

The Rabies Reporter

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In This Issue:

Raccoons on the Road

Rabies in New York State

***The Problem of Incidence by
HealthUnit in the Toronto Area***

In the Insider

Rabies in 1991 - The Year in Review

Raccoons on the Road

Raccoons are notorious mischief-makers, and they have served as excellent vehicles for the northward movement of the raccoon-rabies virus from Florida. Cases of raccoon-rabies virus strain are now appearing in western New York state, about 80 km from the Canadian border. The map in Figure 1, based on township level reports from the New York Department of Health, shows the advance of the raccoon rabies front during 1991.

There are several strains of rabies virus, each of which appears to be spread in the wild by only one or a few species. Monoclonal antibody techniques have enabled identification of at least five strains of rabies among terrestrial mammals in North America, and more among bats, some of which are still being identified. In Ontario, the virus source of our present problems was arctic foxes in the 1950's, and that virus is currently spread by red foxes and skunks. Of the 2,000 animal rabies cases in Ontario in an average year of the 1980's, 900 were foxes, 380 were skunks, and only 15 were raccoons. When the raccoon strain of rabies arrives, those numbers will change significantly. The number of raccoon cases will of course increase, and it is likely that the number of skunk cases will also increase. In Pennsylvania, the ratio of raccoon to skunk cases is about the same as the fox to skunk ratio in Ontario; that indicates that the raccoon strain is capable of infecting quite a few skunks.

Raccoons spread the disease through contact with each other. They normally

do not travel great distances, so the spread of the disease is usually from family to neighbouring family. The size of a home range or area of activity of a raccoon family is between 30 and 100 hectares (75 to 250 acres) (Sanderson, 1987, 491), with smaller home ranges in urban areas. Radio-telemetry analysis of raccoons in metro Toronto indicates that home ranges are about 50 hectares in size. In rural Ontario, Ministry of Natural Resources analysis of radio tracking data shows home ranges as large as 300 or 400 hectares.

If one assumes roughly circular home ranges, the home ranges mentioned above would have diameters of 0.8 km in urban areas and 1.95 to 2.25 km in rural areas. Given that the disease incubation period (i.e. from time of infection to time of being contagious) averages one month, with a range from two weeks to six months, and, assuming for the moment, that raccoons do not leave their home

ranges, a reasonable estimate for the spread of rabies is 27 km per year (2.25 km x 12 months). However, raccoons do not always stay in their home ranges; juvenile raccoons disperse from their natal range during the fall or the spring. In Iowa, dispersal distances averaged 15.1 km (S.E.=1.6, n=22) with a maximum of 34 km. (Clark *et al.*, 1989, 988). Simply adding these two movement components together gives an approximate rate of spread of 42 km per year. This is consistent with the estimate of 25 miles (40 km) per year noted by Jenkins and Winkler (1987, 429) in their examination of the spread of raccoon rabies out of Florida since the 1950's. These "back-of-the-envelope" estimates provide an idea of how fast rabies can be expected to spread, without the help of humans. At this rate the disease had spread to all of Florida, most of Georgia and South Carolina and eastern Alabama by 1981. Rabies cases in these three

