Lake 8. Another was recaptured in the same area almost four years after its release in another area 12 miles away.

SUMMARY

From 1959 through 1965, 2,024 alligators were captured, marked and released in Southwestern Louisiana. The alligators were captured on Rockefeller Wildlife Refuge and Sabine National Wildlife Refuge. The data from tagged animals plus numerous observations on the refuges provided information for this paper.

Movement was greater among immature alligators (less than six feet long) than adults. However, no difference was noted in the movement of tagged immature alligators from three to six feet long.

Tagged alligators captured and released at the same site moved farther and farther from the site as time progressed. Of those recaptured after three years, 67 per cent dispersed over one mile from the release site.

The factors listed as having an effect on natural movement were temperature changes, the breeding season, high water conditions, drought, food supply and water salinity.

Tagged alligators transported elsewhere for release moved three to four times greater than normal and showed strong homing instincts. Of those recaptured two years or more after release, 83 per cent had dispersed eight miles or more from the release site.

ACKNOWLEDGMENTS

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INTERPRETATION OF SOME ALABAMA DEER TRAPPING DATA

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During the winter seasons from January 1960 through February 1965, Alabama Department of Conservation personnel trapped 1,983 deer on two privately owned areas. This paper is an attempt to interpret the catch per trap-night, sex ratios, fawn ratios, population densities and movements from records kept during the several trapping periods.

The trapping of deer for restocking purposes in Alabama was confined to state-owned lands prior to 1960. The records of trap-nights or

the catches of animals that were not moved were often incomplete and rarely comparable. In the spring of 1960, permission was granted the Department of Conservation to remove deer for restocking from private lands in Marengo County. In the fall of 1960, the Department was requested to trap and move a large number of deer in Sumter County.

The primary purpose of this trapping was to get deer for restocking. However, there were some restrictions imposed by the landowners. At least some of the bucks had to be returned to the area. The number (or proportion) of male deer that were returned depended upon the wishes of the landowner. This varied between areas and between years. Returned animals were tagged and released at the trapsite.

Ralph H. Allen, Jr., Chief, State Game Management Section set up the trapping and recording procedures and conducted or supervised the operation throughout the period. The author analyzed the records and interpreted the findings in order to plan an extensive erperimental trapping operation where the primary purpose will be to obtain population estimates.

DESCRIPTION OF AREAS

The area in Marengo County is known as Shady Grove Plantation. It is a 6,700-acre block of bottomland timber interspersed with large cultivated fields and improved pasture. The adjacent Tombigbee River overflows almost annually. The higher ridges of the region are covered in the high floods at about 10 to 15-year intervals. For several years prior to and during the trapping operation, the area was managed primarily for deer and turkey hunting. Some cattle were present. Corn was the main row crop and that portion not eaten by deer in the field was harvested and fed back to the deer during the winter season. In addition, a considerable acreage of winter crops including clovers, oats, wheat, rye grass and rye was planted to furnish green forage for deer and turkey.

The area in Sumter County is owned by the Sumter Farms and Stock Co., Inc. It is in the north-west portion of the county and consists of about 14,000 acres of intensively developed quail habitat, farm land, and improved pasture. The eastern boundary of the area is the small Noxubee River which seldom overflows more than 10 per cent of the area. Deer trapping operations were confined to the eastern portion of the area, or about 8,000 acres.

TRAPPING PROCEDURE

A modified "Wisconsin" type trap was used. It was made of exterior plywood sections which could be transported and assembled at the trap site. Its dimensions were 8' long, 42" high and 3' wide. They were nearly dark when closed. This trap has proved to be satisfactory for trapping Alabama deer.

Traps were baited with shelled yellow corn or occasionally ear corn. There appeared to be no difference in catch between these baits.

The traps were placed along roads at locations that were readily accessible, rather than at established "deer trails."

Traps usually were set and run to suit the convenience of the trapping crew rather than on a basis of predicted weather conditions.

In some years, trapping commenced as early as November. In other

years, it did not begin until January or after the deer hunting season had closed. All trapping usually ended about March 1, or at the end of the dormant season, at which time deer would immediately cease to take the bait.

