

CHAPTER 5

Aspects of the conservation of the Short-clawed Lark *Certhilauda chuana*, with special reference to the eastern population

INTRODUCTION

The southern African endemic Short-clawed Lark has been a species of conservation concern since the first Red Data books were published in the 1980's. In these publications, its status ranged from "indeterminate" (Brooke 1984), and "rare" (Siegfried *et al.* 1976) to "near-threatened" (Collar *et al.* 1994; Barnes 2000) and more recently as "least concern" (Birdlife International 2004). Its inclusion in Red Data lists is principally due to its highly localized distribution within its relatively small global range.

The successful management of a species of conservation concern requires a thorough understanding of its biology, ecological requirements, ethology and the genetic structure, i.e. the amount and pattern of genetic diversity within and between populations. However, Avise (1994) and Lombard (1995) stressed that conservation management programmes should not only focus on the conservation of genes, species and the environment, but that conservation efforts should also be directed at preserving evolutionary processes such as speciation. In light of the foregoing the aim of this chapter is to:

- i. provide a concise overview of the current state of our knowledge regarding the Short-clawed Lark's biology, ecology, ethology and genetic structure,
- ii. discuss current and future potential threats to the eastern population,
- iii. make recommendations on how to address these threats,

- iv. highlight opportunities that may aid the conservation of the species,
- v. identify research needs, and
- vi. to identify the conservation priorities and to present a conservation framework which can be used by authorities and land-owners to facilitate the continued survival of the birds of the eastern population.

Although the abovementioned aims are directed at the conservation of the eastern population of the species, it can also be applied to the conservation of the western population.

5.1. Overview of current knowledge regarding the Short-clawed Lark

5.1.1. General biology of the Short-clawed Lark

Most of our current knowledge of the biology of the species is based on the studies by Herremans and Herremans (1992), Herremans *et al.* (1994), Herremans (1997) and Engelbrecht (2005). The studies conducted by Herremans & Herremans (1992) and Engelbrecht (2005) have shown that there are several differences in the breeding biology of the eastern and the western populations of the species. However, this may merely be due to the fact that the study conducted by Herremans & Herremans (1992) was based on 17 days of observation over a period of three months in a single breeding season. A longer and more detailed study of the western population may indeed erode some of these observed differences. Aspects of the species biology are summarized in Table 5.1.

5.1.2. Habitat preference of the Short-clawed Lark

The present study is the first to provide a detailed description of the preferred micro- and macro-habitat features of the eastern population of Short-clawed Lark (Chapter 3). Furthermore, it also describes habitat characteristics of areas occupied by Short-clawed Larks in the recent past but that have been abandoned. This was done in an attempt to understand the proximate factors that can contribute to the localized distribution of the species. The main features of the preferred habitat of the eastern population of the Short-clawed Lark are presented in Table 5.2.

5.1.3. Ethology with relevance to identification and monitoring

To the layman, the Short-clawed Lark is not an easy species to identify. This can be ascribed to its pipit-like posture and limited distinguishing plumage and morphological characteristics. The most reliable aid to identification is its vocalizations and characteristic display flights. The only species with which it can then possibly be confused is the Eastern Long-billed Lark, *Certhilauda semitorquata*. However, the ranges of these two species do not overlap.

The results presented in Chapter 4 indicate that adults of the species have three types of vocalizations. These are the territorial call (males only), agitated call (males only) and a contact call (both sexes). Male Short-clawed Larks typically sing from the top of low shrubs, small trees or termite mounds. As indicated in Chapter 4, the best time to locate the species by call or its characteristic display flight is within the first three hours after sunrise during the peak-breeding season, i.e. November/December. Although calls and displays can be heard

and seen throughout the year, it is generally at a lower frequency and for shorter periods in the morning.

5.1.4. Population differentiation and taxonomy

Ever since the existence of the eastern population became known, it has been somewhat of an enigma. Several authors have suggested that this population may represent a distinct taxonomic entity and that its status should be verified as a matter of urgency (Herremans 1997; Barnes 2000; Birdlife International 2004; Engelbrecht 2005). The present study used three datasets, namely analyses of territorial calls, morphometrics and genetic diversity of the two populations to confirm the taxonomic status of the two populations.

The results, presented in Chapter 2, indicate that apart from minor statistically significant differences between the two populations in all three datasets, they are virtually identical. The two populations of the Short-clawed Lark thus represent a single species comprised of two isolated sub-populations with virtually no gene flow between them (Chapter 2). The recognition of sub-populations within a taxon is included in the Red Data guidelines and defined as “a fragmented, isolated population which experiences little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less)” (IUCN 2001). The results also revealed that the Short-clawed Lark has very low levels of genetic variation which may render the species vulnerable to the effects of inbreeding or stochastic environmental events. One of the fundamental aims of conservation is to conserve as much genetic diversity that exists within and between populations as possible. It is therefore important that the little genetic diversity that exists between the two Short-clawed Lark populations be conserved by preventing further fragmentation of small sub-populations.

