1972

Development of Techniques for Distribution of Baits To Raccoon for Chemosterilant Studies

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DEVELOPMENT OF TECHNIQUES FOR DISTRIBUTION OF BAITS TO RACCOON FOR CHEMOSTERILANT STUDIES

By

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A thesis submitted
in partial fulfillment of the requirements for the
degree Master of Science, Major in
Wildlife Biology, South Dakota
State University

1972

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OF BAITS TO RACCOON

FOR CHEMOSTERILANT STUDIES

This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable as meeting the thesis requirements for this degree, but without implying that the conclusions reached by the candidate are necessarily the conclusions of the major department.

ABSTRACT

Sudan Red IV, Sudan Black B, and demethylchlortetracycline (DMCT) were tested as physiological markers in baits for raccoon (Procyon lotor). DMCT was readily detected in the jawbone of raccoons given 50 mg when examined under an ultraviolet light at periods of 7, 30, 75, and 450 days following treatment. Seven days after administering 75 mg of Sudan Red IV, it could not be detected in fat deposits. Sudan Black B, administered in similar dosage, could not be detected at 30 days.

A total of 1826 chicken eggs containing 50 mg DMCT was distributed on a 25 square-mile study area between August 20 and September 15, 1970. Animals were later collected on that area from September 27 to December 31, 1970 and during April, 1971. Thirty-one raccoons were collected and 27 (88 percent) were marked. Of 21 skunks (Mephitis mephitis) collected, 6 (29 percent) were marked. It appears that a raccoon population could be controlled if a chemical were available for distribution in late summer or fall that would render an animal sterile the next breeding season.

Diethylstilbestrol (DES), which is effective only during the breeding season, was field tested. Female raccoons were collected and maximum uterine swellings for each embryo in the uterus were measured to determine embryo age and date of conception. Dates of conception

of raccoon in Brookings County, 1971, extended from February 14 to March 7, a span of 22 days. In the field study on evaluation of DES, baits were distributed in March, 1971; however raccoons collected had not consumed baits. An operational baiting technique during this period of the year is needed.

Tail, hind-foot, body, and rump-to-crown length measurements were found to be reliable to estimate embryo age. These measurements follow a quadratic curve when plotted against embryo age ($P<0.01$).

ACKNOWLEDGMENTS

I express sincere appreciation to Dr. Raymond L. Linder, Leader, South Dakota Cooperative Wildlife Research Unit, for advice throughout the project and aid in preparing the manuscript. Mr. Robert B. Dahlgren, Assistant Leader, gave helpful suggestions throughout the study and in editing the manuscript. Dr. Donald R. Progulske and Dr. Ernest J. Hugghins helped edit the manuscript and their critical review is appreciated. Thanks are due Dr. W. L. Tucker for advice on statistical analysis.

Appreciation is extended to the private land owners whose cooperation was necessary for the success of the study.

Lederle Laboratories, a division of American Cyanamid Company, furnished materials (DMCT) used for field evaluation.

Special thanks are also extended to all the students who helped with night spotlighting.

My wife, Bunny, gave much encouragement throughout the course of the study.

Financial support for the project was given through the South Dakota Cooperative Wildlife Research Unit, sponsored jointly by the U. S. Bureau of Sport Fisheries and Wildlife; South Dakota Department of Game, Fish and Parks using Federal Aid in Fish and Wildlife

Restoration funds (Project W-75-R); South Dakota State University; and the Wildlife Management Institute.

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INTRODUCTION

Many animal populations have been controlled by man. Control techniques have varied from widespread use of poisons to trapping individual animals. A technique which has received attention recently is the use of chemicals to limit reproduction. Balser (1964) summarized the advantages of suppressing reproduction rather than removing animals from a population and his conclusions were:

(1) It may be more practical to prevent animals from being born than to reduce their numbers after they are partially or fully grown and established in a secure environment.

(2) Increasing one or more mortality factors often results in a compensating increase in reproduction and/or survival. This reduces the effectiveness of trapping and poisoning programs for control. With use of chemicals to suppress reproduction, compensatory increases may not occur.

(3) Non-toxic antifertility agents are safer to use than lethal agents and likely would be more readily accepted by the public. This could result in more effective population control in areas where use of lethal techniques is now restricted.

Data are limited on use of chemosterilants as a control technique for large mammals. Linhart and Enders (1964) found that fox vixens

(Vulpes fulva) given diethylstilbestrol (DES) 9 days before mating to 10 days after mating failed to produce offspring. In tests on penned coyotes (Canis latrans), Balser (1964) reported that 100 mg of DES terminated pregnancy in six females captured in early March. He also found 20 percent reproductive success in the coyote following distribution of DES-treated drop baits in southeastern New Mexico as compared with 100 percent reproductive success on a reference area. Storm and Sanderson (1969) could not detect significant reduction in striped skunk (Mephitis mephitis) productivity in their field trials with DES. Linhart et al. (1968) reported limited success in controlling coyote populations and suggested that better techniques for bait distribution were needed.

Many people consider the raccoon (Procyon lotor) a pest animal in eastern South Dakota and believe it should be controlled. Present control techniques are by trapping and use of poisons. In 1969 a project was initiated to evaluate use of a reproductive inhibitor to replace the use of poisons.

