refuge and released approximately six miles from the trap site in the Fisheating Creek Management Area. Ten years later, this same turkey was retrapped in the refuge again. The original band was worn very thin, so it was removed and a new band put on in its place. This hen was then taken to the Collier Wildlife Management Area and released. If the turkey is still alive at this time, she is approximately 15 years of age. This hen obviously is an exception to the average life expectancy of about eighteen months.

The increase of band returns in the sixth year obviously deviates from the declining return curves (Table 2). This, at first, was somewhat perplexing until it was discovered that four of the six returns in this sixth year from banding were received from areas that had been restocked with turkeys trapped under the Pittman-Robertson Program in the early 1950's. Since these areas were closed to hunting for five years following release, these returns represent turkeys that had been subjected to only one year of hunting pressure instead of six. This must be considered in analyzing Table 2. It must be remembered that these data were derived from returns on turkeys banded after they had passed their most critical period, i.e., nesting and poult mortality. In addition, since over 90 per cent of the returns are from hunter kills, the information reflects gunning harvest rather than overall mortality factors. This must constantly be kept in mind since it would be fallacious to assume that hunting accounts for 90 per cent of a turkey population's overall mortality.

AN EYE LENS-NUTRITION STUDY OF PENNED EUROPEAN WILD HOGS[1]

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INTRODUCTION

The eye lens-nutrition study described in this paper was conducted as a part of the Tennessee Game and Fish Commission's European Wild Hog Research Project. One objective of the project is to develop an aging technique for the European wild hog (*Sus scrofa*). One technique under consideration is use of the dried eye lens weight.

A method of aging cottontail rabbits (*Sylvilagus floridanus*) was developed by using the dried eye lens weight (Lord, 1959). This technique has been tried with varying success for several game mammals: gray fox (*Urocyon cinereoargenteus* [Lord, 1961]); raccoon (*Procyon lotor* [Sanderson, 1961]); and antelope (*Antilocapra americana* [Kolenosky and Miller, 1962]).

The use of this technique poses one problem: the effect, if any, nutrition has on the eye lens weight. Lord reported that the lenses of pen-raised deer, presumably fed a high level of nutrition, were heavier than those of wild deer of corresponding age (Lord, 1962).

A controlled experiment was designed to determine if the eye lens weights of pen-raised European wild hogs are affected by nutrition.

PROCEDURE

Animals of the same sex were used in the study to eliminate any difference in eye lens growth that may occur between the sexes. By random selection males were chosen over female hogs. The selection of the 24 hogs from a total of 30 male hogs available was made by using a random numbers table. The hogs were placed at random into six pens with four hogs per pen. The estimated starting weight of the hogs was 20-30 pounds.

The experiment was a completely randomized design. There were

[1] A contribution from Federal Aid in Wildlife Restoration project W-35-R, Game Division, Tennessee Game and Fish Commission.

three treatments with each treatment duplicated. The treatments were a 40 per cent protein ration, an 18 per cent protein ration, and dent yellow corn. The chemical analysis and ingredients of the three rations are found in Table 1. The rations were placed in metal self-feeders with a constant supply of feed always available.

Comparing the three rations with the nutrient requirements of young boar hogs (National Research Council, 1959) the 18 per cent protein ration best fits the needs of young boar hogs. The 40 per cent protein ration is far in excess of the protein and energy, inorganic nutrients and vitamins required for young boar hogs, and the corn ration is deficient in the protein and energy, inorganic nutrients and vitamins.

The animals were sacrificed by an injection of succinylcholine chloride into the hindquarters. Both eyeballs were removed unless punctured, and placed in a solution of 10 per cent formalin. After fixation the eye lenses were removed from the eyeballs and placed into pre-weighed aluminum dishes. The eye lenses and dishes were then weighed to the nearest one hundred-thousandths of a gram on a Mettler electric balance. After being weighed they were inserted into a drying oven at 100° C. After a period of drying, the eye lenses and pans were placed in a glass desiccator and allowed to cool until they reached room temperature. The pans and eye lenses were then weighed and replaced in the oven. The drying and weighing procedure continued until the eye lenses weighed within a margin of .03 per cent error or less.

