

Past and present ecological distribution of the redbilled oxpecker (*Buphagus erythrorhynchus*) in South Africa

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The South African records of the redbilled oxpecker *Buphagus erythrorhynchus* are reviewed and acceptable ones mapped. The distribution of this bird species is determined by the distribution of its preferred prey species *Rhipicephalus appendiculatus*. *B. erythrorhynchus* survives in Natal and Transvaal in game reserves, on cattle farms with large game populations and in areas with undipped cattle. The decline in numbers is largely attributed to the unavailability of the preferred prey of acarine ticks that followed the decline of the symbiont species coupled with eating poisoned prey owing to the widespread use of acaricides.

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'n Oorsig van beskikbare rekords van die rooibekrenostervoël *Buphagus erythrorhynchus* in Suid-Afrika word gegee en gekarteer. Die verspreiding van hierdie voëlspezie word bepaal deur die verspreiding van sy voorkeurprooi *Rhipicephalus appendiculatus*. *B. erythrorhynchus* is in Transvaal en Natal beperk tot natuurreservate, beesplase met groot wildbevolkings of gebiede waar beeste nie gedip word nie. Hierdie afname in getalle kan hoofsaaklik toegeskryf word aan die onbekikbaarheid van die voorkeurbosluisspesies wat weer deur 'n afname in die getalle simbioante veroorsaak is, asook aan die gebruik van arseen-dipstowwe op gedomestikeerde diere en die gevolglike inname van die vergiftigde prooi.

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Oxpeckers are confined to Africa south of the Sahara. There are two species, the yellowbilled oxpecker *Buphagus africanus* and the redbilled oxpecker *B. erythrorhynchus*. Although the range of the two species is vast, the fact that they are wholly dependent on the presence of large domestic or wild ungulates means that their distribution is often patchy. The former range of *B. erythrorhynchus* is south of the Sahara from Eritrea, Somalia and the south-eastern Sudan to Zimbabwe, and the Transvaal, Natal and the eastern Cape in South Africa. It is an eastern species, its westerly limit being approximately longitude 30° East (Pitman 1956). Evidence of a shrinking distribution of both species over most of their former ranges is available (Clancey 1964; Attwell 1966). Stutterheim & Brooke (1981) indicated that *B. africanus* is extinct in South Africa, largely as a consequence of the inaccessibility of their preferred prey following the collapse of populations of buffalo and rhinoceros spp., coupled with eating prey poisoned by the arsenical dipping of domestic stock which began at the turn of the century. This paper is an attempt to enlarge knowledge of the ecology and distribution of *B. erythrorhynchus* in South Africa.

Methods

The past and present distribution of *B. erythrorhynchus* was traced from published records and through sending requests for information to museums, universities, ornithologists, conservation bodies, societies concerned and scientific journals in an endeavour to trace unpublished records, specimens, eggs or other relevant information. The Kruger National Park (March 1973 to January 1975), Hluhluwe-Umfolozi Game Reserve complex (June 1977), Bophuthatswana (July 1977), farms in northern Transvaal (July 1977) and Mkuzi Game Reserve (January 1978) were also surveyed to determine the present status of the species. The results have been arranged to indicate distribution during two time periods: before 1970, and 1970 – 1979.

Results

Food preferences

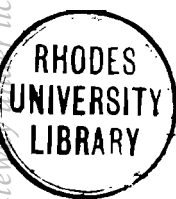
Bezuidenhout & Stutterheim (1980) analysed 53 stomachs of *B. erythrorhynchus* collected in the Kruger National park and found the most important food component to be ixodid ticks of the genera *Boophilus* and *Rhipicephalus*. An experiment on two captive *Buphagus erythrorhynchus* showed (Bezuidenhout & Stutterheim 1980) that they much

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preferred eating *Boophilus decoloratus* and *Rhipicephalus appendiculatus* to the other four ixodid tick species tested. Moreau (1933) analysed 58 stomachs in Tanzania while Van Someren (1951) analysed 12 stomachs collected in Kenya. They recorded a low incidence of *Boophilus* (6% and 20% respectively), and a high incidence of *Rhipicephalus* (67% and 73%). Walker (1970) rarely recorded *Boophilus* from wild animals in Kenya, which may explain the low percentage of this genus found in the stomach contents of oxpeckers from this country.