Most doe deer, both adults and fawns, were moved for restocking vacant areas in the state. Some bucks were also moved; but most of the large bucks and many of the fawn bucks that were trapped were ear-tagged and released at the trap site. Many were tagged in both ears with one of the tags being a reflective cloth streamer. Some were marked with collars and bells.

TRAPPING RESULTS

Trapping success ranged from 48 deer captured in 50 traps in one night down to no deer on some nights. Since deer were often held over one or more days for later removal, there were a number of nights when all traps were not active. All figures given in Table 1, have been converted to catch per trap-night. They relate only to traps that were actually set to catch deer. (The highest catch per trap-night was 1.25 deer—actually the catch was ten deer in the eight traps set.) An attempt was made to correct the data for traps that were tripped without catching deer, or for those which contained other animals and birds. The results varied only slightly in magnitude and were so similar to those of catch per trap-night that the corrections are not included in this report.

Traps were set anywhere from one night to as long as eleven consecutive nights. However, most sets were from three to five nights with two or more nights between sets. Variance in trapping success, or catch per trap-night, during several consecutive nights of a trapping period are given in Table 2. Also shown is the advantage of each consecutive trap-night. This numerical number is actually the number of times a particular trap-night in a series of consecutive nights had the highest catch minus the number of times it had the lowest catch. For example, there were 22 trapping periods when the traps were set for three consecutive nights. During 13 of these periods the catch (per trap-night) on the first night of the series was greater than the catch for the second or third nights. In six of the trapping periods, the catch the first night was less than the catch the second or third night. Therefore, there would be an advantage of 7 (13-6) for the first night. The second night in this series, had an advantage of 1 when there were seven best catches and six worst catches. For the third night, there were two best catches and ten worst catches, for an advantage of −8.

Analysis of these numerical "advantage" numbers indicates that two or three consecutive nights of trapping are adequate during a series of experimental trapping periods. This does not preclude the possibility of certain advantages of trapping according to weather or weather forecasts, but for informational trapping two or three consecutive nights should be satisfactory.

Table 1. Trapping records for two Alabama areas.

AREA	YEAR	TRAPS USED	NO. DAYS	TRAP-NIGHTS	TOTAL CATCH	NO. REMOVED	NO. TAGGED	SEX AND AGE OF INITIAL CATCH			
								Adult female	Adult male	Young female	Young male
Shady Grove	1959-60	18	26	455	161	70	54	49	23	22	30
	1960-61	26	47	808	194	180	12	71	43	34	32
	1963-64	61	52	3023	377	328	39	218	38	77	28
	1964-65	64	34	1975	190	119	37	91	27	11	24
Sumter Farms	1960-61	25	28	653	147	114	16	84	17	17	9
	1961-62	50	42	1890	583	330	105	207	71	101	103
	1962-63	50	47	2291	331	169	80	90	41	49	58
TOTAL			276	11,095	1,983	1,310	343	810	260	311	284

Table 2. Advantage of each night during consecutive nights of a trapping period and catch per trap-night on consecutive nights.

ITEM	CONSECUTIVE TRAP-NIGHTS						CATCH PER TRAP-NIGHT
Number of nights traps set	1	2	3	4	5	6 & +	
Number of trapping periods	1	10	22	28	11	2	
Advantage* of							
First Night	0	0	7	10	3	0	.24
Second Night		0	1	2	0	0	.21
Third Night			-8	-6	2	0	.17
Fourth Night				-6	-2	0	.13
Fifth Night					-3	0	.15
Sixth & + Night						0	.21

* Number of times a night had the greatest catch of a series minus the number of times it had the smallest catch of the series.

SEX AND AGE RATIOS

Whenever large numbers of deer are trapped and handled, various factors will cause some of the data to be incomplete. This trapping was primarily to remove deer for restocking purposes and the trapping crew, at times, was rushed to move a load of deer during a particular period. Occasionally an animal escaped before it could be aged or sexed. Such omissions in data collection would be serious if only a few animals were examined; however, with the large numbers handled during these trapping periods they were relatively insignificant. The total catch figures given in Table 1 include six deer that were not aged and sexed. The animals reported under the column, "Initial Catch" are only those that were identified.

