

## Taxonomic status of the Degodi Lark *Mirafra degodiensis*, with notes on the voice of Gillett's Lark *M. gilletti*

by N. J. Collar, C. Dingle, M. N. Gabremichael & C. N. Spottiswoode

Received 14 May 2008

**SUMMARY.**—When first described, from two specimens taken at Bogol Manyo (=‘Bogol Mayo’) in south-east Ethiopia in 1971, the Degodi Lark *Mirafra degodiensis* was considered a sibling species of the Horn of Africa’s Gillett’s Lark *M. gilletti*. However, subsequent field reports have failed to clarify how the two taxa can be separated. In order to evaluate the differences between Degodi Lark and Gillett’s Lark we measured the two Degodi specimens (plus one we caught ourselves) and 43 Gillett’s, reviewed the literature on the subject to assemble all the published diagnostic characters, and visited Bogol Manyo and adjacent areas to photograph, observe and sound-record both taxa. We find that there is no morphometric disjunction between the taxa, no evidence of vocal separation, no consistent plumage difference, and no molecular distinction. We therefore regard *M. degodiensis* as most probably a synonym of *M. gilletti*; if it is retained as a subspecies of *gilletti* it must be chiefly on account of its smaller mean size.

The Degodi Lark *Mirafra degodiensis* was described on the basis of two specimens collected at Bogol Manyo (=‘Bogol Mayo’), eastern Ethiopia, in November 1971 (Erard 1975 [apparently only published in 1976, *vide* R. J. Dowsett *in litt.* 2008]). These specimens closely resembled Gillett’s Lark *M. gilletti* but were distinguished mainly on the basis of their shorter tails, and also of distinctive combinations of certain other mensural variables; the describer was inclined to consider them as meriting only subspecific status but, on the recommendation of C. Vaurie in the light of their seeming parapatric relationship to populations of Gillett’s Lark, he elected to treat them as a sibling species of Gillett’s (Erard 1975; C. Erard pers. comm. 2007 and *in litt.* 2008). Since that time the species has been found nowhere else and has therefore been listed as at risk (current IUCN status Vulnerable) owing principally to its highly restricted range (Collar & Stuart 1985, Stattersfield & Capper 2000, BirdLife International 2008); in turn, this small range has been crucial in the identification of the pastoral bushlands around Bogol Manyo as an Important Bird Area (EWNHS 1996, 2001).

However, only a few observers have made their way so far east in Ethiopia to investigate the species, and none has sought to survey it in order to determine the true limits of its distribution and therefore its more exact conservation status. Moreover, those few that have made the journey—Ash & Gullick (1990), Webb & Smith (1996), Francis & Shirihai (1999), N. Borrow (*in litt.* 2007)—are by no means uniformly confident or clear over the identification of the species. Consequently the task of attempting a survey of its range and conservation status remains problematic, and the value of such work questionable. Prompted in particular by the doubts of N. Borrow (*in litt.* 2007 and to J. S. Ash in 2006), we assembled the sparse literature on the Degodi Lark and Gillett’s Lark, listed out the characters offered by various observers as certainly or possibly diagnostic of the former, and set them against our own evidence gathered during a two-night visit to Bogol Manyo (18–19 June 2007; 04°31’N, 41°32’E) and adjacent areas along the road from Filtu (05°07’N, 40°39’E) to beyond Cole (05°25’N, 41°49’E), where we sought to find, photograph and sound-record

a sample of birds representative both of *M. degodiensis* and of *M. gilletti*, and to capture a specimen of *M. degodiensis*. We also examined and measured the only material of *M. degodiensis* ( $n=2$ ) and the combined series of *M. gilletti* ( $n=43$ ) held in the American Museum of Natural History, New York (AMNH) (16 specimens), Natural History Museum, UK (BMNH) (21), Los Angeles County Museum (LACM) (1), Muséum National d'Histoire Naturelle, Paris (MNHN) (2) and National Museum of Natural History, Washington DC (USNM) (3), and we sought further information and clarification from previous observers at Bogol Manyo, namely John S. Ash, Nik Borrow and Christian Erard himself.

### Records, range and habitat of the Degodi Lark

Records of birds judged or assumed to be Degodi Lark come from a very limited area, extending from 17 km west of Bogol Manyo (Webb & Smith 1996) to the Cole area, 25 km south-east of Bogol Manyo (C. Hillman & MNG unpubl. data), and comprise these outliers plus Bogol Manyo village itself (N. Borrow & MNG unpubl. data), the type locality 11 km east of Bogol Manyo (Erard 1975, Ash & Gullick 1990, Hornbuckle *et al.* 1996; pers. obs.), and points 15 km and 17 km east of Bogol Manyo (EWNHS 2001). Thus the species is known, so far as we are aware, from six localities extending over 42 km along the Filtu–Dollo road (see Fig. 1) and over an altitudinal range of c.200–400 m.

