Isolated cases of rabies in dogs, house cats, foxes, raccoons, and skunks were investigated for clues to the existence of an inapparent reservoir of the disease.

Sporadic Animal Rabies in Florida

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RABIES in wildlife and domestic animals has been the subject of intensive study in Florida during the past 5 years. The State board of health laboratories examined 519 rabid animals of various species from 1951 through 1958, an average of 65 heads per year (table 1). In the preceding decade an average of 236 animals a year, mostly dogs, were found to be rabid. Vaccination and local quarantine have been credited with reducing the number of rabid animals encountered and have almost eliminated endemic rabies in dogs. With the gradual reduction of this disease in dogs and the evolution of an increasingly effective animal bite reporting procedure, the sporadic cases in wildlife have now assumed major importance in Florida.

When a careful field investigation revealed that only a single animal was infected, it was considered to be a sporadic case; that is, the rabid animal appeared to be isolated in time and space from all other rabies infections. This classification has been useful in guiding our search for evidence of possible repeated contacts with an inapparent reservoir of rabies in nature.

The quest for such a reservoir was intensified after the infection was found to be widespread in insectivorous bats in Florida (*1*, *2*). Examination of 5,503 bats (*3*) established the presence of rabies in apparently normal animals in all locations adequately studied in Florida. The evidence suggested that bats could be the inapparent rabies reservoir. Although on three occasions rabid bats were recovered from dogs and house cats which had captured them, there was no evidence that this contact spread the infection. Several attempts to infect mice in the laboratory by inducing presumably rabid bats to bite them were unsuccessful.

We undertook intensive investigations of sporadic cases of rabies to determine whether or not there existed an inapparent reservoir serving as a source for the spread of the infection in Florida.

Three hypotheses were suggested by the evidence at hand. First, there is the possibility that the bat, or some other equally elusive small mammal species, is the primary reservoir and may infect carnivores directly. In this event, the recognized vectors would be infected while capturing the reservoir species or when sniffing moribund animals that attracted their curiosity. The reservoir species would necessarily be unaggressive when rabid so as to explain its nonrecognition in the past. This theory may be called the nonaggressive, single-species reservoir.

Second, it is possible that some of our recog-

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nized vector species support enzootic rabies which goes undetected because of irregularities in surveillance or because of the usually benign behavior of rabid individuals. Thus, the enzootic condition would be discovered at infrequent intervals, and the new, recognized infections would appear to be sporadic cases. The true nature of the spread would go undetected.

A third possibility is that several different species of wild carnivores together maintain temporary transmission chains for enzootic rabies, but the patterns of transfer within a species or between species are not clear. This may be called the multispecies endemicity hypothesis.

Other explanations, such as the arthropod reservoir and various viral change hypotheses, have been suggested, but data in support of these are not conclusive. Evidence gathered in our studies implies that these two hypotheses are not necessary to account for the behavior and continued existence of rabies infection in Florida.

We undertook intensive investigations of rabies cases which appeared to be sporadic to determine whether or not there existed an inapparent reservoir serving as a source for the spread of infection in Florida. Data in several of the early cases were incomplete or could not be verified. Victims and witnesses could not be located in several instances. We gathered detailed accounts in more than 135 cases; 36 of these were considered to be sporadic.

All rabid animals were diagnosed in the laboratories of the Florida State Board of Health. A positive diagnosis was based on identification of Negri bodies in brain material prepared with modified Sellers' stain. Animal brains in which Negri bodies were not found upon direct examination were inoculated intracerebrally into five laboratory mice which were observed for 30 days. Mice dying within this period, or those sacrificed at the end of it, were examined microscopically. All animals referred to here as rabid yielded Negri bodies at some stage of this examination.

