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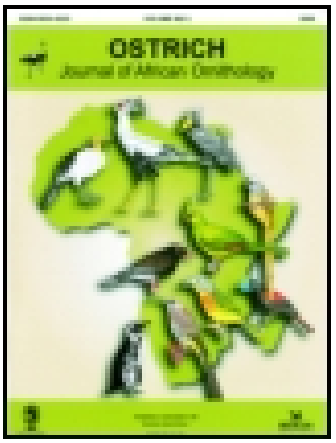

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THE PAST AND PRESENT DISTRIBUTION AND STATUS OF THE CAPE VULTURE IN THE CAPE PROVINCE

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THE PAST AND PRESENT DISTRIBUTION AND STATUS OF THE CAPE VULTURE IN THE CAPE PROVINCE

A. F. BOSHOFF & C. J. VERNON

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SUMMARY

BOSHOFF, A. F. & VERNON, C. J. 1980. The past and present distribution and status of the Cape Vulture in the Cape Province. Ostrich 51:230–250.

Because of the apparent decline in range and numbers of the Cape Vulture *Gyps coprotheres* in the Cape Province, the distribution and status of this species were reviewed according to four time periods from before 1905 to the present day. All available information was assembled, assessed and interpreted. It is apparent that, although the present decline is real, the population has undergone previous fluctuations. The magnitude, nature and possible causes of the fluctuations are discussed. It is postulated that the drastic decline in the game herds, particularly during the 19th century, together with the recent changes in stock farming, are the most important factors determining the numbers and distribution of Cape Vultures. Direct and indirect persecution also have a detrimental effect on vulture populations. Farmers' attitudes towards vultures are mentioned and conservation priorities and problems are listed.

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INTRODUCTION

The Cape Vulture *Gyps coprotheres* is listed as a rare and endangered species in the *South African Red Data Book – Aves* (Siegfried *et al.* 1976 a), which states that the Cape Vulture is "threatened and vulnerable" and that the population decline "is accelerating and gives cause for concern". It attributes this decline to "a decrease in availability of carrion, shooting, electrocution on high tension wires, poisoning, and disturbance at breeding colonies". However, Siegfried *et al.* (1976 b) states that "it is not possible on current information to assess accurately the degree to which species' populations may be threatened or otherwise" and they do not list the Cape Vulture in the "20 species' populations (which) should be given top rating (*sic*) and deserve priority conservation attention".

Although there is widespread agreement that the Cape Vulture is declining in numbers and distribution, there are few reliable statistical data to support this contention. The Cape Vulture is subject to electrocution on power-lines (Markus 1972; Jarvis 1974) and nestlings may develop osteodystrophy (bone deformation) through calcium deficiency (Mundy & Ledger 1976). Direct and indirect poisoning of vultures by farmers is a further mortality factor (*cf.* this paper). Ledger & Mundy (1976, 1977) outline the current status of the Cape Vulture in South Africa and state that the (downward) "trend of the population is critical" and that even the birds in the Transkei are threatened. In the Cape Province Jarvis *et al.* (1974) concluded that "Cape Vultures are maintaining their populations at a satisfactory level in some areas . . . particularly the eastern Cape and Border. However, in other areas they appear to have declined. In some areas where the birds were previously seen frequently, they are apparently now completely absent and some previously large breeding colonies are now extinct". The only statistical evidence available, derived from ringed nestlings in the Transvaal, suggests that the birds have an annual mortality of about 50%. "The figure . . . cannot be considered valid. If mortality had been operating at this level the species could not have survived the past twenty years" (Houston 1974). However the Vulture Study Group, in re-evaluating the ringing recoveries, suggest that the Cape Vulture population may be declining rapidly (Piper *et al.* in prep.)

METHODS AND MATERIALS

The history of the Cape Vulture in the Cape Province was traced from published and unpublished records. In 1965/66 a survey of the Cape Vulture in the Cape Province was conducted by the then Cape Department of Nature Conservation in the form of a questionnaire to secretaries of the 93 Divisional Councils in the Cape Province and the Transkei. The secretaries were asked whether vultures occurred in their magisterial district, whether the birds were increasing or decreasing, and which farmers had vultures breeding on their properties. This was followed by a field survey of some of the replies by visiting various colonies and roosting sites. In 1976 the Cape Vulture was in-

cluded in a survey of birds of prey made by the Cape Department of Nature and Environmental Conservation (CDNEC). A questionnaire and illustrations of 12 birds of prey were sent to 30 487 farmers and Department of Forestry field stations in the Cape Province. Among other questions relating to their farming activities, farmers were asked to indicate which of the birds occurred and bred on their farms and whether there were any problems between raptors and livestock. Altogether 48,4% of the questionnaires were returned and many of them supplied additional, unsolicited information about birds of prey.

To permit rapid access to and tabulation of the data, as well as the drawing of distribution maps, the results were placed on a computer according to the scheme outlined by Boshoff *et al.* (1978). In order assess the validity of the survey a sub-sample of the replies was investigated in a ground-truth survey by members of the CDNEC, consisting of interviews with farmers concerning their replies to the original survey to establish whether the farmer could in fact identify the species he reported, and whether he actually knew of the breeding locality reported. In addition the farmers were questioned about details of interactions between raptors and livestock. The ground-truth survey enabled members of the CDNEC to assess the farmers' reports by personally examining the farms and to keep records of all raptors seen while on such trips.

The 1976 Survey resulted in the following sets of information about the Cape Vulture: (i) distribution, (ii) breeding distribution, (iii) relative frequency of occurrence, (iv) population trends, (v) relationship between vultures and livestock, (vi) attitudes of the farmers towards vultures.

In order to assist with the interpretation of these results it was necessary to assess all available information about the Cape Vulture in the Cape Province for the preparation of a distribution map of all place names containing the word "vulture" and distribution maps for different historic periods.

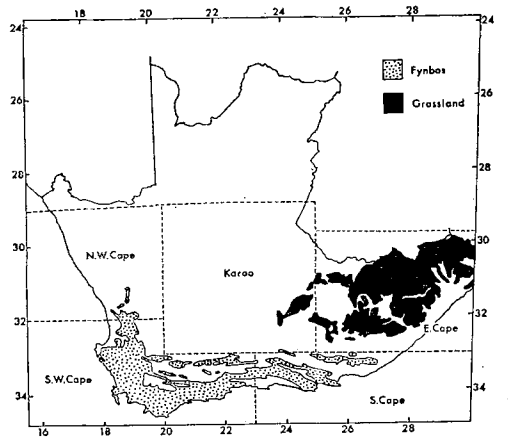

FIGURE 1
Regions of the Cape Province, and distribution of the grasslands and fynbos in 1950.

Historic maps were totally independent of the 1976 Survey and put the 1976 Survey results into perspective. Although the 1976 Survey is based upon replies from white farmers in the Cape Province, several factors determined that we redefine the geographic boundaries of the "Cape Province". Firstly in regions where there were two or more species of vulture the farmers tended to confuse the Cape Vulture with the Whitebacked Vulture *Gyps africanus*. Secondly, although replies were received from East Griqualand, no ground-truth survey was conducted in that area. Thirdly, East Griqualand is separated from the rest of the Cape Province by the Transkei which was not included in the 1976 Survey. However, as we have some information on the Transkei, and the vultures move freely between the Transkei and the Cape Province, we have included the Transkei in the "Cape Province". The "Cape Province" is defined as that part of the actual Cape Province (excluding East Griqualand – now part of Natal) and the Transkei south of 29S.

The index of the frequency of occurrence of vultures, according to the 1976 Survey, was obtained by applying "exact" confidence limits (Diem & Lentner 1970) at the 95% level to the total number of farmers per locus (Greig 1978), who returned questionnaires and who reported vultures.

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The lower confidence limit was used for the final plot in an effort to reduce bias caused by variation in the total number of farmers per locus, who returned questionnaires.

The history of sightings, nests and colonies of the Cape Vulture in the Cape Province has been catalogued and is published elsewhere (Boshoff & Vernon 1979; Boshoff & Currie 1980). Similarly the details pertaining to all other published and unpublished records quoted are listed by Boshoff & Vernon (1979). Numbered localities in the text are listed with their co-ordinates in Appendices 1 and 2.

RESULTS

The results have been arranged to indicate the status and distribution of the Cape Vulture in the Cape Province in four time periods: before 1905, 1905–1949, 1950–1975, 1976–1978. These time periods were chosen *post hoc* according to the information available. In the first two periods we present data from published records only, while in the latter two we are able to compare results from the farmer survey with published records. The terms *E. Cape, S. Cape, N.W. Cape, S.W. Cape* and *Karoo* are used and defined in Fig. 1 These regions approximate to veld types of the 1950 map of Acocks (1975). The E. Cape includes the sweet, sour and scrubby grasslands, and the S. and S.W. Cape include the fynbos (macchia, Cape Flora).

