Status of Short-clawed Lark *Certhilauda chuana* in south-eastern Botswana

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Le statut de l'Alouette à ongles courts *Certhilauda chuana* au sud-est du Botswana. La grande majorité de la population de l'Alouette à ongles courts *Certhilauda chuana*, une espèce endémique à l'Afrique australe, se trouve au sud-est du Botswana. Des recensements par transect ont été effectués en novembre 2007–janvier 2008 afin d'établir son statut dans cette région et de comparer les résultats avec ceux d'un recensement effectué en 1992–93. En janvier 2008 des observations ont également été faites pour établir les limites de son aire de répartition. Les résultats indiquent une modeste augmentation des effectifs et une légère diminution de la superficie d'habitat approprié, tandis que l'aire de répartition a peu changé. On n'a pas trouvé de corrélation entre les changements de la superficie de l'habitat approprié et les changements des effectifs, ce qui indique qu'à présent il y a suffisamment d'habitat qui convient. Au sud-est du Botswana, l'Alouette à ongles courts est presque entièrement confinée à des terrains en jachère où la cultivation est avec des méthodes agricoles traditionnelles. Les dernières années on a enregistré une diminution substantielle de la surface plantée avec du sorgho et du maïs selon des méthodes traditionnelles. Si cette tendance continue, cela pourrait avoir un effet défavorable sur l'Alouette à ongles courts. L'espèce bénéficierait probablement beaucoup de l'instauration d'une prime gouvernementale pour stimuler l'utilisation de méthodes agricoles traditionnelles.

Summary. The large majority of the population of Short-clawed Lark *Certhilauda chuana*, a southern African endemic, is found in south-eastern Botswana. A series of transect surveys was undertaken in November 2007–January 2008 in order to establish its status in this region and to compare the results with those obtained during a 1992–93 survey. In January 2008 observations were made to establish the limits of its range. Results suggest a modest increase in numbers and a small decline in the area of suitable habitat, whilst there has been little change to the range. No correlation between changes to the area of suitable habitat and changes in numbers was found, indicating that currently there is no shortage of suitable habitat. In south-east Botswana, Short-clawed Lark is almost completely confined to fallow land that has been cultivated for field crops using traditional agricultural practices. In recent years there has been a large decrease in the area of land cultivated with sorghum and maize using traditional practices. If this trend continues, this could have an adverse impact on Short-clawed Lark. The most beneficial support for the species is probably a government incentive to farmers to cultivate field crops using traditional practices.

Short-clawed Lark *Certhilauda chuana* (Fig. 1) is endemic to southern Africa. There are two discrete populations: a large one in south-eastern Botswana and the North West Province of South Africa, extending marginally into the Northern Cape and Free State Provinces, and a smaller, isolated, population largely restricted to the Pietersburg Plateau in Limpopo Province, South Africa. A survey conducted in the 2004–05 breeding season in the North West, Northern Cape and Free State Provinces indicated an apparent range reduction and possible decrease of Short-clawed Lark in South Africa (Engelbrecht *et al.* 2007). This prompted CAB and KM to undertake a survey in south-eastern Botswana in November 2007–January 2008, in order to establish the species' current status in the country and make a comparison with an earlier, unpublished survey undertaken by MH in November–December 1992 and November–December 1993.

Short-clawed Lark is found territorially in pairs for most of the year (Herremans & Herremans 1992). Only the male sings the territorial song (Herremans & Herremans 1992). The male usually sings from a bush, fence-post or small tree up to *c.*4 m tall, occasionally from a clod of earth in a ploughed field. In south-east Botswana the intensity of its song increases dramatically from October to December (Herremans & Herremans 1992). There is a spectacular aerial display, which reaches its peak in October–November. Territorial activity is much reduced in the latter part of the rainy season, when birds are moulting, and in the dry season (Herremans & Herremans

1992). In a study of the eastern population in the Polokwane Game Reserve on the Pietersburg Plateau, Engelbrecht (2005) found that territorial activity commenced in early August, reached its peak towards mid and late September, then continued at a low frequency throughout the summer before reaching a second peak at the end of the breeding season in March–April.

Farmers are often familiar with the species and call it *sebota*, the Setswana word for lark. Possibly because it is accustomed to the presence of farmers it is a confiding species, showing little fear of people. The first indication of its presence is often of a male singing, just a few metres away. It appears to have the tendency to move towards an intruder, such as a person or vehicle, venturing into its territory and then announce its presence by singing at close range. Occasionally it follows the intruder at close quarters, right through its territory until the intruder has left. Due to its confiding nature and its obtrusive habits, the male is often easy to observe, particularly in early summer.

Study area

Location

The study area was located in the core range of Short-clawed Lark in south-eastern Botswana. This is an area of *c.*16,000 km^2 extending west to *c.*24°59'E, north to *c.*24°00'S and east to *c.*26°30'E. The international boundary with South Africa represents the southern limit. There are also a few records outside of this core range, particularly north of 24°00'S (Herremans 1997).

Climate

The climate is characterised by long hot summers, with summer rainfall, and short, cool, dry winters. Annual rainfall around Gaborone averages 450–500 mm, with most rain falling in October–April (Campbell & Main 2003). Rainfall varies greatly from year to year. Annual rainfall data at Gaborone since 1980 indicate that the summers with the lowest rainfall were 1984–85, with 243 mm, 1991–92, with 244 mm, and 2006–07 with only 145 mm (Department of Meteorolgical Services, Gaborone, *in litt.* 2008). For the same period the summer with the highest annual rainfall was 1999–2000, with 886 mm; 2007–08 was also particularly wet, with 713 mm. The study period was thus preceded by a particularly dry summer.