Stutterheim & Brooke (1981) related the host preferences of *Boophilus* and *Rhipicephalus* to the symbiont preferences of *B. erythrorhynchus* as indicated by Buskirk (1975); Grobler & Charsley (1978) and Stutterheim (1979, 1980). They came to the conclusion that, with a preference for *Boophilus*, *Buphagus erythrorhynchus* would associate mainly with antelope species but also with domestic cattle *Bos taurus/indicus*. However, with a preference for *Rhipicephalus* a symbiont overlap would occur with *Buphagus africanus*, in the sense that *B. erythrorhynchus* would also favour buffalo *Syncerus caffer* and rhinoceros *Diceros bicornis* and *Ceratotherium simum*.

The distribution of *Boophilus decoloratus* is limited by decreasing humidity and in general it is absent from areas with an average annual rainfall of less than about 380 mm. *R. appendiculatus* generally occurs in areas with an annual rainfall of at least 400 mm, provided the vegetation cover is adequate. It apparently cannot survive on the open grass plains of the Highveld or the Karoo or in any of the dry desert shrub regions. It is also absent from areas with more than thirty days of heavy frost a year (Howell, Walker & Nevell 1978). The distribution of these two preferred tick

species is compared with acceptable records of *Buphagus erythrorhynchus* prior to 1970 (Figures 1 and 2).

Preferred mammalian symbionts

Attwell (1966) demonstrated that *B. erythrorhynchus* associates with 12 ungulate species in Zambia with a preference for eland *Taurotragus oryx*, hippopotamus *Hippopotamus amphibius*, kudu *Tragelaphus strepsiceros*, roan antelope *Hippotragus equinus* and buffalo. Buskirk (1975) who studied oxpeckers in the vicinity of Chiefs' Island (northern Botswana) found that *B. erythrorhynchus* forages on seven ungulate species, with a preference for kudu, impala *Aepyceros melampus* and giraffe *Giraffa camelopardalis*.

In the Kruger National Park *B. erythrorhynchus* associates with 15 ungulate species showing a preference for giraffe, black rhinoceros, roan antelope and sable antelope *Hippotragus niger* (Stutterheim 1979), whereas in the Hluhluwe-Umfolozi Game Reserve complex it associates with seven species, preferring buffalo, black rhinoceros and white rhinoceros (Stutterheim 1980), and in the Mkuzi Game Reserve and Nxwala State Land it forages on six species, with a preference for white rhinoceros, impala and zebra *Equus burchelli* (Stutterheim & Stutterheim 1981b). It also associates with domesticated species, i.e. cattle, donkey, horse, sheep, goat and pig (Attwell 1966; Stutterheim 1979).

Rainfall

The distribution of *B. erythrorhynchus* before 1970 is related to rainfall in Figure 3. This indicates that *B. erythrorhynchus* occurs mainly in areas with an annual

