An Approach to the Application of Field Techniques in Wildlife Research

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In wildlife research we are, in the most general terms, trying to understand adjustments made between the living animal and its environment. We would like, some day, to understand enough to be able to predict the consequence of our actions when we influence the population directly, or indirectly by acting on either the animal or its environment.

Wildlife research has a somewhat restricted meaning in the United States. There the term emphasises an economic connotation and is sometimes referred to as applied or economic zoology. There is an increasing tendency to-day to think of wildlife management simply as applied ecology; of wildlife research as ecological research particularly on animals of some kind of economic importance. (I have heard it referred to, in fun, as what the biologists of the fish and game departments do for a living.)

Research efforts may be directed specifically toward trying to get rid of or reduce a population, as in the case of predators or so-called bird or mammal pests. Or, the research may seek enough understanding to allow us to increase the number of game birds for sport. Concerning rare animals, as **Notornis,** an initial goal would involve understanding enough of the life history to recommend appropriate long range protection and preservation measures.

In teaching wildlife research field techniques, it is common practice to classify them into generalised categories, as, for example: Habitat control (techniques for the manipulation of important environmental elements such as food, cover and water), techniques for protecting animals (laws, nature sanctuaries), for study of disease, for measuring numbers, for measuring productivity, and for harvesting most appropriate sections of the population.

There are dozens of simple or complex field techniques tried, accepted, and in daily use by wildlife research workers in various parts of the world. It can modestly be said, we have a considerable reservoir of techniques to choose from. But having a host of readily applied field techniques at one's command does not imply facility in solving wildlife problems any more than a stack of cookery books nine and one-half feet high should guarantee a new bride freedom from the disgrace of burnt toast.

It is, I think, most appropriate to think of techniques simply as tools. And they are invented to be used, usually to answer a specific question in a special situation. I am emphasising this simple point because I have frequently seen highly trained zoologists, ecologists or wildlife workers—as they variously call themselves—engaged in a remarkable little game called "monkey see monkey do," or, to use the most appropriate anthropomorphism, "aping." I am not implying that only one person or organisatiaon should work on a given subject called "his pigeon." And my intention is not to make fun of critical competition, which has, of course, led to some of our best work. I am thinking of the practice of using techniques for their own sake; of using techniques on wild animal populations blindly and in confident faith like an automatic pilot or a cake recipe. (This sometimes savors of the technique being master of the man, rather than vice versa.)

In some kinds of wildlife field investigations, the work becomes standardised and the techniques largely routine to conform to a particular recurring question in a given area. This is characteristic of several kinds of investigations needed for managing a population. Autopsies to learn the incidence of parasites, and the keeping of shooting diaries to learn the sexes and ages of animals removed from a population, are examples of such periodical type investigations which tend to become standardised.

Even routine tasks, however, if well done, can lead the worker into questions which may eventually lead to the understanding of some fundamental principle of animal behaviour.

We, of course, value the business of raising questions as one of the most important by-products of wildlife research. Questions in the head of the observer play a particularly useful role in determining the course of projects carried out in the field.

The approach I am attempting to summarise can be outlined briefly as follows:—

1. Most important studies, in sequence, are those which:—
   a. Are descriptive and provide the minimum factual background —the perspective—for investigations, and which lay the foundation for more complex problems to come.
   b. Which uncover some fundamental principle of animal behaviour.
   c. Which raise important new questions, or formulate a new conceptual scheme which may aid in further exploration.
2. Field techniques used in these studies have a good chance of being most useful if they are based on experience gained from close observations with the animal involved.
3. Ideally, these field techniques should be designed to take advantage of the research opportunities inherent in the particular environment being studied. This follows from the recognition of close inter-dependency between particular environmental conditions, the behaviour of the species involved, and its associates, and the limited kinds of questions capable of being most readily answered in any given environment.

So much does our concern over the efficiency of wildlife research emphasise questions, it may be appropriate to review certain kinds of questions with which wildlife workers are contending.

On early set of fundamental questions we need to know about a wild species revolves around the life history of the animal. Life histories, to a greater or lesser degree, describe the complete train of phenomena characterising the existence and growth of a species from its inception to its decease. In the field, biologists are interested in such questions as: At what age does the animal have its first young? What are the details of its seasonal movements? When do the young separate from the family group? How long do they live? What do they eat? Where do they normally occur, i.e., what range of habitat do they prefer? What are the dates involved in the main seasonal phenomenon, like breeding season, time at which the young are born, and so on. These life history data provide a foundation of facts upon which many other more complicated investigations depend.

Field techniques for the gathering of life history data are largely observational; the equipment needed, simple. A pen, a notebook, sometimes a pair of field glasses, a few small instruments for making observations quantitative where desired, and a head full of questions. In other words, a trained worker.

The major points in the life histories of game animals are fairly well known. But there still remains much to be done even in Europe and in North America, where most of this type of work has been accomplished.

Let us consider, briefly, a more complex kind of question: population phenomena.

If we are interested in management then we must inevitably be concerned with questions about populations. Questions we wildlife workers have been interested in are, for example: What is the annual turnover in population? Proportionally how many young are coming along each year and how many deaths? If we knew these facts we would automatically know how to handle such subsidiary and immediately more practical questions as: What proportion of the population can be harvested annually? What sexes and ages can be shot? Or, if it is control or elimination of animals with which we are concerned: What proportion of the population must be taken to offset the annual increase? Would this be the same each year? If not, what is the nature of the response involved, which, we know for some animals at least, involves higher productivity following reduction of numbers.