5.1.5. Extent of occurrence and estimated population numbers

The present survey of the extent of occurrence of the eastern population of the species indicates a 27% reduction in its range when compared to Barnes (2000) (Chapter 3). Engelbrecht *et al.* (2007) also report a similar drastic reduction in the distribution range of the western population. This decrease represents a 73% reduction in the western population's range in South Africa and a 28% for the total western population – this is based on the assumption that there has been no similar range reduction in neighbouring south-eastern Botswana.

Brooke (1984) suggested that the western population of the species comprises approximately 500 - 5000 individuals but Herremans (1993) estimated that more than 20000 birds occur in south-eastern Botswana alone. It is estimated that in South Africa as little as 100 - 300 birds occur within protected areas such as nature reserves (Siegfried 1992). The Polokwane Nature Reserve represents the stronghold for the eastern population and Barnes (2000) estimated that between 80 - 150 birds occur in this reserve which is registered as a southern African Important Bird Area (SA 006) (Barnes & Tarboton 1998). The results of a survey to estimate the population size as part of the current study have shown the eastern population of the Short-clawed Lark to be small, with an estimated effective population size of 380 breeding pairs of which at least 57 pairs occur in the formally protected Polokwane Nature Reserve.

5.1.6. Conservation status of the population and species.

At present, the Short-clawed Lark is listed in the category of “least concern” (Birdlife International 2004), a category which contains “widespread and abundant taxa which have been evaluated against the criteria and do not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened”. According to this evaluation, the species is not believed to “approach the thresholds for the population decline criterion of the IUCN Red List i.e. declining more than 30% in 10 years or three generations.” The range reduction reported for the western population in South Africa by Engelbrecht *et al.* (2007) and for the eastern population in the present study (Chapter 3) necessitates a reassessment of the Short-clawed Lark’s conservation status. Following the findings of Engelbrecht *et al.* (2007), the Threatened African Birds forum of Birdlife International initiated a review of the species’ conservation status (D. Butchart, pers. comm.). Consequently, Birdlife Botswana is in the process of planning a survey of parts of the distribution range of the western population in south-eastern Botswana in order to establish whether a similar decline has occurred in the species range in Botswana (P. Hancock, pers. comm.). A preliminary conservation status reassessment of the Short-clawed Lark using the IUCN (2005) criteria, the results presented by Engelbrecht *et al.* (2007) and those of the present study, indicate that the species’ conservation status should be upgraded to near-threatened. This assessment is based on the assumption that there had been no similar decline in the distribution range of the western population in south-eastern Botswana. A conservation status assessment for the eastern population showed that this population’s conservation status should be upgraded to Endangered (Table 5.3).

Despite the Short-clawed Lark’s present inclusion in the lowest category, i.e. least concern, on a global scale, the eastern population of the species is however listed as a specially

protected wild animal in the Limpopo Environmental Management Act 7 of 2003. The act states that "... no person shall without a permit kill, poison, capture, acquire, possess, donate, sell or purchase a specially protected wild animal." Specially protected wild animals are classified as such because of their endemism, Red Data status or scarcity within the province and hold the highest fine classification for offences contravening the act (J. Pienaar, pers comm.). Although the act does afford a certain degree of protection for the species, it falls short in affording protection to suitable habitat for the species. However, the act does make provision for the declaration of private land as sites of ecological importance, e.g. suitable areas for Short-clawed Larks. The declaration of sites of ecological importance may be granted by the Provincial MEC with the concurrence of the land owner for sites where protected plants or animals occur. With such a declaration the Environmental Management Authority undertakes to provide the land owner with a management framework which includes amongst others biodiversity conservation and eco-tourism management plans. The act makes further provision for private land on which sites of ecological importance are declared to be proclaimed and gazetted as "Private Nature Reserves".

5.2. Threats

The following section presents the major present and future threats (in order of importance), facing the eastern population and includes recommendations on how to address these threats.

5.2.1. Habitat loss or change

The Limpopo Province has one of the fastest growing human populations in South Africa (www.statssa.gov.za) of 4% per annum (Gyekye & Akinboade 2003). This is particularly the

case in and around the provincial capital of Polokwane which has seen a steady influx of people seeking work opportunities. The escalating human population and the resulting demand for housing has led to large scale land use changes, predominantly from agricultural and open spaces to residential. Both low-cost housing and middle- to high-income township developments have in the past 10 years seen massive growth in this area. This has led to the destruction of vast areas of natural vegetation typical of the Polokwane Plateau Bushveld vegetation unit.

Similarly, population pressures in the rural parts of the Polokwane Plateau to the east, north and north-west of Polokwane have led to urban and rural sprawl. Not only has this resulted in direct habitat destruction but the related anthropogenic activities have substantial secondary effects on the ecology of the region such as deforestation, overgrazing by livestock and subsistence dry-land crop agriculture.

