Report on Habitat Selection by Breeding Pale Rock Sparrows (*Carpospiza brachydactyla*) on the Barouk Ridge of the Lebanon Mountains in 2001

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Executive Summary

Pale Rock Sparrow in the Bekka valley

- The pale rock sparrow is an uncommon bird found only in the Middle East.
- It is a species of conservation concern.
- The Barouk ridge in the Bekka valley holds an important pale rock sparrow breeding population.
- Breeding occurs in two areas:
  - the high mountain tops
  - sandwiched between human habitation/cultivation at the valley floor and woodland on the slopes in a narrow strip of goat degraded scrub.
- Very little is known about what makes good pale rock sparrow habitat.

This study

- We aimed to discover the aspects of the habitat in the Bekka valley which are associated with the pale rock sparrows' breeding.
- We studied the breeding pale rock sparrows both at the top of the ridge and near the valley floor between Kefraya in the south and Es Saalouk 9km to the north over the 2001 breeding season.
- We measured 14 aspects of the habitat, some physical (e.g. distance from human habitation) and some vegetation (e.g. proportion of tree cover).
- Habitat measurements and pale rock sparrow numbers were recorded at 40 sites across the study area.
- We monitored potential food for the pale rock sparrows (mostly insects) throughout the breeding season.

Findings

- 41 pale rock sparrows were found per square kilometre on average though some sites had none and others up to 100 per square kilometre.
- The top of the mountain and the area near the valley floor held very similar densities of birds on average but only the mountain tops held the highest densities.
- 4 aspects of habitat were associated with breeding pale rock sparrows:
  - Quantity of habitat: The more restricted the area of habitat available, the lower the density of pale rock sparrows.

    * Pebbles: areas with more small pebbles on the ground had higher densities of pale rock sparrows.
    * Slope: steeper areas held greater densities of pale rock sparrows
    * Trees: More or larger trees meant lower densities of pale rock sparrows
- 2 groups of insects were closely associated with the timing of breeding and were seen being taken to feed young:
    * grasshoppers
    * beetles
- Average temperature is closely associated both with the important insect populations and pale rock sparrow breeding.
- We estimate that, across the study area, roughly 200 pairs of pale rock sparrow were present in the area near the valley floor and 300 around the mountain tops.

Implications

- Habitat reduction, e.g. from villages and fields expanding up the lower slopes, is likely to be the most damaging thing for breeding pale rock sparrows.
- This population of pale rock sparrows is sizable and therefore important.
- Reducing goat grazing in the lower area could have serious long-term detrimental effects *if* tree cover increased as a result. However, in the short term there might be little effect.
- Anything damaging the beetle or grasshopper populations is likely to damage pale rock sparrow breeding.
- Not all important aspects of pale rock sparrow habitat can be controlled (e.g. steepness of slope and pebbles) so any conservation measures need to be directed to the most appropriate areas.
- Much of the population is in an area greatly influenced by human activity. The density of birds there is as high as on the mountain tops. Thus activity at present acts both positively and negatively on pale rock sparrow breeding and any conservation measures need to take both into account.

Abstract

The pale rock sparrow (*Carpospiza brachydactyla*) is a species of conservation concern with a significant breeding population on the East slopes of the Barouk ridge of the Lebanon Mountains. Little is known of the ecology or habitat requirements of these birds so a study was carried out to determine which aspects of the habitat are most closely associated with breeding. Breeding occurs in two areas, one of goat degraded scrub on the lower slopes in the Bekka valley and another on the mountain tops. In both these areas quantity of habitat, pebbliness of ground, slope and trees were closely associated with breeding density, highest densities being achieved in large areas of habitat with a steep gradient, high proportion of pebbles and few trees. Analyses are presented to show the nature of these associations. In addition, breeding time, which is later on the mountain tops than in the valley, was closely associated with a rise in beetle and grasshopper populations and a rise in temperature to an average of over 18°C. Some possible implications of these findings are discussed.

Report Scope

This report sets out the complete findings of the study of pale rock sparrows (*Carpospiza brachydactyla*) on the East Slopes of the Barouk ridge of the Lebanon Mountains in their 2001 breeding season. It is a stand-alone document, but complements and may be read in conjunction with the paper for peer-reviewed publication (Knight & Beale 2002) which contains details of data analysis and a full set of references. Unlike that paper, which is written for a broad audience of academic biologists and concerned with general findings and methodology, this report contains site-specific details and concentrates on relevant results without details of data analysis. This report is therefore less technical and aims to be more use in informing practical conservation work.