It would appear that trapped deer could always be accurately aged and sexed. The division of male and female deer should be obvious, and on only two occasions during these trapping periods were the records of the sex of an animal changed—apparently after it had been removed from the trap.

Size alone, in a healthy herd, should separate deer 5 to 9 months old from those that are older than 17 months. However, when trapping in a heavily over-populated area, there may be some doubt as to the accuracy of the age classification. A known juvenile, probably about six months old, was tagged in January 1960. This deer was relatively small and had only "buttons" when retrapped in 1961, at which time it was approximately eighteen months of age. Therefore, deer recorded as "buttons" and "spikes" were considered to be of the same age class (young adults). Additional recoveries on both areas and at a similar location in south Alabama suggests that this interpretation was correct, but also indicates that there is a distinct possibility that some of the smaller adult females were classed as juveniles.

Biologists often give figures of male/female or female/fawn ratios as a single number. Unfortunately, these are sometimes interpreted as absolute figures. The figures given in Table 3 are based upon the number of adult males, or number of fawns, per 100 adult does. Figures for 95 per cent confidence limits also are included.

Table 3 indicates that the number of adult males per 100 adult females at Shady Grove in 1959-60 and 1960-61 and at Sumter Farms in 1963-64 are not too far from a theoretical expectation (the figure of expectation falls within the confidence limit brackets). In other years there were definitely fewer adult males per 100 adult females. The table also shows the ratio of fawns per 100 adult females approaches the theoretical figure in 1959-60 at Shady Grove and in 1963-64 at Sumter Farms. These ratios for 1960-61 at Shady Grove and for 1961-63 at Sumter Farms approach the theoretical figure at a limit of confidence. For all other years, the ratios are far below the ex-

pected theoretical figure and would indicate something wrong with the populations.

It would appear that the trapping at Shady Grove occurred during a period of herd degeneration, while that at Sumter Farms occurred during a period of herd rejuvenation.

During most of the trapping, a higher percentage of male animals was taken late in the season. A check of the data showed, however, that some of these males were repeats. Another influencing factor was the removal of does whereby the sex ratio was changed substantially and a higher percentage of bucks was represented in the population. Seasonal differences in the sex of the animals trapped could be accounted for by the above factors.

Table 3. Number of adult males and number of fawns per 100 adult females, with approximate 95% confidence figures, on two study areas in Alabama.

Area	Year	No Adult males per 100 females			No. Fawns per 100 adult females		
		Lower Limit	Number	Upper Limit	Lower Limit	Number	Upper Limit
Shady Grove	1959-60	34	47	66	83	106	124
	1960-61	46	61	72	81	93	107
	1963-64	11	17	22	40	48	57
	1964-65	13	29	38	23	32	40
Sumter Farms	1960-61	11	20	28	21	31	39
	1961-62	26	34	41	92	98	104
	1962-63	34	45	56	95	119	137
Expectation where of adult bucks are harvested	50%		51			107	

An examination of the data revealed a slight decrease in the number of fawns as the seasons progressed, especially in 1961-62 and in 1963-64. A mortality limited almost exclusively to young was known to have occurred at Sumter Farms in January, February, and March 1962. A similar mortality was reported within a few miles of Shady Grove in February and March 1964. Any decrease in the catch of fawns during the trapping periods could be explained by fawn mortalities.

POPULATION ESTIMATES

In 1960, W. Scott Overton, Southeastern Cooperative Fish and Game Statistician Project, developed a modification of the conventional Schnabel Estimator for use where a known number of animals are removed from the population during a series of study periods, where some of them are tagged, and where the population is otherwise assumed closed. Overton's recent paper (Overton, W. Scott. 1965. A modification of the Schnabel Estimator to account for removal of animals from the population. J. Wildl. Mgmt., 29(2):392-395), suggested use of confidence limits. Table 4 gives the population estimates obtained by use of the modified Schnabel. The confidence limits were obtained by use of a graph of the Poisson distribution method as presented by Adams (Adams, L. 1951. Confidence limits for the Peterson or Lincoln Index used in animal population studies. J. Wildl. Mgmt., 15(1):13-19).