Subsistence maize farming in rural areas has led to large scale habitat change. Herremans & Herremans (1992) described heavily grazed, recently fallow land as distinctive habitat of the Short-clawed Lark in south-eastern Botswana. However, the results of the present study indicate that the eastern population avoids this type of habitat. Although Short-clawed Larks were observed in habitat adjacent to fallow land during the study, they were never seen foraging in fallow land. The absence of Short-clawed Larks from fallow land on the Polokwane Plateau may be ascribed to the particular farming method used in the area. The limited land available for crop production necessitates ploughing and replanting on an annual basis without “resting” the land to recover over several seasons. This practice inevitably leads to nutrient depleted soils and subsequent poor regrowth of natural or cultivated vegetation (Whitbread 2007)

The change and loss of habitat due to commercial crop farming has occurred in areas to the immediate north of Polokwane, particularly along the Sand and Hout Rivers where intensive irrigation is still possible. Indications are that in areas of the Polokwane Plateau beyond these water courses there has been very little expansion in crop farming over the last decade, mainly as a result of low rainfall and depleted aquifers (G. Rall, pers. comm.). Commercial cattle farming remains the main agricultural activity on the Polokwane Plateau, predominantly in the form of free-range cattle ranching. The advantages and disadvantages of this agricultural practice for the Short-clawed Lark are discussed under Section 5.2.2. below.

The loss of habitat due to industrial development is notable but not as greatly significant as compared to the other causes discussed above. Several mining operations are evident on the Polokwane Plateau and although these have had direct detrimental effects on their immediate environments, e.g. granite and quartz outcrops, they have generally not had a significant negative effect on the Short-clawed Lark itself. A concern related to mining is the production and emission of sulphur dioxide by a platinum smelter plant situated near the southern boundary of the Polokwane Nature Reserve. According to published statistics (www.angloamerican.co.uk/static/reports2006), this plant was one of three South African platinum smelters that emitted a combined total of 15.2 kilotonnes of sulphur dioxide during 2005. The negative effects of this pollutant on birds are well documented and include, amongst others, genetic defects, respiratory and haematological effects and detrimental effects on eggshell development (Pandey *et al.* 1986; Llacuna *et al.* 1996; Eeva *et al.* 2006). The effect that long-term exposure to sulphur dioxide will have on the Short-clawed Lark is uncertain but likely to be deleterious.

5.2.1.1. Recommendations

- Determine the edge effect of urban sprawl on Short-clawed Lark occupancy.
- An upgrading of the species' conservation status would be a valuable instrument which could influence where and how developments and changes in land-use are carried out through the compulsory environmental impact assessment processes.
- Conservation authorities should build capacity and manpower to enable them to apply environmental management principles to control urban sprawl, deforestation and unsustainable agricultural practices.
- Environmental management legislation should be enforced.
- Education and awareness programs aimed at commercial game and stock farmers on the Short-clawed Lark's habitat requirements.
- Education of subsistence farmers and encourage sustainable crop cultivation practices.

5.2.2. Altered ecological processes

A significant proportion of suitable and potentially suitable Short-clawed Lark habitat on the Polokwane Plateau falls within commercial beef producing farms. The system of rotational grazing on these free range cattle farms is widely used. Relatively small camps (30 – 150 ha) are heavily stocked for as long as there is sustainable grazing. Once the grass layer has been significantly cropped the cattle are moved to the next camp leaving the heavily grazed camp to recover. This system does provide relatively suitable habitat for Short-clawed Larks albeit for the short-term, i.e. 1 - 2 years. However, a concerning consequence of this farming practice is that it leads to the proliferation of pioneer herbaceous and woody species as

noted by Mucina and Rutherford (2006). It is noticeable that many cattle farms on the plateau, that were once characterised by open habitats with sparse tree cover, are now dominated by *Acacia tortilis* and *A. rehmanniana* closed savanna. This is particularly apparent in the south-western reaches of the plateau where several farmers have recently resorted to bush clearing (J.J. Neethling & P. Mockford, pers. comm.) on farms that were historically good examples of the “Pietersburg Plateau False Grassland” vegetation type as described by Acocks (1953). Since this early classification, the plateau has seen a steady increase of woody vegetation and the resultant structural change has not gone unnoticed by Mucina & Rutherford (2006) who have moved away from the “false grassland” description and have named this habitat the Polokwane Plateau Bushveld vegetation unit. Whether this gradual transition from false grassland (Acocks 1953) to bushveld savanna is a natural phenomenon, or artificially driven, is open to debate. Nevertheless, this long-term transition to a bushveld savanna represents a major threat to the continued existence of the eastern population of the Short-clawed Lark and other species associated with grassland habitats.