1 Introduction

1.1 Pale rock sparrows

The pale rock sparrow (*Carpospiza brachydactyla*) is a Middle Eastern endemic bird of conservation concern (Evans 1994). Associated with mountains, it is uncommon over much of its range and remarkably little is known of its ecology, what work has been done was mostly in Armenia in the 1960s and concentrated on weights and measurements of nests and nestlings.

Pale rock sparrows are of particular importance since they are a unique species, the genus *Carpospiza* was created especially for them (Cramp & Perrins 1994). In particular, whilst having an appearance similar to rock sparrows (*Petronia*), their nests in small bushes, uncoloured eggs, downy nestlings, mating behaviour and song are very different and more similar to a finch or bunting.

1.2 The Bekka pale rock sparrow population

Whilst small breeding populations were known from mount Hermon (Shirihai 1996) and along the Anti-Lebanon (Benson 1970), the sizeable population in the Bekka valley on the Barouk ridge (33º 42'N, 35º 45'E) was only noted in 1999. In this area they breed both above the tree line on the mountain peaks and in the open goat degraded region between the villages and road of the valley floor and the woodland of the middle slopes (Mediterranean maquis becoming steppe woodland higher up). In this lower region they are the second most frequently recorded bird (black-eared wheatear (*Oenanthe hispanica*) being the first).

1.3 Study rationale and objectives

This population of pale rock sparrows appears to be both of a significant size and in a habitat subject to much human influence (in the lower area of goat degraded scrub in particular). The primary objective of this study was therefore:

- To reveal which aspects of the habitat are particularly associated with breeding pale rock sparrows with a view to informing any management decisions affecting their habitat.

This was subdivided to consider two types of habitat associations:

- More or less fixed habitat variables including physical features (e.g. slope, proximity to villages) and vegetation (e.g. tree and grass cover).

- Potential prey species populations that vary over time.

In the process of addressing these questions this study also aimed to:

- Provide a secure baseline data-set for the breeding of pale rock sparrows in the study area.

- Add to the limited available information on pale rock sparrow ecology.

2 Methods

2.1 The study site

Since the population is split between those breeding below the woodland on the mountainside and those breeding on the mountain tops, the study area comprised two strips of land each about 9km long. The lower band was along the bottom of the ridge its lower (Eastern) border being human habitation, cultivation or track and its upper (Western) border being the edge of the woodland (>30% tree cover). This stretched from the North edge of Kefraya in the South to the South edge of the Ez Zalga alluvial fan north of Es Saalouk and Qalaat el Mdiq in the North. The upper band along the mountain tops had a lower (Eastern) border at the edge of the woodland (>30% tree cover) and an upper (Western) border at the top of the ridge, usually the ridge track. The North and South ends of the upper band were set to be approximately at the same latitude as those of the lower band. Twenty 500m transects were spread evenly along each band, each one perpendicular to the ridge and at least 400m from adjacent transects. Three transects in the lower band could only be 400m long as that was the width of the habitat band at that point.

2.2 Pale rock sparrow data collection

We walked all transects twice, the lower band between 2/5/01- 23/5/01 and upper band between 29/5/01- 19/6/01. Each visit was between 0700 and 1400. The second visit to each transect was ~10 days after the first. Between visits we reversed the direction of travel and order of transects in the day.

We recorded all pale rock sparrows seen during a transect, and whether they were greater or less than 40m from the transect line. We estimated density (*D* (km^{-2})) as a function of the total number of birds recorded (*N*) by the equation:

$$D = 10^6 \frac{kN}{L}$$

Where *k* is a detectability constant and *L*(m) is the length of the transect. *k* was calculated from *N*, *L* and *P*, the proportion of records less than *W* (40m) from the transect, by:

$$k = \frac{1 - \sqrt{1 - P}}{W}$$

(Bibby et al. 1992)

We calculated *k* for each visit to each transect and use the average value in all estimates of *D*. We then used the average value of *D* for each transect in subsequent analyses.

2.3 Habitat assessment

We recorded 14 habitat variables (Table 1). At two points approximately a third of the way in from either end of the main transect, we walked five radiating fifty metre transects recording habitat variables. We made point assessments of cover every ten metres along these short transects, using seven categories (corresponding to *Bar*, *Bus*, *Grs*, *Hrb*, *Peb*, *Rok*, *Tre*). Some points included more than one category (e.g. tree and grass). Percentage cover was arcsine transformed ($variable = \arcsin\sqrt{percentage}$ working in radians) to give the variables used in the analyses. In addition we recorded *Wth*, the width of potential habitat at the transect, *Hgt*, the height of the highest object encountered by the 50m transects; *Slp*, the gradient of the ground within the central third of the main transect continuing for the largest distance (in degrees) and *Hmn*, the distance of the nearest human habitation to any part of the main transect. *Dst* and *Alt* identified the locations of the transects, being respectively the number of the transect South to North along the mountain ridge and the approximate altitude in metres. Finally, *Tmp* was the average temperature (see 'Temperature data') for the time nearest that when the transect was walked.