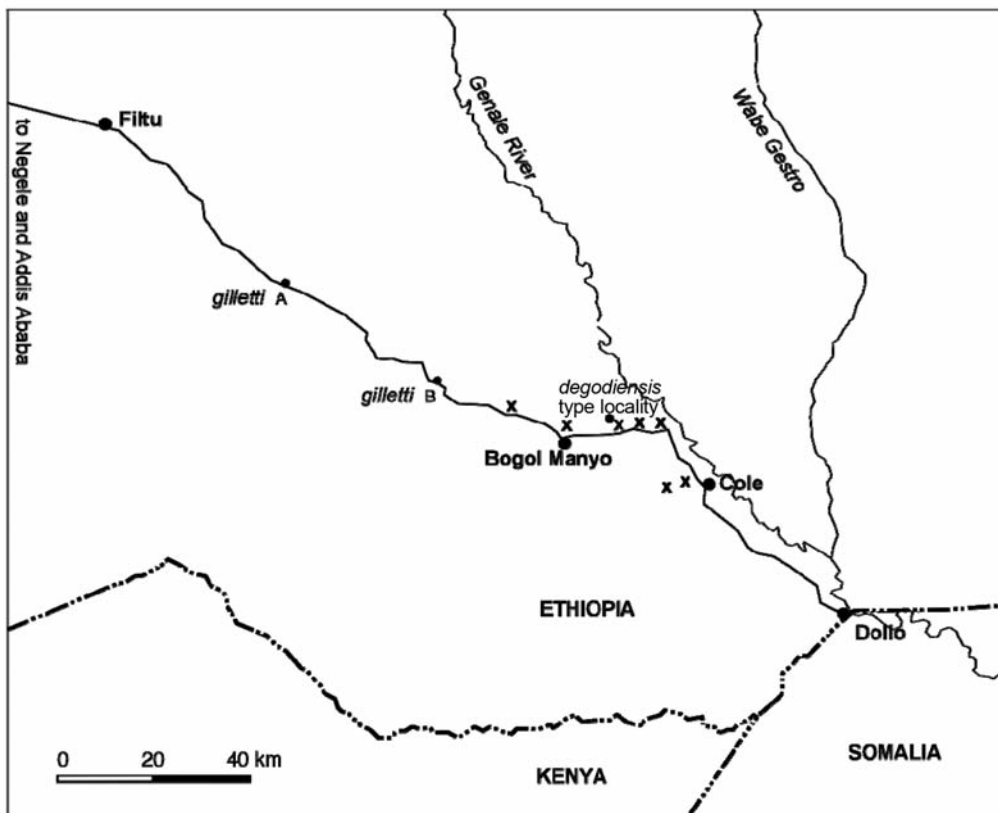


Figure 1. Map of the lower Genale region showing range of Degodi Lark *Miraфра degodiensis* (crosses represent sites from which the taxon has been reported: see text), with localities A and B where in 2007 we encountered Gillett's Larks *M. gilletti*.

We focused our own field work at the type locality to be certain that the birds we sought would unequivocally be attributable to *M. degodiensis*. At this site, a rectangle of 7 ha centred on c.04°32'N, 41°37'E (326 m), on 18 June 2007 we encountered three calling individuals and heard several (probably at least three) more on the north side of the Bogol Manyo–Dollo road between 06.30 h and 08.30 h, over a linear distance of 520 m (individual birds being separated by 250 and 320 m). The impression from this short encounter was that the species must be common in the area. Indeed, the following morning we located two more calling birds on separate territories, within five minutes of walking south of the road, from the same starting point and in the same early morning time-frame. We made minidisc recordings (Sony MZ-RH1 recorder with a Sennheiser MKE300 microphone) of calls and/or songs of five individuals, photographed three of these plus the presumed mate of one of them, and mist-netted one.

Erard (1975) reported that his specimens of Degodi Lark were collected in (our translation) 'a very light brush with low bushy acacias on bare soil'. At what they assumed to be the same locality Ash & Gullick (1990) found birds in 'thin low acacias 3–4 m high with scattered *Commiphora* and other bush species' but without 'any low vegetative ground cover anywhere'. Again, at what we in turn assumed to be the same locality we found habitat to consist of stunted open thorny *Acacia–Commiphora* scrub with scattered deciduous and evergreen trees, 3–5 m high, with open patches and clearings of low herbs, grasses and small woody shrubs, on a very stony substrate of pale red-brown soil. Quantities of livestock grazed and browsed the area, notably camels and goats.

### Records, range and habitat of Gillett's Lark

Gillett's Lark is endemic to the Horn of Africa, ranging from eastern Ethiopia just south of the Djibouti border to the three-way intersection of the frontiers between Ethiopia, Kenya and Somalia, with a small presence in north-east Kenya and a range in Somalia north of 02°N which only excludes the north-east coastal regions either side of the 'horn' itself (Erard 1975, Dean *et al.* 1992, Ryan 2004). More precisely, both Erard (1975) and Ash & Miskell (1998) mapped the distribution of Gillett's Lark in Somalia and showed the species as being recorded at and to the south of Dollo, around 50 km east of Bogol Manyo (04°31'N, 41°32'E in the *Times comprehensive atlas of the world* 1999). Moreover, Miskell & Ash (1985) indicated Gillett's Lark as being recorded in north-east Kenya from localities immediately due south of Bogol Manyo, e.g. Handotu at 03°57'N, 41°53'E and Sarigo at 03°43'N, 41°30'E, and, extrapolating from the Ethiopian evidence and habitat/rainfall evidence, Lewis & Pomeroy (1989) suggested that the species might extend west in Kenya as far as Moyale. Whether or not this is demonstrated, it is already clear that Gillett's Lark flanks the range of Degodi Lark to the north-west, north, east, south and south-southwest.

During our drive to Bogol Manyo from Filtu (17 June 2007), and on our return two days later, we stopped and searched for Gillett's Larks at regular intervals, although the time of day was never favourable and the stage in the breeding cycle appeared to be more advanced than at Bogol Manyo itself (see below), such that the species proved somewhat elusive. However, we found an individual calling at 04°49'N, 41°00'E (802 m), and another only 35 km north-east of Bogol Manyo (822 m), at 04°37'24"N, 41°17'32"E. (According to N. Borrow [pers. comm. 2007], Gillett's Larks prove to be very common all along this road earlier in the year, during or following rain.)

The habitat of Gillett's Lark has been described as 'open scrub savanna on sand and on hard stony soils, and . . . sparse thorny scrub and aloe scrub on edges of rocky outcrops, 1000–1500 m' (Dean *et al.* 1992) and as 'semi-arid savanna and scrub, typically on hard sub-

strates, often near rocky areas . . . [in Somalia in areas receiving 75–450 mm annual rainfall] . . . from near sea-level to 1500 m' (Ryan 2004). Erard (1975), after outlining earlier accounts which mentioned light savanna with low thorny bushes and perhaps a preference for richer hill vegetation, observed birds in (our translation) 'light woody savanna with scattered large acacias dominating a discontinuous bushy stratum intersected by grassy patches on sandy soil'. Our own encounters with Gillett's Larks were in fairly dense to semi-open but heavily grazed thorn-bush (penetrable along myriad cattle-paths), with many trees at least 5 m high and bushy vegetation generally 3–4 m high, the birds themselves feeding frequently in patches of short grass at the base of cover and flying up onto the outer branches of bushes.