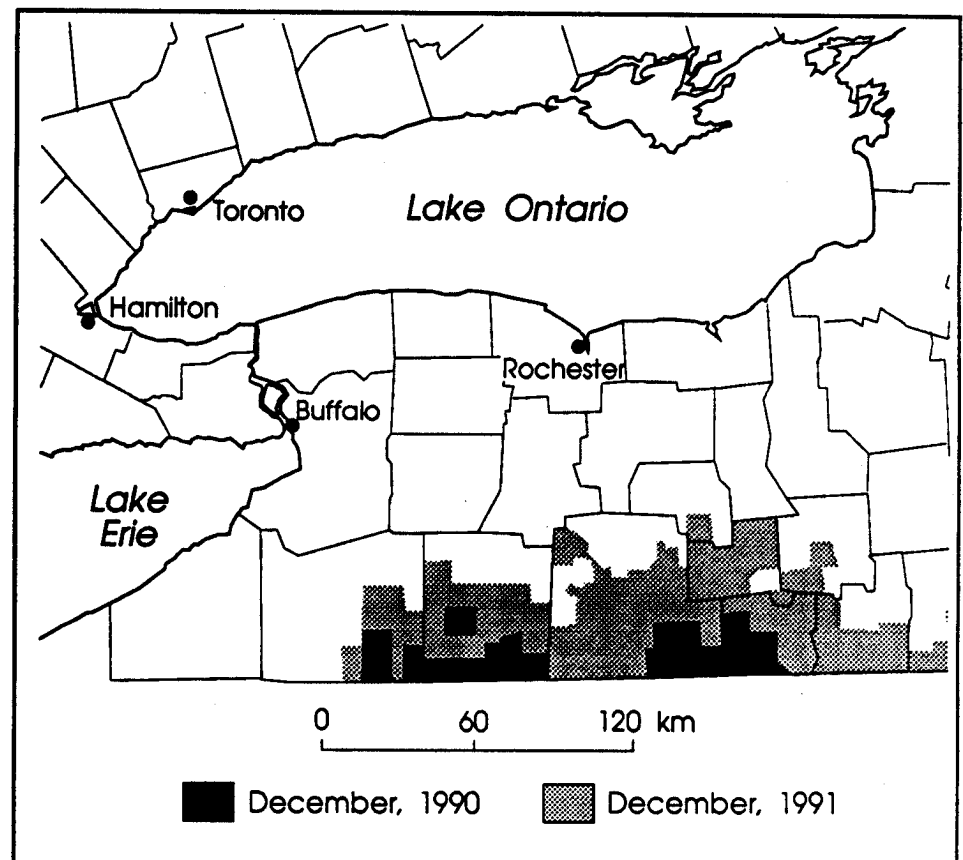


Figure 1. The spread of raccoon rabies in New York State. Data courtesy of Dr. Charles Trimarchi, New York Department of Health.

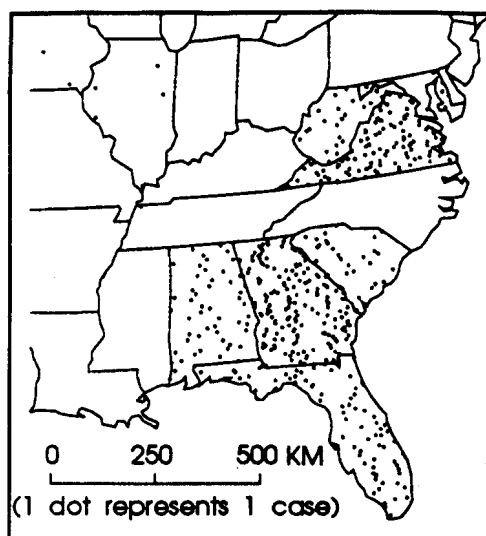


Figure 2. Rabies in raccoons, by state, 1981. Cases in Illinois and Iowa were probably skunk strain. Map is based on state level statistics. Dots do not show actual case locations; they portray relative incidence density by state.

states accounted for 69% of the reported cases in the United States in 1981.

The map of rabies incidence by state in 1981 (Figure 2), shows that rabies had established itself in West Virginia, without leaving a trail through North Carolina. This leap over North Carolina is attributed to the shipment of raccoons from the south eastern states to the middle Atlantic states to be released for raccoon hunting. Between 1977 and 1981 more than 3,500 raccoons were shipped, with legal permits, from Florida and released in Virginia (Jenkins and Winkler, 1987: 431). At least one raccoon was known to be rabid and monoclonal antibody studies of cases in Virginia showed strong similarities to the rabies virus enzootic in Florida.

Another means of spread, again arising from human activity, is through the relocation of nuisance raccoons. It is common practice in dealing with raccoons in urban areas, to live trap them and transport and release them in a rural area some distance away from the city (See Rosatte and MacInnes, 1989). Animal rehabilitators have also been guilty of relocating raccoons some distance from their capture sites, without having vaccinated the released animals. Both these solutions to a wildlife problem are poor, in terms of disease spread and also in terms of humane treatment of animals. Rosatte and MacInnes (1989) report that the relocated raccoons in their study greatly increased their movement over their normal patterns, presumably as

a result of being driven from pillar to post by the locally resident raccoon population. Of the 24 released raccoons, 12 are known to have died within three months of release. Ten of the surviving released raccoon were recaptured and three of these had actually lost weight at a time when they should have been gaining weight as winter approached.

Intentional relocations are not the only problems. In the spring of 1991, two raccoons were caught hitchhiking under the cab of a truck, attempting to cross the Hudson River into New York City -- they were stopped at the toll booth! More recently, the first case of raccoon rabies east of the Hudson River was reported 60 km east of the river, which suggests a long distance transport of a raccoon, perhaps another volunteer hitchhiker or the transport of a nuisance animal. By the time this raccoon was diagnosed, a new outbreak had been started which was 24 km in diameter within three months.

The rivers which separate Ontario from New York State are not impermeable barriers, particularly considering the combined ingenuity of the partners in the rabies-raccoon-human disease transport system. It seems likely, looking at the history of the spread of raccoon rabies in the United States, that Ontario can expect the arrival of the raccoon rabies virus within the next few years, or sooner if the hitchhikers are ingenious.

References:

- Clark, William, James J. Hasbrouck, James M. Kienzler and Thomas F. Glueck (1989) "Vital statistics and harvest of an Iowa raccoon population." *Journal of Wildlife Management* 53(4), 982-990.
- Jenkins, Suzanne R. and William G. Winkler (1987) "Descriptive epidemiology from an epizootic of raccoon rabies in the middle Atlantic states, 1982-1993." *American Journal of Epidemiology* 126(3), 429-437.
- Rosatte, Richard and Charles D. MacInnes (1989) "Relocation of city raccoons" in *Ninth Great Plains Wildlife Damage Control Workshop Proceedings*, USDA Forest Service, General Technical Report RM-171 87-92.
- Sanderson, Glen (1987) "Raccoon." in M. Novak, J. Baker, M. Obbard and B.

Malloch, eds. *Wild Furbearer Management and Conservation in North America*. North Bay: Ontario Trappers Association, 487-499.

Bruce Pond, Wildlife Research Section.