Since baiting techniques had not been developed for use with a chemosterilant in South Dakota and information on time of breeding of raccoon in South Dakota was limited, specific objectives of this study were to (1) develop baiting techniques, (2) determine breeding season of the raccoon and (3) conduct a preliminary evaluation of DES as a reproductive inhibitor.

DESCRIPTION OF STUDY AREAS

Two locations were used for study, the Sinai area on which the bait distribution phases were conducted and an area in the vicinity of the Big Sioux River where the DES was evaluated. Most of the effort was exerted on the 25 square-mile Sinai area which is located in southwestern Brookings and northeastern Lake Counties, South Dakota.

The Sinai area is situated in the southwest part of the Coteau des Prairie physiographic region, a highland area between the Minnesota Red River Lowland to the east and the James River Lowland to the west. It slopes gently to the south and west and is drained to the south by the Big Sioux River, whose tributary streams enter mainly from the east. West of the Big Sioux River, the surface of the Coteau is dotted with lakes, while very few lakes occur east of the river (Westin and Buntley 1962). Topography is gentle sloping and wetland basins are found among hilly portions of the area (U. S. Dept. of Commerce, 1893-1965). The soil is a Cary drift characterized by loam till and patchy loess (Westin et al. 1959). The study area has 50 wetlands which range from 300 acres to small potholes less than an acre in size (Fig. 1). The continental climate of the area has extreme heat and cold with rapid temperature fluctuations. Temperatures rise above 100^{o} F in the summer and drop to -20^{o} F or lower in winter. The average annual precipitation is 20.4 inches, of which 16.3 inches (80 percent) falls during the growing season. Snowfall averages 23 inches per year, but

annual totals have varied from 4 inches to more than 70 inches per year (U. S. Dept. of Commerce 1893-1965).

The 10 square-mile study area used to evaluate DES was located in the flood plain of the Big Sioux River, 5 miles west of Brookings, in east-central South Dakota. The area included 5 miles of the Big Sioux River and extended one mile from each side of the river. For complete description of the area, see study of "Mobility and Behavior of Raccoons in South Dakota" by Geis (1966).

Frogs (Rana sp.) and crayfish (Cambarus sp.) were generally abundant during the summer and fall on both areas. Mammals common to the area were raccoon, striped skunk, red fox, badger (Taxidea taxus), mink (Mustela vison), white-tailed jackrabbit (Lepus townsendii), muskrat (Ondatra zibethica), white-tailed deer (Odocoileus virginianus), eastern fox squirrel (Sciurus niger) and numerous small rodents (names of mammals are taken from Burt and Grossenheider 1964).