### Morphology

Characters judged or suspected to distinguish Degodi Lark from Gillett's Lark have been published by Erard (1975), Ash & Gullick (1990), Dean *et al.* (1992), Francis & Shirihai (1999; also Shirihai & Francis 1999), Vivero Pol (2001), Sinclair & Ryan (2003) and Ryan (2004). These are listed and dealt with in turn below, but obvious handbook repetitions of characters are not cited.

1. *Smaller* (Erard 1975, Ash & Gullick 1990). It is certainly the case that the specimen material appears considerably smaller (see Fig. 12), but we cannot find evidence that proves that this is a real condition. Mensural data for Degodi Lark derive from only three specimens (type, paratype and our live specimen) and appear at the smaller end of the spectrum for Gillett's, but there is much overlap (Table 1).
2. *Shorter tailed* (Erard 1975). This was the single most striking feature of the type material and the one apparently most instrumental in persuading Erard to erect *degodiensis* as a full species ('Le caractère distinctif réside dans la remarquable brièveté relative des rectrices'). However, neither Ash & Gullick (1990) nor Webb & Smith (1996) were able to gauge this feature, the former authors writing that 'the tail did not appear to be inordinately short' and the latter going so far as to 'concur with Ash and Gullick that, contrary to Erard's original description . . . , the bird *appears longtailed in the field*' (our italics). As a result, its 'long-tailed' appearance (Vivero Pol 2001) and 'longish tail' (Sinclair & Ryan 2003) have now, paradoxically, been incorporated into the diagnostic literature. Moreover, re-measurement of the type material (by NJC), combined with measurement of a topotypical live bird (see below), suggests that while the three tails in question are at the shorter end of the spectrum, the complete disjunction indicated in Erard (1975) is not borne out; indeed, a specimen of *gilletti* in AMNH (556934) proved to have a tail 1 mm shorter than the shorter of the two tails of *degodiensis* (Table 1).
3. *Duller and more uniform* (Ash & Gullick 1990). We were unable to detect any such difference, and to some extent this notion is contradicted by differences 4, 5 and 10

TABLE 1

Measurements of *M. degodiensis* and *M. gilletti*. All measurements are in mm and expressed as means ± SE (range). They were made from museum specimens, as follows: AMNH 16, BMNH 21, LACM 1, MNHN 4 (including 2 *degodiensis*), USNM 3, plus a live specimen from the type locality of *degodiensis*. For explanation of museum acronyms, see Introduction.

Taxon	N	Bill	Tarsus	Wing	Tail
<i>M. degodiensis</i>	3	15.0 ± 1.2 (13–17)	22.3 ± 0.3 (22–23)	77.0 ± 1.5 (74–79)	59.0 ± 1.0 (57–60)
<i>M. gilletti</i>	43	16.9 ± 0.2 (13–19)	22.4±0.1 (21–24)	82.3 ± 0.5 (76–91)	62.1 ± 0.4 (56–70)

below. Comparison of birds in all the plates reveals no evidence of greater dullness and uniformity in Degodi, and if there is variation in plumage it is probably a seasonal and/or individual rather than a taxonomic character.

4. *Distinctly paler overall* (Francis & Shirihai 1999). We found no clear evidence of this (see Figs. 5–12).
5. *Paler and more rufous above* (Erard 1975). There is a small degree of individual variation in upperpart coloration, but there is overlap with Gillett's and it is emphatically not a 100% diagnostic character. Arguably this contradicts character 3 above, and reinforces the idea that such differences may depend on wear and/or individual variation.
6. *Streaking above finer and less dense* (Erard 1975), mis-repeated as 'narrower and denser' by Dean *et al.* (1992). This does not hold either on specimens or in photographs (see Figs. 5, 9–11).
7. *Breast less heavily marked (more speckled than streaked; more finely streaked, less blotchy spotting; more camel-coloured and obsolete—by implication darker and stronger in Gillett's)* (Erard 1975, Francis & Shirihai 1999). The breasts of the type material from Bogol Manyo might seem less powerfully marked, but the difference is very minor and is certainly not 100% reliable; indeed, two *gilletti* from one locality in northern Somalia (BMNH 1908.5.28.115–116) show a similar reduction, which may reflect local or individual variation of a trivial nature (Figs. 5–8, 10–12, 14–15).
8. *Breast streaking stops at carpal level, not extending onto lower breast* (Francis & Shirihai 1999). Such a subtle difference may simply be an effect of the angle at which the bird is perched, and we certainly could not confirm it in the field (Figs. 5–8, 10–12). In BMNH, however, it is apparent that breast streaking is moderately variable in both extent and strength (see, e.g., Figs. 14–15) such that this character must be regarded as invalid.
9. *Pale collar more pronounced* (C. Erard in Ash & Gullick 1990). Our live specimen in the hand showed no more pallor around the hindcollar than our photographs of *gilletti* (Figs. 5, 9–11).
10. *Scapulars black-centred and broadly fringed, forming prominent scaly pattern (brown-centred and narrower fringed in Gillett's, forming indistinct pattern)* (Francis & Shirihai 1999). If anything, the photographic evidence (Figs. 5, 9–11) tends to indicate the opposite, suggesting that this character is variable within populations and/or annual cycle.
11. *Sometimes with small, ill-defined darkish breast-side patches (never in Gillett's)* (Francis & Shirihai 1999). We saw no Degodi Larks that showed this feature, which is simply the running-together of a few breast streaks, except for the bird in the hand when its carpal was lifted. We saw no Gillett's which showed this character either, but there are two specimens of Gillett's in BMNH (1906.12.3.69 and 1923.8.7.2639) in which such a dark breast-side mark occurs (Fig. 13); moreover, one of the two specimens of *gilletti* in Paris (MNHN 1976.561) also shows dark breast-side patches (Fig. 12). Thus this character, which in any case (not being 100% diagnostic) must be counted both unreliable and trivial, is in fact invalid.
12. *Moustachial and malar stripes narrower, fainter and buffish-brown (fairly bold and blackish in Gillett's)* (Francis & Shirihai 1999). This is by no means clear-cut and certainly not 100% diagnostic (Figs. 5–11, 13–15). In BMNH, specimens of *arorihensis* are browner and fainter than those of nominate *gilletti*, and despite the map in Erard (1975) it is unknown

how close *arorihensis* approaches Bogol Manyo from the east and south. At any rate, the moustachial and malar markings of Degodi Lark and *M. g. arorihensis* are extremely similar.

