Wildlife Disease Research and Economic Development

Proceedings of a workshop held in Kabete, Kenya, 8 and 9 September 1980

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Contents

What Ecologists Think Veterinarians Should Do[1]

Harvey Croze[2]

This paper will cover two subject areas: the relationship between disease and ecology; and the relationship between veterinary studies and ecological studies, all seen, of course, from an unbiased ecological perspective. I will also be presumptuous enough to point out what I feel are the broad gaps in wildlife veterinary research.

Ecologists are in general concerned with accounting for the distribution and abundance of plants and animals. This exercise often begins with the deceptively simple task of describing distribution and abundance, largely by drawing inferences from samples. Sampling strategies are designed to maximize the likelihood that the inferences are true and to minimize the cost of the sampling. With the basic inventory data collected and while monitoring changes and interdependencies, the ecologist then attempts to probe into causation.

The state of an ecological system at any particular time is the product of a number of processes, most fundamentally, birth and death. In ecological studies, the ecologist, even if primarily a botanist, must also attend to behaviour — from simple movements that can result in a particular instantaneous distribution or a rate of migration to complex social behaviour.

The ecologist likes to think of the task as a complicated one, especially when large numbers of species in whole ecosystems are considered. Figure 1 shows in an abbreviated way the relationship between the environment, basic ecological processes, and the end-products, abundance and distribution. The choice of "end-products" is biased toward those that may be most directly utilized by man — numbers of plants or animals in particular places. One could have picked as a goal for understanding something like social organization, population dynamics, or migratory behaviour; indeed, many respectable ecologists do just that. However, those interesting and important fields rarely lead directly to decisions that contribute to the well-being of people, unless the studies are extended to account for distribution and abundance.

In passing, it may be mentioned that the styles and rates of the processes shown or implied in Fig. 1 are modulated in part by species-specific characteristics of physiology and social organization. Physiological and behavioural adaptations are, like birth and death, determined by the environment, but they are moulded over an evolutionary time scale.

A decade ago, ecologists were faced with what may be called a crisis of scale. They began to realize that single species studies were necessary but by no means sufficient to justify expenditure of government resources and to provide decision-makers with information comprehensive enough to make the best decisions. In such a climate of necessity the ecological monitoring approach was born (e.g. Gwynne and Croze 1975, UNEP 1980). It combines intensive ground-based studies with extensive low-level aerial survey and satellite data collection techniques to understand as much as possible about areas as large as possible. Ground teams investigate the minutiae of primary productivity or animal population dynamics and provide "ground truth" for what the aerial teams observe.

The methodology is particularly well-suited to semi-arid ecosystems in which there are rapid and large-scale seasonal changes. On the one hand it covers in a cost-effective way the space in which the highly mobile populations of animals characteristic of such areas are likely to move about; on the other hand, the time-series nature and the diversity of the monitoring data allow correlations to be established between a number of ecosystem components that should lead to an understanding of causation. Such understanding is just one step away from rational management. To put it more simply, wildebeest, cattle, and pastoralists are dependent on water and grass, which in turn are dependent on weather, soils,

[1]The views expressed in this paper do not necessarily reflect those of the United Nations Environment Programme.

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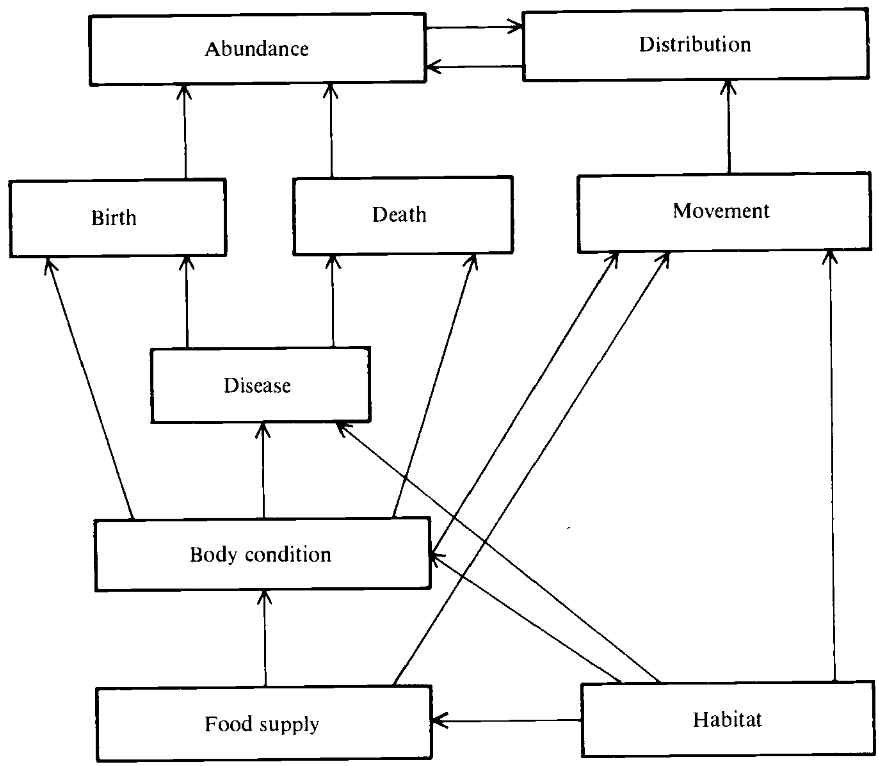

Fig. 1. Cause/effect diagram that shows why ecologists are (or should be) concerned with wildlife veterinary research.

and geomorphology. To know how the dependencies work and which components are most important in control of the system, one must measure them all simultaneously over time: one must monitor.