Habitat

The natural vegetation of south-east Botswana is predominantly *Acacia* savanna, though habitat dominated by broad-leaved tree species is also widespread, particularly on sandy soils and rocky hills. Short-clawed Lark occurs primarily in areas with *Acacia* savanna. Its distribution is centred on luvisols and lixisols on granite substrate. The species is generally absent from rocky ground and, accordingly, avoids rocky hills (Herremans 1997). Rocky hills occupy extensive areas in south-east Botswana, particularly between Mochudi and Molepolole and also to the south-west of Gaborone, and around Kanye and Lobatse. The species avoids Kalahari sands, which are most prevalent in the west of the study area, at the eastern edge of the Kalahari and also avoids vertisols, though such soils are localised and mainly confined to the area between Tlokweng and Sikwane (Ministry of Agriculture 1990).

Most land in south-east Botswana is tribal leasehold land. There is, however, an extensive block of freehold farms around Lobatse, and immediately north and south of Gaborone is also private land. The city of Gaborone is situated on former freehold farming land. Short-clawed Lark is almost totally confined to areas of tribal land that have been cultivated using traditional dry-land farming practices (Herremans 1997, 2005). Such traditional practices involve the dry-land planting of field crops, mainly sorghum and maize, and the grazing of fields, after crops have been harvested, by livestock, primarily cattle, donkeys and goats. Short-clawed Lark prefers fallow fields, grazed by livestock, with scattered bushes and small trees, primarily *Acacia tortilis*, though occasionally *A. mellifera* and *Dichrostachys cinerea* (Fig. 2). It has a preference for open habitat. Large open fields devoid of bushes or small trees, characteristic of commercial farms, are also unsuitable. However, the great majority of arable land in south-east Botswana is cultivated using traditional practices. According to data for 2002, 42.8% of the 16,000 km^2 core range of Short-clawed Lark is considered to be land either cultivated, or previously cultivated, for crops using dry-land farming practices (Department of Surveys and Mapping, Gaborone, *in litt.* 2008). However, this figure is likely to include some land subsequently encroached by *Acacia* and no longer suitable for Short-clawed Larks.

Figure 1. Short-clawed Lark / Alouette à ongles courts *Certhilauda chuana*, Ntlhantlhe, south-eastern Botswana, August 2008 (Eugenie Skelton)

Methods

Both in 1992–93 and in 2007 a series of transect surveys was undertaken along a representative selection of routes in order to estimate the number of territories of Short-clawed Larks and to assess the area of habitat suitable for the species. The same methods were used for both sets of surveys so the results are directly comparable. Most transects were undertaken along gazetted roads but a few went along un-gazetted tracks. All transects had a width of 400 m—200 m on either side of the road or track. Hence for every 1 km of road or track, 40 ha were surveyed.

A Short-clawed Lark was usually first located when a singing bird was heard, although occasionally one was first located by the sound of its alarm or contact call. Only very seldom was a bird initially located by sight. The presence of a singing bird or of a bird in display flight was considered to be evidence of a territorial pair. Habitat was considered to be suitable for Short-clawed Larks if it was open land or fallow land with or without scattered trees or bushes, and unsuitable if it was thick, closed bush, woodland, habitation or had a rocky substrate. Occasionally birds were found in unsuitable habitat, such as closed bush or the vicinity of habitation, but always there was suitable habitat nearby, within 100 m from the bird. Fallow land that had been largely encroached by *Acacia* was considered to be no longer suitable. For each transect habitat was recorded at 100-m intervals for the entire transect, so that the area of habitat and proportion of the land suitable for Short-clawed Lark could be calculated. Habitat was recorded separately on each side of the road, as quite often there was suitable habitat only on one side of the road. Along each transect, on both sides of the road, the start and finish of suitable habitat, to the nearest 100 m, was recorded.

All transects were undertaken by vehicle. Wherever habitat was considered to be suitable, the vehicle was driven slowly and stopped at 100-m intervals to listen for Short-clawed Larks within 200 m of the road or track. If, following a wait of five minutes, no Short-clawed Larks were recorded, a tape-recording of the song (recorded by MH in 1992–93) was played, using the sound system of the vehicle. For all singing birds, the perpendicular distance of the bird to the road and coordinates of the point on the road closest to the bird, were recorded. Coordinates were recorded

Figure 2. Short-clawed Lark *Certhilauda chuana* habitat, Ntlhantlhe, south-eastern Botswana, August 2008 (Eugenie Skelton)

Habitat de l'Alouette à ongles courts *Certhilauda chuana*, Ntlhantlhe, Botswana du sud-est, août 2008 (Eugenie Skelton)

correct to the nearest hundredth of a minute, using a Garmin GPS, model MAP60Cx. If birds were recorded at successive stops, 100 m apart, then an effort was made to hear all birds recorded at both stops at the same time, to avoid recording the same bird or birds twice. When they could not be heard at the same time they were not recorded as birds had the tendency to follow the vehicle while it remained in their territories.

