Turkish Breeding Bird Atlas Pilot Project 2001: Erciyes Mountain and Kayseri Region

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Introduction

The goal of this project was to create a Breeding Bird Atlas for the region surrounding Erciyes Mountain and the city of Kayseri in central Turkey. There are previous scattered bird records for parts of this area but this is the first systematic breeding bird atlas. This region was one of three regions chosen as a pilot project for the Breeding Bird Atlas of Turkey project which is planned to be completed in the next five years. This article is a summary of the atlas which was published in full in the ErKuş 2001 Activity Report (Ertaş, 2002 - in Turkish).

Study Area

For the Breeding Bird Atlas of Turkey project the whole country has been divided into 50x50 km UTM squares. The coordinates of the 50x50 km square we surveyed are from 700,000 - 750,000 m E and 4,250,000 - 4,300,000 m N in UTM Grid Zone 36S. The study area is located in the central Anatolian region of Turkey and includes Erciyes Mountain and the city of Kayseri (Figure 1). The city of Kayseri, with a population of 525,000 and at an elevation of 1041 m, is situated in the northwest part of the study area. Besides the large city of Kayseri there are many smaller towns and villages located throughout the study area. Erciyes Mountain is a volcanic mountain 3917 m high and located in the west central part of the study area to the south of the city of Kayseri. It is the tallest mountain in Central Anatolia. Surrounding Erciyes Mountain are the Develi, Kayseri, and Tomarza plains. The Develi plain is a closed basin. The study area is semi-arid steppe and the plant cover is generally montane steppe vegetation consisting of spiny shrubs and plants such as *Astralgus, Acantholimon, Onobrychis, Gundelia,* and

Genista spp. The plains in the study area are agricultural areas planted mainly to winter wheat, oats, and barley. Some natural *Populus tremuloides* forests grow on the pumice soils of steep mountainous slopes. Other natural forested areas consist of *Quercus* spp. and bushes including *Pyrus, Crateagus, Rosa, Prunus, Amygdalus, Cotoneaster* spp. with scattered *Juniperus* spp. The many valleys with intermittent streams have *Populus, Salix* spp. and fruit trees along the streams. The climate of the area consists of cold snowy winters with an average temperature of -2° C. Summers are hot and dry. Most rain is seen in the spring months.

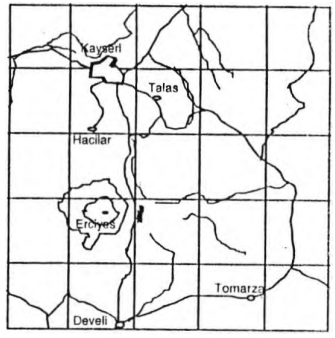


Fig. 1.: Map of the study area showing Erciyes Mountain, the city of Kayseri and a few smaller towns, some major roads, and streams.

Methods

The bird atlas data were collected from May 5, 2001 through July 1, 2001. The 50x50 km UTM square in the Erciyes Mountain and Kayseri study area was divided into 25 10x10 km squares. Each 10x10 km square was visited twice during the breeding season, once early (between May 5 and May 29, 2001) and once late in the season (between May 27 and July 1, 2001). For each visit in a square at least one group of two people completed a one hour breeding bird survey. In many of the squares more than one group completed a survey. For each survey the altitude, UTM coordinates, time of day, habitat types, and the bird species that were seen and/or heard were noted along with their breeding code. The breeding code was noted from 1 to 16 depending on the breeding evidence (EBCC Atlas 1997).

At the start of the project, one hour forms were completed. Later two half hour forms were done in order to gather more information on bird abundance. During this time the atlas workers noted each bird that was seen and/or heard together with the breeding bird code. Apart from the bird atlas form recording times, birds seen and/or heard and their breeding codes were noted on casual record forms. All the breeding bird atlas work was done during daylight hours so nocturnal species were not recorded.

All the bird atlas forms and casual record forms were input into a computer spreadsheet. From this data, the total number of bird species seen in each 10x10 km square was determined. For every square the total number of bird species seen on one hour forms, half hour forms and casual record forms was found along with the total number of hours of atlas work.

Distribution maps for each bird species were made. Dots were placed in the center of each square which had record(s) of the species, with the size of the dot related to the species' relative abundance in that square. The relative abundance in each square was calculated as the fraction of bird atlas forms where the bird was noted divided by the total number of bird atlas forms for that square. An open dot indicated that the bird was recorded only on a casual record form and not during the breeding bird atlas survey work.

For every bird species we calculated the maximum breeding code (1-16) noted in the 50x50 km square. We calculated the overall abundance of a species in the 50x50 km square as the number of forms where the bird was recorded divided by the total number of forms in all the bird atlas work. The number of times a habitat was noted during the bird atlas work was recorded for each habitat type. For each bird species, the percentage of each habitat type that it was seen in was calculated as the number of times each habitat was recorded for the species divided by the total number of habitats recorded for the species. The habitat types with percentages over 10% where the bird was seen were reported. For each habitat where the bird was seen over 10% of the time, a chi-square test was performed to determine if the bird was seen in these habitat types more than would be expected by chance. If the p-value was less than 0.05, it was reported as being statistically significant. For every bird species seen the average, minimum and maximum altitude where the species was seen were determined.

Results

In total 244 bird atlas record forms were completed for a total of 133 hours of bird atlas work. Figure 2 shows the sampling effort, which was the number of breeding bird atlas record forms completed, for each 10x10 km square. The number of bird atlas record forms completed varies from a minimum of 4 to a maximum of 20 forms completed in one square. The average number of forms completed per square was 9.8 ± 4.6 (std. dev).

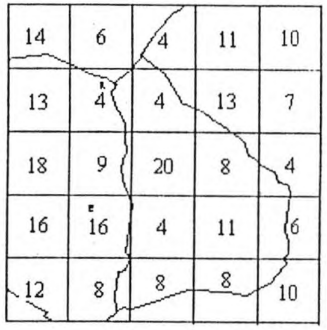


Fig. 2.: For each 10x10 km square the total number of bird atlas record forms completed during bird atlas work.

Table 1 shows the habitat types noted in the 50x50 km study area during the bird atlas surveys together with the percentage of forms where the habitat type was noted. The most common habitat types, which were noted on more than 10% of the forms during bird atlas survey work, were: farmland, arable (dry); bare sediment/rock (montane); orchards, poplar plantations; woodland (unspecified); bare rock faces/inland cliffs; scrub/grass (unspecified); river or stream (slow flowing); marsh, fen, or water fringe vegetation.

