DISPERSAL AND SURVIVAL OF TRANSLOCATED RACCOONS IN KENTUCKY

GEORGE A. WRIGHT, Kentucky Department of Fish and Wildlife Resources, Frankfort, KY 40601

Abstract: A tagging and telemetry study of translocated raccoons (*Procyon lotor*) was conducted during 1975, 1976 and 1977 in Kentucky. In areas of good cooperation from hunters, the reported tag return rate was 19.1% for Kentucky raccoons, 5.5% for Virginia raccoons and 1.7% for Florida raccoons. Mean dispersal distances for tagged Florida, Virginia and Kentucky raccoons was 25.7 km, 7.4 kam and 6.4 km, respectively. Twelve radio-tagged Florida raccoons were monitored an average of 65 days. The probability rate of Florida raccoons released in the spring surviving until hunting season in November is less than 10%. Pen-raised raccoons moved only a few km from their release site and had a higher survival rate than Florida raccoons.

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Importation of raccoons to Kentucky by raccoon hunting clubs has been going on for years and currently involves thousands of animals annually with most of these coming from southern Florida. The Kentucky Department of Fish and Wildlife Resources is also under constant pressure to move raccoons from the more dense raccoon populations in western Kentucky to the eastern part of the state.

It is generally agreed by biologists that such releases do little to improve hunting and may have detrimental effects due to disease implications. Johnson (1970) reported 10 cases of die-offs of raccoons in 7 years in Alabama.

Little information is available concerning translocating raccoons from Florida into mountainous habitat. This project was initiated to answer some basic questions about survival and dispersal of translocated raccoons. By cooperation with raccoon hunting clubs and those who supplied raccoons it was possible to tag a large number of imported animals over a short period of time. The author is grateful to the many Conservation Officers who were involved in this project. Special gratitude is expressed to Officers E. Grey of Jackson County and D. Deskins of Pike County for their interest and involvement in this project. Appreciation is extended to the main supplier of Florida raccoons, I. B. Whittaker of London, Kentucky, for his cooperation and donation of raccoons. Thanks are also extended to the many raccoon hunting clubs participating in this investigation. Appreciation is due E. Hill and L. Nelson for helpful comments on the manuscript.

MATERIALS AND METHODS

Study Area

The ear-tagging portion of this study was conducted in 15 of the easternmost counties in Kentucky. This area is located on the Cumberland Plateau and is composed of moderate to rugged "mountains" with elevations ranging from about 250 m to over 1,000 m. Most of the area consists of narrow ridges with steep slopes and narrow valleys.

About 78 percent of eastern Kentucky is in forest, most of which is hardwoods: oak (*Quercus* spp.), hickory (*Carya* spp.) and beech (*Fagus* spp.) mixture. Except for scattered tobacco patches, corn in narrow valleys, and some grazing of cattle, little of the area is utilized for agriculture. Coal mining by stripping and deep mining is the primary industry of the region.

The area is densely populated by people well dispersed throughout the area. Only a few areas of more than 5,000 ha are uninhabited by people.

The telemetry portion of this study was conducted on and around Robinson Forest Wildlife Management Area in eastern kentucky. This 4,000 ha area is located in Breathitt and Knott Counties, and is operated as a forestry research area by the University of Kentucky. The area is about 97 percent forested (mostly hardwoods) with a few scattered wildlife openings. During this study, the "Forest" was closed to all hunting and public access was restricted. A well developed road and fire trail system made the area well suited to radio-tracking.

*Reference to commercial products does not imply an endorsement.

Ear-tagging Procedures

Raccoons translocated into eastern Kentucky by local raccoon hunting clubs or the Kentucky Department of Fish and Wildlife Resources (KDFWR) were ear-tagged in 1 ear using a numbered metal tag (size 4 monel metal tag from National Tag and Band Company, Newport, Kentucky). Tags were placed on the forward edge of the ear near the base to minimize tag loss. Each tag had a number and "Notify Ky. F&W" stamped on the outer surface. Tag number, sex, age (Grau et al. 1970) and release site were recorded for each raccoon.