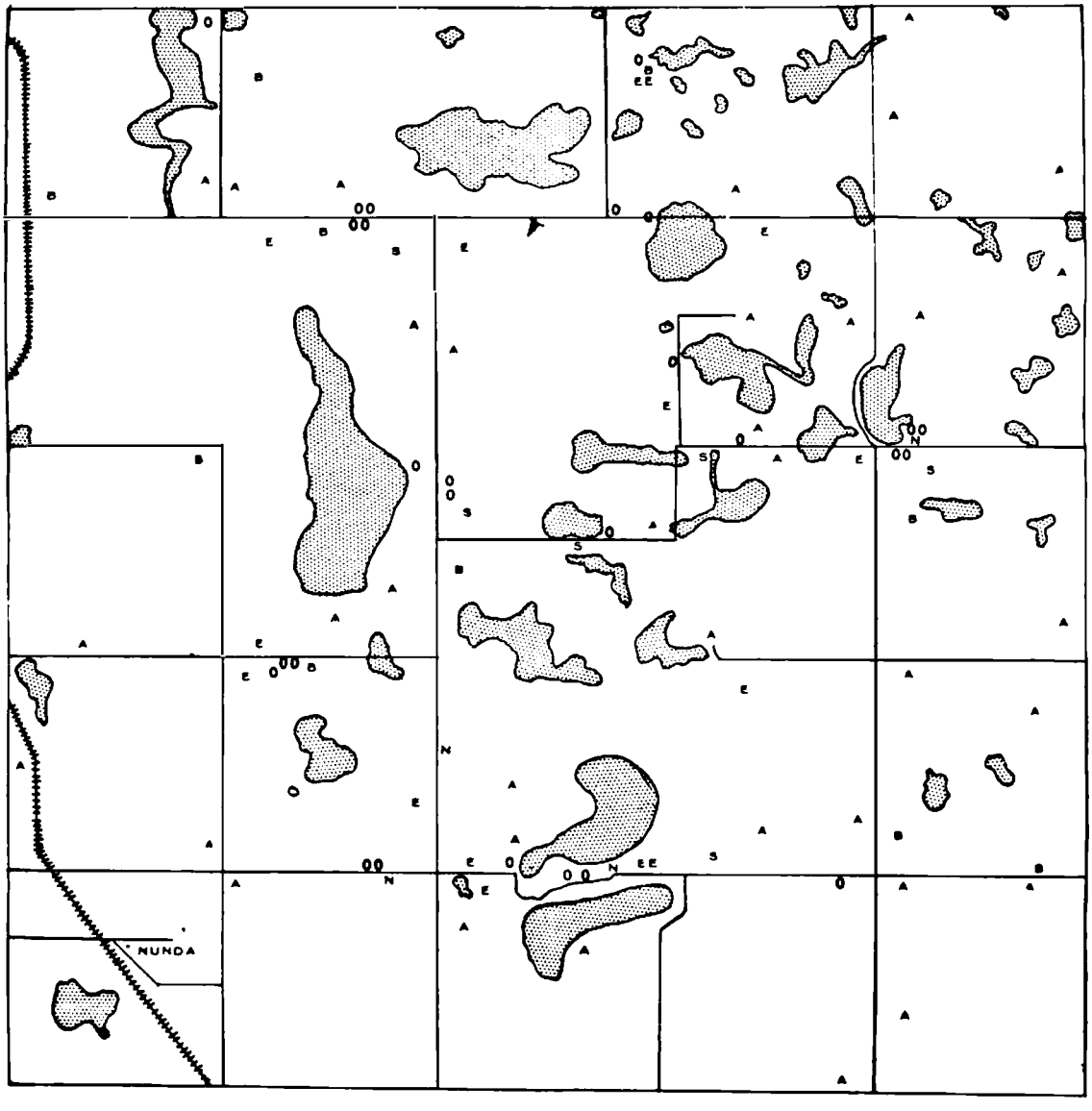

Fig. 1 Sinai study area showing collection sites, farm locations, and wetland areas.

A - Active Farms
B - Abandoned Farms
O - Raccoon Marked
N - Raccoon Not Marked
S - Skunk Marked
E - Skunk Not Marked

METHODS

Development of baits and a physiological marker

If one can identify animals that have consumed baits in a field study, he can measure effectiveness of bait distribution and also effectiveness of the chemical administered. In order to identify animals eating baits, it was necessary to find a physiological marker that could be incorporated in the baits. Penned raccoons were used to make tests of potential physiological markers. Compounds tested were Sudan Red IV, Sudan Black B and demethylchlortetracycline (DMCT). Sudan Red IV and Sudan Black B are fat-soluble dyes that are deposited in fat tissue. DMCT is an antibiotic that forms a stable calcium complex in bone tissue and fluoresces under an ultraviolet light (Linhart and Kennelly 1967).

One male raccoon was treated with 50 mg DMCT, 75 mg Sudan Red IV and 75 mg Sudan Black B. After a period of 7 days the animal was sacrificed and tissues were examined visually for presence of the markers.

Eight raccoons were treated with 50 mg DMCT; four of these animals were also treated with 75 mg Sudan Red IV and the other four were treated with 75 mg Sudan Black B. After 30 days three animals were sacrificed, one control animal, one marked with DMCT and Sudan Red IV, and one marked with DMCT and Sudan Black B. After 75 days, five animals were sacrificed, one control animal, two marked with DMCT and

Sudan Red IV, and two marked with DMCT and Sudan Black B. The remaining two animals were sacrificed and examined 15 months after treatment. Bone and fat tissues were examined visually for presence of the markers.

Untreated chicken eggs and chicken eggs containing DMCT were placed in artificial clutches along travel lanes of raccoons near the Big Sioux River in Brookings County to test their acceptability by raccoons. Each of 5 clutches contained 2 treated eggs and 2 control eggs. Treated eggs had been injected with 50 mg DMCT mixed in 1 cc cherry-flavored syrup to mask the taste (Fig. 2). Clutches were rechecked 48 hours after placement to compare acceptability of treated and untreated eggs.

During studies with DES in the spring, it became apparent that raccoon were not taking tallow baits. A bait acceptance experiment was conducted in March to determine if a suitable bait could be found. One hundred mg DES were mixed with each of tallow, chicken eggs, ground corn and honey, canned cat food, hamburger balls, and leaf lard. One of each of the six baits was placed in a group 1 foot apart at two bait stations in or around six abandoned farms where raccoon sign was evident. Baiting stations were rechecked 24 hours later and type of bait taken was recorded.

Fig. 2. Chicken eggs were injected with DMCT, a physiological marker.

Fig. 3. Egg baits containing DMCT were placed where raccoon sign was present.

Effectiveness of Bait Distribution

Chicken eggs containing 50 mg DMCT masked in 1 cc cherry-flavored syrup were distributed in a 25 square-mile study area (Fig. 1). Eggs were distributed wherever raccoon sign was present which resulted in placing most eggs near wetlands (Fig. 3). Eggs were placed around every wetland on the study area. To increase chances of individuals taking baits four eggs, rather than one, were placed at each baiting site because families of raccoons were still moving together. A mixture of peanut butter and marshmallow cream was smeared on weeds and trees near baiting sites to serve as an attractant. A few eggs were placed where signs of skunks were seen. A total of 1826 eggs was distributed at bait sites on the study area from August 20 to September 15, 1970. A check of 50 baiting sites was made to determine the percentage of eggs taken.

To determine what percentage of the raccoon and skunk populations consumed baits, animals were collected from September 27 to December 31, 1970, and during April, 1971, by trapping and night spotlighting. Night spotlighting was conducted by driving roads on the area and looking for eyeshines. Raccoons and skunks were collected by shooting with a shotgun and location on the study area was noted. Jawbones were removed and taken to the laboratory for examination of presence of DMCT under ultraviolet light.

Jawbones were cleaned and examined before they were exposed to visible light for long periods of time since exposure to light fades the quality of the fluorescence (Linhart and Kennelly 1967). Numbers of marked animals were compared to numbers of unmarked animals to determine the percentage of the raccoon and skunk populations that were reached by this baiting method.