Buck and Thoits (Buck, Homer D. and Charles F. Thoits III. 1965. An evaluation of Peterson estimation procedures employing seines in 1-acre ponds. J. Wildl. Mgmt., 29(3):598-621) give some of the problems involved in census techniques where the population is closed. They also give many examples of poor estimates.

The figures given in Table 4 cannot be considered total population estimates for the two areas, nor can they be used to indicate deer per square mile or other unit of space. We can only assume that the deer populations during the trapping periods were closed, and

it would have been impossible to have checked the estimates by complete removal. The confidence limits have a wide range. The highest figures are from 1.6 times to 3.6 times the lowest figures given. Can population estimates with many chances for a high degree error be of any value?

Both the Schnabel and modified Schnabel Estimator is relatively easy to work with. It is also possible to obtain a "running estimate." Estimates can be computed at the end of each trapping period or even at the end of each trapping night. If the trapping is done entirely for investigational purposes, it is possible to use these running estimates to indicate when a sufficient amount of trapping has been accomplished for the desired accuracy.

The results of the deer trapping in Alabama, as shown by figures in Table 4 suggest that at least 25-30 tagged animals and an equal number of repeats are necessary to avoid bias.

Unfortunately, Table 4 does not really show comparative figures. A different number of traps were used in different years and on different areas. Table 5 shows the estimates that might have been made if 100 traps had been used during all trapping periods.

Table 4. Population estimates for two Alabama areas based upon
a modified Schnabel Estimator.

AREA Year	Shady Grove				Sumter Farms		
	1959-60	1960-61	1963-64	1964-65	1960-61	1961-62	1962-63
Marked animals[1]	52	11	30	36	14	101	76
Repeats	37	12	19	33	16	101	91
Animals removed	70	180	328	119	114	330	105
First estimate[4]	164	220	466	191	159	537	251
Final estimate[4]	166	210	470	195	160	550	251
Lowest confident figure[2]	120	119	357	138	97	445	195
Highest confident figure[2]	256	430	941	318	252	714	355
Actual minimum[3]	122	191	358	155	128	431	181

[1] Animals in population tagged prior to last day.
[2] 95 per cent confidence limits — based upon Poisson distribution.
[3] Known removal plus known tagged.
[4] Is the estimated number prior to any removal.

Table 5. Population estimates for two Alabama areas based upon
a modified Schnabel Estimator and corrected for catch per 100 traps.

	Shady Grove				Sumter Farms		
	1959-60	1960-61	1963-64	1964-65	1960-61	1961-62	1962-63
Estimate[1]	922	807	770	305	640	1100	502
Lowest confidence figure	667	458	585	215	388	890	390
Highest confidence figure	1422	1653	1542	496	1008	1428	710

[1] Is the estimated number prior to any removal.

From the figures given, Shady Grove would have had the highest population in 1959-60 followed by 1960-61, 1963-64, and finally 1964-65. It was possible that there was no change in the population during the first three years listed. (It was also possible that the change could have been in the opposite direction if the change was not too great.)

Only in 1964-65 was there a significant change below the previous years and this was contrary to observations.

At Sumter Farms the highest population according to Table 5, was in 1961-62, followed by 1960-61 and 1962-63. It was possible that the 1960-61 and 1961-62 populations were nearly the same; it was also possible (but rather improbable) that the 1960-61 population was equal to the 1962-63 population. It could not be expected that the 1961-62 and 1962-63 populations were the same. Observations indicated a greatly reduced population at Sumter Farms in 1962-63 when compared with the previous two years.

In preparing Table 4, an "actual minimum" was computed. This is the number of tagged animals in the population plus the number removed. It should be noted that this "minimum" either approached or exceeded the lowest confidence figure.