These questions are desirable to know, but extremely hard to answer directly. We, therefore, try to crack into the enigmas from as many angles as possible. Take the generalised question: "How is this particular animal peculiarly adapted to this particular environment?" Which techniques would we use to pry most efficiently into the heart of this general problem?

First, of course, we make sure we know exactly which kind of animal we are dealing with. And, with a free-ranging wild population, this is not always easy, as sub-specific identification can be bordered by many deep pitfalls.

We get to know the animal next; its life history. We learn as much as we can from individuals, pets in the field, or caged animals. We are always—or should be—on guard and extremely wary about applying findings on one animal directly to another, especially in distantly related groups. (With the accumulation of knowledge of the behaviour of individual species, we are becoming increasingly interested in questions as to what extent generalisations can be made for larger taxonomic groups.)

Next, what is the relation of this animal to its organic and inorganic environment? That is, what is its ecology? If we understood our animals and their environment well enough, we would, incidentally, also know the answers to most of the largest scale "practical" questions with which we are wrestling to-day.

This general question leads to a host of specific questions depending largely upon the interest of the observer. There may never be complete rules for the study of ecology of any vertebrate species. (I believe it would detract from the sheer fun of research work if there were.)

One broad type of approach starts in the laboratory; carefully designed, controlled experiments with penned animals are made, in which they may be subjected to differences in humidity, temperatures, changing length of day, various social combinations. The observer then formulates hypotheses which sometimes lend themselves to being tested in the field.

Another approach to questions of population starts in the field. Individuals are trapped and marked and re-trapped, or recognised without trapping and followed about in an undisturbed state. Specific knowlege thus laboriously gained not only often leads to a notion of

the extent to which individual behaviour varies under a given set of environmental conditions, but allows us to understand the social organisation of the population (family groups, feeding groups, etc.). And this generalised approach is used in obtaining a foundation of facts from which more elaborate kinds of population questions may be answered.

Exemplifying this second approach, we might consider the growth of several ideas relating to a population of deer in the western United States. (1)

Marking individual deer, and following about of individually recognised deer led to the definition and the description of home range in one small area.

This home range, being restricted, led one to wonder if it would not be possible to treat small areas as if they held different populations.

Checking on the composition of different populations in several small areas led to the discovery that significant differences in composition did in fact exist between the different areas.

Having demonstrated that the populations were different, research was initiated to try and answer a series of obvious questions starting with the words "how" and "why?"

These questions are still being worked on. And, to get clues to some of them, I find myself in New Zealand.

But regardless of whether the observer begins his research in the laboratory or in the field, the approach I have tried to emphasise is one founded on the belief that the final authority on any wild animal or wild population is the animal itself. Admittedly, the probability that the animals we study are less given to introspection than is man may cast doubt on the literal truth of this statement. But I believe it will, for some time, continue to be a useful conceptual scheme to consider that the final "last word" is the animal receiving our attention. Most valuable wildlife techniques may be simply those which get their questions, as well as their answers, from the animals themselves, and from the situations in which they are found.

(1) Leopold, S., Riney, T., McCain, R., and Tevis, L. Jr. Game Bulletin, No. 4, California Fish and Game. 1951.

Footnote.—The opinions expressed above are those of the author and are not necessarily endorsed by the Department of Internal Affairs.

Discussion

Dr. WALLACE: Could you tell us what factors influence local populations and the boundaries of the home range?

Mr. RINEY: Many factors are involved and they differ between areas and between species. Some of them are the geology and topography of the area, soils, climate and local weather. Superimposed on this environmental background is the contact that the animal has with other living things, vegetation, other vertebrates and invertebrates, parasites and disease. The behaviour of the animal may be influenced by the population to which the animal belongs. I do not know the answer to the second part of your question, but I guess that once the animals become adult, they tend to remain on a minimum range, unless there is some radical disturbance.

Mr. SEARS: How are individuals recognised?

Mr. RINEY: Marking of deer can be done by branding, ear-marking, paint daubs or by the use of plastic discs attached to the ears. With small animals the toes or ears can be clipped in various combinations, to give a large series for numerical values. For birds, surgical pins with streamers, leg bands or feather staining can be used.

Mr. CLARE: How is the behaviour pattern of deer influenced by the disturbance caused by the observers?

Mr. RINEY: If deer are little used to humans they become quickly tolerant to their close presence, provided they are not disturbed. Where hunting occurs thy become very wary and their feeding hours change. The observations I am suggesting must be done on undisturbed groups.

Mr. McINTOSH: Do you think that wild populations can be controlled by poisoning? All baits fail sometimes. Are natural foods likely to be better baits than artificial materials such as meal or jam? Are attractants likely to be of any use? In the field it is difficult to get the manpower to do the poisoning over the short period that the baits may be atractive.

Mr. RINEY: Yes. In the United States ground squirrels, gophers and coyotes are being controlled by poisoning. Carefully administered and under favourable circumstances poisoning can be very effective. Specific baits must be worked out for each animal, area and time of the year. Both natural and artificial baits can be effective. Anise seed oil has been used an an attractant for the Australian opossum. It has also been recommended for the Virginia deer, but in one area I used it on the Mule deer and found it useless. In one part of California, alfalfa hay and salt have been used alone or in combination for trapping Mule deer. A few miles away they were ineffective even when tried at the same time of the year. Where an animal has a limited range the bait must be placed within it.

Mr. SWAN: Have you seen any evidence of metabolic diseases in deer during lactation when the diet is poor? Have you ever seen footrot in deer on the same country as domestic sheep?

Mr. RINEY: No. In the areas I know, the food supply during lactation is thought to be of good quality. I have not seen footrot in New Zealand. Necrobacillosis takes a heavy toll in several parts of California.