Habitat type	% of total forms
farmland, arable (dry)	41.4
bare sediment/rock (montane)	39.8
orchards, poplar plantations	25
woodland (unspecified)	21.7
bare rock faces/inland cliffs	18
scrub/grass (unspecified)	17.6
river or stream (slow flowing)	11.9
marsh, fen, or water fringe vegetation	10.7
reedbed	8.2
canal or ditch	6.6
bare sediment/rock (lowland)	6.1
broad-leaved woodland	4.9
grassland (dry)	4.1
managed deciduous (pollard/coppice)	4.1
shelterbelts, hedges	3.7
river or stream (fast flowing)	3.3
alpine lake	3.3
urban green space/gardens	3.3
alpine grassland	2.5
coniferous forest (natural)	2.5
even-aged coniferous (plantation)	1.6
mixed woodland	1.6
farmland, rice/cotton (wet)	1.2
freshwater pond (less than 0.5 ha)	0.8
open water	0.4
salt steppe	0.4

Table 1.: Habitat types noted in the 50x50 km square and their overall percentage (number of forms where habitat type was noted divided by 244 total forms).

In the 50x50 km square a total of 130 bird species were seen. Of the 130 bird species seen, 8 species were noted only on casual record forms and not on the breeding bird atlas survey forms. The Chao1 estimator (Colwell 1997) of number of species was 149. Of the 130 bird species, 28 bird species were seen only once. The total number of birds species seen in each 10x10 km square both during bird atlas work and on casual record forms is shown in Figure 3. The number of bird species seen varies from 14 to 50 with an average of 28.8 ± 10.7 (std. dev). Most bird species were seen in squares with marshes, alpine lakes, or streams.

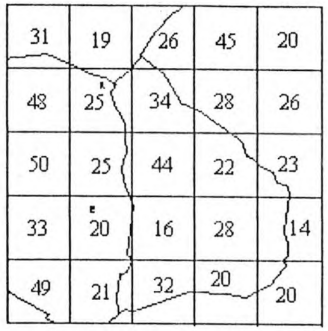


Fig. 3.: The total number of bird species recorded in each 10x10 km square including those recorded on casual record forms.

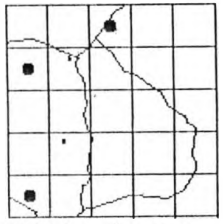
The bird species that were seen most frequently in the study region were: *Apus apus* Swift (recorded on 98 bird atlas forms), *Oenanthe oenanthe* Wheatear (94), *Emberiza hortulana* Ortolan Bunting (88), *Milaria calandra* Corn Bunting (87), *Oenanthe isabellina* Isabelline wheatear (83), *Sturnus vulgaris* Starling (75), *Emberiza melanocephala* Black-headed Bunting (72), *Pica pica* Magpie (70). These species were all noted on more than 25% of the total 244 bird atlas forms.

There were in total 70 Species of European Conservation Concern (SPECs) (Tucker and Heath 1994) noted during atlas work in the study region. Of these 70 species 12 were in SPEC category 2, 39 were in SPEC category 3 and 19 were in SPEC category 4. There were no species of global conservation concern (SPEC category 1) noted during the atlas work.

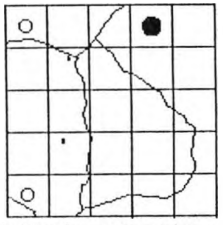
Distribution maps for 127 of the bird species were made (ErKuş 2001 Annual Report). Some examples from the 127 maps are shown in Figure 4. The map for *Tadorna ferruginea* Ruddy shelduck (map no. 13) shows the location of three wetlands in the study area. The map for *Melanocorypha calandra* Calandra Lark (map no. 47) shows the location of agricultural areas. The map for *Melanocorypha bimaculata* Bimaculated Lark (map no. 48) shows places with rocky plateaus. *Luscinia megarhynchos* Nightingale (map no. 66) is found mostly in valleys with tree-lined streams. *Buteo rufinus* Long-legged Buzzard (map no. 19) is quite common in the study area. *Athena noctua* Little Owl (map no. 40) was often noted on casual record forms. *Apus apus* Swift (map no. 42) was the most frequently seen bird in the study area.

followed by *Oenanthe oenanthe* Wheatear (map no. 73), *Emberiza hortulana* Ortolan Bunting (map no. 124), *Milaria calandra* Corn Bunting (map no. 127), and *Oenanthe isabellina* Isabelline Wheatear (map no. 72).

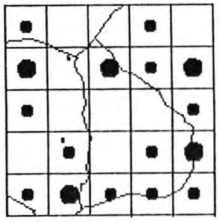
Figure 4. Distribution and abundance maps for some of the bird species noted.



