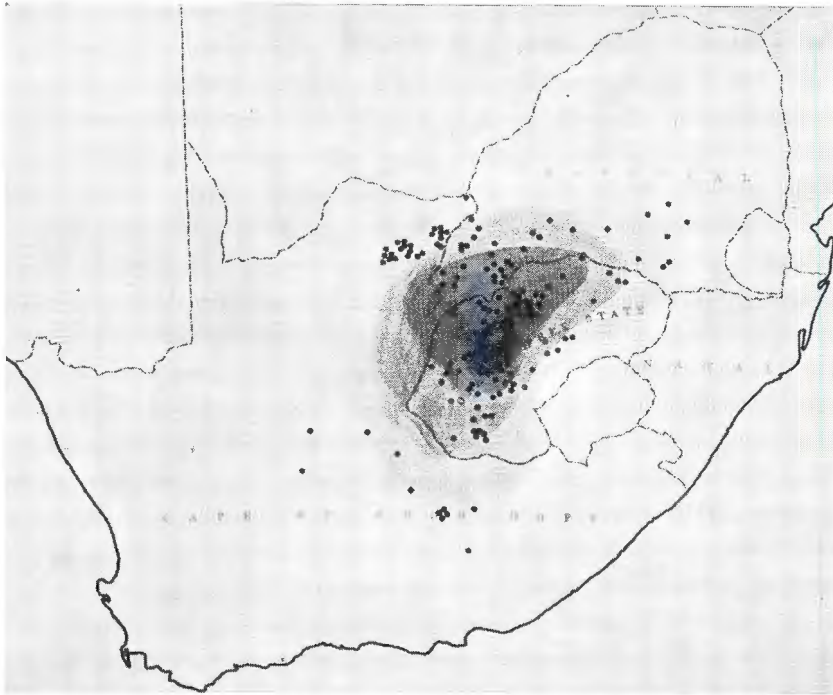


The majority of colonies was located along the two vleis running on either side of the station, one through Ems, Waaikraal, etc., and the other along the boundaries of these farms, involving Jacobusgeluk and Sannahspost farm. Further colonies were located on Valle, Rust-en-Vrede and Bourdillon along the river, and at the foot of the low ridges. At Woonhuis, Goupond and Rampani where soil erosion was prevalent, and on the hillock stretching towards the station, only a few colonies existed on the hillock between the two vleis and on the hillock on Meyersgeluk, Baden, and Kromdraai.

Hence the infection was considered to be among the meercats that stayed along the Modder River, and the two vleis referred to above, involving the whole are indicated on the sketch map.

Table 7 is a summary of the work done in this area.

Map No. 1.



Skeleton Map of the Union of South Africa, showing:—

- (a) Individual farms on which infection has been proved to occur between 1928-39. Whether one case of rabies or several have occurred during that period, the farm is represented by one dot only.
- (b) The estimated population density of *Cynictis*. The dark central area represents an estimated density of one per ten morgen or less, the lighter shades of one per 10-20 or more morgen, and finally 1 per 50 or more morgen. Note the localised areas and the frequency of outbreaks corresponding with the density of *Cynictis*.

Map No. 2.  
 SKETCH-MAP OF MARAH WAAIKRAAL AREA.



Reference:—

..... Vleis, showing where the majority of meercat colonies were located.

× Points where rabid animals were found and suspected cases occurred.

I, II, etc. Represent the sections treated in sequence.

Meercats were exterminated over the whole area.

TABLE 7.  
*Destruction of Meercats on Marah—Waa*

No. of Section.	Date.	Number of Colonies Gassed.	Number of Colonies Open on day following Gassing.	Number of Traps Set and Result.		Number of Colonies Open on 2nd day following Gassing.	Number of Traps Set and Result.	
				Traps Set.	Meercats Caught.		Traps Set.	Meercats Caught.
I.....	11/2/39	12	—	13	9	—	—	—
II.....	13/2/39	18	7	13	9	—	—	—
III.....	14/2/39	5	10	11	10	6	9	8
IV.....	15/2/39	5	2	3	2	—	—	—
V.....	16/2/39	5	2	3	1	2	3	1
VI.....	17/2/39	4	0	0	—	0	0	—
VII.....	18/2/39	—	2	2	1	—	—	—
VIII.....	20/2/39	7	—	—	—	3	4	3
	21/2/39	—	1	1	1	—	—	—
IX.....	22/2/39	17	—	—	—	—	—	—
	23/2/39	13	5	22	0	—	—	—
	24/2/39	15	3	4	0	—	—	—
X.....	25/2/39	11	3	7	0	—	—	—
XI.....	27/2/39	10	—	—	—	8	34	0
	28/2/39	7	7	36	18	—	—	—
	1/3/39	—	4	24	0	4	24	3
	2/3/39	—	—	(40	35)	4	24	3
	3/3/39	10	—	—	—	—	—	—
	4/3/39	4	0	0	—	—	—	—
	6/3/39	—	—	0	—	3	7	0
XIII.....	7/3/39	3	—	—	—	—	—	—
XIV.....	8/3/39	6	0	—	—	—	—	—
XV.....	9/3/39	12	3	3	—	—	—	—
	10/3/39	6	6	19	—	3	3	3
XVI.....	11/3/39	3	0	—	—	6	19	11
XII.....	13/3/39	—	1	—	—	1	2	0
	14/3/39	7	—	—	—	—	—	—
	15/3/39	6	0	—	—	—	—	—
XV.....	16/3/39	9	3	12	8	1	2	0
	17/3/39	8	3	8	3	3	5	3
	18/3/39	3	0	—	—	—	—	—
	20/3/39	—	—	—	—	—	—	—
	21/3/39	—	—	—	—	—	—	—
	22/3/39	—	—	—	—	—	—	—
	23/3/39	—	—	—	—	—	—	—
	24/3/39	—	—	—	—	—	—	—
	25/3/39	—	—	—	—	—	—	—
27/3/39	—	—	—	—	—	—	—	
		210	62	221	97	40	112	32



*Remarks.*

(a) At the outset it must be stated that this was the first time such a large area had been treated, and coupled with the inexperience of the gassing squad, labour shortage (only two boys being employed on some days), the work was carried out under difficult circumstances.

(b) From the number of colonies found reopened at the final inspection, i.e. from the 20th to the 27th, and the number of meercats trapped during that period, the results of the gassing and subsequent trapping appear to be disappointing.

(c) That out of 210 colonies, 62 were found reopened on the day following the gassing and 39 on the second day, and 63 and 31 meercats trapped respectively indicate that the gassing was not as effective as could have been expected. The conditions mentioned under (a) and the wet ground were responsible for this.

(d) In a great many instances birds were trapped at warrens which were found reopened. These were later identified as *Myrmecocichla formicivora*, or the Ant-eating Chat. Dr. Austin Roberts of the Transvaal Museum, who kindly identified these birds, added the following description of their habits: "This is purely a South African species, occurring in open ground, and I have procured them even as far north as Ngamiland and Ondonga districts in S.W.A. It feeds on insects, and nests and roosts in burrows and in the roofs of burrows made by antbears and meercats, so that its being trapped in the way you mention is not unexpected".

This bird's habit of reopening warrens that have been gassed and closed somewhat confused the issue, in that in many instances warrens that had been opened by them were attributed to the work of meercats.

(e) The trapping during the last seven days greatly reduced the number of meercats in the area. A final inspection was made in the areas where the majority of the colonies was located, i.e. along the Modder River, the two vleis, and the hillock on Woonhuis and Klipkraal, the vicinity of Sannaspost Station. In all only two *Geosciurus* were seen, and seven or eight colonies were found open.

All this indicates that the number of meercats on the farm was reduced to an almost negligible amount.

## (2) TAFELKOP—STERKFONTein: BLOEMFONTEIN DISTRICT.

29.5.39-8.7.39.

Outbreaks of rabies in *Cynictis* occurred at Tafelkop on 8.10.38, and at Sterkfontein on 9.12.38. On the latter farm mongooses behaving strangely were seen for some time prior to the outbreak. The localities where the infected mongooses were discovered are about 9 miles apart.

*The Description of the Area.*

(Refer to Map No. 3).—This centre is situated in the South-western part of the Bloemfontein district on the Fauresmith border. The area is marked by a loose range of high hills running from north to south. The altitude of the highest point, Tafelkop, is 5,312 ft., while the altitude of the plains is only 4,500 ft. Small ridges of stone kopjes are scattered over the farms Deelgenoot, Verona, Palmira, Fortuin, Mara, etc. Situated on Sterkfontein is a large dry pan, into which leads a shallow vlei, rising on Tafelkop, with tributaries originating from the range of high hills.

Map No. 3.

TAFELKOP-STERKFONTEIN: BLOEMFONTEIN DISTRICT.



*Reference:—*

I, II, III, etc. indicate subsections to which reference is made in the text.

==== Indicate area where carcasses of meercats were found.

