Bird records from arid and semi-arid areas in southern Kazakhstan, 2009–2017

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The arid and semi-arid steppes of southern Kazakhstan encompass a vast expanse of Central (Middle) Asia, stretching almost 2400 km from the Caspian sea in the west to the border with China in the east. These ecosystems support diverse bird communities, including many internationally threatened species, but remain poorly explored by ornithologists. In this paper, we present records of bird sightings made in four spatially extensive study sites, respectively located in southwestern (Caspian study site) southern (Kyzylkym and Betpak-Dala) and southeastern (Balkash) Kazakhstan, made by the authors during fieldwork supporting the conservation of Macqueen's Bustard *Chlamydotis macqueenii* in these areas. Each of these study sites is dominated by flat or slightly undulating arid grasslands intermixed with or bordered by smaller areas of other habitats, most notably native or artificially planted Saxaul 'forests', wetlands, sand dune fields, and low, rocky hills. Our fieldwork ran for three–four months between March and June in seven years within the 2009–2017 period (although not all sites were surveyed in all years). We also completed two short autumn surveys at Betpak-Dala (14 days, September 2015) and Balkash (nine days, September 2017). Bird records were obtained from a combination of formal fieldwork based on unlimited-radius circular plot point counts (*c*5057 survey hours) and opportunistic observational data (*c*7416 survey hours). The bulk of this survey effort was focused towards Betpak-Dala (72% of fieldwork hours), with remaining survey effort divided between Balkash (21% of fieldwork hours), Caspian (4% of fieldwork hours) and Kyzylkum (3% of fieldwork hours). In total, 286 species were detected across all study sites (including 28 species considered by the IUCN to be globally threatened or near-threatened), with 121 species being detected at Caspian, 105 species at Kyzylkum, 249 species at Betpak-Dala and 213 species at Balkash. A total of 21 of our species records are not currently noted as occurring in at least one of our study areas in previous publications and on global species databases, which we highlight here as potential regional range extensions. We also provide brief details of four vagrant species observed in the course of our fieldwork.

STUDY REGION

Our four fieldwork sites extend across a large spatial cross-section of the arid and semi-arid steppes of southern Kazakhstan (Figure 1). While some sources classify 'true' steppe as a cooler, more humid ecosystem only regionally occurring in northern Central Asia, and categorize all lowland areas of southern Kazakhstan as strictly desert or semi-desert (Ayé *et al* 2012, World Wildlife Fund 2017), we retain the term 'steppe' to refer broadly to all flat, largely treeless grassland ecosystems occurring throughout our study sites, as this is the terminology used both locally and within many literature sources, including the authors' previous publication from Uzbekistan (Martin *et al* 2014).

All four fieldwork sites share broadly similar climatic and biogeographical characteristics. All can be classified as lowland ecosystems, with altitudes ranging from 120 m asl at sites near the coast of the Caspian sea to maxima of 250 m asl at Kyzylkum and Betpak-Dala, and 375m asl at Balkash (Sheikh Khalifa Houbara Breeding Centre unpublished data). All sites possess continental cold desert or cold semi-desert climates

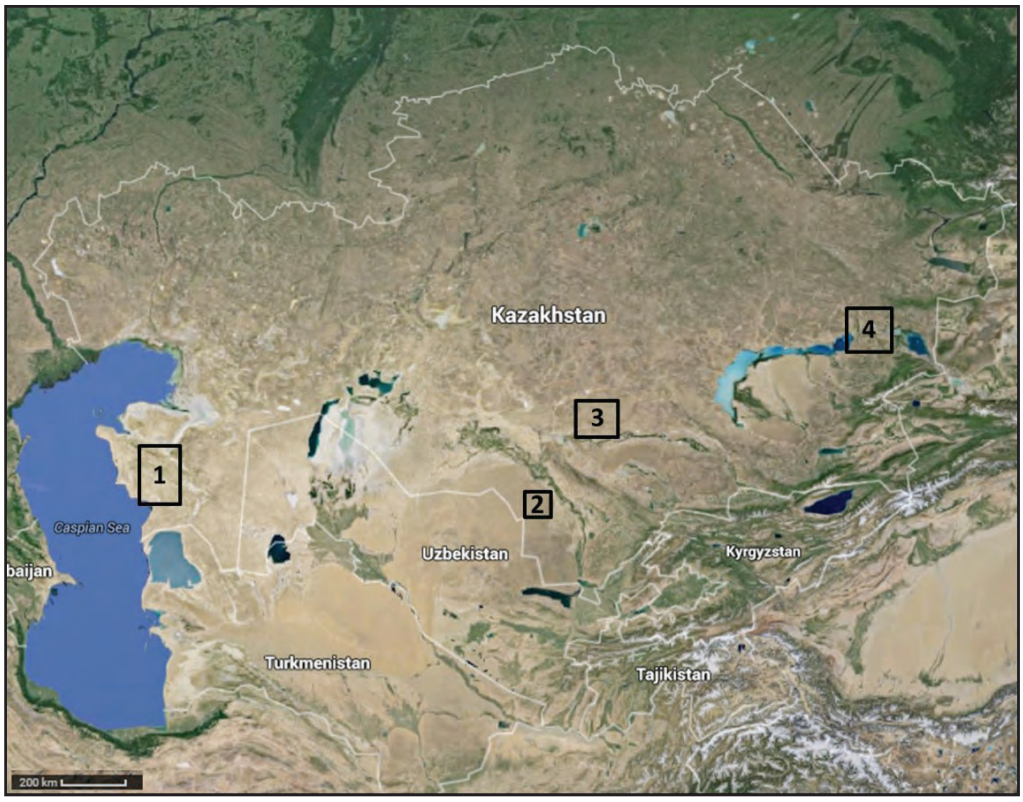

Figure 1. Map showing location of our study sites within Kazakhstan. 1 Caspian, 2 Kyzylkum, 3 Betpak-Dala, 4 Balkash. Map derived from Googlemaps and Landsat (2017).

(*BWk* and *BSk* on the Köppen-Geiger system, Peel *et al* 2007), being characterized by hot, dry summers and cool, relatively wet autumns and cold winters. Mean annual temperature and precipitation does, however, vary considerably between sites—all values presented for each site below are averages from the 2000–2017 climatic data derived from the Global Land Data Assimilation System (GLDAS) (Rodell & Beaudoing 2017). All sites lie within the Irano-Turanian phytogeographic zone (Djamali *et al* 2010), and are largely comprised of quaternary sedimentary geologies overlain with alluvial deposits and wind-blown loess, as is typical of most localities within the Turanian plain (Gintzburger 2003). All sites are also primarily characterized by flat or slightly undulating grasslands dominated by *Artemisia* shrubs (Plate 1), although all possess smaller areas of other important habitat types, notably rocky outcrops and low hills (Plate 2), Saxaul *Haloxylon ammodendron* forests (both natural and Soviet-era plantations) (Plate 3) and localized wetlands (Plate 4). Each site also possesses certain specific geographical characteristics, as summarized below:

The Caspian study site (43° 18′–44° 13′ N, 51° 24′–51° 33′E) is situated in the Mangystau region of southwestern Kazakhstan, in the vicinity of the regional capital of Aktau. Most of the study area is located on the western half of the Ustyurt plateau, which, while largely comprised of flat *Artemisia*-dominated landscapes typical of the other study sites, is also characterized by heavily weathered geological features, such as deep ravines and high cliffs known locally as 'chinks' (Gintzburger *et al* 2005). The study site also includes part of the coastline of the Caspian sea itself, along with adjacent salt marshes and lagoons. Temperature ranges from an average of 1.2°C in January to 28.9°C in July. It is the most arid of our study sites, with an average annual precipitation of 98.56 mm.