Table 1 **Variables used**

Variable	name
Altitude	*Alt*
proportion of bare earth	*Bar*
proportion of spiny bushes	*Bus*
distance along ridge	*Dst*
proportion of grass	*Grs*
maximum height of object	*Hgt*
distance from human habitation	*Hmn*
proportion of herbs	*Hrb*
proportion of pebbles (<10cm diameter)	*Peb*
proportion of rocks (>10cm diameter)	*Rok*
gradient of slope	*Slp*
temperature at the time of the density transects	*Tmp*
proportion of trees	*Tre*
width of potential habitat strip	*Wth*

2.4 Prey species assessment

We used three methods: a) pitfall traps, b) visual surveys and c) sweep-netting:

a) We set 5 Pitfall traps, 7cm diameter, 8.5cm depth with 100ml alcohol under stones at the upper and lower sites. The lower pitfalls were all in the area

immediately South West of Qalaat el Mdiq and the upper pitfalls in the middle of the site directly above Aana village. Contents were removed and classified (to order for insects) and the alcohol replenished weekly.
b) We made weekly visual surveys in each of the upper and lower study sites using a 500m transect loop close to the pitfall traps walked for one hour recording and classifying (as above) all terrestrial invertebrates observed. The quantity of observations was kept manageable by *a priori* excluding flying invertebrates and ants.
c) Visual surveys were broken three times to make ten net sweeps of whatever vegetation was in the vicinity. All invertebrates captured were classified as above and released.

2.5 Other observations

In the course of frequent visits to each site throughout the breeding period, records were made of first observations of pale rock sparrow breeding activity, including the presence of birds, mating and nesting. Observations of feeding behaviour were also made.

Attempts were made to trap and colour ring singing males in the lower study area. Erecting a net close to a singing male and playing a tape of pale rock sparrow song underneath it was found to be rapidly effective in some cases.

2.6 Temperature data

Temperature readings came from two weather stations in the Bekaa valley, usually at three hourly intervals, throughout the study period. The stations (at 34.03N 36.72E and 33.82N 35.85E) are at 920m and 1333m above sea level respectively. This figure was used to extrapolate the likely temperatures at the study sites throughout the study period.

3 Results and discussion

3.1 Pale rock sparrow breeding

The data for each transect is summarised in the appendix. The density of breeding pale rock sparrows in the study area varied from 0 to about 100 birds per square kilometre. The approximate geography of how the population is distributed is shown by the solid lines in Figure 1. There is more variation in the density of pale rock sparrows in the upper area and higher maximum densities than in the lower area. In the lower area densities peaked just South of Qalaat el

Mdiq and, whilst dipping slightly around Aana, increased again towards Kefraya.

Pale rock sparrow densities were not significantly different between the upper and lower areas (p=0.45, Welch t-test) averaging 41 birds per square kilometre. However, the larger quantity of potential habitat in the upper area meant that this section of the study site holds more pale rock sparrows overall. This study was not designed to obtain accurate population estimates, however, extrapolating from the density estimates, habitat width measurements and the fact that the vast majority of records were of singing males (each of which may be taken to represent a breeding pair), a rough approximation may be made. This suggests approximately 200 pairs present in the lower region and approximately 300 pairs in the upper region of the study site

