.

When the mosquito bites a healthy bird, some protozoa enter the bird's blood. These protozoa travel through the blood to the brain,

TABLE 1. SAMPLE DATA		
SAMPLE TIME	AREAS REPORTING MALARIA CASES FOR THE FIRST TIME	COLOR OF SYMBOL
A	D-3, D-4, E-3, E-4, E-5, F-3	blue
B	A-6, A-7, A-8, B-8, B-9, C-9, D-9, E-9, F-9, F-10, G-7, G-8, G-9	red
C	A-1, A-2, A-3, G-1, G-2, H-1, H-2, H-3, H-5 I-2, I-3, I-4, I-5	orange
D	F-4	yellow
E	D-2, D-5, D-6, D-7, E-2, E-6, F-5, C-2, C-3, C-4, C-5	purple
F	B-1, B-2, B-3, B-4, B-6, B-7, C-1, C-6, C-7, C-8, D-1, E-1, E-7, E-8, F-1, F-2, F-6, F-7, F-8, G-3, G-4, G-5, G-6, H-4	brown



spleen, lungs, and liver where they grow and reproduce. The symptoms that the bird suffers as growth and reproduction of the protozoa occur are called malaria.

Construct a map similar to Figure 1 using a sheet of graph paper. Label the vertical scale A through J and the horizontal scale 1 through 10. The map represents Region V Game District, an area that measures five kilometers square. Each large block on the map equals one-fourth of a square kilometer.

Table 1 shows six data samples taken at different times (A through F). These samples are not listed in the order in which they were taken. A is not necessarily the first sample taken, and F is not necessarily the last. Using colored pencils, shade in the areas on the map according to the information given in Table 1. Each color represents the area where new malaria cases were found during each sample. When you are finished, your map should have six different color areas.

Formulating Generalizations

1. In what area of Region V Game District do you think that the protozoan disease bird malaria started? Explain.
2. Into which area did the disease spread next? Explain.
3. List in order the next two areas into which the disease spread. Explain.
4. Can you tell the exact order of areas into which the disease spread after the fourth area was infected? Why or why not?
5. Predict the sectors of the map that will probably be affected next. Explain why you picked the sectors that you did.
6. Why were the pheasants tagged and all of the areas sampled each time a sample was taken?
7. Why were no samples taken during the winter months?
8. You are given the job of controlling bird malaria in Region V Game District. How would you go about controlling the disease?
9. Should the game biologist also examine farm livestock in the district for bird malaria? Explain.