Studies to Determine Breeding Season

To determine dates of conception, 11 pregnant raccoons were collected and maximum measurements of uterine swelling for each embryo in the uterus were taken. Ages of the embryos were estimated by comparing these measurements with data presented by Sanderson (1961) on eight litters of raccoons in Illinois. The mean of the uterine swelling measurements of each litter was used for comparison. Sanderson's data were used for comparison instead of a similar work by Llewellyn (1953) because of a larger sample size on which Sanderson based his graph. Dates of conception were obtained by determining embryo age and dating back from collection date. All dates were recorded to the nearest one-half day for plotting purposes on the graphs.

Tail, hind-foot, body and rump-to-crown length measurements were obtained on 50 embryos from the 11 litters of raccoons to determine if those measurements were reliable for estimating embryo age. Polynomial regression was used to determine if these four measurements fit a quadratic curve when plotted against age.

Evaluation of Chemosterilant

Tallow baits containing 100 mg DES and 50 mg DMCT were distributed on the study area along the Big Sioux River from March 1 to March 5, 1971. Abandoned farms and old buildings appeared to be the major winter denning sites for raccoon; and tallow baits were placed where raccoon sign was present, mainly near denning sites. After it was found that tallow baits were not being taken, chicken eggs were substituted as bait. Eggs were injected with 50 mg DMCT masked with 1 cc cherry-flavored syrup and 100 mg DES dissolved in 2 cc corn oil. Placement of egg baits was the same as the technique used for placement of tallow baits, except that a mixture of peanut butter and marshmallow cream was used as an attractant. Two hundred and fifty eggs were distributed on the area between March 10-20 and eggs not taken were removed March 30.

A check of 106 baiting sites was made to determine what percentage of the treated eggs were taken. Raccoons were collected from the area during April-May, 1971.

RESULTS AND DISCUSSION

Development of baits and a physiological marker

All bones of raccoons receiving 50 mg DMCT fluoresced under an ultraviolet light. The jawbone was selected to detect the presence of the marker since it appeared to have the greatest quality of fluorescence and was easy to dissect from the animal.

Quality of fluorescence appeared to be greatest in animals sacrificed 7 days after treatment. No difference in quality of fluorescence could be detected between animals sacrificed at 30 and 75 days. Fluorescence was not as pronounced in animals sacrificed 15 months after treatment as in animals checked after shorter periods. Linhart and Kennelly (1967) found that fluorescence in coyotes given 10 mg DMCT/kg body weight could be readily detected up to 5.5 years. Apparently, DMCT will serve as an excellent marker for enabling field evaluation of a chemosterilant. DMCT does have a bitter taste and a masking agent was used to insure acceptance of baits. Cherry-flavored syrup proved to be an excellent agent to mask the taste of DMCT.

Sudan Red IV could not be detected in fat deposits of one animal 7 days after administration of 75 mg. Sudan Black B, administered in similar dosages, could be detected as a blue cast at 7 days but could not be seen at 30 days. Sudan Red IV and Sudan Black B were not suitable as physiological markers for this field study.

In the field study five clutches of chicken eggs, with each clutch containing two DMCT-treated eggs and two control eggs, were consumed before they were rechecked 48 hours later. Eggs containing 50 mg DMCT appeared to be accepted as readily as control eggs. During the study on effectiveness of bait distribution on the Sinai study area, 200 of the 1826 DMCT-treated eggs were checked and 199 were consumed within 6 days after placement.

Egg baits and leaf lard were the most readily accepted baits in the study of bait preference conducted during March (Table 1). It was not determined whether raccoons or skunks were taking the baits, but fresh raccoon sign was present at every baiting site. Both raccoon and skunks used the same buildings as denning sites on the Sinai study area.

Effectiveness of Bait Distribution

Twenty-eight raccoons and 14 skunks were collected by spotlighting and 3 raccoons and 7 skunks were collected by trapping on the Sinai study area. During the first collection period, September to December, 1970, 22 raccoons and 17 skunks were collected. DMCT was detected in 20 (91 percent) of the raccoons and 5 (29 percent) of the skunks (Table 2). Nine raccoons and 4 skunks were collected on the study area during April, 1971. Evidence of DMCT was detected in 7 (78 percent) of the raccoons and 1 (25 percent) of the skunks. During the 9 months following placement of the baits, evidence of DMCT was detected in 27 (88 percent) of the 31 raccoons and 6 (29 percent) of the 21 skunks (Table 2).

Raccoons were collected from throughout the study area and were usually near wetland areas (Fig. 1). There appeared to be no

Table 1. Baits consumed by animals at two baiting sites on each of six abandoned farms; one of each bait was placed at each site, March, 1971.

Location	Baiting Site	Type of Bait					
		Egg	Leaf Lard	Hamburger Balls	Cat Food	Tallow	Corn Meal and Honey
Farm 1	A		X	X			
	B		X	X			
Farm 2	A	X					
	B	X					
Farm 3	A	X					
	B	X	X	X	X	X	X
Farm 4	A		X				
	B	X					
Farm 5	A		X				
	B	X	X				
Farm 6	A	X					
	B	X					
Total		8	6	3	1	1	1
Percent		67	50	25	8.5	8.5	8.5

difference in the percentage of marked animals collected on the outer 16 sections and the inner 9 sections of the study area (Table 2). Evidently there was limited movement onto the study area during the period of study.