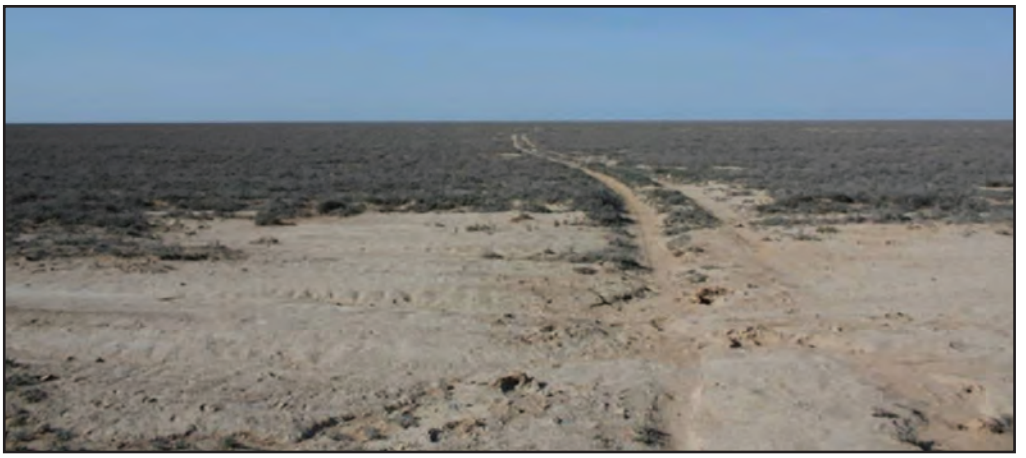

Plate 1. Flat *Artemisia* steppe in the Caspian study site. © *Jérôme Dubos*

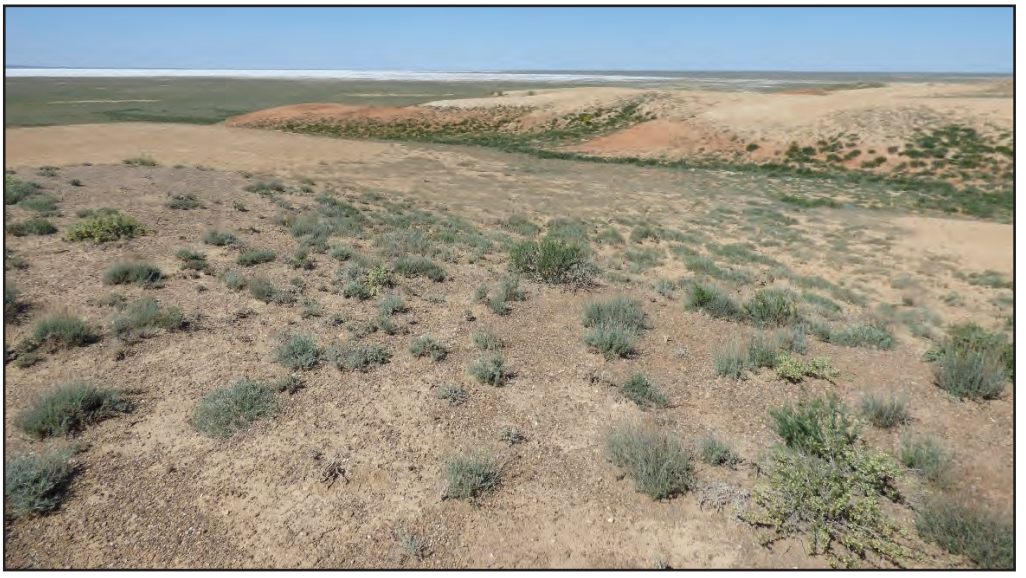

Plate 2. Low hills at Betpak-Dala. © *Thibaut Rivière*

The Kyzylkum site (42° 23′–42° 45′ N, 67° 38′–68° 03′ E) is located on the eastern fringes of the Kyzylkum desert within South Kazakhstan region. Along with the Karakum (primarily located within Turkmenistan), the Kyzylkum is one of the two largest 'true' desert ecosystems occurring within Central (Middle) Asia (Karnieli *et al* 2008). Much of its area within our study site is encompassed by well-vegetated sand dunes, which support distinctive psammophytic vegetation communities, interspersed with smaller areas of flat *Artemisia* steppe. Natural groves and artificial plantations of Saxaul are also common, as are small, sporadic patches of wetlands in low-lying areas. The western extent of the site lies adjacent to the Karaktau state reserved zone, an established protected area and an internationally recognized IBA (BirdLife International 2017a). Temperatures here range from an average of 1.71°C in January–30.18°C in July. The study area receives regionally moderate average annual rainfall (174 mm) due to the orographic influences of the nearby Karatau mountains. The summer months are, however, very arid, with <2 mm of precipitation in August.

Plate 3. A grove of native Saxaul *Haloxylon ammodendron* at Betpak-Dala. © *Tom Martin*

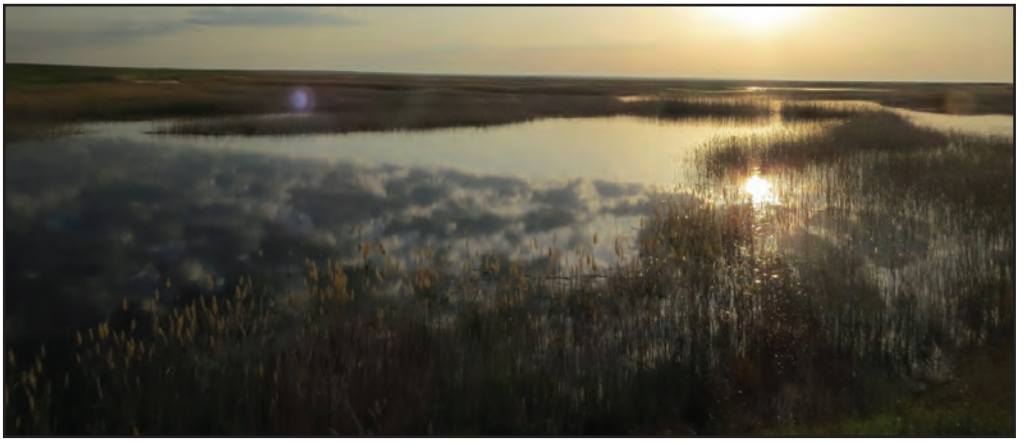

Plate 4. Wetland habitats along the banks of the Chu river, on the southern border of Betpak-Dala. © *Tom Martin*

The Betpak-Dala site (44° 57′–45° 16′ N, 68° 12′–68° 38′ E), also in South Kazakhstan region, lies on the southern border of the Betpak-Dala desert, a vast expanse of arid steppe bordered by the Chu river to the south, the Syr Darya river to the west, lake Balkash to the east, and the temperate grassland ecotone to the north. Betpak-Dala supports the largest extant population of the critically endangered Saiga Antelope *Saiga tatarica* globally (Singh & Milner-Gulland 2010). Most of the study site consists of slightly undulating *Artemisia* steppe, although significant areas are also dominated by larger shrubs of the genus *Salsola* (principally *Salsola arbuscula*), known locally as 'Baylish'. The western borders of the study site also encompass large native Saxaul forests, and its southern border lies alongside the Chu river, where extensive wetland habitats can be found. Temperatures range from an average of −6.5°C in January to 28.5°C in July. Average annual precipitation is 169.11 mm.

The Balkash site (46° 45′–47° 14′ N, 79° 22′–80° 18′ E) is located in Almaty region, near the eastern border of lake Balkash, the second-largest waterbody in Central Asia (after the Caspian sea) and the 15th largest lake in the world (Petr 1992). Although still classified as possessing a cold desert climate (World Wildlife Fund 2017), the Balkash site is located at

slightly higher latitudes compared to the other field sites, and is therefore somewhat cooler and more humid. This is reflected in the vegetation of the area. While *Artemisia* steppe is the most common habitat, large expanses of grasslands dominated by other dwarf shrubs (principally chenopods) also occur, and vegetation cover and height are generally greater than those found in the other study sites. The site borders the shores of lake Balkash and encompasses several smaller lakes and other wetland habitats. The Balkash area experiences a more severe winter compared to our other study sites (average January temperature −10°C), and more temperate summers (average July temperature 26.4 °C). Average annual precipitation is 224.7 mm.

PREVIOUS STUDIES

Detailed ornithological research from Kazakhstan remains fairly limited considering the size of the country. An indirect indication of this can be seen in *Sandgrouse* Index D (OSME 2017), which to date lists only ten articles or short notes from the country published in the journal (of which only one is not focused towards a single species, and none adopt a community-scale approach). Ornithological interest in Kazakhstan is, however, growing (Wassink 2015b), although most recent surveys and observational notes have tended to focus on mountainous areas, the northern temperate zones, and areas in the vicinity of the major cities of Almaty or Astana. Much less research has been directed towards the vast areas of arid and semi-arid steppe in the south of the country. Despite the general paucity of research from our study areas, several recent ornithological surveys and short observational notes have been completed within them or in their vicinity. Cowan (1996) provided a review of desert specialist species found across all arid habitats in Kazakhstan, which encompasses the spatial extents of all our study sites. Wassink & Oreel (2008) and Wassink (2009, 2010, 2013, 2014, 2015a) also produced a series of reports from across the country, including a few records made in close proximity to our study sites. While the most detailed records from the Mangystau region date back to the Soviet era (Gladkov 1957, Rustamov 2003) some recent surveys have been completed in the vicinity of the Caspian sea during the process of identifying local IBAs (BirdLife International 2017b), monitoring anthropogenically-induced raptor mortality rates (Levin & Kurkin 2013), and general ornithological expeditions (Levin & Karyakin 2005, Isabekov 2015). The Kazakh section of the Kyzylkum desert has been subject to intermittent monitoring over the last 30 years (Kovshar 2000, Sabilaev 2014), including surveys providing data for the establishment of the Arys-Karaktau state reserved zone IBA (BirdLife International 2017a). Some general ornithological notes have been published in local journals from the Betpak-Dala region in the last few decades (Gavrilov *et al* 1976, Grachev & Tashibaev 2011), along with some raptor-specific research (Karyakin & Barabashin 2005). Raptor research has also been completed in the vicinity of Balkash (Sánchez-Zapata *et al* 2003, Barashkova *et al* 2009), along with a survey of wetland birds (Cresswell *et al* 1999). Several recent studies have also been produced from the Caspian, Betpak-Dala and Balkash study sites examining the demographics of Macqueen's Bustard (*eg* Tourenq *et al* 2004, Riou *et al* 2011). These references summarize the most significant (and accessible) recent studies in this area. Several other Russian-language publications also exist, most notably those produced under the auspices of the Association for the Conservation of Biodiversity of Kazakhstan (ACBK 2017). The findings of these are largely incorporated within the two recent regional guidebooks for the country (Ayé *et al* 2012, Wassink 2015b), the authoritative range maps produced by BirdLife International (2017c), and detailed species accounts maintained by the Kazakhstan birdwatching community (2017).