Dogs

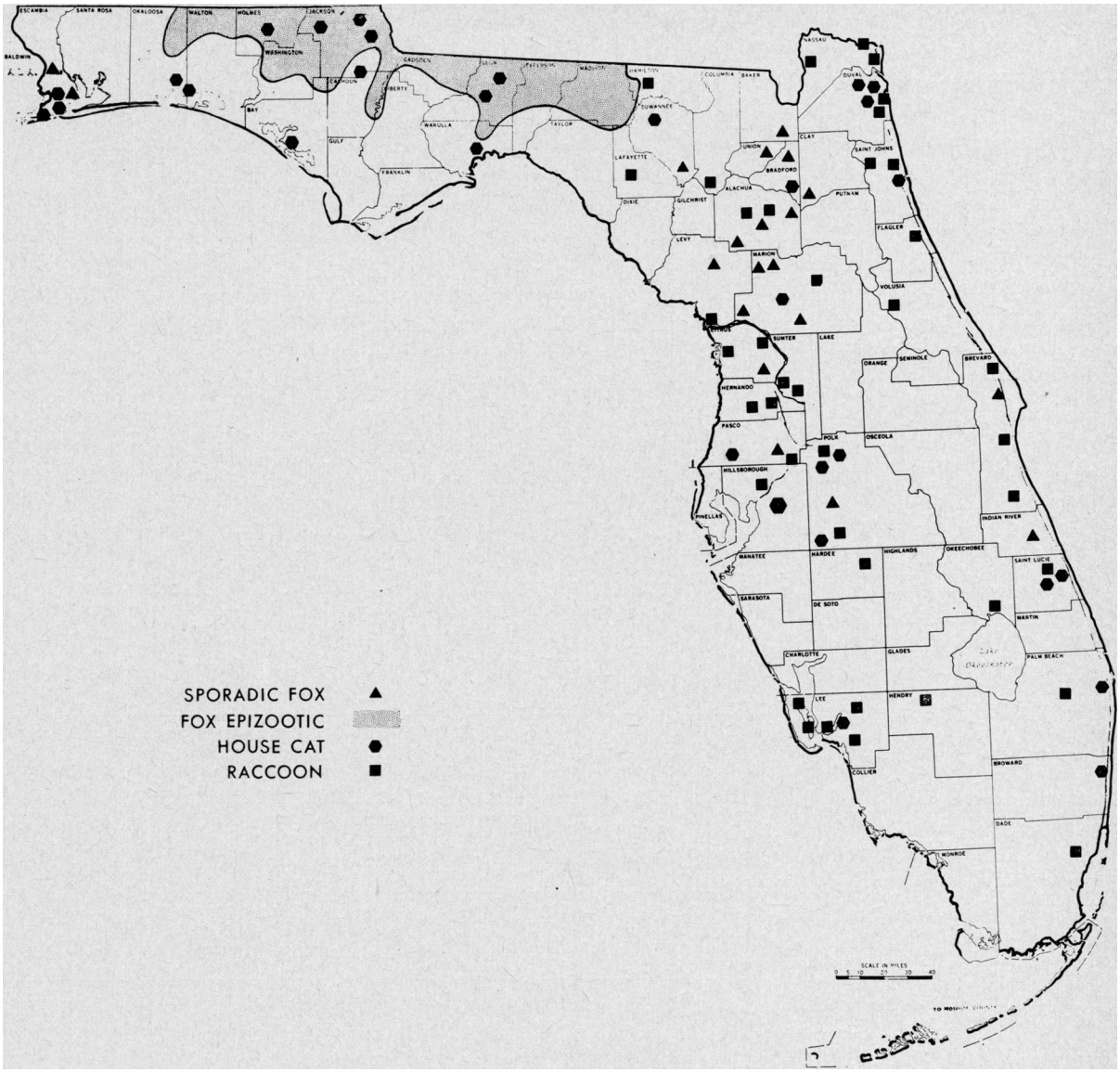
Sporadic cases of rabies in domestic dogs were investigated whenever possible, but little was learned about contacts with a possible inapparent reservoir. Of the 149 rabid dogs reported since 1951, 34 infections occurred simultaneously with a fox rabies epizootic. Most of the remainder were exposures related to urban epizootics confined to dogs. All sporadic cases, with one exception, involved stray or ownerless dogs. Rarely was the owner of a rabid dog known, and details of its origin and recent history were usually not available. This lack of data made the attempted study of sporadic cases of rabies in dogs unproductive. In the search for rabies cases caused by contact with inapparent reservoirs, little progress can be expected from studies of sporadic infection in dogs.