13. *Very narrow pre-ocular eyestripe, more diffuse and paler (grey-brown) behind eye (post-ocular) (broader and blacker along length in Gillett's)* (Francis & Shirihai 1999). Photographs (Figs. 5–11) suggest that this is a variable condition (the Degodi in Fig. 8 seems to have at least as strong a supercilium as the Gillett's in Fig. 11), very difficult to gauge and improbably valid. Specimens are not particularly helpful, and this feature is at best only a possible minor point of divergence.

### *Description of a live individual*

On 19 June at around 08.00 h, at 04°31'N, 41°37'E, 318 m (and as we believe within 500 m of the site at which Erard obtained the holotype), a bird was captured in a mist-net by playback of its own alarm-calls which, as we subsequently discovered, appeared to be given in response to the accidental threat we were perceived to present to at least one just-fledged and still completely dependent young. The captured bird had a fully ossified skull and showed no evidence of moult; it possessed a fairly strong cloacal protuberance, suggesting it was male (as molecular analysis later proved) but an old brood-patch was possibly present; bill from skull was 15 mm; wing 78 mm curved, 82 mm flat; tail 60 mm; tarsus 23 mm; weight 19.2 g.

*Plumage.*—Crown rufous-tinged sandy brown with faint darker brown streaks and pale buffy margins, nape and hindcollar mid brown with pale buffy edges forming slightly paler collar effect (only visible when head held up), mantle and back fairly dark brown with pale brown inner margins and buffy fringes, scapulars plain brown with darker brown centres and buffy fringes, wing-coverts plain brown with buffy-whitish edges, remiges and rectrices brown. Supercilium broad buff; eyestripe dark brown (loral line blackish brown, post-ocular line brownish), ear-coverts rufous-tinged sandy brown, lower lores buff, subocular line buff, moustachial line thin, vague and blackish, submoustachial area creamy whitish, malar line vague and brownish, chin and upper throat creamy whitish, breast lightly streaked rufous-tinged sandy brown, with vague darker central lines to some streaks, darker and broader at breast-sides (but this was only visible in the hand when the wing was raised), remaining underparts dirty whitish. *Bare parts:* irides pale brown, legs pink, upper mandible blackish, lower mandible pale grey with a blackish tip.

The bird was sampled for blood (deposited at the Zoological Museum, Copenhagen), photographed (see Figs. 5–6), and released at the place of capture.

### **Behaviour and voice**

During their February visit, Ash & Gullick (1990) took 7.5 hours of searching before they found any birds, which then proved very quiet and secretive; they speculated that this might be a behavioural difference between Degodi and Gillett's Larks. However, we suspect that this simply reflected season and is not a species-specific behaviour. During our June visit, we found Degodi Larks singing very conspicuously (and on both mornings it took us only a few minutes to find them), whereas by contrast it was then the Gillett's Larks, at higher elevations farther north-west where the rain falls earlier (February–April in the Filtu area, *vs.* start of April at Bogol Manyo: MNG pers. data), that were quiet, giving only calls and no songs, and were shy and relatively difficult to find.

Accounts of the voice of Gillett's and Degodi Lark are heavily compromised by the fragmentary nature of the reports, the individual manner of both description and transcription, and the interpretation placed on them all by the observers and subsequent compilers.

*Literature on Gillett's Lark.*—Dean *et al.* (1992) gave the song as a 'dsee-dsit' (reported by J. S. Ash) and as 'sisidetiio' and 'da-di-da-di-da-di-da' (reported by Erlanger). Sinclair & Ryan (2003) mentioned a 'jumbled, chirpy song similar to Foxy Lark's [*Mirafra (Calendulauda) alopex*] but with more "chissik" notes'. Ryan (2004), making no reference to Sinclair & Ryan, reinterpreted Dean *et al.*'s information so as to treat the 'dsee-dsit' more as a call, while mentioning a 'longer song in aerial display'.

*Literature on Degodi Lark.*—Dean *et al.* (1992) had no information on the voice of Degodi Lark. Webb & Smith (1996) were the first to fill the void, giving its call as a 'high-pitched *tsee-tsee*, the first note ascending in pitch, the latter descending', and, when this call was played back to the caller, it quickly began 'calling or singing' with 'a 4–6 note high-pitched trill, *twill-ill-ill-ill-it* slightly reminiscent of Wood Warbler *Phylloscopus sibilatrix*', the whole vocalisation being lower pitched than the call and even-pitched throughout. Shirihai & Francis (1999) heard birds sing without providing a description, but they mentioned the call as a high-pitched '*tzik*'. Sinclair & Ryan (2003) referred to the Degodi Lark as having a 'distinctive song', but then simply repeated the two vocalisations described by Webb & Smith (1996); their use of the word 'distinctive' is therefore misleading, since they could only have been referring to Webb & Smith's second vocalisation, which involved no comparisons with Gillett's Lark and supplied no evidence of its diagnostic value. Ryan (2004) reported Webb & Smith's two calls, but added that the species is 'also reported as uttering repeated sibilant trill . . . with occasional notes similar to those of *M. gilletti*'; the source of this last vocalisation is not apparent from the literature cited by Ryan (2004). Most tellingly, but without any attempt at a description, Hornbuckle *et al.* (1996) reported three birds at the type locality 'singing identically to Gillett's (heard and taped previous and same day)', their localities for the nearest Gillett's being 7 km west and 20 km east of Filtu.

*Recent field evidence.*—At the type locality of Degodi Lark on 18 June 2007 we heard several birds calling. This mainly consisted of two high-pitched short whistles (the same as the first two notes of the song), *sii-sii*, but sometimes just a single note, *sii*, sometimes a triplet with the emphasis on the last note, *sii-sii-sí*, and sometimes as a more rapid double note, *sisi*. These all fit well with Ash's *dsee-dsit* (Gillett's) and Webb & Smith's *see-see*, and even Francis & Shirihai's *tzik*.