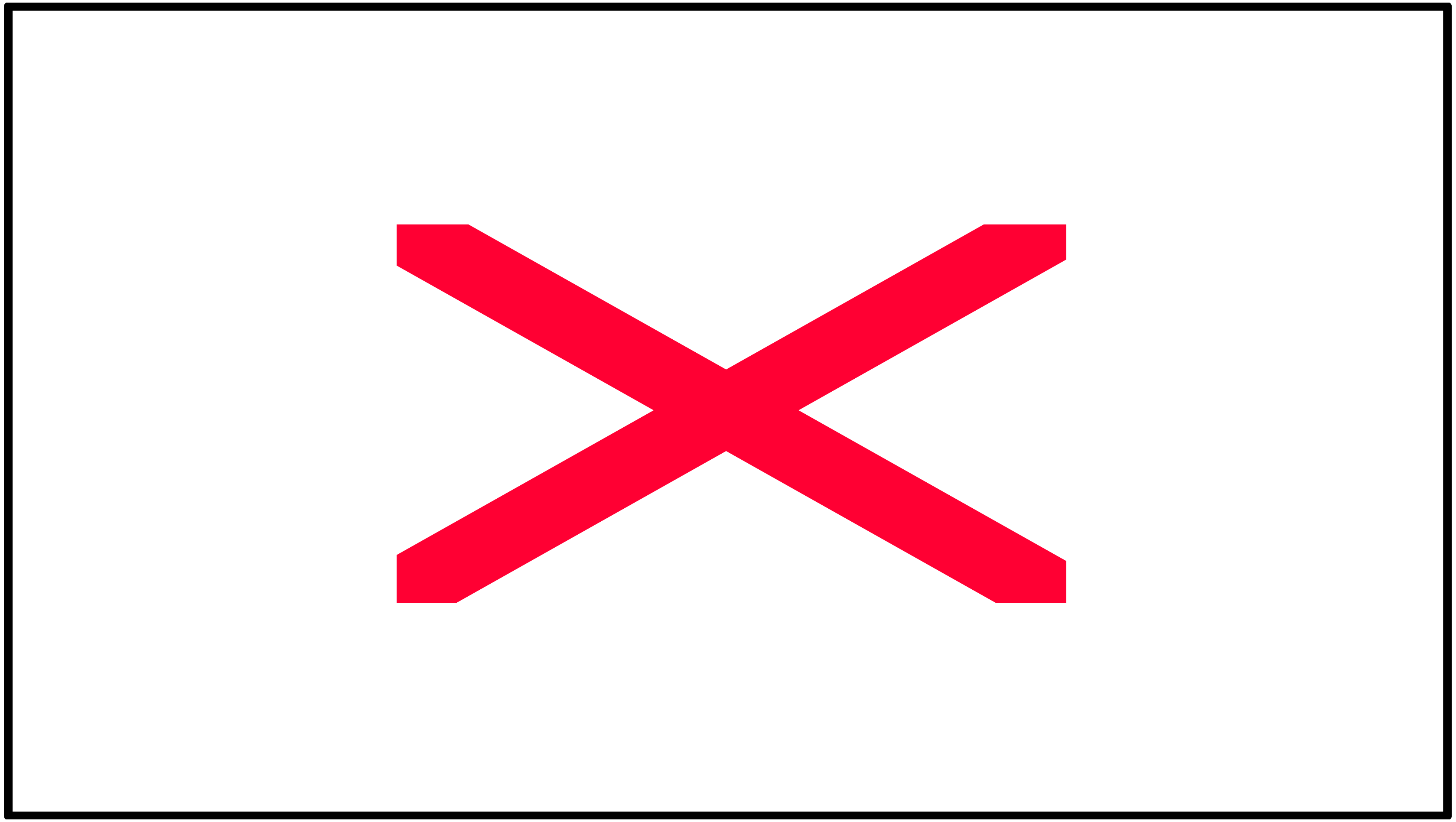


Fig. 1 **Observed densities of pale rock sparrows in the study areas and those predicted by the Multiple Regression analysis.** The upper area (at the top of the Barouk ridge), the lower area (in the Bekka valley) and their approximate location relative to local villages are shown.

3.2 *Habitat associations*

Using the 14 habitat variables recorded for each transect (Table 1), three very different analyses were used to decide which of these were significantly associated with pale rock sparrow densities. This was due to the fact that any one method is liable to produce spurious results by chance alone; however, where several methods agree it is likely to be a real association.

3.2.1 Qualitative results

Three of the variables are agreed to be associated with pale rock sparrow density:

- Proportion of pebbles: pale rock sparrows breed at higher densities where there is a greater proportion of the ground covered by pebbles less than 10cm diameter.
- Quantity of habitat: The wider the habitat strip, the greater the breeding density of pale rock sparrows.
- Slope: The greater the slope of the ground the greater the breeding density of pale rock sparrows.

The different analyses agreed that the most important of these is the proportion of pebbles.

In addition there appeared to be a significant association with trees, either their height (the taller the highest object around the transect, the lower the density of pale rock sparrows) or the proportion of coverage, lower tree cover being associated with higher pale rock sparrow density.