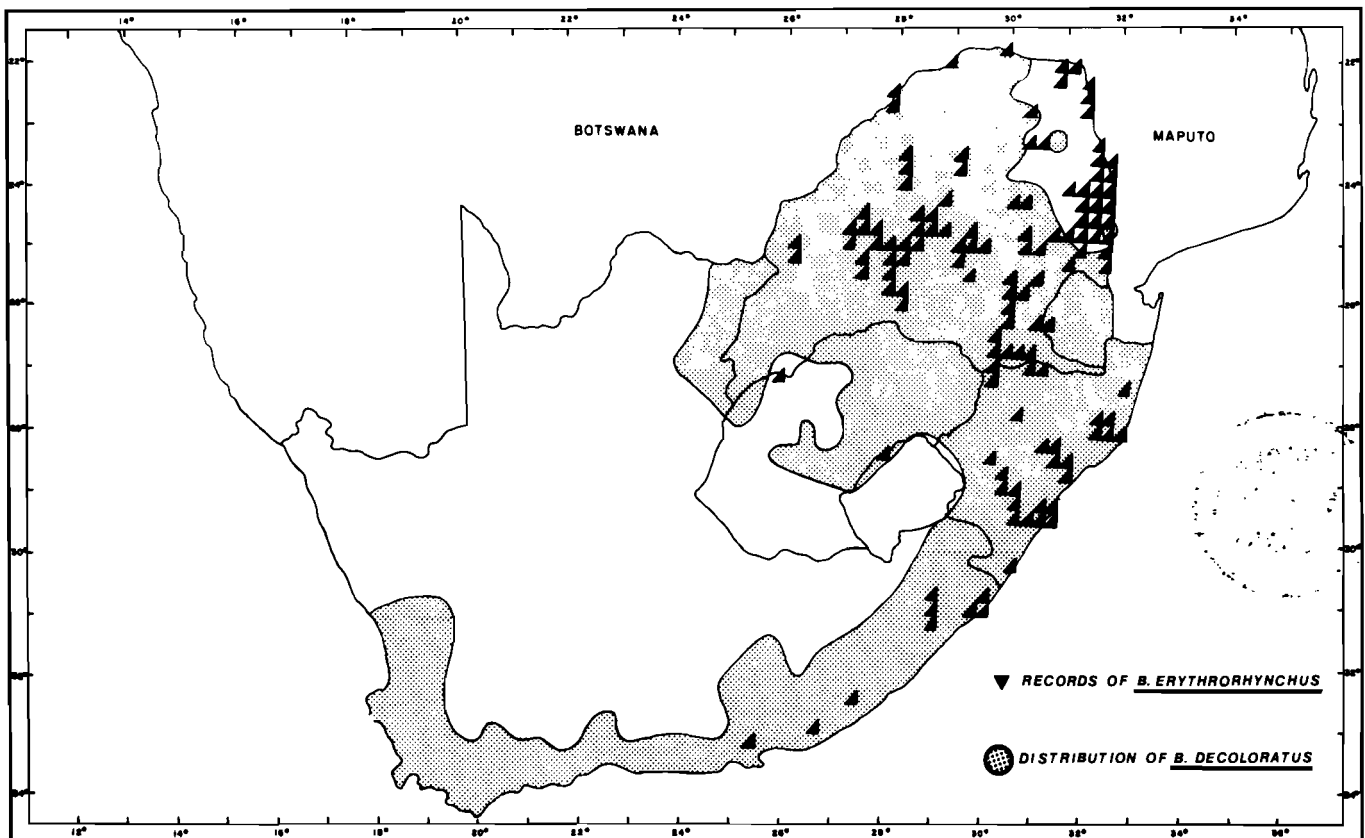


Figure 1 Acceptable records of *Buphagus erythrorhynchus* from before 1970 compared to the distribution of *Boophilus decoloratus* in South Africa.

