ANIMAL ECOLOGY IN NATURAL AREAS

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What is an animal? Isolated from its environment, it is just a curious bit of protoplasm. Why it does what it does, why it is shaped as it is, why its attributes are what they are, is a complete mystery, undecipherable, if you divorce it completely from any knowledge of the environment where it fits in. In order to put animals into the proper perspective let us take another look at Mettler's Woods. To date we have heard mainly about its plants. Actually it is a biotic community, a community of plants and animals—you cannot divorce the two. It is an organism, a super organism, if you will, occupying a piece of land. Such a plant-animal organism is soaking up sunlight to lock up, in the form of organic compounds, the elements that it draws from the soil and from the air. I like to look upon all those organic compounds as just cans of energy—a means whereby temporarily some of this sun energy is locked up and held and is prevented from radiating out into space when the clear nights come, and radiation cooling takes place. The whole understanding of one of these communities can best be obtained in terms of that prospect: these units of sun energy tied up by means of water and minerals of various sorts from the soil and carbon dioxide from the air. As this energy is used up, the minerals go back to the soil, to be drawn up again and recirculated through the community over and over. All that ever disappears really is that energy which comes in from the sun. It is locked up only temporarily. Ultimately it is released through the metabolic processes of the organisms and radiates out into interstellar space. Of course, some leaching occurs and some of the minerals are lost to the ocean, but in a community like Mettler's Woods where the balance is a relatively stable one, the loss is small.

Our knowledge of animals is still very fragmentary. We don't even know as much as we ought to about the few domestic animals upon which we depend for our food—our meat, poultry milk, etc. We are still learning things about those animals. When it comes to the wild animals of the earth's surface, we know very little indeed about them. As a matter of fact, we are just in the process of finishing up the first job, which is to classify and name them, and to organize that knowledge. This is what we do at a museum where we have specimens of them. There we classify them into families and groups, and work out their relationships and some idea of their evolutionary relationships with the earlier organisms from which they evolved. Actually all we have in a museum is just shells. Literally so in the case of marine organisms. In the case of birds, we have a skin, but what's that but a shell? In the case of mammals, we have a skin and a skull. But still the animal isn't there. The animal can be available only out on the land and can be understood only in terms of its role in some biotic community. In the community the animal performs a function in

terms of the over-all life of that community. And if I may draw a parallel, that must not be taken too literally, your body is a community. You have a heart, it has a job to do. You have lungs; you have other organs. Each one of those performs a certain function, does a certain job, and working together they are the animal organism. In the absence of knowledge of the role of the heart or any of the other organs, the isolated organ itself would have little or no meaning. It would be just a curious bit of protoplasm. And so, in terms of the animal in a community, we can evaluate and understand it, only if we go from the laboratory, after we have made our preliminary studies, to the environment where it originated, where it belongs, where it is a functioning member of a community.

Our studies of evolution indicate that most of these organisms have been plastic over the millions of years that life has been evolving and changing. Each organism has been molded and shaped by the forces of its environment. Away from that environment it is impossible to understand why it has these attributes, why its anatomy is what it is. Thus natural communities are essential to an understanding of animal life, especially now that we are deepening our studies in the physiology of animals, animal behavior, animal chemistry, etc.

In the case of these woods we are dealing with a relatively stable community. Here we have an opportunity to study the animals native to such a community in an environment where we know that they have lived in the same setting for a long period of time. Here perhaps we shall be able to explain and truly understand thèm as functioning parts of a biotic community. Presumably each animal species is still evolving. The idea that a species today is what that species was a 100 or 1000 years ago is, of course, false. We must not think of species as frozen, but ever-changing. We have every reason to believe that the organisms here are still evolving in the direction of a better and better adjustment to the community. Not only the plant community, but also the animals, because an animal is influenced by its associates in the animal community as it is by the plants from which it draws its sustenance. The evolutionary process is, of course, continuing and it is rather interesting to speculate that we might eventually achieve some local sub-species of some of the organisms. Our study of evolution would indicate that many of the new species that have arisen in the past have arisen because of the isolation of a small fraction of a total population on an island somewhere—often as islands in an ocean, but we can also have "islands" in the form of mountains rising up out of deserts. Some day this forest will undoubtedly be an island of mature woodland surrounded by a desert of urban development, an environment not suited to many of the organisms that will persist in the forest.

Areas like this that possess relative stability are very valuable in the study of the natural regulation of animal numbers, a subject about which we know very little. The botanists, of course, encounter the same problem in determining how plants, through competition, establish a pattern of vegetation. We know that there is a successional change in vegetation up to the "climax" that has been spoken of. If we want to study

the natural regulation of animal numbers, it is very helpful if we can find a community in which the setting isn't changing very much, because any change that takes place in the plant community that provides the habitat is going to throw out our calculations on the regulations of the animal numbers. In other than climax communities some plants will disappear in time and therefore certain species of animals will decrease in numbers if they are dependent on them. Thus I feel that a great deal of our work in the study of the natural regulation of animal numbers will have to be done in communities where we can find relatively stable conditions. We know in most cases that animal numbers are not stable, they either go up or they go down. Often they tend to be cyclic. We know very little about that cyclic phenomenon. But we can generalize and say that in almost every case the population that is maintained is a very minute fraction of what would be possible if the animal increased in the numbers that its rate of reproduction would permit. As an example, take the English sparrow. A few pairs introduced into Central Park less than 100 years ago have exploded into a population of English sparrows all over North America that numbers in the millions. And yet once the population has reached a certain level, any such potential increase of course ceases and the population oscillates around a certain mean. Such studies hold a great interest because man too is an animal occupying an environment that is not indefinitely expandable, and we need to know more about this whole question of population and the natural controls on population. They may give us clues as to why human populations behave as they do.

I could go on and talk about the soil organisms, but Dr. Kellogg has touched on them. We know relatively little yet about the role of many forms of animal life in building soils, maintaining soils, returning the nutrients that are tied up in the organic matter to the plant roots.

Finally I shall touch on the fascinating study of microclimate. The forest is like this auditorium—it has volume, it has a roof—the canopy. In the summertime when the leaves are on the trees, most of them are at the top, receiving the sun and intercepting it. Under this canopy there is a different humidity from outside, different temperatures, different wind velocities. And here there are different settings for the animals than would be present anywhere else. In a mature woodland there are many microclimates. You have not only that just under the canopy, but also in the various layers down to the forest floor; and then under the rotting logs and in the rotting logs and in the hollow trees and in many other little niches — each has its own microclimate in which certain organisms occur. In this woodland we hope to get a part of the over-all picture of adjustment of organisms to these particular peculiar conditions. This whole field of study is in its infancy, and much of it will be difficult or impossible to pursue in the absence of reserved areas like the William L. Hutcheson Memorial Forest.