

Distribution, habitat and differentiation of the poorly-known black morph of Mourning Wheatear *Oenanthe lugens lugens* in Jordan

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The black morph of Mourning Wheatear *Oenanthe l. lugens* was studied in Jordan and compared with the typical nominate form during 2007–2009. The extremely low density of black morph Mourning Wheatears and the presence of unpaired adults during the breeding season in our study area suggests that this morph, which occurs only in the basalt desert of northeast Jordan and southern Syria, is highly endangered and probably at the edge of extinction, at least in Jordan. The two forms of nominate Mourning Wheatear barely overlap in their geographical distribution in Jordan. The black morph occurs exclusively in black lava desert during the breeding season. Both forms choose similar structural habitats that include rock boulders, rock piles and cliffs, steep slopes or man-made vertical structures. With the exception of coloration, the morphology of both is generally the same, suggesting rather low taxonomic differentiation of the black form. Nevertheless, differences in plumage coloration between the two morphs are also present at the juvenile stage as demonstrated by photos of a black morph juvenile.

INTRODUCTION

The Mourning Wheatear *Oenanthe lugens* has a distribution ranging from northwest Africa to Iran and is generally split into three distinctive subspecies. Populations inhabiting North Africa belong to the subspecies *Oenanthe lugens halophila*, those inhabiting Egypt and the Near East, including Jordan, are assigned to the nominate subspecies *O. l. lugens* and birds which live on the Iranian plateau are *O. l. persica* (Panov 2005). In most of its range, the Mourning Wheatear is an inhabitant of semi-deserts or deserts, where it prefers steep rocky and stony, often barren, hillsides (Panov 2005). In Jordan, it is a typical member of the bird community found along the Rift margins. It is also found breeding locally in the sandstone mountains of the Rum desert and along limestone escarpments in the eastern desert of Jordan (Andrews 1995, Figure 1). However, in northeast Jordan and southern Syria, a rare and poorly known but distinctive and endemic black morph of Mourning Wheatear is restricted to the black lava desert at least during the breeding season, suggesting colour adaptation to local conditions. This black form was assigned to Mourning Wheatear *O. l. lugens* by L Cornwallis (in Cramp 1988) based on the 'typical *Oenanthe lugens lugens* wing pattern' after formerly being believed to be *O. picata opistholeuca* (Wallace 1983b). The status of true geographic subspecies was not supported by Tye (1994) due to reports that stated a broad overlap

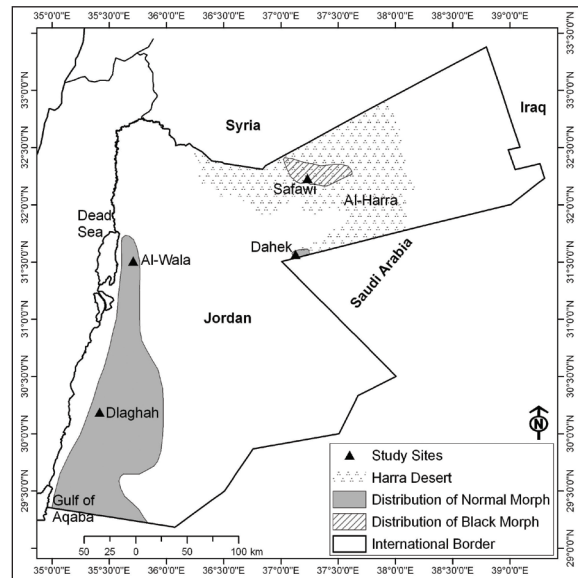


Figure 1. Breeding distribution of Mourning Wheatear *Oenanthe l. lugens* in Jordan. The black morph breeds only in the Harra basalt desert of northeast Jordan, where the typical/normal morph has been recorded only occasionally, mainly outside the breeding season (after Andrews 1994, modified).



Plate 1. Adult normal morph Mourning Wheatear *Oenanthe l. lugens*, east of Wadi Mujib, west Jordan, August 2007. © M Förschler



Plate 2. Adult black morph Mourning Wheatear *Oenanthe l. lugens*, east of Safawi, northeast Jordan, June 2008. © M Janaydeh

in the ranges of the black and typical forms, occasional inter-breeding and the absence of intermediates (Wallace 1983a, Cramp 1988). However, the limited geographic range and habitat of the black form and the absence of observations of mixed pairs other than Cornwallis' evidence suggests that interbreeding is rare and in conflict with the argument for morph status (Andrews 1994).