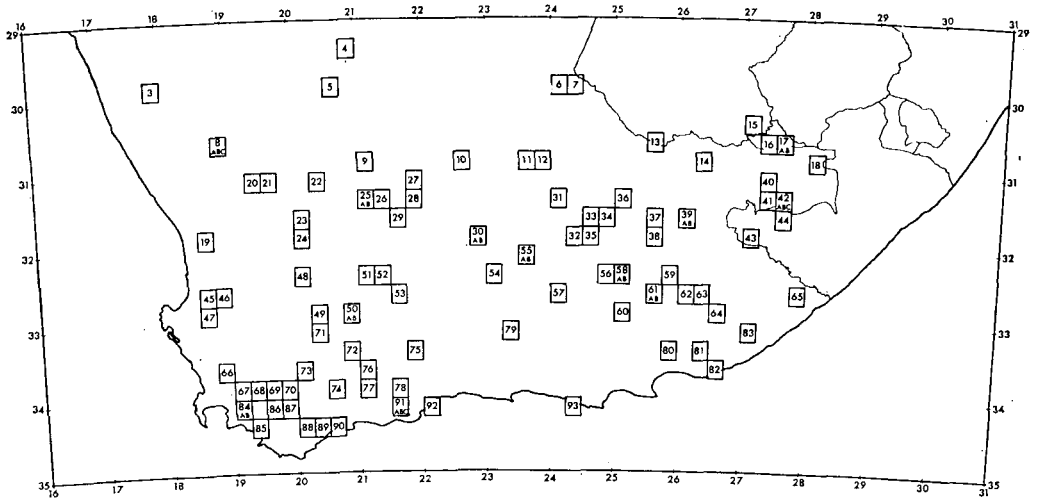

FIGURE 2
Distribution of place names in the Cape Province which contain the word "vulture", "aasvoël", "aasvogel" or "xalanga" (cf. Appendix 1).

DISTRIBUTION AND STATUS BEFORE 1905

The consensus of modern opinion is that the Cape Vulture was widespread and even numerous throughout the Cape Province (Godfrey 1927; Gill 1936; Roberts 1940; Winterbottom 1968; Jarvis *et al.* 1974). This contention is repeated in MacLachlan & Liversidge (1957, 1970, 1978) who give a distribution map showing the presence of the Cape Vulture over the entire Cape Province. The available information about the distribution and status of the Cape Vulture before 1905 is assembled below and this opinion is re-evaluated.

Distribution

The earliest records of vultures in the Cape Province are bushmen paintings depicting the birds. These are known at "Hotfire", Cathcart and at "Buffelsfontein", Dordrecht. Vultures probably occurred at 109 localities where topographical features and farms have names which include the word "vulture" in Afrikaans (aasvoël), Dutch (aasvogel), English or Xhosa (Xalanga). These places are mapped in Fig. 2 and tabulated in Appendix 1.

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The published records of actual localities where vultures were recorded before 1905 are meagre. They are mapped in Fig. 3. With regard to the interpretation of this map, and those of subsequent time periods, it must be emphasized that the changes in the number and distribution of observers through time must be taken into account.

Breeding Distribution

There is only one definite breeding record for the Cape Vulture in the Cape Province before 1905. This is at Nelspoort near Beaufort West (Layard & Sharpe 1884) and an account is given of eggs collected at the site in 1866, 1867 and 1868 (Layard 1869; Jackson *ca* 1920). Breeding may have taken place at six other localities, *viz.* near East London (Layard & Sharpe 1884), near Humansdorp (Masterson 1916), near Grahamstown (Paget-Wilkes 1924), Teebus (98) (Hare 1932a), Aasvoëlkop (61b) (J. Klopper pers.comm. 1977), and Collywobbles (111) (A. Hawkes pers. comm. 1978).

Status

Opinions have been expressed about the status of the Cape Vulture before 1905 by Barrow (1801), Layard (1867), Layard & Sharpe (1884), Stark & Sclater (1903), Shortridge (1905), Haagner & Ivy (1907) and Jarvis *et al.* (1974). These vary from "found throughout the (Cape) colony" and "it has become much rarer of late throughout the colony" to "occasionally common, at most times rare".

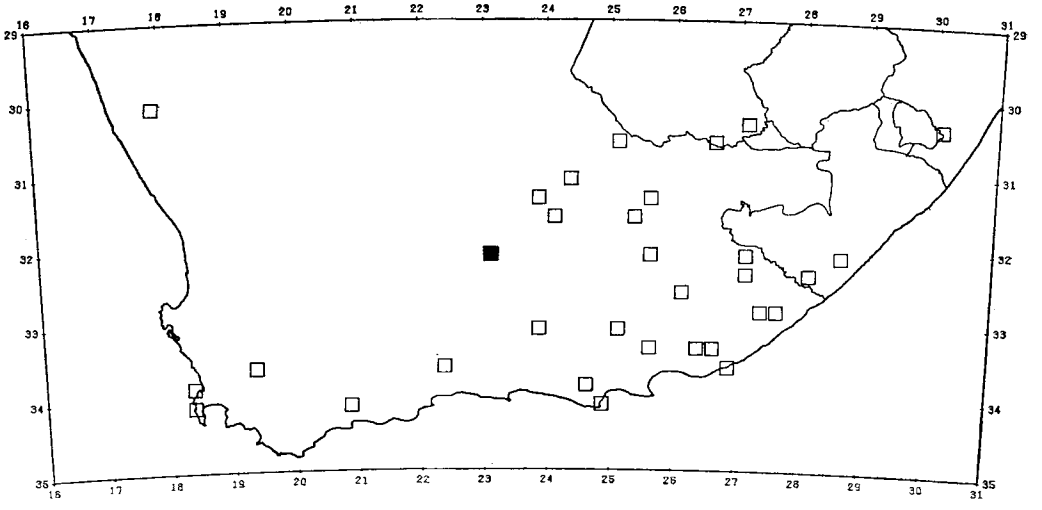

FIGURE 3

Distribution of the Cape Vulture in the Cape Province before 1905 according to published and unpublished records. The solid square represents a reliable breeding record; open squares represent sightings.

Decline about 1900

Opinions gleaned from various published and unpublished sources suggest that the Cape Vulture declined in range and numbers about 1900. These views were expressed for the following districts: Albany (F. Howarth *in litt.* 1963; W. B. Latham *in litt.* 1953; F. G. Turberville *in litt.* 1963; Paget-Wilkes 1924), Beaufort West (Jackson *ca* 1920), Bedford (F. M. Bowker *in litt.* 1952; E. Maasdorp *in litt.* 1960; A. H. J. Vosloo CDNEC 1965 Survey), Cradock (Gilfillan 1952); Humansdorp (Masterson 1916); Keiskammahoek (Godfrey 1927), King William's Town (*The Mercury* 24 January 1955), Lady Grey (O. Briggs *in litt.* 1917), Middelburg (C. E. Jordaan CDNEC 1965 Survey), Pearston (Palmer 1966), Philipstown (Hare 1932b), Queenstown (*Daily Dispatch* 30 October 1924; R. J. Weir *in litt.* 1930), Sterkstroom (S. Stretton pers.comm. 1978). The detailed accounts of these records are given in Boshoff & Vernon (1979).

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Possible reasons for the decline

The decline of the vultures occurred about the time of two major events: the Anglo-Boer War (1899–1902) and the Rinderpest Epidemic. The disappearance of the vultures was associated with and even attributed to these events. For example: "The aasvogels have all gone north with Bobs" (Armstong 1900). This is an allusion to Lord Roberts and the war. The vultures apparently also congregated at places where the war was taking place (*vide* Stark & Sclater 1903).

The abundant supply of carrion caused by the rinderpest epidemic of 1895 and subsequent years was also said to have caused movements of vultures from the southern areas northwards, even as far as Central Africa (Stark & Sclater 1903; Anon. 1907). It was a commonly held view that the absence of the vultures in various parts of the Cape Province was indirectly caused by the rinderpest (Godfrey 1927; Mossel Bay Divisional Council, CDNEC 1965 Survey; S. Stretton pers. comm. 1978). However it was also suggested that the vultures had died as a result of eating the flesh of animals killed by the rinderpest (Masterson 1916; *Daily Dispatch* 30 October 1924).

The rinderpest epidemic spread down Africa and reached the Cape Province near Vryburg in April 1896 and spread to Grahamstown by September 1897 (C. J. Skead). By 1903 the epidemic was over. The disease affected cattle, buffalo and possibly kudu and bushbuck, while horses, donkeys, sheep and goats do not appear to have been affected (Spinage 1962). It is estimated that between two and five million cattle were lost in southern Africa (Anon. 1960), but it is difficult to obtain precise figures. In the Cape Province and Botswana 0,56 million head of stock were lost (Wilson & Thompson 1971). In the Transkei 90% of the cattle were lost, but no figures of the actual numbers killed are available. By 1918 there were 0,7 million cattle in the Transkei, so even if numbers tripled between 1903 and 1918, two million cattle may have been lost (Anon. 1902).