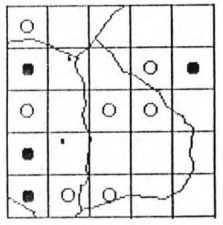
13. *Tadorna ferruginea*



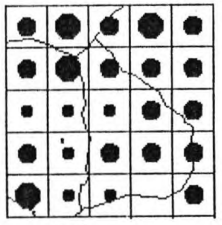
16. *Neophron percnopterus*



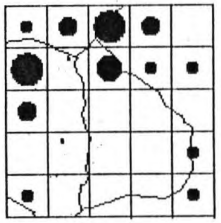
19. *Buteo rufinus*



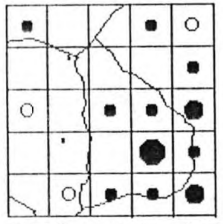
40. *Athena noctua*



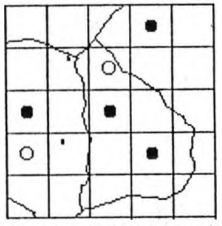
42. *Apus apus*



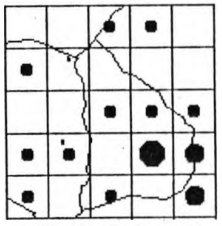
44. *Upupa epops*



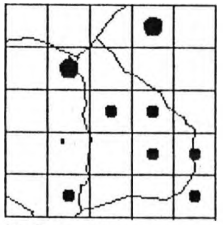
47. *Melanocorypha calandra*



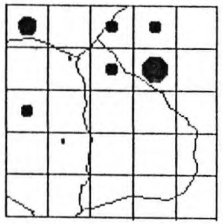
48. *Melanocorypha bimaculata*



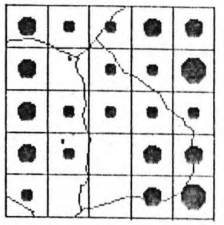
53. *Alauda arvensis*



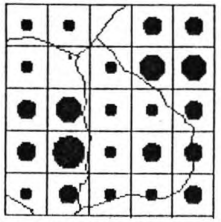
56. *Ptyonoprogne rupestris*



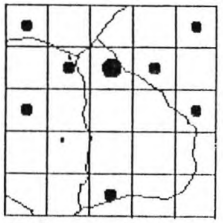
66. *Luscinia megarhynchos*



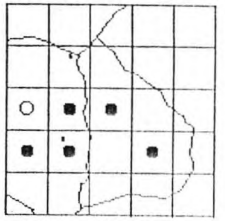
72. *Oenanthe isabellina*



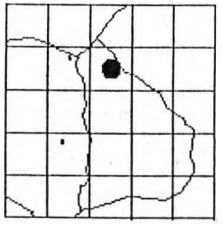
73. *Oenanthe oenanthe*



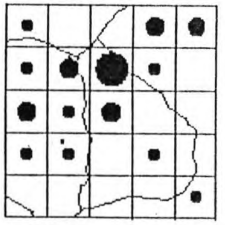
76. *Oenanthe finschi*



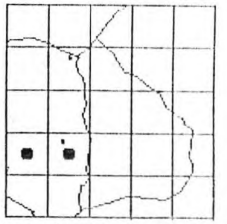
77. *Monticola saxatilis*



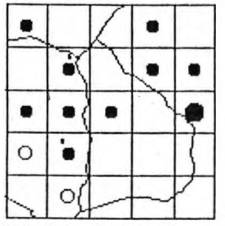
78. *Monticola solitarius*



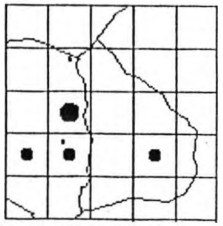
96. *Sitta neumayer*



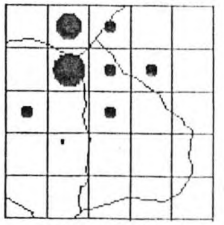
105. *Pyrrhocorax pyrrhocorax*



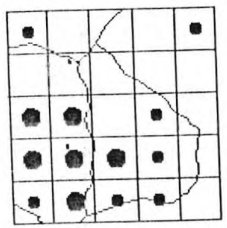
115. *Petronia petronia*



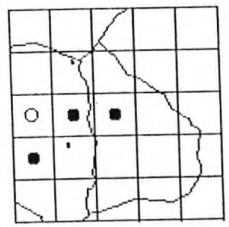
116. *Montifringilla nivalis*



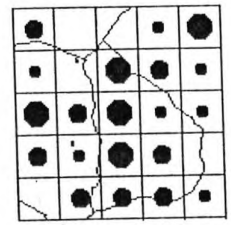
119. *Carduelis chloris*



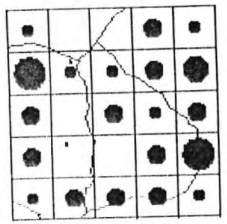
121. *Carduelis cannabina*



122. *Rhodopechys sanguinea*



124. *Emberiza hortulana*



127. *Milaria calandra*





Three sensitive species recorded during the breeding bird atlas work were: *Aquila chrysaetos* Golden Eagle, *Falco cherrug* Saker Falcon, *Alectoris chukar* Chukar. These sensitive species are hunted or persecuted by people and so they were not shown on the distribution maps.

There were 18 bird species noted during atlas work that are associated with mountain ecosystems (Table 2). Of these 18 bird species, 7 are Species of European Conservation Concern because of their unfavorable conservation status (Tucker and Heath 1994).

Latin name	English name (map no.)	Highest Breeding Code Recorded	SPEC
Aquila chrysaetos	Golden Eagle	6	3
Alectoris chukar	Chukar	3	3
Eremophila alpestris	Horned Lark	13	
Ptyonoprogne rupestris	Crag Martin (56)	13	
Motacilla cinerea	Grey Wagtail	1	
Prunella ocularis	Radde's Accentor	14	3
Phoenicurus ochruros	Black Redstart	3	
Oenanthe oenanthe	Wheatear (73)	12	
Oenanthe pleschanka	Pied Wheatear	1	
Oenanthe hispanica	Black-eared Wheatear	16	2
Oenanthe finschii	Finsch's Wheatear (76)	2	
Monticola saxatilis	Rock Thrush (77)	2	3
Monticola solitarius	Blue Rock Thrush (78)	1	3
Sitta neumayer	Rock Nuthatch	16	4
Pyrrhocorax graculus	Alpine Chough	1	
Pyrrhocorax pyrrhocorax	Chough (105)	3	3
Montifringilla nivalis	Snow Finch	1	
Rhodopechys sanguinea	Crimson-winged Finch (122)	3	

Table 2. Breeding birds associated with mountain ecosystems noted during atlas work in the Erciyes Mountain ecosystem.

In the Appendix, all the bird species seen in the study area are listed by their numerical codes from Voous (1977), Latin names, English names, SPEC category if applicable (Tucker and Heath 1994), overall abundance, highest breeding evidence, major habitat types and altitudes (minimum, maximum and mean) where the bird was seen.

Conclusion

With 130 breeding bird species Erciyes Mountain and the surrounding region hosts a very rich biodiversity. Of these 130 species, 51 are Species of European Conservation Concern (SPEC) that have an unfavorable conservation status. Of the 130 species, 18 are birds that are found in mountain ecosystems. Of these 18, 7 are Species of European Conservation Concern (SPEC) that have an unfavorable conservation status.

Because Erciyes Mountain and the surrounding region supports so many breeding bird species, including many SPEC bird species, this is an important area to conserve. Authorities have noticed our atlas and our bird diversity data and plans to declare Erciyes Mountain a conservation area are underway.

Acknowledgements

We would like to thank Hilary and Geoff Welch of RSPB and Bahtiyar Kurt of DHKD for all their help within the framework of the Breeding Bird Atlas of Turkey project. All data has been collected by Erciyes University Birdwatching Club (ErKuş) members and they made this atlas possible. This project has in part been funded by the Erciyes University Office of Health, Culture, and Sports through the support of Rector Prof. Dr. Zeki Yilmaz.

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Appendix. Bird species, breeding code, and habitat information.