Most field work was undertaken in the morning, starting as early as possible after sunrise (05.30 hrs); it was seldom continued after 14.00 hrs. Territorial males are most vocal early in the morning, and till *c.*10.00 hrs it was generally possible to locate them without playing the tape-recording. From *c.*10.00 hrs to *c.*14.00 hrs males were less vocal, although they would often still sing. To locate males at this time it was often necessary to play the tape recordings of the song and wait for a response; these tape recordings included both dialects. After *c.*14.00 hrs territorial males became much more difficult to locate, even using playback. Evidence of this was obtained for the transect survey undertaken along the Kanye–Mmathethe road. When this transect was surveyed in the mid-afternoon, no birds were recorded despite the habitat being suitable, but when the transect was re-surveyed in the early morning, two weeks later, seven pairs were located.

The efficiency with which birds were located was probably also influenced by the weather conditions. It was generally easier to locate birds on windless days than on windy days. It was also easier to locate birds on cool days, following a period of rain rather than during hot and/or dry periods. Fortunately, during the 2007 surveys the weather was relatively cool and cloudy with well above average rainfall, with nearly all transects being undertaken in favourable conditions.

In 1992–93 a total of 1,350 km were surveyed. To allow direct comparison, the large majority of transects in 2007 were exactly the same as in 1992–93. However, transects in which no Short-clawed Larks were recorded in 1992–93, such as from Mochudi and from Sikwane to Olifants Drift, were not repeated in 2007 (see Appendix 1 for all place names mentioned). Transects on which Short-clawed Larks were recorded only at low density in 1992–93, were not deemed to be a priority, so the majority of such transects were not surveyed again in 2007. Un-gazetted tracks in rural Botswana tend to vary their route over time, due to allocation of fields and plots, fallen trees and erosion. Attempts to follow the exact routes of three transect surveys, from Oodi to Mochudi, from Mogoditshane to the eastern corner of the international airport and from Makgomane to Tswaaneng, which were undertaken on un-gazetted tracks in 1992–93, were unsuccessful as the exact route followed could not be re-located. Accordingly the data for these three transects are not directly comparable (although they are certainly in the same area). One transect, from Pitsane via Tlharaseleele to Rakhuna, adjacent to the area where Engelbrecht *et al.* (2007) searched unsuccessfully for Short-clawed Larks in South Africa, was surveyed in 2007, though it had not been surveyed in 1992–93. In January 2008 S. & L. Tyler, using the same methods, surveyed an additional transect from Botlhapatlou via Hatslatladi to Lentsweletau that was also not surveyed in 1992–93; the results of this transect are included in the data. In 2007–08 transects surveyed had a total length of 990 km, which represents *c.*2.5% of the core range of Short-clawed Lark; 841 km of these are directly comparable with data for 1992–93.

In January 2008, an effort was made, with the assistance of S. & L. Tyler, to visit areas at the edge of the range that had not been covered in transect surveys, in order to establish the range limits. Locations where the species occurred 15 years previously were revisited to ascertain if there had been any range changes.

Results

Survey efficiency

The estimated perpendicular distances of territorial birds from the road or track (the centre of the transect) are grouped into 10-m class intervals and are presented in Fig. 3.

The estimated perpendicular distances show a bias to more 'convenient' distances from the road, particularly for greater distances. Class intervals, such as $100 \leq d < 110$, $150 \leq d < 160$ and $200 \leq d < 210$ (d = perpendicular distance, in metres, from road) are represented in the data more frequently than other class intervals, because of rounding-off of estimates.

The data clearly indicate that a greater proportion of territorial birds were recorded closer to the road than further away. Indeed, 77% of territorial birds were recorded at <110 m from the roads, while only 23% were found in the peripheral 48% of the transects.

It is reasonable to assume that the data do not include all the territorial males present within the transects. To estimate the proportion of birds present that were detected in a survey is not straightforward. Assuming the drop-off in numbers recorded with distance (Fig. 3) represents the probability of being detected as a function of distance, we can fit a polynomial curve and estimate the efficiency of the surveys. Accepting the curve as a probability density function, it can be estimated that only 46% of the birds present were actually recorded during the surveys (though see also Discussion).

Numbers and population density

The 30 transects that were surveyed both in 1992–93 and in 2007, for which the results are directly comparable, are listed in Table 1.

For comparable transects a total of 396 pairs were recorded in 1992–93 and 447 in 2007, representing a 12.9% increase. While the results suggest that the numbers of pairs increased between the two surveys, the area of habitat considered suitable for Short-clawed Larks decreased slightly, from 11,410 to 10,810 ha, i.e., for comparable transects, a 5.3% reduction. Accordingly, there was also an increase in density in suitable habitat, from 3.57 pairs / 100 ha in 1992–93 to 4.14 pairs / 100 ha in 2007, an increase of 19.2%.

Short-clawed Lark is clearly more common in some parts of its range than in other areas. In