This change of open grassland habitats of the Polokwane Plateau to “Bushveld-type” savanna is linked to a concomitant decrease in typical grassland-associated bird species over the last 1 - 2 decades, e.g. White-bellied Korhaan *Eupodotis senegalensis* (Vieillot, 1820), Southern Bald Ibis *Geronticus calvus* (Boddaert, 1783), Double-banded Courser *Rhinoptilus africanus* (Temminck, 1807) and Spike-heeled Lark *Chersomanes albofasciata*. The White-bellied Korhaan and Southern Bald Ibis are both listed as vulnerable by Barnes (2000). The decrease in grassland-associated birds is matched by increasing reports and breeding records of bushveld/woodland associated birds on the plateau such as the Red-crested Korhaan *Eupodotis ruficrista* (Smith, 1836), Woodland Kingfisher *Halcyon senegalensis* (Linnaeus, 1766), Groundscraper Thrush *Psophocichla litsitsirupa*, Purple

Roller *Coracias naevius* (Daudin, 1800) and Lilac-breasted Roller *C. caudatus* (Linnaeus, 1766).

The use of fire as a veld management tool is often discarded by free-range cattle farmers as it presents a threat to their grazing resources. There are examples of farms on the Polokwane Plateau that have not had fire for at least two decades (P. Mockford, pers. comm.). The present study has demonstrated that even withholding fire for a relatively short period of 3 - 5 years can significantly alter the basal cover to such an extent that it becomes unsuitable for the Short-clawed Lark (Chapter 3). Grassland and bushveld savanna owe their very nature to a long history with fire which has played an integral role in their development (Tainton & Mentis 1984). The lack of grass cropping by grazing animals or fire in bushveld areas leads to an increase in moribund material and grass species which become hard and unpalatable to most grazing animals (Plowes 1955; Trollope 1979). Fire also plays an important role in retarding the growth or even the killing of coppicing woody species such as *Acacia tortilis* and *A. rehmanniana* which are both encroaching species on the Polokwane Plateau.

Fire is therefore regarded as an important instrument that shapes and maintains the structure of vegetation. Its appropriate and responsible use as a veld management tool in combination with grazing by livestock or game will ensure a healthy environment which will in turn provide suitable habitat for grassland bird species of the Polokwane Plateau, including the Short-clawed Lark.

Maintaining suitable Short-clawed Lark habitat in the Polokwane Nature Reserve is crucial as this protected area supports a significant sub-population of approximately 15%. In order to maintain suitable habitat for the species and the other grassland-associated species, it is

imperative that the ecological management plan (Grosel 2001) of the reserve be adhered to. This management plan includes prescriptions on the carrying capacity for the reserve, a burning programme and the control of bush encroachment, amongst others. If the areas where the species were historically recorded in the reserve is managed as suggested by Grosel (2001), it is possible that an additional 140 - 170ha of suitable Short-clawed Lark habitat can be “reclaimed”. This would represent approximately 20 - 25 territories and could significantly increase the population in this protected area. In addition to this, it will also create habitat for several of the other grassland-associated species mentioned above.

5.2.2.1. Recommendations

- Determine the effect of rotational grazing practices on the spatial and temporal distribution of the Short-clawed Lark.
- Compare population densities on commercial farms versus subsistence farming areas.
- Long-term monitoring of the population to determine the spatial and temporal distribution of the species in relation to different land management practices.
- Investigate to what extent the “reclamation” of previously occupied habitats through sustainable wood harvesting and/or a burning programs leads to re-colonisation of these habitats.
- Control bush encroachment by *Acacia tortilis*, *A. rehmanniana* and *Dichrostachys cinerea* in naturally open areas in the Polokwane Nature Reserve. The prescribed management techniques should be implemented within the following plant communities; “*Themeda triandra* false grassland with scattered bush clumps”,

“*Themeda triandra*/*Acacia tortilis* false grassland” and “Saline patches with sparse vegetation” (Grosel 2001).

- Long-term monitoring of vegetational change on the Polokwane Plateau and its effect on bird species diversity and community structure.
- The use of fire as a veld management tool should be encouraged and a 3-year burning program is recommended, particularly after seasons of normal to above average rainfall. This will remove moribund grass and excess dry material and retard the growth of young *Acacia* and *Dichrostachys* shrubs.
- Adhere to the prescribed game carrying capacity for the reserve as determined by Grosel (2001).

5.2.3. Lack of protected habitat

The Polokwane Nature Reserve represents the stronghold for the eastern population of the Short-clawed Lark (Engelbrecht 2005) and is estimated to support at least 57 breeding pairs (Chapter 3). The reserve has been registered as a South African Important Bird Area (SA 006) on account that, amongst others, it is the only reserve in South Africa supporting the eastern population of the Short-clawed Lark (Barnes & Tarboton 1998). Although the land surface of the reserve is 3200ha, the results of this study indicate that at present only 330ha of this area represents suitable Short-clawed Lark habitat. Most of the other provincial nature reserves on the Polokwane Plateau are either too small, not ecologically suitable for this species or the veld management practices are not conducive to support Short-clawed Larks. The proclamation of additional provincial or state-run protected areas on the Polokwane Plateau is doubtful on account of the other pressing socio-economic challenges placed on the provincial government. The conservation of sustainable breeding sub-

populations and suitable breeding habitat for the Short-clawed Lark thus falls in the hands of private land owners.