Table 2. Numbers of raccoons and skunks collected from the central nine sections and outer 16 sections of a 25 square-mile study area near Sinai, South Dakota. Baits were distributed August, 1970.

Location and Dates of Collection	Raccoons			Skunks		
	Number Collected	Number Marked	Percentage Marked	Number Collected	Number Marked	Percentage Marked
September-December (1970)						
Central 9 Sections	14	13	93	13	4	31
Outer 16 Sections	8	7	88	4	1	25
Total 25 square-miles	22	20	91	17	5	29
April (1971)						
Central 9 Sections	7	6	86	4	1	25
Outer 16 Sections	2	1	50	-	-	-
Total 25 square-miles	9	7	78	4	1	25
Total of All Collections	31	27	88	21	6	29

Three raccoons and one skunk collected on sections adjacent to the study area were not marked. Evidence of DMCT could not be detected in six feral cats and two badgers collected on the study area.

In the study on effectiveness of bait distribution, 88 percent of the raccoons and 29 percent of the skunks consumed baits. Reaching 88 percent of the raccoon on an area with a bait containing an effective chemosterilant would have a significant effect on the population. It seems unlikely that survival and/or reproductive increases could occur to offset the chemosterilant's effect. It is difficult to evaluate what effect reaching 29 percent of the skunks with a bait containing an effective chemosterilant would have on the population. A theoretical model to show the maximum effect of reaching 30 percent of the skunk population can be constructed. The assumptions necessary are that all females reproduce with an average of 3 young females per adult female and an annual mortality of 75 percent. Litter size and mortality approximate data reported by Verts (1967) in Illinois. With a 30 percent reduction in fecundity, 2.1 young females would be produced per adult female. This is a reduction of 22.5 percent of the skunk population in one year. Compounded over 4 years, a population would be reduced by 64 percent. There are several compensatory mechanisms that could occur to reduce effectiveness. Compensatory increases could occur in survival rates, litter size, and number of females producing offspring. Trautman (1971) reported that a

reduction of 78 percent of the fox by use of poisons resulted in a 69 percent increase in litter size, from 4.70 to 7.94 young per female.

Studies to Determine Breeding Season

The timing of distribution of baits containing DES is important, because DES is effective only during the breeding season. Dates of conception were estimated by comparing maximum size of uterine swellings in animals collected with data presented by Sanderson (1961) (Fig. 4). He used the least squares method to fit a line to his data and was able to estimate date of conception with a maximum error of 4 days. In Brookings County, dates of conception in 11 litters of raccoons collected in 1971 were between February 14 and March 7, a span of 22 days (Table 3). This would be the time for distribution of a bait containing a chemosterilant, such as DES.

Rump-to-crown, hind-foot, tail and body length measurements of 50 raccoon embryos were determined to be useful measurements to calculate embryo age. These measurements follow a quadratic curve ($P<0.01$) when plotted against age (Fig. 5 & 6). They are not as variable as uterine swelling measurements and could be used if the uterus was ruptured during collection or when working with road-killed animals. Uterine swelling and rump-to-crown measurements should be taken when the specimen is fresh whereas tail, hind-foot, and body length measurements can be readily taken from preserved specimens.

Table 3. Calculated dates of conception and average measurements of uterine swellings in raccoons collected from Brookings, County, South Dakota, 1971.

Female Number	Date Collected	Number of Embryos	Average Maximum Uterine Swelling (mm)	Embryo Age (days)	Date of Conception
1	4/14/71	5	48.6	39.0	3/7/71
2	4/21/71	5	71.2	51.0	3/2/71
3	4/21/71	2	78.5	54.5	2/26/71
4	4/23/71	3	79.0	55.0	2/28/71
5	4/20/71	5	86.5	58.5	2/22/71
6	4/24/71	5	88.8	60.0	2/24/71
7	4/14/71	6	89.1	60.0	2/14/71
8	4/24/71	5	90.3	60.5	2/24/71
9	4/21/71	7	100.4	62.0	2/20/71
10	4/22/71	2	101.5	62.0	2/21/71
11	4/23/71	5	---	66.0	2/17/71

Evaluation of Chemosterilant

None of the tallow baits containing 50 mg DMCT and 100 mg DES distributed on the Big Sioux study area was taken before the bait sites were rechecked. Chicken eggs were used as an alternative bait. A sample of the 250 treated eggs distributed was rechecked 6 days after placement and 68 of 106 eggs (64 percent) were taken. Eggs were removed from the sites on March 30 because after this point a