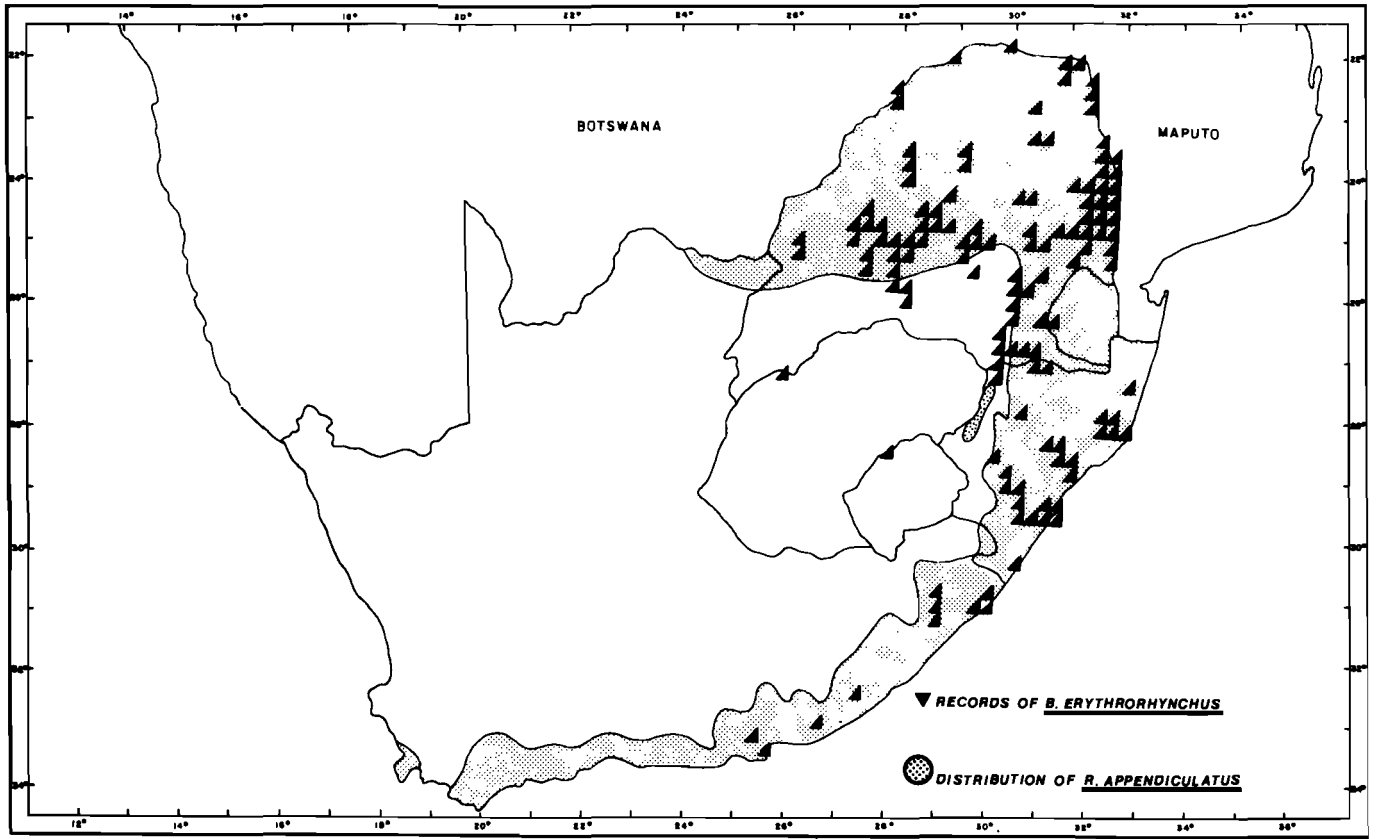


Figure 2 Acceptable records of *Buphagus erythrorhynchus* from before 1970 compared to the distribution of *Rhipicephalus appendiculatus* in South Africa.