Some birds, sitting out vigilantly as if concerned for others in the vicinity, turned this call into a longer, more rolling trill, with the same timbre and pitch, *srrrrrrrii-srrrrrrrii-srrrrrrrii* (but given singly, doubly, triply or in strings). We mist-netted one of these birds by playing this sound back to it, the bird instantaneously flying towards the source. We decided it was in fact an alarm-call, in this case issued to just-fledged young, of which we saw one. The call is illustrated in Fig. 2 and, as can be seen, is precisely matched by Gillett's Lark. We are confident from their description that this is the same as Webb & Smith's *twill-ill-ill-it*.

We detected our first two Degodi Larks by their song, which consisted of a short, sweet, relatively quiet and simple strophe, high-pitched, lilting and slightly descending in pitch in a way reminiscent of a Willow Warbler *Phylloscopus trochilus*, and transcribed as: *sii-sii-sii-twilly-twill-tew-tew* (which clearly corresponds with Erlanger's *sisidetiio*, as cited in Dean *et al.* 1992). These songs were sound-recorded, and samples from the two individuals are

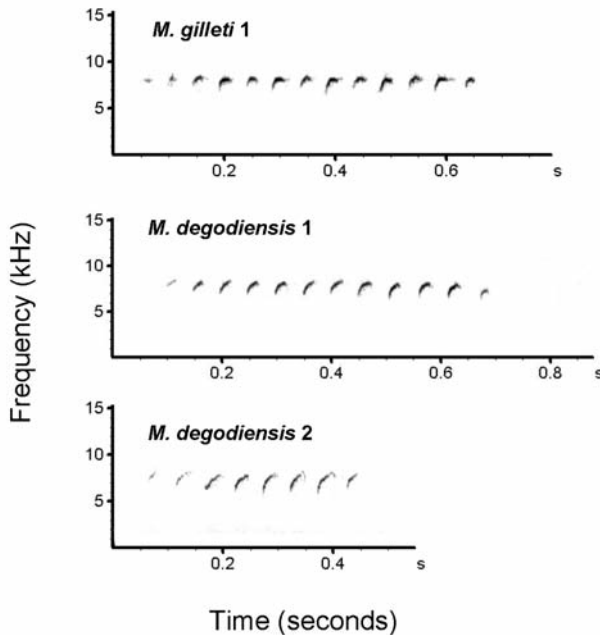


Figure 2. Sonograms of calls of Degodi Lark *Mirafra degodiensis* and Gillett's Lark *M. gilletti*. Recordings of *M. degodiensis* involve two individuals (1 and 2), both recorded 11 km east of Bogol Manyo, 19 June 2007, by CNS. The *M. gilletti* was recorded in Awash National Park, Ethiopia, 26 September 2006, by C. Cohen.

reproduced in Fig. 3, where for comparison several sonograms of Gillett's Larks from various parts of the range are presented. These illustrate the strong similarity of the songs of Degodi with those of Gillett's (notably the upper sonograms marked *M. gilletti* 1 and *M. gilletti* 2) although, as the sonograms show, the songs of Gillett's are somewhat variable (but with a clear basic pattern). In one taped example the Gillett's song is repeated

several times with barely a break, rather than being a self-standing strophe, and it seems likely that more extensive sampling of birds at different times of day and year would produce more evidence of variability in song pattern. However, the key point here is that the songs we recorded of Degodi Lark sit close to or within the small span of variation reflected in our collected vocal material of Gillett's.

Recordings were digitised at a sampling rate of 44.1 kHz using Avisoft SASLabPro (Raimund Spect, Berlin, Germany) with a 16-bit acquisition sound card. Sonograms were created using a Fast Fourier Transformation size of 256 (Frame: 100%, Window: Hamming, Overlap: 50%), which led to a frequency resolution of 172 Hz and a temporal resolution of 2.9 msec.

### Molecular evidence

A blood sample was obtained from the specimen of *Mirafra degodiensis* we mist-netted (see above). The Natural History Museum (BMNH), Tring, UK, kindly provided us with four toe-pad samples of *M. gilletti*, including two of each of the two known subspecies of *M. gilletti* from geographically disjunct populations within their range (*M. g. gilletti* from Hawash, Ethiopia, and Hargesia, Somalia, and *M. g. ahoiensis* from Bera and Wajit, Somalia). Sequences of three other species in the genus *Mirafra* were obtained from GenBank and used as outgroups in phylogenetic analysis (accession numbers: *M. passerina*, AY165163; *M. javanica*, DQ008520; and *M. sabota*, AY165172).

DNA extraction of the toe-pads was performed in a UV hood using a commercial kit (QiAmp, Qiagen). The entire foot skin sample that was provided to us was used in each extraction. Negative extraction controls, using the same instruments and reagents, were carried out simultaneously. DNA extraction from the blood sample was performed in a different laboratory, using a standard phenol-chloroform method (details in Dingle *et al.* 2006). PCR was performed on the blood sample and the museum samples separately to avoid contamination. First, a 674 bp section of *cyt b* was amplified from the blood sample using the primers L14996 and H15646. Cycling conditions were two minutes at 94°C, 45