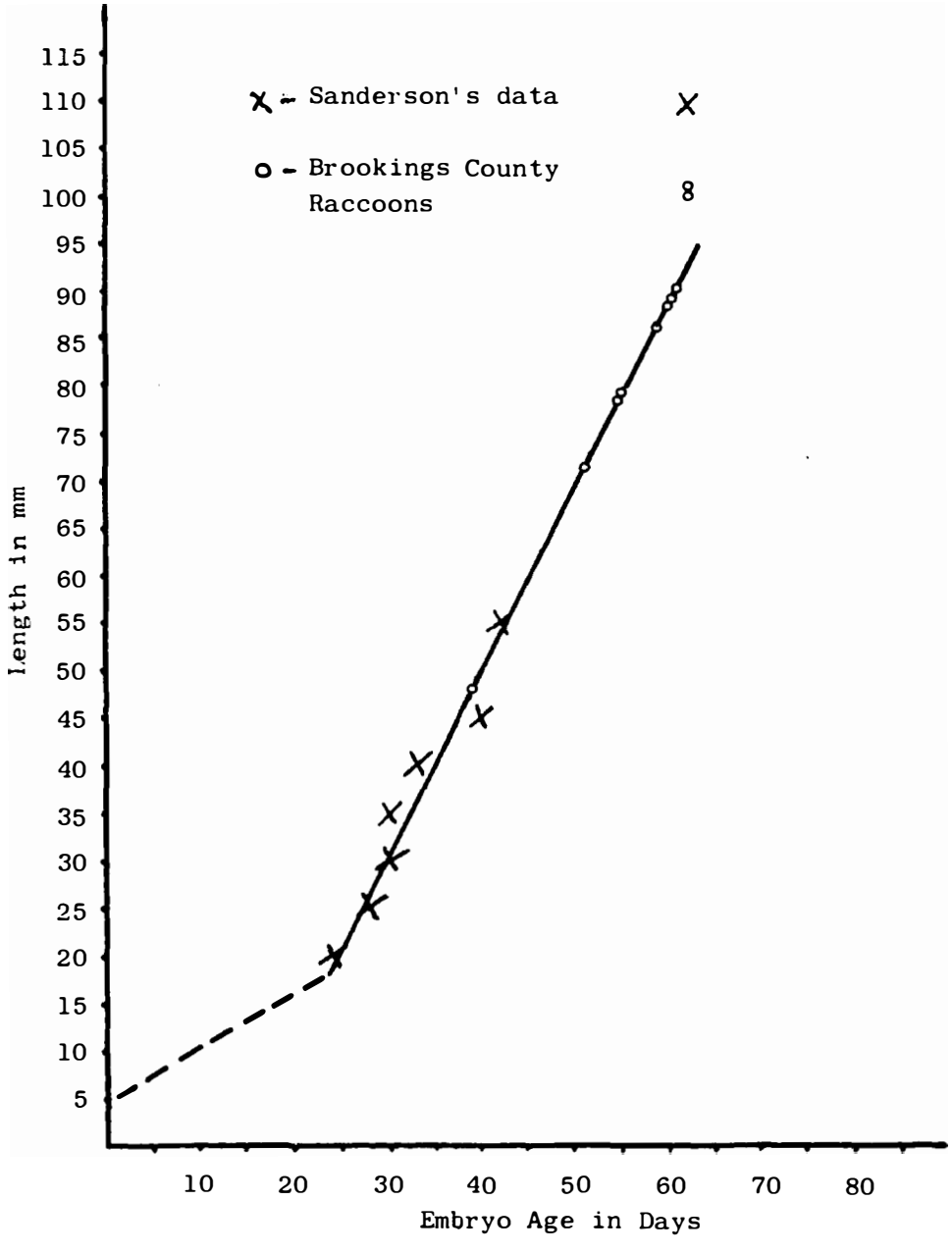

Fig. 4. Embryo ages were estimated by comparison with a curve developed by Sanderson (1961) using uterine swelling measurements.