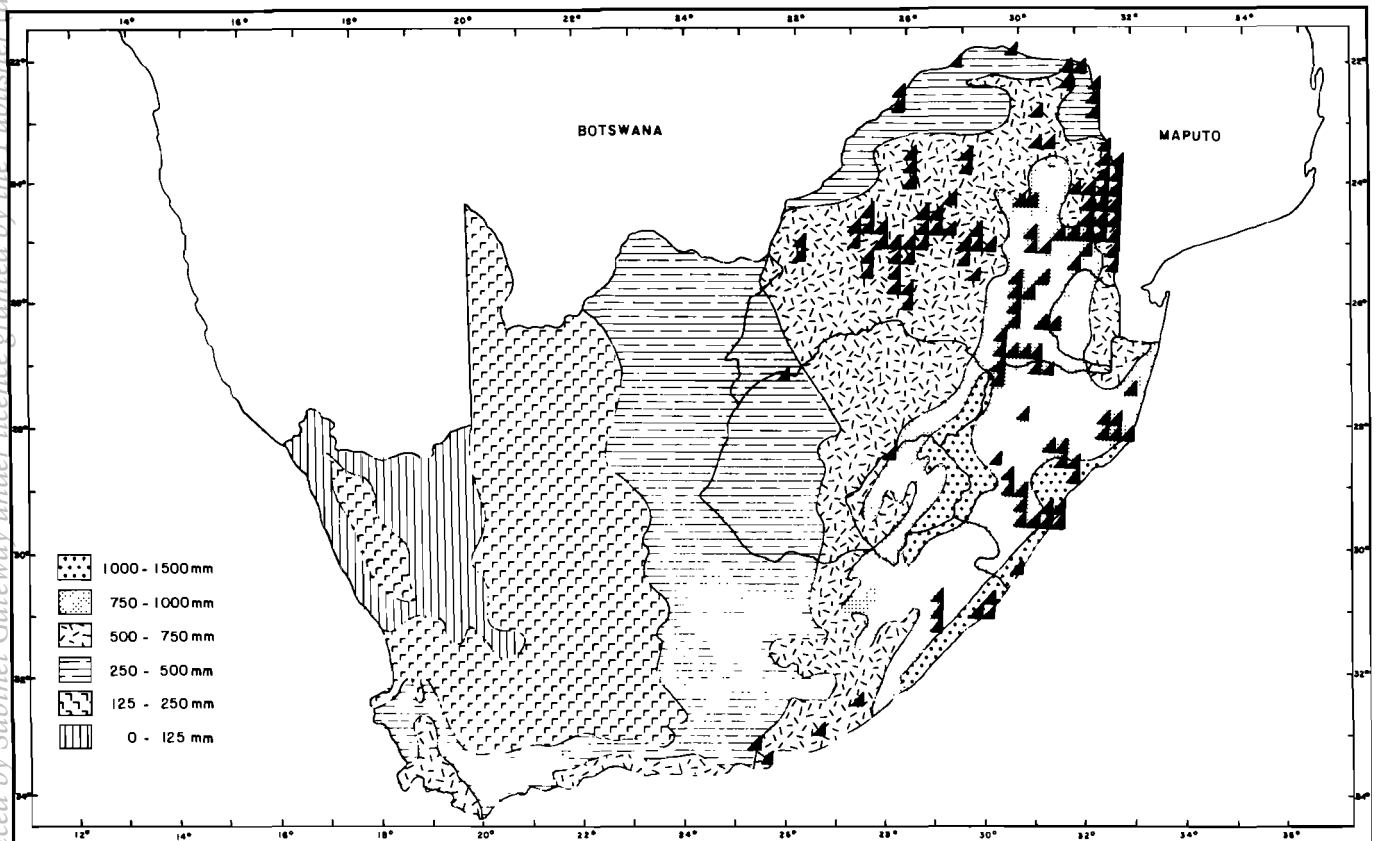


Figure 3 Acceptable records of *Buphagus erythrorhynchus* from before 1970 compared with rainfall distribution in South Africa.

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rainfall higher than 500 mm except for a few records in the northern and northeastern Transvaal where mean rainfall is 250–500 mm per annum.

Vegetation

According to the classification of Acocks (1975), *B. erythrorhynchus* occurred in 29 different vegetation types in South Africa. No pattern was found in this distribution comparison except that *B. erythrorhynchus* is absent from open grassland and semi-desert Karoo flora.

Records of *B. erythrorhynchus*

Cape Province

Acceptable records of *B. erythrorhynchus* for the Cape Province are shown in Figure 1. No records pre-dating 1900 are available. Layard & Sharpe (1884) do not mention this species for the Cape Province, while Stark & Sclater (1900) stated that it was absent. The Albany Museum has specimens from Grahamstown (1902) (Skead 1965) and King William's Town (1907) (Skead 1964) but it is doubtful whether it ever bred in the eastern Cape and was probably a vagrant. Godfrey (1933) described it from near Mqanduli (1902) and Tsolo (1913), while Holt (1928) observed individuals on two or three occasions (no date) on cattle on the banks of the Umtata River in the Transkei (Anon 1925). Davies (1907) described its status in the eastern Transkei as 'Rather scarce: only found in the low country near the coast'. More recently, R. Liversidge reported a single oxpecker near Cape Recife, Port Elizabeth, in 1960 (McLachlan 1960).

These records indicate that *B. erythrorhynchus* occurred sporadically in the eastern Cape from Grahamstown to the Natal Border. Skead (1967) came to the conclusion that *B. erythrorhynchus* is probably extinct in the Cape Province, and in the absence of further evidence this must be accepted to be the case. It does not occur in the Kalahari Gemsbok National Park (Prozesky & Haagner 1962.)

Orange Free State and Lesotho

Acceptable records are shown in Figures 1 and 4. Plowes & Cusach (1944) described *B. erythrorhynchus* as 'quite common' in the *Acacia* savanna of the Hoopstad district. This was echoed by Van der Plaats (1961), but Skead *et al.* (1968) did not record any oxpeckers for that area. The only other records comprise observations of a single bird at Gumtree (Boddam-Whetham 1968) and of two birds near Frankfort (K. Geldenhuys *in litt.* 1976). Neither published nor unpublished records were found for Lesotho.