RESULTS

The experiment was originally planned to last one year but due to the poor condition of the pigs on the yellow corn ration, the experiment was terminated at 119 days.

The body weights and dried eye lens weights for the three treatments are given in Table 2. Two hogs died during the experiment; the data was obtained from the remaining 22 hogs.

TABLE 1: FEED ANALYSIS

	Corn	18% Pig & Sow	40% Hog Concentrate
Crude Protein (Min.)	8.7 to 9.1%	18%	40%
Crude Fat (Min.)	2.0 to 2.1%	2.50%	1.50%
Crude Fiber (Max.)	3.9%	7.00%	8.00%
Vitamin D-3	— 0 —	125 U.S.P./lb.	500 U.S.P./lb.
Vitamin A (Caroten)	2 mg/lb.	2450 U.S.P./lb.	1500 U.S.P./lb.
Riboflavin	.7 mg/lb.	1.90 mg/lb.	2.20 mg/lb.
Niacin	11.3 mg/lb.	25.20 mg/lb.	17.85 mg/lb.
Pantothentic Acid (True)	2.8 mg/lb.	5.50 mg/lb.	7.10 mg/lb.
Choline (True)	2.84 mg/lb.	530.00 mg/lb.	1040.25 mg/lb.
B-12	— 0 —	6.50 mg/lb.	7.90 mg/lb.
Antibiotic-Aureomycin	— 0 —	5 gm/ton	— 0 —
	— 0 —	5 gm/ton	— 0 —
Manganese	.14%	22.70 mg/lb.	113.50 mg/lb.
Iron	9 mg/lb.	22.70 mg/lb.	113.50 mg/lb.
Copper	1.1 mg/lb.	2.27 mg/lb.	11.35 mg/lb.
Cobalt	— 0 —	.23 mg/lb.	1.14 mg/lb.
Iodide	— 0 —	.68 mg/lb.	3.40 mg/lb.
Zinc	8.9 mg/lb.	22.70 mg/lb.	113.50 mg/lb.
Calcium	.03%	.81%	3.12%
Phosphorus (Available)	.31%	.74%	1.28%
Salt	— 0 —	.50%	2.00%

To determine if the difference in eye lens weights is significant, an analysis of variance was computed (Table 3). No significant difference was found between the 40 per cent and 18 per cent ration or between the 40 per cent ration and yellow corn. A significant difference ($P<.05$) exists between the 18 per cent ration and yellow corn.

The rations also caused a difference in body weights; the heaviest body weights were those of the hogs fed the 18 per cent ration, followed by the 40 per cent ration. The lightest weights were those of the hogs fed the yellow corn ration. A highly significant difference ($P<.005$) exists among the body weights (Table 4).

TABLE 2: DRIED EYE LENSES AND BODY WEIGHTS DATA FOR THE THREE TREATMENTS

Treatment 1 — 18%

Ear Notch	Eye Lens Weight in Grams	Body Weights in Pounds
64	.12325 - .12285	103.0
35	.12795 - .12835	101.5
48	.12965 - .12990	116.0
62	.12790 - .12835	100.0
8	.12360 - .12420	114.5
28	.11990 - .11900	103.0
16	.12420 - .12390	94.0
Mean Weight	.12521	104.6

Treatment 2 — 40% Protein

Ear Notch	Eye Lens Weight in Grams	Body Weights in Pounds
34	.12545 - .12540	74.0
63	.12070 - .12090	88.5
55	.13755	97.0
55S	.11920 - .11890	81.0
35	.11965 - .12000	78.0
43	.11345 - .11480	84.0
52	.11600	71.0
54	.10590 - .10780	57.0
Mean Weight	.11897	78.8

Treatment 3 — Yellow Corn

Ear Notch	Eye Lens Weight in Grams	Body Weights in Pounds
61	.09895 - .09700	22.5
30	.10295	22.5
18	.11360	26.5
31	.11420	20.5
26	.11420 - .11235	20.5
59	.11155	27.0
12	.10705	16.0
Mean Weight	.10687	22.2