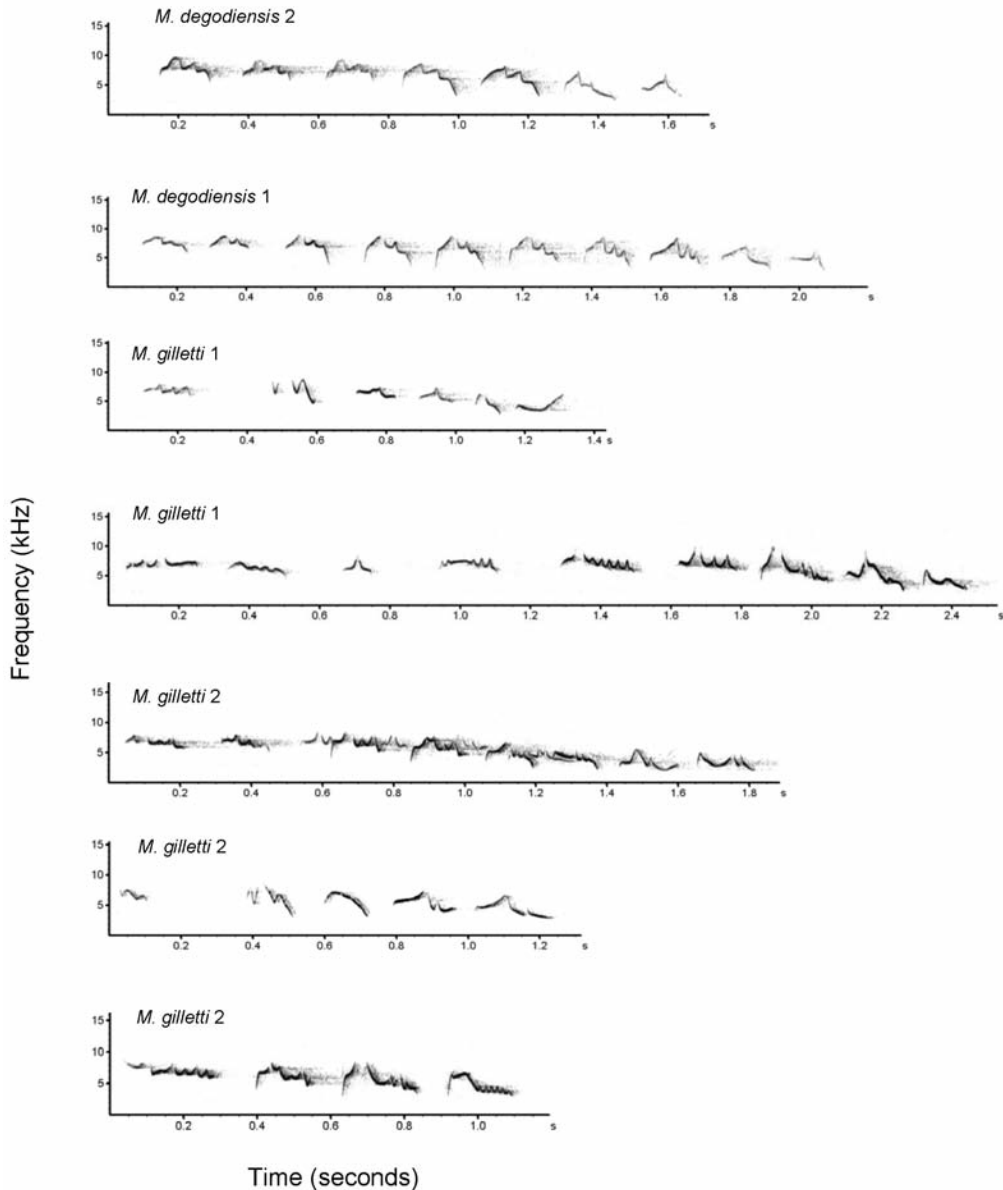


Figure 3. Sonograms of songs from Degodi Lark *Miraфра degodiensis* and Gillett's Lark *M. gilletti*. Recordings involved two individuals of each taxon (distinguished as 1 or 2). Both songs of *M. degodiensis* were recorded 11 km east of Bogol Manyo, 18 June 2007 by CNS. Both songs of *M. gilletti* were recorded in Awash National Park, Ethiopia, 26 September 2006, by C. Cohen.

cycles of 94°C for 30 seconds, 57°C for 45 seconds, and 72°C for one minute, followed by 72°C for 10 minutes. Sequencing reactions were performed using the same primers. Once sequence was obtained from the blood sample, we used the computer program Primer3 (v. 0.4.0) (Rozen & Skaletsky 2000) to design internal primers specific to the larks. These primers were *cytb*F: GACGTCCAATTTGGCTGACT and *cytb*R: GTGGGGTTGTCTACC-GAAAA. A 308 bp segment of the mitochondrial *cyt b* region was successfully amplified from the foot skin of three of the four specimens.

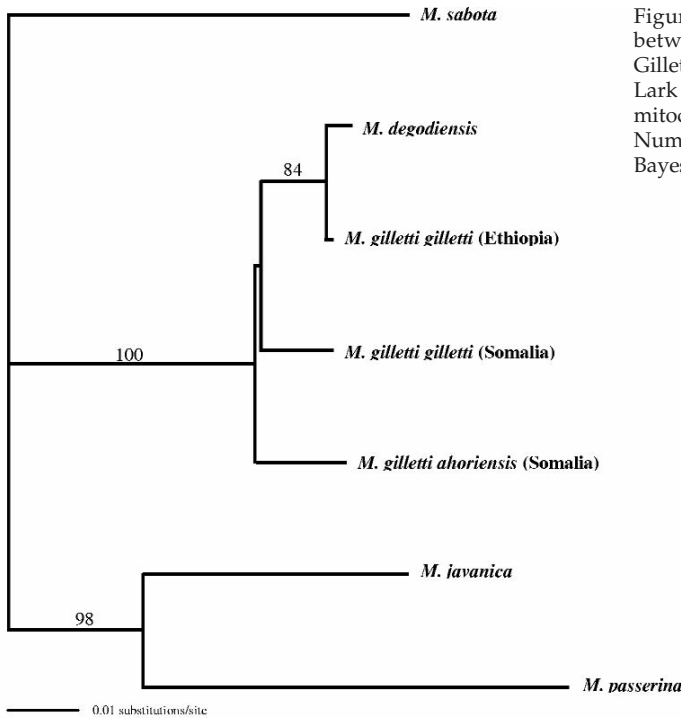


Figure 4. Phylogenetic relationships between haplotypes sampled from Gillett's Lark *Mirafra gilletti* and Degodi Lark *M. degodiensis* based on 308bp of mitochondrial cytochrome *b* sequence. Numbers above the branches represent Bayesian posterior probability scores.