Where Disease Fits In

Disease, the domain of veterinary scientists, has a key position in Fig. 1. Disease obviously imposes a negative influence on the system: it slows down birth, increases the chance of death, decreases abundance, and restricts distribution. Such negative effects are not necessarily a bad thing, but rather part of the natural feedback mechanisms that regulate populations. Quantification of the dynamics of the diseases would allow ecologists to tighten up considerably their predictive population models, both for wild and domestic animals.

Disease in Fig. 1 is depicted as being dependent on food supply (because starved organisms are more likely to get sick than well-fed ones) and on habitat (because the distribution and abundance of a virus or of tsetse flies must be considered as characteristics of an organism's habitat, independent of food supply). Disease as conceived in the scheme is restricted to pathological processes and effects within the organism itself; pests and parasites are characteristics of the habitat, just as toxins would be products of the food supply. From this point of view, virologists and parasitologists could be considered as specialized ecologists.

Gaps in Veterinary Studies

It is difficult for ecologists to accept that disease may be as important as, say, food supply in determining the nature of ecosystems. It may well be so, but we cannot yet be sure for two reasons: (1) the nature of veterinary sampling; and (2) the lack of

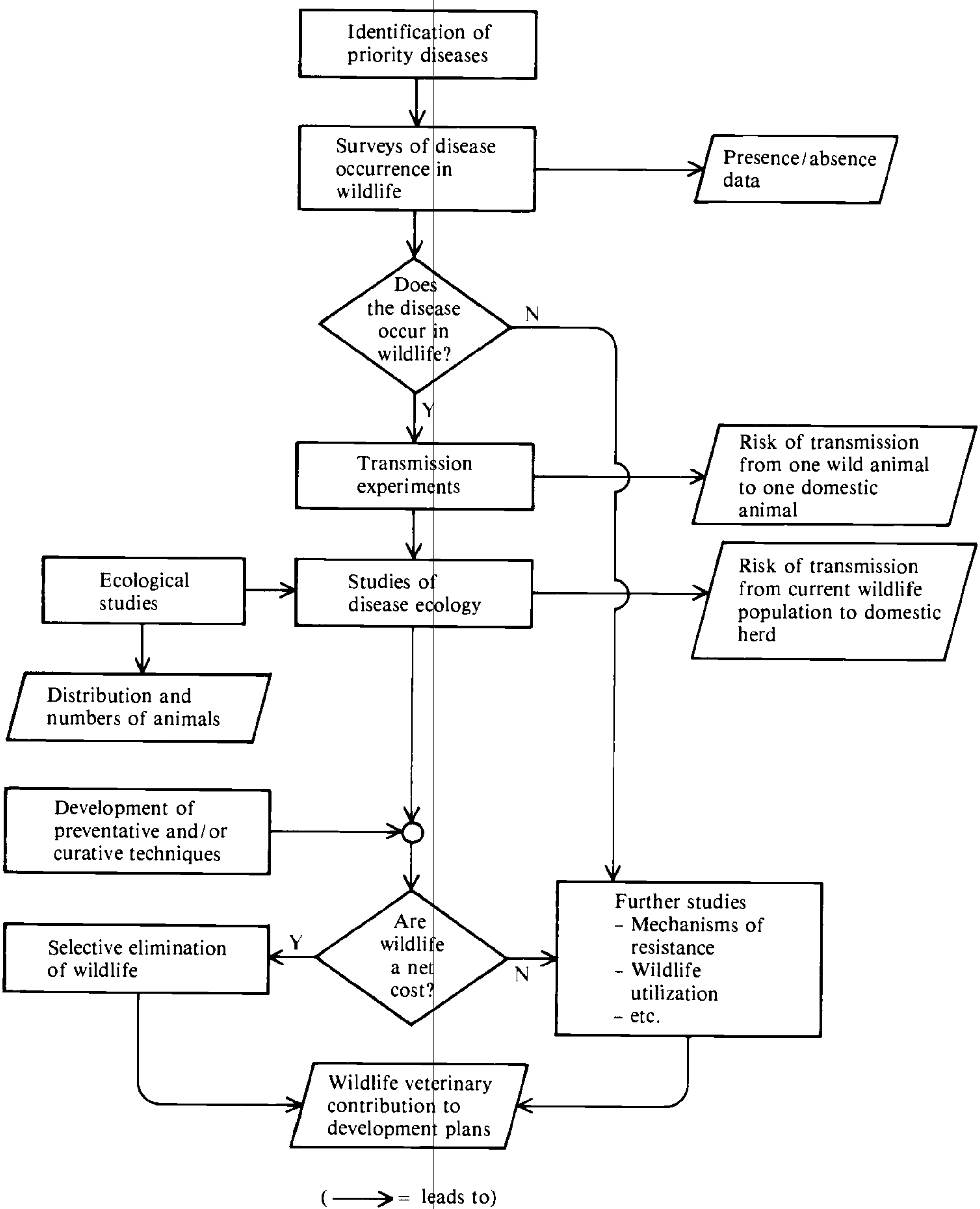

Fig. 2. A suggested framework for wildlife veterinary research.

integration of veterinary studies with ecological studies.

It seems to me that the theoretical base of veterinary sampling is weak or ill-defined. Perhaps my experience is limited, but I do not recall having ever seen a disease distribution map, laced perhaps with "isopaths" which would tell me the probability of a particular species contracting a particular disease at a certain place and time of year. Such a map would be as interesting and potentially useful to an ecologist as one of seasonal grass greenness. If it were overlaid on the seasonal distribution map of some animal species, it might help to explain anomalies in the animal's distribution and abundance which were not accounted for by the distribution of food supply. Such an approach would help to make disease studies part of the whole, rather than an apparently disproportionately investigated part. It would indicate that the veterinary scientist was becoming an ecologist as well as a pathologist, a student of whole systems as well as one of individuals and organs.

I must admit that I am slightly foxed as to how such a metamorphosis would take place in practice, because the increase of investigational scale from the sick individual or its herd to whole populations in ecosystem contexts may be prohibitively expensive given currently available techniques. Nonetheless, there is a real need for rethinking veterinary sampling strategies and for developing rapid and extensive survey and diagnosis methods to produce information in study areas congruent with those now tackled by ecosystem ecologists. It is worth making the attempt because land use decisions and planning, particularly in semi-arid wildlife areas, are made at a scale that far outstrips the location of the individual or its herd.