TABLE 3: ANALYSIS OF VARIANCE OF EYE LENS DATA

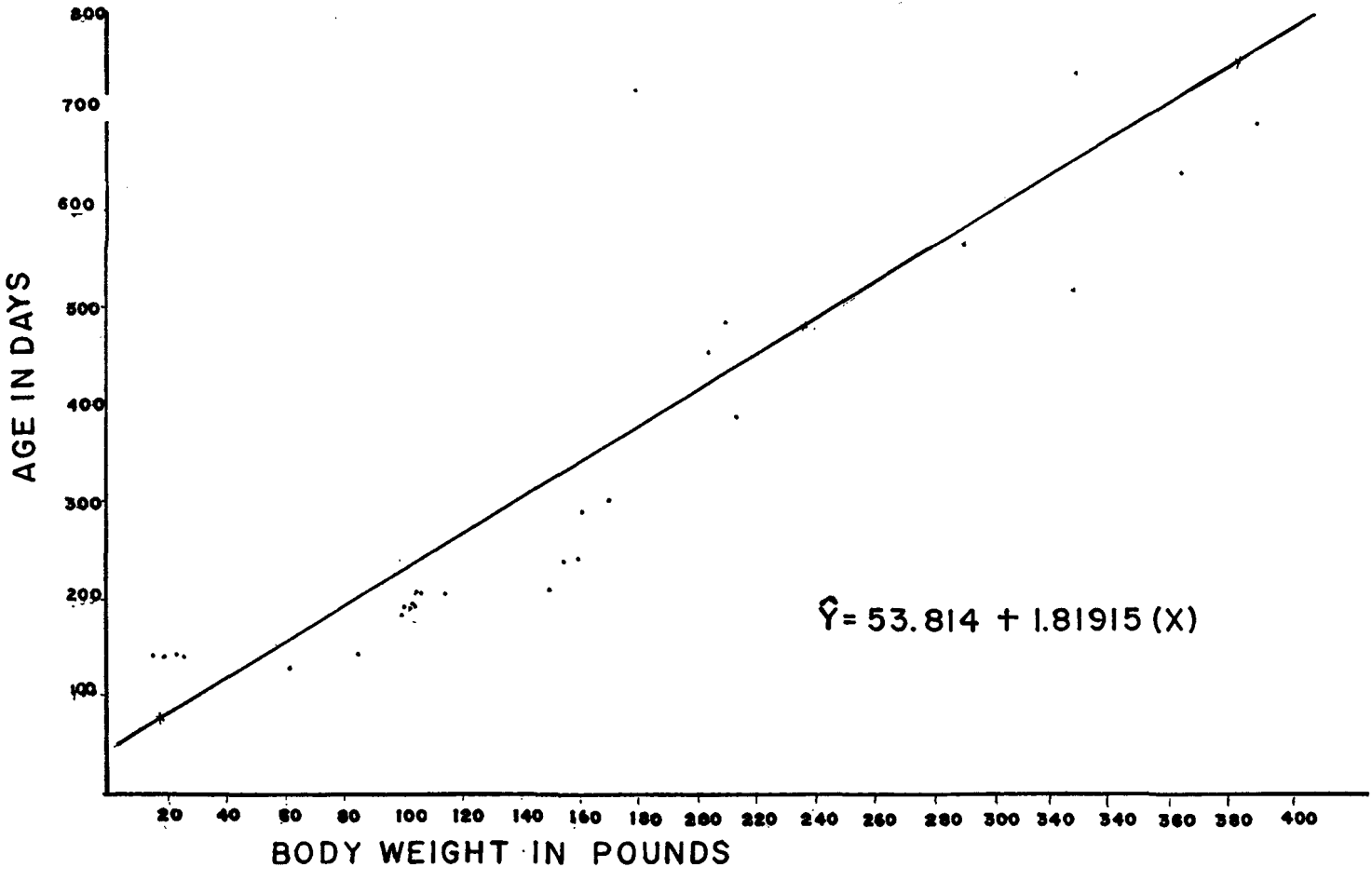
Source of Variation	Degree of Freedom	Mean Square	F	P
Treatment	2	.0009254	5.25	$<.11$
18% P. vs. 40% P.*	1	.0002722	1.54	$>.25$
18% P. vs. Y.C. *	1	.0018431	10.46	$<.05$
40% P. vs. Y.C. *	1	.0005029	4.56	$>.10$
Experimental Error	3	.0001762		
Sampling Error	31	.0000243		