Rabies in New York State

There were 1,030 confirmed animal rabies cases in New York State during 1991. This figure is four times the 1990 total, and is ten-times greater than the annual average for the previous five-year period. This unprecedented increase in rabies in animals resulted from the combined effects of the slowly spreading red fox-vectored outbreak affecting northeastern New York, and the rapidly spreading mid-Atlantic raccoon rabies epizootic affecting southern New York. Rabies was once again reported in bats from all regions of the state.

The raccoon-vectored outbreak had affected 21 counties by the end of the year, accounting for 725 (70%) of all rabies cases statewide. Of those cases, 666 occurred in raccoons. The other 59 cases from that outbreak were the result of spill-over into 11 other species, notably including 3 white-tailed deer, 9 woodchucks, an otter, a coyote and an opossum. Of the 7,434 animals submitted for rabies examination during the year, 56% (4,146) were submitted from a

The Rabies Reporter, a scientific newsletter about current issues in rabies research and control, is a joint effort of the Rabies Research Unit, Ontario Ministry of Natural Resources; the Food Production and Inspection Branch, Agriculture Canada; the Ontario Ministry of Health and the Department of Geography, Queen's University, Kingston. Comments, letters, submissions and enquiries should be sent to:

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county affected by the raccoon rabies epizootic. Among the 1,596 raccoons submitted for testing, rabies was confirmed in 30% overall, 36% that had fought with a cat, and 46% that had fought with a dog. Among rabid raccoons, 1.5% reportedly had bitten a human, 14% had non-bite contact with a human, and 74% had reported contact with one or more domestic animals.

During 1991 the raccoon rabies outbreak expanded northward by approximately 25 miles (40 km) in most areas. The disease "jumped" nearly 50 miles (80 km) and breached the Hudson River into Westchester County in April. It has since spread throughout most of Westchester county and northward into Putnam and Dutchess Counties on the east side of the river. A single case in a red fox captured in southernmost Columbia County was demonstrated by monoclonal antibody analysis to be associated with the raccoon outbreak.

The northern rabies outbreak, which primarily affected Franklin County in 1990, spread throughout Clinton County and into northernmost Essex County in 1991. The red fox was still the primary vector, accounting for 87 of the 124 rabies cases associated with that epizootic. Over 60% (88 of 138) of the foxes submitted from that area were found to be rabid. Transmission of the disease to unvaccinated domestic animals was once again a serious problem, with cases in cattle (12), dogs (10), cats (2), a horse and a pet llama. The northern fox outbreak accounted for 168 of the 944 reported human post-exposure treatments in the state in 1991, and 147 (88%) of those resulted from exposure to these rabid domestic animals.

Rabies in bats was geographically widespread during the year, with the disease confirmed in 79 bats from 65 townships in 35 counties. The 1991 total was the second greatest recorded, down from the 84 rabid bats confirmed in 1990. The distribution of rabies in bats was clearly independent of the two terrestrial rabies outbreaks: the positivity rate among bats collected in counties affected by a terrestrial outbreak (35/675, or 5.2%) was not significantly different than that for counties not affected by a terrestrial outbreak (44/989, or 4.5%).

This report was extracted from a longer version written by Dr. Charles Trimarchi, New York Department of Health.

The Problem of Incidence by Health Unit in the Toronto Area

Until recently, the Ministry of Health (MOH) published rabies incidence in the Ontario Disease Surveillance Report (ODSR). Total monthly rabies cases were listed by species for each Health Unit. As the statistics were obtained from within the MOH, in cooperation with the AgCan Regional Office, rabies counts were available at the Health Unit level. These reports have been discontinued.

Rabies incidence counts can now be found in the Rabies Reporter, produced by the Ministry of Natural Resources. The data are obtained directly from Agriculture Canada's computer database, the Lab Sample Control System (LSCS). The only locational information in this database is the UTM and county where the specimen was found. The purpose of the UTM is to allow specific identification of the location of the specimen. Locations can be identified within 100 meters if the UTM is included in the submissions report. If desired, cases could be attributed easily to local Health Units. This would be a problem, however, in the Toronto region.

This problem is not due to the UTM but to the LSCS. The May, 1990 issue of the Rabies Reporter (Vol. 1, No. 1) outlined how for each rabies submission the LSCS runs a comparison check against a listing of map sheets valid for each AgCan District Office (DO). If the UTM and map sheet do not cross-reference, the UTM is rejected as "Invalid for District". The problem lies where some map sheets have been misassigned, causing UTM's to be rejected erroneously. This is significant to the Toronto area situation and is what prevents assignment by Health Unit. When the check list was developed the Ontario Regional Office (once located in Toronto, but recently moved to Guelph.) was considered responsible for reporting cases falling within various map sheets, including sheets 030M11 and 030M12. The Regional Office, however, is an administrative headquarters and does not function as a DO. Thus, cases falling within these map sheets are actually submitted by DO's. When the LSCS compares the map sheet portion of the UTM to the DO code it does not find a

match. Consequently, the UTM is, incorrectly, rejected from the database. The only locational information then available is the county, and thus cases cannot be attributed to the appropriate Health Unit. They also cannot be mapped.