METHODS

The vast majority of bird records were collected over the course of three–four month fieldwork seasons running from variable dates between early March and late June in seven years within the 2009–2017 period. These spring surveys were conducted in 2009 and 2014 at Caspian, in 2016 at Kyzylkum, in 2009, 2014, 2015, 2016 and 2017 at Betpak-Dala, and in 2010 and 2011 at Balkash. We also completed two short autumn surveys at Betpak-Dala (14 days in September 2015) and Balkash (nine days in September 2017). Methodologies employed were the same as those described for an earlier study in Uzbekistan (Martin *et al* 2014). Fieldwork was conducted by all the authors, each of whom possessed three–fourteen years' experience conducting scientific ornithological surveys prior to arrival in Kazakhstan. Records were obtained in two ways: through formal survey work completed as part of the long-term Macqueen's Bustard monitoring protocols conducted at all sites, and informal observations made during periods of travel between survey work areas and during the authors' free time. Formal survey work was concentrated exclusively in open steppe habitats, and involved completing unlimited radius circular plot point counts (Bibby *et al* 2002) using telescopes and binoculars across a grid of established monitoring stations within each site, as well as at opportunistic sites selected by the authors on the basis of representing good potential Macqueen's Bustard habitat. These formal circular observation counts were conducted at all sites between 05.00–11.00 and 15.00–20.00 h each working day, with two fieldworkers completing each count. The time limit allocated to completing these counts was highly variable depending on site topography and visibility. These formal counts were not completed in adverse weather conditions *ie* rain, snow, heavy winds and dust storms. Informal observations were made by simply recording birds observed at any time when formal counts were not being conducted, whether with binoculars, telescope or the naked eye. These informal observations were carried out in all habitats occurring in our four study sites.

Once survey work was completed, we compiled a full inventory of bird species detected in each study site, following the OSME regional checklist taxonomy (Blair *et al* 2017). Conservation status of each species followed the most recent IUCN Red List (IUCN 2017). Following the methodology used in Martin *et al* (2014), categorical abundance estimates were assigned to each species at each study site based on frequency of records. Designated categories were: abundant (typically recorded multiple times per day in suitable habitat); common (typically recorded at least once per day); fairly common (typically recorded about once per week on average); uncommon (recorded less than ten times in a season); locally common, locally fairly common, local and uncommon (as for above categories, but restricted to specific habitats or spatially small areas); and rare (recorded only once or twice ever). It was also noted whether each species was resident, a summer or winter visitor, or passage migrant at each site where they were recorded, based on data from BirdLife International (2017c), Ayé *et al* (2012), Wassink (2015b), and the Kazakhstan birdwatching community (2017). We also noted those species for which we observed conclusive evidence of breeding in each study site (based on observations of nests, chicks or eggs).

Once full inventories for each study site were compiled, we then noted species for which our observations appear to represent potential range extensions. We classed a species as a potential range extension if it had not previously been indicated as occurring in a study site by previous national-level (Cowan 1996, Wassink & Oreel 2008, Wassink 2009, 2010, 2013, 2014, 2015a) or site-specific (Gladkov 1957, Gavrilov *et al* 1976, Cresswell *et al* 1999, Kovshar 2000, Sánchez-Zapata *et al* 2003, Rustamov 2003, Karyakin & Barabashin 2005, Levin & Karyakin 2005, Barashkova *et al* 2009, Grachev & Tashibaev 2011, Levin & Kurkin 2013, Sabilaev 2014, Isabekov 2015) reports, in inventories of nearby Important Bird

Table 1. Bird species recorded in our four study sites in southern Kazakhstan, 2009–2017. Taxonomy follows Blair *et al* (2017). The 21 species with RE after the English name are those for which our data indicate a range extension for at least one of our four sites. Range extensions marked with a # symbol are mapped as potentially occurring within all study areas by relatively new maps in Wassink (2015b) and/or the Kazakhstan bird watching community (2017), although are not indicated as occurring in all study areas by other sources. A T after the English name indicates threatened and NT near threatened (IUCN 2017). Each record in each site is assigned both an abundance estimate (the first set of letters before the backslash) and residency status (the second set of letters). Abundance estimate: A abundant, La locally abundant, C common, Lc locally common, Fc fairly common, Lfc locally fairly common, U uncommon, Lu local and uncommon, R rare, Vag Vagrant. Residency status: R resident, B breeding migrant, Pm passage migrant, Wv winter visit. A '?' after a residency status indicates uncertainty. The abundance estimate for Macqueen's Bustard should be regarded with some caution given inherent detection bias in our methods (Martin *et al* 2011). Residency status with an asterisk indicates a species for which we have observed evidence of breeding in the study area (based on observations of nests, chicks, or eggs). Species with unclear residency status are denoted with a question mark.

		Caspian	Kyzylkum	Betpak-Dala	Balkash
Greylag Goose	*Anser anser*			Lfc/B*	Lc/B
Taiga Bean Goose	*Anser fabalis*			R/Pm	
Greater White-fronted Goose	*Anser albifrons*		R/Pm	R/Pm	
Mute Swan	*Cygnus olor*	Lfc/Wv		Lfc/B	Lc/B
Whooper Swan	*Cygnus cygnus*	R/Pm			
Common Shelduck	*Tadorna tadorna*	Lfc/B		Lu/B	Lfc/B
Ruddy Shelduck	*Tadorna ferruginea*	Lfc/Pm	Lfc/B	Lfc/B*	Lfc/B
Gadwall	*Anas strepera*	Lfc/Pm	Lfc/B	Lfc/B	Lfc/B
Eurasian Wigeon	*Anas penelope*		Lu/Pm	Lu/Pm	Lu/Pm
Mallard	*Anas platyrhynchos*	Lc/Wv?	Lc/Pm	Lc/R	Lc/R
Northern Shoveler	*Anas clypeata*	Lfc/Pm	Lfc/Pm	Lc/B	La/B
Northern Pintail	*Anas acuta*			Lfc/Pm	Lfc/B
Garganey	*Anas querquedula*	Lu/Pm	Lu/B	Lfc/B	Lfc/B
Eurasian Teal	*Anas crecca*		Lc/Pm	Lc/Pm	Lc/Pm
Red-crested Pochard	*Netta rufina*	Lc/Pm	Lfc/Pm	Lfc/B	Lc/B
Common Pochard T	*Aythya ferina*	Lu/Pm		Lc/Pm	Lfc/Pm
Ferruginous Duck NT	*Aythya nyroca*	R/Pm		Lu/Pm	Lu/B
Tufted Duck	*Aythya fuligula*	Lc/Pm		Lc/Pm	Lfc/Pm
Greater Scaup	*Aythya marila*			R/Pm	
Common Goldeneye	*Bucephala clangula*			U/Pm	Lu/Wv
Goosander	*Mergus merganser*				Lu/B
Red-breasted Merganser	*Mergus serrator*	Lu/Pm			
White-headed Duck T	*Oxyura leucocephala*	Lfc/B?		R/Pm	R/B*
Black Grouse	*Lyrurus tetrix*				R/R
Chukar Partridge RE	*Alectoris chukar*		Lc/R	R/R?	
Grey Partridge	*Perdix perdix*				U/R
Common Quail RE#	*Coturnix coturnix*	Fc/Pm	Fc/Pm	Fc/Pm & B*	Fc/B
Common Pheasant	*Phasianus colchicus*			Lu/R	U/R
Black-throated Diver	*Gavia arctica*	Lfc/Pm			
Little Grebe	*Tachybaptus ruficollis*	Lfc/Wv		Lu/B	Lu/B
Red-necked Grebe	*Podiceps grisegena*	Lu/Wv		U/Pm	
Great Crested Grebe	*Podiceps cristatus*	Lc/Wv		Lc/B	Lc/B
Horned Grebe	*Podiceps auritus*			R/Pm	Lu/Pm
Black-necked Grebe	*Podiceps nigricollis*	Lu/Wv		R/Pm	Lu/B