3.2.2 Quantitative results

These findings can be quantified and visualised by two of the analyses:

Multiple regression analysis

Multiple regression analysis results in an equation that may be used to predict the density of pale rock sparrows from the pebbliness, width, slope and tree cover of the area, each of the variables is calculated as described in the methods (including arcsin transformation where appropriate):

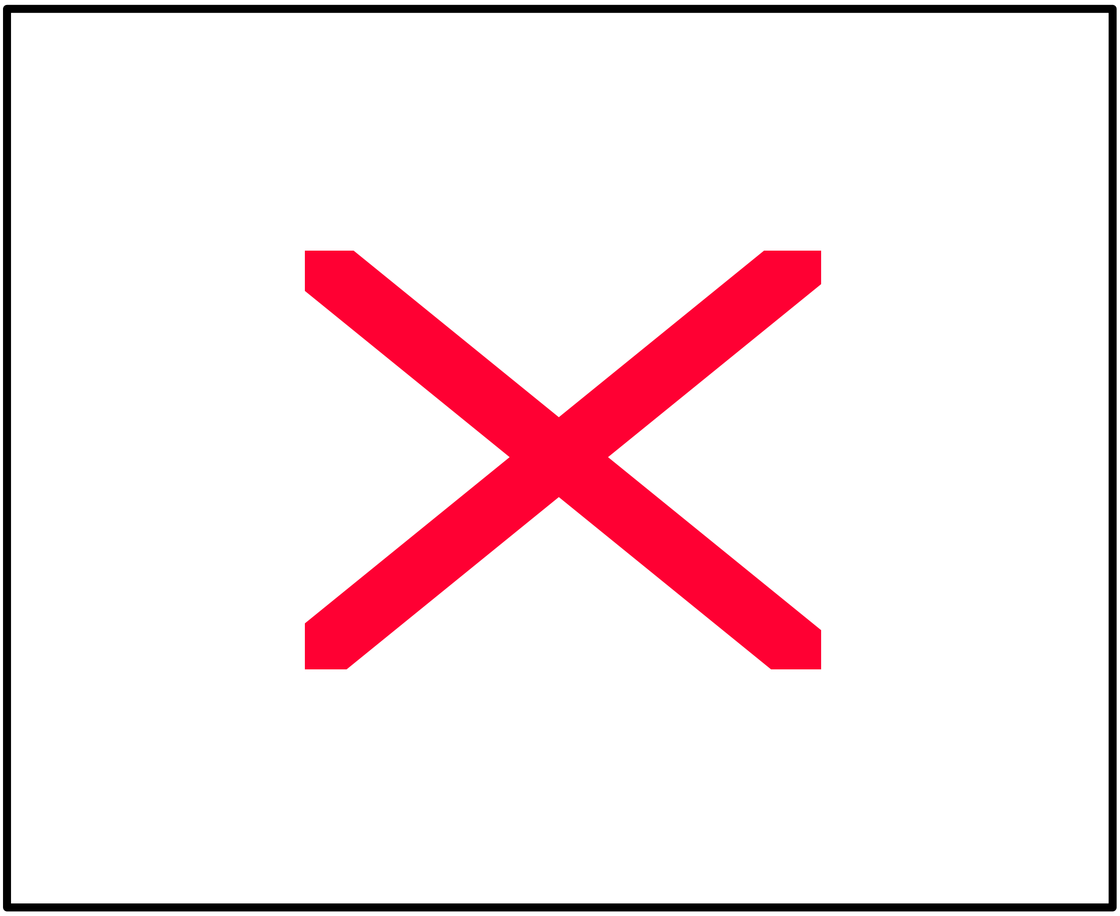
$$Density = -438 - 313Tre^2 + 870Peb + 24Slp - 47PebSlp + 0.83Wth - 1.4PebWth$$
$$-0.046SlpWth + 0.085PebSlpWth$$

These predicted values are plotted in the dashed line in Fig. 1. This shows that, though the analysis is not perfect, it predicts the density of pale rock sparrows adequately in most places.

Regression tree analysis

The second form of analysis shows the findings in a different way. This is a regression tree shown in Fig. 2. This splits up all the transect data into groups, starting at the top. Thus the average density of pale rock sparrows across all transects is 41 per square kilometre. However those transects in wide areas of habitat (>750m) average greater density (51 birds per square kilometre) than those in narrow areas of habitat (<750m, averaging 29 birds per square kilometre). Transects in wide areas of habitat can be further subdivided into those with low (<31%) and high (>31%) pebble coverage, whilst those in narrow areas of habitat are better subdivided into those containing tall objects (usually trees, height>1.75m) and those without, giving low and high densities of pale rock sparrows respectively. In some cases, as shown in Fig. 2 there is then further subdivision by either proportion of bare earth or the slope of the ground. For instance, the Southernmost transect in the upper band had a width of 1000m, 36% pebble coverage and a gradient of 16 degrees (see appendix) which puts it into a category averaging 54 pale rock sparrows per square kilometre. This corresponds well with its observed density of pale rock sparrows of 61 per square kilometre.

