

A survey for the Critically Endangered Liben Lark *Heteromiraфра archeri* in Somaliland, north-western Somalia

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The Critically Endangered Archer's Lark (now Liben Lark) *Heteromiraфра archeri* was formerly considered to be endemic to north-western Somalia and known only from the Tog Wajaale Plain, where 18 specimens were collected between 1918 and 1922. Fifteen visits between 1970 and 2008 failed to relocate the species here, although populations are now known from adjacent Ethiopia. We conducted three days of intensive surveys on the Tog Wajaale Plain in May 2010. Despite the three other lark species present being in full display, and *H. archeri* being recorded to have bred in early June, no Liben Larks were found. Vegetation structure surveys indicated that the plain has a taller and denser growth of grass than either of the other known localities for Liben Lark, the Liben and Jijiga Plains, making Tog Wajaale Plain seem superficially more suitable for the species, which prefers areas of taller grass elsewhere. However, previous large-scale agricultural activities may have altered the composition of grass species and precipitated the observed invasion of exotic weeds, notably *Parthenium hysterophorus*.

Importantly, too, the Tog Wajaale Plain has a greater density of bushes than either the Liben or Jijiga Plains, possibly making ground-nesting birds more susceptible to predation by perch hunters.

Keywords: Archer's Lark, *Heteromiraфра archeri*, Somalia, grassland, habitat degradation, *Parthenium hysterophorus*

Introduction

Prior to recent work reported in Spottiswoode et al. (2013), Archer's Lark *Heteromiraфра archeri* (now Liben Lark; hereafter *H. archeri* to avoid confusion) was known only from 18 specimens collected by Geoffrey Archer on the Tog Wajaale Plain, Somaliland, north-western Somalia, between September 1918 and June 1922, where he described it as "quite numerous" (Clark 1920, Archer & Godman 1961, Spottiswoode et al. 2013). Since then, the only report of it has been an unpublished sighting in 1955 by John Williams in "fairly open rocky country with scattered and sparse bush and limited grass cover", 15-40 km north-west of Boorama, c. 100 km north-west of the Tog Wajaale Plain (J. G. Williams in litt. 1984 in Collar and Stuart 1985). Subsequent searches of this area have failed to reveal any sign of it, and taken together with the atypical habitat and complete lack of supporting evidence, this record has been discounted (e.g. J. Miskell in litt. 2013). At the type locality, the Tog Wajaale Plain, fifteen visits by John Ash and John Miskell between 1970 and 2008 failed to turn up any birds and found widespread habitat disturbance within its range (BirdLife International 2015).

In this study our aim was to conduct an intensive survey across the Tog Wajaale Plain in order (i) to attempt to find *H. archeri*, and (ii) to characterise the habitat following methods employed on the Liben and Jijiga Plains (Spottiswoode et al. 2009, Donald et al. 2010,

Spottiswoode et al. 2013), such as to allow comparison with vegetation known to support *Heteromirafra* larks in southern and north-eastern Ethiopia respectively.

Study site and methods

The Tog Wajaale Plain (c. 9°40'N, 43°21'E) is situated along the Somaliland/Ethiopia frontier in north-western Somalia. It covers the region between the Wajaale River that forms the Somalia/Ethiopia border and two conspicuous hills to the north, Jifa Medir (9°42'47"N 43°16'44"E) in the north-west and Jifa Uri (9°43'19"N 43°23'30"E) in the north-east, located c. 11 km and 16 km north of the Wajaale River respectively. The area between these hills and the Wajaale River is approximately 250 km². The plain lies between 1525 m and 1640 m altitude.