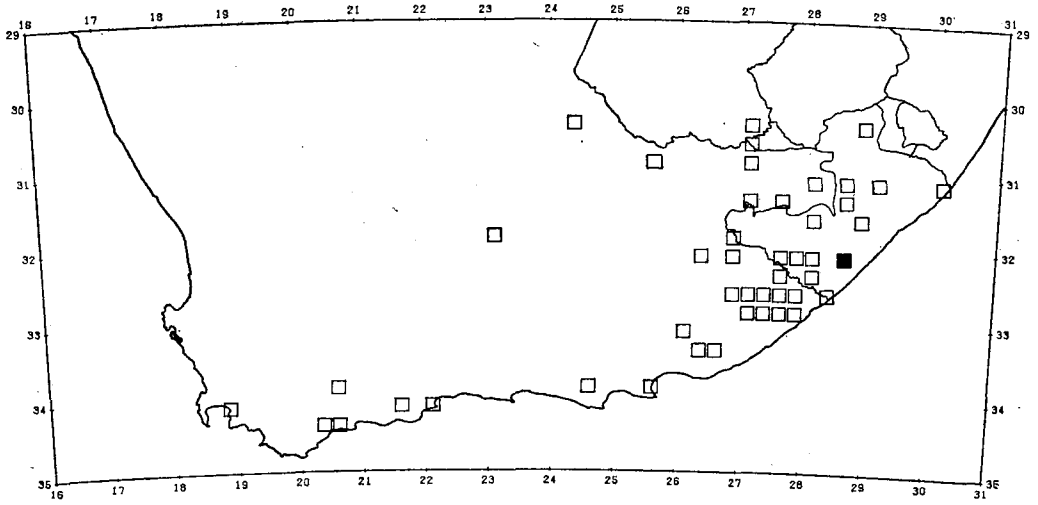

FIGURE 4

Distribution of the Cape Vulture in the Cape Province between 1905 and 1949 according to published and unpublished records. The solid square represents a reliable breeding record; open squares represents sightings.

Poisoning has also been suggested as a reason for the decline of the vultures about 1900. A widely held view was that the vultures died from feeding on carcases poisoned to combat scavenging carnovores (Stark & Sclater 1903; Haagner & Ivy 1907; Jackson *ca* 1920). The carcasses of animals killed by the rinderpest were also often poisoned, apparently with disinfectants to reduce the stench, and this contributed to the vulture mortality (*Daily Dispatch*, 30 October 1924; E. Maasdorp *in litt.* 1960). Furthermore there were "poison clubs" formed in certain districts specifically to deal with the "vulture problem" (Finch-Davies 1907; C. J. Skead *in litt.* 1978).

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DISTRIBUTION AND STATUS BETWEEN 1905 AND 1949

From 1905 to 1949 the Cape Vulture was found in the E. Cape and the S.W. Cape but not the Karoo and S. Cape. The available records are mapped in Fig. 4. Comparison of Figs. 3 and 4 shows that the most marked change occurred in the S. Cape. By 1930 the vultures were considered to be rare in the Albany district and this has been their status ever since (Hewitt 1931; Paterson 1958; Skead 1965). The available evidence indicates that the vultures' range contracted to the Transkei and the northeast of the E. Cape. The birds were apparently present in the Transkei throughout the period (Godfrey 1927; unpublished records). At Karnmelkspruit (96) there is no oral tradition to suggest that the vultures ever declined there (C. C. Cloete pers.comm. 1978). At Goedverwacht (94) the vultures "left during the Boer War and returned two years later" (G. H. de Beer pers.comm., CDNEC 1965 Survey). At Aliwal North, in 1949, the vultures were "still as numerous as ever" (L. S. Dorrington, *Daily Dispatch*, 24 February 1950). These three localities are indicated in Fig. 4.

From 1905 to 1949 the vultures gradually increased their range in the E. Cape with the spread being southward and westward from the northeast. In the Bedford district the vultures were apparently absent between 1928 and 1949 (A. H. J. Vosloo, CDNEC 1965 Survey) while in the King William's Town district vultures were considered to be a scarce species in the 1920s (Godfrey 1934; V. Tainton *in litt.* 1952); R. Godfrey also has several records of vulture sightings for this district from 1942 to 1945. Vultures were said to have reappeared in the Philipstown, Queenstown, Sterkstroom and Steynsburg districts during this period (*Daily Dispatch*, 30 October 1924; Hare 1932b; S. Stretton pers.comm. 1978). In the S.W. Cape few records are available for this period but the vultures may have been locally common: Aasvoëlkrans (88) (C. J. Uys *in litt.* 1978); Aasvoëlberg (91b) (H. van Rensburg pers. comm. 1978); Van Wyksdorp (J. Gelderblom pers.comm. 1978); Heidelberg (A. Rother pers.comm. 1979). However there was a decline in the range and numbers of the vultures in some areas, *e.g.* a site near Swellendam became extinct about 1930 and Aasvoëlberg (91b) was extinct by 1946 (Jarvis *et al.* 1974)

Breeding Distribution

Between 1905 and 1949 there appears to be only one definite breeding record for the Cape Province. This is at Collywobbles (111) where over 100 nests were recorded in 1949 (Pringle 1974) However this colony was known in the late 1920s (G. Thornton pers.comm. 1978; M. Sibam pers.-comm. 1978) and H. C. Trow collected eggs there during the 1939–45 war (A. Whitfield pers.comm. 1978). Breeding may have occurred during this period at four other sites, *viz.* Aasvoëlberg (91b) (Muir 1940), near Barkly East (S. Coutts *in litt.* 1962) on the Tsomo River (E. O. Pike *in litt.* 1976) and near Bawa Falls, Transkei (C. D. Quickelberge *in litt.* 1978).

DISTRIBUTION AND STATUS BETWEEN 1950 AND 1975

The distribution of the Cape Vulture, according to the available records, is shown in Fig. 5. The period appears to be a continuation of the trend of expansion of the vultures' range from the E. Cape into the Karoo that started in the period 1905–1949. Various records in indicate that the birds reappeared and were on the increase in the following districts: Adelaide (W. de Klerk *in litt.* 1962), Bathurst (Jones 1965), Cradock (Gilfillan 1952; S.A.B.C. Regional News, January 1954), J. H Neethling *in litt.* 1966; Graff-Reinet (Divisional Council, CDNEC 1965 Survey), King William's Town (*The Mercury*, 24 Jsnuary 1956) and Tarkastad (S. Clarke *in litt.* 1953). In the S.W. Cape there are relatively few records of Cape Vultures for the period 1950–1975 and there is little indication of any change in status.

The CDNEC 1965 Survey

The CDNEC 1965 Survey is described and reported by Jarvis *et al.* (1974). The population trends of the Cape Vulture which they report in Table 4 are mapped in Fig. 6. Figs. 5 and 6 show the localized nature of the vulture population in the S.W. Cape, the lack of vultures in the S. Cape, and the abundance of birds in the E. Cape. About one-third of the 57 districts, remarking on the change in status of vultures, considered that the birds had decreased or disappeared. Only one such opinion, at Komga, was expressed of the situation in the E. Cape.

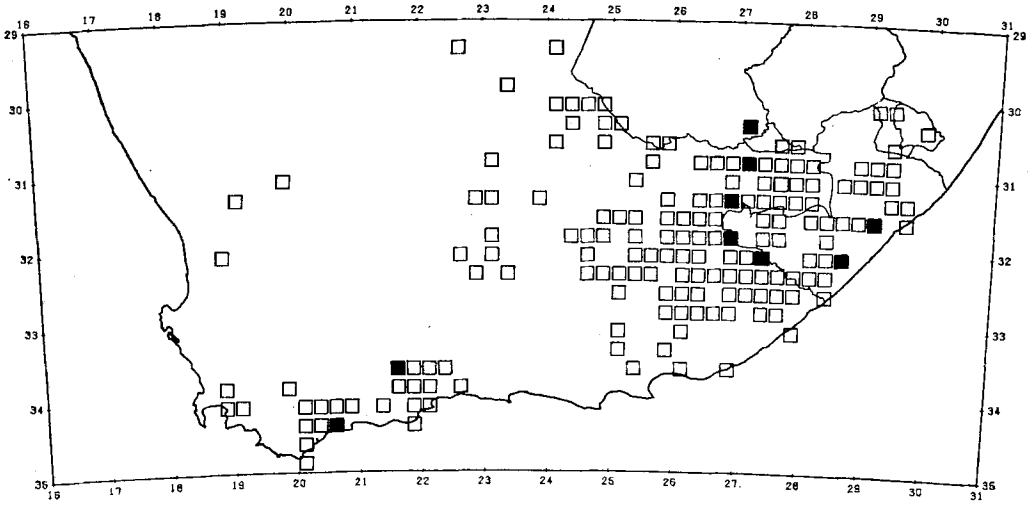

FIGURE 5
Distribution of the Cape Vulture in the Cape Province between 1950 and 1975 according to published and unpublished records. Solid squares represent reliable breeding records; open squares represent sightings.