Natal

Acceptable records of distribution for Natal and Zululand are shown in Figures 1 and 4. Layard & Sharpe (1884) described *B. erythrorhynchus* as 'not uncommon' at St Lucia. Shelley (1875) stated that it was 'common' about Durban and Pinetown which corresponds with Stark & Sclaters' (1900) description of it occurring 'sparingly in Upper Natal, but becomes more abundant in Zululand'. A recapitulation of records made prior to 1970 (Sharpe 1897; Woodward & Woodward 1899; Clarke 1904; Bucknill 1908; Sclater 1911; Henderson 1953; West *et al.* 1964;

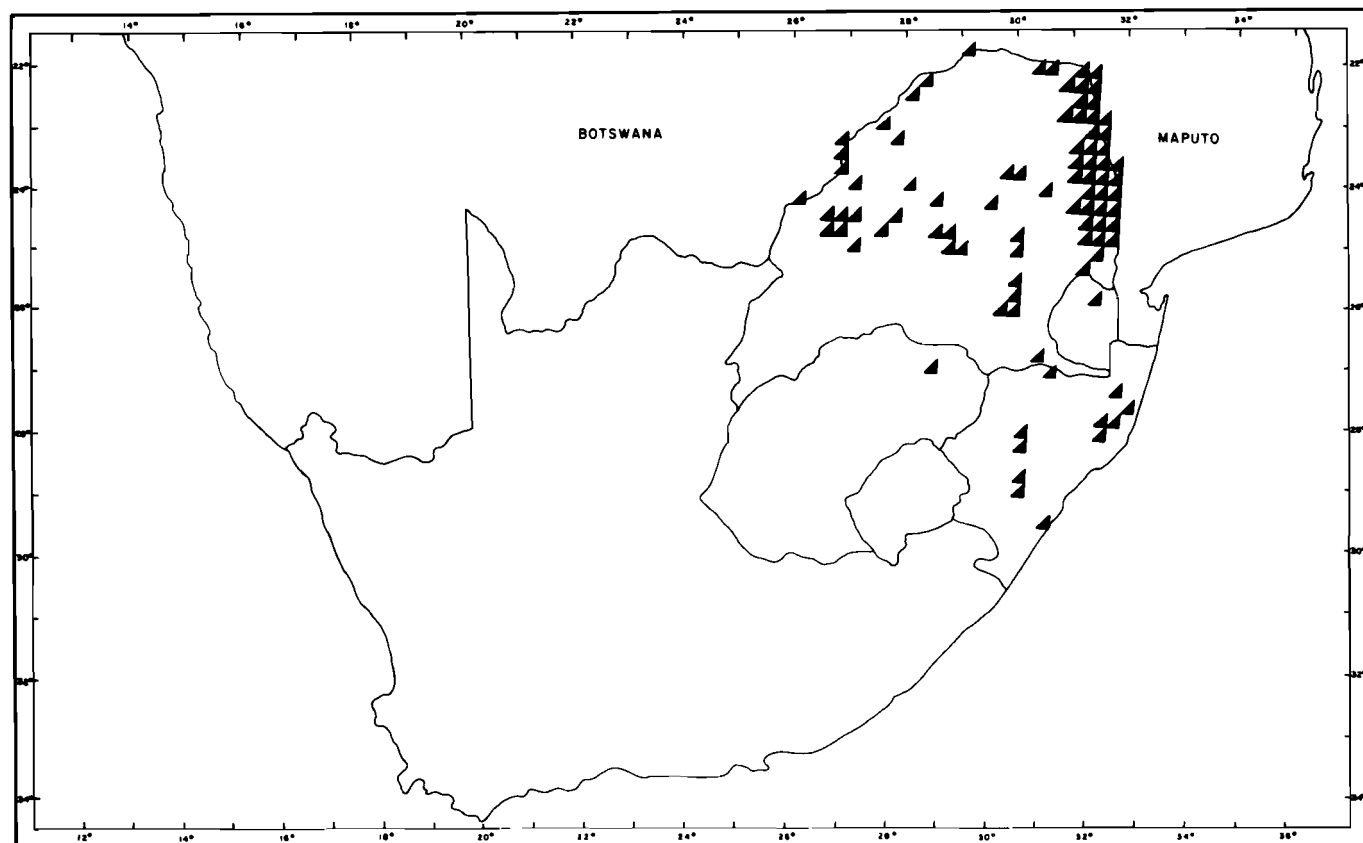


Figure 4 Acceptable records of *Buphagus erythrorhynchus* for the period January 1970 to December 1978.

Oatley & Pinnell 1968) as shown in Figure 1, indicate that it was formerly widely distributed throughout Natal and Zululand.