Three days were spent on the Tog Wajaale Plain by MSLM, CC and JF in May 2010. On 19 May they covered as much of the area as possible, mostly driving along vehicle tracks and stopping to walk wherever habitat looked suitable for *Heteromirafra* larks, based on their experience on the Liben Plain and the habitat of Rudd's Lark *H. ruddi* in the South African montane grasslands, i.e. relatively pristine, open grassland. All observers were familiar with the vocalisations, plumage and behaviour of *H. archeri* in Ethiopia. They visited Jifa Medir, Jifa Uri and the Wajaale River, and as much area as possible in between, travelling c. 70 km in distance in order to identify the best areas for further survey. The mornings (sunrise to 10:30 am) of 29 and 30 May were spent walking straight-line transects through the least transformed grasslands in search of *H. archeri* and to conduct vegetation structure surveys every 250 m (following Spottiswoode et al. 2009, 2013 and Donald et al. 2010), walking a total of 4.90 km and 5.25 km on the two days, respectively. During the rest of these days, further explorations were made across c. 20 km of the area not previously covered, to search the plain as comprehensively as possible. During this time some basic interviews were made with local farmers and villagers as to previous agricultural activity in the area. The timing of the field visit coincided with the expected period of greatest display activity of *H. archeri*, immediately prior to breeding; seven active nests were found in early June 1922

(Archer & Godman 1961). All lark species present (Singing Bush Lark *Mirafrja cantillans*, Somali Short-toed Lark *Calandrella somalica* and Thekla Lark *Galerida theklae*) were in full display and song during the time. All other bird species observed were noted.

Results

Incidence of H. archeri

During our visit, no *H. archeri* were found. A total of 46 bird species was recorded (see Appendix 1) including species typical of the Liben Plain in Ethiopia, such as Kori Bustard *Ardeotis kori*, White-bellied Bustard *Eupodotis senegalensis*, Black-winged Lapwing *Vanellus melanopterus*, Somali Courser *Cursorius somalensis*, Somali Fiscal *Lanius somalicus*, Somali Crow *Corvus edithae*, Somali Short-toed Lark, Ethiopian Swallow *Hirundo aethiopica*, Speke's Weaver *Ploceus spekei* and Plain-backed Pipit *Anthus leucophrys* (Spottiswoode et al. 2010).

Vegetation

Vegetation surveys were conducted at 41 sample points spread at 250 m intervals along six transect lines. Data are presented in Appendix 2. Basic analyses of these quantitative data were made to compare the vegetation on the Tog Wajaale Plain with that of the Jijiga and Liben Plains (summarised in Table 1). We emphasise that the surveys on the Tog Wajaale Plain were conducted during an exceptionally wet year (Food Security and Nutrition Analysis Unit 2010). This suggests that comparisons with the other two locations from which *Heteromirafrja* larks have been recorded (the Jijiga and Liben Plains), surveyed in the same month the following year, should be treated with caution. With these caveats in mind, Kruskal-Wallis rank sum tests revealed significant differences between the three sites for all the variables we recorded (all $P < 0.001$). Notable differences between the Tog Wajaale Plain and the two other sites were as follows: of the three sites, the Tog Wajaale Plain had the lowest density of cowpats (which could either reflect lower grazing pressure, or decreased visibility owing to longer grass and increased decomposition arising from recent heavy rains) and had much the lowest proportional cover of bare ground and very short grass. Correspondingly, it had the highest proportional cover of the two longer grass categories. It also had the highest density of bushes (which were

woody species and hence unrelated to the unusually high rainfall that year). Two conspicuous features of the Liben Plain, the presence of giant fennel *Ferrula communis* plants and large circular open areas formed by nests of the harvester ant *Messor cephalotes* (Spottiswoode et al. 2009), were absent from both the Tog Wajaale and Jijiga Plains.

Although it was beyond our capability to do a comprehensive vegetation survey, almost all the plant species that we encountered and were able to identify are associated with soil disturbance. In particular, the plain was extensively invaded by the American weed *Parthenium hysterophorus*, a well-established and economically deleterious invasive species in north-eastern Africa (Nigatu et al. 2010; McConnachie et al. 2011) as it is elsewhere in Africa, Asia and Australia. In some of our transects, this weed was dominant in thick, waist-high patches, while in others the seedlings were only beginning to germinate and could easily have been under-recorded among the grasses. Other conspicuous invasive weed species recorded were *Solanum elaeagnifolium*, *Hibiscus trionum*, *Datura stramonium* and *Flaveria bidentis*. A number of grasses were not identified but common grasses we encountered, which occur predominantly in disturbed areas elsewhere in Africa, were *Tragus berteronianus*, *Aristida congesta* and *Chloris pycnothrix* (Van Oudtshoorn 2012). Both isolated bushes and large clumps of *Acacia etbaica*, which was dominant in the surrounding area, are invading the plain, especially on disturbed soil.

