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Factors Influencing Migration of "Wintering" Raptors in Southern Africa

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In the semi-arid and variable rainfall environment south of the equator, raptors are very often unpredictable in their occurrence. The habitat does not influence their distribution, though roosting sites can be important. In their winter quarters raptors are a) mainly opportunistic feeders that move with the weather fronts seeking areas of abundant food; or b) those that return to the same wintering site year after year.

This paper is presented in three sections:-

1. A taxonomic note.
2. Original observations taken in the Kalahari Desert over the long term which provide the questions that give rise to
3. Consideration of wintering raptors forming two strategies; a) those that return regularly to their winter home range and b) those that range around in search of abundant food resources.

The Southern African environment

Generally speaking, the areas south of the Zambesi, Okavango and Cunene Rivers constitute southern Africa. The areas to the east are wetter, especially to the north-east and highlands. The middle and west are dry and tend to be much dryer the further west one goes, culminating in the Namib Desert against the Atlantic Ocean. There is a central plateau with a mountainous perimeter with higher mountains in the east. The vegetation is simplistically divided into the Cape Region of winter rainfall; the arid Karoo/Namaqualand/Namib region of the south-west, the adjoining Kalahari Region, the highveld grassveld and the so-called Zambesi floral region. This last is grassveld savannah in the south running into pure open stands of broad-leaved trees in the areas north of the Zambesi River.

Except for the western Cape the areas enjoy summer rainfall with the western semi-arid regions taking late summer reduced precipitation. As is well established, the lower the rainfall the less reliable and less regular it is. Drought is a regular feature and it is suggested that rainfall cycles of about twenty years are the norm with ten years of above average rainfall followed by ten years of below average rainfall (Tyson 1978).

Primary production is not well or reliably investigated for a simplistic presentation. There is a correlation with rainfall where greater biomass occurs with greater rainfall. But it has been stated that there are few if any stable ecosystems in Southern Africa (Rutherford 1978). Even less is known about secondary productivity except perhaps with herbivores, where it is shown that higher rainfall areas produce greater biomass. However, there is a lower productivity with high rains on poor soils of lowland tropics, than with less rain on fertile soils in the savannah arid regions (East 1984).

The important food resources for migrant raptors in the south are the locusts, termites (especially *Hodotermes* sp.), quelea and rodents. Locusts erupt after several years of drought when good

rains come. Termites occur in tremendous numbers when reasonable rain occurs in 'normal' times. Quelea are abundant after periods of good rainfall in good years. Rodent populations occur irregularly with peaks and crashes having periodicities from nine months upwards (Nel *et al.* 1985). Thus one or another form of abundant food resource is available except under prolonged drought.

Table 1. The status of wintering migrants in southern Africa.
(N=nomadic; R=returns to the same area)

Aquila pomarina	Lesser Spotted Eagle	N
Aquila nipalensis	Steppe Eagle	N
Buteo buteo vulpinus	Buzzard	R
Circus aeruginosus	Marsh Harrier	N
Circus macrourus	Pallid Harrier	N
Circus pygargus	Montagu's Harrier	N
Hieraeetus pennatus	Booted Eagle	?
Milvus migrans	Black Kite	N
Pernis apivorus	Honey Buzzard	N
Falco amurensis	Eastern Red-footed Kestrel	R
Falco concolor	Sooty Falcon	R
Falco naumanni	Lesser Kestrel	R
Falco peregrinus	Peregrine	?
Falco subbuteo	Hobby	R
Falco vespertinus	Western Red-footed Kestrel	R
Pandion haliaetus	Osprey	R

Taxonomic note

There are three groups of birds that provide food for thought. The Tawny/Steppe Eagle (*Aquila rapax*), the Snake-Eagle (*Circaetus gallicus/ beaudouini/pectoralis*) and the Kites.

First, a philosophical point. Taxonomy must not be a museum exercise divorced from the living bird. A species must stand in its own right and, if it can be distinguished one way or another, then it seems logical to recognise it. We must guard against confusion with convergent evolution which has provided the "lumpers" and the "splitters" with most of their problems. It is with convergence that we should consider the role of ontogeny and its importance in the evolution of the species. We must also recognise the fact that hybridisation between species is recorded in many different avian families, and that this happens particularly when the habitat, which previously acted as an isolating mechanism, has been changed by man.

There appears to be no valid reason put forward as to why the Tawny Eagle and the Steppe Eagle should be considered as one species. Cramp *et al.* (1980) have done so (ignoring size, colour, etc), in that individual specimens from geographical borderline areas are sometimes hard to assign to either group. They also state that the Steppe is migratory and the Tawny sedentary. As I will show later, this last statement is not correct.