Two methods of releasing imported raccoons were employed, depending on the desires of the club involved. One method consisted of tagging the animals at the release site. This was a very time consuming method as only a few raccoons would be released at each site if club members were directing the release. However, this method provided the best information because the exact release site was known by project personnel.

The other method consisted of Department personnel tagging the raccoons at 1 location and having club members take the animals to their release site. Most imported raccoons were released by Department personnel. Pen-raised and wild raccoons from western Kentucky were also released by the investigator or a Conservation Officer.

Most raccoons were imported into Kentucky from southern Florida. Many of these animals were captured by use of live-traps or treeing dogs in orange groves and watermelon patches. They were transported in a pick-up truck with a camper. The animals were free to move about the camper and were provided with dry dog food and water. They were usually transported during the evening and night to minimize heat problems. Most raccoons were imported during February through May.

There are presently no restrictions on the importation of raccoons in Kentucky other than request of a free transportation permit issued by the KDFWR and a health certificate stating that the animals show no symptoms of communicable disease from the state of origin. During this study, permits for an average of over 3,000 raccoons per yr were issued, almost exclusively for eastern Kentucky. Because of the availability and relatively low cost, 85 percent of these permits were for Florida raccoons. Some raccoons were imported from eastern Virginia, Texas and Ohio. The price of raccoons varied from a low of $8.50 per animal for delivered Florida raccoons in 1975 to $25.00 per raccoon in 1977 for Virginia raccoons at the place of origin.

Raccoons transported from western Kentucky were captured on the Ballard County Wildlife Area by one of the following methods: (1) live-trapping, (2) treeing dog and dart gun, and (3) by capturing out of backwater during flooding using a dip-net or hog-snare. The Kentucky raccoons were released to serve as a control group by which to judge the imported animals. Because of the relatively low population in eastern Kentucky it would have been almost impossible to trap and tag enough native raccoons to serve this purpose.

Because most investigators have reported meager tag returns from translocated raccoons in other states (Johnson 1970 and Giles 1943) an intense public relations effort was made to explain the project and encourage the return of information from tagged raccoons harvested. The investigator met with numerous raccoon hunting clubs and sportsmen's groups to explain the project. Radio tapes were sent to radio stations throughout the region and news releases were sent to newspapers prior to and during the raccoon season each year. Conservation Officers were encouraged to work with the clubs and to make a special effort to recover tags from harvested or dead animals.

When a tagged raccoon was reported recovered, the tag number, date and location were obtained. Distances from release site were determind by plotting both sites on scaled maps. Dispersal distances referred to in this study are straight line (linear) distances between release site and point of recovery unless otherwise indicated. Tagged raccoons found sick or dead from unknown causes were submitted to the Kentucky Animal Disease Diagnostic Laboratory in Lexington, Kentucky for necropsy.

Telemetry Techniques

Raccoons imported from southern Florida were obtined from the normal supply coming into the state. Animals selected for radio-tagging were taken off the delivery truck during ear-tagging operations. Selection of animals to be radio-tagged for the telemetry study was accomplished to obtain a balanced sex ratio and to avoid small animals that might have trouble carrying the transmitters. All raccoons were donated by the clubs or the transporter; these animals were held in pens from 3 to 10 days before release.

Pen-raised raccoons were obtained from the KDFWR game farm in Frankfort, Kentucky. To facilitate proper fitting of the transmitter collar and obtaining weight, each raccoon was anesthetized by an intramuscular injection of 0.25 cc of Ketaset (a ketamine hydrochloride equivalent to 100 mg per ml of ketamine) (Frampton 1974). Each animal was ear-tagged, and information on age, sex, weight, general physical condition and date of release were recorded.

Transmitters, ranging from 150.800 to 151.125 MHz, were obtained from Wildlife Materials Incorporated, Route 3, Carbondale, Illinois[a]. The transmitters were mounted on plastic collars which were placed around the raccoon's neck and secured with a brass split-rivet. The transmitters had incorporated into them a mercury activity switch and were powered by a Lithium battery. Transmitters were activated at least 2 days before release to insure proper operation. Life of these units varied from 40 to over 200 days.