However, one case had an interesting history. The head of a rabid puppy about 4 months old was submitted to the State laboratory from a subdivision in Gainesville in April 1958. The puppy had been born in a nearby subdivision, and all dogs with which it had had contact, including littermates and the mother, were accounted for. After leaving the litter, the

Table 1. Rabies reported in Florida, 1951–58

Species	1951	1952	1953	1954	1955	1956	1957	1958	Total
Dog	8	12	24	23	41	10	17	14	149
Cat	0	1	2	11	5	10	9	6	44
Fox	1	0	15	19	12	14	73	16	150
Raccoon	4	7	10	16	11	13	7	15	83
Skunk	0	1	1	2	1	0	2	2	9
Bat	0	0	7	1	8	10	7	7	40
Cattle	2	0	5	16	3	4	6	2	38
Bobcat	0	0	0	0	1	0	0	0	1
Horse	1	0	0	1	1	1	1	0	5
Total	16	21	64	89	83	62	122	62	519

Figure 1. Sites [1] of rabies cases found in foxes, house cats, and raccoons, Florida, 1951–58



[1] Symbols indicate the locality. In several sites more than one individual of a species was found to be rabid. Data in some of the older records could not be confirmed and the sites are not indicated.

puppy had been housed in a utility room every night and had never had noticeable wounds. It was seen by a veterinarian several times during this period but was not immunized against rabies. No other animals became rabid during 90 days of quarantine observed by the subdivision.

It seemed unlikely that a rabid dog, skunk, fox, or raccoon could have passed through the subdivision, which was heavily populated with children and unvaccinated dogs, without attracting attention or infecting another animal. Inspection of the utility room indicated that such a vector would have had to contact the puppy outdoors in the daytime. During the previous year three rabid bats had been collected within a mile of this subdivision.

House Cats

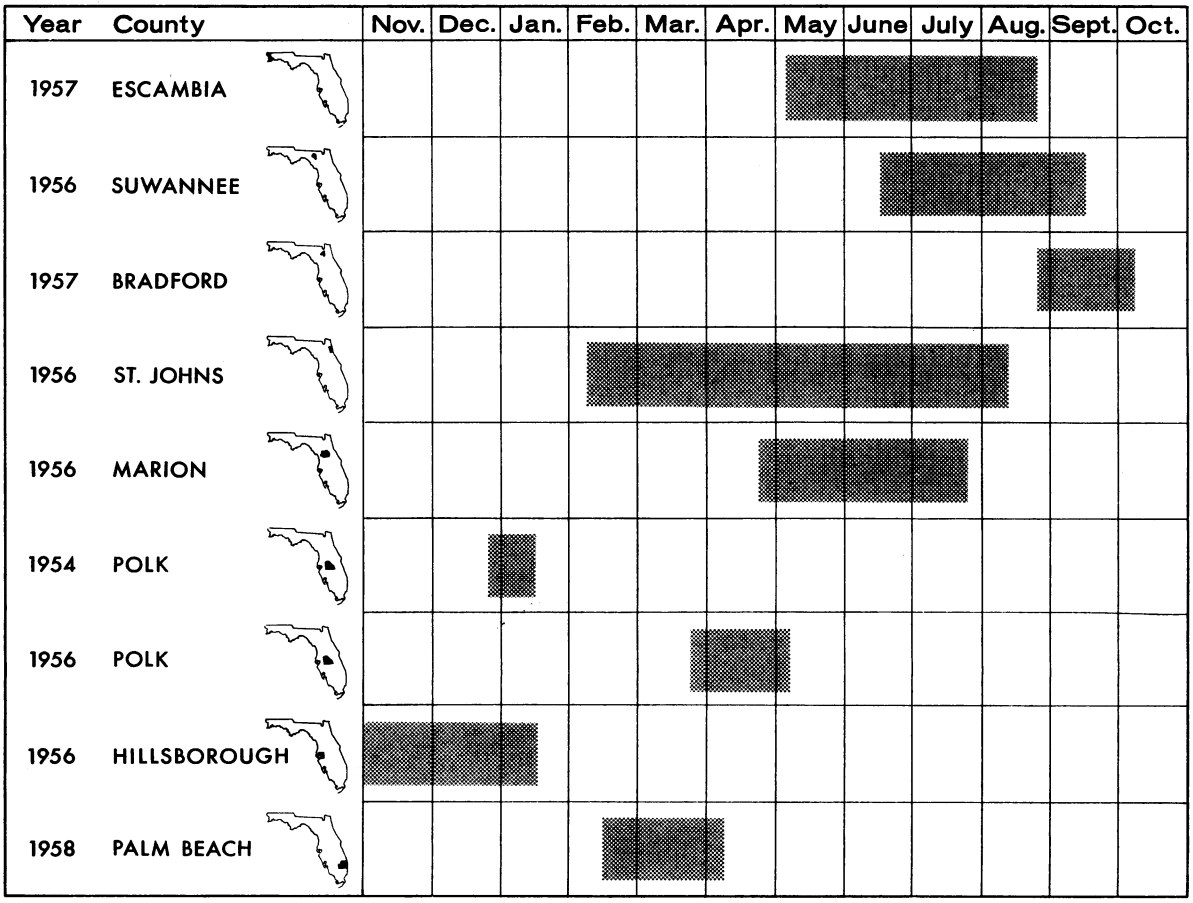
Forty-four house cats from all parts of the State were recorded as being rabid during the