1. 00070 *Tachybaptus ruficollis* Little Grebe. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation: 1075.
2. 00820 *Phalacrocorax pygmeus* Pygmy Cormorant. SPEC 2. Overall abundance 0.8%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1040, max: 1067, mean: 1053.5.
3. 00970 *Ixobrychus minutus* Little Bittern. SPEC 3. Overall abundance 1.2%. Highest Breeding Evidence: 1 . Major habitat types: marsh and water fringe vegetation, reedbed. Elevation: 1067.
4. 01040 *Nycticorax nycticorax* Night Heron. SPEC 3. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation. Elevation: 1093.
5. 01080 *Ardeola ralloides* Squacco Heron. SPEC 3. Overall abundance 1.2%. Highest Breeding Evidence: 1. Major habitat types: broad-leaved woodland, marsh and water fringe vegetation, reedbed. Elevation: 1093.
6. 01190 *Egretta garzetta* Little Egret. Overall abundance 2.0%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation: 1030.
7. 01210 *Egretta alba* Great White Egret. Overall abundance 0.4%. Highest Breeding Evidence: 1 . Major habitat types: open water, marsh and water fringe vegetation, reedbed, broad-leaved woodland. Elevation: 1093.
8. 01220 *Ardea cinerea* Grey Heron. Overall abundance 2.0%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1030, max: 1040, mean: 1033.3.
9. 01310 *Ciconia nigra* Black Stork. SPEC 3. Overall abundance 0.4%. Highest Breeding Evidence: 1 . Major habitat types: canal or ditch, broad-leaved woodland, marsh and water fringe vegetation.
10. 01340 *Ciconia ciconia* White Stork. SPEC 2. Overall abundance 7.8%. Highest Breeding Evidence: 16. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1030, max: 1112, mean: 1058.6.
11. 01440 *Platalea leucorodia* Spoonbill. SPEC 2. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation: 1030.
12. 01470 *Phoenicopterus ruber* Greater Flamingo. SPEC 3 Overall abundance 0.8%. Highest Breeding Evidence: 1. Habitat type: 50.0% marsh and water fringe vegetation, 50.0% reedbed. Elevation: 1030.
13. 01710 *Tadorna ferruginea* Ruddy Shelduck. SPEC 3. Overall abundance 2.0%. Highest Breeding Evidence: 3. Major habitat types: broad-leaved woodland, marsh

and water fringe vegetation, reedbed. Elevation min: 1030, max: 1093, mean: 1042.6.

14. 01860 *Anas platyrhynchos* Mallard. Overall abundance 0.8%. Highest Breeding Evidence: 5. Major habitat types: open water, marsh and water fringe vegetation, reedbed. Elevation min: 1030, max: 1093, mean: 1051.
15. 02380 *Milvus migrans* Black Kite. SPEC 3. Present in square. Highest Breeding Evidence: 1.
16. 02470 *Neophron percnopterus* Egyptian Vulture. SPEC 3. Overall abundance 1.2%. Highest Breeding Evidence: 1. Major habitat types: bare sediment/rock (montane). Elevation min: 1183, max: 1303, mean: 1273.
17. 02600 *Circus aeruginosus* Marsh Harrier. Overall abundance 2.0%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1067, max: 1093 mean: 1072.2.
18. 02870 *Buteo buteo* Buzzard. Overall abundance 0.4%. Highest Breeding Evidence: 3. Major habitat types: river or stream (slow flowing), bare sediment/rock (montane), bare rock faces/inland cliffs, woodland (unspecified), orchards, poplar plantations. Elevation: 1460.0.
19. 02880 *Buteo rufinus* Long-legged Buzzard. SPEC 3. Overall abundance 14.3%. Highest Breeding Evidence: 3. Major habitat types: bare sediment/rock (montane), farmland arable (dry). Elevation min: 1030, max: 2341, mean: 1463. Long-legged Buzzard is seen in farmland arable (dry) significantly more than expected by chance ($p = 0.039$).
20. 02960 *Aquila chrysaetos* Golden Eagle. SPEC 3. Overall abundance 1.2%. Highest Breeding Evidence: 6. Major habitat types: bare sediment/rock (montane), bare rock faces/inland cliffs, woodland (unspecified). Elevation min: 1519, max: 2260, mean: 1796.3.
21. 02980 *Hieraaetus pennatus* Booted Eagle. SPEC 3. Present in square. Highest Breeding Evidence: 1.
22. 03040 *Falco tinnunculus* Kestrel. SPEC 3. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: grassland (dry), bare sediment/rock (montane), bare rock faces/inland cliffs, farmland arable (dry). Elevation: 1508.0.
23. 03160 *Falco cherrug* Saker Falcon. SPEC 3. Present in square. Highest Breeding Evidence: 1.
24. 03550 *Alectoris chukar* Chukar. SPEC 3. Present in square. Highest Breeding Evidence: 3.
25. 03700 *Coturnix coturnix* Quail. SPEC 3. Overall abundance 0.4%. Highest Breeding Evidence: 2. Major habitat types: grassland (dry), farmland arable (dry). Elevation min: 1058, max: 1058, mean: 1058.
26. 04240 *Gallinula chloropus* Moorhen. Overall abundance 1.2%. Highest Breeding Evidence: 7. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1067, max: 1093, mean: 1075.6.
27. 04290 *Fulica atra* Coot. Overall abundance 0.8%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1030, max: 1067, mean: 1048.5.
28. 04330 *Grus grus* Crane. SPEC 3. Present in square. Highest Breeding Evidence: 1.
29. 04550 *Himantopus himantopus* Black-winged Stilt. Overall abundance 1.2%. Highest Breeding Evidence: 7. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation: 1030.
30. 04870 *Hoplopterus spinosus* Spur-winged Plover. SPEC 3. Overall abundance 1.2%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation: 1030.
31. 04930 *Vanellus vanellus* Lapwing. Overall abundance 1.2%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1030, max: 1093, mean: 1061.5.