The same release site was used for all radio-tagged raccoons. No attempt was made to determine exact dispersal routes. Attempts were normally made to locate each animal 2 or 3 times a week. Because of the terrain and lack of roads off the management area, triangulation (Cochran and Lord 1963) from practical locations was impossible most of the time. Exact locations were not deemed necessary except in cases where the animal was thought to be dead.

Aerial searches using the Department's single engine airplane were conducted whenever contact could not be maintained on the ground. This proved to be a valuable tool as the airplane was used weekly during the periods following releases.

Although not originally designed as part of this project, a survey of raccoon hunters during the training season (February through October) was conducted during 1975 to help game management personnel better understand the raccoon hunter and his effect on the raccoon in Kentucky. All Conservation Officers were required to submit monthly reports to the Game Management Division stating the number of raccoon hunters checked, the number in violation of game laws and the types of violations. Firearms, other weapons, climbers and squealers are prohibited during the training season.

RESULTS AND DISCUSSION

Tagging Study

During this study from January 1975 through June 1977, 2,310 translocated wild raccoons were ear-tagged and released in eastern Kentucky (Table 1). On a regional basis, the percentage of tagged raccoons reported harvested varied from 0.7 percent for animals from southern Florida to 8.8 percent for raccoons translocated from western Kentucky.

Table 1. Tag returns from raccoons translocated into eastern Kentucky during 1975 and 1976 and harvested the hunting season after release.

Origin	*Total number tagged*	*Number harvested*	*Percentage harvested*
Southern Florida	1,750	13	0.7
Eastern Virginia	307	17	5.5
Western Kentucky	125	11[a]	8.8
Texas	76	1	1.3
Ohio	52	0	0
Total	2,310	42	

[a]One harvested the second hunting season after release.

Because cooperation from raccoon clubs in different counties varied from excellent to poor, the investigator does not feel that the data collected for all the tagged raccoons (Table 1) represent a true estimated of the percentage of raccoons actually harvested. The best cooperation came from clubs in Pike and Jackson Counties where 41 percent of all tagged raccoons were released and 86 percent of all tag returns were reported.

Therefore, data from these 2 counties (Table 2) are best suited to compare the percentages of harvested raccoons from Florida, Kentucky and Virginia. The investigator

Table 2. Tag returns from raccoons translocated into Pike and Jackson Counties in eastern Kentucky during 1975 and 1976 and harvested the following hunting season.

Origin	*Total number tagged*	*Percentage harvested*	*Number tagged by sex*	*Number harvested by sex*	*Percentage harvested of number released by sex*
Southern			Male 300	Male 6	Male 2.0
Florida	588	1.7	Female 288	Female 4	Female 1.4
Eastern			Male 153	Male 12	Male 7.8
Virginia	307	5.5	Female 154	Female 5	Female 3.2
Western			Male 27	Male 5[a]	Male 18.5
Kentucky	47	19.1	Female 20	Female 4	Female 20.0
			Male 480	Male 23	Male 4.8
Totals	942	3.8	Female 462	Female 13	Female 2.8

[a]One harvested the second hunting season after release.

believes that most tagged raccoons taken in these 2 counties were reported, and the combined tag return data for these counties is as accurate as can be obtained under conditions set out in the project design.

Nine (19.1%) of the 47 control raccoons from western Kentucky were reported harvested. This success compares favorably to the 10.7 percent hunter recovery rate for 103 raccoons translocated from the lower coastal plain in South Carolina in 1973 reported by Frampton (1974). Clements (1972) reported a 16.0 percent hunter harvest of 186 raccoons transported from eastern Virginia and released in Dickenson County in western Virginia.

Raccoons imported from eastern Virginia had a reported hunter harvest of 5.5 percent for the 307 animals tagged. This is somewhat lower than that reported by Clements (1972) in Dickenson County, Virginia which is adjacent to Pike County, Kentucky. The rather severe winter of 1976-1977 probably reduced the harvest during that hunting season. Stains (1956) reported that cold weather and in some cases snow restricted movements by raccoons. Severe cold and snow also reduce activity by raccoon hunters.