Of further concern is the evidence of habitat change within the Polokwane Nature Reserve. There is ample visible evidence indicating an increase of particularly *Acacia tortilis* shrubs within historically open grassland habitats within the reserve. This increase in woody vegetation renders the habitat unsuitable for occupation by Short-clawed Larks as demonstrated in Chapter 3. As mentioned above, this increase in woody vegetation has also been noted in several areas on the Polokwane Plateau (Mucina & Rutherford 2006).

The Polokwane Municipality is a significant owner of undeveloped land within the greater municipal district. One such municipal property lies to the immediate east of the Polokwane Nature Reserve. Currently a large portion of this 2000ha property, known as the south-eastern townlands is leased to private cattle owners as grazing camps. Several large developments within and on the periphery of this area, including a granite quarry, silicon smelter and a municipal landfill site, have rendered a significant portion unsuitable for human habitation. The fact that most of these townlands have been utilized as cattle grazing camps for several years has ensured that much of the habitat has remained suitable for the Short-clawed Lark. The incorporation of these townlands into the Polokwane Nature Reserve would be difficult as they are separated by a provincial road linking all the industries mentioned above to the city of Polokwane. Thus, conservation of suitable habitat for the Short-clawed Lark would entail a combination of managing the existing areas occupied by Short-clawed Larks to ensure that the habitat remains suitable and to “reclaim” historically occupied habitats to the extent that these areas are recolonised by the species.

In recent years, a number of private game ranches have been established on the Polokwane Plateau while several other free range cattle farmers now run combined cattle/game ranches. Grassland habitats that have been naturally shaped by wild ungulates are of great value and importance to the Short-clawed Lark. Free-range cattle farms currently occupy a greater land area than game ranches and these too are crucial to the future success of the species (G. Rall, pers comm.). Therefore several farms where the present land management practices create and maintain viable areas of suitable Short-clawed Lark habitat have been identified as “important lark areas”. The selected farms are listed in Table 5.4.

5.2.3.1. Recommendations

- The south-eastern townlands and cattle camps should be managed as a municipal natural “green” area on which cattle farming and wood harvesting can take place on an ecologically sustainable basis.
- Wood harvesting should reduce selected trees and shrubs to no more than 25% per hectare and preferably less than 10% (Chapter 3), in suitable areas. Stumps should be treated to prevent excessive coppicing.
- The Polokwane Nature Reserve’s ecological management strategy should also be applied to the south-eastern townlands to ensure that suitable habitat remains for the grassland-associated bird species including White-bellied Korhaan, Southern Bald Ibis, Double-banded Courser, Spike-heeled and Short-clawed Larks.
- An education and awareness campaign of the species ecological requirements should be initiated. This would sensitise owners and managers of private farms on which the Short-clawed Lark occurs regarding the plight of the species and will

highlight the essential role they can play in biodiversity conservation on the Polokwane Plateau.

5.2.4. Direct and indirect anthropogenic effects

A large proportion of the eastern population of the Short-clawed Lark occurs on the fringes of densely populated rural communities. The majority of residents in these communities face many socio-economic hardships mainly as a result of large scale unemployment. This situation places great strain on the natural environment adjacent to these communities including the animal life which is affected by habitat loss and more harshly by direct persecution. Small birds are widely utilized as a supplementary protein source in many impoverished rural communities. A common site on the outskirts of these communities is young boys hunting birds with rubber catapults, often accompanied by packs of dogs. Informal interviews conducted with residents have shown that Short-clawed Larks make easy targets compared to other smaller passerines as they are relatively large, males are quite conspicuous during the breeding season and they are somewhat sluggish flyers that do not fly very far once disturbed (A. Manamela & A.M Maake, pers comm.)

In the rural and tribal areas, cattle are regarded as valuable assets representing both status and wealth to the owners, who have in the past been rather reluctant to sell or utilize their stock as a food source. It was not possible to get accurate figures with regards to the number of cattle within the rural areas of the Polokwane Plateau, but indications are that numbers are high and increasing (G. Rall, pers. comm.). This is evident by the degree of overgrazing seen in these areas. Ironically, moderate grazing pressure by domestic herbivores, e.g. cattle, donkeys and goats, creates suitable habitat for the Short-clawed Lark through continuous cropping of the grass layer and the browsing of small shrubs. However,

the contrary occurs in overstocked areas where heavy grazing pressure creates an environment devoid of basal cover and which ultimately turns into a homogenous habitat dominated by pioneer plants. It is also possible that the presence of such large concentrations of free-roaming livestock may result in direct mortality through the trampling of nests or nest abandonment due to continuous disturbance.