The CDNEC 1976 Survey

The distribution of the Cape Vulture according to the distribution of the 3 341 farmers who reported the occurrence of vultures on their farms in response to the CDNEC 1976 Survey is shown in Fig. 7. It is only possible to give an approximate time-base to this map. Although the farmers stated that the vultures occurred on their farms, they were not asked when the vultures were last seen. It was apparent from replies to questions put to farmers by members of the ground-truth survey, that the farmers' replies were drawn from their life-time experience on the farms. The fact that vultures were reported on a farm could have referred to this year, last year or 25 years ago. Comparison of the farmers' replies with the published records of the distribution of the Cape Vulture between 1950 and 1975 (Figs. 5 and 7) show a high degree of correspondence. Thus we suggest that the farmers' response to the 1976 Survey, regarding occurrence of vultures, reflects the distribution of the birds during the period 1950 to 1975.

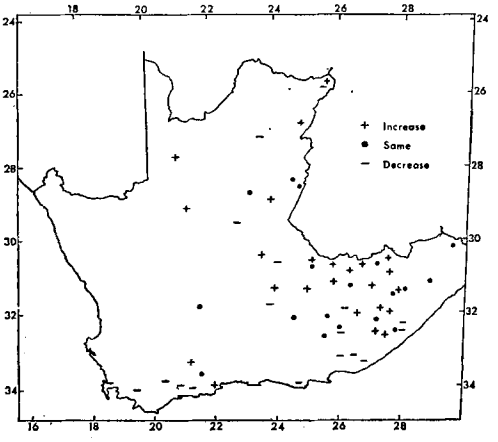

FIGURE 6
Population trends of the Cape Vulture in the Cape Province according to the CDNEC 1965 Survey.

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Frequency of occurrence

An index of the frequency with which the Cape Vulture occurred throughout the Cape Province is shown in Fig. 7 (cf. "Methods and Materials"). The greatest frequency of vulture occurrence is in the E. Cape in the grasslands. The division between areas of >80% occurrence and of 50% occurrence approximates to the division between the grassland and the karoo in the 1950 vegetation map of Acocks (1975) (compare Figs 1 and 7).

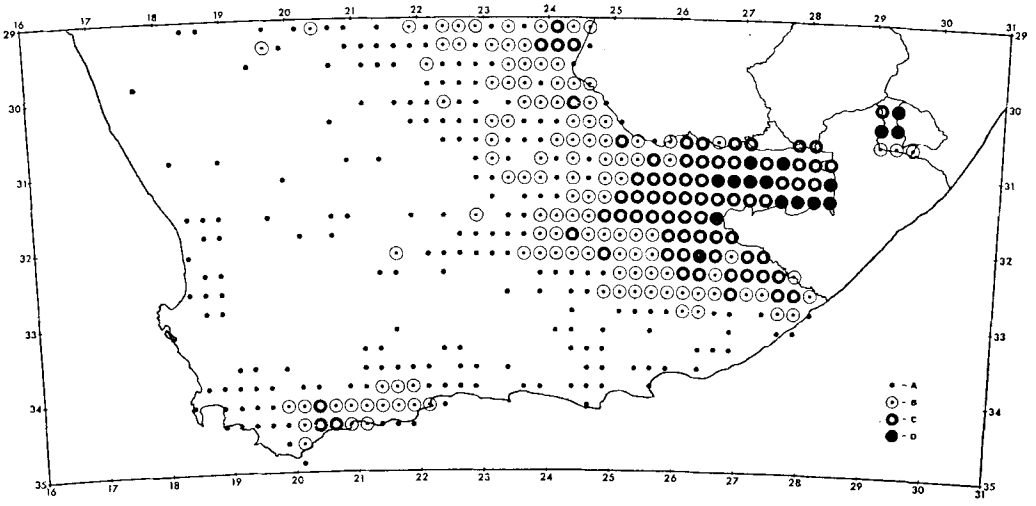

FIGURE 7

Distribution of the Cape Vulture in the Cape Province according to the CDNEC 1976 Survey Index of frequency of occurrence indicated as follows: A = ≤4 total returns per locus and <10% of farmers reporting vultures; B = 10–49% reporting vultures; C = 50–79% reporting vultures; D = ≥80% reporting vultures.

Ringing results

Nestling vultures have been ringed in the Cape Province at Potberg (116) since 1959, in 1972 at Mlengana (103) and at Collywobbles (111) from 1976 onwards. In the Transvaal over 3000 nestling vultures have been ringed at several colonies from 1949 onwards. Four Potberg vultures have been recovered away from their site of ringing. One of these moved about 330 km to near Calvinia within five months of being ringed, while another bird moved about 105 km to the east of the Potberg (Boshoff & Currie 1980). There have been three recoveries of vultures ringed at Collywobbles. All were recovered about one year after ringing in the area between Jamestown, Dordrecht and Queenstown.

There have been 26 recoveries of Transvaal-ringed vultures in the Cape Province, mostly from the E. Cape. Between 1950 and 1975 the proportion of recoveries of Transvaal-ringed vultures recovered in the Cape Province gradually declined. One deduction made from this is that the immature Transvaal birds may no longer be dispersing to the Cape Province (Vernon 1978).

Breeding Distribution

In the 1976 Survey the farmers confused roosting and breeding sites of the Cape Vulture. This was because the farmers tended to assume that vultures, which were regularly seen at a cliff, actually bred there. The vultures were reported as breeding on 375 farms and 169 of these reports were investigated during the ground-truth survey. Subjective decisions were then made and the results are given in Table 1.

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TABLE 1
BREEDING OF THE CAPE VULTURE IN THE CAPE PROVINCE ACCORDING TO THE GROUND-TRUTH SURVEY OF THE CDNEC 1976 SURVEY

Status	Southwestern Cape	Eastern Cape	Total
Breeding (nucleus) colony	1	1	2
Active roost; have bred or may have bred (satellite colony)	2	5	7
Inactive roost; have bred or may have bred (satellite colony)	1	19	20
Inactive roost	1	36	37
May roost	1	–	1
Not a roost	7	74	81
Duplicate reports	4	16	20
Incorrect identification	1	–	1
Total	18	151	169

There were several sites, where vultures either have or may have bred during the period 1950–1975: Balloch (97), Collywobbles (111), Forest Range (106), Gamka Mountain (113), Goedverwacht (94), Karnmelkspruit (96), Langeberg (115), Langkloof (114), Mlengana (103), Nonesi Nek (102), Potberg (116), Rooipoort (95), Rooiberg (100) and Tafelberg (110). At Goedverwacht (94), Rooipoort (95) and Tafelberg (110) artefacts eaten as bone substitutes were found below the cliffs, which may strengthen the contention that these were once breeding colonies.

There were several sites, where no substantiated records of vultures breeding were obtained, but which may have been breeding colonies during the 1960s or early 1970s: Andriesberg (101), Boschberg (112), Elandsberg (105), Inverket (107), Martha & Mary (104), Stonehenge (108), Teebus (98) and Witkransnek (99).

At a further 108 sites vultures have occurred and roosted in the Cape Province, and it is possible that the vultures may have bred at many of them (Boshoff & Vernon 1979).

DISTRIBUTION AND STATUS BETWEEN 1976 AND 1978

Distribution according to the CDNEC 1976 Survey

a) Ground-truth observations

The sightings of vultures from available records, other than those of farmers, are shown in Fig. 8.

b) "Breeding" vultures – farmer opinions.

The distribution of the 375 farmers who reported that the vultures bred on their properties is shown in Fig. 9. We have concluded from the comparison between Figs 8 and 9 that the distribution map resulting from farmers reporting vultures breeding on their farms, reflects the present (1976) distribution of vultures in the Cape Province.

Status

The Cape Vulture has apparently declined in distribution in recent years. This is apparent from comparisons between Figs 5 and 8, and between Figs 7 and 9. This assertion is supported by the opinions of 386 farmers who supplied additional, unsolicited comments with their replies to the 1976 Survey. These farmers all stated that the vultures were declining in numbers. The distribution of these farmers is shown in Fig. 10 and the numerous reports from the S. and S.W. Cape confirm the trend indicated in Fig. 6. There was only one farmer, at Langkloof (114), who considered that the numbers of the vultures had remained constant, and none who thought that the birds were increasing.