Human transformation

The entire extent of the Tog Wajaale Plain has been used for arable agriculture at different times since the 1950s, as corroborated by interviews of five residents of the plain, our own observations and reports of large-scale agricultural schemes for wheat, sorghum, millet and maize and associated ploughing (Ash & Miskell 1998). In addition, several hundred cattle and some goats, sheep and camels were observed grazing the plain, but no native grazing mammals were observed.

Discussion

While the extinction of *H. archeri* on the Tog Wajaale Plain is hard to prove, our failure to find this species during our deliberately-timed visit and the previous 15 failed attempts by Ash and Miskell (BirdLife International 2015) makes it highly probable that this is the case. We feel that further searches on the Somali side of the border are unlikely to bring positive results, although similar-looking habitat across the border in Ethiopia may be worth investigating as it would have been subject to a different sociopolitical history. Even here, however, satellite imagery from Google Earth suggests widespread human impacts on the habitat.

The most probable cause of the observed extinction of *H. archeri* on the Tog Wajaale Plain, or at least a major decline in its population here, is habitat change associated with agricultural activity. Higher and denser grass growth on the Tog Wajaale Plain compared with the Liben and Jijiga Plains may superficially appear to make the Tog Wajaale Plain more suitable for *H. archeri*, which favours areas of taller grass on the Liben and Jijiga Plains (Spottiswoode et al. 2009, Donald et al. 2010, Spottiswoode et al. 2013) and possesses a long hind claw associated with species that prefer denser grass to open ground (Green et al. 2008). The height of the grass probably resulted from particularly high rainfall in 2010, together with a lower density grazing mammals, as evidenced by fewer cowpats compared to the Liben and Jijiga Plains. However, extensive invasion of the grasslands by exotic weed species and likely changes in grass species composition, as evidenced by a preponderance of grass species associated with disturbance, appear to have made the habitat unsuitable. Furthermore, the Tog Wajaale Plain has a greater density of trees and bushes compared to the Jijiga and Liben Plains (and contrasting with Archer's original description of it as "open meadowland"; Archer & Godman 1937), perhaps facilitated by soil disturbance from ploughing. This is particularly relevant since some ground-nesting birds, such as Skylark *Alauda arvensis*, avoid nesting in fields with tall boundaries (Donald et al. 2001). This is thought to be an anti-predator response, since elevated perches such as fence lines, bushes and trees may increase predation risk and predation risk has been demonstrated to influence habitat selection of birds breeding in open habitats (Suhonen et al. 1994).

Fortunately a new population of *H. archeri* has been found on the Jijiga Plain of Ethiopia, c. 50 km south-west of the Tog Wajaale Plain, and is now known to belong to the same taxon as the birds collected by Archer on the Tog Wajaale Plain (Spottiswoode et al. 2013). Moreover, both populations appear to be conspecific with the Liben Lark (Spottiswoode et al. 2013). While this at least means that the taxon is not extinct, it is still known only from two very small and isolated populations where intensive human land-use is causing habitat degradation, putting it at high risk of extinction. The proliferation of the alien invasive plant *Parthenium hysterophorus* needs to be monitored closely as it is invading large areas of the remaining grasslands at the Tog Wajaale Plain. If it spreads to the species' last remaining populations on the Jijiga and Liben Plains it may compound the severe threats (overgrazing, bush encroachment and agricultural expansion) that *H. archeri* is already facing there. Early detection of *Parthenium* and developing effective methods to control it may play an important role in the future conservation of the species.