32. 05460 *Tringa totanus* Redshank. SPEC 2. Overall abundance 1.2%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation: 1030.
33. 05820 *Larus ridibundus* Black-headed Gull. Overall abundance 1.2%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation: 1030.
34. 06150 *Sterna hirundo* Common Tern. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: open water, marsh and water fringe vegetation, reedbed. Elevation: 1093.
35. 06240 *Sterna albifrons* Little Tern. SPEC 3. Present in square. Highest Breeding Evidence: 1.
36. 06260 *Chlidonias hybridus* Whiskered Tern. SPEC 3. Overall abundance 5.3%. Highest Breeding Evidence: 9. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1030, max: 1093, mean: 1060.
37. 06270 *Chlidonias niger* Black Tern. SPEC 3. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: open water, marsh and water fringe vegetation, reedbed. Elevation: 1093.
38. 06650 *Columba livia* Rock Dove. Overall abundance 5.7%. Highest Breeding Evidence: 13. Major habitat types: bare sediment/rock (montane). Elevation min: 1040, max: 1917, mean: 1450.8.
39. 06840 *Streptopelia decaocto* Collared Dove. Overall abundance 2.8%. Highest Breeding Evidence: 2. Major habitat types: broad-leaved woodland, coniferous forest (natural), mixed woodland, urban green space/gardens. Elevation min: 1300, max: 1634, mean: 1523.1.
40. 06870 *Streptoplia turtur* Turtle Dove. SPEC 3. Overall abundance 6.1%. Highest Breeding Evidence: 2. Major habitat types: woodland (unspecified), farmland arable (dry), orchards, poplar plantations. Elevation min: 1300, max: 1620, mean: 1494.4.
41. 07160 *Clamator glandarius* Great Spotted Cuckoo. Overall abundance 0.8%. Highest Breeding Evidence: 1. Major habitat types: woodland (unspecified), orchards, poplar plantations. Elevation min: 1183, max: 1553, mean: 1306.3.
42. 07240 *Cuculus canorus* Cuckoo. Overall abundance 12.7%. Highest Breeding Evidence: 3. Major habitat types: orchards, poplar plantations. Elevation min: 1067, max: 2139, mean: 1448.5.
43. 07570 *Athena noctua* Little Owl. SPEC 3. Overall abundance 2.0%. Highest Breeding Evidence: 5. Major habitat types: bare sediment/rock (montane). Elevation min: 1030, max: 1640, mean: 1207.8.
44. 07780 *Caprimulgus europaeus* Nightjar. SPEC 2. Overall abundance 0.4%. Highest Breeding Evidence: 15. Major habitat types: woodland (unspecified). Elevation: 1526.0.
45. 07950 *Apus apus* Swift. SPEC Overall abundance 35.6%. Highest Breeding Evidence: 3. Major habitat types: bare sediment/rock (montane), farmland arable (dry). Elevation min: 1040, max: 2341, mean: 1458.5.
46. 08400 *Merops apiaster* Bee-eater. SPEC 3. Overall abundance 2.0%. Highest Breeding Evidence: 3. Major habitat types: bare rock faces/inland cliffs, broad-leaved woodland. Elevation min: 1093, max: 1895, mean: 1502.6.
47. 08460 *Upupa epops* Hoopoe. Overall abundance 15.1%. Highest Breeding Evidence: 5. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1030, max: 1640, mean: 1260.3. Hoopoe is seen around marsh and water fringe vegetation ($p = 0.0002$) and reedbed ($p = 0.022$) significantly more than expected by chance.
48. 08760 *Dendrocopos major* Great-Spotted Woodpecker. SPEC Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: woodland (unspecified), orchards, poplar plantation. Elevation: 1303.

49. 08780 *Dendrocopos syriacus* Syrian Woodpecker. SPEC 4. Overall abundance 4.9%. Highest Breeding Evidence: 13. Major habitat types: woodland (unspecified), orchards, poplar plantations. Elevation min: 1067, max: 1510, mean: 1356.7.

50. 09610 *Melanocorypha calandra* Calandra Lark. SPEC 3. Overall abundance 10.2%. Highest Breeding Evidence: 13. Major habitat types: scrub/grass (unspecified), bare sediment/rock (montane), farmland arable (dry). Elevation min: 1183, max: 1700, mean: 1520.2. Calandra Lark is seen in farmland arable (dry) significantly more than expected by chance (p = 0.0001).

51. 09620 *Melanocorypha bimaculata* Bimaculated Lark. Overall abundance 2.0%. Highest Breeding Evidence: 2. Major habitat types: scrub/grass (unspecified), bare sediment/rock (montane), farmland arable (dry). Elevation min: 1300, max: 1700, mean: 1529.1.

52. 09670 *Calandrella brachydactyla* Short-toed Lark. SPEC 3. Overall abundance 4.0%. Highest Breeding Evidence: 2. Major habitat types: 15.6% bare sediment/rock (montane), 18.7% farmland arable (dry). Elevation min: 1406, max: 1508, mean: 1451.6.

53. 09700 *Calandrella rufescens* Lesser Short-toed Lark. SPEC 3. Overall abundance 0.8%. Highest Breeding Evidence: 1. Major habitat types: bare sediment/rock (montane), farmland arable (dry). Elevation min: 1183, max: 2260, mean: 1721.5.

54. 09720 *Galerida cristata* Crested Lark. SPEC 3. Overall abundance 7.3%. Highest Breeding Evidence: 3. Major habitat types: bare sediment/rock (lowland), bare sediment/rock (montane), farmland arable (dry). Elevation min: 1030, max: 1700, mean: 1354.

55. 09740 *Lullula arborea* Woodlark. SPEC 2. Present in square. Highest Breeding Evidence: 2.

56. 09760 *Alauda arvensis* Skylark. SPEC 3. Overall abundance 9.8%. Highest Breeding Evidence: 13. Major habitat types: bare sediment/rock (montane), farmland arable (dry). Elevation min: 1030, max: 2341, mean: 1591.1.

57. 09780 *Eremophila alpestris* Shore Lark. Overall abundance 15.1%. Highest Breeding Evidence: 13. Major habitat types: bare sediment/rock (montane). Elevation min: 1496, max: 2341, mean: 2046.9. Shore Lark is seen around bare sediment/rock (montane), alpine lake, and alpine grassland significantly more than expected by chance (p < 0.001).

58. 09810 *Riparia riparia* Sand Martin. SPEC 3. Overall abundance 1.2%. Highest Breeding Evidence: 1. Major habitat types: canal or ditch, marsh and water fringe vegetation. Elevation min: 1030, max: 1030, mean: 1030.

59. 09910 *Ptyonoprogne rupestris* Crag Martin. Overall abundance 10.2%. Highest Breeding Evidence: 13. Major habitat types: sediment/rock (montane). Elevation min: 1112, max: 1700, mean: 1421.7.

60. 09920 *Hirundo rustica* Swallow. SPEC 3. Overall abundance 21.7%. Highest Breeding Evidence: 16. Major habitat types: bare sediment/rock (montane), woodland (unspecified), marsh and water fringe vegetation, farmland arable (dry), orchards, poplar plantations. Elevation min: 1030, max: 2260, mean: 1386.5. Swallow is seen around marsh and water fringe vegetation significantly more than expected by chance (p = 0.025).

61. 10010 *Delichon urbica* House Martin. Overall abundance 9.0%. Highest Breeding Evidence: 6. Major habitat types: bare sediment/rock (montane), bare rock faces/inland cliffs. Elevation min: 1493, max: 2260, mean: 1765.0. House Martin is seen in bare sediment/rock (montane) significantly more than expected by chance (p = 0.01).

62. 10040 *Anthus campestris* Tawny Pipit. SPEC 3. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: bare sediment/rock (montane), farmland arable (dry). Elevation: 1070.