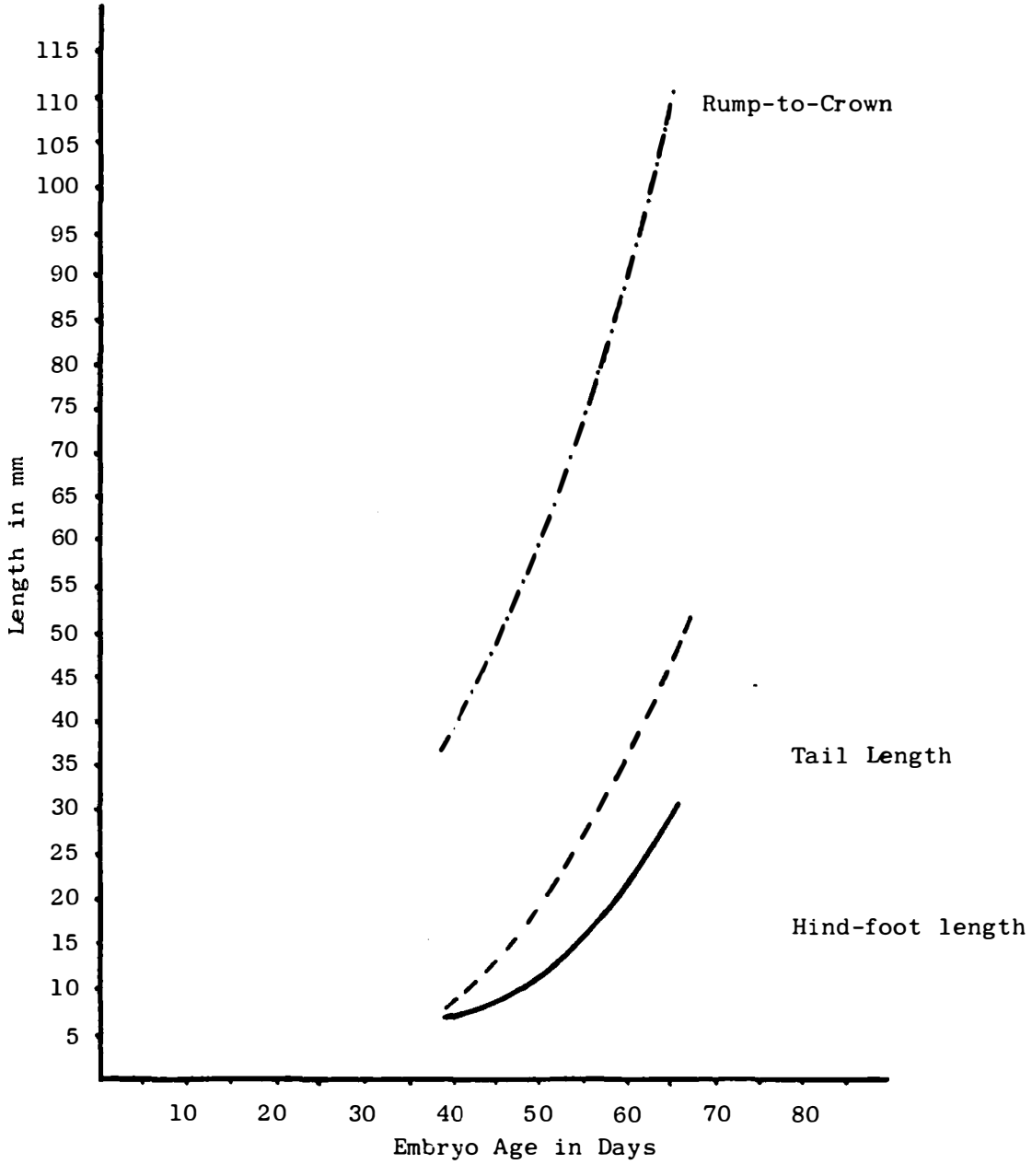

Fig. 5. Relationship between embryo age and rump-to-crown, tail, and hind-foot length as calculated from raccoons collected in Brookings County, 1971.

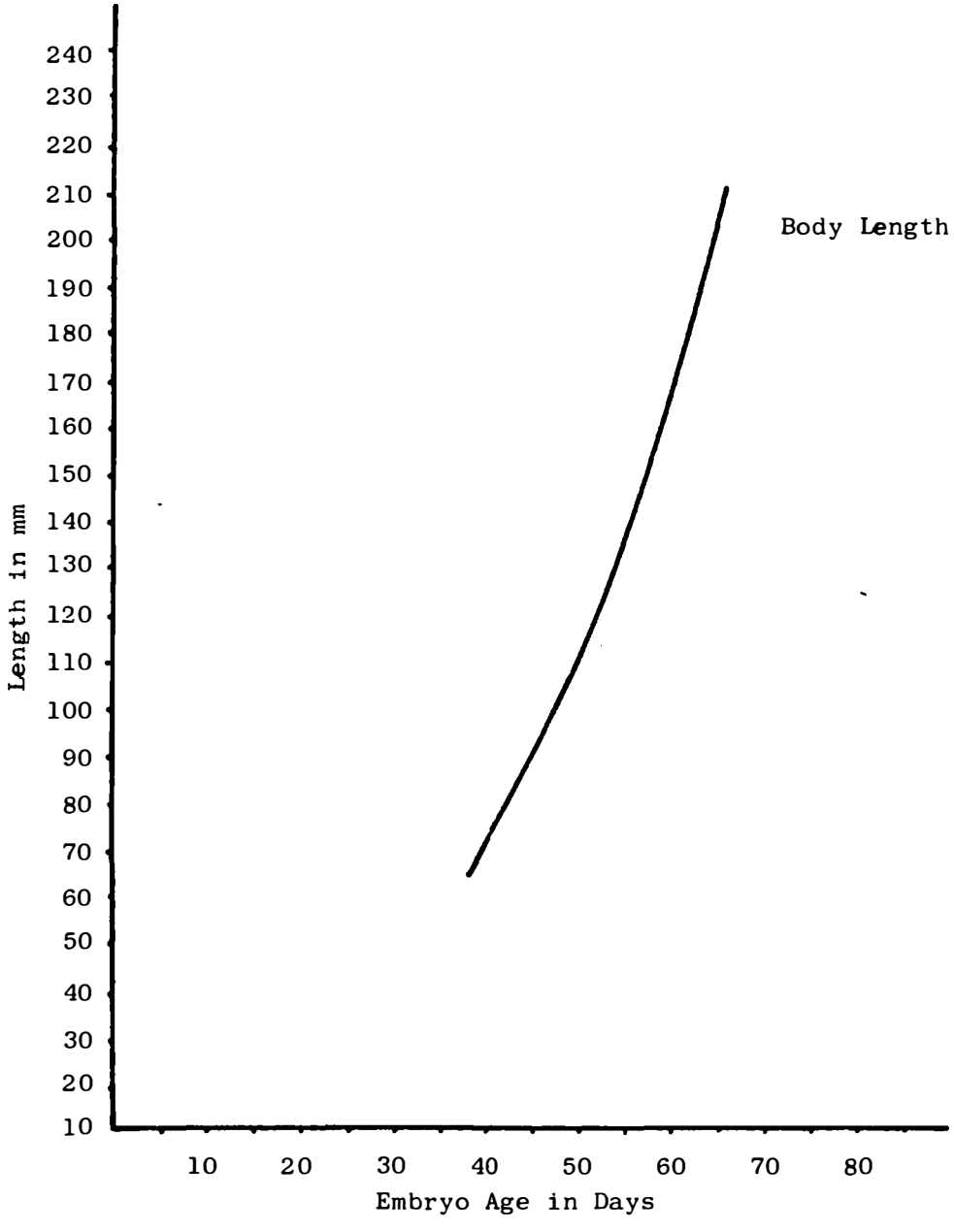

Fig. 6. Relationship between embryo age and body length as calculated from raccoons collected in Brookings County, 1971.