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Table 1. Comparison of vegetation and land use traits between the three sites from which *Heteromirafra* larks have been or are currently known in the Horn of Africa, as counted along transects at 250 m intervals, following Spottiswoode et al. (2009) and Donald et al. (2010). Within a 25 m radius of a central point, trees were counted. Within each of two sub-plots of 5 m radius, the number of bushes and cowpats were counted, the proportion cover of bare ground was estimated, and the percentage contribution to grass cover of each of four categories of grass height was estimated. Data are medians (ranges). Please see main text for cautionary comments.

	Tog Wajaale Plain (May 2010)	Jijiga Plain (May 2011)	Liben Plain (May 2011)
N sampling points	40	72	205
Trees	0 (0)	0 (0–1)	0 (0–76)
Bushes	0.2 (0–1.2) *	0 (0–7.5)	0 (0–30)
Cowpats	0 (0–1.9) *	1 (0–3)	2 (0–12)
Bare ground (%)	10 (0–90)	57.5 (2.5–100)	55 (5–95)
Grass < 5 cm (%)	50 (5–100)	95 (0–100)	65 (0–97.5)
Grass 5–15 cm (%)	28.8 (0–80)	2.5 (0–22.5)	32.5 (2.5–100)
Grass 15–40 cm (%)	15.0 (0–45)	0 (0–7.5)	0 (0–30)
Grass > 40 cm (%)	0 (0–50)	0 (0)	0 (0–10)

* On the Tog Wajaale Plain the number of bushes and cowpats were instead counted per 25 m radius plot in the field, but were converted here to being expressed per unit area represented by a 5 m radius plot.

1 APPENDIX 1. An annotated list of the birds observed on the Tog Wajaale Plain on 19, 29 and
 2 30 May 2010. Details of the two new species for Somaliland (*) are available elsewhere
 3 (Mills & Cohen, 2015 and Cohen et al., submitted).

English Name	Scientific Name	Notes
Yellow-necked Spurfowl	<i>Pternistis leucoscepus</i>	Seen on one day
Egyptian Goose	<i>Alopochen aegyptiaca</i>	Seen each day
Abdim's Stork	<i>Ciconia abdimii</i>	A flock of 21 on one day
African Sacred Ibis	<i>Threskiornis aethiopicus</i>	Nesting at Tog Wajaale town
African Spoonbill	<i>Platalea alba</i>	Two at a wetland
Western Cattle Egret	<i>Bubulcus ibis</i>	Nesting at Tog Wajaale town
Black-headed Heron	<i>Ardea melanocephala</i>	Nesting at Tog Wajaale town
Black-winged Kite	<i>Elanus caeruleus</i>	Just one
Black Kite	<i>Milvus migrans parasiticus</i>	Several over Tog Wajaale town
Tawny Eagle	<i>Aquila rapax</i>	One seen
Kori Bustard	<i>Ardeotis kori</i>	A couple seen in the north
White-bellied Bustard	<i>Eupodotis senegalensis</i>	Heard and seen on all days
Spur-winged Lapwing	<i>Vanellus spinosus</i>	Seen at wetlands
Black-winged Lapwing	<i>Vanellus melanopterus</i>	Quite numerous
Crowned Lapwing	<i>Vanellus coronatus</i>	Quite numerous
Kittlitz's Plover	<i>Charadrius pecuarius</i>	Two seen
Caspian Plover	<i>Charadrius asiaticus</i>	One bird in non-breeding plumage
Somali Courser	<i>Cursorius somalensis</i>	Small numbers seen
Dideric Cuckoo	<i>Chrysococcyx caprius</i>	One
Blue-naped Mousebird	<i>Urocolius macrourus</i>	Seen in bushy areas on the north of the plain
European Roller	<i>Coracias garrulus</i>	Two on our first visit
Red-backed Shrike	<i>Lanius collurio</i>	One seen
Somali Fiscal	<i>Lanius somalicus</i>	Quite numerous. Recently fledged nestlings seen
Cape Crow	<i>Corvus capensis</i>	Common
Pied Crow	<i>Corvus albus</i>	Fairly common
Somali Crow	<i>Corvus edithae</i>	Several seen. One hybrid with Pied Crow seen
Singing Bush Lark	<i>Mirafra cantillans</i>	Common and in full display
Somali Short-toed Lark	<i>Calandrella somalica</i>	Common and in full display
Thekla Lark	<i>Galerida theklae</i>	Fairly numerous
Chestnut-backed Sparrow-Lark	<i>Eremopterix leucotis</i>	Common
Barn Swallow	<i>Hirundo rustica</i>	Three seen
Ethiopian Swallow	<i>Hirundo aethiopica</i>	Quite numerous
*Zitting Cisticola	<i>Cisticola juncidis</i>	A few seen, the first record for Somaliland
Wattled Starling	<i>Creatophora cinerea</i>	One seen
*Red-breasted Wheatear	<i>Oenanthe bottae</i>	One seen, the first record for Somaliland
Swainson's Sparrow	<i>Passer swainsonii</i>	Common
White-headed Buffalo Weaver	<i>Dinemellia dinemelli</i>	Seen in more bushy areas
Speke's Weaver	<i>Ploceus spekei</i>	A few small colonies seen
Chestnut Weaver	<i>Ploceus rubiginosus</i>	One breeding male seen
Red-billed Quelea	<i>Quelea quelea</i>	Fairly numerous
Northern Red Bishop	<i>Euplectes franciscanus</i>	One breeding-plumage male