====

On inspection, colonies were found along the vlei and extending upwards to the foot of the high hills, and along the scattered kopjes on the western part of the area. The infection was considered to extend from Tafelkop to Sterkfontein along the vlei, and outwards towards the hills. Extermination of the meercats was, therefore, undertaken over the area on the east of the range of high hills from Mooiuitzicht to Sterkfontein, up to the scattered hills on Deelgenoot, Verona, Palmira, Fortuin, Mara. The area was approximately 18,600 morgen in extent.

*Results.*

See Table 8.

*Remarks.*

The results on the whole seem very satisfactory.

(a) Out of a total of 1,591 meercat colonies treated, only 71 were found reopened on the day following gassing and 34 on the second day. This indicates that gassing is the most effective means of killing the majority of the meercats, especially in view of the fact that only 57 and 46 meercats were trapped on the two days following the gassing.

(b) 605 Colonies were found reopened at subsequent visits, i.e. less than half of the colonies treated. For the first 25 days a record was unfortunately not kept of the number of colonies visited at the periodic inspections. During the 69 days on which this record was kept, 3,954 visits to colonies were made, which shows that each colony, besides the inspection on the day subsequent to the gassing and the second day thereafter, was inspected at least a further three times.

(c) The success obtained in reducing the number of meercats is clearly shown in that, during the final inspections of the colonies, when almost half of the 1,591 colonies were visited, only 104 colonies were found reopened, at which only 23 *Cynictis*, 3 *Suricata* and 43 *Geosciurus* were trapped.

(d) As in the case of the previous area, a considerable number of birds (the total being 222 for the whole area), and 90 mice and rats were trapped. These birds and small rodents are, therefore, responsible for the reopening of a large number of warrens, and they should be regarded as an important modifying factor when the number of colonies found reopened, at the subsequent and final inspections, is taken as a measure of the amount of success attained.

(e) An important fact, to which little significance has been attached, is the number of carcasses of all three species of meercats in various stages of decomposition that have been found on the infected areas, at colonies or in close vicinity to them. The localities in which these were found in the Tafelkop-Sterkfontein area rouse suspicion that these animals died of rabies, and the presence or absence of such carcasses may be an indication of the extent of the infection.

Carcases of meercats were found on the following points marked on the map: in areas VIII, IV, IX, V and XV, eleven of *Cynictis* and one of *Geosciurus*; while in areas XXI, XXIII, XXII, and XXIV, twelve of *Cynictis* and two of *Geosciurus*. Yet none was found in the other areas. It may be assumed, therefore, that two distinct centres of infection were present in this area, coinciding with the places where the infected animals were actually found.

(3) SUNNYSIDE: BLOEMFONTEIN DISTRICT, 13TH TO 29TH JULY, 1939.

On 4th May, 1939, an outbreak of rabies was diagnosed in a cow, which grazed in the camp marked No. III on the sketch, and on the 21st of the same month a rabid *Cynictis* was found in the same camp at the spot marked "Y Cyn".

*Description of Area.*

(Refer to Map No. 4.) The farm Sunnyside, situated about three miles from Bloemfontein, is bounded on the west and north-west by small holdings of 5 to 10 morgen each in extent. The watermain for Bloemfontein water-supply from the Modder River runs over the farm. The farm Vaalbank Suid adjoins Sunnyside on the north. A dry spruit arising on Bloemfontein runs through Camp III on Sunnyside and through Vaalbank Suid. To the east of the spruit the country is very level, while on the west the land is higher and stony ridges are found.

*Location of Meercat Colonies.*

One was struck by the number of warrens in the loose soil, which covered the water-main. Groups of warrens, which could hardly be termed colonies, existed every few yards. The warrens swarmed with *Cynictis*. On one occasion while motoring along the main on the farm Sunnyside, 11 *Cynictis* were seen escaping into the warrens. Colonies were also frequent along the dry spruit and especially on the higher ground to the west on Vaalbank Suid. But none was found on the plots, and only scattered ones on the rest of Sunnyside and Vaalbank.

On account of the fact of the infected cow being in Camp III and that a rabid *Cynictis* was found near the water main, it was considered that the infection existed in the meercats along the main and those in Camp III, and possibly amongst those on the hillock on Vaalbank Suid to the west of the spruit. The localities where a further rabid *Cynictis* and the carcasses of meercats were found, to some extent supported our assumption of the extent of the infection.

During the gassing operations an infected *Cynictis* was found at the spot "Z Cyn", and eleven carcasses of *Cynictis* in areas II and III all near the water main, while those of four *Cynictis* and of one *Geosciurus* were found in area IV along the dry sloop and to the west of it.



*Destruction of Meercats: Tafelkop—St*

No. of Section.	Date.	Number of Colonies Gassed.	Number of Colonies open on day following Gassing.		Number of Traps Set and Result.		Number of Colonies open on 2nd day following Gassing.	
			Number of Colonies.	Number of Warrens.	Number of Traps.	Meercats Caught.	No. of Colonies.	No. of Warrens.
I.....	31/3/39	19	—	—	—	—	—	—
	1/4/39	15	5	8	8	7	—	—
II.....	3/4/39	—	6	19	13	6	—	—
	4/4/39	9	—	—	—	—	—	—
	5/4/39	7	1	1	1	0	—	—
	6/4/39	18	1	1	1	1	—	—
III.....	11/4/39	20	—	—	—	—	—	—
	12/4/39	13	2	2	2	1	—	—
IV.....	13/4/39	15	3	12	10	2	—	—
V.....	14/4/39	17	0	—	—	—	—	—
	15/4/39	9	0	—	—	—	—	—
VI.....	17/4/39	48	—	—	—	—	6	55
	18/4/39	17	—	—	—	—	—	—
VII.....	19/4/39	19	4	5	5	1	—	—
	20/4/39	13	1	10	4	0	—	—
	21/4/39	21	—	—	—	—	—	—
	22/4/39	—	0	—	—	—	—	—
	24/4/39	18	—	—	—	—	—	—
	25/4/39	15	1	2	2	0	—	—
VIII.....	26/4/39	15	2	6	6	4	—	—
	27/4/39	13	5	8	8	4	—	—
	28/4/39	15	1	3	3	2	—	—
IX.....	1/5/39	23	—	—	—	—	—	—
X.....	2/5/39	13	1	6	5	1	—	—
	3/5/39	7	1	1	1	0	—	—
XI.....	4/5/39	5	0	—	—	—	—	—
	5/5/39	13	1	1	1	1	—	—
XII.....	6/5/39	30	0	—	—	—	—	—
	8/5/39	25	—	—	—	—	8	26
	9/5/39	17	2	2	2	0	—	—
XIII.....	10/5/39	24	2	5	4	3	—	—
	11/5/39	24	1	3	3	2	—	—
XIV.....	12/5/39	10	5	13	9	0	—	—
	13/5/39	16	0	—	—	—	—	—
	15/5/39	27	—	—	—	—	3	3
XV.....	16/5/39	17	5	8	8	6	—	—
	17/5/39	19	1	2	2	2	—	—
	18/5/39	—	—	—	—	—	—	—
XVI.....	19/5/39	25	—	—	—	—	4	24
	20/5/39	22	3	13	—	—	—	—
	22/5/39	23	—	—	—	—	4	17
XVII.....	23/5/39	19	0	—	—	—	—	—
	24/5/39	—	2	9	9	3	—	—
XVIII.....	25/5/39	31	—	—	—	—	—	—
	26/5/39	8	0	—	—	—	—	—
XIX.....	27/5/39	19	0	—	—	—	—	—
XX.....	29/5/39	10	—	—	—	—	2	9
XXI.....	30/5/39	—	0	—	—	—	—	—
	31/5/39	—	—	—	—	—	—	—
	1/6/39	40	—	—	—	—	—	—
	2/6/39	34	2	4	4	3	—	—
	3/6/39	15	2	3	—	—	—	—
	5/6/39	29	—	—	0	—	—	—

TABLE 8.