In this study we compared habitat variables and morphological measurements of both forms in Jordan with the aim of describing the possible distinctiveness of the black morph and providing further data that may contribute to clarifying its status. Furthermore, we give an update on the current distribution of the black form in Jordan and on possible threats for this locally endemic bird in the future.

METHODS

Study species

The typical form of Mourning Wheatear *Oenanthe l. lugens* is a small insectivorous passerine (weight 22–28 g, Plate 1) that is fairly widespread in Jordan in arid areas. These areas vary in rainfall and productivity. It is a typical bird of the Rift margins of western Jordan and is also found locally on low limestone escarpments and wadis in the eastern desert of Jordan. In contrast, the black morph (Plate 2) in Jordan is restricted at least during the breeding season to the undulating basalt desert landscape of the northeast (Plate 3) where it inhabits areas with wadis, road cuttings and boulder piles (Andrews 1994, 1995). In nominate *lugens* there is no obvious sexual dimorphism (Panov, 2005). Although considered a resident bird in Jordan (Andrews 1995), the Mourning Wheatear is not strictly sedentary there (FK pers obs): most individuals carry out seasonal movements, some apparently moving to slightly higher areas in June–August, *ie* after the breeding season, and many usually move to lower areas for the winter. Breeding territories are usually occupied by March and the breeding season extends to June.

Study areas

Field observations were carried out at four study sites, along the Rift margins and in the eastern desert (Figure 1). The regions inhabited by normal morph birds have differing rainfall (National Atlas of Jordan 1984) and vegetation (Alberts *et al* 2004).

The northwest-facing slopes above **Wadi al-Wala** (c31° 30' N 35° 43' E, 415–625 m asl) have a mean annual precipitation of c250 mm falling mainly November–March. Vegetation cover is moderate, dominated by various dwarf shrubs, and with a relatively rich annual

cover during spring. The vegetation is generally a mosaic of Mediterranean-type (semi-steppe batha) and Irano-Turanian *Artemisia* steppe. Grazing pressure is high during winter and spring when the study site is used as rangeland for goats and sheep by semi-nomadic Bedouins and locals from a nearby village. Only typical morph birds are found breeding in this area.

The arid mountains of **Dlaghah** and **Jebel Mas'uda** (c30° 12' N 35° 27' E, 990–1600 m asl), south of Petra, have an annual precipitation in the range 120–200 mm. Rain (and snow) falls in this area mainly November–March. The vegetation on the stony and rocky mountain slopes is sparse, dominated by dwarf shrubs. Grazing pressure is high, and most of the area is densely populated during the winter by nomadic Bedouin who own large sheep herds. Again, only normal morph birds are found breeding in this area.

Al-Dahek (31° 34' N 37° 09' E, 500–550 m asl), in the eastern desert of Jordan, is a limestone escarpment where a population of 5–10 pairs of typical morph Mourning Wheatears breed. The wheatears here hold their breeding territories along barren limestone slopes and cliffs that border on an open flood plain that is covered with large patches of dry salt marsh dominated by low *Tamarix* sp shrubs. The mean annual precipitation is c50 mm, falling November–May.

The second study area in the eastern desert is located in the undulating Al Harra basalt desert **near Safawi** (32° 10' N 37° 30' E, 670–700 m asl), where black morph birds dominate numerically over normal morph birds. The mean annual precipitation is c80 mm, falling mainly November–March. Vegetation is scarce in the black basalt desert and dominated by dwarf shrubs that are usually confined to small depressions and wadi beds. Grazing pressure by sheep is rather high along the wadis.

Field methods

Breeding habitats were described for territories of pairs and occasionally of single foraging birds during the breeding season, April–early June 2008 and 2009. Habitat description included of structural features (presence of rock boulders, rock piles, slopes, cliffs, water runnels and wadis) and the estimation of substrate variables related to vegetation and overall stone and rock cover within the territories of pairs and territorial males or to a distance of 100 m from foraging birds if territory boundaries were not determined. Rock coloration was classified as 1 for pale rocks (eg limestone), 2 for intermediate or mixed pale–dark and 3 for very dark rocks as in basalt lava rocks (Plate 3). Habitat descriptions for the normal morph were carried out in the two study areas along the Rift margins (16 territories) and in the eastern desert at al-Dahek (5 territories).