All authors agree and refer to the two groups of eagles that fall under the name Tawny Eagle, *A. rapax*. So there is no doubt that we are concerned with two discrete and recognisable groups, each with their own subspecies. Why then have the lumpers been allowed to get away with lumping them together as one species? I strongly support the arguments put forward by Brooke *et al.* (1972). The feet of the Tawny are noticeably larger and heavier than those of the Steppe Eagle. The gape of the Steppe is also more prominent and larger. It is conceded by all authors that the nostril shape (an acceptable criterion to distinguish another *Aquila* species), size and sub-adult plumage are different between the two groups. The fact that the immature plumages differ so markedly indicates that the two species have different origins and that convergence has produced two look-alikes as adults.

At least from working in the field we are dealing with two discrete species. It must be conceded that there are often times when it is difficult to distinguish one form from the other, but it cannot be accepted that, if one had the two species as live birds in the hand, there would be any difficulty identifying which species it was. Thus one must reject Cramp *et al.*'s negative explanation that, because some specimens are hard to identify, this is an adequate reason for lumping the two species together.

With the case for the Snake-eagles it is much easier to reject the opinions of the lumpers. We are dealing with three groups, namely:- *Circaetus gallicus*, called the Short-toed Eagle, which breeds in the Palearctic and winters in Africa; *Circaetus beaudouini*, Beaudouin's Snake Eagle, which occurs in West Africa and recently has spread eastwards; *Circaetus pectoralis*, our southern Black-breasted Snake Eagle, which extends into East Africa. The lumping of the three species depends upon one record by Leslie Brown (1974) of a breeding pair with mixed *pectoralis* and *beaudouini* parentage. This in western Kenya. Brown also records two other mixed pairs observed in the same area in Ethiopia. It is noteworthy that all three records extend the eastward range of the West African species (Brown 1974). Also it must be noted that the breeding attempt was unsuccessful.

It is important to investigate exactly what is going on with the West African species; why is it being seen in new areas to the east of its normal range? It may well turn out to be a case of breakdown of habitat through human activities and subsequent intermingling of two species which had previously been isolated from each other through the natural habitat. Sibley (1954) has shown that breeding between two sibling species can occur in nature. I have shown (Liversidge 1985) that habitat breakdown can induce hybridisation between two similar species.

It is unacceptable on present evidence that the three species of Snake Eagle should be regarded as one species with three races. What is important again is that there are considerable differences between their immature plumages which indicate different origins. The fact that man has broken down the habitat that probably kept two of these three species reproductively isolated is no reason for lumping the three into one species with three races. There is no logic in the proposals and until some good case studies are done they must remain as three species.

The *Milvus* kites *M. migrans migrans* and *M. migrans parasiticus* are considered by most as one species and certainly there is some confusion in north-eastern Africa. But Brown (1982) says that racial variation is sometimes confused by separating this species into two. He then mentions that there are the yellow-billed forms and the black-billed forms.

At least in southern Africa we are dealing with two discrete species and it is relatively easy to distinguish one from the other. For this reason one questions the opinions of those who have become confused by the racial status of the two species. Again, the areas where confusion exists are areas of high human population where habitat destruction has occurred. For this reason one must ask whether man is not responsible for some of the "hybridisation" that confuses the taxonomists. Until this matter has been more specifically investigated the conservative approach seems desirable, i.e. no change rather than lumping what were two species into one. Furthermore, species should have priority over subspecies and we should not accept that, because subspecies cannot be sorted out, the species must be merged.

Field observations

Eleven years of strip census in the Kalahari National Park have yielded some interesting and unexpected results. I shall only discuss three species pertinent to this seminar. The methodology has been described elsewhere (Liversidge 1978). The assumption is made that differences between years are real differences and that the figures are adequate enough to draw conclusions.

The Steppe Eagle was recorded in substantial numbers in 1976 and 1978 (Table 2). The wettest years in the southern Kalahari in living memory and rainfall records were 1974 and 1976. The rainfall in 1977 and 1978 was 'normal'. It is suggested that the termites in particular were abundant at this period and certainly the Steppe Eagles were seen to be feeding on them. There does not appear to be any reason why they were not present in the years the Tawny Eagles were present in numbers, especially 1977. This leads me to believe that it is factors outside the southern Kalahari that determine the relative abundance of the species there.