Records after 1970 (Figure 4) create the impression that resident populations of *B. erythrorhynchus* are only found in the Hluhluwe-Umfolozi Game Reserve complex (Stutterheim 1980), Mkuzi Game Reserve and adjacent Nxwala State Land (Stutterheim & Stutterheim 1981b), and Ubizane and I. Bester Game Ranches (T. Feeley *in litt.* 1976), with small and isolated populations at Paulpietersburg (J. Bezuidenhout *in litt.* 1978), Dundee (J. Meyer *in litt.* 1978) and Mooirivier (G. Bennett *in litt.* 1978). This corresponds to the description of Cyrus and Robson (1980), who found *B. erythrorhynchus* in Natal to be common in the Mkuzi and Hluhluwe-Umfolozi Game Reserves and surrounding areas but occasionally encountered over a wide range of localities.

Transvaal

Acceptable records of distribution for the Transvaal are shown in Figures 1 and 4. Records before 1900 are limited to specimen records from Middelburg (1881), Olifants River (1885) and Komatipoort (1896). Buckley (1874) and Layard & Sharpe (1884) do not mention *B. erythrorhynchus* as occurring in the Transvaal while Stark & Sclater (1900) and Haagner & Ivy (1907) considered it to occur locally.

The large numbers of specimens, sight records and published records available for the period 1900–1970 (Figure 1), however, indicate that this species was present over a wide range of localities, although absent from the southwestern Transvaal (south of the Magaliesberg). Records after 1970 indicate that resident populations of *B. erythrorhynchus* are now found only in the Kruger National Park (Stutterheim 1979) and surrounding private nature reserves (H. Chittenden *in litt.* 1976), along the Limpopo River (M. Kemp *in litt.* 1976; Stutterheim 1979), and at Carolina (J. de V. Little *in litt.* 1976), Rust der Winter (P. Mendelsohn *in litt.* 1976; Stutterheim 1979), Marble Hall (B. de Waal *in litt.* 1976), Lebowa (B.A. Le Cordeur *in litt.* 1977) and Bophuthatswana (Stutterheim & Stutterheim 1981a).

Discussion

The distribution of *B. erythrorhynchus* is related to the presence of woodland but the species is absent from open grassland. *B. erythrorhynchus* breeds in natural cavities in trees (Stutterheim *in press*), and the absence of trees that could support a sufficiently large nesting hole could therefore be a limiting factor as oxpeckers also roost in trees.

Rainfall and temperature are important factors in determining the type of vegetation in a given area (Levyns 1962). Vegetation, temperature and rainfall are also factors that determine the distribution of the preferred tick species (Howell *et al.* 1978). *R. appendiculatus* is absent from the Cape plateau, the Orange Free State, the southern Transvaal and along the Drakensberg in southern Natal. *Boophilus decoloratus* is also absent from the Cape plateau, but occurs in the southern Transvaal, northern parts of the Orange Free State, and along the Drakensberg in southern Natal.

In the eastern Cape, the past distribution of vagrant *Buphagus erythrorhynchus* corresponds to the distribution of the two preferred tick species (Figures 1 & 2). In Natal the absence of *B. erythrorhynchus* along the Drakensberg (above 1 500 m a.s.l.) corresponds to the absence of *R. appendiculatus* although *Boophilus decoloratus* occur in this area. A few records of *Buphagus erythrorhynchus* were found for southern Transvaal and the Orange Free State but the occurrence of a viable population is unlikely, as although *Boophilus decoloratus* occurs in these areas, *R. appendiculatus* is again absent. The opposite situation is found in the eastern Transvaal (present day Kruger National Park), where *B. decoloratus* is relatively rare and *R. appendiculatus* is present. These results tend to indicate that although *B. decoloratus* constitute an important food item (Bezuidenhout & Stutterheim 1980), it is the presence of *R. appendiculatus* that determines the distribution of *Buphagus erythrorhynchus*.

The past distribution of the different preferred symbiont species ($n = 21$) is given by Roberts (1951). The feeding habits of oxpeckers result in their dependence on mammalian symbionts (Stutterheim 1981) which are always found in the areas where *B. erythrorhynchus* occur. However, the converse is not necessarily true. For example, although eland, wildebeest and zebra occur in the Kalahari Gemsbok National Park, *B. erythrorhynchus* is absent (Prozesky & Haagner 1962), presumably as a consequence of the two preferred tick species in this area (Howell *et al.* 1978).