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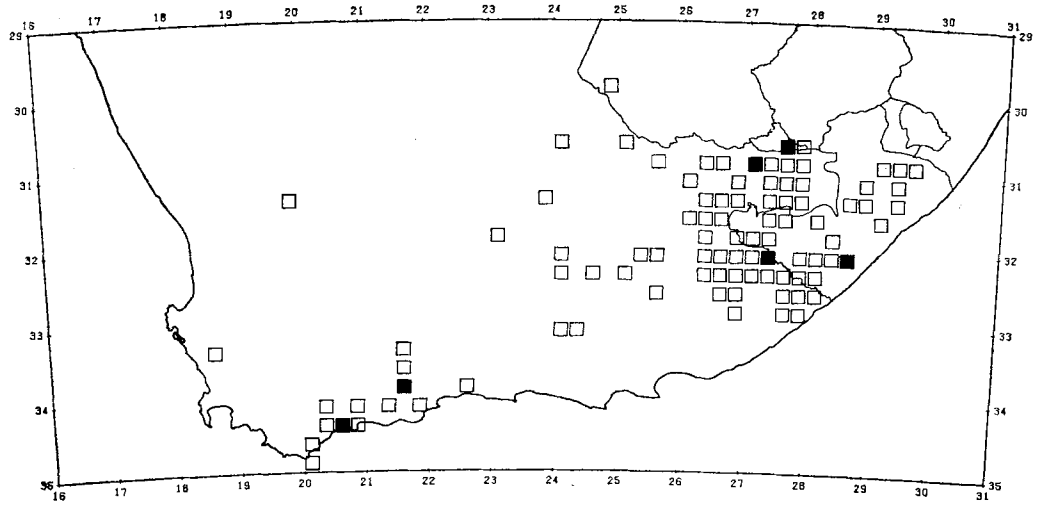

FIGURE 8

Distribution of the Cape Vulture in the Cape Province between 1976 and 1978 according to the ground-truth survey and published and unpublished records. Solid squares represent reliable breeding records; open squares represent sightings.

Breeding Distribution

The total number of breeding pairs of Cape Vultures in the Cape Province is not accurately known. Two independent sources related that vultures bred at Langkloof (114) in 1976 where 10 unoccupied nests were located in 1978. In 1978 there were about 250 breeding pairs as follows: Collywobbles (111) (180 pairs, 480 birds counted), Karnmelkspruit (96) (40 pairs, 250 birds count-

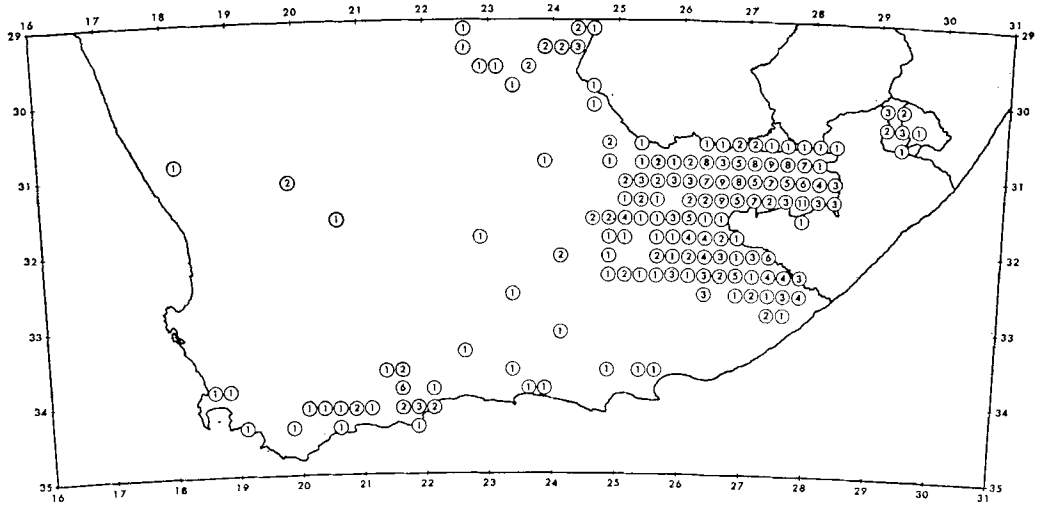

FIGURE 9

Distribution of farmers in the Cape Province who reported that vultures bred on their farms (CDNEC 1976 Survey). Circled digits represent the number of farmers per locus.

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ed), Potberg (116) (12 pairs, 45 birds counted), Balloch (97) (11 pairs, 50 birds counted), Forest Range (106) (9 pairs, 36 birds counted) and Langeberg (115) (1 pair, 28 birds counted). At these colonies there were 889 birds, indicating that not all birds at the colonies attempt to breed. We consider it unlikely that there was an equal number of birds away from these colonies. We suggest that there were between 1 200 and 1 600 birds in the Cape Province in 1978. In the Transvaal in 1978 there were about 1 270 breeding pairs and approximately 3 000 birds (W. R. Tarbotton pers.comm. 1978). In 1979 there were about 265 breeding pairs: Collywobbles (111) (±200 pairs), Karnmelkspruit (96) (40 pairs), Balloch (97) (14 pairs), Potberg (116) (10 pairs) and Langeberg (115) (1 pair).

REASONS FOR THE RECENT DECLINE IN NUMBERS

Five reasons may account for the recent decline in the range and numbers of the Cape Vulture in the Cape Province: direct persecution, accidental poisoning, electrocution, calcium deficiency, and starvation.

Direct persecution

The vultures have been directly persecuted by shooting and poisoning, but it has been difficult to obtain evidence of this. The birds have been victimized through fear, ignorance, superstition, wantonness and retaliation. The birds are said to spread diseases such as quarter-evil and anthrax, to be responsible for blow-fly plagues, to vomit and excrete into drinking water provided for stock and to kill livestock. These controversial allegations against the vultures have caused farmers to shoot and poison the birds. Some are discussed in a subsequent section.

The incidence of direct persecution of the vultures could not be measured. We believe that it is not high and is decreasing. However it requires only one farmer per district to victimize the birds, and he has the potential to eliminate the vulture population in that district.

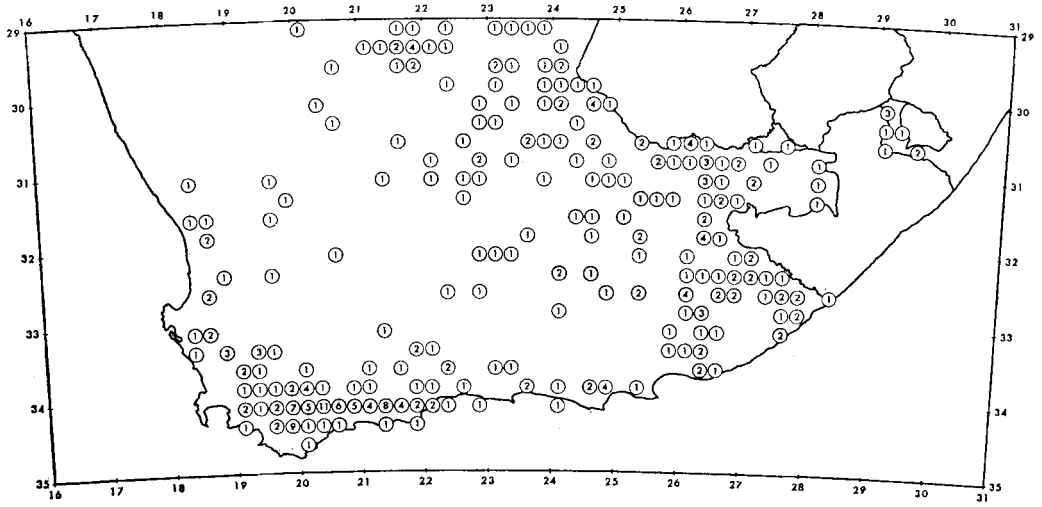

FIGURE 10

Distribution of farmers in the Cape Province who considered that vultures were declining (CDNEC 1976 Survey). Circled digits represent the number of farmers per locus.

Indirect persecution

Poisoning

Vultures are indirectly persecuted when they feed on carcases which have been poisoned to kill other predatory animals. A Herbertsdale farmer reported that all or most of the 100 vultures that used to occur on his farm were killed by farmers putting out poisoned carcasses for lynx. In 1975, in the Dordrecht district, a lamb was dosed with "Topclip" to combat maggots and this caused the

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death of 28 vultures, 16 crows and the lamb. Many farmers visited during the CDNEC 1976 Survey related incidents similar to those given above.

There are several accounts of vultures drowning in reservoirs. The most publicised of these was in May and June 1975, at Queenstown, when a total of 50 birds drowned. According to widespread oral tradition, vultures which have eaten poisoned meat become thirsty and then will drown when drinking. This disaster may be magnified as one bird entering the reservoir may induce others to follow (P. J. Mundy pers.comm. 1979).

Electrocution

Vultures in the Cape Province have been electrocuted accidentally when they roost on power-lines. At Seymour 30 birds were reported killed in a 10-year period along 1 km of 11–Kv line (Jarvis 1974). Subsequent investigation gave a revised figure of three birds killed along 8 km of line (P. Burdett *in litt.* 1977). At the Ouberg F. M. mast near Graaff-Reinet in 1977 F. Marais (pers.comm. 1978) saw "heaps" of vulture carcases below the pylons of the 11–Kv powerline while in 1976 about 40 vultures were killed along about 5 km of 22–Kv powerline near Kimberley (P. Schneekluth *in litt.* 1976). Similarly three "Whitebacked Vultures" were found below a pylon between De Aar and Dealesville (E. F. Otten *in litt.* 1976) and vultures were blamed for power cuts in the E. Cape (*Eastern Province Herald*, 12 March 1976).