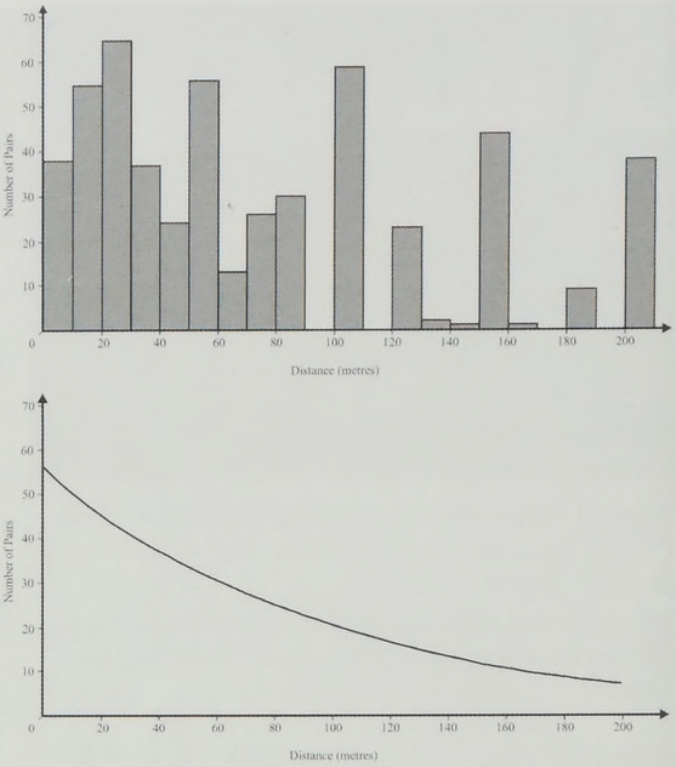

Figure 3. Perpendicular distance of pairs of Short-clawed Larks *Certhilauda chuana* from line of transect.

Distance perpendiculaire des couples de l'Alouette à ongles courts *Certhilauda chuana* par rapport au transect.

2007 the highest densities were around Mosopa, Kubung and Thamaga; >10 pairs / 100 ha of suitable habitat were recorded for several transects in this area. Relatively high densities of >6 pairs / 100 ha of suitable habitat were also found around Ntlantlhe and north of Gaborone. Densities in the southern part of the range, south of the Lobatse–Kanye main road, were noticeably lower: south of 25°10'S densities for all transects were < 4 pairs / 100 ha of suitable habitat. The pattern of densities is illustrated in a 15-minute grid (Fig. 4).

For most transects more pairs were recorded in 2007 than in 1992–93. Those for which fewer were recorded are Bokaa–Kopong (from 12 pairs to nine pairs), Lentsweletau–Kopong (ten pairs to five pairs), Letlhakeng–Gasese (24 pairs to three pairs), Mmangodi–Moshupa (26 pairs to 22 pairs), Boatle–Mmankgodi (11 pairs to eight pairs), Mmathethe–Metlojane (11 pairs to two pairs), Good Hope–Mmathethe (nine pairs to six pairs) and Metlojane–Good Hope (two pairs to one pair). For the Mmankgodi–Mosopa transect, the reduction in numbers was due to a large decrease in pairs recorded around Mmankgodi, whereas near Mosopa a small increase was actually recorded.

Table 1. Summary of results of transect surveys (from north to south)

Tableau 1. Aperçu des résultats des recensements par transect (du nord au sud)

TRANSECT	Total ha	% suitable habitat		Pairs		Density, pairs/100 ha in suitable habitat	
		2007	1992–93	2007	1992–93	2007	1992–93
Molepolole—N of Hatsalatladi	2,180	34.4	25.7	19	13	2.54	2.32
Molepolole—Lentsweletau	1,400	22.8	23.6	5	3	1.57	0.91
Lentsweletau—Rasesa—Pilane	1,334	19.7	12.9	4	1	1.52	0.58
Lentsweletau—Kopong	1,020	9	15.4	5	10	5.42	6.37
Bokaa—Kopong	572	34.8	38.5	9	12	4.52	5.45
Mabalane—Mochudi	1,682	7.3	14.2	2	1	1.62	0.42
Mmamashia turn-off—Modipane—Mabalane	1,664	20.8	16.9	9	2	2.6	0.71
Letlhakeng—Gasese	1,994	19.8	29.6	3	24	0.76	4.06
Gasese—Pitseng	844	41	52.3	16	11	4.62	2.49
Molepolole—Thamaga	1,398	27.7	20.8	18	10	4.65	3.44
Thamaga—west along power-line	1,360	15.9	36	23	14	10.63	2.86
Kubung—north to power-line—N of Losilokgokong	924	20.5	24.5	25	19	13.17	8.4
Mosopa—Kubung	644	25.2	20.9	19	6	11.72	4.46
Mosopa—edge of sandveld (Ralekgetho road)	792	31.1	27.5	17	15	6.9	6.89
Mosopa—Thamaga	624	21.1	51.3	14	11	10.66	3.44
Mmankgodi—Mosopa	948	24.3	36.3	22	26	9.58	7.55
Boatle (Ramotswa turn-off)—Mogonye—Mmankgodi	1,060	18.8	28.2	8	11	4.01	3.68
Mogobane turn-off—Borotsi—Ntlhantlhe—Ranaka	1,396	38.8	36.1	40	37	7.38	7.34
Ranaka—south through fields—Ntlhantlhe	778	62.8	47.4	43	41	8.8	11.13
Ntlhantlhe—Gamoswane (Kanye—Lobatse road)	858	57.8	62.6	38	36	7.67	6.71
8 km along Mmathethe—Kanye road	326	79.1	70.2	7	5	2.71	2.18
Pelotshetlha turn-off—Dipotsana	748	52.8	75.5	10	8	2.6	1.42
Lobatse road turn-off—Mmathethe	1,548	55.7	56.8	17	16	2.07	1.82
Mmathethe—Metlojane	1,084	28.1	21.3	2	11	0.66	4.77
Mmathethe—Good Hope	1,100	39.4	30.6	6	9	1.38	2.67
Mmathethe—Metlobo	1,470	43.2	45.3	14	10	2.21	1.5
Good Hope—Lorwana	944	57	75	18	17	3.34	2.4
Metlojane—Good Hope	372	60.1	43.5	1	2	0.45	1.24
Metlojane—Makgomane	630	79.2	60.9	15	7	3.01	1.83
Borobodilepe—Hebron—Phitsane Molopo	1,946	28.2	27.2	18	8	3.27	1.51
TOTAL OF 30 TRANSECTS SURVEYED IN BOTH 1992–93 AND 2007	33,640	32.1	33.9	447	396	4.14	3.47
Oodi—Mochudi	1,282	14.1		11		6.08	
Oodi—Mochudi	1,580		18.9		3		1.05
Mogoditshane—Mmopane—E corner of airport	896	28.4		18		7.08	
Mogoditshane—Mmopane—E corner of airport	1,092		30.9		14		4.14
Makgomane—Tswaaneng	1,132	48		4		0.74	
Makgomane—Tswaaneng	1,256		47.1		4		0.68
TOTAL OF 33 TRANSECTS (2007 data)	36,950	31.9	33.6	480	417	4.07	3.3
Lentsweletau—Botlhapatlou (January 2008)	1,962	29.3		37		6.25	
Pitsane—Tlharaseleele—Rakhuna	692	54.5		4		1.06	
TOTAL OF ALL DATA	39,604	32.2		521		4.09	