*Tafelkop—Sterkfontein—Bloemfontein.*

Number of Traps Set and Result.		Number of Colonies open on Periodic Inspections.				Number of Traps Set and Result.	
Number of Traps.	Number of Meercats Caught.	Date Colony Gassed.	Number of Colonies Inspected.	Number of Colonies Open.	Warrens Open.	Number of Traps.	Number of Meercats Caught.
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	31st and 1st	—	2	7	5	0
—	—	31st- 1st	—	9	14	10	6
—	—	31st- 1st	—	3	7	7	5
—	—	31st- 4th	—	3	6	6	1
—	—	4th- 6th	—	8	95	57	8
—	—	5th- 6th	—	21	84	83	19
—	—	6th-11th	—	23	139	89	30
—	—	4th-12th	—	14	52	45	11
—	—	1st-13th	—	15	61	47	11
37	4	12th-14th	—	9	63	37	5
—	—	12th-15th	—	10	52	37	16
—	—	4th-16th	—	33	186	91	20
—	—	31st-18th	—	33	155	96	31
—	—	31st-18th	—	26	120	96	37
—	—	31st-20th	—	26	115	96	22
—	—	4th-21st	—	25	92	73	13
—	—	4th- 21st	(74)	26	85	85	73
—	—	13th-24th	(64)	12	30	28	4
—	—	13th-24th	(85)	8	29	26	16
—	—	21st-26th	(60)	15	4	38	26
—	—	22nd-28th	(76)	25	58	49	18
—	—	22nd-28th	(54)	23	98	83	25
—	—	19th- 1st	(70)	19	77	61	36
—	—	19th- 1st	(77)	19	69	67	16
—	—	20th- 3rd	(82)	7	25	24	6
—	—	1st- 5th	(99)	4	5	4	2
23	12	1st- 5th	(67)	9	46	38	3
—	—	1st- 7th	(81)	12	68	57	19
—	—	1st- 8th	(84)	7	31	29	15
—	—	2nd- 9th	(76)	8	24	23	8
—	—	3rd-10th	(90)	10	30	27	5
—	—	4th-11th	(102)	15	39	36	12
3	1	4th-12th	(105)	25	65	60	3
—	—	6th-13th	(102)	14	32	32	21
—	—	1st-15th	(121)	18	46	42	23
—	—	8th-16th	(92)	16	48	46	20
20	8	9th-16th	(90)	9	25	20	8
—	—	10th-17th	(73)	14	46	46	18
11	3	11th- 5th	(69)	9	52	40	11
—	—	12th-20th	(98)	20	83	58	22
—	—	15th-22nd	(89)	9	21	20	16
—	—	16th-23rd	(103)	16	53	45	22
—	—	15th-24th	(73)	14	74	64	21
—	—	17th-25th	(81)	12	73	54	17
7	3	12th-26th	(74)	12	33	33	6
—	—	12th-28th	(68)	6	21	20	13
—	—	13th-29th	(59)	7	25	23	10
—	—	15th-29th	(67)	10	35	31	15
—	—	15th-29th	(61)	4	9	9	6
—	—	22nd- 1st	(47)	4	9	9	8
—	—	29th- 2nd	(60)	11	33	28	13

[CONTINUED OVERLEAF.]

← 109-110a

109-110b

TABLE 8 (continued)

No. of Section.	Date.	Number of Colonies Gassed.	Number of Colonies open on day following Gassing.		Number of Traps Set and Result.		Number of Colonies open on 2nd day following Gassing.	
			Number of Colonies.	Number of Warrens.	Number of Traps.	Meercats Caught.	Number of Colonies.	Number of Warrens.
XXII.....	6/6/39	28	0	—	—	—	—	—
	7/6/39	42	1	1	1	1	—	—
	8/6/39	19	2	3	2	0	—	—
	9/6/39	33	0	—	—	—	—	—
	10/6/39	12	2	3	0	—	—	—
XXIII.....	12/6/39	24	—	—	0	—	—	—
	13/6/39	30	1	1	1	1	—	—
	14/6/39	22	0	—	—	—	—	—
	15/6/39	24	1	1	1	0	—	—
	16/6/39	22	0	—	—	—	—	—
	17/6/39	15	0	—	—	—	—	—
	19/6/39	20	—	—	—	—	6	20
XXIV.....	20/6/39	23	1	1	1	1	—	—
	21/6/39	36	0	—	—	—	—	—
	22/6/39	36	1	1	1	0	—	—
	23/6/39	42	1	1	1	1	—	—
	24/6/39	—	0	—	—	—	—	—
	26/6/39	29	—	—	—	—	—	—
	27/6/39	33	4	8	7	4	—	—
	28/6/39	30	0	—	—	—	—	—
	29/6/39	32	0	—	—	—	—	—
	30/6/39	27	0	—	—	—	—	—
	1/7/39	21	0	—	—	—	—	—
	3/7/39	43	—	—	—	—	—	—
	4/7/39	23	0	—	—	—	—	—
5/7/39	—	0	—	—	—	—	—	
		1,591	71	166	126	57	34	163

(5) FINAL INSPECTION.

Date.	Areas Visited.	Number of Colonies Visited.	Number of Colonies Open.	Number of Warrens Open.
5	I, IV, IX.....	159	31	85
6	I, IV, IX, XXI.....	202	16	90
7	V, XIV, XVII, XXII, XVI, XXIV, XXII	217	34	105
8	VI, VII, VIII, X.....	133	23	98
		701	104	378

## SUMMARY OF ANIMALS TRAPPED.

<i>Cynictis</i> .....	384
<i>Geosciurus</i> .....	648
<i>Suricata</i> .....	119
<i>Felis</i> spp.....	4
<i>Ictonyx</i> .....	32
Jackals.....	4
	<u>1,191</u>

111-112b →

TABLE 8 (continued).

Number of Traps Set and Result.		Number of Colonies open on Periodic Inspections.				Number of Traps Set and Result.	
Number of Traps.	Number of Meercats Caught.	Date Colony Gassed.	Number of Colonies Inspected.	Number of Colonies Open.	Warrens Open.	Number of Traps.	Number of Meercats Caught.
—	—	29th- 3rd	(63)	6	27	25	17
—	—	1st- 5th	(61)	5	15	13	12
—	—	1st- 6th	(51)	6	21	21	3
—	—	2nd- 7th	(69)	6	10	10	10
—	—	10th- 6th	(42)	6	10	10	8
—	—	4th- 9th	(63)	7	34	30	3
—	—	5th-10th	(58)	8	25	24	11
—	—	6th-12th	(61)	8	24	23	14
—	—	6th-13th	(57)	10	26	23	14
—	—	9th-14th	(52)	18	39	32	21
—	—	9th-15th	(52)	18	39	32	11
17	9	10th-15th	5(1)	3	15	13	0
—	—	10th-17th	(42)	6	28	26	9
—	—	12th-19th	(63)	11	38	37	18
—	—	13th-20th	(62)	5	15	13	11
—	—	16th-22nd	(52)	9	20	18	11
—	—	13th-22nd	(33)	9	20	18	6
—	—	22nd-24th	(51)	19	43	38	9
—	—	22nd-24th	(60)	7	21	20	15
—	—	23rd-26th	(64)	7	17	17	10
—	—	23rd-27th	(82)	8	22	22	15
—	—	24th-28th	(63)	2	12	10	10
—	—	24th-28th	(33)	2	10	10	10
9	2	27th-30th	(64)	7	23	22	4
—	—	26th- 1st	(52)	13	39	37	18
—	—	—	—	—	—	—	—
127	46		(3,954)	605	3,335	2,602	1,017

## (5) FINAL INSPECTION.

Number of Warrens Open.	Number of Traps Set.	Results.	SPECIES.			
			<i>Cynictis.</i>	<i>Suricata.</i>	<i>Geosciurus.</i>	Other Animals.
85	77	27	5	1	21	—
90	89	19	10	—	8	1
105	89	20	6	2	11	1
98	73	7	2	0	3	2
378	288	73	23	3	43	4

## NUMBER OF ANIMALS AND BIRDS TRAPPED.

Mice and rats.....	90
Birds.....	220

← 111-112a

111-112b

Table 9

*Destruction*

Number of Section.	Date.	Number of Colonies Gassed.	Number of Colonies open on day following Gassing.	
			Number of Colonies.	Number of Warrens.
L.....	13/7/39	17	—	—
	14/7/39	53	—	—
	15/7/39	21	—	—
	17/7/39	47	—	—
	18/7/39	47	4	6
	19/7/39	15	2	2
	20/7/39	36	—	—
	21/7/39	42	4	5
	22/7/39	—	—	—
	24/7/39	45	—	—
	25/7/39	40	2	4
	26/7/39	25	—	—
	27/7/39	41	—	—
	28/7/39	—	2	2
	29/7/39	—	—	—
			429	14

113-114b →

113-114a

TABLE 9. (cont.)

*Destruction of Meercats.—Sunnyside, Bloemfontein.*

Number of Traps Set and Result.		Number of Colonies open on 2nd day following Gassing.	Number of Traps Set and Result.
Number of Traps.	Meercats Caught.		
—	—	—	—
—	—	—	—
—	—	—	—
6	6	—	—
2	2	—	—
4	3	—	—
—	—	—	—
3	2	—	—
—	—	—	—
2	1	—	—
—	—	—	—
17	14	—	—

SUMMARY OF ANIMALS TRAPPED.

<i>Cynictis</i> .....	141
<i>Geosciurus</i> .....	105
<i>Suricata</i> .....	14
<i>Ictonyx</i> .....	6
	<hr/>
	266
	<hr/>
Birds.....	41
Rats and mice.....	22

FINAL INSPECTION.

677 Inspections were made.  
112 Colonies were found open and 72 meercats caught.

← 113-114a

113-114c →

113-114b

Table 9 (cont.)

fontein.