There are 9 962 km of 11–Kv line and 5 004 km of 22–Kv line in the Cape Province, of which only 226 km of 111Kv and 285 km of 22–Kv line occur in the Eastern Cape (ESCOM Annual Report 1977). While no estimate can be made of the overall effect of electrocution on the Cape Vulture population, the potential hazard is least in the area where the birds are most numerous.

Calcium deficiency

Cape Vultures in the Transvaal and Botswana suffer from calcium deficiency which manifests itself during the breeding season, when nestlings receive insufficient bone in their diet and develop osteodystrophy (Mundy & Ledger 1976). This reduces the reproductive output of the vultures. The syndrome is also characterized by the presence of artefacts, which serve as bone substitutes, below the breeding cliffs. Nestlings with distorted bones resulting from calcium deficiency have been found at Potberg (116), Karnmelkspruit (96) and Forest Range (106). Artefacts, but not distorted bones, have been found at Clifford (109), Vulture Crag (65), Collywobbles (111), Tafelberg (110), Goedverwacht (94) and Rooipoort (95).

Starvation

There is much oral tradition among the farmers that the vultures have declined as a result of a diminution of their food supply. This has come about due to a reduction in the actual numbers of stock, improved farming methods which has in turn reduced stock mortality, and the removal or burial of carcases from the veld. Evidence to support these contentions is supplied by S. Stretton (Sterkstroom), V. L. Pringle (Bedford), C. C. Cloete (Lady Grey), E. K. Moorcroft (Adelaide) (all pers. comm. 1977/1978).

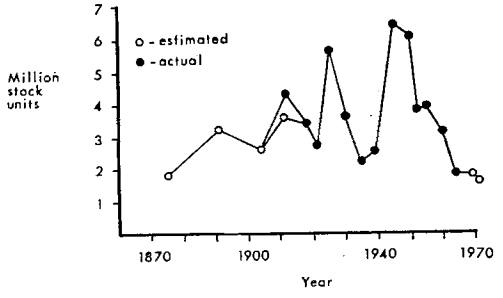

FIGURE 11
Stock losses in the Cape Province in certain years between 1875 and 1971. Based on data in handbooks of agricultural statistics and Noble (1886, 1893). Raw data in Tables 1–3 (Boshof & Vernon 1979). One cow taken to equal seven sheep.

ESTIMATES OF FOOD AVAILABLE TO THE VULTURES

The number of sheep and cattle (stock) in certain years between 1875 and 1973 in the Cape Province are provided by Noble (1886, 1893) and various handbooks of agricultural statistics. The

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actual figures were summarized and from them the number of stock lost per year was estimated and is presented in Fig. 11.

The stock losses per year increase until about 1950 and thereafter decrease to 1971. This supports the farmers' contention that less stock is now available to the vultures. The figures suggest that there had been about a threefold decrease in stock losses between 1950 and 1970. Between 1935 and 1949 statistics are available for four years which indicate that about 67% of the sheep, and about 85% of the cattle in the Cape Province were located in the Karoo and E. Cape (Table 4, Boshoff & Vernon 1979). Here "Karoo" is used in a more restricted sense than élsewhere in this paper and is considered as the Karoo almost as far west as 23 E.

FARMERS ATTITUDES TOWARDS VULTURES

About one farmer in four was of the opinion that vultures killed livestock as 763 (22,8%) of the 3 341 farmers who replied to the CDNEC 1976 Survey attributed loss of stock to vultures. Significantly more farmers ($\chi = 21{,}3; p > 0{,}01$) did so among those who reported vultures "nesting" on their farms than those who only reported sighting the vultures (Table 2). During the ground-truth survey, information was obtained from 16 farmers about the frequency of vultures attacking stock. Only one farmer stated that it often happens, seven stated that it happens sometimes, occasionally or has been known to happen, and eight recalled that it once happened. As some farmers were recalling events over a lifetime, vultures do not apparently attack livestock very frequently. Many reports that we have gathered of vultures taking livestock have been taken from newspapers e.g.: "Vultures are menacing and so far 20 sheep (have been) attacked in the Graaff-Reinet district" (*E.P. Herald*, 28 January 1955). The members of the ground-truth survey did not encounter anyone who had actually witnessed an occasion where vultures attacked live stock. We believe that most accounts are secondhand or even based on episodes many years ago. The actual events of vultures attacking stock are remembered while the majority of occasions where vultures do not molest stock are soon forgotten.

TABLE 2
FARMERS IN THE CAPE PROVINCE REPORTING LOSSES OF STOCK TO VULTURES ACCORDING TO WHETHER THE VULTURES "NESTED" ON OR "VISITED" THEIR FARMS. DATA FROM THE CDNEC 1976 SURVEY

Reports of:	Total reports	Reports of vultures taking stock	%
Sighting	2 966	640	21,6
Nesting	375	123	32,8
Total	3 341	763	22,8

While a few accounts of vultures attacking stock were explicit (*e.g.* G. Ranger, CDNEC 1965 Survey) most were generally vague. It is often difficult for a farmer to determine how a sheep or cow died, especially if it is found after vultures have been feeding on it. The vultures are said to take both healthy and ailing stock (J. J. Meyer, A. H. J. Vosloo, B. C. Greyling, C. C. Cloete – all CDNEC 1965 Survey; *E.P. Herald*, 24 July 1955).

Thirty-three accounts of vultures taking live stock can be divided into: nine in which healthy animals were attacked, four in which lambs were attacked, ten in which the victims were lambing ewes and ten in which weak or emaciated sheep were attacked. Some farmers expressed the opinion that live stock are attacked only in extreme circumstances (*e.g.* N.P. Oates, CDNEC 1965 Survey but it is certainly often difficult to obtain the correct facts relating to an incident between vultures and stock. To illustrate this we refer to a news item in the *Oudtshoorn Courant* (19 November 1976) wherein it was stated that "in the Ladismith district 20 vultures caught three live lambs". In following up this report CDNEC staff found that the report had come from a shepherd who had not act-

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ually witnessed the attack. There are several reports of vultures attacking stock in abnormal or unusual ways. We consider these to be faulty observations or incorrect deductions, as evidenced by the accounts thereof (*e.g.* R. W. Purchase *in litt.* 1977; *Daily Dispatch*, 31 March 1934).

The farmers attitudes towards the vultures vary from tolerance of the birds to extreme dislike: "The vultures give no trouble" (J. Pienaar, CDNEC 1965 Survey), to "Vultures get into water tanks and drown and so cause a problem. In drinking troughs they foul the water and can spread disease . . . and they vomit into the water" (V. L. Pringle *in litt.* 1977), to "The vulture is a greater pest than any other wild animal . . . I believe that the vulture must be eliminated" (A. H. J. Vosloo, CDNEC 1965 Survey).

DISCUSSION

Distribution and Status

We contend that the available information does not support the opinion that the Cape Vulture was widespread and common everywhere in the Cape Province before 1905. The map of place names (Fig. 2) is the only evidence which supports that opinion, and apart from the generalization of Layard (1867) all records either deal with local situations or mention changes in status of the vulture.

The two distribution maps (Figs 2 and 3) are both misleading and present conflicting information. It is assumed that the place names containing the word "vulture" were given because the birds were seen at those localities. In some cases this assumption is supported by oral tradition or our observations. The place names indicate that the vultures were liable to occur virtually anywhere in the Cape Province. However the map does not show that the vultures occurred at all the localities simultaneously. This is because the places were not all named at the same time, but probably at various times between 1700 and 1900. In retrospect, the map conveys the impression that the vultures were once widespread, as it "telescopes" an unknown period of time into a single instance. The map of published records suffers from the same defect as that of the place names, and has an additional bias. It reflects the distribution of vultures according to the observers who kept records and it is therefore not possible to make any deductions about the blank areas of the map. An important aspect of the map is the occurrence of the vultures in the S. Cape.

We suggest that the distribution of the Cape Vulture before 1905 reflected the following pattern. There were two populations, the first in the S.W. Cape and the other in the E. Cape. The former lived along the ecotone of the fynbos and karoo, which is the junction of the winter and summer rainfall areas. These vultures took advantage of the game which lived in and moved seasonably between the two areas. The E. Cape population lived in grasslands. The vultures were concentrated where game occurred and followed game westwards into the Karoo when conditions were favourable there. The two populations met in the S. Cape and there was probably no barrier between them; dividing them into the two populations is merely convenient for description. According to maps of the past distribution of game animals in the Cape Province in Du Plessis (1969) the game animals were found mainly in the eastern and southern parts of the province. Noble (1886) mentions that in former times the plains of the Karoo abounded with wild game and as late as 1844 records vast herds of springbok, wildebeest, zebra, ostriches and other game.