There is no correlation between change in area of suitable habitat and change in numbers, indicating that there is currently no shortage of suitable habitat. While near Mmankgodi and Kopong a decline in numbers appears to be related to bush encroachment, there are other transects where numbers have increased despite a large decrease of suitable habitat between the two surveys. For example, for the transect from immediately north of Thamaga westwards along the power-line, the area of suitable habitat decreased from 490 ha to 216 ha, whilst the number of pairs recorded increased from 14 to 23 pairs.

In 2007 the highest densities of Short-clawed Larks were recorded for the transect northwards from Kubung to north of Losilokgokong, with 25 pairs in 189.86 ha, i.e. 1 pair / 7.6 ha. Noticeably high densities were also recorded locally around Gathwane, on a section of the transect from Good Hope to Lorwana. Around Gathwane ten pairs were recorded in 78 ha of suitable habitat, a density of 1 pair / 7.8 ha. In 1992, between Ranaka and Ntlhantlhe, 30 pairs were recorded in 234 ha of suitable habitat, i.e. 1 pair / 7.8 ha.

Continued occupation by territorial males

In both surveys, coordinates (correct to the nearest hundredth of a minute) were recorded for the point on the road closest to each territorial male. The perpendicular distance from the road was also recorded. With these data the localities of territories could be compared between the two surveys.

For all birds recorded less than 110 m from the road in 2007, 38% (127 out of 334) were in the same localities (±100 m) as a territorial male in 1992–93. For birds <60 m from the road, 39% (93 of 237) were at the same location (±100 m) as a territorial bird in 1992–93. However, continued occupation of localities by territorial males was in general lower, or even non-existent, for transects where Short-clawed Lark occurs at lower densities and higher for transects with higher densities. Such a relationship is perhaps not unexpected as where Short-clawed Larks occur at highest densities, the great majority of suitable habitat is likely to be occupied. The highest continued occupation of localities by territorial males was for all three transects near Ntlhantlhe where 63% of the territories <110 m from the road remained occupied and 68% of those <60 m from the road.

Range limits

The 1992–93 survey found that the core range of Short-clawed Lark extended westwards to Phitsane Molopo, Tswaaneng, Metlobo, Pitseng and Gasese. Field work in January 2008, in areas not visited in 1992–93, established that it extends slightly further west along the Molopo Valley, west of Phitsane Molopo. The westernmost record in this area is of a bird seen west of Leporung at 25°47.50'S 24°52.27'E. In January 2008 the species was also found commonly to the south of Sesung. These records extend its known range but it seems likely that it had simply been overlooked in 1992–93, due to lack of visits, rather than the species has expanded its range.

Between Gasese and Letlhakeng, along the Moshaweng Valley, there was a drastic reduction in numbers at the edge of the range between the two surveys: from 24 territorial males in 1992 to only three in 2007. In 2007, the most northerly record was in the Moshaweng Valley at 24°22.97'S 25°01.04'E, exactly where there was also a record in 1992, whereas in 1992 the northernmost record was at 24°14.82'S 24°59.84'E, 16 km further north. The apparent contraction of range from the northern Moshaweng Valley is the only indication of any change in the core range between the two surveys.

The northern limit of the core range of Short-clawed Lark is *c.*24°00'S. North this there are only scattered records. There were two isolated records in 1993, north-west of the core range, one *c.*14 km north-northwest of Letlhakeng and the other *c.*17 km north-west of Botlhapatlou. These two locations were not visited in 2007–08; both are situated in valleys, which provide some localised suitable habitat, in areas that are largely unsuitable for Short-clawed Larks, due to the predominant Kalahari sands.