Number of Colonies open on Periodic Inspections.				Number of Traps Set and Result.	
Date Colonies Gassed.	Number of Colonies Inspected.	Number of Colonies Open.	Number of Warrens Open.	Number of Traps.	Meercats Caught.
—	—	—	—	—	—
—	—	—	—	—	—
13th	(17)	4	7	—	—
13th-14th	(65)	15	38	36	5
13th-16th	(59)	18	36	36	20
13th-17th	(56)	10	23	21	12
13th-18th	(62)	12	34	30	27
13th-19th	(52)	8	26	26	18
13th-20th	(33)	8	26	26	11
13th-21st	(124)	17	27	25	10
13th-21st	(133)	19	35	35	13
th-24th	(107)	39	57	55	29
14th-25th	(125)	21	55	55	34
—	(384)	56	157	138	48
—	(293)	56	120	117	24
—	(1,503)	283	641	600	233

← 113-114b

113-114c

Table 10

*Meercat*

Number of Section.	Date.	Number of Colonies Gassed.	Number of Colonies open day following Gassing.	
			Number of Colonies.	Number of Warrens.
II.....	2/8/39	21	—	—
I.....	3/8/39	28	—	—
II.....	4/8/39	53	6	10
	5/8/39	21	2	5
III.....	7/8/39	37	—	—
	8/8/39	30	—	—
IV.....	9/8/39	22	1	1
	10/8/39	26	5	8
	11/8/39	30	2	7
	12/8/39	11	—	—
		279	16	31

14th and  
16/8/39 :

115-116b 

115-116a



TABLE 10. (cont.)

*Meercat Extermination.—Edenburg Town Commonage.*

Number of Traps Set and Result.		Number of Colonies open 2nd day following Gassing.		Number of Traps Set and Result.	
Number of Traps.	Number of Meercats Caught.	Number of Colonies.	Number of Warrens.	Number of Traps.	Number of Meercats Caught.
—	—	—	—	—	—
—	—	—	—	—	—
9	4	—	—	—	—
5	5	10	19	18	10
—	—	—	—	—	—
—	—	—	—	—	—
1	1	—	—	—	—
8	2	—	—	—	—
7	1	—	—	—	—
—	—	—	—	—	—
30	13	10	19	18	10

FINAL INSPECTION OF AREA.

14th and 15/8/39 : 247 Colonies visited ; 45 reopened ; 114 traps set ; result 74 meercats trapped.  
 16/8/39 : 255 Colonies visited ; 131 traps set ; result 29 meercats trapped.

SUMMARY OF ANIMALS TRAPPED.

<i>Cynictis</i> .....	132
<i>Geosciurus</i> .....	111
<i>Suricata</i> .....	11
<i>Ictonyx</i> .....	7
	<hr/>
	261
	<hr/>
Birds.....	20
<i>Pedes cafra</i> .....	3
Rats and Mice.....	5
Rock Rabbit.....	1
	<hr/>
	29
	<hr/>

← 115-116a

115-116c →

Table 10 (cont.)

Number of Colonies open on Periodic Inspection.				Number of Traps Set and Result.	
Date Colonies Gassed.	Number of Colonies Inspected.	Number of Colonies Open.	Number of Warrens Open.	Number of Traps.	Number of Meercats Caught.
—	—	—	—	—	—
—	—	—	—	—	—
—	—	—	—	—	—
—	—	—	—	—	—
3rd- 4th	(82)	18	56	51	21
3rd- 5th	(137)	17	40	40	27
3rd- 7th	(144)	19	41	41	31
3rd- 8th	(179)	25	66	65	27
3rd- 9th	(198)	24	61	61	18
2nd-10th	(175)	25	72	69	19
—	935	128	336	332	145

meercats trapped.

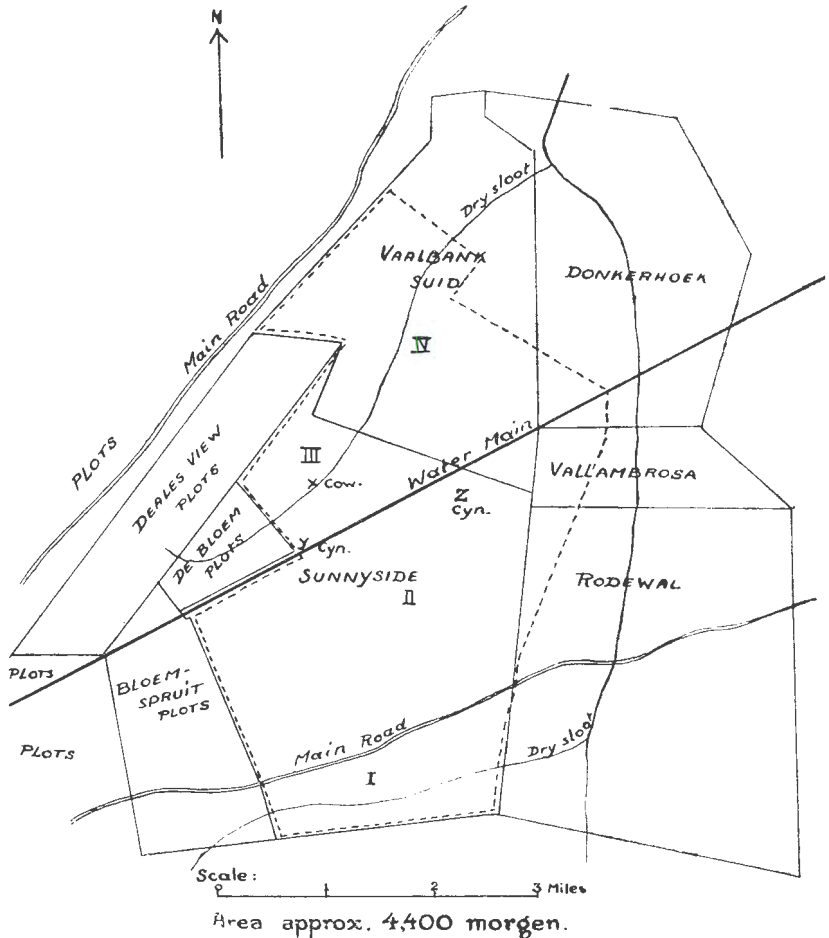
← 115-116b

115-116c

The area mapped out to be treated, was the whole of Sunnyside, the portions of Roodewal and Vallambrosa which adjoin Sunnyside and that portion of Vaalbank Suid on which the infection was thought to exist. The area treated is marked by a broken line on the sketch.

Map No. 4.

SUNNYSIDE: BLOEMFONTEIN DISTRICT.



Reference:—

- — — — Shows area in which meercats were eradicated.
- × Cow Position where infected cow was found.
- Y & Z Position where infected yellow mongooses were found.
- I, II Indicate sections into which the area was divided for purposes of gassing.

## STUDY AND CONTROL OF THE VECTORS OF RABIES.

### *Results.*

See Table 9.

### *Remarks.*

(1) Out of the 429 colonies gassed, fourteen were found upon the following day.

(2) As the area was comparatively small, the colonies in the area, which were considered actually infected, were visited at least three times subsequent to the third day after gassing.

### (4) EDENBURG COMMONAGE.

The following outbreaks of rabies have occurred on the Edenburg Commonage. In April and August, 1933, the disease was diagnosed in two *Cynictis* found at the points marked X on the sketch map of the Commonage. In June, 1939, a further case occurred in a *Cynictis* at the point marked XI, and a week later another suspected case in a *Cynictis* occurred in the same spot.

### *Description of Area.*

(Refer to Map No. 5.) The area treated consisted mainly of Karroo-bush covering the fairly flat country; in Area I a low ridge of hills extends from north to south, while in Area II an isolated koppie exists. Two vleis traversed this area, in which colonies were plentiful. The limits of the infection were considered to be along the two vleis, as the hillocks on either side contained only a few colonies which were widespread over the area. The carcasses found in the veld confirmed this. Carcasses of two *Cynictis* and one *Geosciurus* were found in Area II, while in Area IV, those of a *Cynictis* and a *Suricata* were found.

### *Results.*

The results are summarized in Table 10.