The Karoo was permanently occupied only by low density non-herd species like duiker and klipspringer, or by nomadic species like springbok and eland. As the vultures' distribution and status were determined by the game animals, it supports our postulation that the vultures were resident in the east and south, and visitors to the west. The dividing lines followed the boundaries of the karoo and grassland and the karoo and fynbos.

The vultures may have had ancestral breeding colonies in each of the two areas. We suggest that Gamka Mountain (113), Karnmelkspruit (96) and Collywobbles (111) are possibly examples of ancestral breeding sites. The birds dispersed from these sites, roosted, and even bred at many other localities. These movements depended upon the birds finding suitable food supplies and they were quick to capitalize on localized abundance. We suggest that Nelspoort was such a site and was (re) occupied in the mid-1800s as a consequence of the slaughter of the game herds in the Karoo, and the records of vultures in the S. Cape before 1905 were a result of the white settlers introducing stock to that area.

The above suggestions cannot be substantiated by evidence. They present an alternative opinion to the current one. We suggest that the vulture populations were dynamic and not static, that they

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were localized, sometimes abundant, fluctuated in time and space, and were regulated by ecological factors. We consider the decline of the Cape Vulture at about 1900 to have been a real one. However the decline is recorded only for the E. Cape and S. Cape but apparently did not happen in the Transkei (Godfrey 1927). Thus the decline can be considered a contraction of range. The events that took place elsewhere are not known. The only evidence for a decline over most of that area is that the birds left Aasvoëlberg (79) long before 1900, and that there is no record of vultures breeding at Nelspoort after 1869.

The causes of the decline cannot be established. The rinderpest, the war and poisoning may have contributed to it, but are not considered to be the main causes. From the evidence presented earlier it appears that there were apparently two schools of thought about the effect of the rinderpest epidemic on vulture populations. The first was that the vultures died as a result of feeding on carcases of stock killed by the epidemic; however this can be discounted, as vultures are not susceptible to the rinderpest virus. Secondly it was said that the birds had disappeared after the epidemic; in this case this was probably due to the fact that the epidemic provided a substantial amount of food for the birds but after the epidemic they suffered a food shortage which could have affected the population. We suggest that the extermination of the game herds during the 1800s played a major role in the decline of the vultures.

In the S.W. Cape the indigenous mammals were replaced by domestic stock, wheatlands and vineyards. In the Karoo and E. Cape the game was replaced by crops and domestic stock. By 1876 the government had appointed a commission of enquiry into the mismanaged and degraded state of the karoo, and the three main causes were identified, *viz.* overstocking, trampling and the poor condition of the kraals which favoured parasite infestation (Noble 1886). By 1891 there were 16 million sheep, three million goats and two million cattle in the Cape Province; about 13 million of the sheep were in the karoo and eastwards (Noble 1893). It will never be known how many game animals they replaced, the springbok alone are estimated conservatively at eight million (Liversidge 1978).

Different dispersal patterns of game and stock are involved. The game was frequently concentrated in herds and some undertook migrations, while stock was spread thinly and widely, and was sedentary. Some indication of the effect of man's activities on the natural food supply of vultures is obtained from an analysis of the relevant literature (Du Plessis 1969). For example herd species such as buffalo, roan and tssessebe disappeared entirely from the Cape Province while others such as the gemsbok, red hartebeest, black wildebeest and eland were virtually exterminated from the Cape Province south of the Orange River. In addition the range of the kudu was largely reduced in the E. Cape and, while the springbok still occurs throughout its former range, numbers are a fraction of former totals. The continued existence in the province of kudu, black wildebeest, red hartebeest, springbok and eland, on a very limited scale, has been assured only because of the recent interest in game farming. It is difficult to assess the numbers of game animals in earlier times but there is little doubt that they occurred in seemingly vast herds throughout their former range. While the slaughter of the game herds was already taking place during the 17th and 18th centuries it appears that the main period of large scale destruction was during the 19th century and even the early part of the 20th century. The vultures' response to this change can only be speculated upon.

Population Dynamics

Populations of the Cape Vulture in the Cape Province have not remained static since 1905. In the S.W. Cape there appears to have been a gradual decline in numbers and range. At least three breeding colonies, Albertinia (91b), Gamka Mountain (113), and Langkloof (114), have become extinct. There is now only one "major" breeding colony, at the Potberg (116), and even there numbers are apparently declining. In the E. Cape the population expanded in range between 1905 and 1960 and then declined sometime thereafter. The current range of the vultures is approximately the same as that of 50 years ago, the only difference being that the trends are reversed and the population is contracting. The expansion of range of the vulture was slow, taking approximately 50 years, but the contractions in range have been rapid. In the mid-1960s there was apparently a "flourishing" population, and by the late 1970s the decline was almost complete.

We assume that the expansion and contraction of range had been paralleled by a similar increase and decrease in population size. Thus the build-up in numbers was slow and the decline in numbers relatively fast. These changes are similar to the increase and decrease in stock losses in the

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Cape Province. We have assumed that the trends of stock losses may be a reliable indicator of the food available to the vultures. We suggest that the changes in stock numbers were the cause of the changes in the vulture numbers, and that they follow each other in the classical relationship between predator and prey population numbers.

The vultures gradually recovered from their decline about 1900 and they increased in numbers and range as livestock increased. The vulture population built up to a level which could not be sustained when their food supply declined. The decline in the food supply was apparently due to destocking, improved husbandry and control of parasites. The vultures which had set up breeding colonies in the area they had colonized, then stopped breeding, remained on as non-breeding birds for a while, and finally were forced to move elsewhere. At the same time, vultures dispersing from the Transvaal to the Cape Province, were possibly not staying as before, because of unfavourable conditions. The two contractions in range of the vultures have both been from the south and west, back to the north and east. The birds have vacated the karoo and retreated to the grasslands in the northeast of the E. Cape. The area where the vultures now occur may be considered the optimum range for the species, while other areas are occupied only when favourable. This is similar to the ancestral pattern of distribution postulated earlier, where the vultures lived permanently in the eastern grasslands and followed the game herds into the karoo when conditions there were favourable

The largest breeding colonies of Cape Vultures in the "Cape Province" are those at Karnmelkspruit (96) and Collywobbes (111). They are the only colonies where according to oral tradition there has been continuous occupation this century. These may be ancestral colonies which have served as nuclei from which young have dispersed to colonize other areas. These dispersive birds probably settled where they found sufficient food and roosted on convenient cliffs nearby. If conditions were favourable, these birds may even have bred on such cliffs, to form a satellite breeding colony. As the food supply fluctuated, so satellite breeding colonies may have waxed and waned. It is probable that similar fluctuations can occur at nuclear colonies. Thus the range of the Cape Vultures population may be capable of shifting with time. This accords with the dynamics of the range of any species postulated by Taylor & Taylor (1977). In the case of the Cape Vulture the changes may be so slow as to appear static because of the extended life-span of the birds.

Although mainly ascribable to a decrease in the vulture's food supply, secondary factors have accelerated the decline. The effects of poisoning, shooting and electrocution of vultures on the population are unmeasured, but they are obviously detrimental. Each vulture has to spend more time searching as the number of carcases or vultures decreases. Thus while food supply is the critical limiting factor, a decrease in vultures through persecution, may reduce the population below the critical number able to find sufficient food.

The population of Cape Vultures in South Africa is now fragmented, but the recoveries of Transvaal juveniles in the Cape Province indicates that the population should be considered as an entity. A large and productive colony could in theory restore the vultures to areas where they have declined, provided that the detrimental limiting factors in those areas are removed. Birds dispersing from the Transvaal colonies may have bolstered the local populations when the latter increased during the period 1905 to 1960.

A final problem facing the vultures is osteodystrophy. Even if the food supply is good enough to support colonies of vultures, they will not be productive if there is insufficient calcium available to feed to their nestlings. This problem is symptomatic of unbalanced communities and a consequence of disrupting the relationships between animals in a community. In this case the loss of large carnovores, capable of crunching bones so as to leave fragments, affects the breeding success of the vultures (Mundy & Ledger 1976). There is evidence that some nestlings in the Cape Province have suffered from osteodystrophy, but the magnitude of the problem cannot be measured because so few vultures breed.

Conservation

The conservation of the Cape Vulture in the Cape Province presents a problem because it cannot easily be confined to a reserve large enough to sustain a viable population anywhere in southern Africa.

Vultures depend upon dead stock for their food supply but carcases of dead stock are often burned or buried. Thus modern trends do not favour the vultures. The situation is further aggra-

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vated by man's direct and indirect persecution of the birds. Lastly the optimum area for the vulture in the "Cape Province" is the Transkei, which is now beyond the jurisdiction of the CDNEC.

The present conservation of the Cape Vulture revolves around the efforts of the Vulture Study Group initiated and organized by Dr J. A. Ledger and P. J. Mundy in the Transvaal. We have a general understanding of the problems facing the vultures and there has been some extension work in the form of popular articles, press releases and radio talks. However it is not yet known exactly how to ensure the survival of the species in the province.