In 1992 two birds were found near Lephephe, well to the north of the core range of the species, and birds were also recorded at two other different locations to the east-northeast of Lephephe. There was also, in 1992, an isolated record east of Shoshong at 23°15.01'S 26°34.85'E, which is the most northerly location at which Short-clawed Lark has been reported in Botswana. In 2007–08 the Lephephe area was searched, without success, for Short-clawed Lark. Attention was then focused on the Sojwe area, west of Lephephe, where a territorial bird was eventually located 11 km

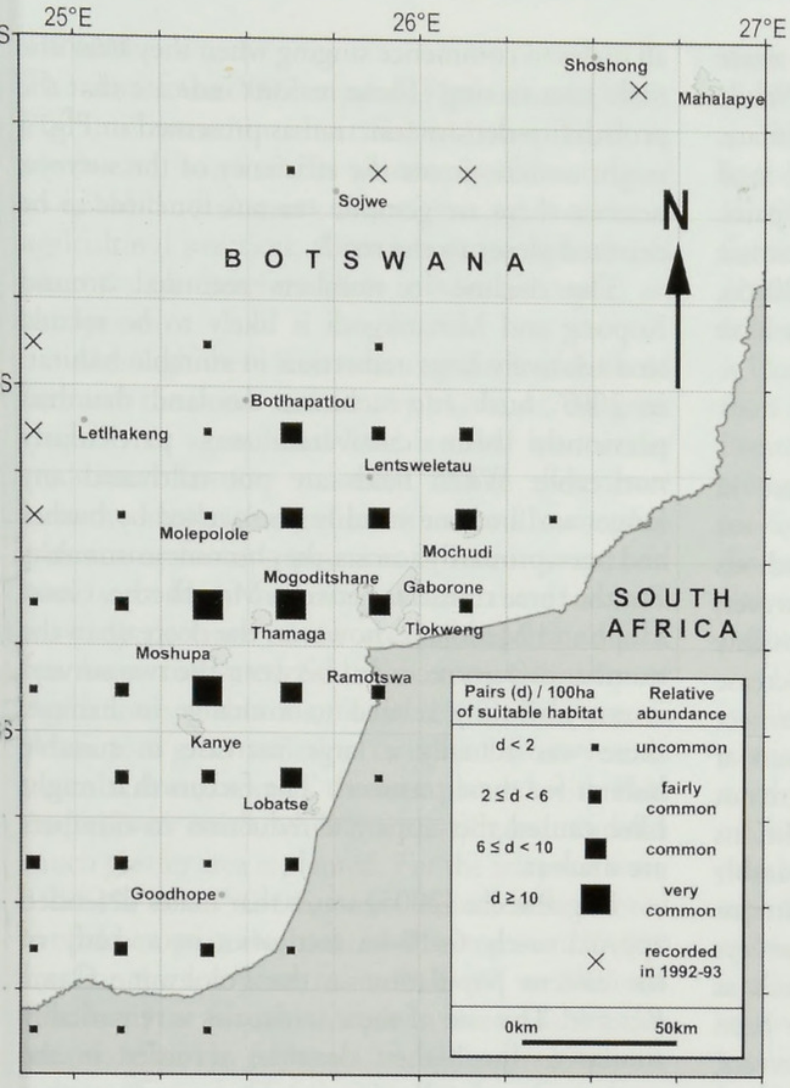

Figure 4. Distribution of Short- clawed Lark *Certhilauda chuana* in south-eastern Botswana 2007–08.

Répartition de l'Alouette à ongles courts *Certhilauda chuana* au sud-est du Botswana 2007–08.

north of Sojwe. The continued presence of Short-clawed Lark in the Lephephe area was therefore confirmed, though it certainly must occur only sparsely in this area

In the east, in 1992–93, transect surveys from Sikwane and from Mochudi to Olifants Drift failed to produce any records of Short-clawed Lark and, apart from one record *c.*20 km south-east of Mochudi, on the road to Mabalane, it was not found to the east of Mochudi. In January 2008 territorial birds were seen about 22 and 28 km east north-east of Mochudi. These records extend the known limits of its range in the east; it is likely, however, that Short-clawed Lark had been overlooked in this area, due to lack of visits, rather than the species had extended its range.

Short-clawed Lark was searched for, without success, between Tlokweng, a large urbanised village immediately to the east of Gaborone, and the South African border; the predominantly black cotton soils in this area appear to provide unsuitable habitat. It was neither recorded in the city of Gaborone, nor on freehold land immediately to the south of Gaborone, where suitable habitat is lacking. On most freehold land to the north and south of Lobatse it is likely to be absent due to lack of suitable habitat (rocky hills and wooded savannas). It does, however, occur commonly close to the South African border in the Ramotswa area.

Population estimate

An estimate of the population of Short-clawed Lark in south-eastern Botswana involves the consideration of several parameters. These include the range, the proportion of the range that is suitable, the representativeness of the transects, the density in suitable habitat and the proportion of the territories that were detected in surveys.

The total range, excluding the outlying Lephephe area, where it occurs only sparsely, is estimated at 16,000 km^2. For the calculations, we use 2007 and January 2008 transects except for parts of three transects (Mmamashia–Mabalane, Mabalane–Mochudi and Letlhakeng–Gasese) that are not considered to be within the range. 2002 data (Department of Surveys and Mapping, Gaborone, *in litt.* 2008) indicate that 42.8% of the range of Short-clawed Lark has a land-use which could make it suitable for the species. From our transect surveys 31.7% is suitable habitat and the average density of Short-clawed Lark here was 3.9 pairs / 100 ha; we use these figures in the calculation.

The proportion of occupied territories that were detected during transect surveys is more debatable than the other variables. We use the figure of an efficiency of 46% as indicated by the curve in Fig. 3, which could represent a probability-density function.

Based on the above figures, we estimate the total population of Short-clawed Larks at 43,000 pairs. If the efficiency of the data is assumed to be higher (e.g. 60%, see discussion for particular reasons affecting the probability of recording),

the population could be 33,000 pairs. Both these figures contain a wide margin of error. While it is difficult to make a more accurate estimate, it seems reasonable to assume that the total population in 2007 was in excess of 20,000 pairs. This is an improvement on the previous estimate ('over 10,000 pairs') made by Herremans (2005), which even referring to data of 1992–93 may have been too prudent.

