

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.

A search of the literature and previous papers which have been given at several meetings indicates that such problems have been with us for many years. Actually, since wildlife biology as such, is comparatively new, we can expect mutual problems to be with us for some years to come.

I hasten to explain that most of the problems of fish and game administration in connection with biological programs are influenced largely by the basic structure and stature of the fish and game department itself. I cannot see how any procedure or system for handling the biological programs of game and fish departments can be standardized or made uniform because of the great variation in the basic nature of the departments and the established authority of the administrators. Such things as legislative control of budgets and work programs, the number of commissioners involved and their administrative authority, together with the authority of the director, make these biological as well as all other problems, unique to each individual state.

Administrators have comparatively few problems in the fields of research when their department is closely associated with a college or university which has a well established wildlife curriculum or a cooperative wildlife research unit. On the other hand, administrators often have a rough time justifying research programs when they have no college connections and a very limited budget which must be appropriated to them item by item by the legislature.

I mention these items, which are not new to most of you, to emphasize the point that many of the problems of administrators and the biologists are not because of each other, but because of the system or atmosphere under which they operate. This is one of the mutual problems that biologists must understand and recognize when they accept employment in state service. I sometimes think that "rural contemporary sociology" should be a required major in wildlife biology.

That statement may sound like we are placing the blame for public apathy toward research on the biologists. Such is definitely not the case. It would help the administrators a great deal if more biologists understood this social problem more thoroughly. I don't like to reveal my age, but I well remember when, in some states "biologist" was an ugly name. Thank goodness those days are about over. There does still exist, however, too little public support of the biological approach to fish and game management. As you well know, there are more lay experts and authorities on fish and game management than all other sciences combined.

This lack of public acceptance is often very discouraging to biologists. Then it falls on the shoulders of the administrators to create a more favorable atmosphere for all concerned. This can be accomplished only by a give and take attitude and understanding. Someone said many years ago that the common sense solution to this matter was for the administrators to become a little more scientific and for the scientists to concentrate a little more on applied biology. The public, legislators and administrators need to see and understand the usable returns for biological investments.

I mentioned before that these biological problems depend on how the department is organized. Dr. W. J. K. Harkness summed it up most clearly in 1953 by explaining the three types of biological research and how they fit into fish and game administration.

First, is fundamental research. This is logically carried on at universities where the proper atmosphere for such studies is maintained.

Second, is applied research. Useful to administration and carried on through cooperative agreements and connections with universities such as cooperative wildlife research units.

Third, biological investigations. This is the type of information directly useful to administration for management programs and for designing regulations.

Therefore, the key men in fish and game biology are the administrative biologists. These personnel get their fundamental information from the universities, other states, the literature and of course, through years of experience. They are the administrator's right-hand men. Organization to effect a cooperative research program of this ideal nature is, of course, the responsibility of the administrator. Not all states have such desirable connections or facilities.

You are all familiar with the problems of family unity and cooperation between divisions within the department. Law enforcement personnel are gen-

erally the most numerous and through their various activities naturally contact more people than do personnel of any other division. They are frequently difficult to sell on research and if not well informed can make life miserable for biologists. Inexperienced biologists, however, too frequently see little connection between their work and that of other divisional personnel. The administrator is the goat when situations of this nature arise.

Part of this difficulty is often caused by the inability or reluctance due to lack of time of some biologists to explain their work to other personnel or to the public and sometimes even to the Commission. The administrator must be kept informed of research progress or he is at a loss to justify these studies when the going gets rough. It is quite natural for non-technical personnel to become impatient over the time often required for research before management recommendations are made. Long time research projects without progress reports cause disunity within the organization. The experienced biologist makes all other personnel of the department his helpers and keeps them informed of his objectives.

Another area of concern frequently develops when research reports are circulated publicly or within the department before administration has had the time and opportunity to set the stage for its acceptance. Initiation of radical changes in practices of long standing must be preceded by a cautious information and education program. Examples of such cases are controlled burning, doe deer season, split dove season, year-round fishing with liberal bag limits, protection of hawks and many regulatory measures of controversial nature even though they have a sound biological basis.

It is often necessary and natural for the administrators to shield the biologists from public criticism in order to give them the freedom and peace of mind necessary to their profession. The biologists need also to shield the administrators from criticism by channeling bits of information to them at frequent intervals which will head off misunderstanding on both sides. Biologists who are employed entirely by the department should prepare popular reports on their studies for direct use in the current program no matter how technical the end results may be. Administrators run into trouble when personnel are paid for several years of research work then an individual prepares a highly technical report or paper which he sits on until he can have it published in some scientific journal before he reveals its contents to the administrator, the public or other personnel. We are thankful that such cases are very rare. It is the responsibility of the administrators to keep advised of all research progress and at the same time not stifle the initiative and ambition of individuals to advance in their profession.

In this area there is another knotty problem which rears its ugly head. That is the case of the very capable student who comes to work all decked out with degrees from a prominent university. He accepts employment under the nominal pay scale of the department, then turns out a fine piece of research and suddenly discovers that he is worth much more than he is being paid and away he goes to a government job or some organization that offers more pay. Sometimes this happens even after administration has granted special privileges for more schooling on the job, time off for special courses, etc. Such cases result in the loss of considerable investment on the part of the department.

These problems have been mentioned here strictly for discussion purposes. I am not critical of any individuals, either biologists or administrators. As was stated in the beginning, these matters are either complicated or simplified according to the basic structure and administrator's authority within the department itself. It is the job of the administrator to determine how far he can go into biological fields considering the machinery he has to operate with. This same caution has to be exercised in all divisions of the organization. It's easy to go overboard in any direction. The biological field has no monopoly on this problem.

It is sound practice, generally speaking, to keep basic research in the universities, applied research in cooperative agreements and projects between universities and the department and investigations entirely within the department staff. That appears to be the safest policy and where it is practiced, the states