The conservation priorities appear to be to isolate and study the major factors causing the decline of the population, to monitor the food supply particularly in those areas incorporating nucleus breeding colonies, to colour ring as many vultures as possible in order to understand movements and population dynamics, to implement an intensive conservation education programme to prevent or minimize vulture persecution, and to provide a sustained source of uncontaminated food including bone fragments at "vulture restaurants" where this is deemed necessary and feasible. These priorities will require co-operation between various state and provincial bodies and the public, and will involve close liaison with the Vulture Study Group.

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APPENDIX 1

GAZETTEER OF PLACE NAMES IN THE CAPE PROVINCE CONTAINING THE WORD "VULTURE" (FIG. 2). MAINLY FROM S.A. TOPOGRAPHICAL SERIES (SCALE 1:50 000; 1:250 000; 1:500 000), GOVT. PRINTER, PRETORIA. PLACES 1a, b AND 2 ARE NOT INCLUDED IN FIG. 2

Place	Name	Locality
1a	Klein-Aasvoëlpan	27 08S; 20 51E
1b	Aasvoëlpan	27 11S; 20 57E
2	Aasvoëlkop	27 59S; 23 07E
3	Aasvoëlkrans (farm name)	29 48S; 17 51E
4	Aasvoëlkop	29 23S; 20 59E
5	Aasvoëlkop	29 56S; 20 40E
6	Aasvoëlpan	29 45S; 24 02E
7	Aasvoëlkop	29 58S; 24 17E

APPENDIX 1 (*continued*)

Place	Name	Locality
8a	Aasvoëlkop (farmname)	30 40S; 18 56E
8b	Aasvoëlkop (farmname)	30 42S; 18 53E
8c	Aasvoëlneus	30 42S; 18 58E
9	Aasvoëlkop	30 57S; 21 13E
10	Aasvoëlkop	30 47S; 22 43E
11	Aasvoëlberg	30 55S; 23 37E
12	Aasvoëlkop	30 45S; 23 54E
13	Aasvoëlkop	30 31S; 25 37E
14	Aasvoëlkrans	30 57S; 26 29E
15	Aasvoëlberg	30 19S; 27 03E
16	Aasvoëlkrans	30 43S; 27 17E
17a	Vulture's Crag	30 42S; 27 41E
17b	Aasvoëlkrans	30 43S; 27 30E
18	Aasvoëlkrans	30 52S; 28 02E
19	Aasvoëldrif	31 56S; 18 41E
20	Aasvoëlneus	31 12S; 19 19E
21	Aasvoëlkop	31 00S; 19 38E
22	Aasvoëlkop	31 08S; 20 25E
23	Aasvogelkuil Berg	31 41S; 20 06E
24	Aasvoëlhoek	31 59S; 20 01E
25a	Ou Aasvoël	31 28S; 21 03E
25b	Aasvoëlvlei	31 29S; 21 01E
26	Aasvoëlkrans	31 21S; 21 17E
27	Aasvoëlkop	31 09S; 21 58E
28	Aasvoëlvlei	31 18S; 21 55E
29	Aasvoëlkrans	31 32S; 21 33E
30a	Aasvoëlberg	31 51S; 22 50E
30b	Aasvoëlberg	31 53S; 22 45E
31	Aasvogelkuil (farm name)	31 18S; 24 12E
32	Aasvoëlkop	31 50S; 24 20E
33	Aasvoëlkrans	31 36S; 24 37E
34	Aasvoëlberg	31 40S; 24 50E
35	Aasvoëlkrans	31 54S; 24 34E
36	Aasvoëlkop	31 29S; 25 14E
37	Aasvoëlkop (farmname)	31 41S; 25 32E
38	Aasvoëlkop	31 54S; 25 38E
39a	Aasvoëlberg	31 35S; 26 11E
39b	Aasvoëlkop	31 36S; 26 06E
40	Aasvogelkop (farm name)	31 07S; 27 24E
41	Xalanga Peak	31 20S; 27 27E
42a	Aasvoëlkop	31 24S; 27 31E
42b	Xalanga Post Office	31 24S; 27 39E
42c	Xalanga Siding	31 24S; 27 40E
43	Maxalanga Peak	31 46S; 27 10E
44	XalangaBridge	31 31S; 27 40E
45	Aasvoëlkop	32 40S; 18 44E
46	Aasvoëlkop	32 33S; 18 47E
47	Aasvoëlkop	32 55S; 18 44E
48	Aasvoëlkrans	32 20S; 20 12E
49	Aasvoëlkop	32 49S; 20 18E
50a	Aasvoëlkop	32 50S; 20 46E
50b	Aasvoëlbos	32 56S; 20 47E

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APPENDIX 1 (*continued*)

Place	Name	Locality
51	Aasvoëlbanke	31 29S; 21 12E
52	Aasvoëlkrans	32 27S; 21 16E
53	Aasvoëlbos	32 37S; 21 31E
54	Aasvoëlkop	32 18S; 23 06E
55a	Aasvoëlkrans	32 06S; 23 42E
55b	Aasvoëlkrans	32 07S; 23 40E
56	Aasvoëlberg	32 22S; 24 48E
57	Aasvogel Nest (farmname)	32 37S; 24 09E
58a	Aasvoëlberg	32 21S; 25 08E
58b	Aasvoëlkrans	32 26S; 25 13E
59	Aasvoëlkop	32 25S; 25 52E
60	Aasvoëlkrans	32 56S; 25 12E
61a	Aasvoëlkop	32 33S; 25 35E
61b	Aasvoëlkop	32 37S; 25 40E
62	Ntaba Xalanga	32 36S; 26 00E
63	Aasvoëlberg (-krans)	32 32S; 26 22E
64	Aasvoëlkrans	32 59S; 26 35E
65	Vulture Crag	32 44S; 27 47E
66	Aasvoëlkop	33 35S; 18 50E
67	Aasvoëlberg	33 56S; 19 14E
68	Aasvoëlberge	33 55S; 19 15E
69	Aasvoëlberge	33 45S; 19 38E
70	Aasvoëlnes	33 47S; 19 58E
71	Aasvoëlbos (farm name)	33 11S; 20 29E
72	Aasvoëlkrans	33 26S; 20 59E
73	Aasvoëlkrans	33 41S; 20 13E
74	Aasvoëlkrans	33 59S; 20 35E
75	Aasvoëlberge	33 15S; 21 52E
76	Aasvoëlkop	33 43S; 21 12E
77	Aasvoëlkrans	33 57S; 21 08E
78	Aasvogelvlei (farm name)	33 51S; 21 41E
79	Aasvoëlberg	33 14S; 23 28E
80	Aasvoëlvlei	33 29S; 25 57E
81	Aasvoëlkrans (iliwa amaXalanga)	33 16S; 26 19E
82	Aasvoëlkrans	33 34S; 26 37E
83	Iliwa yu Maxalanga	c. 33 10S; 27 03E
84a	Aasvoëlkop	34 07S; 19 14E
84b	Aasvoëlkop	34 08S; 19 07E
85	Aasvoëlkop	34 22S; 19 18E
86	Aasvoëlkop	34 12S; 19 33E
87	Aasvoëlkrans	34 03S; 19 57E
88	Aasvoëlkrans	34 21S; 20 14E
89	Aasvoëlkrans	34 25S; 20 19E
90	Aasvoëlkrans (-berg)	34 22S; 20 33E
91a	Aasvoëlberg (farm name)	34 13S; 21 35E
91b	Aasvoëlberg	34 13S; 21 40E
91c	Aasvoëlklip	34 13S; 21 40E
92	Aasvoëlkrans	34 12S; 22 01E
93	Aasvoëlkrans (-punt)	34 05S; 24 17E

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APPENDIX 2
OTHER LOCALITIES REFERRED TO IN THE TEXT

No.	Name	Locality
94	Goedverwacht	30 50S; 25 32E
95	Rooipoort	30 57S; 26 29E
96	Karnmelkspruit	30 51S; 27 14E
97	Balloch	30 44S; 27 41E
98	Teebus	31 24S; 25 38E
99	Witkransnek	31 41S; 25 11E
100	Rooiberg	31 22S; 26 49E
101	Andriesberg	31 38S; 26 42E
102	Nonesi Nek	31 50S; 26 59E
103	Mlengana	31 32S; 29 10E
104	Martha & Mary	32 06S; 26 20E
105	Elandsberg	32 29S; 26 51E
106	Forest Range	32 07S; 27 19E
107	Inverket	32 12S; 27 25E
108	Stonehenge	32 21S; 27 16E
109	Clifford	32 31S; 27 41E
110	Tafelberg	32 08S; 26 16E
111	Collywobbles	32 01S; 28 37E
112	Boschberg	33 43S; 21 42E
113	Gamka Mountain	33 43S; 21 46E
114	Langkloof	33 49S; 21 38E
115	Langeberg	33 56S; 21 38E
116	Potberg	34 22S; 20 33E

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