Discussion

For comparable transects a 12.9% increase in numbers and a 19.2% increase in density was recorded between the two surveys. The methods used for the two surveys were the same. However, some of the differences in numbers could possibly be accounted by factors other than an increase in numbers. For example, comparable transect surveys could have possibly been undertaken at different times of day, when detection rates are not necessarily the same. Secondly, weather conditions might not have been the same for comparable transects; surveys undertaken in good conditions are likely to be more comprehensive than surveys undertaken in unfavourable conditions, such as windy or hot days. There might too have been differences in the approaches of the observers. Due to these factors it likely, as stated above, that the data contain a wide margin of error. Nevertheless, the results of the two surveys suggest that there has been a modest increase in numbers between the two surveys.

There appear to be three possible reasons for a greater proportion of birds being recorded closer to roads. Firstly, detection probability decreases with distance: birds that are at greater distance from the road are more likely to be overlooked as their vocalisations are less likely to be heard than those that are closer to the road, particularly on windy days. Secondly, as already indicated, Short-clawed Larks tend to move towards an intruder, which makes them more likely to be encountered nearby than further away. Birds at greater distances are, however, expected to be less likely to move to an intruder as their territories would be less likely to include the road. Thirdly, the use of a tape-recording to locate territorial birds is more likely to be effective for birds nearby than for distant birds, particularly because the vehicle's sound system was not powerful (50 watt). However, these factors could be partially offset by the tendency of all males to commence singing when they hear one male start to sing. These reasons indicate that the probability-density function as presented in Fig. 4 might underestimate the efficiency of the surveys, because there are genuine reasons for birds to be detected closer to the roads.

The decline in numbers recorded around Kopong and Mmankgodi is likely to be related to a relatively large reduction in suitable habitat: in 2007, bush encroachment on land that had previously been cultivated was particularly noticeable. When fields are not cultivated any longer and become steadily encroached by bushes and trees, primarily acacias, they become unsuitable. For the three transects between Mmathethe, Good Hope and Metlojane, however, the decrease in the number of pairs recorded between the two surveys is not obviously related to a change in habitat; there was actually a large increase in suitable habitat for these transects. The factors that might have caused this apparent reduction in numbers are unclear.

Engelbrecht (2005) states that males defended approximately 6–10-ha territories in a study of the eastern population in the Polokwane Game Reserve. The size of these territories is remarkably similar to the highest densities recorded in the two surveys in Botswana. This suggests that when Short-clawed Lark was recorded at its highest densities in south-east Botswana, almost all available suitable habitat was occupied by territorial males.

Considering, firstly, that not all territorial birds were recorded and, secondly, that 12.9% more territories were located in 2007 compared to 1992–93, the degree of continued occupation of localities by territorial birds is probably considerably higher than the above figures suggest. If all territories <60 m from the road were detected in 2007 and 60% of the territories, irrespective of the distance from the road, were detected in 1992–93, then an estimated 65% of the localities recorded as occupied in 2007 were also occupied in 1992–93. Given the higher number of territories recorded in 2007, the degree of continued occupation of localities over the period between the two surveys is likely to be slightly higher, possibly over 70%. These figures suggest that localities have ceased to be occupied at an estimated average rate of *c.*3% per annum between the two surveys.

Threats

The data from 2007 support Herremans' (1997, 2005) contention that Short-clawed Lark in south-east Botswana is almost totally restricted to tribal land that is cultivated using traditional agricultural practices. Any changes to agricultural practices are therefore likely to have an impact on the species.

Although there is an extensive block of freehold farms to the north and south of Lobatse, the great majority of agricultural land is tribal land under traditional farming practices. While there have been no major changes in either land ownership patterns or farming practices in recent years, and none seem likely in the near future, there has been a steady decrease in the area of tribal land that has been cultivated for field crops (Ministry of Agriculture, Gaborone, *in litt.* 2008). Botswana is prone to a great variation in rainfall from year to year. In drought years the area planted with field crops is very small, while in years of good rainfall a much greater area is planted. For the ten years from 1981–82 to 1990–91, mean annual area planted for field crops in the traditional sector was 227,890 ha. For the ten years from 1996–97 to 2005–06 (the last year for which figures are available) this area decreased by 53% to 106,260 ha. In 1988–89, a year of good rainfall, 237,100 ha of sorghum and 76,000 ha of maize were planted in the traditional sector, while in 2005–06, another year with good rainfall, the totals were only 38,700 and 45,900 ha. These figures illustrate the precipitous decline of the area planted with sorghum in the traditional sector in recent years. The area planted with maize has also decreased, but less markedly. Though there are no supporting data, the reasons for these decreases are likely to be primarily socio-economic. With increasing prosperity and a higher standard of education young people tend to lose interest in farming. Older people also appear to have lost some of the enthusiasm to farm, either due to increasing age or due to the opportunity now to be able to rely financially on their relatives working in the urban areas. Whereas previously, young people would help their older relatives with cultivation of their fields, now they are more likely to be gainfully employed in urban areas and unable to assist their relatives in cultivation of the land. In 2008 the government introduced a new scheme, ISPAAD (Integrated Support Programme for Arable Agricultural Development), to support the traditional sector, in a bid to reverse the decline in crop production.