		Caspian	Kyzylkum	Betpak-Dala	Balkash
Greater Flamingo	*Phoenicopterus roseus*	U/Pm		R/Pm	
Black Stork	*Ciconia nigra*			R/Pm	U/B* & Pm
Glossy Ibis RE	*Plegadis falcinellus*	U/Pm	R/B	U/B*	
Eurasian Spoonbill	*Platalea leucorodia*	Lu/Pm		R/Pm?	U/B
Eurasian Bittern	*Botaurus stellaris*			Lu/B*	R/B
Little Bittern	*Ixobrychus minutus*	R/Pm		Lu/B	
Black-crowned Night Heron RE†	*Nyticorax nyticorax*	U/Pm		R/B?	
Squacco Heron	*Ardeola ralloides*	U/Pm			
Cattle Egret	*Bubulcus ibis*	R/Pm			
Grey Heron	*Ardea cinerea*	C/Wv	Fc/B	C/B	C/B
Purple Heron	*Ardea purpurea*	Lu/B		Lu/B	
Great Egret	*Ardea alba*	Lu/Pm		Lfc/R	Lfc/B
Great White Pelican	*Pelecanus onocrotalus*			U/Pm	Lfc/B
Dalmatian Pelican T	*Pelecanus crispus*			R/Pm	Lfc/B
Pygmy Cormorant	*Phalacrocorax pygmaeus*			R/Pm	
Great Cormorant	*Phalacrocorax carbo*	Lc/Wv		Lc/B	Lc/B
Osprey	*Pandion haliaetus*		U/Pm	U/Pm	Fc/Pm
Egyptian Vulture T RE	*Neophron percnopterus*	Lfc/B	Lu/B*	Lu/B	
European Honey Buzzard	*Pernis apivorus*			U/Pm	U/Pm
Crested Honey Buzzard	*Pernis ptilorhynchus*				R/Pm
Eurasian Griffon Vulture RE	*Gyps fulvus*	R/?	U/?	U/?	
Cinereous Vulture NT RE#	*Aegypius monachus*	R/Wv?	U/Wv	U/Wv	Fc/Wv
Short-toed Snake Eagle	*Circaetus gallicus*		Fc/B	Fc/B	C/B
Greater Spotted Eagle T	*Clanga clanga*			U/Pm	R/Pm
Booted Eagle	*Hieraaetus pennatus*			U/Pm	U/Pm
Steppe Eagle T	*Aquila nipalensis*	Fc/B	U/Pm	C/Pm & B*	C/B
Eastern Imperial Eagle T	*Aquila heliaca*		U/R	Fc/B*	U/B
Golden Eagle	*Aquila chrysaetos*	U/R	U/R	Fc/R	U/R
Shikra	*Accipiter badius*			R/B	
Eurasian Sparrowhawk	*Accipiter nisus*		U/Pm	U/Pm	Fc/Pm
Northern Goshawk	*Accipiter gentilis*			R/Wv	
Western Marsh Harrier	*Circus aeruginosus*	Fc/Pm	A/B	A/B*	A/B
Hen Harrier	*Circus cyaneus*			U/Pm	U/B
Pallid Harrier NT	*Circus macrourus*		U/Pm	U/Pm	Fc/B*
Montagu's Harrier	*Circus pygargus*		Fc/Pm	C/Pm	Fc/B
Black-eared Kite	*Milvus lineatus*		U/Pm	U/Pm	U/B
Pallas's Fish Eagle T	*Haliaeetus leucoryphus*				R/Pm
White-tailed Eagle	*Haliaeetus albicilla*			R/Pm	Lu/Wv
Rough-legged Buzzard	*Buteo lagopus*			R/Wv	U/Wv
Common Buzzard	*Buteo buteo*		Fc/Pm	Fc/Pm	Fc/Pm
Long-legged Buzzard	*Buteo rufinus*	A/B	A/B*	A/B*	A/B
Great Bustard T	*Otis tarda*		R/Pm		Lfc/B
Macqueen's Bustard T	*Chlamydotis macqueenii*	C/B*	C/B*	C/B*	C/B*
Little Bustard NT	*Tetrax tetrax*		Fc/B?	Fc/Pm & B*	C/B

		Caspian	Kyzylkum	Betpak-Dala	Balkash
Water Rail	*Rallus aquaticus*			U/Pm	
Baillon's Crake	*Porzana pusilla*			Lu/Pm	
Spotted Crake	*Porzana porzana*			Lu/Pm	
Common Moorhen	*Gallinula chloropus*	Lu/Pm		Lu/Pm	Lu/B
Eurasian Coot	*Fulica atra*	La/B		La/B	La/B
Demoiselle Crane	*Anthropoides virgo*		Fc/Pm	Fc/Pm	Fc/B
Common Crane	*Grus grus*		Fc/Pm	Fc/B*	C/B
Eurasian Stone-curlew	*Burhinus oedicnemus*	U/B	Fc/B*	Fc/B*	Fc/B
Eurasian Oystercatcher NT	*Haematopus ostralegus*	U/Pm?		Lu/B	Lfc/B
Black-winged Stilt	*Himantopus himantopus*	Lc/Pm	Lc/Pm	Lc/B*	Lfc/B
Pied Avocet	*Recurvirostra avosetta*	Lu/Pm		Lfc/B*	Lu/B
Northern Lapwing NT	*Vanellus vanellus*	Lu/Pm		Lfc/B*	C/B
Sociable Lapwing T	*Vanellus gregarius*			R/Pm	R/B* & Pm
White-tailed Lapwing	*Vanellus leucurus*	Lu/Pm	Lfc/B	Lfc/B	
Grey Plover	*Pluvialis squatarola*	Lfc/Pm		R/Pm	R/Pm
Common Ringed Plover	*Charadrius hiaticula*	Lc/Pm		R/Pm	Lfc/Pm
Little Ringed Plover	*Charadrius dubius*	Lu/Pm?	Lfc/Pm	R/B*	Lfc/B
Kentish Plover	*Charadrius alexandrinus*	Lc/B*	Lfc/Pm	Lfc/B	Lc/B
Greater Sand Plover RE	*Anarhyncus leschenaultii*	Fc/B*	C/B*	C/B*	Fc/B
Caspian Plover	*Anarhynchus asiaticus*			U/B*	U/B
Jack Snipe	*Lymnocryptes minimus*			Lu/Pm	
Pin-tailed Snipe	*Gallinago stenura*				R/Pm
Great Snipe NT	*Gallinago media*	R/Pm			
Common Snipe	*Gallinago gallinago*	R/Pm	R/Pm	Lc/Pm	Lfc/B
Black-tailed Godwit NT	*Limosa limosa*		Lfc/Pm	Lfc/Pm	Lfc/B
Bar-tailed Godwit NT	*Limosa lapponica*	R/Pm		R/Pm	
Whimbrel	*Numenius phaeopus*		R/Pm	U/Pm	R/Pm
Eurasian Curlew NT	*Numenius arquata*			U/Pm	Fc/Pm
Green Sandpiper	*Tringa ochropus*	Lfc/Pm	Lfc/Pm	Lfc/Pm	Lfc/Pm
Common Redshank	*Tringa totanus*	Lfc/Pm	Lfc/Pm	Lc/B*	Lc/B
Marsh Sandpiper	*Tringa stagnatilis*			Lu/Pm	Lu/Pm
Wood Sandpiper	*Tringa glareola*	Lfc/Pm		Lu/Pm	Lfc/Pm
Common Greenshank	*Tringa nebularia*	Lfc/Pm	Lfc/Pm	Lfc/Pm	Lfc/Pm
Spotted Redshank	*Tringa erythropus*		R/Pm	Lu/Pm	Lu/Pm
Terek Sandpiper	*Xenus cinereus*	Lu/Pm		Lu/Pm	R/Pm
Common Sandpiper	*Actitis hypoleucos*	Lfc/Pm	Lfc/Pm	Lfc/Pm	Lfc/Pm
Ruddy Turnstone	*Arenaria interpres*	Lfc/Pm		R/Pm	Lu/Pm
Sanderling	*Calidris alba*	Lfc/Pm			R/Pm
Little Stint	*Calidris minuta*	Lfc/Pm	Lfc/Pm	Lfc/Pm	Lfc/Pm
Dunlin	*Calidris alpina*	Lu/Pm	R/Pm	Lu/Pm	Lu/Pm
Curlew Sandpiper NT	*Calidris ferruginea*	Lu/Pm		Lu/Pm	
Temminck's Stint	*Calidris temminckii*	Lu/Pm		Lu/Pm	Lu/Pm
Red Knot NT	*Calidris canutus*				Vag/Pm
Broad-billed Sandpiper	*Limicola falcinellus*	Lu/Pm		R/Pm	
Ruff	*Philomachus pugnax*	Lu/Pm	Lu/Pm	Lu/Pm	

		Caspian	Kyzylkum	Betpak-Dala	Balkash
Red-necked Phalarope	*Phalaropus lobatus*	Lc/Pm	R/Pm	Lu/Pm	Lu/Pm
Collared Pratincole	*Glareola pratincola*			Fc/B	Fc/B
Black-winged Pratincole NT RE (Plate 5)	*Glareola nordmanni*			U/Pm & B*	
Slender-billed Gull	*Chroicocephalus genei*	Lfc/B		U/Pm	
Common Black-headed Gull	*Chroicocephalus ridibundus*	La/Pm	Lc/Pm	La/B	La/B
Mediterranean Gull	*Ichthyaetus melanocephalus*	Vag/Pm			
Great Black-headed Gull	*Ichthyaetus ichthyaetus*	Lfc/Pm		Lu/Pm	Lu/B
Caspian Gull RE#	*Larus cachinnans*	Lfc/R		Lu/Pm	Lfc/B
Steppe Gull	*Larus barabensis*		C/Pm	Lfc/Pm	
Gull-billed Tern	*Gelochelidon nilotica*	Lu/Pm	Lu/Pm	Lu/B	Lfc/B
Caspian Tern	*Hydroprogne caspia*		U/Pm		Lfc/B
Sandwich Tern	*Thalasseus sandvicensis*	Lu/B			
Little Tern	*Sternula albifrons*	Lfc/B		Lfc/B	Lfc/B
Common Tern	*Sterna hirundo*	Lfc/Pm		Lfc/B	Lfc/B
Whiskered Tern	*Chlidonias hybridus*	Lu/Pm		Lu/Pm	
White-winged Tern	*Chilidonias leucopterus*	Lu/Pm		Lfc/Pm	Lfc/B
Black Tern	*Chlidonias niger*			R/B	R/B
Pallas's Sandgrouse	*Syrrhaptes paradoxus*		R/R	U/R*	U/B
Black-bellied Sandgrouse	*Syrrhaptes orientalis*	Fc/B	Fc/R	C/B*	C/B
Pin-tailed Sandgrouse	*Pterocles alchata*		C/B	A/B*	
Rock Dove	*Columba livia*		Lfc/R	Lc/R	Lfc/R
Stock Dove	*Columba oenas*				R/Pm
Common Woodpigeon	*Columba palumbus*		U/Pm		Fc/B
European Turtle Dove T	*Streptopelia turtur*			Fc/B	
Oriental Turtle Dove RE#	*Streptopelia orientalis*	U/Pm		U/Pm	R/Pm
Eurasian Collared Dove	*Streptopelia decaocto*			U/R	A/R
Laughing Dove	*Spilopelia senegalensis*			U/R	Lu/R
Common Cuckoo	*Cuculus canorus*	Fc/Pm		Fc/B	Fc/B
Eurasian Scops Owl	*Otus scops*				R/B
Eurasian Eagle Owl	*Bubo bubo*	U/R		Fc/R*	
Little Owl	*Athene noctua*	Fc/R	C/R	C/R*	
Long-eared Owl	*Asio otus*				U/R
Short-eared Owl	*Asio flammeus*			Fc/B	Fc/R*
European Nightjar	*Caprimulgus europaeus*			Fc/B	U/B
Egyptian Nightjar	*Caprimulgus aegyptius*			U/B	
Alpine Swift	*Tachymarptis melba*	U/B			
Common Swift	*Apus apus*	C/B		C/B	A/B
European Roller NT	*Coracias garrulus*			Fc/B*	Fc/B
Common Kingfisher	*Alcedo atthis*		Lu/B	Lu/B	Lu/B