The incessant collecting of wood for fuel in the rural areas of the Polokwane Plateau has led to large-scale deforestation particularly in the Moletsi, Perskebult, Mothibaskraal, Dikgale and Sebjeng regions. Once again the removal of woody vegetation has ironically led to the creation of suitable Short-clawed Lark habitat in the short-term. A combination of deforestation and heavy grazing pressure often leads to the proliferation and domination of a single woody or herbaceous pioneer species (Van der Schijff 1957; Trollope 1999). In this particular case, bush encroachment by *Acacia hebeclada* and *A. tortilis* has been noted in many areas on the Polokwane Plateau (Fig. 3.20c; Chapter 3). In their shrub form, these two species are extremely spiny and grow as low, multi-stemmed bushes, making their removal by hand exceptionally difficult. Bush encroachment in the rural areas of the Polokwane Plateau thus has the potential to alter large areas of suitable Short-clawed Lark habitat. This represents a major threat to the eastern population as these areas currently support a significant proportion of this population.

5.2.4.1. Recommendations

- The degree of negative impacts on the Short-clawed Lark sub-populations in and around rural areas as a result of direct human activities should be investigated.
- Establish the breeding success of Short-clawed Larks in rural areas in order to determine the long-term viability of populations in these areas.

- Education of subsistence farmers to encourage sustainable agricultural practices.
- The extent of wood harvesting and alternatives should be investigated.
- Long-term monitoring of the population should be done to establish how anthropogenic activities impact upon the population.
- The Limpopo Environmental Conservation Act 7 of 2003 makes provision for the protection of indigenous birds, including the Short-clawed Lark. Conservation authorities should monitor the illegal hunting of birds and enforce the legislation.

5.2.5. Predation

Within the rural areas on the Polokwane Plateau are large numbers of feral domestic dogs. Packs of hunting dogs are also kept by many inhabitants who use these dogs to hunt small antelope and hares in the undeveloped regions around the rural communities. In many cases rural dogs survive on scavenging and foraging on the outskirts of these areas. Although there is no data to assess its impact, it is possible that the dog populations could have a significant impact on many ground-nesting bird species including the Short-clawed Lark. Illegal refuse disposal on the perimeter of rural settlements may also lead to a population explosion of rodents which may have a local detrimental impact on the breeding success of birds.

5.2.5.1. Recommendations

- Determine the impact of feral dogs on the environment around rural communities.
- Investigate the breeding success and causes of nest failures outside protected areas.

5.2.6. Pesticides and herbicides

The main commercial crop production areas on the Polokwane Plateau are situated north of Polokwane which represents the northern and north-western reaches of the Short-clawed Lark's range. Potatoes and tomatoes are the main crops farmed in these areas. These soft-leafed crops are particularly susceptible to insect damage and fields are regularly treated with organophosphorus cholinesterase-inhibiting insecticides (G. Rall, pers.comm.). Beason (1995) reports direct mortality of Horned Larks *Eremophila alpestris* in the USA from exposure to carbamate and organophosphorus pesticides. It is unlikely that waterborne herbicides and pesticides would have a noteworthy detrimental impact on the Short-clawed Lark due to the fact that this species does not drink water but instead relies on metabolic water for its water requirements as is typical of many insectivorous Larks (Maclean 1970). Although no Short-clawed Larks were recorded at or in close proximity of crop fields during the present study, the possibility exists that the indiscriminate use of pesticides and herbicides may result in local extinction of small sub-populations. This may be due to habitat destruction and/or decreased prey availability.

5.2.6.1. Recommendations

- Determine the proximal causes of their absence from commercial crop production farms, e.g. habitat destruction, direct poisoning or reduced prey availability as a result of the use of pesticides.
- Establish what the edge effect of commercial crop production farms on occupation of Short-clawed Larks is, i.e. what is the distance between crop production farms and areas occupied by Short-clawed Larks?

5.2.7. Stochastic and small population threats

The eastern population of the Short-clawed Lark has a relatively small and very patchy distribution. The population itself is small, estimated to comprise fewer than 400 pairs (Chapter 3) and preliminary genetic work suggests that there is very little genetic diversity within the population and within the species as a whole. This suggests the species experienced a bottleneck in its evolutionary past (Chapter 2). This is exacerbated by the species' apparent limited dispersal abilities which restricts gene flow between sub-populations and which may contribute to inbreeding. This may in turn place constraints on the future adaptive potential of the species. This is of particular concern in the eastern population which is small and occupies a limited geographical range. These limitations would imply that this population would be extremely vulnerable to environmental stochasticity, e.g. disease.

Although a relatively small sample was used in the present study, there is enough evidence to suggest that there is no movement between the eastern and the larger western population of the species. Since conservation involves not only conservation of a species, but also of the diversity of all its sub-populations, it is important that both populations of the species be conserved. From an evolutionary point of view, it is imperative that as much as possible of the present genetic variation in the two populations be conserved to enable the species to respond to future stochastic environmental effects.

5.2.7.1. Recommendations

- A long-term monitoring programme should be initiated to determine the spatial and temporal distribution of different sub-populations.
- Where possible, establish and maintain corridors of suitable habitat between sub-populations to ensure gene flow within the populations.

