methods described. Thanks are due Mr. J. E. Davis for permitting us the use of his Dee Dot Ranch and its facilities for this work.

SUMMARY

A new method of trapping white-tailed deer employing cloth net drive-traps on planted foot plots was developed. It is considered especially useful where deer eat planted crops in preference to artificial or cereal baits.

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MANDIBULAR CAVITY TISSUE AS A POSSIBLE INDICATOR OF CONDITION IN DEER[1]

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ABSTRACT

Preliminary data suggest that the fat content of the soft tissue in the cavity under the grinding teeth of the mandible might be a useful indicator of condition in deer. Seven physical characteristics were measured on 85 deer. Statistical treatment of these data suggest a strong relationship between the fat content of the mandibular cavity tissue and the condition of the deer. Three of the five best correlations were between mandibular cavity tissue fat and other characteristics related to condition. Simple means of mandibular cavity tissue fat separated out three condition classes of deer effectively. Further research on the subject is suggested.

INTRODUCTION

The word, "condition," is commonly used by deer biologists to refer to the general state of health and well being of a deer or a deer herd as indicated by the extent of build up or depletion of fat reserves. The average condition of a herd may be used as an indicator of the adequacy of the herd's environment, to compare one herd with another, or to compare the same herd from year to year. Condition may be estimated during the hunting season by examining deer carcasses at checking stations. A common practice is to classify individuals in one of several

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classes, such as good, fair, or poor. Such subjective estimates may be useful for the game management biologist who personally examines deer, but, even with specific guidelines for such evaluation of condition, different people are likely to make different evaluations. As a result the estimates given by different biologists may not provide a valid comparison.

More objective methods, such as percentage of fat in the bone marrow, depth of back fat, and the amount of kidney fat, have been used as criteria of condition. Unfortunately, the parts of the carcass needed to make these tests (kidneys, back fat, and femurs) are not usually available to the biologists examining hunter-killed deer at a checking station. There remains, therefore, a need for a technique for objectively estimating the condition of a deer, using parts of the carcass commonly available at checking stations.

Using the method described by Marshall *et al.* (1964) for removal of a deer mandible without defacing the trophy, we collected mandibles from hunter-killed deer (*Odocoileus virginianus*) at the Choccolocco Game Management Area near Heflin, Alabama, primarily to double check the field estimate of ages of the deer. The Choccolocco hunters are accustomed to having their deer examined, and having various parts removed by biologists, and hunter acceptance of the removal was high. Although this acceptance might vary from place to place, the authors' experience indicates that good samples of mandibles could be obtained at checking stations. Thus, a technique involving use of the lower mandible need not be limited by inadequate samples.

In cleaning and studying mandibles, it was noted that a small bit of fatty tissue frequently protruded from the cut proximal end. Dissection of several mandibles revealed that considerable fat might be found in the cavity underlying the grinding teeth, and that the amount of tissue was sufficient for a fat assay. It seemed possible that this mandibular cavity tissue, hereinafter referred to as MCT, might be useful as an indicator of condition, and a technique involving its use was investigated.

Presented in this paper are some preliminary findings that suggest usefulness of MCT as an indicator of condition in deer.

REVIEW OF THE LITERATURE

While there is an extensive literature on the subject of the evaluation of condition, only a few papers are pertinent to the immediate subject. According to Harris (1945), in periods of low food intake, deer first lose subcutaneous fat, then visceral fat, and finally bone marrow fat. These fat deposits are replaced in reverse order when food is abundant. Riney (1955) demonstrated that in the red deer in New Zealand, kidney fat was the best of several indicators of condition tested. His technique, in brief, was to cut out and weigh a block of tissue the length of the kidney including the kidney and associated fatty tissue. The weight of associated fatty tissue expressed as a percentage of kidney weight, was the "kidney fat index." Ransom (1955) compared the kidney fat index to the percentage of fat in marrow of the femur and found the kidney fat index was most useful in fat deer and the marrow most useful in poor deer. This finding, of course, agrees with the description given by Harris (*loc. cit.*).