63. 10170 *Motacilla flava* Yellow Wagtail. Overall abundance 10.2%. Highest Breeding Evidence: 3. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1030, max: 1700, mean: 1133.3.

64. 10180 *Motacilla citreola* Citrine Wagtail. Present in square. Highest Breeding Evidence: 1.

65. 10190 *Motacilla cinerea* Grey Wagtail. Overall abundance 0.8%. Highest Breeding Evidence: 1. Major habitat types: river or stream (slow flowing), bare sediment/rock (montane), woodland (unspecified). Elevation min: 1460, max: 1526, mean: 1493.

66. 10200 *Motacilla alba* Pied Wagtail. Overall abundance 1.6%. Highest Breeding Evidence: 1. Major habitat types: bare sediment/rock (montane), woodland (unspecified), orchards, poplar plantations. Elevation min: 1067, max: 1508, mean: 1334.5.

67. 10660 *Troglodytes troglodytes* Wren. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: river or stream (slow flowing), woodland (unspecified). Elevation: 1460.

68. 10880 *Prunella ocularis* Radde's Accentor. SPEC 3. Overall abundance 0.8%. Highest Breeding Evidence: 14. Major habitat types: bare sediment/rock (montane). Elevation: 2341.

69. 11040 *Luscinia megarhynchos* Nightingale. SPEC 4. Overall abundance 7.4%. Highest Breeding Evidence: 2. Major habitat types: river or stream (slow flowing), woodland (unspecified), farmland arable (dry), orchards, poplar plantations. Elevation min: 1183, max: 1520, mean: 1368.3. Nightingale is seen in woodland (unspecified) significantly more than expected by chance (p = 0.001).

70. 11170 *Irania gutturalis* White-throated Robin. Overall abundance 4.1%. Highest Breeding Evidence: 14. Major habitat types: scrub/grass (unspecified), bare sediment/rock (montane), bare rock faces/inland cliffs, orchards, poplar plantations. Elevation min: 1493, max: 1700, mean: 1551.1.

71. 11210 *Phoenicurus ochruros* Black Redstart. Overall abundance 2.5%. Highest Breeding Evidence: 3. Major habitat types: bare sediment/rock (montane). Elevation min: 1303, max: 2341, mean: 1651.3.

72. 11220 *Phoenicurus phoenicurus* Redstart. SPEC 2. Overall abundance 0.8%. Highest Breeding Evidence: 1. Major habitat types: woodland (unspecified), orchards, poplar plantations, shelterbelts, hedges. Elevation min: 1303, max: 1303, mean: 1303.

73. 11370 *Saxicola rubetra* Whinchat. SPEC 4. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: scrub/grass (unspecified), bare rock faces/inland cliffs. Elevation. -.

74. 11390 *Saxicola torquata* Stonechat. SPEC 3. Overall abundance 2.0%. Highest Breeding Evidence: 12. Major habitat types: bare sediment/rock (montane). Elevation min: 1510, max: 1895, mean: 1595.4.

75. 11440 *Oenanthe isabellina* Isabellina Wheatear. Overall abundance 29.1%. Highest Breeding Evidence: 13. Major habitat types: bare sediment/rock (montane), farmland arable (dry). Elevation min: 1030, max: 2341, mean: 1516.8. Isabellina Wheatear is seen in scrub/grass (unspecified) significantly more than expected by chance (p = 0.019).

76. 11460 *Oenanthe oenanthe* Northern Wheatear. Overall abundance 35.7%. Highest Breeding Evidence: 12. Major habitat types: bare sediment/rock (montane), farmland arable (dry). Elevation min: 1040, max: 2341, mean: 1700.4. Northern Wheatear is in seen bare sediment/rock (montane) significantly more than expected by chance (p = 0.001).

77. 11470 *Oenanthe pleschanka* Pied Wheatear. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: farmland arable (dry). Elevation: 1496.

78. 11480 *Oenanthe hispanica* Black-eared Wheatear. SPEC 2. Overall abundance 3.7%. Highest Breeding Evidence: 16. Major habitat types: bare sediment/rock (montane), bare rock faces/inland cliffs, woodland (unspecified). Elevation min: 1030, max: 2341, mean: 1413.4.

79. 11500 *Oenanthe finschii* Finsch's Wheatear. Overall abundance 4.1%. Highest Breeding Evidence: 2. Major habitat types: bare sediment/rock (montane), bare rock faces/inland cliffs. Elevation min: 1188, max: 1590, mean: 1394.3.

80. 11610 *Monticola saxatilis* Rock Thursh. SPEC 3. Overall abundance 2.5%. Highest Breeding Evidence: 2. Major habitat types: bare rock faces/inland cliffs. Elevation min: 1526, max: 2341, mean: 1980.5.

81. 11660 *Monticola solitarius* Blue Rock Thrush. SPEC 3. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: bare sediment/rock (montane), bare rock faces/inland cliffs. Elevation: 1300.

82. 11870 *Turdus merula* Blackbird. SPEC 4. Overall abundance 11.9%. Highest Breeding Evidence: 12. Major habitat types: orchards, poplar plantations. Elevation min: 1300, max: 1895, mean: 1528.6.

83. 12020 *Turdus viscivorus* Mistle Thrush. SPEC 4. Overall abundance 0.8%. Highest Breeding Evidence: 12. Major habitat types: bare sediment/rock (montane), woodland (unspecified). Elevation: 1526.

84. 12200 *Cettia cetti* Cetti's Warbler. Overall abundance 4.5%. Highest Breeding Evidence: 2. Major habitat types: river or stream (slow flowing), woodland (unspecified). Elevation min: 1183, max: 1473, mean: 1231.9.

85. 12410 *Acrocephalus melanopogon* Moustached Warbler. Overall abundance 1.6%. Highest Breeding Evidence: 2. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1040, max: 1067, mean: 1060.3.

86. 12430 *Acrocephalus schoenobaenus* Sedge Warbler. SPEC 4. Overall abundance 1.2%. Highest Breeding Evidence: 2. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1040, max: 1067, mean: 1049.0.

87. 12510 *Acrocephalus scirpaceus* Reed Warbler. SPEC 4. Overall abundance 2.0%. Highest Breeding Evidence: 1. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1067, max: 1067, mean: 1067.

88. 12530 *Acrocephalus arundinaceus* Great Reed Warbler. Overall abundance 4.5%. Highest Breeding Evidence: 2. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation min: 1040, max: 1093, mean: 1063.9.