*Non-orthogonal comparison

TABLE 4: ANALYSIS OF VARIANCE FOR BODY WEIGHT

Source	Degree of Freedom	Sum of Squares	Mean Square	F	P
Treatment	2	25043.5	12521.7	160.4384	$<.005$
		1482.89			
Error	19	26526.4			
Total	21				

FIG. I. REGRESSION OF AGE ON BODY WEIGHT



An analysis of convariance was computed for the average eye lens weights corrected for the relationship to body weight (Table 5). A nonsignificant difference (P>.25) in the F-test indicates the significant difference in treatments of the uncorrected eye lens weights was really due to the relationship of eye lens weights to body weights and not due to the treatments, except as treatments affect body weights, and through this medium, the eye lens weight.

The controlled feeding experiment showed that nutrition affects the body weight which in turn affects the eye lens weight.

The body weights of the hogs were, however, too variable to be an indicator of age. The mean body weights were: 104.6 pounds for the hogs on treatment one, 78.8 pounds for the hogs on treatment two, and 22.2 pounds for the hogs on treatment three (Table 2).

The eye lens weights were also variable and were not an accurate indicator of age as the relationship between age and eye lens weight is not significant at the 95 per cent confidence limits (t=1.694, P>10).

Under penned conditions known-age European wild hogs were raised from birth on an 18 per cent protein ration. Periodically a hog was sacrificed and the body and eye lens weights were recorded. Data have been obtained on animals up to 24 months of age. For the animals raised under these controlled conditions body weight is an indicator of age (t=4.469, P>.005) (Fig. 1). The relationship between eye lens weight and age is also significant (t=21.53, P<.005) (Fig. 2).

TABLE 5: ANALYSIS OF COVARIANCE FOR THE AVERAGE EYE LENS WEIGHTS CORRECTED FOR THE RELATIONSHIP TO BODY WEIGHT

Source	Regression Coefficient	Degrees of Freedom	Sum of Squares	Mean Squares	F	P
Treatment 1	.0000506678E	5	.0000780041E	.0000156008		
Treatment 2	.000576669E	6	.000224349E	.0000373915		
Treatment 3	.000429764E	5	.000192431E	.0000384862		
Within		16	.000494784	.0000309240		
Regression Coefficient		2	.0000759838	.0000379919	1.2285	P > .25
Common	.000434333	18	.000570768	.0000317093		
Adjusted Means		2	.0000653141	.0000326570	1.0298	P > .25
Total		20	.000636082			
Const. Term	.0876316					
Std. Error	.000146230					
Coef. of Var.	.0478913					

DISCUSSION

When body weight indicates age, eye lens weight will also indicate age, and when body weight fails as an indicator of age, eye lens also normally fails.

Because of the many environmental factors influencing the body weight of the wild hogs, the body weight fails as an indicator of age (Matschke, 1961). Trapping data indicates that there are periods of the year that the wild hogs lose weight; nursing sows also lose weight while suckling. Consequently, the eye lens weights of wild hogs are not a reliable indicator of age.