Having computed the estimated number of deer prior to the trapping season and knowing the number removed by trapping, an attempt was made to predict the number of adult animals in the population for the following year. In each attempt, the estimated population the following year (when trapping occurred) was somewhat smaller than predicted. The percentage below the predicted was erratic, but there were some interesting revelations. In all cases, the predicted number of adult males had a greater "error" than the predicted number of adult females. This could be explained by legal harvests of the bucks. The predicted number of adult females was very close to the estimated population of those females at Sumter Farms in 1962-63. When corrections were made for the fewer traps used, the predicted populations for Shady Grove in 1960-61 and for Sumter Farms in 1961-62 were also relatively good as far as adult females were concerned.

The "guesstimated" population on Shady Grove was about one deer to each five to seven acres, or a total population of around 1,000 animals. The District Biologist made a number of counts on the area prior to trapping. These counts were made by driving along the roads and field in late afternoon and recording the number of deer observed. More than 300 deer were observed on several occasions.

The "guesstimated" population at Sumter Farms was approximately 1,000 deer prior to the initial trapping. Here, too, 300 or more deer could be seen in the fields at dusk.

The "guesstimated" populations, based upon unrecorded observations, are notoriously inaccurate and yet they are the ones often used to check a "measured estimate." (It is like checking a one-foot ruler with an ungraduated meter stick.)

At Shady Grove, the removal of the animals in any year made no apparent change in population. Even the 328 removed in 1963-64 could not be missed by those working on the area.

At Sumter Farms the removal of 330 animals in 1961-62 did make an apparent change in the population, but it is estimated that perhaps as many died "natural deaths" as were removed by trapping. The removal of 150 animals (some by legal hunting) the following year did not make an apparent difference in the already reduced herd. There are indications that as much as fifty per cent of a deer herd can be taken before there is an observed decrease in population.

While population estimates based upon the Schnabel or modified Schnabel may not meet the requirements of a "good" population estimate (i.t., within five per cent or even ten per cent of the real population) they do afford working tools until a more efficient method is discovered.

TAGGED ANIMALS

During the trapping operations, 343 animals were tagged and released at the trap sites. Some of these deer were later removed from the areas for restocking. One was killed legally during the season it was tagged, and some others died during the trapping period.

The sum of 319 tagged animals was assumed to have remained at the end of the various trapping periods. Of these, twenty-five were removed approximately one year after tagging. Most of these were

taken by legal hunting. Only 8 per cent of the tagged animals were harvested the first year after tagging. Another tagged animal was found dead in the woods at the end of the first year. Two animals were harvested during the second season after tagging and one animal was taken during the third year after it was marked. The legal harvest of tagged animals was slightly less than 10 per cent, even though most of the marked deer were bucks.

Since trapping was not continued over a longer period of time at both areas, there were only 179 animals that could have possibly been recaptured during the second year. These were tagged animals minus the known kill (or mortality) the first year. Only twelve of these animals were recaptured, or approximately 7 per cent of the potential number of tagged animals.

It is interesting to note that of the 28 animals harvested, only one was reported as being killed at a location more than two miles from the site where it was tagged. Most recoveries were well within a mile of the original trap site. This applies to animals recaptured during the same season they were marked, and even to animals recovered a year or more after tagging.

SUMMARY

1. During the years 1959-60 through 1964-65, personnel of the Alabama Department of Conservation trapped on two privately owned areas that were overpopulated with deer.

2. In 276 days of trapping, deer traps were operated for 11,095 trap-nights and 1,983 animals were caught.

3. Of these animals, 1,310 were transplanted, 343 were tagged and released at the trap site and the remaining were primarily repeats.

4. The catch per trap-night was greater for the first two nights of a set.

5. Some difficulty was encountered in aging the animals.

6. The adult male/adult female and/or fawn/adult female ratios varied drastically from the expected on four of the seven trapping occasions.

7. Population estimates using a modified Schnabel Estimator can be used as a working tool—but not as a "real" estimate.

8. There are some indications that populations may vary as much as 50% without a noticeable change in "observed animals."

9. On the two study areas, the reported legal harvest of tagged bucks was slightly under 10%, even though some were tagged for five hunting seasons.

10. Repeat catches and kills of marked animals indicate a very limited range for deer on these study areas.