		Caspian	Kyzylkum	Betpak-Dala	Balkash
Blue-cheeked Bee-eater	*Merops persicus*	Fc/B	U/B	Fc/B*	Fc/B
European Bee-eater	*Merops apiaster*	Fc/B	C/B	Fc/B	Fc/B
Eurasian Hoopoe	*Upupa epops*	Fc/B	C/B	C/B*	C/B
Eurasian Wryneck	*Jynx torquilla*		R/Pm	R/Pm	U/Pm
Great Spotted Woodpecker	*Dendrocopos major*				R/R
Lesser Kestrel	*Falco naumanni*			U/Pm	U/B
Common Kestrel	*Falco tinnunculus*	C/R	C/B	C/R*	C/B
Red-footed Falcon	*Falco vespertinus*				R/Pm
Merlin	*Falco columbarius*		U/Wv	Fc/Wv	Fc/Wv
Saker Falcon T	*Falco cherrug*			U/Pm	Lu/B*
Eurasian Hobby	*Falco subbuteo*	U/Pm		U/B	U/B
Peregrine Falcon	*Falco peregrinus*		R/Pm	U/Pm	
Red-backed Shrike	*Lanius collurio*			Fc/Pm	U/B
Daurian Shrike	*Lanius isabellinus*		Fc/Pm	Fc/Pm	Fc/Pm
Turkestan Shrike	*Lanius phoenicuroides*		C/B	C/B*	C/B
Long-tailed Shrike RE (Plate 6)	*Lanius schach*			U/B	
Lesser Grey Shrike	*Lanius minor*	U/Pm		R/B	U/B
Great Grey Shrike	*Lanius excubitor*	R/Wv		Fc/Wv	R/Wv?
Mauryan Grey Shrike	*Lanius lahtora*	C/B	Fc/R	C/B*	C/B
Eurasian Golden Oriole	*Oriolus oriolus*	U/Pm		U/Pm	Fc/Pm
Eurasian Magpie	*Pica pica*	Lc/R	Lc/R	Lu/R	La/R
Western Jackdaw	*Coloeus monedula*		U/B	Fc/B	U/B
Rook	*Corvus frugilegus*		U/Pm	U/R	Fc/Pm
Carrion Crow	*Corvus corone*	C/Wv		C/R	C/R*
Hooded Crow	*Corvus cornix*	Fc/Wv		U/Wv	Fc/Wv
Brown-necked Raven	*Corvus ruficollis*		R/R		U/R
Northern Raven	*Corvus corax*	U/R			
Azure Tit	*Cyanistes cyanus*				R/R*
Bearded Reedling	*Panurus biarmicus*			Lu/R*	Lu/R
European Penduline Tit	*Remiz pendulinus*			Lu/Pm	
Calandra Lark	*Melanocorypha calandra*		A/B	A/B*	A/B
Bimaculated Lark	*Melanocorypha bimaculata*		Fc/B	C/B*	C/B
Crested Lark	*Galerida cristata*	A/R	A/R	C/R	A/R
Greater Short-toed Lark	*Calandrella brachydactyla*		A/B	A/B*	A/B
Lesser Short-toed Lark	*Alauda rufescens*		R/B	U/B*	U/B
Eurasian Skylark	*Alauda arvensis*				Fc/B
Oriental Skylark RE#	*Alauda gulgula*			Lu/B	R/B
White-winged Lark RE	*Melanocorypha leucoptera*			A/Wv & B*	U/B*
Horned Lark	*Eremophila alpestris*	U/R			U/Wv
Sand Martin	*Riparia riparia*			Lc/B	Lc/B
Barn Swallow	*Hirundo rustica*	A/B	A/B	A/B*	A/B

		Caspian	Kyzylkum	Betpak-Dala	Balkash
Common House Martin	*Delichon urbicum*		U/Pm	U/Pm	
Cetti's Warbler	*Cettia cetti*		Lu/B	Lfc/B	Lfc/B
Willow Warbler	*Phylloscopus trochilus*			Fc/Pm	
Siberian Chiffchaff	*Phylloscopus tristis*		Fc/Pm	C/Pm	C/Pm
Sulphur-bellied Warbler	*Phylloscopus griseolus*				R/B
Hume's Leaf Warbler	*Phylloscopus humei*			R/Pm	U/Pm
Greenish Warbler	*Phylloscopus trochiloides*			Fc/Pm	U/Pm
Great Reed Warbler	*Acrocephalus arundinaceus*			Lu/B	
Clamorous Reed Warbler	*Acrocephalus stentoreus*		Lfc/B	Lc/B	
Moustached Warbler	*Lusciniola melanopogon*			R/B	
Sedge Warbler	*Acrocephalus schoenobaenus*	Lu/Pm		Lu/Pm	R/Pm
Paddyfield Warbler	*Acrocephalus agricola*			Lu/B	
Blyth's Reed Warbler	*Acrocephalus dumetorum*			Lu/Pm	R/Pm
Eurasian Reed Warbler	*Acrocephalus scirpaceus*			Lfc/Pm	
Booted Warbler	*Iduna caligata*			Fc/B*	
Skyes's Warbler	*Iduna rama*			Fc/B	
Upcher's Warbler RE	*Hippolais languida*			U/B	
Eastern Grasshopper Warbler	*Locustella straminea*			R/B	R/B
Savi's Warbler	*Locustella luscinioides*			U/B	
Barred Warbler	*Sylvia nisoria*	U/Pm		R/Pm?	
Lesser Whitethroat	*Sylvia curruca*			Fc/B*	Fc/B
Asian Desert Warbler	*Sylvia nana*		Fc/B	C/B*	Fc/B
Common Whitethroat	*Sylvia communis*			U/Pm	U/Pm
Ménétriés's Warbler RE	*Sylvia mystacea*			R/B?	
Common Myna	*Acridotheres tristis*		Lc/R	Lc/R	
Rose-coloured Starling	*Pastor roseus*	La/B		La/B	La/B
Common Starling	*Sturnus vulgaris*		Lc/B	Lc/B	Lc/B
White's Thrush	*Zoothera aurea*			Vag/Pm	
Black-throated Thrush	*Turdus atrogularis*			R/Pm	U/Pm
Fieldfare	*Turdus pilaris*			R/Wv	R/Pm
Rufous-tailed Scrub Robin	*Cercotrichas galactotes*			Fc/B	R/B
Spotted Flycatcher	*Muscicapa striata*	Fc/Pm		Fc/Pm	Fc/Pm
Red-breasted Flycatcher RE	*Ficedula parva*			R/Pm	
European Robin	*Erithacus rubecula*				Fc/Pm
Bluethroat	*Luscinia svecica*			Fc/Pm	Fc/B
Thrush Nightingale	*Luscinia luscinia*			U/Pm	R/Pm
Eastern Nightingale	*Luscinia golzii*			R/Pm	U/B
White-throated Robin RE	*Irania gutturalis*			R/B?	
Red-flanked Bluetail	*Tarsiger cyanurus*			Vag/Pm	
Central Asian Black Redstart	*Phoenicurus phoenicuroides*	Fc/Pm	C/Pm	U/Pm	C/Pm
Common Redstart	*Phoenicurus phoenicurus*			Fc/Pm	Fc/Pm
Common Rock Thrush	*Monticola saxatilis*		Lu/B*	R/Pm	Lfc/B