Nine of 60 eastern Virginia raccoons tagged in 1975 were harvested the following season for a 15.0 percent return which was about the same as Clements reported. However, only 8 of 247 tagged in 1976 were reported harvested for an unimpressive 3.2 percent.

A similar situation existed for raccoons imported from southern Florida. The overall 2 yr hunter harvest was 1.7 percent. Of the 350 tagged in 1975, 8 were harvested for a 2.3 percent return. Only 2 of the 238 Florida raccoons tagged in 1976 were reported harvested for a 0.8 percent tag return.

Even with the adverse effects of the severe winter, there was a significant difference in the reported harvest of Kentucky and Virginia raccoons as compared to those from southern Florida. This would indicate that the survival rate for Florida raccoons was much lower than for Kentucky and Virginia raccoons. Some possible reasons for this low survival will be discussed when telemetry data are presented.

Although there appeared to be a higher tag return for males than females from Florida and Virginia (Table 2) this difference was not significant ($P > .10$) for raccoons from the same area. The overall 4.8 percent harvest for all tagged male raccoons in Pike and Jackson Counties was significantly ($P < .10$) higher than the 2.8 percent harvest of females. A higher harvest of translocated males was reported by Giles (1943) and was generally attributed to greater activity by male raccoons. Thus, the data presented here are not sufficient to determine if any difference in survival rates of males and females existed.

Movement data for transplanted raccoons are presented in Tables 3, 4 and 5. Thirteen Florida raccoons averaged moving 25.7 km. This is significantly greater than the 7.4 km average for 17 Virginia raccoons ($P < .01$) and the 6.4 km average for 11 Kentucky raccoons ($P < .02$). Wide dispersion by transplanted raccoons was also noted by Giles

Table 3. Movement data for raccoons translocated from southern Florida tagged and released during the spring of 1975 and 1976 and harvested the following hunting season in eastern Kentucky.

Tag No.	*Sex*	*County released in*	*Distance moved (Km)[a] ± SD*
90	M	Jackson	36.8
98	M	Jackson	24.0
248	M	Jackson	19.2
251	M	Jackson	35.2
668	M	Leslie	107.2
1,070	M	Pike	4.8
1,723	M	Jackson	4.6
2,041	M	Breathitt	22.2
Mean			31.8 ± 32.7
288	F	Jackson	24.0
1,073	F	Pike	4.8
1,184	F	Pike	32.4
1,994	F	Jackson	6.6
2,121	F	Magoffin	12.3
Mean			16.0 ± 11.8
Mean for males and females			25.7 ± 27.1

[a]Straight line distance from release site to place of harvest.

Table 4. Movement data for raccoons translocated from eastern Virginia tagged and released during the spring of 1975 and 1976 and harvested the following hunting season in eastern Kentucky.

Tag No.	*Sex*	*County released in*	*Distance moved (Km)[a] ± SD*
1	M	Pike	9.6
13	M	Pike	17.6
14	M	Pike	4.8
49	M	Pike	16.3
57	M	Pike	9.5
61	M	Pike	3.0
1,409	M	Pike	6.4
1,413	M	Pike	0.8
1,415	M	Pike	8.0
1,451	M	Pike	4.8
1,650	M	Pike	9.7
1,687	M	Pike	6.3
Mean			8.1 ± 5.0
10	F	Pike	1.8
50	F	Pike	6.2
51	F	Pike	12.8
1,629	F	Pike	1.7
1,684	F	Pike	6.2
Mean			5.7 ± 4.5
Mean for males and females			7.4 ± 4.9

[a]Straight line distance from release site.

Table 5. Movement data for raccoons translocated from western Kentucky tagged and released during 1975 and 1976 and harvested the following hunting season in eastern Kentucky.