1951–58 period, and persons who had been attacked by 29 of these were interviewed. Fourteen rabid house cats were reported concurrently with several fox rabies epizootics in western Florida, and at least three of these cats had been bitten severely shortly before exhibiting symptoms of rabies. Presumably, fox rabies spilled over into the house cat, since no rabid cats were observed in the years before or after fox rabies swept through these counties. All of them bit or attacked human beings, but no other cats or domestic animals. This behavior, as reported by the victims, indicated that house cats do not transmit rabies virus freely among themselves.

Twenty-one cats became rabid in peninsular Florida, where epizootic rabies has apparently been limited to infection in raccoons, which probably attack house cats. However, most of these counties have recorded sporadic rabies in other carnivores. Epidemiological investigations of rabies in house cats failed to reveal evidence of the disease in any other animal. Every rabid house cat in the peninsular counties investigated appeared to have acquired a truly sporadic infection (fig. 1).

Some of these cases may have resulted from contact with a hidden rabies reservoir. Data on rabid kittens obtained in interviews with owners were especially enlightening. Nine cases of rabies occurred in kittens less than 7 months of age. None of the mother cats or other neighborhood pets became rabid or had disappeared. Figure 2 shows the lifespans and dates of death of the kittens, arranged by counties in north-to-south order. There is some indication of a

Figure 2. Seasonal appearance of rabies during the lifespan [1] of nine kittens in Florida, 1954–58



[1] Birthdates were calculated from the best estimate of age at death, often based on the owner's memory or on size alone.

winter trend in seasonal appearance of infection toward the south.

In two cases the behavior of the vector was indicated because the kittens had been confined in screened dwellings all of their lives. One case occurred in May 1956 in the heart of Lakeland, Polk County, within a section of small, closely spaced houses. Two 6-week-old kittens were being weaned by the healthy mother cat after having lived on a screened porch since birth. The owner was reasonably sure that neither kitten had been off the porch, although a daughter may have carried them out for short periods once or twice. The rabid kitten bit the child and died a few hours later. The owner had been scratched a few days before. Evidence of rabies was found when brain tissue from the kitten was injected intracerebrally into mice and the virus was isolated by standard methods.

The littermate and three adult cats belonging to the same owner were healthy at that time. Wounds had never been observed on either kitten. The littermate died of some disease while in quarantine, but rabies virus could not be isolated from it. No other cases of rabies were reported from this area that year. Two years earlier and less than a half mile away, a rabid 3-week-old kitten, one of a litter of three or four belonging to a stray mother, bit a child. It was known that the mother cat had brought rats and mice to the kittens. Lakeland is noted for the large number of yellow bats (*Dasypterus floridanus*) collected in town (*1*). This bat has been found to have an infection rate of about 2 percent in nature and is one of the most powerful biters among Florida bats.

A similar case occurred in West Palm Beach during April 1958. Two kittens from a litter of three died of rabies at an age of 6 or 8 weeks. These kittens were born and reared inside a screened house and left it only once, when a visiting child played with them on the lawn one morning for about an hour. The owners were certain that the kittens never left the house at any other time before they were adopted. All three went to separate homes and one developed symptoms of rabies about a week later. The other two kittens were recovered and quarantined, one dying of rabies 17 days after quarantine. The third kitten was killed and examined, but no evidence of rabies was found. The mother cat was healthy 8 months later and was described as a wonderful hunter. She had often brought in living rats and mice with which the kittens played; however, no bats were observed among the offerings.

Six other cases of rabies in kittens were investigated and found to follow this general pattern. These kittens had all spent more time outdoors, and some had never been in a house. Three of them were less than 6 weeks old. None of these kittens showed any evidence of a bite or wound. The wounds usually observed on victims of dogs, raccoons, and some foxes would kill a kitten of this size outright, and certainly could not be overlooked in the usual attention given to pets.