		Caspian	Kyzylkum	Betpak-Dala	Balkash
Blue Rock Thrush	*Monticola solitarius*				Lfc/B
Western Siberian Stonechat	*Saxicola maurus*		A/Pm	A/Pm	A/Pm
Pied Stonechat	*Saxicola caprata*			R/B	
Northern Wheatear	*Oenanthe oenanthe*		C/Pm	C/Pm	C/B
Isabelline Wheatear	*Oenanthe isabellina*	Fc/B	A/B*	A/B*	C/B
Desert Wheatear	*Oenanthe deserti*		Fc/B	Fc/B*	U/B
Pied Wheatear	*Oenanthe pleschanka*	U/Pm	Fc/Pm	Fc/B*	Fc/B
Finsch's Wheatear RE (Plate 7)	*Oenanthe finschii*	U/B		U/B*	
House Sparrow	*Passer domesticus*		La/R	Lc/R*	Lc/R
Indian House Sparrow	*Passer indicus*			Lc/B*	Lu/B
Spanish Sparrow	*Passer hispaniolensis*		Lc/B*	U/B	Lc/B
Eurasian Tree Sparrow	*Passer montanus*			R/R	U/R
Rock Sparrow	*Petronia petronia*	Lu/R			
Sykes's Wagtail	*Motacilla beema*	Fc/Pm		C/B	C/B
White-headed Wagtail	*Motacilla leucocephala*				R/Pm
Black-headed Wagtail	*Motacilla feldegg*	Fc/Pm	C/B	C/B	C/B
Citrine Wagtail	*Motacilla citreola*		Fc/Pm	Fc/Pm	Fc/Pm
Grey Wagtail	*Motacilla cinerea*	U/Pm		Lfc/Pm	Lfc/B
White Wagtail	*Motacilla alba*		C/B	C/B	C/B
Masked Wagtail	*Motacilla personata*			C/B*	C/B
Richard's Pipit	*Anthus richardi*				U/B*
Tawny Pipit	*Anthus campestris*			U/B	U/B
Meadow Pipit NT	*Anthus pratensis*		Fc/Pm	U/Pm	
Tree Pipit	*Anthus trivialis*		Fc/Pm	Fc/Pm	Fc/Pm
Red-throated Pipit	*Anthus cervinus*	U/Pm		R/Pm	
Water Pipit	*Anthus spinoletta*			U/Pm	Lfc/Pm
Common Chaffinch	*Fringilla coelebs*			U/Wv	U/Wv
Brambling	*Fringilla montifringilla*			U/Pm	U/Wv
European Goldfinch	*Carduelis carduelis*			R/Wv	
Mongolian Finch	*Bucanetes mongolicus*				U/B
Common Rosefinch	*Erythrina erythrina*	Fc/Pm		Fc/Pm	Fc/B
Long-tailed Rosefinch	*Carpodacus sibiricus*				U/Wv
Desert Finch RE#	*Rhodospiza obsoleta*	Fc/R	Lc/R	Fc/B	Lfc/B
Common Linnet	*Linaria cannabina*			R/Pm	
Eurasian Siskin	*Spinus spinus*			R/Pm	
Corn Bunting RE	*Emberiza calandra*	Lfc/R	Lfc/R	Lu/R	Lfc/R
Pine Bunting	*Emberiza leucocephala*			R/Wv	R/Wv
Ortolan Bunting	*Emberiza hortulana*			U/Pm	U/Pm
Red-headed Bunting	*Emberiza bruniceps*	Fc/B		C/B	C/B
Common Reed Bunting	*Emberiza schoeniclus*			Lc/R	Lc/R
Snow Bunting	*Plectrophenax nivalis*			R/Wv	

Areas (Birdlife International 2017a,b), or in distribution maps provided in the two current regional guidebooks (Ayé *et al* 2012, Wassink 2015b) by BirdLife International (2017c), and by the Kazakhstan birdwatching community (2017). Given that relatively new species maps in two of these sources (Wassink 2015b, Kazakhstan bird watching community 2017) appear to have been overlooked by other key sources (*ie* BirdLife International 2017c), we also highlight species mapped as occurring in our study sites solely by these sources as possible range extensions, with an extra notation that these species have been mapped as potentially occurring in these resources, to draw further attention to both these records and these up-to-date resources.

RESULTS

Our combined total survey effort in the study sites corresponded to *c*5057 person-hours of formal survey work and *c*7416 person-hours of opportunistic observational data, totalling 12473 person-hours of fieldwork effort overall. This effort equated to 517 person-hours in Caspian, 314 in Kyzylkum, 9070 in Betpak-Dala and 2572 in Balkash. A total of 286 species were recorded overall, with 121 being observed in Caspian, 105 in Kyzylkum, 249 in Betpak-Dala and 213 in Balkash. These records included 13 species considered to be threatened (VU vulnerable, EN endangered or CR critically endangered) and 15 species considered to be near threatened. We noted 61 species for which we observed evidence of breeding in at least one study site. A total of 21 species we recorded do not appear to be previously noted as occurring in at least one study site in our consulted literature; we highlight these as potential range extensions worthy of further attention. We also made observations of four species considered to be vagrants in southern Kazakhstan (Aye *et al* 2012, Wassink 2015b). Table 1 summarizes species recorded in all sites. The following species descriptions provide further information for species we highlight as potential range extensions. Brief details regarding the four vagrants observed are also provided at the end of this section.

Chukar Partridge *Alectoris chukar*. A locally common resident at Kyzylkum, where it is regularly observed within rocky hills, and a rare, probable resident at Betpak-Dala, where it is known from a single observation 09 June 2015. This latter sighting consisted of two individuals flushed by a car within low hills dominated by native Saxaul forest. All consulted sources (*eg* Gavrilov *et al* 1976, Ayé *et al* 2012, Wassink 2015b, IUCN 2017, Kazakhstan birdwatching community 2017) do not appear to indicate this species as occurring within this part of Betpak-Dala. Existing maps indicate the nearest areas of occurrence to Betpak-Dala to be within the Karatau mountains *c*130 km to the south, and *c*180 km upstream in the Chu valley to the east. While it is not certain that the species has a permanent presence in our Bet-pak Dala study area based on this single sighting, this may be likely given that small patches of potentially suitable habitat occur there. Further work is necessary to fully determine the status of *A. chukar* in this part of Betpak-Dala, although we highlight this observation as a tentative extension to the species' known breeding range.

Common Quail *Coturnix coturnix*. A fairly common passage migrant at Caspian, Kyzylkum and Betpak-Dala, and a fairly common breeding visitor at Balkash. We have also recorded the species nesting at Betpak-Dala several times, and these observations appear to represent an extension to its known breeding range. With the exception of Wassink (2015b), who maps the species as breeding throughout most of the eastern half of Kazakhstan, all sources consulted (*eg* Ayé *et al* 2012, IUCN 2017, Kazakhstan birdwatching community 2017) indicate *C. coturnix* to be absent as a breeder throughout the entire belt of deserts and semi-deserts that encompass the central part of the country. Our observations from Betpak-Dala indicate this is not the case, and confirm the data presented in Wassink (2015b).

Glossy Ibis *Plegadis falcinellus*. An uncommon passage migrant at Caspian, a rare breeding visitor at Kyzylkum, and an uncommon breeding visitor at Betpak-Dala, with nesting individuals being observed near-annually in wetland areas adjacent to the Chu river. Our Betpak-Dala records appear to represent a modest extension to the known breeding range of this species. IUCN (2017) maps the species as breeding further upstream along the Chu valley, *c*160 km to the east, and in the Syr Darya valley *c*130 km to the southwest, but not within our study area. Most other consulted sources (*eg* Gavrilov *et al* 1976, Wassink 2015b, Kazakhstan birdwatching community 2017) do not map the species as breeding in the lower Chu valley at all, while Ayé *et al* (2012) indicate its presence as a breeder in southern Kazakhstan as uncertain, and Wassink (2015b) indicates that it occurs as a non-breeding visitor at the Shoshkakol lakes, which lie close to the Syr Darya valley.

Black-crowned Night Heron *Nycticorax nycticorax*. An uncommon passage migrant at Caspian and a rare species at Betpak-Dala (known from a single observation within a small wetland area on 22 April 2017, hbw.com/ibc/1389521). The status of this Betpak-Dala record remains uncertain, although it is likely this bird was either a breeding visitor or a passage migrant travelling to breeding grounds further north. Either way, this is a record of interest, as while some sources map this species as a breeding visitor across much of central Kazakhstan (Wassink 2015b, Kazakhstan birdwatching community 2017) others (Ayé *et al* 2012, IUCN 2017, BirdLife International 2017c) do not map the species as occurring either as a breeding visitor or as a passage migrant in northern, central, or southern Kazakhstan at all, with the exception of the Syr Darya valley and the drainage basin of lake Balkash. We therefore highlight this record as a potential range extension, given that its presence in Betpak-Dala as either a breeding visitor or a passage migrant appears to have been overlooked by most consulted sources.

Egyptian Vulture *Neophron percnopterus* EN. A breeding visitor to Caspian, where it is locally fairly common, and to Kyzylkum and Betpak-Dala, where it is local and uncommon. Records made at Kyzylkum, where pairs have been observed nesting within cliff faces on large rocky hills, are of particular interest, as these appear to represent a modest range extension to the species' known breeding range. Ayé *et al* (2012), Wassink (2015b) and the IUCN (2017) all indicate the species as breeding nearby, both in the Karatau mountains (*c*156 km to the east) and close to the Uzbek border (*c*150 km to the south), but no previous sources appear to report the species as breeding within our study area. Our records are valuable both because they represent a minor extension to the known range of this globally endangered species, and because they suggest the species could also occur within the adjacent Arys-Karaktau state reserved zone. The species does not seem to have been previously recorded as occurring here (BirdLife International 2017a), although if this could be confirmed it could enhance the conservation value of this designated protected area.