Although this problem plagues several DO's where map sheets have been misassigned, the problem is most pronounced in the Toronto area due to the apparent existence of "another" DO. AgCan is aware of this program but has yet to correct it. Until then, Health Unit identification for rabies cases in the Toronto area will not be possible using the LSCS as the data source.

Carolyn Fielding, Geography Department, Queen's University.

Raccoon Rabies Task Force Report Available

A Task Force set up by the Rabies Advisory Committee completed its report in February. The report is titled "The Raccoon Strain of Rabies: Recommendations to Prevent Its Becoming Established in Ontario". Copies are available on request from the Rabies Research Unit.

Errata and Updates

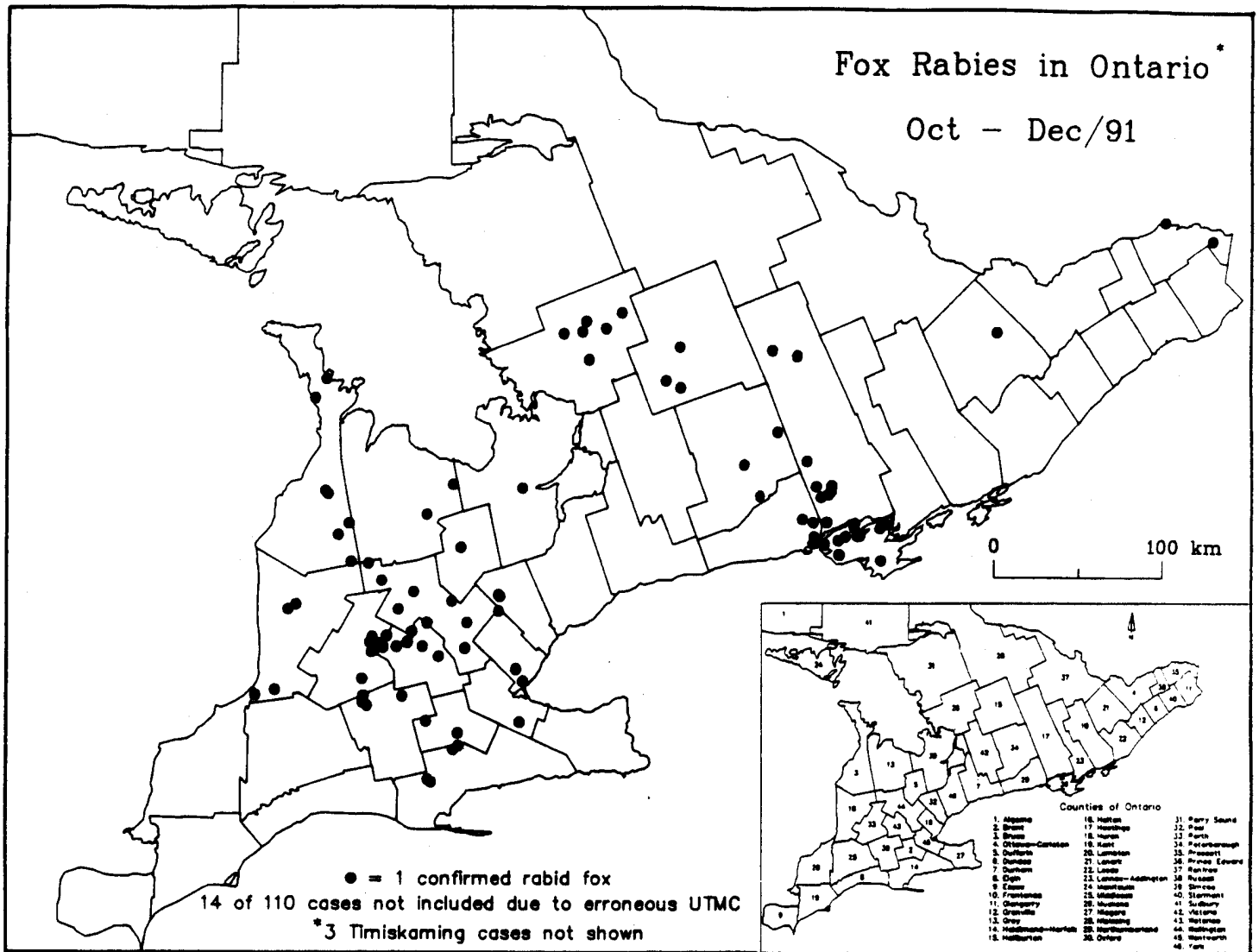
The last issue of the Rabies Reporter was full of errors. The predictions were incorrectly listed as written by C.D. MacInnes, when, in fact, credit should have gone to R.R. Tinline.

Carolyn Fielding's article on difficulties with UTM codes for the Toronto area was butchered so badly that it is repeated in this issue.