Sequences were aligned and proofread using *CodonCodeAligner* (CodonCode Corporation, Dedham, MA, USA). No insertions or deletions were present, so sequence alignments were unambiguous. Phylogenetic analyses were conducted using *PAUP\*4.0b10* (Swofford 2002). Pairwise divergence values represent uncorrected divergences. We are confident that the present results cannot be attributed to contamination as no positive PCR results were

obtained with negative extraction controls and different genotypes were obtained from different individuals.

We detected seven variable sites between the four *Mirafra* samples that we sequenced. At six of the variable sites, *M. degodiensis* shared the same allele with at least one of the *M. gilletti* sequences. Sequences from *M. degodiensis* only differed from the *M. gilletti* sequences by 1.2–1.3%, which was less than the level of divergence between the three *M. gilletti* samples (2.0–2.3%); the level of sequence divergence between the different species was significantly higher, ranging from 9.5–11.7%.

For the phylogenetic analysis, we included sequences from three other *Mirafra* species. A total of 60 nucleotide sites varied among the seven sequences, of which 31 were parsimony-informative. Phylogenetic reconstructions reveal that *M. degodiensis* is nested within the clade which includes all three *M. gilletti* individuals, indicating that the two taxa are not reciprocally monophyletic (Fig. 4).

### Discussion and conclusion

Erard (1975) suggested that the variation in the abundance of certain species between Bogol Manyo and Filtu, and the shift between members of two species pairs somewhere between the two settlements, could be attributed to subtle differences in habitat, and this may indeed be the case. However, our own experience of Gillett's and Degodi Larks in 2007 suggested nothing by way of a real habitat shift. Both taxa were in areas of moderately dense vegetation where trees grew to 5 m or more, small thorn-bushes abounded and a fairly rich herb-layer, mostly consisting of grass, grew wherever the absence of cattle-tracks



Figure 5. Degodi Lark *Mirafra degodiensis*, east of Bogol Manyo, June 2007 (C. N. Spottiswoode)

Figure 6. Degodi Lark *Mirafra degodiensis*, east of Bogol Manyo, June 2007; same individual as in Fig. 5 (C. N. Spottiswoode)

Figure 7. Degodi Lark *Mirafra degodiensis*, east of Bogol Manyo, October 2006 (N. Borrow)

Figure 8. Degodi Lark *Mirafra degodiensis*, east of Bogol Manyo, June 2007 (C. N. Spottiswoode)

Figure 9. Gillett's Lark *Mirafra gilletti*, south-east of Filtu, June 2007 (C. N. Spottiswoode)

Figure 10. Gillett's Lark *Mirafra gilletti*, south-east of Filtu, June 2007; same individual as in Fig. 5 (C. N. Spottiswoode)

Figure 11. Gillett's Lark *Mirafra gilletti*, Awash National Park, Ethiopia, October 2006 (N. Borrow)



permitted. Possibly our Gillett's were in taller, denser vegetation, but this is scarcely an aid to taxonomic distinction.

Equally implausible from a taxonomic standpoint is the apparent shift in breeding regime between the Gillett's Larks higher up on the road to Filtu and the Degodi Larks in the relatively low-lying lands towards the Somali border, in which Degodi breeds rather later in the year (April–June, perhaps) than Gillett's (February–May, perhaps), reflecting different rainfall regimes between higher and lower ground. However true this may be, it is no good ground for taxonomic discrimination. In any case there must be some point of contact between the taxa along the rainfall gradient west of Bogol Manyo, and the acknowledged Gillett's to the east and south of Bogol Manyo, in Somalia and Kenya, would be on the same rainfall regime as the Degodi Lark.

There seems to be no clear and consistent morphological distinction to be made between Degodi Lark and Gillett's Lark. Degodi certainly sits at the smaller end of the mensural spectrum, with mean bill, wing and tail lengths respectively 2 mm, 5 mm and 3 mm shorter than Gillett's, but nevertheless with complete nestedness in bill and tail lengths, and the sample size is only three (Table 1). All plumage distinctions between the two appear to be based on minor individual variations or mistaken perceptions, as detailed in 'Morphology' above. A possible behavioural difference—reclusive, *vs.* obtrusive temperament—has been shown to be invalid. Vocal differences do not exist either: recordings and sonograms of these songs demonstrate Degodi Lark identical to or sitting within the relatively minor variation found in Gillett's. Finally, the mtDNA data provide no basis for phylogenetic distinction of *M. degodiensis* from *M. gilletti*, although the phylogram (Fig. 4) suggests some structure within *M. gilletti* that would bear further study.

On the basis of all this evidence we conclude that *Mirafra degodiensis* is conspecific with *M. gilletti*. This is a conclusion with which Christian Erard (pers. comm. 2007, *in litt.* 2008) concurs, having seen our evidence; he mentioned to us (NJC and CNS) that security issues were so serious at Bogol Manyo in 1971 that he was unable to stop over at the site and merely collected there on part of one day before pressing on, thereby being deprived of acquiring enough comparative material to allow him a more informed judgement. Moreover, despite the trend towards smaller size we cannot identify a single character that dependably and consistently separates the two taxa, suggesting that *M. degodiensis* may in fact be a junior synonym of nominate *M. gilletti*. However, we suggest that, for the present and provisionally, *degodiensis* is retained as a subspecies of *gilletti*, based on its mean smaller size. Nonetheless, all information provided in this paper on *M. degodiensis*, notably that on voice, therefore refers to *M. gilletti*.