Eurasian Griffon Vulture *Gyps fulvus*. A rare species at Caspian (known from a single observation 25 May 2009), and an uncommon species at Kyzylkum and Betpak-Dala, where it is typically observed two to three times per season. Records from all three sites represent potential range extensions, our consulted sources do not explicitly indicate the species as present within any of them. However, some caution is required when considering these records, as the status of the birds observed in our study areas remains somewhat ambiguous. The species is currently known to be resident in the Karatau and Tian-Shan mountains (Ayé *et al* 2012, IUCN 2017) with some sporadic breeding records in the steppe habitats of southern Kazakhstan (Kazakhstan bird watching community 2017). Dispersing individuals have also been observed in open habitats throughout much of Kazakhstan, including within all our study areas (Wassink 2015b, Kazakhstan bird watching community 2017). Given

that we observed no direct breeding evidence for this species, it remains uncertain if our records relate to dispersing transients, seasonal breeders, or, in the case of Kyzylkum and Betpak-Dala, even isolated resident populations inhabiting the rocky hills found within these study sites. The exact status of *G. fulvus* therefore requires further research, although we highlight it here as a tentative range extension within three of our study areas.

Cinereous Vulture NT *Aegypius monachus*. Occurs as a wintering visitor within all of our study sites, being rare in the Caspian site, uncommon at Kyzylkum and Betpak-Dala, and fairly common at Balkash. Our records from the Caspian site are of particular interest, given that all sources except one (Kazakhstan bird watching community 2017) do not indicate it to occur on the Mangystau peninsula. We therefore highlight these records as a tentative range extension, although, as with *G. fulvus*, some caution must be taken when considering these records, as the status of the individuals observed here remains uncertain.

Greater Sand Plover *Anarhyncus leschenaultii*. A common to fairly common breeding visitor at all our study sites. We believe our records of the species nesting at Balkash (including along the eastern shores of lake Balkash itself) represent an extension to its known breeding range. Most resources consulted indicate its breeding extent as limited to more southerly parts of Kazakhstan, along with a known breeding population at lake Alakol near the Chinese border, *c*100 km to the east of lake Balkash (Ayé *et al* 2012, Wassink 2015b, IUCN 2017). Cresswell *et al*. (1999) also did not report the presence of this species in the vicinity of Balkash.

Black-winged Pratincole NT *Glareola nordmanni*. An uncommon passage migrant and breeding visitor at Betpak-Dala, where it has been observed nesting numerous times in both open steppe and wetland areas adjacent to the Chu river (Plate 5). As with the case of the White-winged Lark *Melanocorypha leucoptera*, the species appears to breed at Betpak-Dala most years, although in particularly dry years with unfavorable nesting conditions (as was the case in 2015: see *M. leucoptera* below for meteorological data) it seems only to occur as a passage migrant. Nevertheless, our observations of Black-winged Pratincole nesting here in most, if not all, years appears to represent a significant extension to its known breeding range. All consulted sources indicate its breeding distribution in Kazakhstan to be limited to the belt of temperate 'true' steppe in the north of the country, at least 500 km to the north of our observations of nesting pairs close to the Chu river (Ayé *et al* 2012, Wassink 2015b, IUCN 2017, Kazakhstan birdwatching community 2017). We thus highlight these records as an important extension to the known breeding range of this near-threatened species.

Plate 5. A juvenile Black-winged Pratincole *Glareola nordmanni* at Betpak-Dala, May 2016. © *Maxime Loubon*

Caspian Gull *Larus cachinnans*. A fairly common resident at Caspian, a rare passage migrant at Betpak-Dala, and a fairly common breeding visitor to wetland habitats in the vicinity of lake Balkash. We believe our records from Balkash represent a modest extension to the known breeding range of this species. Several sources map it as breeding in the

western saltwater half of lake Balkash (IUCN 2017), as well as at lakes Alakol and Zayshan 100 km to the east of Balkash (Cresswell *et al* 1999, Ayé *et al* 2012), but not near the eastern freshwater half of the lake and associated nearby wetlands where our observations were made. Wassink (2015b) maps this species as breeding throughout the whole of central, northern and eastern Kazakhstan (including the entirety of the Balkash drainage basin). However, as this assessment appears to have been overlooked by most other sources, we highlight these specific breeding records here.

Oriental Turtle Dove *Streptopelia orientalis*. An uncommon–rare passage migrant at Caspian, Betpak-Dala, and Balkash. The records from Caspian are noteworthy, as most consulted sources do not indicate this species as occurring on passage as far west as the Mangystau peninsula (Gladkov 1957, Ayé *et al* 2012, IUCN 2017). Wassink (2015b) and Kazakhstan bird watching community (2017) both note the species as occurring as far west as the Caspian coast, albeit rarely. However, given that most sources overlook the species' presence here, we tentatively highlight our records as a potential extension to its known passage zone.

Long-tailed Shrike *Lanius schach*. An uncommon breeding visitor at Betpak-Dala (Plate 6). Our records of Long-tailed Shrike here appear to represent an extension to its known breeding range. All sources consulted (*eg* Ayé *et al* 2012, Wassink 2015b, IUCN 2017, Kazakhstan birdwatching community 2017) indicate the species to occur only in far-southern Kazakhstan, as well as in the Syr Darya valley *c*150 km to the southwest of our study site.

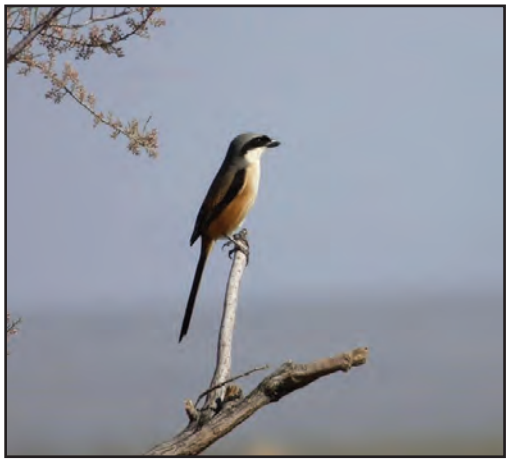

Plate 6. A Long-tailed Shrike *Lanius schach* at Betpak-Dala, May 2017. © *Thibaut Rivière*

Oriental Skylark *Alauda gulgula*. An uncommon and rare breeding visitor at Betpak-Dala and Balkash respectively. Our records from both of these sites appear to represent potential extensions to this species' known breeding range. Existing range maps for *A. gulgula* vary substantially between sources (*eg* Ayé *et al* 2012, IUCN 2017, Kazakhstan birdwatching community 2017) suggesting the status of the species is poorly-known in Kazakhstan. However, most of these sources do not indicate the species to occur within any of our study sites. The only exception is Wassink (2015b), who maps the species as breeding throughout southern Kazakhstan, including much of Betpak-Dala and the entirety of the Balkash region. However, as the species' presence in these two sites seems to have been overlooked by most other sources, we highlight our observations as potential range extensions.

White-winged Lark *Melanocorypha leucoptera*. An abundant winter visitor at Betpak-Dala that also breeds most years (www.hbw.com/ibc/1395656), and an uncommon breeding visitor at Balkash. Its breeding status at Balkash is acknowledged by most (Wassink 2015b, IUCN 2017), if not all (Ayé *et al* 2012, Kazakhstan birdwatching community 2017) consulted sources. However, our records of the species as an abundant, albeit intermittent, breeding species at Betpak-Dala appear to be new. In most years (2014, 2016 and 2017) this species was observed breeding in high numbers throughout this study site. However, in 2015 the species was not observed breeding at the site at all. This year was notable in that it pos-

sessed the driest winter and spring yet recorded during our fieldwork at Betpak-Dala, with an average daily precipitation of 0.45 mm falling in January–April period, compared to a 16-year average of 0.6 mm per day during the same period (Rodell & Beaudoing 2017). We therefore highlight our records from Betpak-Dala as a potential extension to the known breeding range of *M. leucoptera*, though breeding here appears to be intermittent, with the species abandoning this breeding ground in unfavorable years. This appears to be a pattern consistent with certain other species, notably *G. nordmanni*.

Upcher's Warbler *Hippolais languida*. An uncommon breeding visitor at Betpak-Dala, where it has been observed several times within scrubby bush habitats on low hills on the edge of the open steppe (www.hbw.com/ibc/139229). We believe these records represent an extension to the known breeding range of the species, with all consulted sources indicating it occurs only as far north as the southern bank of the Syr Darya river, *c*180 km to the southwest of our study area (*eg* Ayé *et al* 2012, Wassink 2015b, IUCN 2017, Kazakhstan bird watching community 2017), and possibly in the Muyunkum desert 130 km to the southeast of our study area (Kazakhstan bird watching community 2017).

Ménétriés's Warbler *Sylvia mystacea*. A rare species at Betpak-Dala, where it is known from a single observation 16 April 2017 (www.hbw.com/ibc/1392293) consisting of a single individual seen in thorny scrub on an isolated hill surrounded by open steppe. It remains uncertain whether this species is a common breeding visitor to Betpak-Dala, or whether our single observation represents an isolated vagrant—further fieldwork is required to establish its exact status here. However, given that small areas of suitable breeding habitat for the species do exist within this area of Betpak-Dala, we tentatively highlight our observation as a potential extension to its known breeding range. All existing sources consulted indicate the nearest localities for this species to be within the Syr Darya valley and the Karatau mountains, both *c*100 km to the southwest of our observation (Ayé *et al* 2012, Wassink 2015b, IUCN 2017, Kazakhstan bird watching community 2017). The species also occurs further upstream in the Chu valley, to the south of Qandyozek (Wassink 2015b).