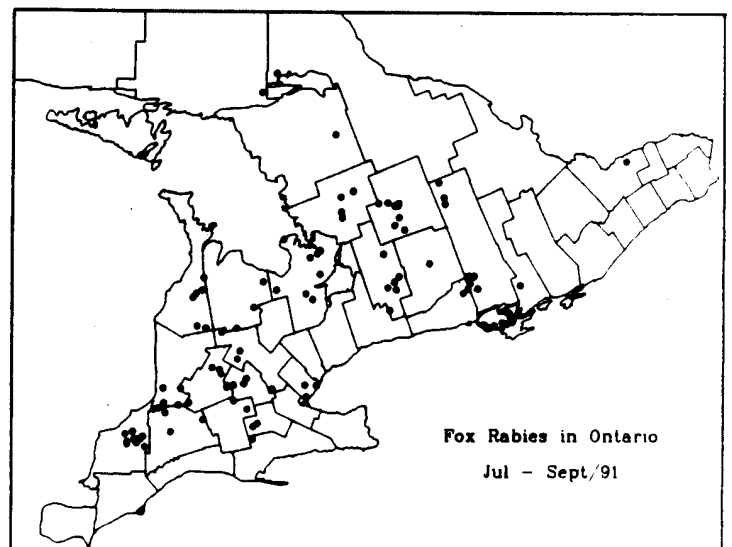
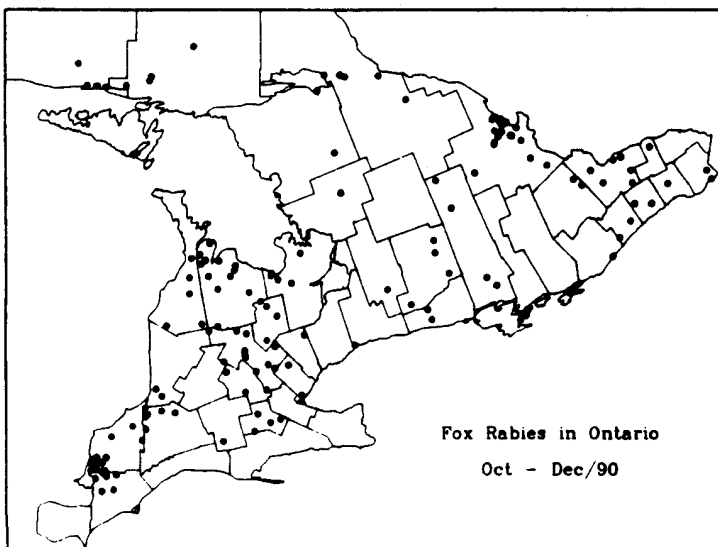
The Rabies Reporter apologises to both Roly and Carolyn. We also note, in passing, that Roly's predictions were very accurate.

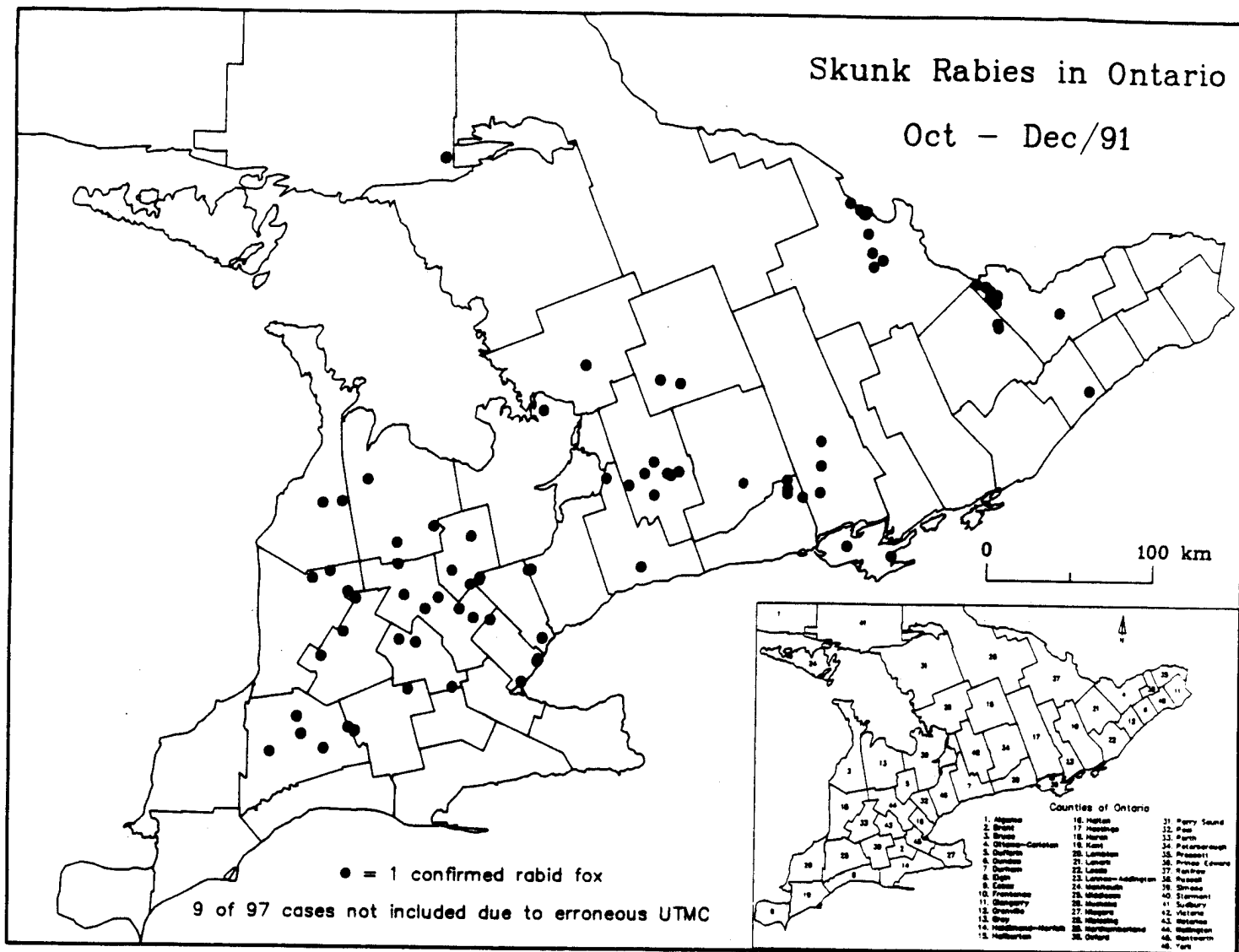
The address and telephone numbers for the Rabies Reporter have finally been corrected.