Cheatum (1949) described use of the femur marrow as an indicator of starvation in deer. This remains the best use for the technique, for the fat reserves in the marrow are not depleted until in the later stages of malnutrition.

METHODS

Collection and Preparation of Materials

Eighty-five deer were collected from February through August, 1965, from several areas in Alabama having good to high populations of deer. The primary purpose of the collections was to study reproduction. Data pertinent to this paper were recorded as follows: age, estimated by tooth replacement and wear; condition, estimated by use of such criteria as boniness of the tail and backline and recorded as good, poor, or fair; sex; and date of collection. A mandible and femur were collected from each carcass, labelled to permit later correlation with other characteristics of each deer, then kept frozen until they were prepared for analysis. Femurs were cracked and the marrow removed and mandibles were dissected with an electric bone saw. Both kinds of soft tissue were stored in stoppered vials and again frozen until time for analysis of fat content. Sex, estimated age, and condition of deer studied are summarized in Table 1.

Table 1. Summary of sex, age, and estimated condition of deer available for study

	External estimate of condition		
	Good	Fair	Poor
Females over 1-year old	22	22	9
Males over 1-year old	0	6	4
All yearlings	0	7	15
Total	22	35	28

Analysis of Fat Content

The tissue samples were dried and the fat assays made by the Soxhlet ether extract method. Laboratory reports listed the percentage of fat in the dried soft tissue of the femur and mandible of each deer.

Analysis of Data

Data concerning age, sex, weight, date of collection, condition, femur fat, and MCT fat were compiled for the 85 deer and submitted for computer analysis. The computer report included the correlation coefficients of each variable with each of the other six variables and a stepwise regression wherein the MCT fat was treated as the dependent variable. Further analysis of the data was made by calculating the means and 95 per cent confidence limits of the percentage of fat in the femur marrow and in the MCT for each of three groups of deer; those judged by the collector to be in poor, fair, or good condition.

RESULTS AND DISCUSSION

The computer-derived correlation coefficients are given in Table 2.

Table 2. Correlation coefficients of each of seven variables with each of the other variables, N=85

	Femur fat	Sex	Age	Weight	General condition	Date
Sex	0.266					
Age	0.268	0.345				
Weight	0.297	0.184	0.612			
General condition	0.402	0.312	0.291	0.535		
Date	-0.023	-0.074	-0.133	0.196	0.243	
MCT fat	0.396	0.221	0.148	0.507	0.478	0.599

None of the correlations was notably high. The best correlation was found between weight and age—a rather obvious relationship. Another obvious relationship was in the correlation of weight and general condition. The other three of the five best correlations were found between MCT fat and the three variables that would be most expected to be related to condition, i.e., weight, general condition, and date of collection. The latter is to be expected since the span of collection dates included the annual period when deer would normally be improving in condition. The correlation between MCT fat and the three variables mentioned was much better than that found between femur fat and the same three variables.

The stepwise regression analysis indicated that the date of collection, percentage of fat in the femur marrow, and weight were sufficient to account for 61 per cent of the variability found in the percentage of fat in the MCT. Since each of these three is related to condition, a moderate degree of relationship is indicated between the fat content of the MCT and the condition of the deer.

The means and confidence limits of the fat content of the marrow and of the MCT are of especial interest (Table 3 and Fig. 1). A better

Table 3. Means and 95 per cent confidence limits of the percentage fat in mandibular tissue and femur tissue by externally estimated condition classes

Condition Class	N	Means and 95 per cent confidence limits Mandibular tissue	Femur tissue
Poor	28	37.62 ± 8.08	27.09 ± 7.32
Fair	35	53.38 ± 6.90	37.58 ± 6.82
Good	22	66.30 ± 7.54	49.34 ± 9.07

separation of condition classes results from the MCT fat than from the femur marrow fat. Poor and fair classes are clearly separated by MCT fat. The difference between the fair and good classes might also have been significant with a slightly larger sample. With bone marrow, on the other hand, there is a considerable overlap between body condition classes.