The Tawny Eagle shows several peaks in 1976, '77, then declining numbers with peaks in 1979, '80, '81 and '83 (Table 2 and Fig. 1). It can be seen from the monthly graph that there is a small resident population that is increased from October by reproductive success (Thiollay 1978). The February peak, however, is typical for that shown by migrants and indicates quite clearly that

Table 2. Number of birds observed and distance travelled in the Kalahari National Park.

Date	Distance: kms	Tawny Eagle	Steppe Eagle	Lanner
Jan 1973	574	9	0	7
Aug	1,003	14	0	7
Apr 1974	986	9	0	15
Oct	847	2	0	15
Feb 1975	803	12	0	9
Mar	795	28	5	18
May	920	1	0	4
Oct	592	11	0	0
Feb 1976	974	118	18	58
Mar	273	12	40	2
Aug	536	9	0	1
Mar 1977	555	69	6	84
Aug	692	4	0	0
Dec	799	36	0	13
Feb 1978	388	5	38	29
Aug	957	4	0	1
Oct	705	20	0	5
Feb 1979	779	72	1	26
May	752	14	0	18
Nov	767	13	0	8
Mar 1980	1,564	126	0	71
Aug	397	1	0	1
Mar 1981	270	13	0	94
Apr	460	23	0	7
Sep	819	9	0	3
Feb 1982	973	23	0	12
Nov	282	3	0	0
Feb 1983	848	41	0	15
Mar	116	1	0	0
Apr	581	3	0	2
Aug	717	16	0	3

Tawny Eagles are coming in from elsewhere. Indeed the migrants are easily identified by plumage colouration. At this period we get irrgularly what we call 'blondies' - immature birds which are much paler than our own progeny. We also get darkly-streaked birds which are only seen at this time of the year. I have come to the conclusion that these are birds from elsewhere.

It is difficult to sort out the literature because of the confusion between the two species *rapax* and *nipalensis*. Smeenk (1974), for example, does not indicate a great change in populations of *rapax* such as might lead one to suspect migratory movements in East Africa. On the other hand he refers his race to the paler *belisarius* which is a migrant in East Africa. Brown (1980) refers to the 'blondies' but does not state whether they are East African in origin or from the paler Moroccan population. Cramp *et al.* give the 'blondie' description to *belisarius*. It would seem that the birds I observed from the southern Kalahari came from northern or West Africa. The incidence of 'blondies', however, is not regular.

Considering the two species and the background mentioned above, I have come to the conclusion that not only are we dealing with two independent species but also that we are dealing with species which are not regular or influenced by the same attraction, or whatever word one should use, to indicate their presence so far south. It would appear that factors that influence them to proceed further south than normal originate in Central Africa. This knowledge is important for conservation because we are compelled to look to a far greater ecosystem, embracing many more nations, than we had imagined necessary in the past.

The inclusion of the Lanner *Falco biarmicus* is deliberate because I believe that there is much understanding yet to come on this species. It is clear from the monthly numbers (Fig. 1) that there is a large late summer influx in the southern Kalahari. Also it will be noted that the population