FIG. 2. REGRESSION OF AGE ON EYE LENS WEIGHT

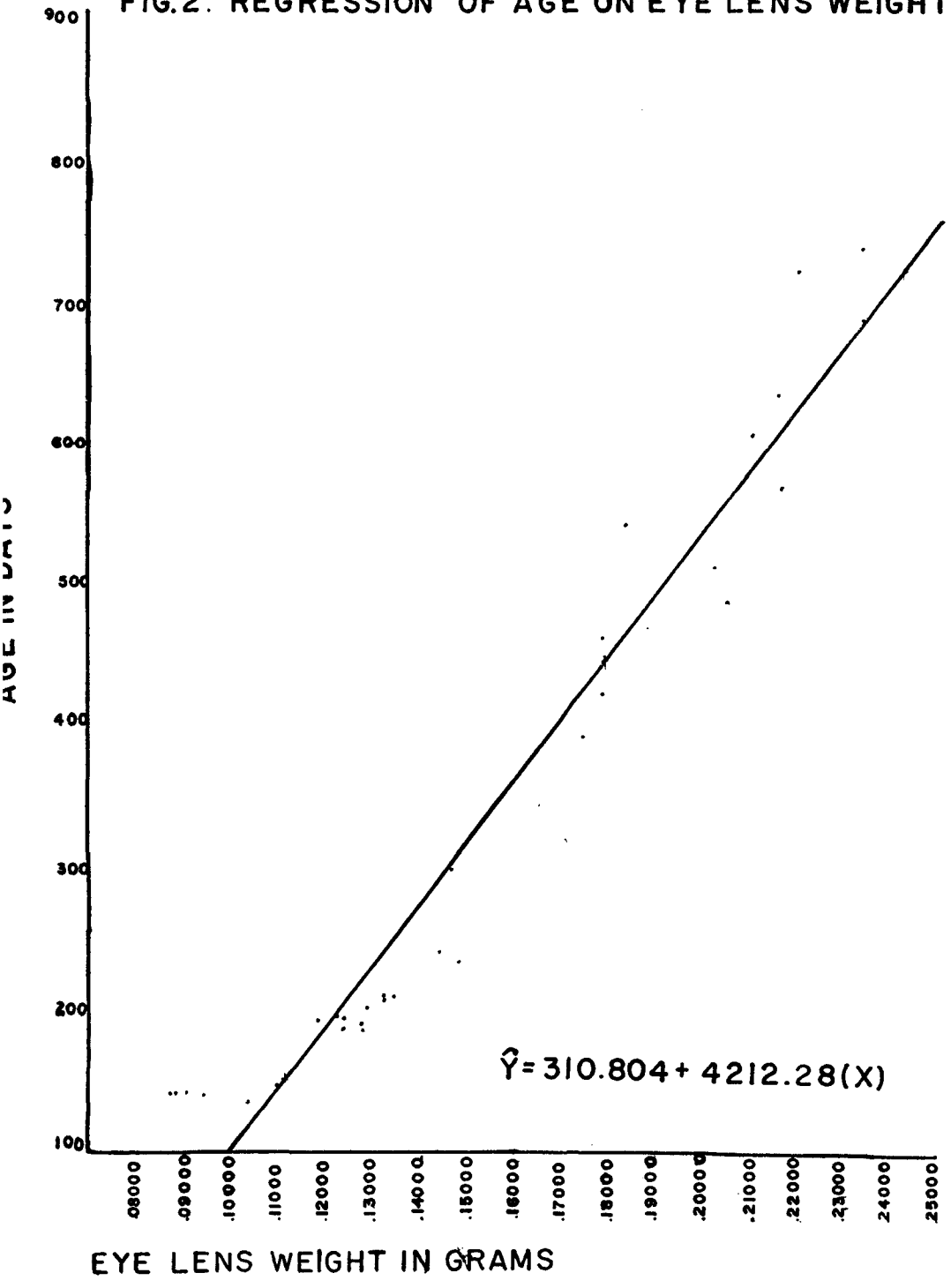
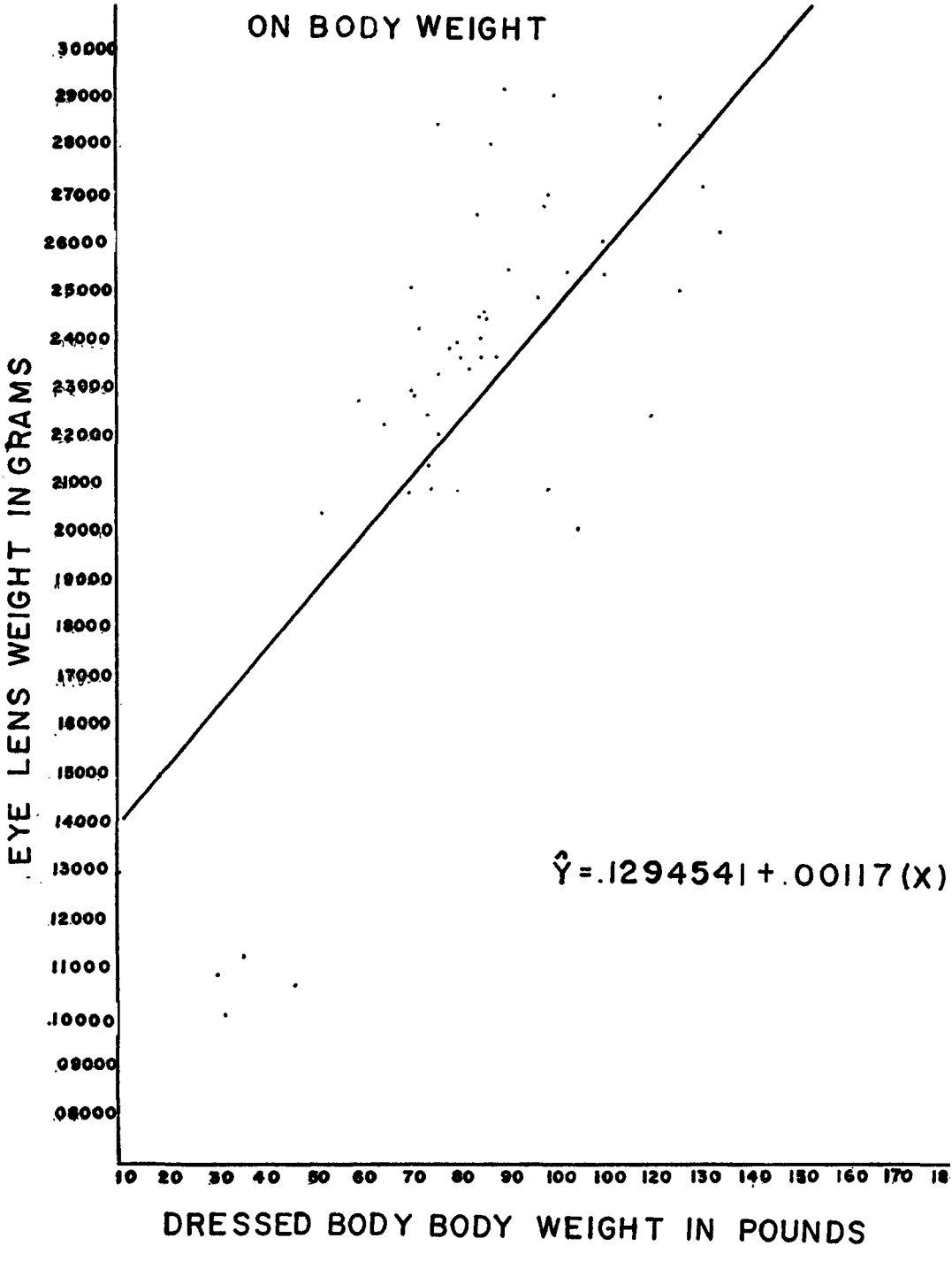