89. 12550 *Hippolais pallida* Olivaceous Warbler. SPEC 3. Overall abundance 7.8%. Highest Breeding Evidence: 2. Major habitat types: bare sediment/rock (montane), woodland (unspecified), farmland arable (dry), orchards, poplar plantations. Elevation min: 1093, max: 1637, mean: 1384.9. Olivaceous Warbler is seen in woodland (unspecified) significantly more than expected by chance ($p = 0.015$).

90. 12670 *Sylvia melanocephala* Sardinian Warbler. SPEC 4. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: scrub/grass (unspecified), bare rock faces/inland cliffs, farmland arable (dry). Elevation: -.

91. 12730 *Sylvia nisoria* Barred Warbler. SPEC 4. Overall abundance 0.4%. Highest Breeding Evidence: 2. Major habitat types: scrub/grass (unspecified), bare sediment/rock (montane), woodland (unspecified). Elevation: 1590.

92. 12740 *Sylvia curruca* Lesser Whitethroat. Overall abundance 9.4%. Highest Breeding Evidence: 5. Major habitat types: scrub/grass (unspecified), bare sediment/rock (montane), woodland (unspecified), orchards, poplar plantations. Elevation min: 1183, max: 1895, mean: 1548.3.

93. 12750 *Sylvia communis* Whitethroat. SPEC 4. Overall abundance 2.9%. Highest Breeding Evidence: 2. Major habitat types: grassland (dry), bare rock faces/inland cliffs, managed deciduous (pollard/coppice), farmland arable (dry), shelterbelts, hedges. Elevation min: 1505, max: 1520, mean: 1511.8.

94. 13110 *Phylloscopus collybita* Chiffchaff. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: orchards, poplar plantations. Elevation: 1493.0.

95. 13350 *Muscicapa striata* Spotted Flycatcher. SPEC 3. Overall abundance 2.0%. Highest Breeding Evidence: 1. Major habitat types: woodland (unspecified). Elevation min: 1510, max: 1590, mean: 1563.3.

96. 13640 *Panurus biarmicus* Bearded Tit. Overall abundance 0.4%. Highest Breeding Evidence: 2. Major habitat types: marsh and water fringe vegetation, reedbed. Elevation: 1040.

97. 14620 *Parus caeruleus* Blue Tit. SPEC 4. Overall abundance 2.5%. Highest Breeding Evidence: 14. Major habitat types: woodland (unspecified), broad-leaved woodland, coniferous forest (natural), mixed woodland, orchards, poplar plantations. Elevation min: 1303, max: 1510, mean: 1405.3.

98. 14640 *Parus major* Great Tit. Overall abundance 15.6%. Highest Breeding Evidence: 13. Major habitat types: woodland (unspecified), orchards, poplar plantations. Elevation min: 1067, max: 1526, mean: 1374.5. Great Tit is seen in woodland (unspecified) ($p = 0.017$) and near river or stream (slow flowing) ($p = 0.008$) significantly more than expected by chance.

99. 14810 *Sitta neumayer* Rock Nuthatch. SPEC 4. Overall abundance 18.0%. Highest Breeding Evidence: 16. Major habitat types: bare sediment/rock (montane), woodland (unspecified), orchards, poplar plantations. Elevation min: 1040, max: 2260, mean: 1472. Rock Nuthatch is seen around river or stream (slow flowing) significantly more than expected by chance ($p = 0.031$).

100. 14900 *Remiz pendulinus* Penduline Tit. Overall abundance 5.3%. Highest Breeding Evidence: 13. Major habitat types: river or stream (slow flowing), woodland (unspecified), marsh and water fringe vegetation, orchards, poplar plantations. Elevation min: 1067, max: 1637, mean: 1328.2.

101. 15080 *Oriolus oriolus* Golden Oriole. Overall abundance 9.4%. Highest Breeding Evidence: 3. Major habitat types: woodland (unspecified), orchards, poplar plantations . Elevation min: 1183, max: 1520, mean: 1436.1. Golden Oriole is in seen orchards, poplar plantations ($p = 0.011$) and woodland (unspecified) ($p = 0.016$) significantly more than expected by chance.

102. 15150 *Lanius collurio* Red-backed Shrike. SPEC 3. Overall abundance 7.4%. Highest Breeding Evidence: 13. Major habitat types: scrub/grass (unspecified), bare sediment/rock (montane), farmland arable (dry). Elevation min: 1093, max: 2341, mean: 1622.3.

103. 15190 *Lanius minor* Lesser Grey Shrike. SPEC 2. Overall abundance 8.2%. Highest Breeding Evidence: 15. Major habitat types: bare sediment/rock (montane), woodland (unspecified), farmland arable (dry), orchards, poplar plantations . Elevation min: 1300, max: 1526, mean: 1460.9.

104. 15240 *Lanius nubicus* Masked Shrike. SPEC 2. Overall abundance 0.8%. Highest Breeding Evidence: 3. Major habitat types: farmland arable (dry), orchards, poplar plantations. Elevation min: 1510, max: 1510, mean: 1510.

105. 15390 *Garrulus glandarius* Jay. Overall abundance 2.9%. Highest Breeding Evidence: 2. Major habitat types: woodland (unspecified). Elevation min: 1300, max: 1526, mean: 1438.8.

106. 15490 *Pica pica* Magpie. Overall abundance 28.7%. Highest Breeding Evidence: 9. Major habitat types: bare sediment/rock (montane), farmland arable (dry), orchards, poplar plantations. Elevation min: 1030, max: 1917, mean: 1379.8.

107. 15580 *Pyrrhocorax graculus* Alpine Chough. Overall abundance 0.4%. Highest Breeding Evidence: 1. Major habitat types: farmland arable (dry). Elevation: 1637.

108. 15590 *Pyrrhocorax pyrrhocorax* Chough. SPEC 3. Overall abundance 0.8%. Highest Breeding Evidence: 3. Major habitat types: bare sediment/rock (montane). Elevation min: 2260, max: 2341, mean: 2300.5.

109. 15600 *Corvus monedula* Jackdaw. SPEC 4. Overall abundance 0.8%. Highest Breeding Evidence: 2. Major habitat types: grassland (dry), bare sediment/rock (montane), bare rock faces/inland cliffs, farmland arable (dry), urban green space/gardens. Elevation min: 1508, max: 1634, mean: 1571.0.

110. 15630 *Corvus frugilegus* Rook. Overall abundance 3.3%. Highest Breeding Evidence: 3. Major habitat types: marsh and water fringe vegetation, farmland arable (dry). Elevation min: 1093, max: 1508, mean: 1310.2.