The worst feature of the last reporter was the publication date. This issue is closer to time, but still two months late. This will improve, as a new team is working on production. Sarah Crossey and Bruce Pond are the assemblers of articles, and Charlie MacInnes will be in charge of preparing the final copy. Wendy Sinclair will produce and mail the reporter.

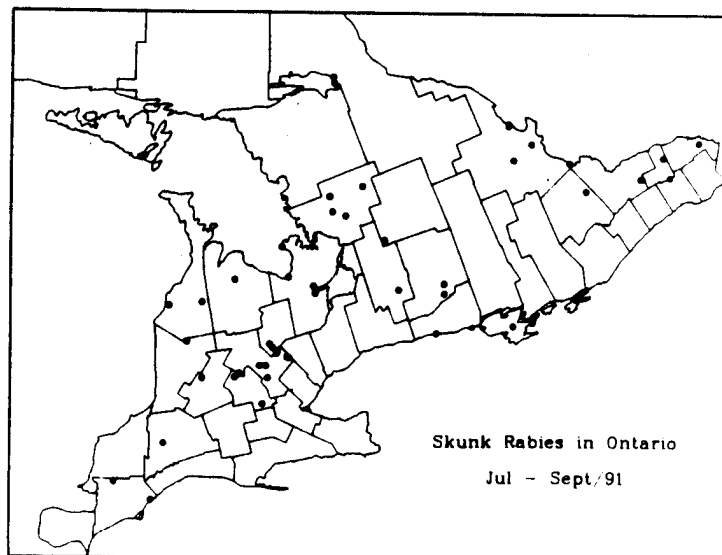
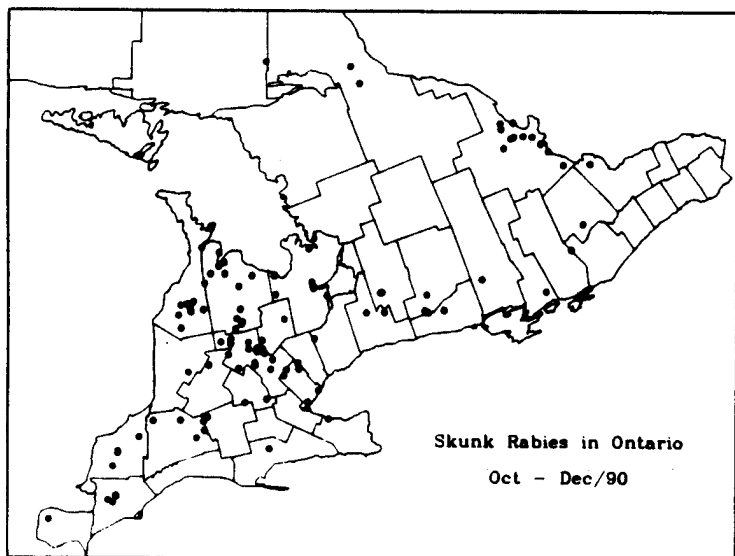


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Inside This Issue

Rabies in 1991 - The Year in Review.

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The 1144 rabid animals recorded during 1991 is the lowest total recorded in two decades. There were 1157 cases in 1977, 1058 in 1967 and 971 in 1966 (fig. 1). The level of human post-exposure treatments also dropped, but the picture is complicated by the change to human diploid cell vaccine (HCDV) about 1980.

There are two sources of this drop, the success of the control program in eastern Ontario, and levels of rabies in the rest of southern Ontario, which were towards the low side of the normal range. The summary of rabid animals by region is shown in figure 2. The eastern and southern regions both had exceptionally low levels of rabies in 1991. In the central and western regions, numbers of cases were down from the very high levels in 1986, but were fairly typical of the situation in the 1970's. The continued spread of rabies in northern Ontario kept levels high for the northern region.