Transkei records of Holt (1928) and Godfrey (1933) were of birds observed on domestic cattle indicating a replacement of wild ungulates by domesticated species. Dipping with arsenic as the accepted dipping ingredient, was initiated as early as 1890 in the eastern Cape; by 1910 there were already 124 dipping tanks in use in the Ciskei, 13 in the southern Cape and 16 in the Transkei (Bekker 1960). In controlled experiments with *B. erythrorhynchus* in captivity, arsenic trioxide proved to be fatal within a 48-h period (Bezuidenhout & Stutterheim 1980). It therefore seems reasonable to presume that dipping may have been the final agent of extinction in settled areas.

Stutterheim & Brooke (1981) proposed that the extinction of *B. africanus* since the turn of the century in Natal, Zululand and the Transvaal was largely a consequence of the inaccessibility of prey following the collapse of populations of buffalo and rhinoceros spp., coupled with consumption of poisoned prey as a result of arsenical dipping of domestic stock. In these areas, however, *B. erythrorhynchus* has survived, although it is now largely confined to the vicinity of game reserves, cattle farms with large game populations, and areas with undipped cattle.

The first record of a decline in the *B. erythrorhynchus* population was given by Gurney (1887) with the publication of the observations of W. Ayres who collected birds in the eastern Transvaal in 1885. Ayres collected one specimen at the Olifants River and remarked 'I met with but very few of these birds, which seem to be disappearing as the large game becomes scarcer'. J. Snyman (*in litt.* 1977), indicated that a large resident population associating with cattle on a farm near Northam in the Transvaal, was exterminated within a few months in 1940 after the introduction of arsenic dipping for tick control. Line (*in litt.*

1977) documented a large resident population on a farm near Howick in Natal before 1930: the use of arsenic for tick control was followed by a gradual reduction in numbers to zero by 1950.

W.R.J. Dean (*in litt.* 1977) recorded *B. erythrorhynchus* on cattle at a dairy at Overport near Durban in 1954; these oxpeckers disappeared when the dairy was closed. Stutterheim & Stutterheim (1981a), who studied a *B. erythrorhynchus* population in the Pilansberg complex (Bophuthatswana) observed a significant decline in oxpecker numbers between 1977 and 1979, following widespread use of quinthiophos as an acaricide. From these examples it appears that the primary reason for the decline of *B. erythrorhynchus* in South Africa, as in the case of *B. africanus*, the inaccessibility of the preferred prey, acarine ticks, following the decline of the symbiont species, coupled with consumption of poisoned prey resulting from the widespread use of acaricides.

The reason why *B. erythrorhynchus* did not itself become extinct in South Africa can probably be attributed to its preference for *Boophilus decoloratus* and *R. appendiculatus*. These acarine ticks associate mainly with antelope species, of which some, for example impala and kudu, are able to hold their own against heavy hunting pressure (Kettlitz 1962). They also associate with domesticated species like donkeys and pigs, which are not usually dipped for tick control, and therefore can also become established in areas where these species occur.

Bezuidenhout & Stutterheim (1980) tested the effect of representative dipping compounds selected from all the important groups of acaricides used on cattle in South Africa, on the survival of *Buphagus erythrorhynchus*. Three dips, namely chloromethiuron, amitraz and DDT, did not cause any clinically detectable signs of toxicity during an observation period of 50 days. In the case of DDT, however, because of its potential for accumulation in living organisms, it is likely that it would have had an adverse effect on the birds in the long run. If chloromethiuron and amitraz are really non-toxic in the long term, this would mean that their use would remove the primary limiting factor on oxpeckers. However, intensive dipping would limit the number of ticks available to the birds.

J.S.S. Beesley (*in litt.* 1977) documented a decrease in a resident population of *B. erythrorhynchus* at Broadhurst in Botswana when all the *Combretum imberbe* trees which were utilized for breeding were felled. The Indian mynah regularly perches on and gleans ectoparasites from ungulates in its native habitat, and it behaves similarly on domestic animals, eland, zebra, bushbuck *Tragelaphus scriptus* and impala in Natal (Dean & MacDonald 1981). J. Line (*in litt.* 1976) reported that a resident population of *B. erythrorhynchus* near Howick declined to extinction in 1974 following an invasion of Indian mynahs which have now usurped their role of gleaning the cattle for ectoparasites.

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