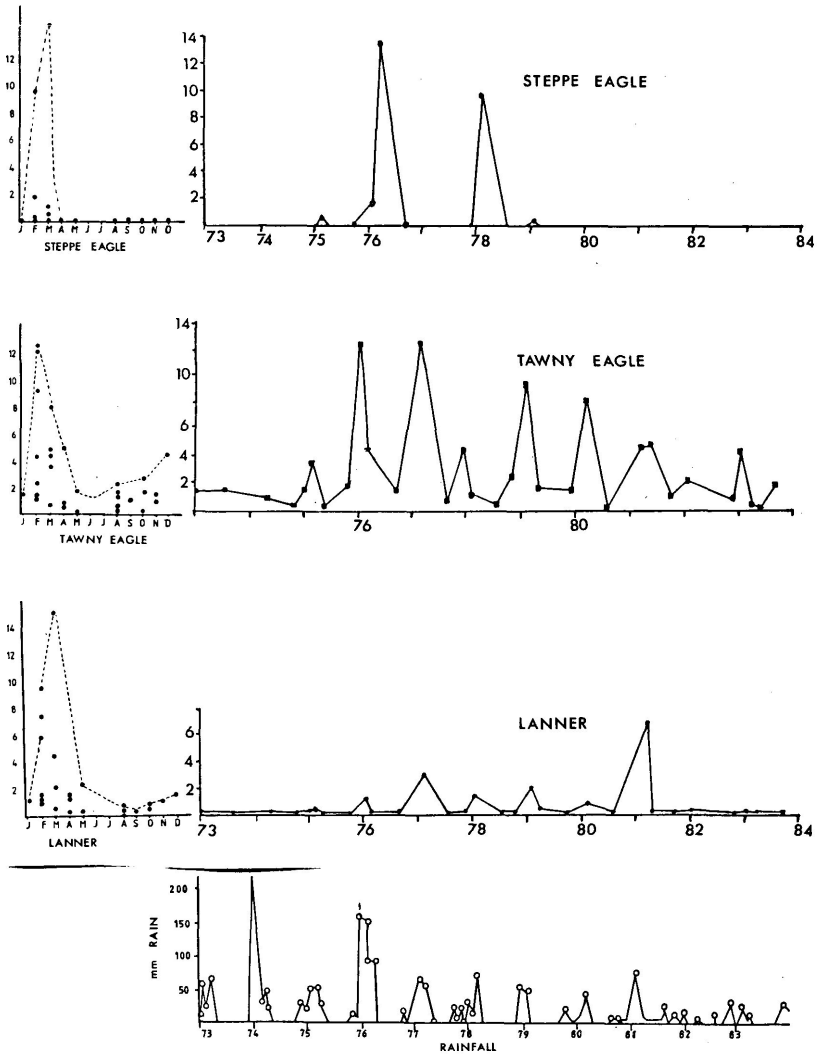

Figure 1. Field counts from strip census counts in Kalahari National Park. Number of birds per 100kms. On the left monthly means. The rainfall of 1974 and 1976 were exceptionally high.

varies from year to year with an 1981 peak. Add to this the remarkable return from five birds ringed in the Kalahari; one was found two months later in Malawi (Nyala 1979). This has opened a whole new horizon. Add to this that Smeenk (1974) had high numbers at the same time in East Africa and that there is a well established movement through Arabia, known to falconers but little recorded, and I begin to wonder if we know very much about this species. In my field work I recognise three differing juvenile types such as those with a very wide, pale superciliary eye-stripe or

those with pale cream crowns and differences in heaviness of breast streaking. Do these perhaps denote juveniles from different geographical regions? One comment stands out and that was by Dr. Alan Kemp, who expressed the opinion that our Lanners from the Kalahari were a different population from those he was familiar with in the Kruger National Park.

I hope in drawing attention to the Lanner that more interest and perhaps more recording will be done so that we might get to understand its population changes and movements.

Migration strategies

Looking at 16 species of raptors from Europe and Asia that reach southern Africa, there are two definite ecological groupings with regard to their migratory habits. Firstly, there are those that return to the same area year after year. Secondly, there are those that are completely unpredictable or irregular in their appearance on the extreme southern wintering grounds (Table 1). There is not enough known about two of the species.

In an attempt to determine whether there were any common factors that underlie these behaviour patterns, the following points were considered.

Social behaviour

It must be noted firstly that all the species breed as discrete pairs, although polyandry is recorded with one or two of them. However, in their winter quarters and as it appears from the literature, many species become social on migration and form flocks, sometimes of many hundreds. Such social behaviour occurs in both groups, so this does not appear to influence species' behaviour in respect of whether they return to the same area or not.

Method of hunting

Thiollay (1978) discusses the different hunting approach for residents and migrant species, showing clearly that resident species perch lower, change their perches less and cover less distance during the course of the day. The reason that I bring this forward here is that such behaviour of migrants in their winter quarters may differ from their breeding habitat behaviour. With the Lesser Kestrel, the move to winter quarters places them in a more open habitat where in fact they behave more like the resident birds.

Most of the species that return to the same wintering quarters in fact behave like residents. Most of those that are nomadic conform to Thiollay's migrant behaviour.

Sexual dimorphism

It is well known that in some species the wintering area and timing of their return to breeding quarters differs between sexes. So far as we can determine, the wintering quarters in southern Africa do not indicate any differences between sexes. Ecologically speaking, the difference in size between the sexes would indicate a differentiation in prey species competition.

As has been stated elsewhere, winter quarter prey selection is more broadly based than on the breeding grounds and thus competition would be minimised in view of the abundance of food supply.

Habitat restrictions

It is difficult to be certain how much change occurs between breeding and wintering habitats until more ringing data are available. But, for example, Moreau (1972) draws attention to the anomalies of the Buzzard, regarded as a woodland bird in Central Africa but as a plains bird in the western Cape. Ringing results, according to Siegfried (1968), show that the western Cape birds originate from southern breeding populations that in fact occur in more open country.

There is no clear-cut difference between the regular and irregular migrants, although there is a much greater tendency for those that migrate regularly to occupy habitats different from those in their breeding areas. One thinks in terms of the Lesser Kestrel, which roosts in large flocks, usually in towns, in the south, where it seems that the availability of suitable tall trees is the main factor, because roosts often occur near old farmsteads which have eucalyptus trees. Yet in Europe they breed on cliffs in treeless, flat, barren areas. From this evidence it seems the first priority is not habitat but more probably food resources.