The data from these interviews suggest some small animal as a reservoir, perhaps one brought to kittens by mother cats and used in hunting practice. A study of the mammals used in this way is indicated. Rabies has not been reliably reported from native rats and mice in Florida, though only a few dozen of these have been examined carefully. We have observed cats use moribund and rabid bats as practice game on several occasions.

Foxes

Data on fox rabies in Florida are presented in another paper (*4*) and are summarized here. The distribution appears in figure 1. There was no clear seasonal trend in the sporadic cases. Sporadic infections were not reported from the epizootic fox rabies areas along the Georgia and Alabama borders, where two known epizootics occurred in adjacent areas of the three States.

In the peninsular counties of Florida, which are distinct from the epizootic area in geography, ecology, and economy, 18 sporadic cases of rabies have occurred in foxes since 1951. Two other rabid foxes, near Pensacola in Escambia County, were not correlated with other rabies cases and appeared to be sporadic. Since rabid foxes are reported frequently during epizootics, it is unlikely that an epizootic in the fox population would be unreported in peninsular counties such as Alachua, Marion, and Polk, where reporting is as effective as in the counties with epizootics. The fox epizootics discussed here

swept through 13 or 14 counties in one movement, requiring more than 5 years to subside. In areas with sporadic fox rabies, cases of rabies in cattle are unknown, but they are common where rabid foxes occur in numbers. Our data indicate that rabies is easily recognized when it exists in epizootic form in gray foxes. The preponderance of evidence suggests that sporadic cases are caused by an effective contact with an inapparent reservoir. However, additional data are needed on the proportion of rabid foxes which attack people as compared with those which do not.

Raccoons

Rabies was first recorded in Florida raccoons about 1947 when it appeared in Brevard County and spread north and south along the Intracoastal Waterway. By 1958, a total of 31 counties had reported rabid raccoons, most of them occurring as a sporadic case. The 83 recorded since 1951 were investigated whenever victims and witnesses could be located. Figure 1 shows the localities from which rabid raccoons were submitted to the State laboratories. The disease in raccoons is restricted to the peninsular part of the State. Even during fox epizootics, rabid raccoons were never reported from western Florida. There was no seasonal trend in the occurrence of the 47 cases on which data were available.

Estimates of the raccoon population in 11 sites where rabid raccoons had most recently been reported revealed no clear correlation between the appearance of the infection and density of the raccoon population. In five sites the local populations appeared to be at cyclic lows; in three, at nearly maximal density; and in the remaining three, the density was intermediate. These investigations revealed the short duration of extremes of abundance in raccoon populations, as evidenced by trapping success, tracks, and other signs. Movements and seasonal shifts in response to changes in water levels and seasonal food supplies influenced simple abundance estimates even more than the absolute number of animals in a unit area. It proved almost impossible to trap out a raccoon population, even when intensive efforts were made for more than a month. This is in strong contrast to fox populations, in which a reduction in tracks and in trap success is apparent after a few days of trapping (*5*).

A time and space relationship was found between rabid raccoons reported from the counties along the Withlacoochee-Hillsboro River system (midwest coastal area) and along the Intracoastal Waterway from Miami to Jacksonville. These movements showed a strong correlation between raccoon rabies and the water; 40 of the 43 animals investigated were first observed within 3 miles of a major stream or waterway. Most of them were taken along the waterways. The data indicate that spread of rabies through raccoon populations follows major waterways. The slow rate of movement and the inapparent nature of the infection make us reluctant to term this an epizootic spread, however.

The apparent sporadicity of reports seems to be caused by the unaggressive nature of rabid raccoons, according to witnesses and victims. In 38 incidents, not one person indicated that the raccoon had attacked persons or dogs unless a close approach was followed by an overt act by the victim. People were usually bitten when they or their dogs tried to kill or capture raccoons that wandered, often obviously sick and in daylight, into doorways or along streams and highways. Victims "knew" something was wrong in some cases but were vague as to how they "knew." At least five of these animals were thought to be escaped pets, and three of them were put in cages because of their gentle behavior. Two were kept as pets for several days, and their captors suspected rabies only after the animals were found dead.

Two fishermen allowed a fearless and obviously distressed raccoon to pass between them and the river in which they were fishing without being attacked. When the animal passed a second time under their cane poles, they decided to capture and submit it for laboratory examination. This uniformly benign behavior is startling when first observed by anyone familiar with the viciousness of a significant portion of rabid dogs and foxes, which attack from considerable distances.