The cavity underlying the molariform teeth of the mandible in mammals contains the blood vessels and nerves that supply the mandibular teeth and parts of the face. Nerve fibers contain some fatty substance that is not metabolically active, i.e., this fat would not be affected by the condition of the deer. This fat content in deer is not known, but it must be small for in some very poor deer the percentage of fat found in the MCT was as low as 1.5 per cent. The corresponding fat content in the femur marrow of the same deer was 3.3 per cent. If this figure of 1.5 per cent is taken as the minimum fat of the MCT, then this tissue would appear to store a higher percentage of metabolically active fat than does the femur marrow. This is apparent from Table 3 and Figure 1 wherein the difference between the two types of tissue range from approximately 10 to 17 per cent — well above what appears to be the basic minimum fat of the nerve tissue.

At this time we do not have a really good measure of condition with which to compare the MCT fat content. While the external estimate of condition used for comparison with the fat content is subjective, variation in estimates made in this study were probably minimal since they were all made by the same person. Considering the relatively good correlation of MCT fat with other factors known to be related to body condition and the rather clear separation of condition classes by the MCT fat content, it seems that MCT may prove to be a useful index to the condition of deer. In view of the availability of the mandible compared to other body parts, at least, the technique should be further explored using more definite estimates of condition as a means of comparison.

Further study of the technique should also attempt to define exactly what MCT fat is and where it fits into the fat build up and depletion sequence. Techniques for removing and assaying the tissue need to be improved and made less expensive if the technique is to be practical.

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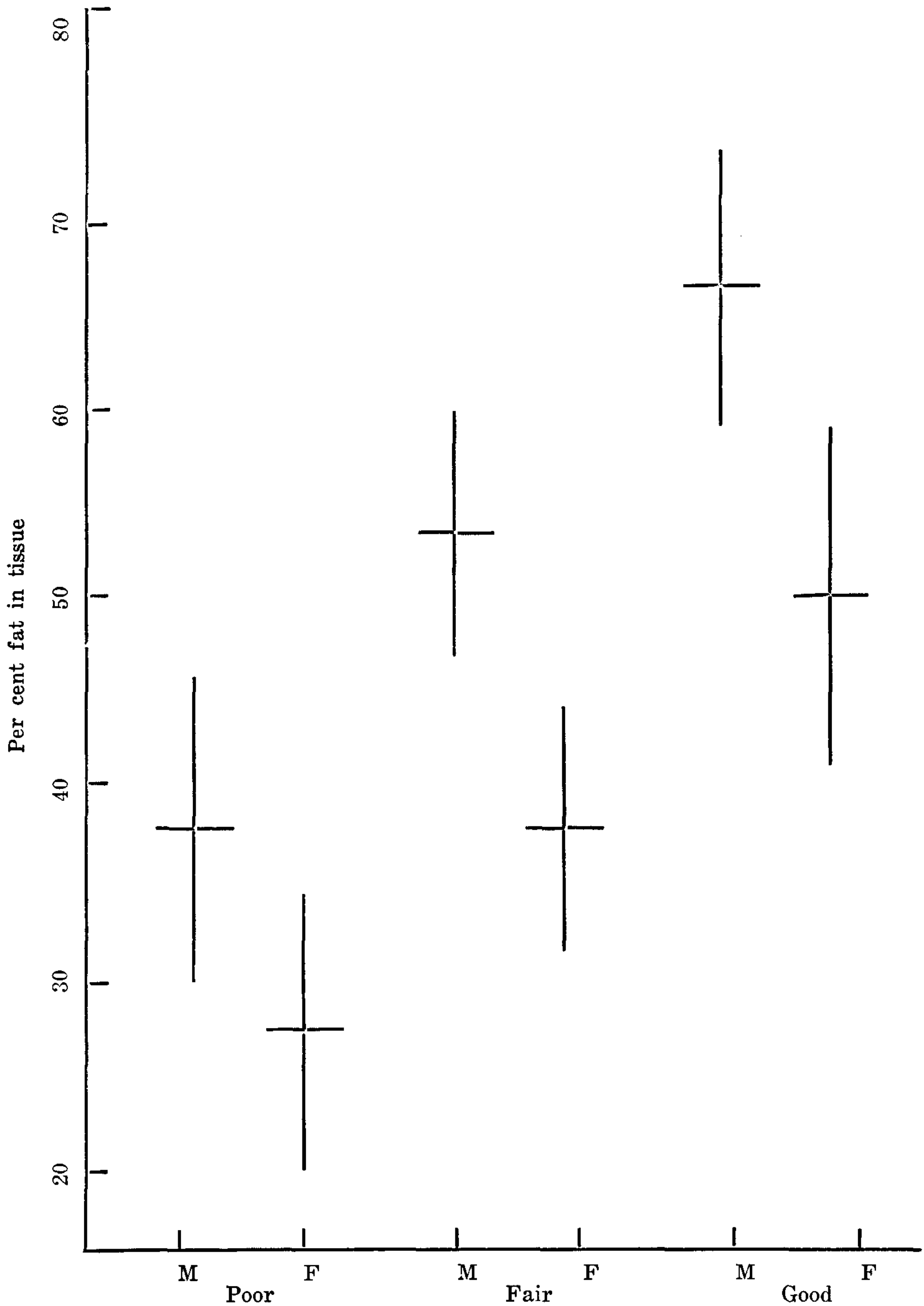