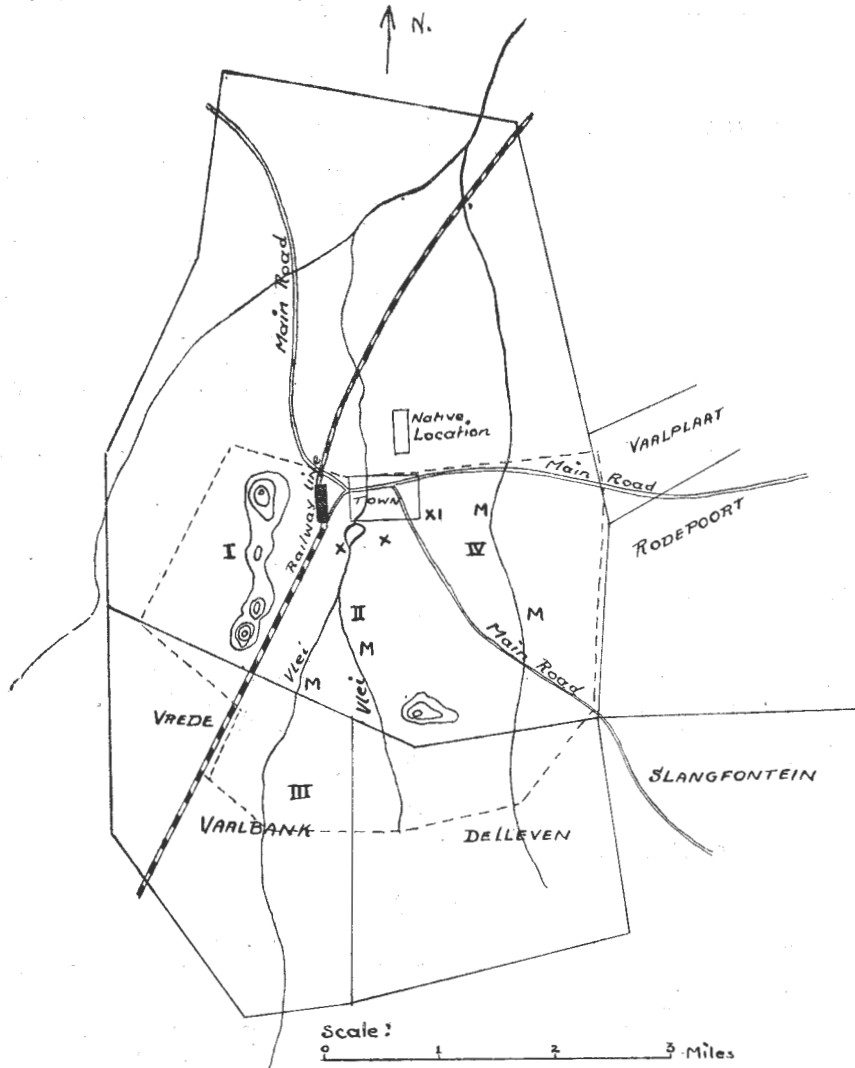
### *Remarks.*

The results invite little comment, as they are practically the same as those of the areas done previously. Three weeks later a second visit was paid to this area to determine to what extent immigration of meercats to the area had taken place. The whole area was gone over twice during two successive days, and traps were set at all warrens that were found to have been re-opened.

The results of the trapping were as follows: 217 colonies were visited, of which 60 were found re-opened, and 160 warrens had been cleaned by animals. 71 meercats were trapped: *Cynictis* 36, *Geosciurus* 21, *Suricata* 15, *Ictonyx* 4, *Pedescaffer* 1, and *Anteating Chats* 7.

These results show that immigration of meercats, once an area has been cleaned of them, does not take place very rapidly to such an area, from which, it may further be concluded, that it is possible to keep such an area free from meercats by trapping only.

Map No. 5.  
EDENBURGH COMMONAGE.



Reference:—

- × × Points where infected Cynictis were located in 1933.
- ×I Points where infected Cynictis were located in 1939.
- M Approximate position of meercat carcasses.

## (5) TROMPSBURG COMMONAGE.

*Description of Area.*

(Refer to Map No. 6.) This area includes the whole of the Commonage, and the farms Spes Bona and Middelfontein. The area consists of semi-karoo veld, with isolated low hill-ranges and kopjes. The spruit running from South to North through the area is very shallow and broadens out into vleis, especially near the southern boundary. Weirs across the spruit result in water pools, existing almost throughout the year.

*Extent of the Infection.*

No less than eight cases of rabies had been diagnosed in Viverrids on the commonage from June, 1932, to July, 1939. The rabid animals were all found in an area, two miles square, on the southern side of the village. An infected Genet at Spes Bona was found near the commonage boundary. The infection was considered to extend amongst the Viverrids on the southern half of the Commonage, and probably on those portions of the farms Spes Bona and Middelfontein adjoining the Commonage.

In 1937 a careful survey was made of the infected portion of the Commonage. The positions of the larger colonies and groups of colonies were recorded on a sketch-map, to assist in recording the results of extermination experiments.

The object of the experiment was to determine to what extent gassing alone was successful. At the conclusion of the experiments, it was considered that all the meercats had been exterminated except a few, which took refuge in the kopjes. As a further case of rabies occurred in July 1939, the experiment must be considered as having been unsuccessful.

When the area was traversed in the recent attempt to eradicate the meercats, a considerable number of colonies was still found closed and many which had been reopened were unoccupied.

It is therefore, essential, before any measure of success in eradicating rabies in an infected area can be obtained, that all meercats in such an area should be exterminated.

*Results.*

*The Results* are summarized in Table II.

*Remarks.*

(a) The carcasses of dead animals were found as follows: In Area II that of a *Cynictis*, and those of a *Suricata* and four *Geosciurus* in Area V.

(b) 266 Colonies were fumigated, and of these 17 were found reopened within two days of the gassing, 11 meercats being trapped in them.

(c) Each colony was inspected at least 8 times during the 19 days.

(d) During the final inspection the Areas Nos. I, II and III, marked as A on the summary, considered to be the centre of the infection, were very carefully inspected. The results of the last four

Table 11

*Meercat Ex*

Number of Section.	Date.	Number of Colonies Gassed.	Number of Colonies open on day following Gassing.	
			Number of Colonies.	Number of Warrens.
I.....	19/8/39	12	—	—
	21/8/39	24	—	—
	22/8/39	10	2	2
II.....	23/8/39	7	1	3
	24/8/39	28	2	2
	25/8/39	18	1	1
III.....	26/8/39	9	2	2
	28/8/39	26	—	—
	29/8/39	15	2	3
	30/8/39	11	3	4
	31/8/39	16	1	1
	1/9/39	13	0	—
IV.....	2/9/39	1	2	4
	4/9/39	16	—	—
	5/9/39	18	0	—
V.....	6/9/39	13	0	—
	7/9/39	19	0	—
	8/9/39	10	2	—
	9/9/39	—	—	—
	11/9/39	—	—	—
	12/9/39	—	—	—
	13/9/39	—	—	—
			266	16

N.B.—A. contains the date


121-122b 

TABLE 11. (cont.)

Meercat Extermination.—Trompsburg Town Commonage.

Number of Traps Set and Result.		Number of Colonies open on 2nd day following Gassing.		Number of Traps Set and Result.	
Number of Traps.	Number of Meercats Caught.	Number of Colonies.	Number of Warrens.	Number of Traps.	Number of Meercats Caught.
—	—	—	—	—	—
—	—	1	8	8	1
2	1	—	—	—	—
3	1	—	—	—	—
2	2	—	—	—	—
1	1	—	—	—	—
2	0	—	—	—	—
—	—	—	—	—	—
3	2	—	—	—	—
4	2	—	—	—	—
1	0	—	—	—	—
—	—	—	—	—	—
4	0	—	—	—	—
0	—	—	—	—	—
—	—	—	—	—	—
—	—	—	—	—	—
2	1	—	—	—	—
—	—	—	—	—	—
—	—	—	—	—	—
—	—	—	—	—	—
—	—	—	—	—	—
24	10	1	8	8	1

B.—A. contains the date for Areas I, II and III, which is considered as the centre of infection.

NUMBER OF ANIMALS TRAPPED.

<i>Cynictis</i> .....	151
<i>Geosciurus</i> .....	67
<i>Suricata</i> .....	32
<i>Ictonyx</i> .....	5
	<hr/>
	255
Rats and Mice.....	2
Birds.....	2
Springhare.....	1
	<hr/>
TOTAL.....	266

← 121-122a

121-122c →

121-122b



Table 11 (cont.)

