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Attendance Report: Small Mammal Workshop

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IBP
DESERT BIOME

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Helsinki, 1970

by

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This meeting was the third since 1966, and included papers concerning almost all aspects of small mammal ecology. Most of the speakers addressed themselves directly to the problems of IBP, and although the species were different from those found in the desert, the problems and discussions concerned with them were rather helpful. Much of this report is included in a summary papers presented by Frank Golley and Lech Ryszkowski which also attempts to point out the direction of future work that should be undertaken by the international working group on small mammals. The proceedings of this meeting will be published as the third in a series, beginning with the 1966 proceedings, "Secondary Productivity in Terrestrial Ecosystems," and including the 1968 proceedings, "Energy Flow through Small Mammal Populations."

When the working group was first organized in 1966, two research programs were outlined for further work: (1) a standard or minimum program to provide information on the impact of small mammal populations on primary production, and (2) an advanced program to develop methods to investigate special problems associated with measuring energy flow in small mammal populations. In partitioning the effort, density determinations, sex ratios, body weight distributions, age distributions, and sexual activity were assigned to the first program; methods to determine densities, food habits, metabolism, and energy assimilation were specified for the second program. The efforts of this research have produced many helpful findings. A brief review of the most important of these (as far as the desert IBP work is concerned) may assist those who are looking for specific kinds of information.

Standing crop measurements have been reported from Bulgaria -- Picea -- Fagus mountain forest for Clethrionomys glareolus and Apodemus flavicollis (Markov et al., 1968); Czechoslovakia -- mixed deciduous forest for C. glareolus and A. flavicollis (Pelikan, 1968; Turcek, 1968); Finland -- meadow for Microtus agrestis (Myllymaki, 1969a), Poland -- cultivated fields for Microtus arvalis (Trojan 1969), peat bog for Microtus oeconomus (Bulchalczyk and Pucek, 1968), mountain meadow for Pitymys subterraneus, M. agrestis, and A. flaviocollis (Grodzinski et al., 1966), Cladino -- Pinetum community for C. glareolus and A. flavicollis (Ryszkowski, 1969a, 1969b), Fagetum community for C. glareolus and A. flavicollis (Bobek, 1969), Tileo -- carpinetum community for C. glareolus and A. flavicollis (Aulak, 1967), and Cirecio -- Alnetum community for C. glareolus and A. flavicollis (Aulak, 1967); Rumania -- cultivated fields for M. arvalis (Hamar and Tuta, 1969); Sweden -- meadow for M. agrestis and a spruce plantation for C. glareolus (Hansson, 1969a); United States -- mixed deciduous forests for Peromyscus gossypinus, Blarina berevicauda, and Ocrotomys nutalli (Gentry et al., 1968); and USSR -- several communities (Svarc et al., 1969).

A standard minimum method was proposed by Grodzinski et al. (1969) to obtain density estimates for small mammals. This method consists of pre-baiting for five days and then removal trapping of the resident population for six days on a 5.06 ha grid, which contains 256 points with two snap traps at each location. This method has been variously used, tested, and modified by Chelkowska and Ryszkowski (1967), Gentry et al. (1968), Hansson (1969b), Janion et al. (1968), Pelikan (1969), Ryszkowski (1969a), Ryszkowski and Petrusewicz (1967), Smirnov (1969), and Smith et al. (1969). Work has also been done to estimate the boundary effects of the grid using stained bait (Adamczyk and Ryszkowski 1968, Halisova 1969) and bait impregnated with radioisotopes (Myllymaki 1969b). Perhaps the most promising method of assessing border effect of kill trapping was proposed at the meeting by Michael Smith who used assessment lines, thus allowing for estimates of variance in the size of the grid. His method is also more flexible for varied communities and has been tested in the desert at the Rock Valley site in southern Nevada.

Data on natality, survival, and longevity are not numerous but have been reported for a number of species (Bujalska et al., 1968; Petrusewicz, 1968, 1969; Petrusewicz et al., 1969; Pucek et al., 1969; Ryszkowski, 1967; and Walkowa, 1969). These and other population parameters received considerably more attention at the Helsinki meeting, but still, very little data are yet available.

Progress has been made in the determination of energy parameters for certain species. Metabolic characteristics under laboratory conditions (Grodzinski and Gorecki, 1967; Grodzinski and Klekowski, 1968; Trojan and Wojciechovska, 1969), digestibility of food (Drozdz, 1967; Petrides and Stewart, 1967), caloric values and body composition of different tissues (Golley, 1967; Gorecki, 1967; Evans, 1969), and growth (Petrusewicz et al., 1968) have been determined for a variety of species. These topics were also discussed during the Helsinki meeting but considerably more time was spent in discussing methods and rates of transfer within the ecosystem.

Mineral cycling, interactions of small mammals with other components of the ecosystem, and distribution characteristics have not been studied and a request for more of this type of work was made. It was felt that it was especially important that studies be expanded to include the deserts, the tundra, and the tropics.

The following statement of future plans is taken directly from the summary submitted by Frank Golley and Lech Ryszkowski.