Fig. 2 **Regression tree analysis**. The tree is followed from top to bottom, the numbers in the ovals indicating the density of pale rock sparrows in birds per square kilometre



This analysis is a straightforward way of looking at the way habitat is associated with pale rock sparrow density. However caution should be exercised if wanting to use this method for predicting pale rock sparrow densities. In particular the left hand side of the tree (i.e. for use in narrow sections of habitat) is not well corroborated by other methods, especially the question of the quantity of bare

earth. It is preferable to compare results with those of the equation from the regression analysis.

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3.3 Prey species associations

Potential invertebrate prey was monitored at both the upper and lower sites throughout the breeding season. Since the pale rock sparrows breed later at the upper site than the lower site, it was possible to see which groups of invertebrates were associated with these breeding periods. Invertebrate numbers in general were found to be associated with pale rock sparrow breeding, however, two groups in particular were associated:

- Beetles (Coleoptera)
- Grasshoppers (Orthoptera)

That these two groups really are key prey species was corroborated by the fact that these were the only groups that were observed being chased or carried by pale rock sparrows during the breeding period.

In addition temperature was associated with both pale rock sparrow breeding and the numbers of beetles and grasshoppers. Specifically, the rise to an average temperature (day and night) of 18°C was associated with pale rock sparrow breeding, and increases in the beetles and grasshoppers.

The details of these findings are shown in Fig. 3.

Among the grasshoppers some further classification was possible. They comprised a small number of bush crickets (Tettigoniidae) and a range of grasshoppers (Acrididae). These dominated the visual counts averaging 64% of all records at the lower site, though only 34% at the upper. Only some species could be readily identified on the visual transects, but of these, species peaking in conjunction with pale rock sparrow breeding at the lower site included *Sphenophyma rugosa* and *Oedipoda miniata*, and at the upper site *Dociostaurus hauensteini*.