Tag No.	*Sex*	*County released in*	*Distance moved (Km)[a] ± SD*
180	M	Jackson	16.0
652	M	Pike	14.4
2,477	M	Pike	0.9
3,505	M	Jackson	2.4
3,511	M	Jackson	2.6
Mean			7.3 ± 7.3
197	F	Jackson	3.1
410	F	Breathitt	6.6
632	F	Letcher	6.0
648	F	Pike	3.4
654[b]	F	Pike	5.6
3,504	F	Jackson	1.8
Mean			4.4 ± 1.9
Mean for males and females			6.4 ± 5.1

[a]Straight line distance from release site to place of harvest.

[b]Harvested the second hunting season after release.

(1943) in Arkansas who attributed it to a difference in environmental conditions. The raccoons from Florida did have the greatest change in habitat which may explain their greater movements. There was no difference between movements of Kentucky and Virginia raccoons ($P > .10$).

The greatest movement noted during this study was that of an adult male from southern Florida released in April 1975 in Leslie County, Kentucky and harvested in Hamblen County, Tennessee during December of that same year. It had moved about 107 km and was reported to be in good condition when taken.

Average movements by harvested male raccoons were somewhat greater than for females from the same area (Tables 3, 4 and 5). However, this difference was not statistically significant ($P > .05$). Neither was there a significant difference ($P > .05$) in the mean distance for all males (15.5 km) as compared with all females (8.4 km). Giles (1943) also concluded that males wander more than females and that no directional or homing "instinct" was exhibited by transplanted raccoons. Frampton (1974) found no difference ($P > .10$) between mean distances of males and females for transplanted South Carolina raccoons and that direction of dispersal was random. Direction of dispersal during this study was also found to be random.

Little information as to the rate of tag loss was obtained by this study. Eleven radio-tagged animals that were also ear-tagged were recovered after release. None of these animals had lost an ear-tag, but the mean release time was only 19 days with a range of 4 to 56 days. Stuewer (1943 reported that only 6 of 256 ear-tagged raccoons were known to have lost their ear-tag; some of these were known to retain their tags for 2 years. More recently, Frampton (1974) using identical equipment and procedures as in this study reported a 35 percent tag loss over an average of 109 days. If it is assumed that tag loss among animals from the different geographic areas and between the sexes is the same, the rate of tag loss will have little effect on this study in comparing the relative survival rates of these animals.

During this study, 11 other tagged raccoons were recovered through other than legal hunting: 4 killed by house dogs, 1 killed in a chicken house, 1 road kill, 1 found dead, 1 found sick and 3 taken by illegal hunting. All of these were Florida raccoons recovered within 1 month after release. This brought the recovery rate for all Florida raccoons to 1.4 percent (24 out of 1,750). Only 54.2 percent of the returns were reported taken by legal hunting.

During the falls of 1975 and 1976, 23 pen-raised juvenile raccoons were ear-tagged and released in Pike, Jackson and Wolfe Counties. Four of these animals were subsequently recovered (3 by hunting and 1 road kill) for a 17.4 percent return. Mean recovery time was 167 days and mean dispersal distance was 4.3 km. In Michigan, Stuewer (1943) reported a 43 percent hunter harvest of 70 pen-raised raccoons released on 2 areas. He also found average dispersal distances of 3.2 km for adults and 4.8 km for juveniles.

Telemetry Study

During the springs of 1975 and 1976, 28 raccoons from southern Florida were selected for radio-tagging and release on Robinson Forest Wildlife Management Area. Four of these animals died while being held in pens and their carcasses were submitted for necropsy.

Eight others which appeared in good health when released were found dead within a few kilometers of their release site within 3 weeks. Only one of these was in good enough condition to be necropsied. One was killed illegally with a .22 cal. slug 14 days after release 3.8 km from his release site. The transmitter had also been shot and was not functioning when it was recovered by a fisherman.

Radio contact was lost with 4 others shortly after release. They were tracked for an average of 16 days and had moved an average of 4.2 km when lost. An aerial search within 16 km of their release site proved unsuccessful in re-establishing radio contact. Poaching was strongly suspected in 2 of these cases. It was also possible that movement beyond the searched area or transmitter failure may have occurred.