FIG. 3. REGRESSION OF EYE LENS WEIGHT ON BODY WEIGHT



SUMMARY

A controlled study was designed to determine the effect of nutrition on eye lens weight. A significant difference occurred between the 18 per cent protein and yellow corn treatments; however, the difference in eye lens weights was really due to the relationship of eye lens weights to body weights and not due to the treatments except as treatments affect body weight and through this medium the eye lens weight.

Under controlled conditions dried eye lens weights can be used to age pen-raised European wild hogs.

For the European wild hogs, dried eye lens weight is not useful as an indicator of age.

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DEER AND WILD TURKEY AT A BARGAIN

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South Carolina Wildlife Resources Department is providing good hunting on Piedmont Management areas with a minimum expenditure of funds, about fifteen cents an acre per year.

This low cost is possible for the following reasons:

1. When the sites of the areas are selected, very careful attention is paid to the natural food already available on the proposed areas.

2. Excellent public cooperation is assured by creating a desire, if not already present, for the areas before they are established.

Management areas for public hunting in the Piedmont section of South Carolina were initiated by selecting parts of the Sumter National Forest that seemed most suited to deer and wild turkey from a natural habitat point of view. The Piedmont part of the Sumter National Forest is composed of three districts located in nine counties. Now areas made up entirely of private lands are being developed. Areas selected for management should contain a minimum of 12,000 acres in a common block with plenty of hardwoods, browse and water available. If the