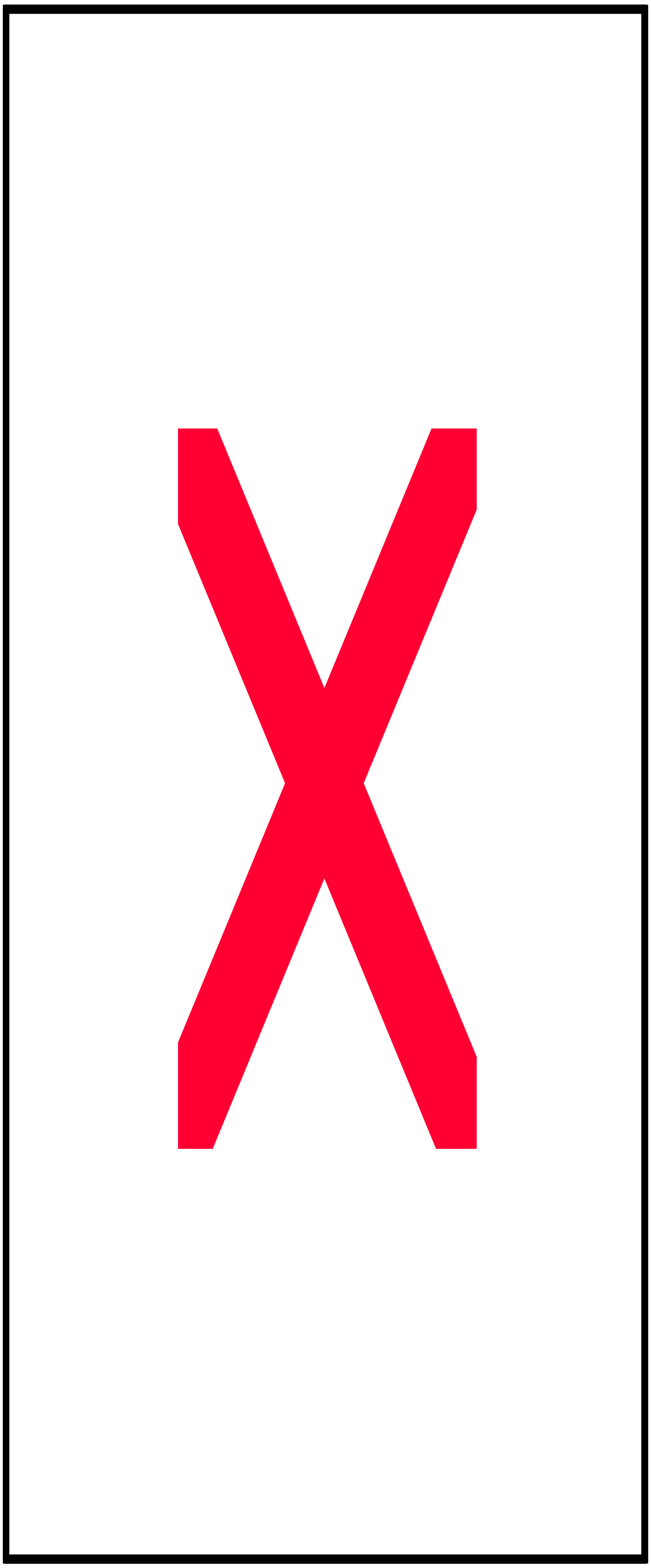

Fig. 3 **Associations with pale rock sparrow breeding** Dashed lines correspond to the lower site, solid lines to the upper site. The light vertical lines indicate the date of arrival of pale rock sparrows at each site, other breeding observations are shown by the black triangles at the bottom.
(a) Average temperature at the study sites throughout the breeding season as extrapolated from weather stations in the Bekaa. Weekly means.
(b) Total numbers of invertebrates recorded.
(c) Number of grasshoppers recorded.
(d) Number of beetles recorded. The dip on 12-May corresponds to greatly reduced numbers of small rove beetles (Staphylinidae) present on the preceding and succeeding weeks.

3.4 General ecological observations

The first pale rock sparrow of 2001 arrived in the lower study area on 25th April the day before a flock of 45 was found in the area and two days before singing males were spread along the whole length of the slope. This compares with the end of May for the arrival of an Armenian population and early May for the small mount Hermon population. It was notable that in this, 2001 spring, there were already males holding territories at the base of the Anti-Lebanon mountains near the North Eastern corner of Lebanon, even earlier, on 7th April. Having arrived, breeding commenced rapidly, mating was first observed on 30th April and a nest with a single egg (later abandoned) was found on 5th May.

We found no pale rock sparrows in the upper area until singing males were present 17th May, from which time birds were present in both upper and lower areas. Mating was not observed in the upper area until 29th May. Breeding was confirmed in the upper area by a nest found with a full complement of 4 eggs (later predated probably by fox (*Vulpes vulpes*) or wildcat (*Felis silvestris*)) on 6th June. Food carrying was observed in the lower area until 8th June and in the upper area until 19th June.

Small flocks of pale rock sparrows (6-20) were regularly encountered in the early evening at the lower study area. These frequented the edge of vineyards and may have been associated with drinking from irrigation water. Pale rock sparrows were also observed in small numbers both morning and evening drinking at the pool close to the upper area above Aana.

This sequential breeding in lower then upper areas was also observed in the 2000 breeding season, and might suggest two broods with a switch of area in between. Two broods have not previously been recorded for pale rock sparrow. However, despite attempts using colour ringing to confirm that individuals were switching area (6 were colour ringed in the lower area), none was relocated in the upper area over the course of 15 days' data collection there. The small sample size and limited study area cannot exclude that this might be happening. However, given the 2 week minimum incubation period, the first individuals in the upper area could not have raised a full brood since the arrival of the population in the lower area, implying that at least some of the breeding population in the upper area had not previously bred in the lower area. Instead it is possible that these birds may have bred much earlier elsewhere in the region, as for example, in the North of Lebanon.

4 Concluding remarks

This study has shown that pale rock sparrow breeding on the Barouk ridge of the Lebanon mountains is associated with a number of features of the habitat in general (width of potential habitat, pebbliness of ground, slope and some aspect of the tree cover), some food sources in particular (grasshoppers and beetles) and minimum temperatures. Whilst not very surprising, these associations appear to be robust and analyses have been done which show how these associations work.

Prediction based on observed associations should only be applied with great caution. However, various implications which could affect management decisions, and future monitoring of the site may be surmised from these results. A few are suggested here in no particular order, others may be possible:

- Habitat quantity is shown to be important for breeding densities, so the continuing encroachment up the slope by human habitation and cultivation is likely to be doubly detrimental to pale rock sparrow populations– giving both less available habitat and lower densities within what remains. This study suggests that a habitat width of over 750m leads to high populations of pale rock sparrows.

- Ground cover vegetation is not associated with pale rock sparrow density, implying that, in the short term, changes in grazing regime which affect principally ground vegetation may not impact pale rock sparrow breeding

- Large trees are associated with reduced pale rock sparrow breeding densities thus management leading to more, or more coverage by tall (>1.75m) trees (e.g. permanent removal of grazing) is likely to be detrimental to pale rock sparrows.

- Pale rock sparrow density is closely associated with two physical characteristics which are not easily manipulated (slope and pebbliness of the ground) implying that any management for the benefit of pale rock sparrows needs to be directed to appropriate areas.

- The health or otherwise of the beetle and grasshopper populations is likely to be closely associated with pale rock sparrow breeding success. So these would be good groups to target for monitoring.