Success of the bait program in eastern Ontario is becoming clearer each month, but there are still at least two

years to wait before we can be sure that rabies has been eliminated from the system. Cases of rabies in foxes have stayed low for an exceptional length of time. Figure 3 shows the history of rabies in foxes. The strong cycle of fox rabies in eastern Ontario is clearly evident. It is also obvious that there have been low periods between previous highs, notably in 1977. What is different this time is that the levels have stayed low for over a year. In fact, in the month of January 1992, there was not a single rabid fox in the whole 12-county area covered by the

bait drops. Statistical analysis of the past history shows that the probability of low levels of rabies for so many quarters, under the normal cycle, is less than 0.02. That indicates that some new force has affected the situation - is this a sign that the bait program is effective?

There were rabies outbreaks in Quebec, and along the west side of the

vaccination zone during 1991. In fact, as mentioned in the last issue of the Rabies Reporter, most of the fox cases within eastern Ontario during 1991 were along the Ottawa River, some in eastern parts of Ottawa, others in the Hawkesbury area. A single rabid fox was reported in the county of Lennox and Addington during the third quarter. Failure of these outbreaks to spread into the vaccinated area is additional evidence that the vaccination program is effective.

During 1990, there were several rabid foxes reported south and west of

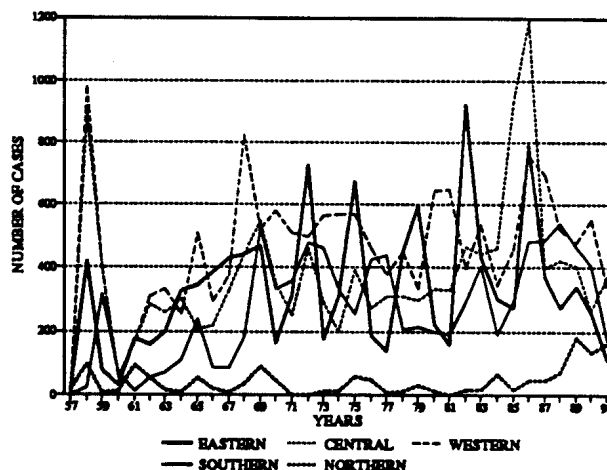


Figure 2. The annual totals of rabies cases for each of the regions listed in the Rabies Reporter.

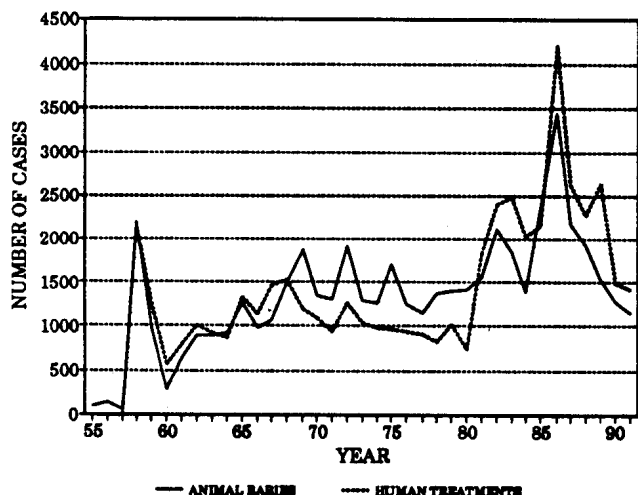


Figure 1. The annual totals of rabies cases and human post-exposure treatments in Ontario, 1955-1991.

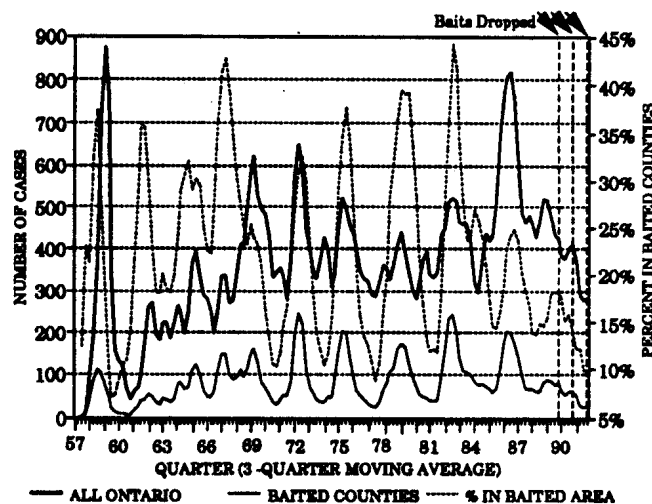


Figure 3. Rabies cases by quarter in Ontario. The graph shows the importance of eastern Ontario to the overall provincial picture, and the effects of the baits program.