111. 15670 *Corvus corone* Hooded Crow. Overall abundance 0.8%. Highest Breeding Evidence: 6. Major habitat types: farmland arable (dry), orchards, poplar plantations, urban green space/gardens. Elevation min: 1473, max: 1634, mean: 1553.5.

112. 15720 *Corvus corax* Raven. Overall abundance 0.4%. Highest Breeding Evidence: 13. Major habitat types: scrub/grass (unspecified), bare sediment/rock (montane), bare rock faces/inland cliffs, farmland arable (dry). Elevation: 1464.

113. 15820 *Sturnus vulgaris* Starling. Overall. abundance 30.7%. Highest Breeding Evidence: 16. Major habitat types: bare sediment/rock (montane), woodland (unspecified), farmland arable (dry), orchards, poplar plantations. Elevation min: 1030, max: 2260, mean: 1400.7. Starling is around seen river or stream (slow flowing) significantly more than expected by chance (p = 0.026).

114. 15840 *Sturnus roseus* Rose-coloured Starling. Overall. abundance 0.4%. Highest Breeding Evidence: 3. Major habitat types: river or stream (slow flowing), bare sediment/rock (montane), bare rock faces/inland cliffs, woodland (unspecified), farmland arable (dry).

115. 15910 *Passer domesticus* House Sparrow. Overall abundance 16.8%. Highest Breeding Evidence: 13. Major habitat types: bare sediment/rock (montane), marsh and water fringe vegetation, farmland arable (dry), orchards, poplar plantations. Elevation min: 1030, max: 1640, mean: 1374.4. House Sparrow is around seen marsh and water fringe vegetation significantly more than expected by chance (p = 0.038).

116. 15920 *Passer hispaniolensis* Spanish Sparrow. Overall abundance 3.3%. Highest Breeding Evidence: 13. Major habitat types: river or stream (slow flowing), canal or ditch, bare sediment/rock (montane), woodland (unspecified), marsh and water fringe vegetation, farmland arable (dry). Elevation min: 1030, max: 1637, mean: 1262.7.

117. 15980 *Passer montanus* Tree Sparrow. Overall abundance 1.6%. Highest Breeding Evidence: 3. Major habitat types: broad-leaved woodland, coniferous forest (natural), mixed woodland. Elevation min: 1473, max: 1473, mean: 1473.

118. 16040 *Petronia petronia* Rock Sparrow. Overall abundance 6.9%. Highest Breeding Evidence: 12. Major habitat types: bare sediment/rock (montane), bare rock faces/inland cliffs, woodland (unspecified). Elevation min: 1188, max: 2341, mean: 1597.8. Rock Sparrow is seen in bare sediment/rock (montane) significantly more than expected by chance (p = 0.034).

119. 16110 *Montifringilla nivalis* Snow Finch. Overall abundance 3.3%. Highest Breeding Evidence: 1. Major habitat types: bare sediment/rock (montane), bare rock faces/inland cliffs. Elevation min: 1700, max: 2341, mean: 2052.1.

120. 16360 *Fringilla coelebs* Chaffinch. SPEC 4. Overall abundance 6.6%. Highest Breeding Evidence: 3. Major habitat types: woodland (unspecified), orchards, poplar plantations. Elevation min: 1300, max: 1526, mean: 1450.6.

121. 16400 *Serinus serinus* Serin. SPEC 4. Overall abundance 0.8%. Highest Breeding Evidence: 2. Major habitat types: woodland (unspecified), orchards, poplar plantations. Elevation: 1303.

122. 16490 *Carduelis chloris* Greenfinch. SPEC 4. Overall abundance 6.6%. Highest Breeding Evidence: 5. Major habitat types: farmland arable (dry), orchards, poplar plantations, urban green space/gardens. Elevation min: 1300, max: 1634, mean: 1515.1.

123. 16530 *Carduelis carduelis* Goldfinch. Overall abundance 6.9%. Highest Breeding Evidence: 2. Major habitat types: woodland (unspecified), farmland arable (dry), orchards, poplar plantations. Elevation min: 1067, max: 1526, mean: 1424.2.

124. 16600 *Cardualis cannabina* Linnet. SPEC 4. Overall abundance 11.1%. Highest Breeding Evidence: 12. Major habitat types: bare sediment/rock (montane), farmland arable (dry), orchards, poplar plantations. Elevation min: 1093, max: 2341, mean: 1927.1. Linnet is in seen bare sediment/rock (montane) significantly more than expected by chance (p = 0.001).

125. 16730 *Rhodopechys sanguinea* Crimson-winged Finch. Overall abundance 1.2%. Highest Breeding Evidence: 3. Major habitat types: bare sediment/rock (montane). Elevation min: 1526, max: 2341, mean: 1933.5.

126. 18600 *Emberiza cia* Rock Bunting. SPEC 3. Overall abundance 2.5%. Highest Breeding Evidence: 3. Major habitat types: bare sediment/rock (montane), bare rock faces/inland cliffs, woodland (unspecified), orchards, poplar plantations. Elevation min: 1510, max: 1895, mean: 1897.8.

127. 18660 *Emberiza hortulana* Ortolan Bunting. SPEC 2. Overall abundance 35.2%. Highest Breeding Evidence: 14. Major habitat types: bare sediment/rock (montane), bare rock faces/inland cliffs, woodland (unspecified), farmland arable (dry), orchards, poplar plantations. Elevation min: 1030, max: 2341, mean: 1592.1. Ortolan Bunting is seen in bare rock faces/inland cliffs significantly more than expected by chance (p = 0.026).

128. 18680 *Emberiza caesia* Cretzschmar's Bunting. SPEC 4. Overall abundance 0.4%. Highest Breeding Evidence: 2. Major habitat types: scrub/grass (unspecified), bare sediment/rock (montane), bare rock faces/inland cliffs, woodland (unspecified), farmland arable (dry), 14.3% orchards, poplar plantations. Elevation: 1508.

129. 18810 *Emberiza melanocephala* Black-headed Bunting. SPEC 2. Overall abundance 29.5%. Highest Breeding Evidence: 10. Major habitat types: bare sediment/rock (montane), farmland arable (dry), orchards, poplar plantations. Elevation min: 1040, max: 1700, mean: 1421.6. Black-headed Bunting is seen in farmland arable (dry) significantly more than expected by chance (p < 0.001).

130. 18820 *Milaria calandra* Corn Bunting. SPEC 4. Overall abundance 32.4%. Highest Breeding Evidence: 5. Major habitat types: bare sediment/rock (montane), farmland arable (dry), orchards, poplar plantations. Elevation min: 1030, max: 2341, mean: 1461.1. Corn Bunting is in seen in farmland arable (dry) significantly more than expected by chance (p = 0.005).