Red-breasted Flycatcher *Ficedula parva*. A rare passage migrant at Betpak-Dala, known from two observations; a male on 16 April 2017 (www.hbw.com/ibc/1392288), and a female on 08 May 2017. Although we have only observed this species twice, we still highlight our records as a potential eastwards range extension to the known migration routes of this species in Kazakhstan, as all consulted sources except one (Kazakhstan birdwatching community 2017) map the species as occurring on passage strictly in the western half of the country. Wassink (2015b) also highlights a further record made at Zhuantobe in 2012; a locality that is in close proximity to our Betpak-Dala study site.

White-throated Robin *Irania gutturalis*. A rare species at Betpak-Dala, where it is known from a single observation made in an area of dry scrub on 20 May 2017. This record could represent an extension to its known breeding range. All sources consulted (*eg* Ayé *et al* 2012, Wassink 2015b, IUCN 2017, Kazakhstan birdwatching community 2017) only indicate it occurs in far-southern Kazakhstan, *c*170 km to the south of our observation. Given that we only saw *I. gutturalis* once, we cannot be certain of the species' status here, and it may be that our observation was a migrating bird that had overshot its typical breeding habitat in dry montane foothills further to the south. Nonetheless, given the presence of small areas of dry semi-desertic scrub in our study area which is known to be suitable breeding habitat for this species (Ayé *et al* 2012), we tentatively highlight this observation as a potential range extension. This possibility should, however, be treated with some caution, pending further evidence.

Finsch's Wheatear *Oenanthe finschii*. An uncommon breeding visitor at Caspian and Betpak-Dala. We believe our records from Betpak-Dala, where several direct observations of nesting females and juveniles (Plate 7) have been made in hilly areas with scrubby vegetation, represent a range extension to the known breeding range of this species. All consulted sources (*eg* Ayé *et al* 2012, Wassink 2015b, IUCN 2017, Kazakhstan birdwatching community 2017) indicate the species to occur as far north as the southern bank of the Syr-Darya river, *c*180 km to the southwest of our study area, but not to the north of the river.

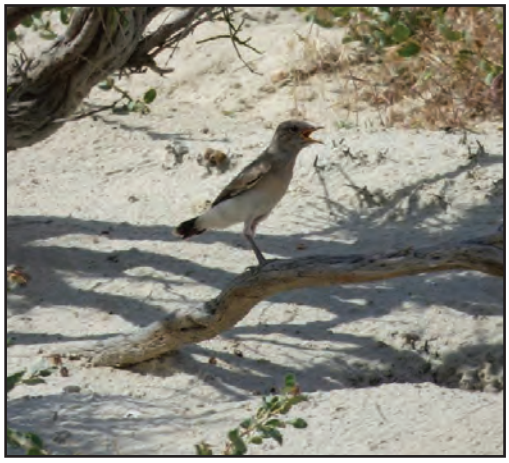

Plate 7. Juvenile Finsch's Wheatear *Oenanthe finschii* at Betpak-Dala, May 2017. © *Thibaut Rivière*

Desert Finch *Rhodospiza obsoleta*. A common to fairly common resident at Caspian and Kyzylkum, a fairly common breeding visitor at Betpak-Dala, and a fairly common breeding visitor at Balkash. Our records from Balkash appear to represent a slight range extension to the species' known breeding range. Most consulted sources map the species as breeding along the western shore of lake Balkash, as well as *c*100 km to the east of our study area in the vicinity of lake Alakol (*eg* Ayé *et al* 2012, IUCN 2017, Kazakhstan birdwatching community 2017), but not in the vicinity of the far-eastern shore of Balkash. Wassink (2015b) notes that the species occurs as far north as the town of Aktogay, close to our study site. However, given the species is not indicated to occur here in most consulted sources, we highlight it here as a record of interest.

Corn Bunting *Emberiza calandra*. A locally common resident at all of our sites, except Betpak-Dala where it is an uncommon resident. Our records from Betpak-Dala appear to represent a range extension for this species, with consulted sources mapping it resident throughout far-southern Kazakhstan, the Syr Darya valley, and (by most, although not all sources) in the eastern Balkash region (Ayé *et al* 2012, IUCN 2017, Kazakhstan birdwatching community 2017). We could find no other report of this species occurring in the section of Betpak-Dala north of the Chu river.

Vagrants

Red Knot *Calidris canutus*. Four individuals seen in a freshwater pool surrounded by open steppe at Balkash May 2011.

Mediterranean Gull *Ichthyaetus melanocephalus*. A single adult in breeding plumage observed on the Caspian sea coast 13 May 2009.

White's Thrush *Zoothera aurea*. A single individual seen in wetlands near a water processing plant at Betpak-Dala 20 May 2017 (www.hbw.com/ibc/1392292).

Red-flanked Bluetail *Tarsiger cyanurus*. A single individual seen at Betpak-Dala in the same locality as the White's Thrush 18 May 2016 (www.hbw.com/ibc/1395658).

DISCUSSION

The records reported in this paper represent the most comprehensive account of the avifauna of the arid and semi-arid steppes (and associated habitats) of southern

Kazakhstan compiled in recent decades, being based on over 12 000 h of survey effort conducted over multiple years. Our results cast new light on these poorly-explored areas, especially with respect to the 21 potential new species range extensions.

There has been a noticeable rise in threatened and near-threatened species inhabiting the Central Asian steppes in recent years. Of the 28 species listed in Table 1 as being threatened or near-threatened by the IUCN (2017), ten (35.7%) have had their threat category upgraded in the last two years. The principal causes of this rise in threatened species appear to be habitat loss and alteration, hunting, and infrastructure development—all of which are associated with rapid demographic and economic growth occurring in Kazakhstan (Kamp *et al* 2016). These status changes reflect an increasing urgency for addressing regional conservation priorities (Krever *et al* 1998, Chemonics International 2001).

While our results provide important data on the birds of the southern Kazakhstan steppes, they also possess limitations which could be addressed with further fieldwork in the study areas. Perhaps the most significant of these limitations is the heavily skewed fieldwork bias towards some of our study sites compared to others. Given that 72% of total survey effort was directed towards Betpak-Dala, it is perhaps not surprising that we detected the greatest number of species here. Conversely, the fairly low species counts at the Caspian and Kyzylkum sites are in likelihood a result of the 4% and 3% of survey effort in these areas respectively. Some of our relative abundance categories for these two sites in particular may also be somewhat influenced by our spending less time surveying in these areas. As such, the species lists for Caspian and Kyzylkum in particular should be considered as collections of observations rather than comprehensive inventories, and it is highly likely that further fieldwork here would result in an increase in the number of species records, as well as a refinement of the abundance categories we assign here.

Other species are likely to remain undetected due to other forms of bias in our fieldwork methods, which were also apparent in our earlier Uzbekistan study (Martin *et al* 2014). One such bias is our focus towards the open steppe habitats where bustard survey protocols were conducted, with a corresponding lesser effort expended towards the wetlands, dune fields, Saxaul forests and hills of our study sites. These could potentially include rare, poorly-studied species such as Saxaul Sparrow *Passer ammodendri*, which is indicated as occurring in areas of the Kyzylkum desert adjacent to our study site (BirdLife International 2017a), or Pander's Ground-Jay *Podoces panderi*, which range maps indicate as occurring near the vicinity of our Balkash study site (Ayé *et al* 2012, BirdLife International 2017c). Our survey effort in Kazakhstan was also strongly weighted towards the spring and early summer months, and as such certain wintering species may have been overlooked *eg* Snowy Owl *Bubo scandiacus*, Yellowhammer *Emberiza citrinella* and Twite *Carduelis cannabina* which are all indicated to winter at Balkash and/or Betpak-Dala (Ayé *et al* 2012, BirdLife International 2017c) but were not recorded during our fieldwork. The vast bulk of our records were also made during daylight hours, with no specialist survey effort being dedicated towards the surveying of nocturnal birds. This could also have led to some other species being overlooked, such as Pallid Scops Owl *Otus brucei*, which we never observed, despite it being indicated to occur at Balkash by Ayé *et al* (2012) and Wassink (2015b).

In summary, the results of this paper provide valuable information regarding the avifaunal communities occurring in our study areas, including particularly noteworthy data regarding regional range extensions and species of global conservation concern. However, further fieldwork targeting specific habitats, seasons, time periods, and species groups is necessary in order to create a fully comprehensive inventory of these communities. Further work is also required to improve the accuracy of our relative

abundance estimates for certain species, and the completeness of our knowledge of breeding species in the region. We plan to produce periodic updates to the observations summarized in this paper as future field seasons yield further information regarding the diverse yet poorly-studied bird communities inhabiting the arid and semi-arid steppes of southern Kazakhstan.

ACKNOWLEDGEMENTS

This project was completed with the support of the Sheikh Khalifa Houbara Breeding Centre (SKHBC), under the management of Reneco for Wildlife Preservation (www. reneco.org). We are grateful to HH Sheikh Khalifa, founder of SKHBC, for his support. We greatly thank Frédéric Lacroix, Romain Guerin and Yves Hingrat, respectively general manager of Reneco, project manager of SKHBC, and head of Reneco's ecology and conservation department. We would also like to thank staff involved in data collection, and particularly ecology coordinators Eric Le Nuz and Cédric Ferlat. Finally, we thank an anonymous reviewer for helpful and constructive comments on an earlier version of this paper.

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