Cut-throat Finch	<i>Amadina fasciata</i>	Several sightings
African Silverbill	<i>Euodice cantans</i>	A flock of c. 10 seen
Straw-tailed Whydah	<i>Vidua fischeri</i>	One male in breeding plumage
African Pipit	<i>Anthus cinnamomeus</i>	Common
Plain-backed Pipit	<i>Anthus leucophrys</i>	Four seen

APPENDIX 2. Vegetation structure data collected at the 42 sample points located at 250 m intervals along six transect lines. Methods follow Spottiswoode et al. 2009 and Donald et al. 2010. Briefly, number of trees, fennel plants and ant nests (both of which were absent from the Tog Wajaale Plain), cattle or human paths, cattle, huts, bushes (woody shrubs) and cowpats were counted within a 25 m radius of the central point given. Then, the proportion coverage of bare earth, *Parthenium* weeds (not present on the Liben Plain), and grass of four height categories were estimated by eye in each of two subplots of 5 m radius within the main 25 m plot. Transect 2, point 10 was in a maize field and is excluded from analyses.

Transect	Point	Lat (°N)	Lon (°E)									Sub-plot A						Sub-plot B					
				Trees	Fennel	Ant nests	Paths	Cattle	Huts	Bushes	Cowpats	% bare	% weeds	Grass <5	Grass 5-15	Grass 15-40	Grass >40	% bare	% weeds	Grass <5	Grass 5-15	Grass 15-40	Grass >40
1	1	9.63408	43.34856	0	0	0	0	0	0	24	1	0	10	75	5	20	0	0	40	30	50	20	0
1	2	9.63586	43.34718	0	0	0	0	0	0	6	0	20	20	40	10	50	0	20	-	70	10	20	0
1	3	9.63764	43.34579	0	0	0	0	0	0	9	0	30	0	90	10	0	0	10	0	80	0	20	0
1	4	9.63940	43.34438	0	0	0	0	0	0	7	0	0	30	60	10	20	10	10	20	70	10	20	0
1	5	9.64118	43.34300	0	0	0	0	0	0	16	0	20	10	50	10	10	30	10	0	50	10	30	10
1	6	9.64297	43.34162	0	0	0	0	0	0	3	0	0	30	50	40	10	0	10	10	70	10	20	0
1	7	9.64475	43.34022	0	0	0	1	0	0	12	1	10	0	90	0	10	0	20	0	70	0	30	0
1	8	9.64654	43.33883	0	0	0	0	0	0	2	1	10	30	60	10	30	0	10	10	80	10	10	0
1	9	9.64832	43.33744	0	0	0	0	0	0	6	2	10	10	80	10	10	0	10	10	80	10	10	0
2	1	9.64330	43.33365	0	0	0	0	0	0	5	3	10	20	50	10	20	20	0	10	40	10	40	10
2	2	9.64172	43.33203	0	0	0	0	0	0	3	6	20	10	50	10	40	0	10	20	40	10	50	0
2	3	9.64019	43.33037	0	0	0	0	0	0	3	0	10	10	60	10	30	0	10	20	50	30	20	0
2	4	9.63868	43.32868	0	0	0	0	0	0	3	0	10	0	90	10	0	0	20	10	50	0	50	0
2	5	9.63714	43.32702	0	0	0	1	0	0	1	0	10	10	20	70	10	0	10	10	50	30	20	0
2	6	9.63555	43.32541	0	0	0	1	0	0	8	1	10	10	80	0	10	10	10	20	50	0	10	40
2	7	9.63414	43.32364	0	0	0	1	0	0	3	0	80	90	50	0	0	50	80	90	50	0	0	50
2	8	9.63264	43.32193	0	0	0	0	0	0	8	0	10	20	70	10	20	0	0	20	40	50	10	0
2	9	9.63106	43.32031	0	0	0	0	0	0	2	0	10	30	40	50	10	0	0	30	20	80	0	0