raccoon could possibly consume a bait with no effect on reproduction and still be marked with DMCT. Ten raccoons were collected from the area during April, 1971, and evidence of DMCT could not be detected in any. This indicated that raccoons had not taken baits or that there was movement into the area. Raccoons may winter in abandoned farms away from the river and move into the river when food becomes more abundant along the river banks.

CONCLUSIONS

Eighty-eight percent of the raccoons ingested baits that were distributed between August 20 and September 15, 1970. It appears that a raccoon population could be controlled if a chemical were available for distribution at that time and would render the animal sterile for the next breeding season. It is not known if reaching 30 percent of a skunk population with a bait containing an effective chemosterilant would control their numbers.

Distribution of chemosterilants, such as DES, which are effective only during the breeding season, presents many problems. During February and March, which is the breeding season and time DES should be distributed, temperatures are low in South Dakota. During these periods of low temperature, many preferred baits such as eggs freeze and cannot be used. It also appears that raccoons do not take baits readily during these weather conditions.

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APPENDIX

APPENDIX TABLE A--Measurement, collection dates, and age of embryo collected in Brookings County, 1971
Figures 5 and 6 are based on these measurements*
(measurements are in mm)

Litter Number	Calculated Age	Date Collected	Maximum Uterine Swelling	Rump-to-Crown Measurement	Tail Length	Hind Foot Length	Body Length
1	39	4/14/71	51	36	9	6	56
	39	4/14/71	46	34	9	6	54
	39	4/14/71	48	36	9	6	55
	39	4/14/71	48	35	9	6	55
	39	4/14/71	50	36	9	6	56
2	51	4/21/71	78	71	27	12	112
	51	4/21/71	67	64	26	13	107
	51	4/21/71	75	67	27	12	95
	51	4/21/71	-	67	24	11	100
	51	4/21/71	65	61	25	12	108
3	54.5	4/21/71	78	69	30	15	121
	54.5	4/21/71	79	74	30	15	126
4	55	4/23/71	83	75	27	15	121
	55	4/23/71	77	74	30	15	121
	55	4/23/71	77	73	31	16	120
5	58.5	4/20/71	88	81	36	18	146
	58.5	4/20/71	87	82	35	19	145
	58.5	4/20/71	87	81	34	18	143
	58.5	4/20/71	84	80	33	17	138
	58.5	4/20/71	-	-	33	17	137
6	60	4/24/71	87	84	39	20	160
	60	4/24/71	90	89	39	21	160

APPENDIX TABLE A, Continued

Litter Number	Calculated Age	Date Collected	Maximum Uterine Swelling	Rump-to-Crown Measurement	Tail Length	Hind Foot Length	Body Length
6	60	4/24/71	91	88	38	21	165
	60	4/24/71	87	83	39	21	157
	60	4/24/71	89	82	40	21	162
7	60	4/14/71	85	83	37	21	153
	60	4/14/71	91	90	36	20	154
	60	4/14/71	91	90	37	21	152
	60	4/14/71	89	89	36	20	152
	60	4/14/71	87	87	36	21	156
	60	4/14/71	92	91	37	21	154
8	60.5	4/24/71	89.5	86	42	22	161
	60.5	4/24/71	91	84	40	21.5	159
	60.5	4/24/71	91	87.5	39	22	161
	60.5	4/24/71	87	85	46	23	162
	60.5	4/24/71	93	86	41	22	161
9	62	4/22/71	94	90	41	25	177
	62	4/22/71	109	107	41	25	172
10	62	4/21/71	101	100	45	23	181
	62	4/21/71	105	102.5	43	23	183
	62	4/21/71	100	97	48	24	175
	62	4/21/71	99	87	46	24	174
	62	4/21/71	97	86	45	24	175
	62	4/21/71	-	102	45	24	178
	62	4/21/71	-	95	47	25	180

APPENDIX TABLE A, Continued

Litter Number	Calculated Age	Date Collected	Maximum Uterine Swelling	Rump-to-Crown Measurement	Tail Length	Hind Foot Length	Body Length
11	66	4/23/71	—	120	55	32	205
	66	4/23/71	—	118	55	30	201
	66	4/23/71	—	-	53	30	203
	66	4/23/71	—	111	51	32	205
	66	4/23/71	—	113	52	30	202

APPENDIX TABLE B--Formulas used to obtain points to plot body, hind foot, tail, and rump-to-crown length curves.

Tail Length = $22.6265 - (1.4768)(\text{days}) + (0.0292)(\text{days})^2$

Hind Foot Length = $52.7491 - (1.4300)(\text{days}) + (0.0317)(\text{days})^2$

Body Length = $13.1961 - (6.3927)(\text{days}) + (0.0114)(\text{days})^2$

Rump-to-Crown = $55.1780 - (2.4012)(\text{days}) + (0.0493)(\text{days})^2$