#### Captions to figures on opposite page

Figure 12. Holotype (inner left) and paratype (outer left) of Degodi Lark *Mirafra degodiensis* next to the only two specimens of Gillett's Lark *M. gilletti* (outer right certainly nominate) in MNHN (N. J. Collar)

Figure 13. Breast-side patches in two Gillett's Larks *Mirafra gilletti* (BMNH 1923.8.7.2639 and 1906.12.3.69), a character supposed never to be present in the species (see text) (N. J. Collar, © The Natural History Museum, Tring)

Figure 14. Breast streaking on two specimens of Gillett's Lark *Mirafra gilletti ahorihensis*, showing considerable individual variation in strength and extent. Left, BMNH 98.6.13.44, male, Arabsiyu, 09°40'N, 43°46'E, November 1897; right, BMNH 1908.5.28.115, male, Eil Dab, 100 miles south-southeast of Berbera, hence roughly at Qoryale, 09°07'N, 45°57'E, December 1904. Coordinates from Ash & Miskell (1998) and *Times atlas* respectively (N. J. Collar, © The Natural History Museum, Tring)

Figure 15. Reduced breast streaking on two specimens of Gillett's Lark *Mirafra gilletti ahorihensis* (BMNH 1908.5.28.115–116) from Eil Dab, 100 miles south-southeast of Berbera, hence roughly at Qoryale (09°07'N, 45°57'E *fide Times atlas*), December 1904. Note similarity to type material of *M. degodiensis* (N. J. Collar, © The Natural History Museum, Tring)

### Acknowledgements

We especially thank Christian Erard for his generous consideration of our new evidence and for his support for our conclusion, John Ash and Nik Borrow for very helpful input into the evaluation of the taxa, Nik Borrow for photographs, Callan Cohen and Jon Hornbuckle for tape-recordings, our driver Abiy Dange for his solid support, Julian Francis for drawing our attention to Hornbuckle *et al.* (1996), Nick Mundy for the use of his lab for the genetic analysis, Nick Mundy and Marie Pointer for advice on conducting the genetic analysis, Paul Sweet (AMNH), Robert Prŷs-Jones and Mark Adams (BMNH), Kimball Garrett (LACM), Eric Pasquet (MNHN) and James Dean (USNM) for access to specimens in their care, and especially Mark Adams for supplying sample toe-pads of specimens of Gillett's Lark. Bob Dowsett and Françoise Dowsett-Lemaire were very helpful referees. Funding for our field work came from the Bromley Trust, BirdLife International, Birding Africa and Julian Francis; we thank them all.

### References:

- Ash, J. S. & Gullick, T. M. 1990. Field observations on the Degodi Lark *Mirafra degodiensis*. *Bull. Brit. Orn. Cl.* 110: 90–93.
- Ash, J. S. & Miskell, J. E. 1998. *Birds of Somalia*. Pica Press, Robertsbridge.
- BirdLife International. 2008. *Threatened birds of the world 2008*. CD-ROM. BirdLife International, Cambridge, UK.
- Collar, N. J. & Stuart, S. N. 1985. *Threatened birds of Africa and related islands: the ICBP/IUCN Red Data book*. International Council for Bird Preservation, Cambridge, UK.
- Dean, W. R. J., Fry, C. H., Keith, S. & Lack, P. C. 1992. Alaudidae, larks. Pp. 13–124 in Keith, S., Urban, E. K. & Fry, C. H. (eds.) *The birds of Africa*, vol. 4. Academic Press, London.
- Dingle, C., Lovette, I. J., Canaday, C. & Smith, T. B. 2006. Elevational zonation and the phylogenetic relationships of the *Hemicorhina* wood-wrens. *Auk* 123: 119–134.
- Erard, C. 1975. Variation géographique de *Mirafra gilletti* Sharpe: description d'une espèce jumelle. *Oiseau & RFO* 45: 293–312.
- EWNHS. 1996. *Important Bird Areas of Ethiopia: a first inventory*. Ethiopian Wildlife and Natural History Society, Addis Ababa.
- EWNHS. 2001. Ethiopia. Pp. 291–336 in Fishpool, L. D. C. & Evans, M. I. (eds.) *Important Bird Areas in Africa and associated islands: priority sites for conservation*. Pisces Publications, Newbury & BirdLife International, Cambridge, UK.
- Francis, J. & Shirihai, H. 1999. *Ethiopia: in search of endemic birds*. Privately published, London.
- Hornbuckle, J., Archer, M., Aspinall, S., Gardner, N. & Greensmith, A. 1996. Ethiopia, 24 Oct–18 Nov 1996. Unpubl. birdwatching report.
- Lewis, A. D. & Pomeroy, D. E. 1989. *A bird atlas of Kenya*. A. A. Balkema, Rotterdam.
- Miskell, J. E. & Ash, J. S. 1985. Gillett's Lark *Mirafra gilletti* new to Kenya. *Scopus* 9: 53–54.
- Rozen, S. & Skaletsky, H. J. 2000. Primer3 on the WWW for general users and for biologist programmers. Pp. 365–386 in Krawetz, S. & Misener, S. (eds.) *Bioinformatics methods and protocols: methods in molecular biology*. Humana Press, Totowa, NJ.
- Ryan, P. G. 2004. Gillett's Lark *Mirafra gilletti* and Degodi Lark *Mirafra degodiensis*. Pp. 553–554 in del Hoyo, J., Elliott, A. & Christie, D. A. (eds.) *Handbook of the birds of the world*, vol. 9. Lynx Edicions, Barcelona.
- Shirihai, H. & Francis, J. 1999. Endemic birds of Ethiopia. *Alula* 1: 2–15.
- Sinclair, I. & Ryan, P. 2003. *Birds of Africa south of the Sahara*. Struik, Cape Town.
- Stattersfield, A. J. & Capper, D. R. 2000. *Threatened birds of the world*. Lynx Edicions, Barcelona & BirdLife International, Cambridge, UK.
- Swofford, D. L. 2002. *PAUP\*: phylogenetic analysis using parsimony (\*and other methods)*. Version 4.0b10. Sinauer Associates, Sunderland, MA.
- Vivero Pol, J. L. 2001. *A guide to endemic birds of Ethiopia and Eritrea*. Shama Books, Addis Ababa.
- Webb, R. & Smith, S. 1996. Degodi Lark *Mirafra degodiensis*, one of Africa's most poorly-known species. *Bull. Afr. Bird Cl.* 3: 85–86.
- Addresses:* N. J. Collar, BirdLife International, Wellbrook Court, Girton Road, Cambridge CB3 0NA, UK, & Bird Group, Natural History Museum, Akeman Street, Tring, Herts. HP23 6AP, UK. C. Dingle, Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, UK. M. N. Gabremichael, c/o Atsede W Mariam, P.O. Box 1169, UNICEF Addis Ababa, Ethiopia. C. N. Spottiswoode, Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, UK.