Various questions remain outstanding at the end of this study which could lead to further work, for instance:

- It is still unclear whether individuals which breed at the bottom of the mountain subsequently (when the temperature and beetle and grasshopper populations have increased) have a second brood around the mountain tops. If this were the case, not only would it be the first record of two broods in pale rock sparrow, but it would be a good example of habitat switching, a phenomenon of significant biological interest. This could only be resolved by further ringing. The attempts at colour ringing individuals were unsuccessful due to the small number of individuals trapped by the chosen method (targeting individuals) and the difficulty of seeing colour rings on pale rock sparrows in the field. Much greater numbers were caught much more easily in later trapping targeted at drinking sites.

- Since very little is known of the ecology of these birds almost any further observations on their breeding biology, particularly targeted to particular pairs would be of value.

- This work has provided some baseline data against which this population of pale rock sparrow could be compared in the future. In particular it would be valuable to compare the analyses presented here with differences in the population following any management related habitat changes.

Acknowledgements

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Appendix

Data used in analyses

Site	Transect	Density (birds /km²)	Bare earth %	Rock %	Spiny bush %	Herb %	Grass %	Tree %	Pebble %	Gradient degrees	Highest object (m)	Distance to houses	Habitat width	Altitude	Temp •C
low	1	47	4	20	14	4	40	0	38	11	1.2	0	400	1000	22
low	2	50	16	16	18	2	38	0	26	12	1.5	100	500	1000	24
low	3	44	14	16	12	0	64	0	18	8	1.5	200	500	1000	22
low	4	50	24	18	8	2	28	2	28	26	4	100	550	1000	22
low	5	25	16	26	16	0	18	0	30	18	2	500	600	1000	22
low	6	28	14	34	0	10	40	0	16	20	2	200	450	1000	22
low	7	13	6	34	16	6	34	2	12	10	2.5	100	500	1000	21
low	8	19	8	26	36	6	18	2	10	13	5	200	500	1000	20
low	9	13	12	28	20	4	22	0	16	23	5	300	500	1000	23
low	10	31	20	18	22	12	26	2	8	16	2.5	500	500	1000	23
low	11	31	16	6	34	10	30	8	26	12	4	1400	900	1000	25
low	12	25	30	20	8	14	40	2	18	18	3	1000	550	1000	24
low	13	63	14	6	24	12	34	2	36	10	3	200	800	1000	20
low	14	38	12	14	8	8	54	0	20	10	0.5	100	550	1000	20
low	15	38	16	12	16	4	56	4	16	18	4	500	800	1000	20
low	16	69	8	8	42	2	18	0	30	9	1	50	500	1000	14
low	17	76	4	2	42	4	16	0	44	10	1	400	600	1000	16
low	18	57	14	4	28	4	16	0	44	8	1.5	100	800	1000	16
low	19	44	2	6	58	0	12	0	36	11	2	300	1000	1000	15
low	20	19	8	4	30	2	56	0	18	10	3	400	600	1000	15
high	1	61	14	20	4	18	26	0	36	16	1.4	1500	1000	1850	22
high	2	30	6	38	0	12	6	0	50	11	0.7	1500	700	1850	22
high	3	41	2	28	4	14	14	0	44	12	0.5	1500	900	1850	22
high	4	30	4	28	4	12	28	4	28	26	3	1500	800	1850	24

high	5	81	14	16	2	18	14	0	40	19	1.3	1500	900	1850	25
high	6	41	10	22	12	22	4	0	36	15	0.6	1500	900	1850	25
high	7	71	22	4	2	26	18	0	32	11	0.8	1500	900	1850	24
high	8	61	8	32	6	8	18	0	38	22	3.5	1500	800	1850	21
high	9	101	18	22	4	16	12	0	44	24	0.3	1500	800	1850	21
high	10	30	20	32	4	14	16	0	22	22	0.8	1500	800	1850	21
high	11	51	10	28	2	22	10	0	40	20	1.5	1500	700	1850	21
high	12	41	8	24	2	24	14	6	30	18	2	1500	800	1850	21
high	13	0	12	10	0	18	16	12	38	19	3.5	1500	600	1850	24
high	14	0	12	26	10	16	10	4	30	20	2	1500	600	1850	25
high	15	71	6	8	8	26	16	0	42	20	0.6	1500	900	1850	22
high	16	61	16	20	12	14	10	2	38	18	4	1500	1000	1850	22
high	17	0	8	22	2	12	4	8	50	31	2.5	1500	500	1850	27
high	18	0	8	30	8	16	2	14	30	19	3	1500	600	1850	26
high	19	0	12	32	12	20	16	4	18	28	3	1500	700	1850	26
high	20	101	12	28	2	18	12	2	34	18	3	1500	800	1850	27