The result of declining cultivation of field crops is a decline in the availability of suitable habitat for Short-clawed Larks. As less land is cultivated, fields are encroached by bushes, rendering them unsuitable. It is unclear how long it takes for a fallow field to become bush encroached, but it is likely to be more rapid in years of high rainfall than in dry years and when there is no grazing by livestock. Though there are no supporting data, it seems possible that it can take ten years or more for a fallow field to be encroached by *Acacia* to the extent that it becomes unsuitable for Short-clawed Lark. For several years, when bushes are coppicing, the land can still be suitable.

The other main threat to Short-clawed Larks is likely to be the expansion of settlements, particularly the city of Gaborone and the villages nearby. While currently Gaborone is situated on land that in recent years has never provided suitable habitat for Short-clawed Larks, the rapid expansion of the city and of nearby villages, such as Mogoditshane, Mmopane and Metsimotlhaba, is taking place where Short-clawed Larks occur at relatively high density. Inevitably there will be a localised decline in the numbers of Short-clawed Larks, particularly to the north of Gaborone. The expansion of settlements is also taking place elsewhere in south-east Botswana, albeit to not such a great extent. It is possible, too, that the large numbers of small stock discourage farmers to cultivate fields close to the settlements due to the high risk of goats destroying their crops. Therefore bush encroachment of fields is likely to be greater close to settlements than elsewhere. This was noted particularly around Kopong, Mmankgodi and Lorwana.

The current favourable status of Short-clawed Lark in south-east Botswana is in sharp contrast with that in the adjacent parts of its range in South Africa, where the species has experienced an apparent range contraction and a possible decline in numbers (Engelbrecht *et al.* 2007). The factors that Engelbrecht *et al.* (2007) consider to be inimical to Short-clawed Lark in South Africa include commercial agriculture, cultivation of pasture grass, insufficient grazing pressure resulting in excessively lush vegetation, bush encroachment in areas with traditional agricultural practices and, lastly, development. In contrast to

its status on agricultural land there, where very few birds were found, it was common in the Botsolano Game Reserve, a protected area in Botswana close to the South African border, near Pitsane, where commercial agriculture, cultivation of pasture grasses and insufficient grazing pressure do not occur, or only marginally so. Bush encroachment and development have, as yet, only a localised effect on numbers in south-eastern Botswana.

In conclusion, Short-clawed Lark is currently still doing well in south-eastern Botswana. Results suggest that numbers have shown a small increase since an earlier survey was undertaken in 1992–93. Its conservation status is favourable, and, due to a possible decline in numbers in South Africa (Engelbrecht *et al.* 2007), its population probably constitutes an increasingly large proportion of the world population of this species. However, the continued decline in the cultivation of field crops using traditional practices presents a potential threat. The most beneficial support for the species would appear to be an incentive, by the government of Botswana, to farmers to cultivate sorghum and maize using traditional practices. This would not only support the Short-clawed Lark but also improve farmers' livelihoods and Botswana's food security.

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Appendix 1. Gazetteer of localities
Annexe 1. Liste des localités citées

Boatle	24°50'S 25°49'E	Mmopane	24°44'S 25°52'E
Borobodilepe	25°37'S 25°29'E	Mochudi	24°23'S 26°08'E
Borotsi	24°57'S 25°43'E	Modipane	24°37'S 26°07'E
Bokaa	24°26'S 26°01'E	Mogobane	24°58'S 25°42'E
Botlhapatlou	24°02'S 25°30'E	Mogoditshane	24°37'S 25°52'E
Dipotsana	25°14'S 25°25'E	Mogonye	24°49'S 25°42'E
Gaborone	24°40'S 25°55'E	Molepolole	24°24'S 25°31'E
Gamoswane	25°07'S 25°29'E	Mosopa	24°47'S 25°25'E
Gasese	24°31'S 25°03'E	Ntlantlhe	24°58'S 25°35'E
Good Hope	25°28'S 25°26'E	Olifant's Drift	24°11'S 26°51'E
Hatsalatladi'	24°08'S 25°35'E	Oodi	24°34'S 26°02'E
Hebron	25°40'S 25°24'E	Pelotshetlha	25°12'S 25°22'E
Kanye	24°58'S 25°20'E	Pilane	24°24'S 26°05'E
Kopong	24°28'S 25°54'E	Pitsane	25°28'S 25°36'E
Kubung	24°37'S 25°20'E	Phitshane Molopo	25°45'S 25°13'E
Lephephe	23°21'S 25°51'E	Pitseng	24°41'S 25°02'E
Leporung	25°46'S 24°58'E	Rakhuna	25°34'S 25°34'E
Letlhakeng	24°06'S,25°02'E	Ralekgetho	24°41'S 25°11'E
Lentsweletau	24°15'S 25°51'E	Ramotswa	24°52'S 25°53'E
Lobatse	25°13'S 25°40'E	Ranaka	24°55'S 25°28'E
Lorwana	25°19'S 25°32'E	Rasesa	24°22'S 26°05'E
Losilokgokong	24°33'S 25°22'E	Sesung	24°53'S 25°00'E
Mabalane	24°38'S 26°22'E	Shoshong	23°02'S 26°30'E
Makgomane	25°33'S 25°14'E	Sikwane	24°38'S 26°24'E
Metlobo	25°26'S 24°58'E	Sojwe	23°26'S 25°45'E
Metlojane	25°32'S 25°22'E	Thamaga	24°40'S 25°32'E
Mmamashia	24°32'S 26°00'E	Tlharaseleele	25°29'S 25°37'E
Mmankgodi	24°44'S 25°39'E	Tlokweng	24°40'S 25°57'E
Mmathethe	25°19'S 25°16'E	Tswaaneng	25°31'S 24°59'E