Number of Colonies Open on Periodic Inspection.			Number of Traps Set and Result.	
Number of Colonies Inspected.	Number of Colonies Open.	Number of Warrens Open.	Number of Traps.	Number of Meercats Caught.
—	—	—	—	—
19th (12)	2	2	10	2
(36)	4	9	9	7
(47)	3	6	6	4
(52)	3	6	6	4
(63)	2	2	2	2
(89)	16	33	33	10
(89)	13	28	28	21
(95)	12	24	24	15
(64)	7	15	15	14
(107)	7	19	19	14
(76)	7	15	15	9
(108)	10	22	21	7
(111)	9	21	21	4
(110)	7	21	21	14
(111)	6	14	14	10
(137)	18	28	28	16
A. (179)	18	30	30	19
A. (159)	11	16	16	4
(76)	19	46	46	10
A. (159)	5	8	8	4
(78)	20	46	46	33
A. (159)	5	10	10	0
(78)	20	46	46	11
(1,935)	223	485	484	250

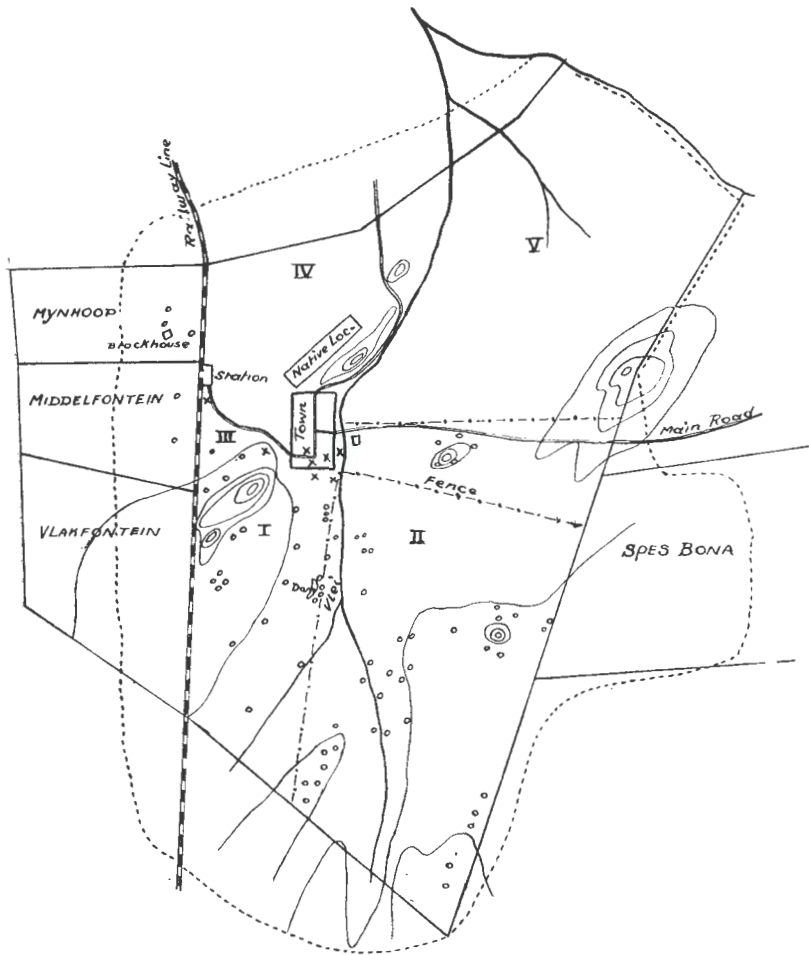
of infection.

← 121-122b

121-122c

days' inspection, when 159 colonies were visited (of which a few only were found reopened and no meercats trapped) showed that if not all the meercats had been exterminated, then only an odd one might have escaped. The extermination of the meercats must, therefore, be considered as having been successful.

Map No. 6.  
TROMPSBURG COMMONAGE.



Scale: 1 2 3 miles

Reference:—

- × Denotes points at which infected Cynictis were found at different times.
- o o Approximate position of colonies. A detailed survey was made of areas I, II and III in 1937.
- — — — — Boundary of area in which meercats were exterminated.

TABLE 12.  
Summary of Work performed on the Five Infected Farms, and the Expenditure involved.

Area.	Approximate size of Area in Morgen.	Number of Colonies Gassed.	Number of Meercats trapped.			Number of days taken to exterminate the Meercats.	Amount of Cyanogas Used.	Cost of Cyanogas.	Wages and Rations of Labourers.	Total Cost.
			<i>Cynictis</i> .	<i>Suricata</i> .	<i>Geosciurus</i> .					
Marah, Waaikraal.....	6,850	210	150	47	364	38	lb. 175	£ s. d. 10 18 9	£ s. d. 21 3 10	£ s. d. 32 2 7
Tafelkop-Sterkfontein....	18,300	1,512	384	119	648	79	513	32 1 3	80 10 9	122 12 0
Sunnyside.....	4,400	429	141	14	105	16	75	4 10 9	16 8 1	20 18 10
Edenburg Com.....	3,100	279	168*	26*	132*	13*	37	2 6 3	16 5 0	18 11 3
Trompsburg Com.....	8,250	266	151	32	67	22	63	3 13 9	18 19 10	22 13 7
TOTAL.....	40,900	2,696	994	238	1,296	165	863	55 10 9	150 7 6	208 18 3

\* Include the number of meercats trapped on a subsequent visit for two days.

The cost of Cyanogas is calculated at 1s. 3d. per lb., a price quoted to Municipalities.

The wages of a native labourer amounts to 2s. 5d. per day plus 2½ lb. of mealie-meal.

The Salary of the Supervisor is not included in the column of expenditure ; it amounts to £1 per day.

The above data, when calculated on a basis of 1,000 morgen, gives the following details approximately :—

- The number of colonies was..... 66
- The number of *Cynictis* trapped was..... 22
- The number of *Suricata* trapped was..... 6
- The number of *Geosciurus* trapped was ..... 31

The amount of Cyanogas used was 21 lb.

The number of days taken in gassing was 4.

The total cost amounted to £5, 1s. 0d., and if the salary of the Supervisor is included, £9, 1s. 0d.

This figure may be taken as representative of the number of colonies on average infested ground.

### PART III.

#### CONCLUSIONS.

##### A. THE NECESSITY OF DESTROYING MEERCATS AND THE VALUE OF STUDYING THEIR HABITS AND WARRENS.

In general, as has been pointed out, the control of rabies consists in preventing the rabid animal from biting persons and other animals.

Where the dog plays the principal rôle in the epizootology of the disease, the methods adopted to check dissemination of rabies is comparatively easy, as dogs can be placed under proper restraint by their owners, and ownerless dogs can be rounded up and destroyed. In addition prophylactic inoculation is employed in some countries with success, in spite of the fact that, this method may produce occult carriers.

When the disease is established in wild animals, as is the case in our viverrids, there can be but one way of eradicating the disease, and that is by destruction of the vectors.

Before effective weapons can be devised, something must be known of the enemy, his habits, weaknesses and defences. That is why a study of meercats was a *sine qua non* of any useful work. Not only have these studies shown, that the burrow is a place of refuge to which meercats run when disturbed, and to which they owe their survival in settled areas, but they have revealed, that the burrow is a convenient place, not easily missed, in which these elusive animals can be "run to earth" and completely destroyed.

It is indeed fortunate that the yellow mongoose, which is undoubtedly the most important vector of rabies in this country, can so effectively be attacked and destroyed. If some other free roaming animal, such as the jackal, had been the principal carrier of the disease, then we would have had to face the same difficulties in the control of the disease, as for instance the sheepfarmer has in protecting his stock from this marauding beast.

##### B. EVOLVING THE MOST EFFECTIVE AND PRACTICAL METHODS OF DESTRUCTION.

(a) Of the various methods tried to destroy meercats, gassing of the burrows with calcium cyanide dust, followed up by trapping, has proved to be the most effective.

The digging up of colonies subsequent to gassing revealed, that it was possible in many instances completely to destroy meercats in their burrows, and where this was not possible the causes of failure were exposed, and remedial measures to overcome them were devised.

Among the causes which may lead to failure or ineffective work must be mentioned—

(i) using a pump not in perfect working order, resulting in bad distribution of calcium cyanide in burrows;

STUDY AND CONTROL OF THE VECTORS OF RABIES.

(ii) using poor quality, old, or spent cyanide powder. Good fresh powder should have a very fine pulverulent texture and have a bluish slate colour;

(iii) gassing when the humidity, looseness and gas-absorbing properties of the soil are too high;

(iv) bad circulation of gas in the intricate tunnel maze of a colony, due to the presence of obstructions and long cul-de-sacs;

(v) closing any openings before gas has emerged from them, and finally,

(vi) failure to fumigate for a long enough period, i.e. until powder is seen emerging from all openings before these are closed.

Causes of failure due to equipment and technique can be avoided or remedied, but those inherent to the burrow itself cannot be prevented. If the technique is perfect, therefore, and meercats still escape alive from a burrow it can be assumed, that the cause lies in the burrow, and it would be sheer waste of time and money to fumigate such burrows repeatedly, since the results would probably be the same.

Where only one or two meercats per odd colony escape as seen from the reopened holes, it is therefore far more economic and more effective to set traps and so catch the last surviving animals.

The advantage of this method of gassing combined with trapping is that it is cheap, simple and with care safe to handle, eliminating many elaborate precautions.

(b) This method of gassing combined with trapping has been successfully employed to destroy the meercats in several large areas. Although not considered feasible or necessary in so far as the particular method of rabies-control adopted, an area so cleaned could, if desired, be maintained clean at a minimum cost by continuing trapping indefinitely in this fashion.

To ensure success attention should be paid to the following details:—

- (i) locate all the colonies;
- (ii) comb the veld systematically, to ensure that all the meercats have been chased into the burrows prior to gassing;
- (iii) fumigate thoroughly—bearing in mind the pitfalls mentioned above;
- (iv) close all disused holes and colonies;
- (v) revisit systematically all colonies and set traps where required;
- (vi) continue trapping as long as any holes are being re-opened while operations last in that area.