Six of the twenty-eight raccoons taken in traps or found dead on highways in Palm Beach County by J. E. Held, D.V.M., in 1956, were

rabid. Despite this evidence of a severe localized epizootic, no attacks were reported from the area, although large numbers of people fished and picnicked along the highways and canals in this part of the Everglades. Reports of cattle and other livestock dying of rabies were rare in the raccoon rabies area, in marked contrast to the situation in parts of the State where dog or fox epizootics occurred. If raccoons are no more aggressive toward each other than they were toward the victims interviewed in this study, it is difficult to understand how the infection can be maintained in the raccoon population. Our observations on prevalence and geographic movement suggest that enzootic spread of rabies does occur in raccoons.

Unaggressive behavior did not mean that raccoons were not a serious rabies problem. On the contrary, an average of nine persons per year were bitten in Florida. Often such persons were so severely and painfully bitten they needed help to escape from the animals. Further, rabid raccoons were even more important as a vector for introducing rabies into dog populations. Dogs were especially likely to be bitten when they harassed sick raccoons that wandered into communities or towns. The dog rabies epizootic of 1955 in Tampa, Hillsborough County, probably started with a hound that had caught an infected raccoon. Nearby Pasco County had a number of rabid dogs during the same year, the disease probably spreading up the Hillsboro River through infected raccoons.

Most of the danger from the raccoon stems from the inapparent nature of rabies in these animals. This characteristic permitted the infection to move considerable distances without attracting attention. When a rabid raccoon was reported from Inverness, Citrus County, on the Withlacoochee River and its lakes, a trapping program was initiated to investigate the animal population. Of 24 raccoons captured along the river, 1 was rabid. This animal was taken about 35 miles downriver from Inverness, but the two intervening waterfront towns of Dunnellon and Yankeetown did not report any rabid animals or unusual raccoon behavior. Rabid raccoons were discovered almost simultaneously on either side of eight other river or waterfront towns, but none of the towns reported any rabid animals, although infected raccoons presumably passed through the communities.

Our data indicate that rabies was common in the raccoon population of peninsular Florida. The unaggressive nature of rabid raccoons and, consequently, the low reporting rate merit further study. Our data fail to show that raccoons have had any contact with an inapparent rabies reservoir in other species. The wide distribution but sporadic reporting of rabies in raccoons made it virtually impossible to recognize such contacts.

Skunks

Data on rabid skunks are meager in Florida. Nine cases were recorded, but there were no data on animal populations where six of these occurred. In two cases trapping yielded 30 skunks, but none of these was rabid. No rabid skunks were submitted to the State laboratories from the fox rabies epizootic area, although striped skunks, *Mephitis mephitis*, were abundant in some places. This animal inhabits all mainland Florida. The spotted skunks, *Spilogale ambarvalis* and *Spilogale putorius*, are reported only from the lower peninsula and from extreme western Florida, respectively. It is not known which species made the attacks.

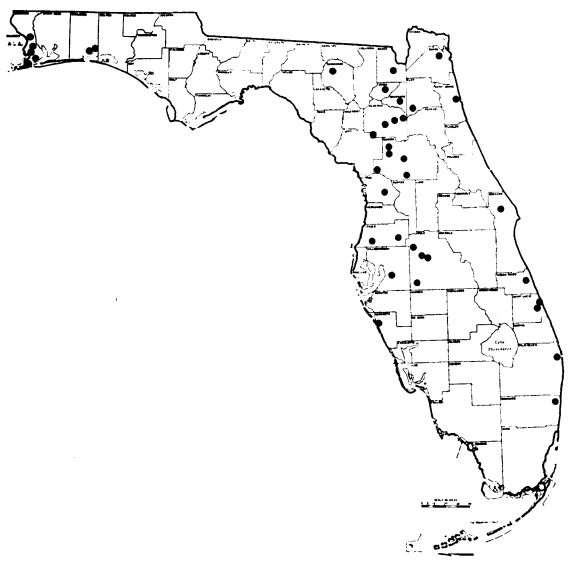
Heads of two rabid animals, one fox and one raccoon, smelled so strongly of skunk scent when received in the laboratory that there was little doubt they had contacted a skunk shortly before they were killed. Obviously, rabid skunks might infect other carnivores that attack them. The infrequency of attacks by rabid skunks, the aggressive nature of one of the two rabid skunks observed, and the attention they get when active in the daytime seem to exclude the striped skunk, at least, from consideration as the effective but inapparent rabies reservoir we seek. The behavior of both genera of skunks, when rabid, should be studied under experimental conditions.