Animal Rabies Report: October to December 1991

Animal Type	Fox			Skunk			Other Wildlife			Dog			Cat			Livestock			Total	
County or Area	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative
		91	90		91	90		91	90		91	90		91	90		91	90		
Eastern																				
Stormont	0	1	6	0	2	7	0	1	1	1	0	0	0	2	0	0	2	1	5	18
Dundas	0	0	6	0	0	5	0	0	1	0	0	2	0	0	0	2	5	0	4	17
Glengarry	0	0	10	0	0	1	0	2	0	0	0	0	0	1	0	1	6	0	3	18
Prescott	4	6	1	0	2	1	0	0	0	1	0	1	1	0	1	2	0	6	12	2
Russell	0	5	1	0	1	2	0	1	0	0	0	0	0	0	0	0	0	0	7	3
Carleton	0	13	16	7	13	7	1	3	2	0	1	0	2	0	0	4	10	8	36	35
Renfrew	0	3	92	9	20	15	1	2	4	1	2	11	3	3	0	3	45	12	33	170
Lanark	1	1	9	2	3	3	0	1	3	0	0	2	0	0	0	0	5	3	5	22
Grenville	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Leeds	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Frontenac	0	0	2	0	2	0	1	5	0	0	0	0	0	0	0	0	0	1	7	2
Lennox-Addington	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	2	1
Central																				
Hastings	9	32	10	3	6	5	1	2	0	1	4	2	2	4	1	1	2	5	17	23
Prince Edward	14	40	2	1	7	0	0	1	1	2	3	0	0	2	0	3	6	0	20	59
Northumberland	4	15	7	4	10	4	1	2	1	0	0	0	0	3	1	1	9	7	10	39
Victoria	1	13	8	7	12	9	1	2	2	0	1	0	0	0	0	5	7	3	14	35
Haliburton	3	30	7	2	6	0	1	1	0	0	0	1	0	0	0	1	4	2	7	41
Peterborough	3	10	14	2	7	7	3	4	5	0	3	0	1	2	3	2	5	5	11	31
Durham	0	1	6	2	6	1	1	3	0	0	2	0	0	0	1	0	1	3	3	13
York Region	0	1	2	1	11	1	5	7	0	0	0	0	0	0	0	0	0	6	19	3
Scarborough																				
East York																				
City of Toronto																				
City of York																				
North York																				
Eriebecker																				
Simcoe	3	46	74	2	22	22	0	4	7	0	3	3	0	0	6	2	12	138	7	250

Animal Rabies Report: October to December 1991

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Animal Rabies Report: October to December 1991

Animal Type	Fox			Skunk			Other Wildlife			Dog			Cat			Livestock			Total		
County or Area	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative	
		91	90		91	90		91	90		91	90		91	90		91	90		91	90
Northern (continued)																					
Thunder Bay																					
Rainy River																					
Kenora																					
Subtotals																					
Eastern	5	30	146	19	44	42	4	16	11	2	6	13	2	8	6	1	12	73	33	116	291
Central	37	188	130	24	87	49	13	26	16	3	16	6	3	11	12	15	46	163	95	374	376
Western	50	118	265	40	116	128	4	11	14	2	4	10	5	10	33	18	63	199	119	322	649
Southern	9	62	187	9	36	68	0	14	13	0	3	26	4	12	35	4	41	107	26	168	436
Northern	9	115	95	4	24	14	0	9	4	0	4	4	1	3	1	1	9	9	15	164	127
Totals	110	513	823	96	307	301	21	76	58	7	33	59	15	44	87	39	171	551	288	1144	1879

Clinically Diagnosed Cases not included above. In 1991 there were 79 bovine, 10 ovine and 1 porcine diagnosed clinically.

Livestock: This quarter: 15 bovine, 1 equine, 2 ovine, 4 porcine All 1991: 125 bovine, 5 caprine, 8 equine, 27 ovine, 6 porcine

Other Wildlife: This quarter: 6 big brown bat, 1 little br. bat, 4 coyote, 1 raccoon All 1991: 40 big br. bat, 2 little br. bat, 1 red bat, 13 coyote, 9 wolf, 2 groundhog, 9 raccoon

Renfrew. The first cases were in an area not covered by the 1989 bait drop. This outbreak could have been the start of the large outbreak which should have occurred in eastern Ontario during 1991. Fox rabies spread into the edge of the 1989 vaccination area in the late summer of 1990, and continued at high density until December, then abruptly vanished. The whole area was baited during October 1990 and 1991.

Rabies is persisting in skunks in the vaccination zone. That was expected, since the vaccine does not immunize skunks orally. However, rabid skunks have always been few in eastern Ontario, and most cases occurred in the 6 months to a year which followed outbreaks in foxes, indicating that the majority of rabid skunks were probably infected with rabies by a fox rather than by another skunk. As a result, we hoped that rabies would not persist in skunks once the disease was eliminated from foxes. Clearly it will take time, perhaps 2-3 years, to see if that prediction is valid. As long as rabies persists in skunks, there is danger that foxes can be infected, since the virus strain is the same in both species in eastern Ontario. Meanwhile research towards an effective oral vaccine for skunks continues.

Human treatments continued to drop during 1990 and 1991. As figure 1 shows, the number of post-exposure treatments has always related closely to the total number of rabid animals. The relationship did change around 1980, when the HCDV vaccine was phased in, and the danger of serious side effects due to vaccine was reduced. The 1990 and 1991 treatment levels were the lowest since the new vaccine was introduced.

The drop from 113 rabid livestock in 1989 to 12 in 1991 also represents a substantial contribution to the farm community.

The very large natural fluctuations in rabies cases in eastern Ontario have made it difficult, until recently, to assess whether the low levels were due to the bait program. We now believe that the prolonged low levels are good evidence that baiting has had a real effect.

C.D. MacInnes - MNR Rabies Unit.