Habitat descriptions for the black morph were carried out for 1 pair and 4 single birds that were either territorial or using a particular area for feeding during the breeding season. This was carried out in the basalt desert, mainly around Safawi.

Morphology

Mourning Wheatears were trapped for morphological measurements using clap nets and mealworms as bait (permission granted by RSCN-Jordan). After handling and ringing, the birds were released at the capture site. Typical form birds were trapped in western Jordan, from Wadi Wala south to Wadi Rum, during the summers of 2007 and 2009 and black morph birds in the basalt desert east of Safawi 2007 and 2008. In addition to measurements taken from live birds, some morphological data for black morph birds collected in Jordan were obtained from the literature (Andrews 1994) and from two specimens in the collection of the Natural History Museum at Tring, England (collection numbers 1947.14.214 and 81.5.1.933).

RESULTS AND DISCUSSION

Distribution and current status of the black morph

Most (c80%) of the Mourning Wheatears recorded during this study in the basalt desert were of the black morph. During extensive studies March–June 2008, we recorded the black morph of the Mourning Wheatear only in two areas of the basalt desert: east of Safawi between Safawi and Wadi Rajel along the main road to Ruweished and Iraq (one pair, later with two fledged juveniles, and three single adult birds), and at the village of Mithnat Rajel (Jawa) near the Syrian border (1 single adult bird). The breeding pair and one territorial male were constantly present in their territories east of Safawi late March–early June 2008. Later, these birds apparently dispersed elsewhere.

Although most of the basalt desert north of the main road to Ruweished was covered by driving a total off-road distance of 300 km March–May 2008, no Mourning Wheatears of either form were found in the interior, fairly undisturbed, areas of mainly featureless, rolling, boulder fields. Even the major wadis and areas of moderate relief in the basalt desert covered, *eg* Wadi Salma, Tal El-Abed, Wadi Suwei'ed (Wadi Al-Awsaji), Wadi Ghussein and Burqu', did not harbour black morph birds, although normal-type (probably wintering) birds occurred singly at the latter two sites. Wheatears are usually conspicuous birds and less conspicuous bird species were recorded frequently along the wadis *eg* the dark form of Sand Partridge *Ammoperdix heyi*, Desert Lark *Ammomanes deserti annae*, Bar-tailed Desert Lark *Ammomanes cinctura*, Thick-billed Lark *Ramphocoris clotbey*, Temminck's Horned Lark *Eremophila bilopha* and Trumpeter Finch *Bucanetes githagineus*. Two other wheatear species also breed in the basalt desert of Jordan, where they are more common than Mourning Wheatear. The Desert Wheatear *Oenanthe deserti* is usually present in flat areas and wide wadi beds with sandy patches and some low scrub vegetation. The White-crowned Black Wheatear *Oenanthe leucopyga* has recently spread into the basalt desert (Andrews *et al* 1998) and was frequently recorded during 2008, mostly as pairs along wadis including Wadi Suwei'ed where L Cornwallis (Ian Andrews pers comm) recorded black morph Mourning Wheatears in the 1980s. The lack of observations in large parts of the basalt desert in this study suggests a severe decline of the black morph population of Mourning Wheatear at least in Jordan.

Breeding habitats of both morphs

The Mourning Wheatear in Jordan generally inhabits arid areas where mean annual precipitation is in the range 50–250 mm. Mountains, hills and escarpments with steep rocky sides and stony areas are preferred for breeding, but shrubby, flat areas may be included within the territories and are often used for foraging (*eg* at Al-Dahek). There are differences between forms in some substrate habitat variables (Table 1). Although the basalt desert landscape is generally flat or undulating (Plate 3), black morph habitats had significantly higher overall rock cover than normal morph habitats (Table 1). The small patches of ground that were not covered by basalt rocks and stones, were often used for foraging. All black morph habitats were located in areas with very dark lava rocks and always contained large rock boulders, stone and rock piles (Plate 3, Table 1, Figure 2). Additionally, the territories/feeding habitats of black morph birds always contained man-made vertical structures that were frequently used by the birds for perching and as singing posts; these structures included telephone poles, bridges, road signs and barriers, fences and even at one site, a small house at the edge of a village (Mithnat Rajel). These vertical structures possibly compensated for the lack of steep slopes and cliffs available to typical morph birds (Figure 2). Additionally, black morph birds often foraged along the sides of tarmac roads where there were open spaces, not covered by the usual stones and rocks,