County Observations

The nature of sporadic rabies can be better understood when the cases recorded in a single county are examined. Polk County is typical

of the area where sporadic cases occurred most frequently. Twelve rabid animals were reported between 1951 and 1958, and these were distributed among six species. Careful case history studies established that no two animals of a single species were ever in contact with each other. Five animals, one bat, two kittens, one puppy, and one fox, were reported within the city limits of Lakeland, but there is reason to doubt that contact existed between any two of them. The lifespan of the kittens and the puppy did not overlap. The remaining seven rabid animals were widely separated in time and space, covering an area of more than 700 square miles and a period of 5 years. Similar situations were observed in at least 10 other counties. These 11 counties had a total of 84 sporadic cases, excluding the cases in raccoons and those related to dog rabies epizootics in two counties, or an average of almost 8 cases per county. Some cases involved bats or livestock, but an average of almost two cases per year was maintained in carnivores in each county for the years in which rabies was reported. There seemed to be a slow but steady rate of infection among the susceptible carnivores. The surveillance and animal bite reporting in these counties was probably as good as that attained anywhere.

Figure 3. Sites of sporadic rabies cases in Florida in carnivore species,[1] 1951–58



[1] Dogs and raccoons excluded. Each case for which a site is given was found to be isolated in time and geography from other known rabies cases. Sites for a few early cases could not be determined.

Comment and Conclusion

From locations of sporadic cases of rabies, excluding dogs and raccoons (fig. 3), and their seasonal incidence (table 2), it must be inferred that, if a single reservoir was responsible, it functioned constantly over a large area, but rather infrequently at any given place. There was no evidence of a slack season or of periods of increased activity in one circumscribed area.

The possibility that a multispecies enzootic exists, with infection between different species being more frequent than within any one species, has been mentioned. From data given in 197 case histories, the relationships of species of rabid animals to their victims, including persons, has been charted (table 3). A need for further study of the behavior of rabid animals of all species under experimental conditions is indicated. Some knowledge of the usual relationship between foxes and skunks, foxes and house cats, and skunks and house cats would be enlightening. The behavior of animals of all species toward rabid raccoons and bats should be investigated.

We can see from our present data, however,

Table 2. Seasonal incidence of sporadic rabies in Florida, 1951–58

Species	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Fox	3	3	0	1	1	0	2	1	0	2	1	2	16
House cat	2	0	0	2	1	0	2	3	1	2	1	0	14
Other [1]	0	1	1	1	0	0	1	0	0	0	1	1	6
Total	5	4	1	4	2	0	5	4	1	4	3	3	36

[1] Skunk, cattle, dog.

Table 3. Species exposed by rabid animals in 197 case histories

Victim	Vector					
	Dog	Cat	Fox	Raccoon	Skunk	Bat
Dog	Yes	No	Yes	Yes	?	Yes.
Cat	Yes	No	Yes	No	No	Yes.
Fox	No	No	?	No	No	No.
Raccoon	No	No	?	?	No	No.
Skunk	No	No	?	?	No	No.
Bat	No	No	No	No	No	?.
Humans	Yes	Yes	Yes	Yes	Yes	Yes.
Livestock	Yes	No	Yes	No	?	No.

Yes = Observed contact.
No = No observed contact.
? = No observed contact but with attack indicated by epidemiological evidence.

that dogs, foxes, and possibly raccoons support epizootic rabies when suitable populations exist. Bats of various species may support epizootic rabies also, although the methods of transmission between bats, even between individuals of one species, have not been established in Florida. House cats and skunks apparently do not support epizootics, and seemingly do not infect others of their species, although skunk epizootics are reported from other States.

Dogs, when rabid, infected other dogs, house cats, and livestock, but apparently did not infect wildlife. In contrast, rabid house cats attacked only persons, and cats in contact with them did not become rabid. Foxes attacked other carnivore species, livestock, and humans. Observations indicated that some rabid foxes will attack anything moving, including inanimate objects. In contrast, rabid raccoons attacked nothing that did not first attack or threaten them.

Bats have exposed persons, dogs, cats, and presumably wildlife species also. There is now evidence that rabid bats are infective (*6*). Any reservoir likely to infect cats, kittens, or puppies may be considered equally likely to function for skunks, foxes, and even raccoons.