5.2.8. Climate Change

Global climate change has been recently recognized as one of the most profound and far-reaching threats to biodiversity (Thomas *et al.* 2004). As a result of increased concentrations of greenhouse gases such as carbon dioxide (CO₂) there has been a 0.6°C increase in the earth's mean temperature over the last decade (IPCC 2001). Climate change in southern Africa is expected to involve higher temperatures and lower, less predictable rainfall with a greater frequency of severe storms, fire and El Niño events (Hulme 1996; Lovejoy & Hannah 2006). Erasmus *et al.* (2002) suggests that avian species with restricted ranges are more likely to become extinct under climate change shifts than other species. Simmons *et al.* (2004) further imply that species with a global range of less than 50000km² are particularly vulnerable and rank the Short-clawed Lark as one of 40 southern African species which are at risk, albeit low, as a result of this factor. Apart from restricted range, other demographic and ecological traits which are likely to increase bird species' vulnerability to climate change include sedentarism, reliance on vulnerable habitats, limited dispersal tendencies and specific habitat requirements (Simmons *et al.* 2004). These traits would all be applicable to the eastern population of the Short-clawed Lark.

5.2.8.1. Recommendations

- The uncertainty regarding the likely impact of climate change on a regional level complicates the formulation of specific recommendations on how to reduce the effects that climate change may have on the species. Nevertheless, there are numerous local, national and international initiatives that attempt to curb the effects of climate change. Most of these initiatives are based on sound scientific research and should be adhered to.

5.3. Opportunities

5.3.1. The role of “avi-tourism”

Birding has become one of the world’s fastest-growing leisure activities and South Africa is rated as one of the top ten birding destinations worldwide (Cohen *et al.* 2006). The Short-clawed Lark is listed as one of the top 150 out of 1400 bird species to be seen in the greater southern African region (Cohen *et al.* 2006). This list represents species that are highly sought-after by bird watchers to the region and which may be difficult to locate without some additional guidance (Cohen *et al.* 2006). The Polokwane Nature Reserve is arguably the most accessible place to see this bird and results of an informal survey conducted by the Polokwane Municipality revealed that over 280 visitors entered this reserve for the sole purpose of seeing the Short-clawed Lark during the calendar year of 2003 (Grosel *et al.* 2004). It is quite possible that this figure has increased over the past few years as a result of a greater marketing effort through the establishment of the Capricorn – Letaba Birding Route and the publication of several “birding” guides for the region. The Short-clawed Lark

can thus be regarded as a tourist attraction and avi-tourism could be an important mechanism to ensure its survival.

5.3.2. The role of NGO'S

The recently established Polokwane Conservation Forum (PCF) is a private NGO/NPO initiative which consists of a combination of concerned amateur naturalists and specialists in the field of ecology, ornithology, botany, herpetology, etc. The role of the PCF until now has focused on functioning solely as an environmental “watchdog” concentrating on the wellbeing of the ecology of the Polokwane Plateau. With all the expertise at its disposal, it is recommended that the PCF can play an equally important environmental role as an advisory body for private land owners of the Polokwane Plateau. In this way farmers in particular, could be advised on aspects of ecological management and in so doing, conserving the remaining pockets of relatively undisturbed examples of the Polokwane Plateau Bushveld vegetation type along with its associated species.

A recent publication concerning the range reduction of the Short-clawed Lark's western population in South Africa by Engelbrecht *et al.* (2007) has prompted the involvement of Birdlife International through its Threatened African Birds Forum in the conservation of the species. Consequently, Birdlife Botswana has responded by initiating a population and range survey of the species' population in that country. It is hoped that the Birdlife South Africa will follow suite by initiating and/or funding future relevant research projects and by creating public awareness of the plight of the species and the Polokwane Plateau in general through the Community Based Conservation, Conservation and Education divisions of the organization.

The recently launched SABAPII could also contribute to our knowledge and understanding of the distribution of the species. Close co-operation with the SABAPII coordinators is essential and careful vetting of all records is vital to obtain a better understanding of the species' distribution range.

5.4. Research needs

In addition to the research needs highlighted in Section 5.2, the following research needs have been identified that could assist in the conservation of the species.

- The causes of the poor breeding success of the species reported by Engelbrecht (2005) should be established, including the possible effects of chemicals such as sulphur dioxide (SO₂).
- The significance of the Polokwane Nature Reserve as a source population for the eastern population should be investigated. Such a study should include data on juvenile dispersal and the subsequent success or failures of the establishment of territories outside these areas.
- Establish if artificial habitats such as road verges (where the species is often encountered) are used as corridors of dispersal.

5.5. Proposed conservation priorities

In light of the foregoing discussion, three conservation priorities were selected that could contribute to the continued survival of the eastern population. These priorities are presented in a concise format in Table 5.5.