(i) *Location of all Colonies.*

The importance of locating all the colonies need hardly be stressed, as success in eradicating the meercats in a given area depends largely on the thoroughness with which this is done. Even disused ones should be located and closed. The best method to ensure that all the colonies are located, is for the members of the gassing gang, consisting of from six to eight persons, to walk in extended-rank formation. The space between the men should not be more than fifty to a hundred yards, depending on the denseness of the vegetation. A good procedure to follow to avoid overlapping of areas, or which is more important of skipping portions, is for the flank member to stake or erect temporary beacons at least at the ends of his beat, and at such other points along his patch as may be necessary. These beacons indicate on the return journey, the strip of land previously traversed. Instead of carrying flags etc., it is convenient and just as effective where there are trees and fences, to place tufts of grass on them for beacons. In open country, where antheps are plentiful, the top of an anthep may be removed and an easily recognisable mark is made by replacing it with the inner side upwards.

Both the inhabited and uninhabited colonies should be marked and, if possible, numbered in such a way, that they can be easily relocated and identified at subsequent visits. A suitable method of marking these colonies is by driving a light metal fencing-dropper with a numbered tag on it into the ground near the colony.

(ii) *Ensuring that all meercats are chased into the burrows.*

The system of combing the veld as described above also serves the very important purpose of ensuring that the meercats are chased into their burrows, where they are to be gassed.

Meercats invariably run to their burrows when disturbed in the veld, unless hard pressed or closely chased, when they may seek refuge in any convenient hole. In the Sanna'spost area, where extensive mealie fields existed, neglect to comb these fields, where meercats hunted for food, resulted in many of them being absent at the time of the gassing of their burrows, and they had to be trapped afterwards.

(iii) *Fumigating thoroughly.*

Gassing is the quickest and easiest way to kill the meercats, when they are in their burrows. Success in doing so depends on the thoroughness with which it is done. The pitfalls mentioned above should, therefore, always be borne in mind, and the necessary steps should be taken to eliminate them when possible.

Before a colony is gassed, one or two strokes of the pump should be given, to see that the correct amount of powder is forced out. Regular attention should be given to the pump, as regards lubrication and keeping it in perfect working order. The procedure in gassing as described above should be closely followed.

(iv) *Closure of all disused holes and colonies.*

At the farms Beestekraal and Philip, where a careful record of all the colonies was kept, it was found that six out of thirty-five and two out of thirteen colonies respectively, which were unoccupied and deserted at the time of the general survey of the farms, became occupied at a later date. Unless such colonies are closed and revisited later and treated as if they were inhabited, they become the abode of meercats, which would otherwise escape destruction.

(v) and (vi) *Systematic revisiting of all colonies, and the setting of traps.*

White (1932) gave up all hopes of exterminating meercats on a large scale on account of the rapid reinfestation taking place on a farm, even before the gassing operations on that farm were completed.

Thornton (1935) also described the lack of success in destroying veld rodents in connection with anti-plague measures due to neglect to treat deserted and spare warrens.

From the observations made at the farms Beestekraal, Middagson, Philip, Sannahspost, etc., it was concluded that colonies were reopened by (a) meercats which had escaped contact with gas in the burrow and succeeded in digging themselves out; (b) by meercats, that were away at the time of gassing and returned to dig themselves in; (c) by meercats migrating from adjoining untreated ground, finding in their new hunting-ground convenient shelter by merely opening up and cleaning out existing burrows; (d) by meercats visiting colony after colony opening a few holes; (e) by marauding animals like the skunk digging after prey; and (f) by ant-eating chats, which nestle in burrows.

It stands to reason therefore, that if one wishes to exterminate meercats in a given area, one will have to pay very close attention to this most important supplementary method of destroying, viz. trapping. Not only is it the cheapest method of destroying these animals, but it is very effective and can well be used without gassing, when the time factor is not very important.

The following procedure gives the best results.

The area gassed should be revisited the following day, and sufficient traps provided to place at all reopened holes. In practice fifty traps are found sufficient. The person in charge of the trapping is given the numbers allocated to the colonies gassed the day before to serve as a check to himself and to ensure that every colony is found, as cattle may sometimes push the droppers over and the latter can also not be seen easily from a distance.

At all holes and warrens found reopened, traps are set. These are inspected the following day, and any not sprung may be removed and the holes closed, since many burrows are reopened but do not become occupied. The same applies when an animal or bird has been caught, unless there are other holes, which have been found reopened again.

It is essential that the person with the traps follow closely on the heels of the gassing gang.

Since many colonies are re-opened and become occupied as many as three times or more by meercats, which are continually filtering into the area from the untreated adjoining ground, a second and if necessary a third person should be detailed to pay repeated visits at regular intervals to the area already treated in order to trap any animals, that may continue to re-open burrows.

Immigration of meercats takes place soon after an area has been treated, but as the number available in the neighbourhood is gradually reduced by gassing and trapping, the rate of migration steadily decreases, until finally a stage is reached, when the infiltration becomes negligible. It is essential, therefore, that trapping should be continued until all holes, that are being re-opened by meercats, remain closed.

The re-opening of holes by the anteating Chat sometimes causes much trouble, as in many instances it is not easy to distinguish whether the hole has been re-opened by one of these birds or by a meercat. In such cases traps have to be set, and rarely fail to show which of the two is responsible for the re-opening of the holes. As many as eight birds have been trapped in one day.

After the extermination of meercats in any locality by the methods outlined above, it should be a comparatively easy matter, if so desired, to maintain effective control and keep such an area clean with very little expenditure of time and money, by making frequent periodic inspections and setting traps at any warrens that have been re-opened. Especially would this be the case with *Cynictis*, the most important carrier of the disease. This animal, unlike *Geosciurus*, when occupying an old (closed) colony, only opens and uses a few warrens on the periphery; thus the purchase of a large number of traps by the farm owner, who may wish to keep his farm free from *Cynictis*, would be unnecessary.

### C. LABOUR, EQUIPMENT AND WORKING COST.

(i) For continuous and large-scale extermination of meercats the operations can be carried out to advantage by units, or groups of eight natives, under the supervision of a trained European. The supervisor should be selected for his energy and reliability, as the whole scheme depends on the thoroughness with which the work is executed.

All the equipment necessary for such a unit comprises two gassing pumps, a supply of cyanide dust, a few spades, and about two hundred three-inch gin traps. Such a unit must, of course, be self-contained and mobile, i.e., provided with its own camping outfit and transport, so as to be on the spot the whole time and not to waste time going to and from their homes.

Naturally in all undertakings of this nature the cost involved should not be out of proportion to results obtained.



From the summary of the work performed on the five infected farms, and the expenditure in eradicating the meercats, it is estimated that a party consisting of eight natives under the supervision of a trained European can clean an area of 1,000 morgen in four days, at an approximate cost of a little over £9.

For small-scale operations (e.g., for the farmer, who wishes to clean up his farm), the only equipment necessary would be one pump at £2. 15s.; say 2 dozen traps at 1s. 6d. each, and a small amount of Cyanogas. If the eradication is undertaken on a co-operative basis (several neighbouring farmers pooling together their equipment and labour) the cost can be brought down, well within the reach of every one.

#### D. DESTRUCTION OF MEERCATS WITH A VIEW TO THE ERADICATION OF RABIES.

Eradication of rabies in South Africa depends on the possibility of destroying the wild carnivora, which disseminate and propagate the disease amongst themselves.

It is fortunate perhaps, that the viverrids and particularly *Cynictis penicillata* seem to play the major rôle and that the infection discovered in other animals, until proved otherwise, may well be regarded as accidental.

Consequently a campaign of this sort must be directed mainly against the yellow mongoose. With this species should be included the suricate and ground-squirrel on account of their close association, commensal habits, and on account of the damage to crops done by the last.

Generalized extermination of these three species over the large area in which rabies occurs represents a formidable task; even if the work were undertaken voluntarily and co-operatively, or even under compulsion, by land-owners. It is doubtful whether anything more than a temporary reduction in the numbers of meercats would result from such an effort. The tremendous cost of organising, supervising, and maintaining such a scheme of total eradication, whether done by landowners themselves or by the State, would be prohibitive and out of all proportion to the losses due to the disease.

Before total eradication is resorted to, its effects on other animals, birds, and insects would have to be very carefully considered. It is possible that the "balance of nature" might be upset, resulting in a "plague" more harmful than rabies.

In a previous communication (Snyman and Thomas, 1939) it was shown that, although rabies occurs over a large part of the Union, yet it is restricted to more or less well-defined centres and localities, where it seems to smoulder for long periods and thence spread slowly.

This hypothesis is supported by the following observation:—

- (a) In glaucing at the incidence map of rabies, one will notice that outbreaks are bunched together within a restricted area. The history of the outbreaks in these areas further supports this presumption.