Only 12 of the 28 raccoons originally selected for radio-tagging provided useful movement data (Table 6). These animals were monitored for an average of 65 days which was considerably longer than that reported for recent translocated raccoon telemetry projects (Frampton 1974, and Clements 1972), although Frampton (1974) monitored 1 individual for 130 days.

Table 6. Movement and fate of twelve radio-tagged raccoons imported from southern Florida and released in eastern Kentucky during 1975 and 1976.

Tag No.	*Sex*	*Age*	*Release date*	*Distance to home range (KM)*[a]	*Approximate time to reach area of home range (days)*	*Minimum distance moved (Km*[b]*)*	*Maximum known distance from release site (KM)*[a]	*No. days monitored*	*Fate*
200	M	A	3/11/75	4.4	20	10.5	4.5	78	lost contact
204	F	A	3/11/75	—	—	75.0	19.5	56	killed by car
401	F	A	3/19/75	20.0	19	24.2	20.0	70	lost contact
403	F	A	3/20/75	7.9	12	8.5	7.9	62	lost radio
601	M	A	3/27/75	7.0	14	8.2	7.0	126	illegal kill
792	F	J	4/30/75	2.4	0	2.4	2.4	90	lost contact
1,065	F	J	5/20/75	2.3	14	4.2	2.3	72	lost contact
2,214	F	A	4/23/76	5.3	14	5.3	5.3	40	radio failure
2,216	F	A	4/23/76	16.6	28	20.8	16.6	71	dead, unk.
2,218	F	A	4/23/76	0	0	11.0	1.0	27	lost contact
2,219	M	A	4/23/76	—	—	10.4	10.4	23	dead, unk.
3,002	M	A	6/15/76	—	—	38.6	27.5	60	lost contact
Mean				7.3	13	17.4	9.9	65	
Standard deviations				6.1	9.0	21.1	8.5	28	

[a]Straight line distance from release site.

[b]Straight line distance between known locations (to home range if one was established).

These 12 animals moved an average maximum known distance of 10.4 km from their releaese site. These mean movements are less than the 25.7 km reported here for ear-tagged Florida raccoons as expected because they covered a much shorter time period and include data on dead and missing animals. The mean distance traveled for 12 translocated South Carolina raccoons was 2.9 km (Frampton 1974). This figure is somewhat misleading because it includes several early deaths and transmitter failures which reduce the average time monitored to 35 days. The greatest individual movements noted in this study were 27.5 and 20.0 linear km from their release site by an adult male and female, respectively.

Nine radio-tagged raccoons dispersed an average of 7.3 km to establish a home range. The mean time after release to reach the area of their new range was 13 days. Three other animals did not establish a home range while being monitored.

Normally, raccoons remained near their release site for 2 or 3 days before starting to disperse. An adult female remained near her release site for 27 days before radio contact was lost. Two juvenile females moved short distances of 2.4 and 2.3 km to establish a home range. Two adult females had the longest moves to their new ranges; 16.6 and 20.0 km.

Movements by an adult female (Number 204) were among the more interesting of animals monitored. She survived several days of cold weather (−10°C) and a light snow immediately after release. Two weeks after release she was located about 10.0 km southwest of her release site, where she remained for 2 weeks when radio contact was lost. She was located again by aerial search 2 weeks later 7.7 km southwest of her last known location or 17.7 km southwest of her release site. Ground contact was lost immediately, and an aerial search 10 days after the last contact covering a radius of 20 km from last location was unsuccessful in finding her. Four days after the aerial search or 14 days after last contact she was killed by a car 32.2 km north of the last contact point. This placed her 19.5 km northwest of her release site after 56 days. Minimum movement (straight line distance between known locations) for her was 75 km and actual movement was probably in excess of 160 km. Her movements followed major streams and a river. During her last move, she averaged moving about 2.3 km per day.