2	10	9.62944	43.31875	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-		
3	1	9.62673	43.33573	0	0	0	0	0	0	5	0	10	10	70	20	10	0	10	0	30	60	10	0
3	2	9.62526	43.33400	0	0	0	0	0	0	5	0	10	20	20	60	10	10	10	10	10	60	20	10
3	3	9.62377	43.33230	0	0	0	0	0	0	15	3	90	10	-	-	-	-	90	10	100	0	0	0
3	4	9.62232	43.33057	0	0	0	0	0	0	3	1	20	20	30	50	20	0	20	10	50	30	20	0
4	1	9.62627	43.33147	0	0	0	0	0	0	4	0	0	10	10	60	30	0	0	20	10	50	20	20
4	2	9.62830	43.33245	0	0	0	0	0	0	6	0	20	-	50	30	20	0	10	0	0	80	20	0
4	3	9.63037	43.33337	0	0	0	0	0	0	5	0	10	20	20	60	20	0	10	10	10	80	10	0
4	4	9.63240	43.33432	0	0	0	0	0	0	4	0	10	30	30	20	30	20	10	0	30	10	50	10
4	5	9.63445	43.33526	0	0	0	0	0	0	6	0	0	50	0	40	60	0	10	20	10	60	20	10
4	6	9.63648	43.33622	0	0	0	0	0	0	3	0	20	0	70	0	30	0	30	0	50	0	30	20
4	7	9.63852	43.33717	0	0	0	0	0	0	2	0	50	20	0	50	50	0	30	0	60	10	30	0
5	1	9.66328	43.33155	0	0	0	0	0	0	31	0	30	20	10	80	10	0	10	10	10	80	10	0
5	2	9.66458	43.32970	0	0	0	0	0	0	22	0	20	10	60	0	0	40	30	20	30	60	0	10
5	3	9.66594	43.32788	0	0	0	0	0	0	26	2	30	10	70	10	10	10	20	30	50	30	20	0
5	4	9.66723	43.32602	0	0	0	1	0	0	27	2	20	20	40	40	20	0	10	20	20	60	10	10
5	5	9.66861	43.32421	0	0	0	0	0	0	18	0	60	10	100	0	0	0	50	40	50	50	0	0
5	6	9.67000	43.32244	0	0	0	0	0	0	6	0	40	10	50	50	0	0	40	10	50	50	0	0
6	1	9.67163	43.33174	0	0	0	0	0	0	30	0	60	30	50	50	0	0	60	30	50	50	0	0
6	2	9.66940	43.33206	0	0	0	0	0	0	15	1	10	20	10	80	10	0	10	30	10	80	10	0
6	3	9.66727	43.33281	0	0	0	0	0	0	12	0	10	20	30	60	0	10	10	30	10	70	10	10
6	4	9.66504	43.33317	0	0	0	0	0	0	16	0	10	0	90	0	0	10	10	20	10	60	20	10
6	5	9.66288	43.33377	0	0	0	0	0	0	14	1	10	10	40	40	20	0	10	20	10	60	30	0