If these data adequately depict the status of rabies in Florida, some general impressions can be expressed concerning the existence of an inapparent reservoir. The epizootics observed in foxes and the endemism seen in raccoons may explain all of the rabies cases recorded from western Florida and some of the sporadic cases in the peninsula. Since some of the sporadic cases, especially in kittens, could not possibly be traced to a bite by a raccoon, fox, or dog, it is logical to assume that some other vector is responsible, at least for some of these cases. It may be that this vector, which functions for kittens, and presumably for cats, infects other species also. Whether rabid insectivorous bats are capable of this, we do not know, though our data seems to exclude the carnivores. There is little room for doubt that some wildlife reservoir for rabies exists in Florida. Its identity and the means of the spread of infection need to be determined by further study.

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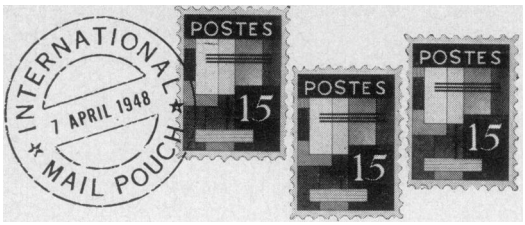

Wells for Siem Reap

After 8 wells were drilled in a demonstration, the residents of Siem Reap, a town of 10,000 population, drilled an estimated 300 additional wells themselves. Cambodia's Ministry of Public Health and the U.S. Operations Mission supplied pumps, casing, and drilling equipment.

—ANTHONY J. KRANASKAS, *acting chief, Public Health Division, U.S. Operations Mission, Cambodia.*

Quackery in the U.S.S.R.

For publishing and promoting quack cures for cancer and other diseases, the Soviet press was assailed by a panel of 16 prominent Soviet physicians, headed by Prof. Nikolai N. Blokhin, president of the Academy of Medical Sciences, it was reported by the *New York Herald Tribune,* April 22, 1960. The physicians charged that the press was confusing the public and discrediting Soviet medicine in publishing reports of "cures" which had been proved to be spurious and dangerous.

The articles the physicians cited described a professor's claim that cancer was caused by round worms, a "cured" case of stomach cancer in a patient who later had to have his stomach removed because of the malignancy, a remedy of boiled vodka and nonrefined resin for tuberculosis, and a special machine that "cured" a ballet dancer's rheumatic affliction.

Self-Help in Thailand

In the Korat Province of Thailand, village health committees are sponsoring the development of health services in 20 village areas, each comprising one or more villages. A total of 14 wells have been installed, protected, equipped with pumps, and 1,344 sanitary privies completed.

For example, in Natavong an eight-member health committee has been functioning energetically for 5 months. The headman donated, for the use of the health worker, a demonstration house which was quickly improved and became a model for the 74 families of the village. Under the committee's leadership, the villagers dug, cased, and covered one well, dug a second, and are planning two more. All but 16 families have privies and many of the men constructed their own privy slabs at the demonstration house. The village is clean and road work is underway. A midwife has established herself and is working effectively. The people of neighboring villages, interested in the achievements in Natavong, asked for a meeting, and a single health committee to serve a nine-village area is planned.

The villagers of Talang in the island Province of Bhuket wanted a clean marketplace and safe water. Although they numbered fewer than 1,000, they organized, and in a few weeks planned and built a market with concrete stalls and good drainage and developed a safe deep well with sufficient flow of water to clean the market daily and serve two schools and public outlets on the main street. Funds, raised locally, paid for a pump, a 4,000-liter elevated storage tank, and the construction of the market.

—ANDREW P. HAYNAL, M.D., *chief, public health division, U.S. Operations Mission, Thailand.*

The Korat Pump

Thai and United States members of the village health and sanitation project have devised a low-cost hand pump to meet special needs in supplying water to the villages.

Required was a pump that could be manufactured of materials locally available throughout the country, and capable of being maintained without removing the pipe from the well, so that block, tackle, and tripod would not be needed.

The Korat pump consists almost entirely of ordinary 2-inch water pipe, including the cylinder. A machine shop can produce it at a total cost equivalent to $20. Thirty of the Korat pumps were built and installed in various areas and are being evaluated under varying conditions. A form was developed to record data on operations. If the findings are favorable, large-scale production of the pumps will be started to supply an increasing demand in the villages.

—ANDREW P. HAYNAL, M.D., *chief, public health division, U.S. Operations Mission, Thailand.*