At release she weight 5.6 kg and apeared to be pregnant. Upon examination within 2 hours of death, she weighed 5.0 kg and appeared in good health with well worn toe nails. Examination of the uterus revealed 4 highly visible placental scars (Sanderson and Nalbandov 1973). Fate of her "kittens" was not known but they were likely abandoned under the stress of translocation.

One other instance of possible failure to raise young after translocation was noted. Another adult female (Number 2214) was checked in a den 40 days after release. One recently born "kitten" was found dead in the den. Apparent transmitter failure prevented further contact with this animal. One attempt to locate her with a raccoon dog was unsuccessful.

A relatively rapid movement away from the release site was observed for an adult male (Number 3002). On the third day after release he was located 6.0 km from his release site. On day 8 he was located by aerial search 10.2 km from his third day location. On day 17 he had moved 17.3 km from his position on day 8. Thus, he had moved a minimum of 33.5 km in 17 days for an average of 2.0 km per day. His last known location on day 60 was 5.1 km from his position on day 17. This placed him 27.5 km from his release site. He never settled down enough to have established a home range.

Of the 28 raccoons from Florida selected for radio-tagging, only 8 (28.6%) were known to be alive when contact with them was lost after an average of 74 days. Sixteen of the animals were known to be dead for a minimum mortality rate of 57.1 percent. Most of this mortality occurred within a few weeks after they were obtained. The causes of mortality were as follows; 11 (68.8%) died in pens or shortly after release due to stress and/or natural causes, 2 (12.5%) were killed illegally, 2 (12.5%) died from unknown causes and 1 (6.3%) was hit by an automobile.

Because of the obvious effects of the severe winter of 1976-77, the tag return data in Table 2 was not considered suitable to determine the actual survival rate of Florida raccoons. In reviewing the 1975 release in Pike and Jackson Counties, 8 of 350 Florida raccoons were harvested for 2.3 percent while 14 of 84 Kentucky and Virginia raccoons were harvested for 16.7 percent. Assuming an obviously high survival rate of 100 percent for Kentucky and Virginia raccoons to hunting season, a reported harvest of 1 out of 6 raccoons present would be expected. Making the assumption that the reported harvest rate for raccoons present is the same for Florida raccoons as it is for Kentucky and Virginia raccoons, the 2.3 percent harvest for Florida raccoons would convert to a theoretical survival rate of 13.8 percent to hunting season.

The data presented here for the radio-tagging portion of this investigation supports the poor survival rate indicated by the ear-tagging study. Considering all the data collected, the investigator felt that the actual survival rate to hunting season for Florida raccoons released in the spring and summer was less than 10.0 percent.

At the cost of $12.00 per Florida raccoon released, it was costing the clubs over $120.00 to have a live raccoon in the woods during hunting season. The actual cost for the 10 Florida raccoons reported harvested (of the 588 released) during this study in Pike and Jackson Counties is $535.50 each. The cost per Virginia raccoon reported harvested was $270.00 per animal for 17 of 307 released. A total of $9,960.00 plus some transportation cost were spent in these 2 counties in 1975 and 1976. It was obvious that

stocking imported raccoons was not successful and that on a "put-and-take" basis it was very expensive. The total cost for importing raccoons into Kentucky for 1975 and 1976 was in excess of $64,000.00

Twelve pen-raised raccoons were radio-tagged and released on Robinson Forest Wildlife Management Area during 1975 and 1976. Most of these animals were released during the summer after the imported Florida raccoons had dispersed off the area. Nine of these animals provided useful information and 3 others were monitored only a few days before contact was lost. In most cases, transmitters recovered from Florida raccoons were used on the pen-raised animals. Somewhat depleted batteries might explain a relatively high "lost" rate for animals not known to move far.

The average maximum known distance traveled from their release site was 2.5 km for 9 animals monitored an average of 30 days. Movements by these animals were similar to those of the ear-tagged raccoons of this study and those reported by Stuewer (1943). Four (44.4%) of the 9 raccoons monitored were known to survive an average of 48 days before contact was lost. The fate of the other 5 was as follows: 1 killed by dogs, 2 killed illegally by raccoon hunters, 1 taken alive illegally and 1 died of unknown causes.