Food selection

Again, we have very little detailed work that allows good comparisons. What information is available indicates that most migrants feed from a broader base on migration than when breeding. Thus, for example, the Lesser Spotted Eagle feeds on vertebrates in its breeding quarters but in its wintering quarters includes insects, worms and even carrion (Moreau 1972).

When one considers that many species show special adaptations for selected food, it is therefore to be expected that they will not change prey selection very much in their winter quarters.

Food availability

The availability of food taken is another question, however, and here we look at the populations of the prey species. It is probable that this availability is what influences whether or not a species is regular. It might also influence survival rates, especially of immature birds, and this in turn influences breeding populations.

There is a great deal made of the fact that in the southern summer the raptor migrants from Europe and Asia outnumber the endemic species by as much as 12 to 1 (Cade 1969). However, it appears to be overlooked that during the southern summer the productivity that is of importance to raptors is vastly increased. It is in the nature of the environment of the semi-arid regions that when conditions are right there is a superabundance in productivity. This applies to primary as well as secondary production. It is an adaptation to meet irregular and inadequate rainfall, to enable the species to survive over the years.

Of the species *that return regularly,* only two occur in sufficiently large numbers to warrant consideration as to whether they might suffer from a food shortage. These are the Buzzard and the Lesser Kestrel.

The largest, most regular winter population of Buzzards occurs in the western Cape (Schmitt *et al.* 1980), where one bird per 6km was recorded (Broekhuysen & Siegfried 1971). The food selection given by Schmitt *et al.* and Siegfried (1968) indicates a wide spectrum. One year a rodent eruption in the wheatlands attracted many Buzzards, but such events are rare. However, it would be very surprising if there was any competition for food, especially as Buzzards outnumber all other raptors except the endemic Black-shouldered Kite. This, then, indicates that at the level of densities recorded the habitat should more than adequately provide food resources for this species.

The Lesser Kestrel mainly roosts in urban areas and it is curious that with all the counts available we have no record of the range in size of flocks.

Certainly several hundreds - probably up to 500 - occur in the larger roosts and Siegfried and Skead (1971) have indicated that the highveld grassveld is the most densely populated habitat for this species. Here there is a constant supply of grillids of various forms which constitute its main diet, so that, unless severe drought conditions prevail, there should be no shortage of food. The greatest concern for this species is insecticides, that may be used to control locust swarms or in the intensively cultivated agricultural areas.

As to food availability for *migrants that are not regular,* it has been stated by a number of authors (Brooke *et al.* 1972; Steyn 1982) that most of these species in fact move with the weather fronts, and Steyn's remarks for the Lesser Spotted Eagle would cover all species in this group: "they move with the rain, seldom staying for long in any locality and in drought years are not seen at all".

The main food sources are provided by termites, locusts, quelea and rodents. These are all adapted to rapid reproduction and high productivity after good rains. The productivity is so great that many species of predators, both migratory and endemic, freely indulge themselves without any real competition. Indeed, they are so bent on feeding that they do not seem to take notice of each other. For this reason I do not consider it a serious matter that migrants outnumber endemics in the southern summer; the migrants are merely utilising a resource that is superabundant even when they are present.

The Steppe and Tawny Eagles, when competing for the same superabundant food source, are recorded in incredible numbers relative to the casual incidence of these species under less favourable conditions. Thus we get records of 100-120 Steppe Eagles at a quelea colony, whereas this species is otherwise rarely seen and may only be recorded once in a winter season (Tarboton & Allan 1984). Cade (1969) also records several instances of flocks of eagles at quelea colonies. In the wet years in the southern Kalahari, I myself have witnessed termite eruptions at which hun-

dreds of raptors were sighted. On one occasion I saw more individuals of the Hobby *Falco subbuteo* (12) than I had seen in my whole life in southern Africa at that stage.

We are not looking at distribution as such but at the presence and absence of numbers of the migratory species. Of course we can fill in more detail on distribution in the forms of maps, and this will satisfy the twitchers, but it has no real ecological importance other than that birds can fly.

The migratory species that do not return regularly to the same area occur right across southern Africa from Namibia to Mozambique. Termites and quelea occur in Namibia and thus supply a rich food resource.

It would seem that most of the eagle species have variable populations in East Africa down to, and including, Zimbabwe and the Republic of South Africa. Some years they are found in large numbers and in other years they are virtually absent.

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