Table 1. Means (\pm SD) of substrate variables in the breeding habitats of normal (black and white) morph and black morph Mourning Wheatears *Oenanthe l. lugens* in Jordan.

	typical morph	black morph	t-test/U-test statistic
N	21	5	
Rock (%)	34.9 \pm 9.9	57.0 \pm 4.5	$t = 4.8 \quad p < 0.001$
Stone (%)	22.9 \pm 7.2	24.0 \pm 5.5	$t = 0.3 \quad p = 0.74$
Soil/Gravel (%)	42.4 \pm 9.7	19.0 \pm 7.4	$t = 5.0 \quad p < 0.001$
Colour of rocks	1.4 \pm 0.6	2.8 \pm 0.4	$U = 4.0 \quad p < 0.001$
Total vegetation* (%)	23.7 \pm 14.3	8.4 \pm 4.2	$t = 2.3 \quad p = 0.03$

* total vegetation cover = cover of herbaceous plants + dwarf shrubs + shrubs

and where productivity (due to run-off) and prey abundance appeared to be higher than in the surroundings.

Morphological differentiation of the morphs

Table 2 summarizes the main morphological measurements of both forms. There were no significant differences in the length of wing, tail, bill and tarsus. Numerous other measurements of the black morph were within the range of those taken for the typical morph (data not shown). Black morph juveniles have been described as having 'smoky' plumage (Cramp 1988). Indeed, coloration of most of the body plumage is quite different between juveniles of the two morphs (Plates 4 & 5). In contrast to the dark juveniles of the black morph, juveniles of the normal morph have very pale juvenile body feathers even in those parts that are mostly black in the adults, *ie* throat, mantle, scapulars and wing coverts (Plate 5). The weak sexual dichromatism in the adults of black morph birds is equivalent to what is known for the normal morph. In the field the slight dichromatism is obvious only when male and female are observed together: females have slightly paler/more brownish primaries than males and this was noted for a black morph pair during prolonged observation.

Conservation and future studies of the black morph

Currently, the very low population density and the presence of unpaired males (possible Allee effect, *ie* low chance of pairing due to extremely low density) indicate that the population of the black morph of the Mourning Wheatear in Jordan is highly endangered. Andrews (1994) mapped the distribution of the normal morph of Mourning Wheatear

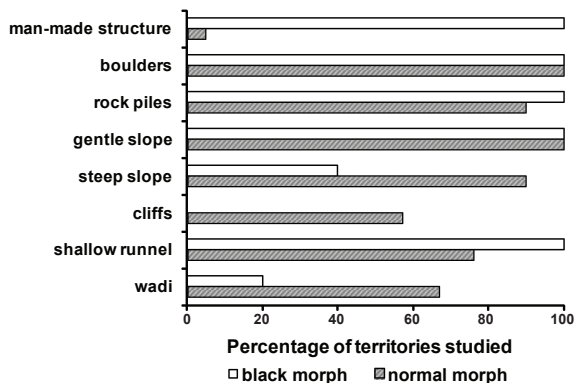


Figure 2. Presence of structural habitat features of normal and black morph Mourning Wheatears *Oenanthe l. lugens* during the breeding season in Jordan.

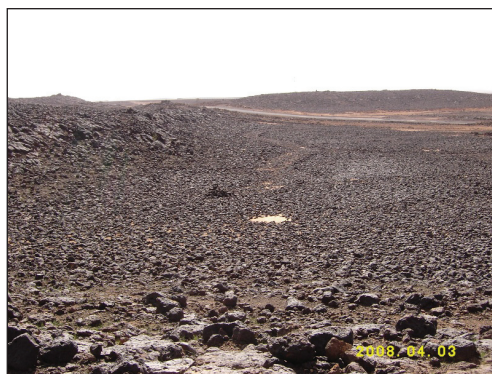


Plate 3. Breeding habitat of black morph Mourning Wheatear *Oenanthe l. lugens*, east of Safawi, northeast Jordan, April 2008. © M Janaydeh