> It is appropriate at this stage in the development of the working group that we examine our progress in terms of the overall program of the IBP. At least one of the initial objectives of the IBP/PT program was to investigate whole ecological systems, with specialists contributing to the solution of whole system problems by investigating those groups of organisms in which they had special competence. The small mammal working group was one of these special groups and one of the final objectives of our investigations was to contribute to the understanding of the production dynamics of terrestrial ecosystems. Over time the ecosystem view has tended to be lost in our enthusiasm for special aspects of our studies and there has been little whole-system work accomplished, except in a few national programs. Since our working group has been highly successful and our knowledge of the impact of small mammal populations on production has advanced greatly, it may be useful for us to restate the basic underlying concept of the ecosystem IBP studies. Such a statement is especially appropriate today because it is widely understood that the environment of the planet Earth is deteriorating under the stress of expanding human populations and many people are looking to biologists and ecologists for solutions to environmental problems.
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> Man depends upon the ecosystems of the planet for sustenance, air, water, shelter, and for psychological needs. Because of the growing populations of human beings and more intensive use of ecosystems throughout the planet, it is essential that we develop sound plans for the use of the resources of the biosphere. Planning requires knowledge of ecosystem structure, function, and relationships. It is especially important that we have knowledge about how the most abundant and significant ecosystems influence the hydrologic cycle, and interact with the geosphere in the maintenance of soil fertility. We must also know the rates of loss of material from systems, the rates and form of production of ecosystems, the rates of energy flux through the system, and the resiliency of ecosystems to stress from the environment or man.
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> It is well known that ecological systems are composed of producers, which convert solar energy to chemical energy and are the initial step in the cycling of chemical materials in the system, decomposers, which break down organic material, and consumers, which probably function mainly in control processes on producers and decomposers. Small mammals are consumers and we should consider their broader role in control of ecosystem processes, as well as to continue our studies on the impact of populations on primary production. For example, a larger proportion of primary production channeled through the small mammal populations is expended as heat energy than that channeled through insect populations. In this respect, small mammals may function as a "steam engine" regulator in an ecosystem. Similarly, the formation of burrows by small mammals can influence the location and movement of organic matter in the soil. We should be concerned with such questions as how do mammals change the pathways or the rates of flow of energy and materials? How do mammals interact with other groups of consumers to influence these processes?
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> A focus of the small mammal wroking group such as we suggest has further value. Mammals are of economic concern as competitors with man for food and fiber and as disease vectors. History is replete with evidence that increase in density of man or mismanagement of wastes results in an increase in mammalian and other pest species. While control measures can be instituted, they are seldom successful over long periods of time. In contrast, an ecosystem approach, because it considers all aspects of the system, may provide the basis for successful management of pests, as well as other components of the system. In our opinion, effective and sustained management of our environment demands this total approach, rather than exclusive concentration on immediate, local solutions to specific problems.
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> If it is agreed that our working group should accept the ecosystem or biogeocenosis as the ultimate focus of our research, then an expanded program should be organized which takes this large concern into consideration as well as to further research those specific problems which we have investigated over the past five or ten years. First, we should support the Man and Biosphere program and become officially associated with it, if that is possible. Second, we should expand our research to other major ecosystems. Third, we should include studies on cultivated and urban-village ecosystems in our program. Fourth, we should expand our study of the interaction of mammal populations with other components of the system.
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> To this end, we suggest that the following reviews be prepared for presentation at a meeting of the working group in 1972. These papers would not only summarize the state of knowledge of small mammals but would also provide the information to design an expanded ecosystem-oriented program for the working group. We propose that the following papers comprise the main part of the meeting, with shorter comments and supporting or critical statements from other investigators included as comments in the published proceedings:

(1) density estimatior and density in different habitats, (2) age indices and growth curves, (3) natality and survival rates in the natural environment, (4) bioenergetic parameters and foods, (5) energy flow and mineral cycling in different habitats, (6) the role of small mammals in food chains, in conditioning the environment, and in energy flow and mineral cycling of the whole system, (7) mammals in cities and in stores of food and fiber, and (8) mammals as disease vectors.

Environmental planning without consideration of the role of small mammals in ecosystems will be incomplete. We have an obligation to identify the kinds of information required for effective management of the earth and to supply that information appropriate to our specialty. A change in the emphasis of our working group does not necessarily change the kind of research carried out by the scientist in the field but, rather, it enlarges the view of the group and makes our studies more meaningful in a larger context.

Generally, the meeting was the most relevant I have attended and it helped my perspective greatly. Some of my general reactions are itemized below:

1. The small mammal working group does not seem to be coordinating well with ongoing Biome programs. I feel that the presence of Norman French and myself was helpful in pointing out the advantages of a closer association.

2. Modeling efforts were obvious by their absence. The general lack of equipment may account for much of this lack, but they have not, as yet, make a clear effort to coordinate with ongoing programs. This would be of considerable help. An invitation to them to contact the Desert Biome for assistance was extended by both Norman French and myself.

3. The group will meet again to concentrate on sampling methods. It is hoped that the basis for the proposed meeting will be real data and programs that can be submitted to a simulated population. The simulator will likely come from the efforts already begun in the Desert Biome at Brigham Young University.

4. Members of this group had made no effort to sample small mammals with live traps. I was the only person present with a proposal for live trapping. This proposal was well received and, if it had been in sufficiently final form, could have been included in the proceedings even though it was not included on the agenda. The group expressed a desire to see it as soon as possible so as to test it under European conditions.

5. The role of predators was discussed considerably. I decided that, generally, in the forests and meadows of Europe predators transfer an amazing quantity of energy and must be considered. We might also consider them in the desert.

6. I feel we should retain a working relationship with this group. The Desert Biome has much to offer, and we can learn such from an association. Also, I would like to request support for my own participation in future meetings.

7. Thank you for the opportunity; it has been of significant help.

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