An adult male (Number 659) moved 2.7 km from the release site where he stayed near a house where he was given food until his death. He was killed by dogs 17 days after release. His body weight at release was 5.2 kg and at death 5.0 kg. One other animal, a juvenile female, showed signs of domestication. She was known to raid a feed bin. This behavior probably led to her being illegally taken alive 16 days after release.

Pen-raising raccoons has always been considered expensive. Stuewer (1943) reported that the cost of raising raccoons by Michigan breeders was over $5.15 in 1940. The cost to raise raccoons today exceeds $20.00 per animal.

Pen-raised raccoons appeared to survive better than the imported Florida raccoons, but in limited numbers could probably do little to increase the raccoon population over a large area. Woehler (1957) reported that pen-raised raccoons had little effect on fall harvest or native breeding populations.

Pen-raised raccoons were not known to utilize trees during their first few weeks after release, as might be expected. They were usually located in holes either along creeks or on ridge tops during the day. Quite often they were observed resting on the open ground usually on ridge tops. Reports from hunters taking ear-tagged raccoons indicate that they did "tree" during the hunting season, although they used small trees. One ran for 30 minutes before treeing.

Disease Findings

One of the primary concerns of health officials relating to translocating raccoons is the possible spread of rabies. Bigler et al. (1973) reported that while raccoons only accounted for 17 percent of all reported rabies cases in Florida from 1953-1956, the incidence increased to 68 percent for 1969-1972. Tomas and Bigler (pers. comm. 1975) stated that during the period of 1951-1974 1 in every 5 raccoons examined in Florida were diagnosed as rabid. Whitehead in Tennessee (pers. comm. 1977) reported that none of 87 confiscated Florida raccoons examined had rabies. Recently, 2 cases of rabies were confirmed in shipments of Florida raccoons into North Carolina (Nettles, pers. comm. 1977). Test results for the only Florida raccoon examined for rabies during this study were negative.

During 1975 and 1976, transportation permits were issued for importation of 5,375 raccoons from Florida into 25 counties. The total number of confirmed rabies cases in 1976 and 1976 in Kentucky was 161. Of these, 105 were wildlife and 56 were domestic animals. Only 3 of these cases (1 untagged raccoon, 1 skunk and 1 gray fox) were in counties where Florida raccoons had been released.

Six dead Florida raccoons were submitted to the animal disease lab for necropsy and were diagnosed as follows: (1) septicemia, (2) chronic hepatitis and enteritis, (3) gastrointestinal parasitism and suggestive canine distempter, (4) gastric ulcers, subacute nephritis and gastrointestinal parasitism, (5) chronc parasitism and malnutrition and (6) toxic tubular nephrosis and parasitic enteritis. Stress was thought to be an important factor contributing to the death of these animals.

A current investigation into the diseases and parasites of raccoons from areas that supply most animals for translocation is presently underway. This timely project is being conducted by the Southeastern Cooperative Wildlife Disease Study in Athens, Georgia and should answer some questions about the dangers of translocating raccons.

Raccoon Hunter Survey

During this training season survey, Conservation Officers reported checking 1,925 raccoon hunters. Of these, 696 (36%) were found in violation of game laws, 544 (28%) of these involved acts such as carrying a gun which could have resulted in the illegal taking of raccoons. Officers in eastern Kentucky checked over 3 times as many raccoon hunters per officer as did the officers in central and western Kentucky. The annual statewide hunter telephone survey indicates that about half of the 16,000 to 20,000 raccoon hunters in Kentucky live in the eastern one-fourth of the state. Unfortunately, the violation rate in the eastern part of the state was also significantly greater ($P < .01$) than the rest of the state. From July through October a violation rate of 47 percent was noted for the eastern part of the state with 73 percent of the violations involving the presence of guns.

This illegal hunting pressure on the raccoon especially during the "kitten" season may partially account for the shortage of raccoons in some areas and thus the widespread stocking programs carried out by raccoon clubs in the eastern part of the state.

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