Table 2. Means (\pm SD) of selected morphological measurements (mm) taken for typical (black and white morph) and black morph Mourning Wheatears *Oenanthe l. lugens* from Jordan. Number of samples in brackets.

	normal morph	black morph	t-test statistic
Wing length	93.0 \pm 1.1 (10)	95.6 \pm 3.4 (8)	$t = 1.1 \quad p = 0.3$
Range	88–99	92–100	
Tail length	64.6 \pm 3.7 (10)	66.9 \pm 3.9 (7)	$t = 1.2 \quad p = 0.3$
Bill length*	19.5 \pm 0.7 (9)	20.5 \pm 1.6 (7)	$t = 1.8 \quad p = 0.1$
Tarsus length	25.7 \pm 0.9 (9)	25.9 \pm 0.7 (7)	$t = 0.7 \quad p = 0.5$

* to skull



Plate 4. Juvenile black morph Mourning Wheatear *Oenanthe l. lugens*, east of Safawi, northeast Jordan, June 2008. © M Janaydeh



Plate 5. Juvenile normal morph Mourning Wheatear *Oenanthe l. lugens*, near Wadi Al-Wala, west Jordan, June 2009. © M Janaydeh

in west/southwest Jordan and indicated locations of records of both forms outside that area. Records of the black morph came mostly from the road east of Safawi. There are a few large wadis in the basalt desert in Jordan that appear to be suitable habitat for black Mourning Wheatears. However, during our study, most of these areas were either vacant or occupied by White-crowned Black Wheatears. The latter species has expanded into this area in the last two decades (Andrews *et al* 1998).

One reason for the rarity or total absence of black morph Mourning Wheatears in the few major wadis (except for Wadi Rajel) with apparently suitable habitat in the basalt desert, might be the prolonged drought in the last 5 years combined with overgrazing that may have led to a decrease in plant biomass and thus arthropod density. In our study the few records came from areas with human impact (roadsides, borders of a village), most likely because these sites had sufficient food due to higher productivity (run-off along roads) and excreta of livestock that attracted insects. Further, there might be some impact by the White-crowned Black Wheatear, which may be better adapted to the increasingly harsh desert conditions. Due to its larger size this species would be expected to be dominant over the Mourning Wheatear and might therefore easily exclude the black morph from breeding sites and food places. However, during observations that lasted for up to 5 hours, aggressive interactions were not recorded between a black morph male that defended a territory and an adult White-crowned Black Wheatear with overlapping territory.

In Syria, five black morph birds including a pair were recently observed during one day within an area of 50 km diameter (Nico Martinez pers comm, see two photos by Martinez in Balmer & Murdoch 2009). These birds were in the basalt desert east of Jebel Druz, the extension of the Harra basalt desert of northeast Jordan. Martinez's records suggest that the black morph in southern Syria may currently be more common than in Jordan, perhaps due to somewhat higher rainfall and associated productivity that

generally increase towards the north. A study of the distribution of the two morphs in Syria would be of especial interest.

The results of the present study suggest that black and normal morphs of the Mourning Wheatear select breeding habitats that differ in rock cover and colour. However, both choose habitats that have certain features in common: rock boulders and piles are usually included, combined with steep slopes, cliffs, and/or man-made vertical structures; these structures are used as song and foraging perches. There was a significant difference in rock coloration, normal morph birds selected habitats that vary in rock coloration, but the breeding sites of the black morph were confined to areas with very dark basalt rocks (Table 1). As an adaptation to this difference in habitat selection, we confirm that the overall dark coloration of the black morph is not only found in adult birds, but also in juveniles, evidence that the melanism of the black form is an adaptation to the dark environment. In contrast, juveniles of the normal morph have very pale juvenile body feathers even in those parts that are mostly black in the adults (Plate 5). The similarity of other morphological features suggests that the two forms are close in body structure and ecology.

We suggest that the so-called black morph might be better treated as having an independent taxonomic status from the typical morph of nominate *lugens*. Future research has to test how long the two forms have diverged from each other or if regular gene flow occurs. Additionally, behavioural experiments with dummies and playback might reveal if a prezygotic reproduction barrier exists. Given the rarity of the black morph at least in Jordan we suggest a breeding survey be carried out urgently in the basalt desert of southern Syria followed by regular monitoring in both countries.

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