One immediate approach would be to attach a veterinary subprogram to the ground work of ecological monitoring studies, and, who knows, to the aerial component as well. Already, the species, distribution, and density of carcasses observed from the air could provide stratification data for veterinary ground sampling. And, I wonder if a staring coat has special reflectance characteristics that could be detected on infra-red film, as is the case with diseased forest trees?

It should be stressed that I am suggesting augmentation to veterinary investigations, rather than replacement of classical studies that lead to such useful things as understanding of some effects of particular diseases, identification of pathways of transmission, and the development of control measures. The addition, involving a reexamination of the scale, scope, and methodology of sampling, would allow veterinary science to contribute to land use planning as surely as to prevention and cure of illness.

A Framework for Veterinary Research

Until wildlife comes into its own as a resource that can be utilized at the local as well as national level, it must be admitted that the raison d'être of wildlife veterinary scientists will be to show how their studies are useful to domestic animal husbandry. With this in mind, Fig. 2 represents a logical sequence of what one ecologist thinks veterinarians should do. It is a precedence diagram that leads from simple presence/absence statements of whether or not important diseases occur in wildlife (important in the sense of potential effect on livestock or man) to veterinary contributions to land use planning. Admittedly, the steps are grossly simplified, but they are an example of an orderly approach to the science.

Progress so far appears to be mainly confined to the first couple of boxes, that is, studies of occurrence and probability of transmission in quasi-laboratory conditions. Investigations of "disease ecology" that would lead to realistic risk assessments seem to be rather underdeveloped. Contrary to the logic of the scheme, research into prevention and cure technology seems in fact to have taken precedence over a basic understanding of the way disease systems work in the wild. I suppose this is because the demand to cure sick domestic animals and to keep healthy ones healthy is very pressing. Selective elimination of wildlife is probably necessary when they are proven reservoirs of harmful diseases and prevention and/or cure is costly. Otherwise, it is worth fighting the disease on a limited front, monitoring both its ecological and pathological effects, and using the wildlife in further studies, for example, to investigate alternative beneficial uses or to try and capitalize on their resistance mechanisms.

In conclusion, wildlife diseases are probably extremely important in the regulation of animal distribution and abundance. Wildlife veterinary research appears to have made good progress in what are viewed to be the preliminary stages of a comprehensive program that could contribute to rational land use planning and resource management. It is necessary to expand the scope of the research, to consider seriously the effectiveness of current sampling regimens, and to integrate veterinary studies with ecological research and monitoring.

Gwynne, M. D. and Croze, H. 1975. East African habitat monitoring practice: a review of methods and application. In Proceedings International Livestock Centre for Africa Seminar on Evaluation and Mapping of Tropical African Rangeland, Bamako, March 1975.

United Nations Environment Programme. 1980. Selected works on ecological monitoring. GEMS/PAC Information Series No. 1.