CONCLUSION

As can be seen from this assessment, there are numerous significant threats to the eastern population of the Short-clawed Lark. To ensure the long-term survival of this population and indeed the entire species it is imperative that these threats be addressed as a matter of urgency and that the species' conservation status should be elevated. The enigmatic stature of the Short-clawed Lark makes it an ideal "flagship" species for the protection of the threatened habitats and other associated and threatened species on the Polokwane Plateau.

Table 5.1. Summary of the biological characteristics of the Short-clawed Lark.

Parameter	Description	Reference
Diet	Insectivorous, relies on metabolic water for water requirements	Hockey <i>et al.</i> (2005)
Breeding system	Monogamous. Males are sedentary and defend territories for 1 - 4 years. Most females disperse from breeding territory during the non-breeding season.	Del Hoyo <i>et al.</i> (2004) Engelbrecht (2005)
Nest site	Open cup on ground, usually at the base of a grass tuft or herbaceous plant	Engelbrecht (2005)
Clutch size	2 – 3	Herremans & Herremans (1992), Engelbrecht (2005)
Incubation period	14 – 16 days	Engelbrecht (2005)
Nestling period	11 – 12 days	Engelbrecht (2005)
Post-fledging dependence period	Up to 4 weeks	Engelbrecht (2005)
Juvenile dispersal	Poorly known. Very few re-sightings of colour-ringed juveniles	Engelbrecht (2005)
Number of breeding attempts	Up to three successful breeding attempts	Engelbrecht (2005)
Breeding success	22%	Engelbrecht (2005)
Longevity	Estimated 6 - 8 years	Engelbrecht (pers. comm.)

Table 5.2. A summary of the features that constitute the preferred habitat of the eastern population of the Short-clawed Lark.

Geographical features	Altitude: 1170 - 1402masl Slope: Flat to less than 10°
Substrate	Sandy loam soils sometimes loosely covered with quartz pebbles
Micro-habitat and vegetation features	Basal cover: 40 - 50% grass, 40 - 60% bare ground, 0 - 13% herbs and forbs and 0 - 6% loose pebbles Tree cover: Between 1 and 25% Important tree species: <i>Acacia tortilis</i> Tree height: >1 - 4m Tree crown diameter: 1 - 4m Grass height: 51 - 150mm Grazing by large herbivores: moderately to heavily grazed Grass succession stage: Sub-climax stage
Fire	2 - 3-yearly cycles

Table 5.3. Evaluation of the status of the Short-clawed Lark based on IUCN Red List categories and criteria (2005). Values for the eastern population are based on the results of the present study while those for the western population are derived from published data.

Criteria		Eastern Population	Western Population	Species
A. Population reduction	Declines measured over 10 years or three generations			
		<30% = Near-Threatened (Chapter 3)	<30% = Near-Threatened Engelbrecht <i>et al.</i> (2007)	<30% = Near-Threatened
B. Geographical range	B1. Extent of occurrence	<5000km ² = Endangered (Chapter 3)	= >20000km ² Least concern (Barnes 2000)	Least concern*
	B2. Area of occupancy	Near-threatened (Chapter 3)	Data deficient	-
C. Small population size & decline	C1. Number of mature individuals	<2500 individuals = Endangered (Chapter 3)	20000+ = Least concern (Herremans 1993)	Least concern
	C2. Individuals in largest sub-population.	<1000 individuals = Vulnerable (Chapter 3)	Data deficient	-

* The current estimated extent of occurrence is 46801km². This is based on the results of the present study and the results presented by Engelbrecht *et al.* (2007), assuming that the extent of occurrence of the western population remained unchanged in south-eastern Botswana as presented by Harrison *et al.* (1997).

Table 5.4. Farms selected as important Short-clawed Lark areas where, as a result of certain land management practices, viable breeding habitat have been created for the species.

Registered Farm Name	Ownership	Land Use
Snymansdrift 738LS	Private	Cattle & Game
Snymansdrift 738LS	Private	Game
Zandrivier 742LS,	Private	Cattle & Game
Papkuil 855LS	Private	Cattle
Onverwacht 914LS	Private	Cattle
Weltevreden 746LS	Municipal	Cattle
Rondepan 622LS	Private	Cattle & Game
Vlaklaagte 625LS	Private	Cattle & Game

Table 5.5. Conservation priorities for the eastern population of the Short-clawed Lark.

Priority	Action	Time frame	Aim	Outcomes
1	Revision of conservation status	Immediate	Upgrade of conservation status	Stronger arguments for preservation of lark habitat. Influence EIA process.
2	Conservation of suitable habitat	0 - 10 years	Create and maintain suitable habitat	More areas of suitable habitat and possible population growth and expansion. The creation of suitable habitat will also benefit other false-grassland-associated species of conservation concern, e.g. Bald Ibis and White-bellied Korhaan.
3	Monitoring	Every 2 years	To gain a better understating of the spatial and temporal distribution of the species	Pro-active information is vital to management of the species.