Figure 1. Means and 95 per cent confidence limits of the per cent-fat in mandibular cavity tissue (M) and femur marrow (F) arranged by type of tissue and condition class. Each horizontal line represents a mean and each vertical line represents a confidence limit. cf. Table 3.

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MOVEMENTS OF TRANSPLANTED EUROPEAN WILD BOAR IN NORTH CAROLINA AND TENNESSEE [1]

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ABSTRACT

Movements and homing instinct of transplanted European wild boar were studied on adjacent wildlife management areas in western North Carolina and eastern Tennessee over a six-year period (1960-1965). Ninety-one wild boars were live-trapped within the Great Smoky Mountains National Park, transferred to the game department representing the state within which they were captured, ear-tagged for subsequent identification, and released at distances ranging from 13 to 27 airline miles from the point of capture. Movements information was derived by (1) recovering tags and pertinent kill data from hunters, (2) retrapping, and (3) locating dead animals. Hunters reported tags from 26 (28.5 percent) of the transplanted wild boars during the study period. Hunter-killed boars had traveled airline distances of from one-half mile to approximately 14 miles from the release site and were killed at time intervals ranging from one day to over three years following the release date. None of the transplanted wild boar were known to return to the Great Smoky Mountains National Park as determined both by a continuous trapping program and the direct removal of 44 additional animals from areas of heavy concentration within the park.

The objective of this study was to determine movements and homing instinct of European wild boar (*Sus scrofa L.*) transplanted from the Great Smoky Mountains National Park to wildlife management and adjacent areas in North Carolina and Tennessee. Boars were removed from the park because of wildlife management policies adopted by the National Park Service which specify the perpetuation of native fauna and the elimination or reduction of exotic species (National Park Service, 1955).

Under the terms of cooperative agreements, hogs trapped within the park were given to the game department representing the state within which they were captured for use in supplementing established hog populations on lands managed by that state. State agencies represented were the North Carolina Wildlife Resources Commission and the Tennessee Game and Fish Commission.

This paper presents movement data on transplanted wild boar collected during a six-year period, 1960 through 1965, and discusses homing instinct.

The terms *wild boar* and *wild hog*, or *hog*, are used interchangeably in the present paper to denote descendents of 13 swine of European

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