OVARIAN ANALYSIS AS A TECHNIQUE FOR STUDYING REPRODUCTION IN BEAVER

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I think most of us will agree that in the final analysis, game management boils down simply to the calculated manipulation of the populations of our so-called economically important species. However, I feel equally confident you will agree that the actual accomplishment of the end embodied in this ostensibly naive definition is frequently anything but simple. Much of the research directed toward the accomplishment of this end is necessarily oriented toward the development of techniques applicable in the particular place and with the particular animal which happens to concern us at the time. Though the techniques are simply tools, they are, nevertheless, requisite to the job in hand.

The animal of concern in the present discussion is the beaver. We are all familiar with the decimation of beaver in North America during the heyday of the fur trade, and also with the conservation program of live-trapping and transplanting which resulted in the restocking of these animals throughout much of their former range. Unfortunately, many of us are equally familiar with the conflicts and problems which have resulted from the re-establishment of this largest of North American rodents, particularly in areas adjacent to man's so-called cultural developments. But, regardless of whether we are concerned with producing more beaver, or with holding the present population in check, the problem of beaver management, as with the management of most any species, must of necessity be concerned with the basic concepts of natality and mortality. In the final analysis, the status of any population is the resultant of the number of births and the number of deaths occurring in any given period. Since these factors are so important in determining population levels, it behooves us to learn all we can about them in any population we are interested in managing. This afternoon I should like to discuss the application of some basic morphological characteristics which provide a technique useful in understanding and, hence, manipulating beaver populations.

Anatomists have long known that the ovulation of an egg follicle in the mammalian ovary, resulting in the release of the egg, is followed by the development at the site of the ruptured follicle of a solid ball of cells called the *corpus luteum*, or yellow body. This structure functions as an endocrine organ, producing a hormone which is requisite to the establishment and maintenance of normal pregnancy. When pregnancy is terminated, or a few days after ovulation in the case of any animal which has not bred successfully, the *corpus luteum* degenerates into a smaller mass of scar tissue called the *corpus albicans*, or white body, which persists for some time. Thus, we find in the ovary some discrete structures which provide us with direct evidence of the number of eggs produced by a given animal during a particular estrous cycle. We will examine the usefulness of this information shortly, but first, let us look at some pictures which illustrate the situation in beaver.

(A series of slides was presented at this point, illustrating the female reproductive system and the ovarian structures being discussed.)

The procedure for collecting and analyzing these materials is relatively simple. The ovaries to be studied are removed after the animal is skinned. Their position near the kidneys at the tip of the uterine horns makes them easy to locate. They are placed in a jar containing eight or ten times their volume of "ten percent formalin" (commercial formalin diluted with ten parts of water), or some other tissue preservative. Examination of fresh specimens is possible but the task is easier after the organs have hardened for two or three days in the preserving fluid. The examination is accomplished by slicing the ovary longitudinally with a thin, sharp instrument such as a razor blade.

It will be noted that the *corpora lutea* are large and easily recognized when the ovary is sliced open. The *corpora albicantia* are much smaller, darker, and harder, but still readily apparent. Four or five cuts through the organ suffice to reveal these structures, and their number in the ovary can be easily deter-

mined. In some animals such as deer, structures resembling true *corpora lutea* will occasionally develop without prior release of the egg from the follicle in which it grew, thus posing identification problems when counting *corpora lutea* in these animals. Fortunately, this difficulty is not encountered with beaver. In the examination of many hundreds of *corpora lutea* from beaver we have always been able to locate an associated rupture scar on the surface of the ovary. This leads us to conclude that the presence of a *corpus luteum* in a beaver ovary can be accepted as evidence that an egg has been produced. The *corpora albicantia* persist in the ovary at least until the next breeding season, and hence, can be relied upon to indicate the level of egg production long after the breeding season in which they were formed.

So much for the morphological aspects of the problem. Granting that there exist structures readily discernible in the ovary which give us an accurate count of eggs produced, what use can be made of this information in managing beaver? If the ovaries from 100 animals contained 340 *corpora lutea,* the population from which this sample was taken showed an ovulation incidence (number of eggs produced per female *per estrus*) of 3.4. Not all of these eggs can be legitimately expected to result in young beaver, however, since some may not be fertilized and some embryos may die during development. This figure is useful in estimating the reproductive capacity of a population and in making comparisons between populations, but otherwise it has limited application. Of greater concern to the wildlife manager is the actual number of animals being added to the population. In the ovarian analysis technique under discussion we can determine this figure by establishing a *parturition frequency* (the ratio of eggs released to young born). Determination of such a factor requires comparison of a sample of ovaries and the associated embryos from pregnant females in the area being studied. Such information can only be determined during a limited period, but once the parturition frequency has been established for a given area, the ovaries alone will suffice to estimate population gain from year to year. To calculate the addition to the population represented by the sample studied it is only necessary to multiply the number of *corpora albicantia* counted, by the parturition frequency factor. In addition to estimates of yearly increment, ovarian analyses will also indicate the date when breeding commences and the percentage of the population actually breeding, thus permitting regulation of the harvest to maintain the population at the desired level. Since the ovaries can be easily collected and stored in large numbers, and may be studied when time is available, they provide the biologist with a ready source of information on the population changes in an economically important animal which is difficult to census under most field conditions. This type of information is a prerequisite for the intelligent manipulation of any wild population.

JOINT SESSION GAME AND FISHERIES

ADMINISTRATIVE PROBLEMS WITH FISH AND GAME BIOLOGISTS

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After I accepted this assignment to discuss "Administrative Problems with Fish and Game Biologists," I have given considerable thought to just what is expected of this portion of the panel. After seeing the topics assigned to the other speakers, it would seem that there is a general feeling, at least by the program committee, that either biologists are a problem to administrators or that administrators are a problem to the biologists.