- (b) In many centres the history of the outbreak shows that the disease had been smouldering for several years, e.g., on Trompsburg, Edenburg, and Vryburg town commonages.
- (c) At the farms Beestekraal and Philip in the Hoopstad District, and Sunnyside in the Bloemfontein District, rabid *Cynictis* were found in the same locality on the farms several months after the original outbreaks had been reported.
- (d) The number of meercat carcasses found on the infected farms, on which eradication was in progress, also would seem to indicate the presence of an epizootic amongst them.

If the hypothesis of the localized nature of the disease is correct, then eradication of rabies can be undertaken on a much reduced scale, involving only the actual centres of infection. For if all the infected animals, as well as all susceptible ones which might have been bitten, are destroyed, the disease at that point must die out, since it cannot persist outside the live animal. Should the area so cleansed of meercats become repopulated, it would be of no consequence provided the newcomers are not infected.

Success obviously depends on defining the area in which the destruction is to be carried out, and secondly on the thoroughness with which the destruction takes place.

The area in which such restricted destruction of meercats is to be carried out, depends on the extent to which the disease is believed to have spread in that locality.

Therefore a preliminary survey of the locality, becomes necessary, and when taken in conjunction with the history of the outbreak, the topography of the ground and a sound knowledge of the habits and habitation of meercats, one is enabled to determine the area in which the meercats have to be eradicated. In practice one can also judge the probable extent of the infection from the position and number of colonies, and the ease of contact between them. Such other portions of the adjoining ground are then also included according to local circumstances so that as wide a margin of safety is allowed consistent with the purpose in view, viz. to destroy all meercats likely to have been infected. On the other hand one should endeavour not to make the area unnecessarily large, as the increased cost may have an unfavourable effect on the issue.

Of great assistance, is the occurrence of carcasses of meercats, which have presumably died of rabies. The evidence of these constitutes a valuable guide in defining the centre of the infected area. When combing the area adjoining that regarded as infected, a keen look-out should be kept for the occurrence of such carcasses, and if they are found, the area to be treated should be extended accordingly.

Control measures should not only be directed towards the isolated outbreaks, but the ultimate aim should also be the total eradication of the disease from the country.

Such an ambitious aim is not entirely out of the question. For, if it is possible to eradicate or greatly to reduce the meercats, it follows that the disease will find it more and more difficult to persist and spread. Thus, by systematically destroying the carriers in the infected centres, by starting in the sparsely infected areas and gradually closing in on the central areas, the incidence of the disease will, it is hoped, be greatly reduced and in time even eradicated.

This is the scheme as envisaged, and as now being carried out, with a view to reduction and eventual eradication of rabies in the Union.

This does not mean, however, that other isolated or concerted efforts toward general destruction of meercats should not be contemplated, or should be abandoned if already started.

On the contrary, if farmers in a given district can be persuaded voluntarily to exterminate the meercats, so much the better; obviously rabies would have very little chance of persisting in such a district.

By every means at our disposal the general reduction of meercats should be encouraged, provided it is done in an economical way. There is, for instance, the system of premiums offered for captured vermin, which is worth a trial at any rate.

The Provincial Administration of the Orange Free State has as from 1st April, 1939, added *Cynictis penicillata* to the list of vermin, for whose destruction a reward is paid, on account of its pernicious habit of attacking newly born lambs. The reward of three pence per tail should be sufficient encouragement to reduce the number of these animals, as they are easily trapped. The response for the first three months has been very disappointing. Altogether rewards for only 2,720 tails, i.e. a total of £34 were claimed in the whole of the Province. Whereas at the price, trapping could be made quite a profitable "business".

It does not seem, therefore, that at this rate the encouragement given by the Provincial Administration will reduce the meercat numbers to such an extent as to have any noticeable effect on the incidence of rabies, because the eradication may be spasmodic on farms, and only undertaken, where the animals have acquired pernicious habits, and secondly no intensive campaign would be undertaken, unless farmers formed clubs on lines similar to those of the Jackal Clubs. Isolated undertakings in a small area, will, of course, only have a very transient effect on the meercat population at that point.

There are, however, weaknesses in the scheme outlined above to which consideration will have to be given.

In the first place outbreaks are not always noticed, or even reported, when they are known. One of the primary conditions on which the success of the scheme depends is thus rather uncertain, but susceptible to improvement by suitable propaganda.

Secondly this scheme depends on the assumption, that the yellow mongoose is the only source of infection. In the Vryburg district, where a large proportion of the outbreaks occurred in the genet, infection in them can hardly be regarded as accidental. Thus, even if the infection in meercats is completely destroyed, the genet may still be a source of reinfection for meercats. Here again it is hoped, that it will be possible to combat the disease in genets as well.

Apart from the obvious weaknesses above mentioned, it is fully realised, that the scheme is by no means foolproof and could easily go wrong at several points. That is why it has been insisted upon all along, that the eradication of meercats in rabies centres should not be left to the haphazard action of landowners, but should be undertaken by the State, and the work entrusted to a reliable staff specially trained for the purpose.

#### E.—OTHER CONTROL MEASURES AGAINST RABIES IN THE UNION.

Although constituting the main attack on the rabies problem in the Union, the proposed campaign against the carriers of this disease should not be regarded as the only weapon to be used. There are other measures, of more general nature, which should not be overlooked, e.g. :—

- (a) Prevention of fresh importation of rabies;
- (b) Quarantine and other State Veterinary measures against spread of the disease by domestic and other animals, especially dogs and cats.
- (c) And above all nation-wide propaganda, to—
  - (i) enlighten the public;
  - (ii) report all suspicious cases;
  - (iii) help destroy and keep down meercats;
  - (iv) and to collaborate with the State in all its measures to eradicate rabies.

##### (a) *Prevention of fresh Importation of Rabies.*

Although rabies is wide-spread and firmly established in some of our wild carnivora, it has the peculiarity, mentioned already, of not spreading in dogs. The outbreaks that have occurred in dogs, during the past twelve years, have been isolated cases, and in a few instances only did the infected dogs communicate the disease to members of their own species, or to other animals. It is therefore of the greatest importance, that the regulations imposed on the importation of dogs from neighbouring territories, and from overseas, should be rigidly enforced to prevent the introduction of a virus, which might behave differently when affecting dogs.

The provisions of the Stock Disease Act, No. 14 of 1911, aim mainly at total prohibition of the importation of dogs and cats from countries, where the disease is enzootic; and prescribe a period of six months quarantine for canines at Ports of Entry from other countries.

(b) *Quarantine and Other State Veterinary Measures against Spread of the Disease by Domestic and Other Animals.*

In 1936 the author described the legislation dealing with rabies, and the lines to be followed when outbreaks occur. Stress was laid on the special precautions to be taken when outbreaks, even in wild animals, occur near towns and villages, on account of the large dog population, to which the disease may be communicated in such places.

The usual precautions of restraining movements of dogs, isolating all suspected animals and destroying all stray animals and those, that have been bitten or have been in contact with infected animals, should be enforced.

These precautions, no matter how rigidly they be enforced, would not have the desired effect unless the source of the infection, which is usually the yellow mongoose, is not eradicated. On the contrary if dogs and cats are confined or destroyed, vermin and rodents will increase, thereby enhancing the propagation of rabies and possibly of bubonic plague also.

(c) *Nation-wide Propaganda.*

One of the first and most important steps to take against a disease of which the existence has been known for a short time only, and of which the epizootology is not understood by the public, is to enlighten them by all possible means as to dangers they run, how to protect themselves, and the duties they should perform.

This can be done by public lectures, addresses to farmers at association meetings, natural history lessons to school children by teachers, cinematographic representations, and by giving prominence to outbreaks in the press.

Two points should particularly be stressed, firstly to avoid being bitten by small wild carnivora. Special attention should be drawn to the fact, that a great many of the fatal cases in human beings have occurred in children, as a result of catching, what appeared to them to be tame meercats, but which were semi-paralysed animals in the last stages of rabies.

Secondly, people should be encouraged to report suspected cases of the disease, as success in eradicating by the methods at present at our disposal depends on an early recognition of all, or as many centres of infection as possible.

It should further be impressed on the public, that it is their duty to destroy and help keep down the numbers of meercats, and to collaborate with the State in all its measures to eradicate the disease.

**SUMMARY.**

A.—The study of the habits of meercats and their burrows has shown, (a) that the burrow is the most convenient place in which to destroy meercats, and (b) that those meercats, which escape contact with the gas in the burrows, together with those, that filter into an area on which destruction of meercats is taking place, may easily be destroyed by trapping.

B.—It is a practical proposition to exterminate *Cynictis penicillata*, the principle carrier of rabies, together with *Suricata suricatta* and *Geosciurus capensis* in an area, up to 10,000 morgen in extent, infected with rabies.

C.—A scheme has been evolved aiming at total eradication of rabies in the Union, by destroying the meercats in infected centres, first in the sparsely infected areas, and then by gradually closing in on the central infected areas.

D.—Success of the scheme depends on the thoroughness with which the eradication of meercats in the infected centres takes place; it should therefore, be undertaken by the State, and the work entrusted to a reliable staff, specially trained for the purpose.

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